# GROUP 17

# ENGINE AND EMISSION CONTROL

## CONTENTS



**Continued on next page**

**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 INFORMATION

M1171000100329

A cable-type accelerator mechanical suspended-type pedal has been adopted.

## SERVICE SPECIFICATIONS

M1171000300130

| Items | | | Standard value |
|---|---|---|---|
| Accelerator cable play mm | | | 1.0 – 2.0 |
| Engine idle speed r/min | 4G63 | | 750 ± 100 |
| | 4G69 | M/T | 680 ± 100 |
| | | A/T | 750 ± 100 |

## TROUBLESHOOTING

### INTRODUCTION TO ENGINE CONTROL SYSTEM DIAGNOSIS

M1171002000287

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

### ENGINE CONTROL SYSTEM DIAGNOSTIC TROUBLESHOOTING STRATEGY

M1171002100314

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an engine control system fault.

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

### SYMPTOM CHART

M1171002200333

| Symptom | Inspection procedure | Reference page |
|---|---|---|
| Throttle valve will not fully open or close <4G63-Non-Turbo> | 1 | P.17-4 |
| Throttle valve will not fully open or close <4G63-Turbo, 4G69> | 2 | P.17-4 |
| Accelerator pedal operation is not smooth (over acceleration) | 3 | P.17-5 |

# SYMPTOM PROCEDURES

## INSPECTION PROCEDURE 1: Throttle Valve will not Fully Open or Close <4G63-Non-Turbo>

### DIAGNOSIS

**STEP 1. Check the accelerator cable adjustment.**

**Q: Is the accelerator cable properly adjusted?**
**YES :** Go to Step 2.
**NO :** Adjust the accelerator cable (Refer to P.17-6). Then go to Step 3.

**STEP 2. Check the throttle valve.**
Check that the throttle lever of the throttle body assembly moves smoothly by moving it by hand.

**Q: Does the throttle lever of the throttle body assembly move smoothly?**
**YES :** Go to Step 3.
**NO :** Cleaning the throttle body (Refer to GROUP 13A, On-vehicle Service P.13A-315), or replace the throttle body assembly (Refer to GROUP 13A, Throttle Body P.13A-330). Then go to Step 3.

**STEP 3. 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: Throttle Valve will not Fully Open or Close <4G63-Turbo, 4G69>

### DIAGNOSIS

**STEP 1. Check the accelerator cable adjustment.**

**Q: Is the accelerator cable properly adjusted?**
**YES :** Go to Step 2.
**NO :** Adjust the accelerator cable (Refer to P.17-6). Then go to Step 5.

**STEP 2. Check the accelerator pedal position sensor assembly.**
Check that the lever of the accelerator pedal position sensor assembly moves smoothly by moving it by hand.

**Q: Dose the lever of the accelerator pedal position sensor assembly move smoothly?**
**YES :** Go to Step 3.
**NO :** Replace the accelerator pedal position sensor assembly (Refer to P.17-11). Then go to Step 5.

**STEP 3. Check the accelerator pedal position sensor assembly.**
Refer to GROUP 13B, On-vehicle Service P.13C-431 <4G63-Turbo> or GROUP 13C, On-vehicle Service P.13C-431 <4G69>.

**Q: Is the accelerator pedal position sensor assembly normally?**
**YES :** Go to Step 4.
**NO :** Replace the accelerator pedal position sensor assembly (Refer to P.17-11). Then go to Step 5.

**STEP 4. Check the Throttle valve (Throttle valve control servo).**

Refer to GROUP 13B, On-vehicle Service P.13B-400<4G63-Turbo> or GROUP 13C, On-vehicle Service P.13C-436 <4G69>.

**Q: Is the throttle valve control servo normally?**

**YES :** Go to Step 5.

**NO :** Cleaning the throttle body (Refer to GROUP 13B, On-vehicle Service P.13B-390 <4G63-Turbo> or GROUP 13C, On-vehicle Service P.13C-425 <4G69>), or replace the throttle body assembly (Refer to GROUP 13B, Throttle Body P.13B-404 <4G63-Turbo> or GROUP 13C, Throttle Body P.13C-439 <4G69>). Then go to Step 5.

**STEP 5. Retest the system.**

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

**YES :** The procedure is complete.

**NO :** Return to Step 1.

## INSPECTION PROCEDURE 3: Accelerator Pedal Operation is not Smooth (Over Acceleration)

### DIAGNOSIS

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

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

**YES :** Tighten the fasteners. Then go to Step 4.

**NO :** Go to Step 2.

**STEP 2. Check the accelerator cable wiring.**

**Q: Is the accelerator cable routing bent sharply?**

**YES :** Correct the cable routing Then go to Step 4.

**NO :** Go to Step 3.

**STEP 3. Check the accelerator cable lubricant.**

**Q: Is the accelerator cable lubricated sufficiently?**

**YES :** Go to Step 4.

**NO :** Refill or replace the lubricant. Then go to Step 4.

**STEP 4. Retest the system.**

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

**YES :** The procedure is complete.

**NO :** Return to Step 1.

# ON-VEHICLE SERVICE

## ACCELERATOR CABLE CHECK AND ADJUSTMENT

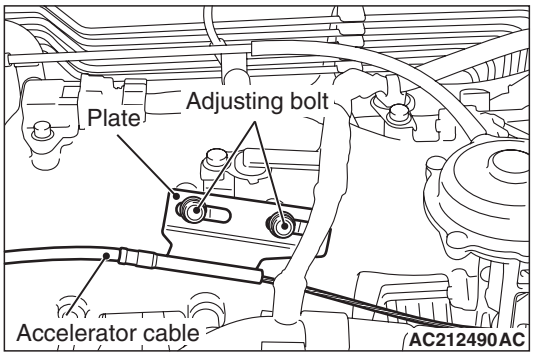
M1171000900574

### <4G63-NON-TURBO>

1. Turn A/C and lights OFF. Inspect and adjust at no load.
2. Warm engine until stabilized at idle.
3. Confirm idle speed is at standard value.

   **Standard value: 750 ± 100 r/min**
4. Stop engine. [ignition switch: LOCK (OFF) position].
5. Confirm there are no sharp bends in the accelerator cable.
6. Check the inner cable for correct slack.

   **Standard value: 1.0 – 2.0 mm**



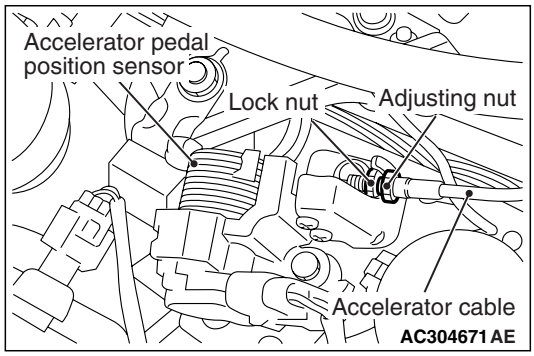

7. If there is too much slack or no slack, adjust play by the following procedures.
   (1) Loosen the adjusting bolts to release the cable.
   (2) Move the plate until the inner cable play is at the standard value, and then tighten the adjusting bolts.
   (3) After adjusting, check that the throttle lever is touching the stopper.

### <4G63-TURBO, 4G69>

1. Turn A/C and lights OFF. Inspect and adjust at no load.
2. Warm engine until stabilized at idle.
3. Confirm idle speed is at standard value.

   **Standard value:**
   **680 ± 100 r/min <4G69-M/T>**
   **750 ± 100 r/min <4G63-Turbo, 4G69-A/T>**
4. Stop engine. [ignition switch: LOCK (OFF) position].
5. Confirm there are no sharp bends in the accelerator cable.
6. Check the inner cable for correct slack.

   **Standard value: 1.0 – 2.0 mm**




7. If there is too much slack or no slack, adjust play by the following procedures.
   (1) Loosen the lock nut and adjusting nut to release the cable.
   (2) Tighten the adjusting nut until the inner cable play is at the standard value, and then tighten the lock nut.

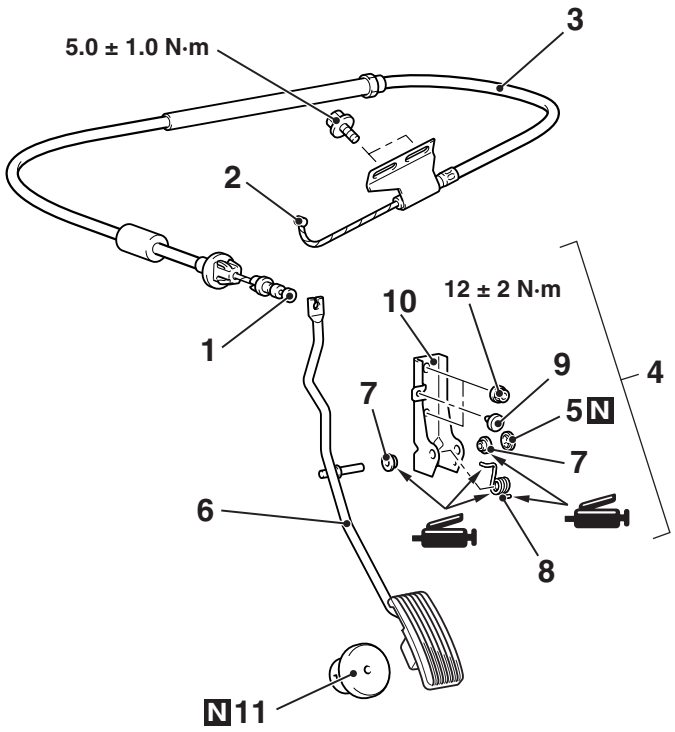
# ACCELERATOR CABLE AND PEDAL

## REMOVAL AND INSTALLATION

M1171001200749

**Post-installation Operation**
Adjusting the Accelerator Cable (Refer to P.17-6).

### <4G63-Non-Turbo>



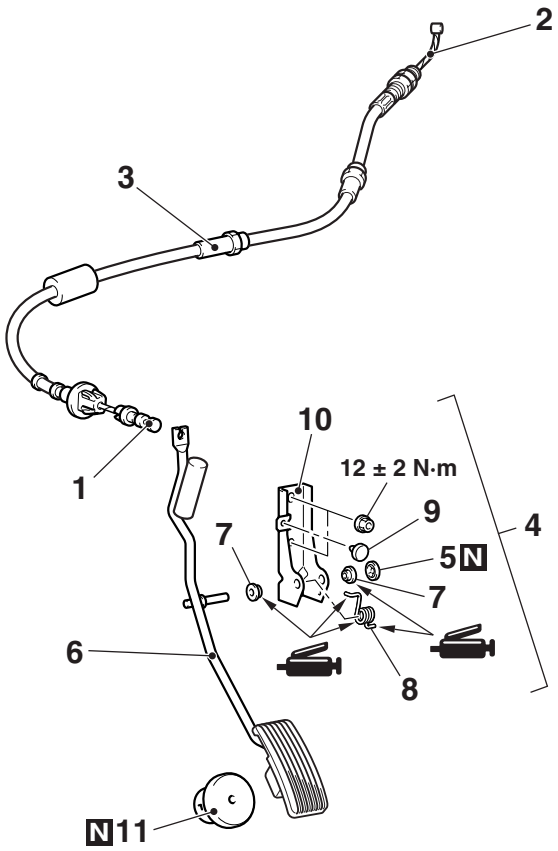

AC309483 AC

**Accelerator cable assembly removal steps**
1. Inner cable connection (Accelerator pedal side)
2. Inner cable connection (Throttle body side)
3. Accelerator cable assembly

**Accelerator pedal assembly removal steps**
1. Inner cable connection (Accelerator pedal side)
4. Accelerator pedal assembly
5. Push-on spring nut
6. Accelerator pedal arm
7. Bushing
8. Spring
9. Stopper
10. Accelerator pedal bracket

>>**A**<< 11. Accelerator pedal arm stopper

## <4G63-Turbo>




AC400920AC

**Accelerator cable assembly removal steps**

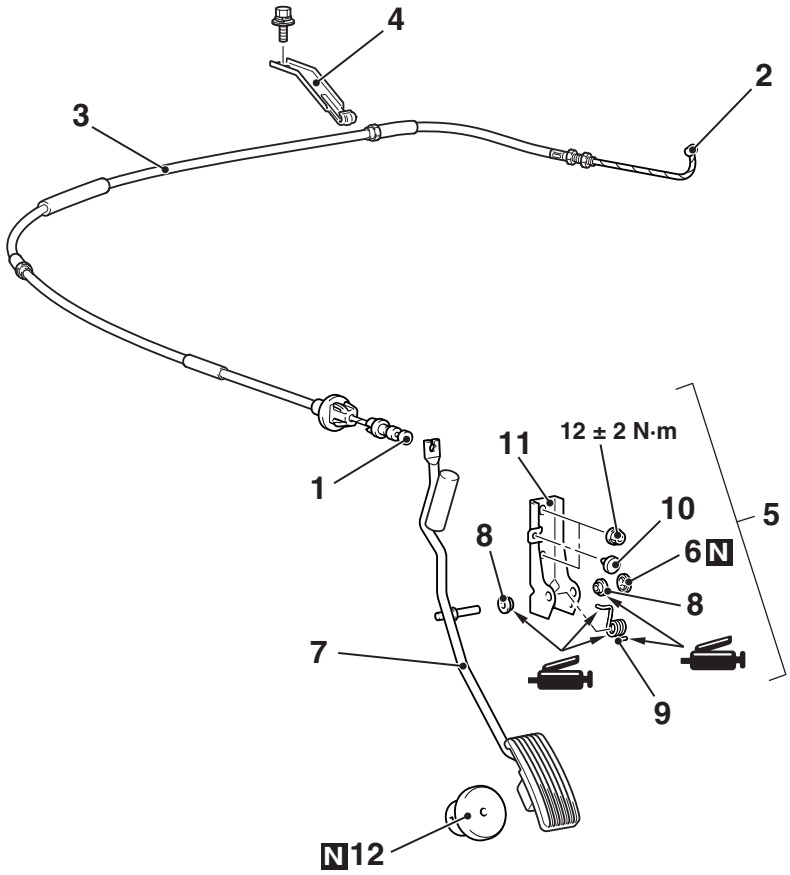
1. Inner cable connection (Accelerator pedal side)
2. Inner cable connection (Accelerator pedal position sensor side)
3. Accelerator cable assembly

**Accelerator pedal assembly removal steps**

1. Inner cable connection (Accelerator pedal side)
4. Accelerator pedal assembly
5. Push-on spring nut
6. Accelerator pedal arm
7. Bushing
8. Spring
9. Stopper
10. Accelerator pedal bracket

>>**A**<< 11. Accelerator pedal arm stopper

**<4G69>**




AC309484AC

**Accelerator cable assembly removal steps**

1. Inner cable connection (Accelerator pedal side)
2. Inner cable connection (Accelerator pedal position sensor side)
3. Accelerator cable assembly
4. Accelerator cable bracket

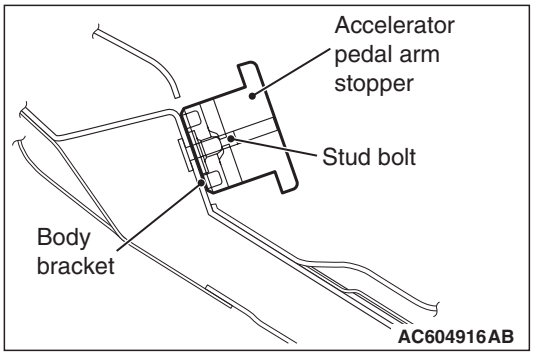
**Accelerator pedal assembly removal steps**

1. Inner cable connection (Accelerator pedal side)
5. Accelerator pedal assembly
6. Push-on spring nut
7. Accelerator pedal arm
8. Bushing
9. Spring
10. Stopper
11. Accelerator pedal bracket

>>**A**<< 12. Accelerator pedal arm stopper

## INSTALLATION SERVICE POINT

## >>A<< ACCELERATOR PEDAL ARM STOPPER INSTALLATION




1. Insert the accelerator pedal arm stopper straight into the stud bolt of the floor.
2. Install the accelerator pedal arm stopper securely by turning it clockwise until its underside contacts with the body bracket as shown in the figure.
3. After the installation, slightly pull the accelerator pedal arm stopper by hand to check that it cannot be removed easily (appropriate holding power: 100 N or more).

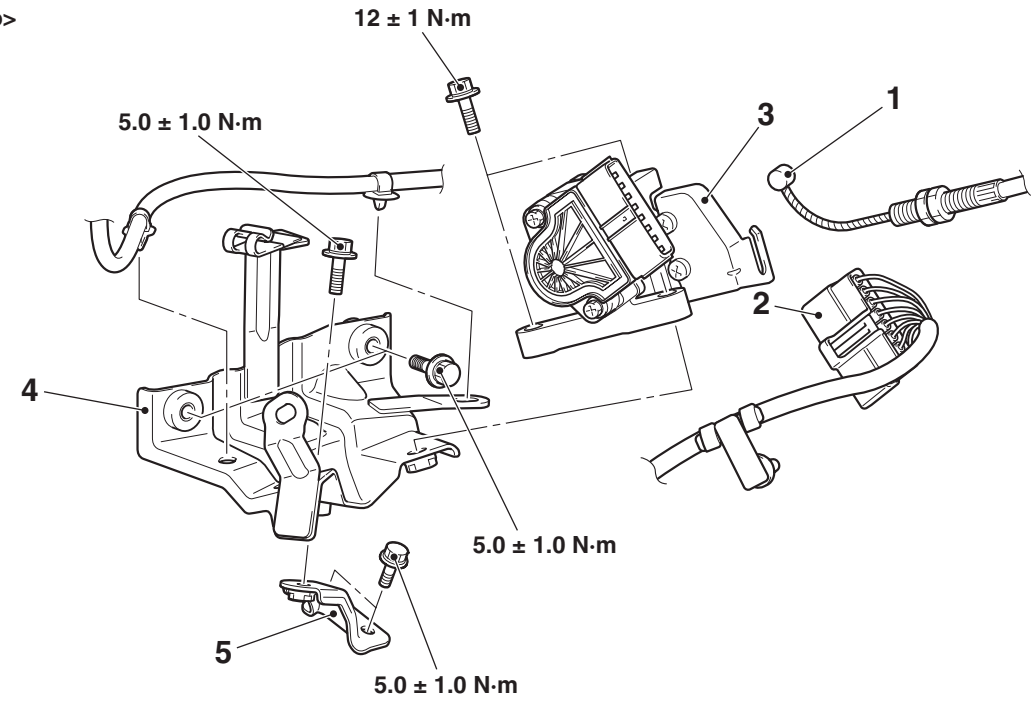
# ACCELERATOR PEDAL POSITION SENSOR <4G63-Turbo, 4G69>

## REMOVAL AND INSTALLATION

M1171001800064

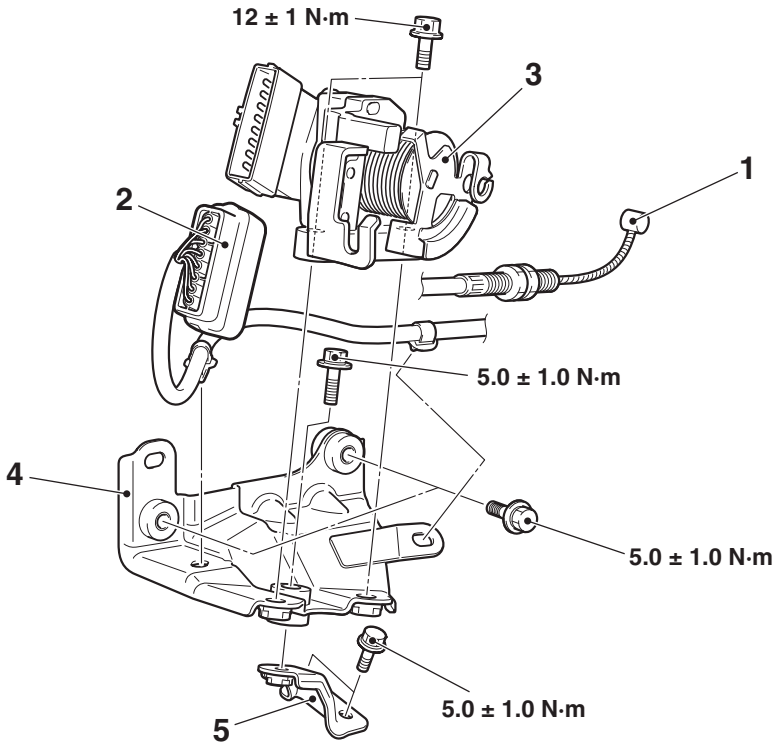
**Post-installation Operation**
Adjusting the Accelerator Cable (Refer to P.17-6).

<4G63-Turbo>




AC400921AB

<4G69>




AC305408AD

**Removal steps**

1. Inner cable connection (Accelerator pedal position sensor side)
2. Accelerator pedal position sensor connector
3. Accelerator pedal position sensor assembly

**Removal steps (Continued)**

4. Accelerator pedal position sensor bracket
5. Accelerator pedal position sensor bracket support

# AUTO-CRUISE CONTROL

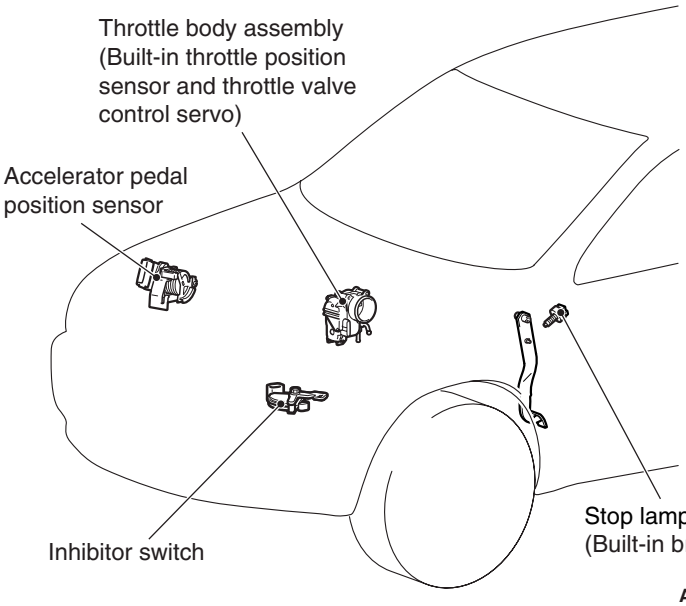
## GENERAL INFORMATION

M1172000100515

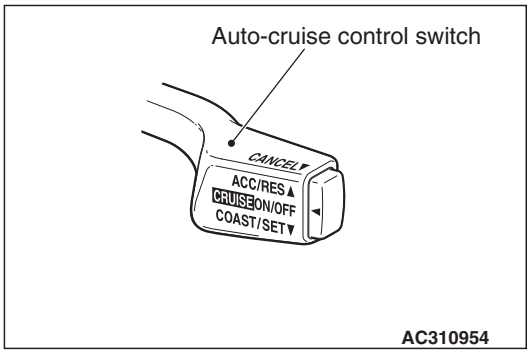
By using the auto-cruise control, the driver can drive at preferred speeds in a range of approximately 40 to 200 km/h without depressing the accelerator pedal.

For this auto-cruise control system, in conjunction with the electronic throttle valve control system, the engine-A/T-ECU electronically controls the throttle valve.

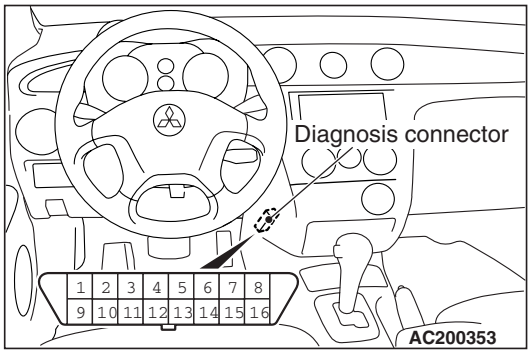
## CONSTRUCTION DIAGRAM



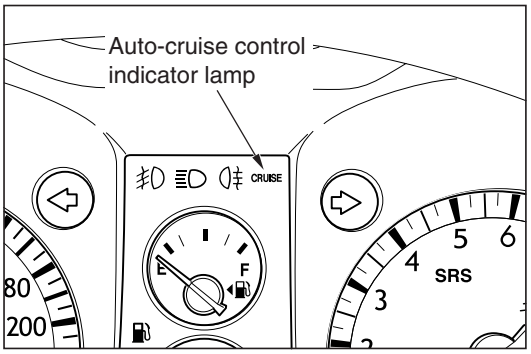

AC304566

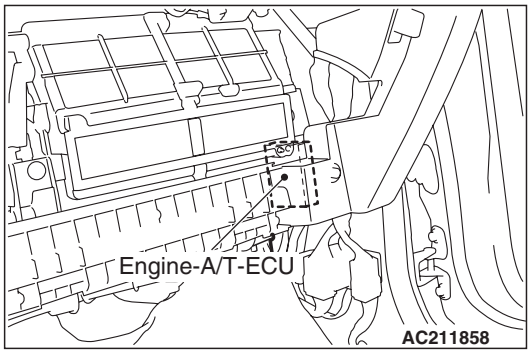



AC310954




AC200353



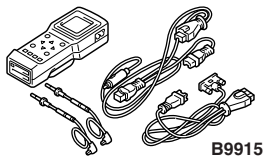
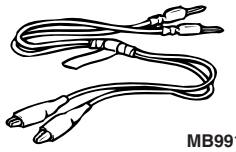
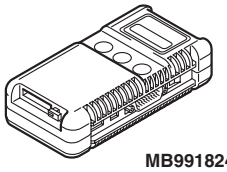
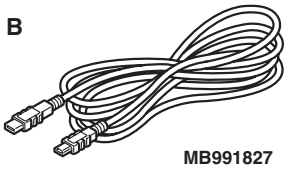
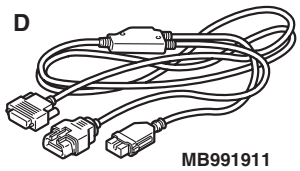
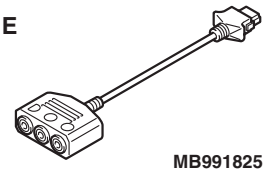
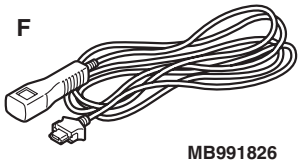



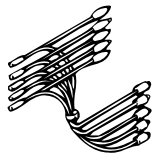

AC211858

AC605098AB

## SPECIAL TOOLS

M1172000600747

| Tool | Number | Name | Use |
|---|---|---|---|
|  B991502 | MB991502 | M.U.T.-II sub assembly | • Reading diagnosis code<br>• Auto-cruise control system check |
|  MB991529 | MB991529 | Diagnosis code check harness | |
| A  MB991824<br>B  MB991827<br>C  MB991910<br>D  MB991911<br>E  MB991825<br>F  MB991826<br>MB991955 | MB991955<br>A: MB991824<br>B: MB991827<br>C: MB991910<br>D: MB991911<br>E: MB991825<br>F: MB991826 | M.U.T.-III sub-assembly<br>A: Vehicle Communication Interface (V. C. I.)<br>B: M.U.T.-III USB cable<br>C: M.U.T.-III main harness A (Vehicles with CAN communication system)<br>D: M.U.T.-III main harness B (Vehicles without CAN communication system)<br>E: M.U.T.-III adapter harness<br>F: M.U.T.-III trigger harness | **⚠ CAUTION**<br>**If you connect M.U.T.-III main harness A to a vehicle without CAN communication system to use the M.U.T.-III, a pulse signal may interfere with the simulated vehicle speed lines, thus causing the M.U.T.-III inoperative. Therefore, use the M.U.T.-III main harness B (MB991911) instead.**<br>Reading diagnosis code |

| Tool | Number | Name | Use |
|---|---|---|---|
|  MB991658 | MB991658 | Test harness | Inspection of data list |

# TROUBLESHOOTING

## DIAGNOSIS TROUBLESHOOTING FLOW

M1172002000417

Refer to GROUP 00 - How to Use Troubleshooting/Inspection Service Points P.00-6.

# DIAGNOSIS FUNCTION

M1172002100384

## METHOD OF READING THE DIAGNOSIS CODE

Use the M.U.T.-II/III to read the diagnosis code (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-6).

## METHOD OF ERASING THE DIAGNOSIS CODE

Use the M.U.T.-II/III to erase the diagnosis code (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-6).

## CHECK CHART FOR DIAGNOSIS CODES

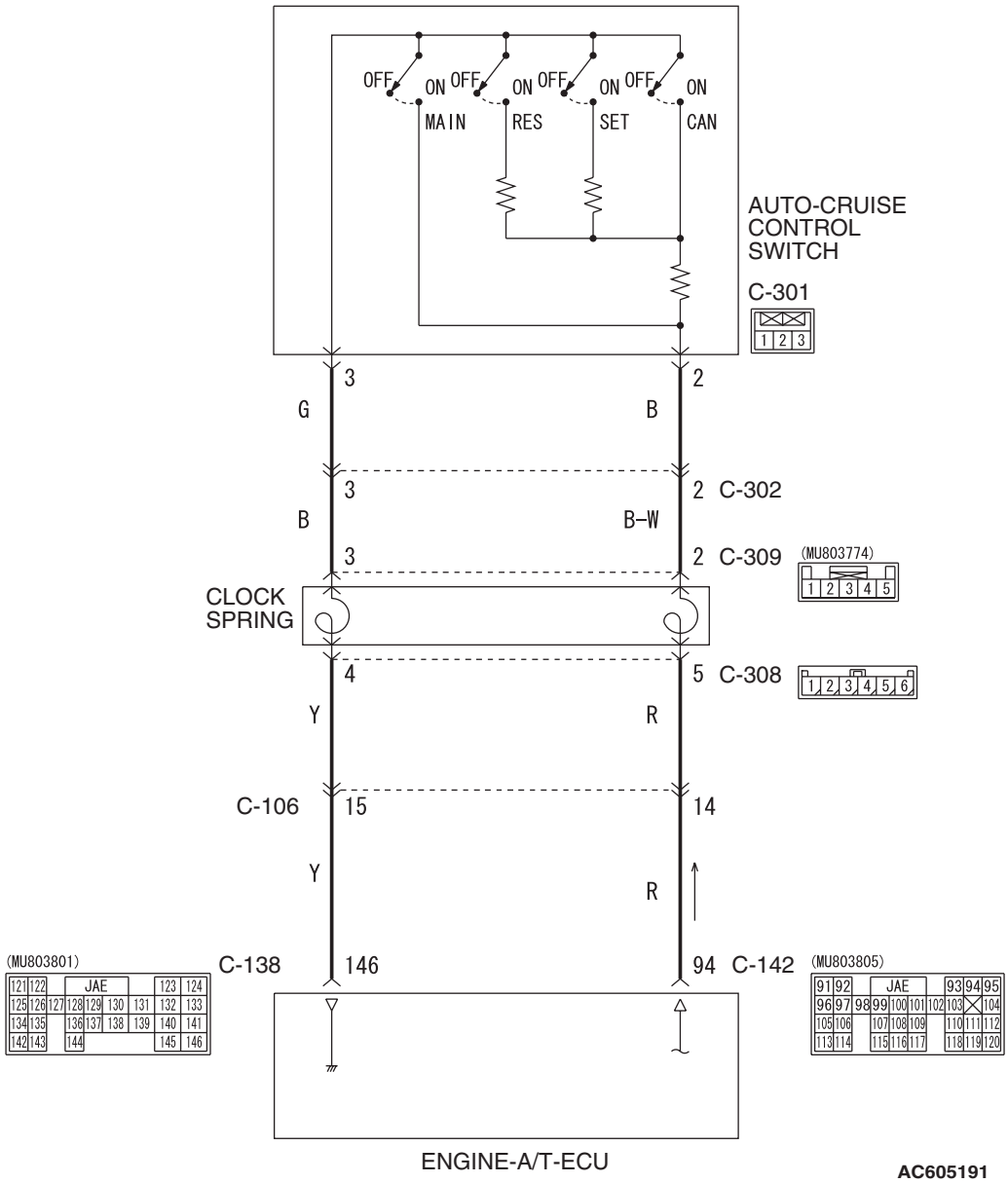
M1172002200381

| Code No. | Diagnosis item | Reference page |
|---|---|---|
| 15 | Auto-cruise control switch system | P.17-16 |
| 21 | Cancel latch signal system | P.17-24 |
| 22 | Stop lamp switch system | P.17-25 |
| 23 | Engine-A/T-ECU and its related components | P.17-34 |

# DIAGNOSTIC TROUBLE CODE PROCEDURES

## Code No.15 Auto-cruise Control Switch System

**Auto-cruise control switch system circuit**




Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet

## OPERATION

This circuit judges the signals of each switch (SET, RESUME and CANCEL) of the auto-cruise control switch. The engine-A/T-ECU detects the state of the auto-cruise control switch by sensing the voltages shown below.

- When all switches are OFF: 4.7 – 5.0 volts
- When the MAIN switch is ON: 0 – 0.3 volt
- When the SET switch is ON: 2.0 – 2.8 volts
- When the RESUME switch is ON: 3.3 – 4.1 volts
- When the CANCEL switch is ON: 0.8 – 1.5 volts

## DIAGNOSIS CODE SET CONDITIONS

If the auto-cruise control switch is operated, this diagnosis code will be set when the engine-A/T-ECU terminal voltage is different from the standard value.

## POSSIBLE CAUSES

- Malfunction of the auto-cruise control switch.
- Malfunction of the clock spring.
- Damaged harness or connector.
- Malfunction of the engine-A/T-ECU.

## DIAGNOSIS

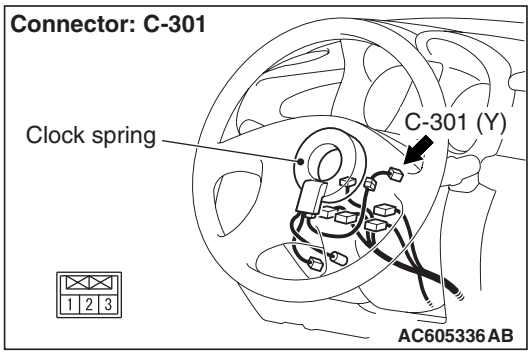
**STEP 1. M.U.T.-II/III data list**

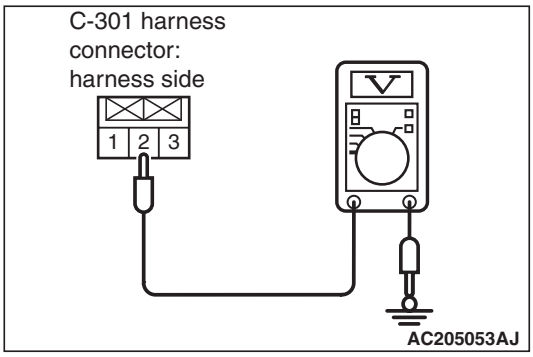
- Item 01: Main switch (Refer to data list reference table P.17-44).
- Item 02: Set switch (Refer to data list reference table P.17-44).
- Item 03: Resume switch (Refer to data list reference table P.17-44).
- Item 04: Cancel switch (Refer to data list reference table P.17-44).

**Q: Is the check result normal?**
**YES :** Go to Step 17.
**NO :** Go to Step 2.

**STEP 2. Measure the voltage at auto-cruise control switch connector C-301.**

(1) Remove the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136).
(2) Connect the negative (–) battery cable.
(3) Turn the ignition switch to the "ON" position and the MAIN switch to the "OFF" position.



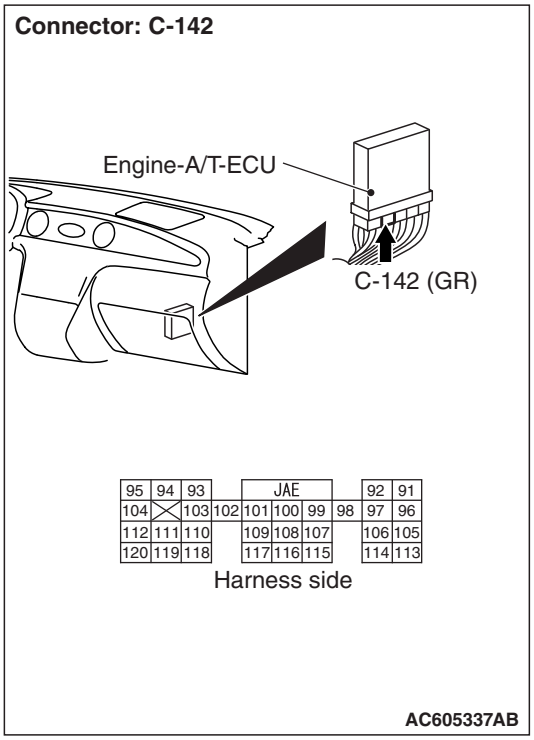



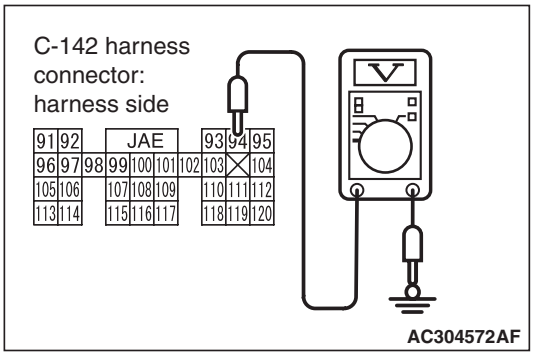

(4) Measure the voltage between connector C-301 terminal No.2 and earth.
**OK: 4.7–5.0 V**
(5) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the check result normal?**
**YES :** Go to Step 9.
**NO :** Go to Step 3.

**STEP 3. Measure the voltage at engine-A/T-ECU connector C-142.**

(1) Turn the ignition switch to the "ON" position and the MAIN switch to the "OFF" position.




(2) Measure the voltage between engine-A/T-ECU connector C-142 terminal No.94 and earth.

**OK: 4.7–5.0 V**

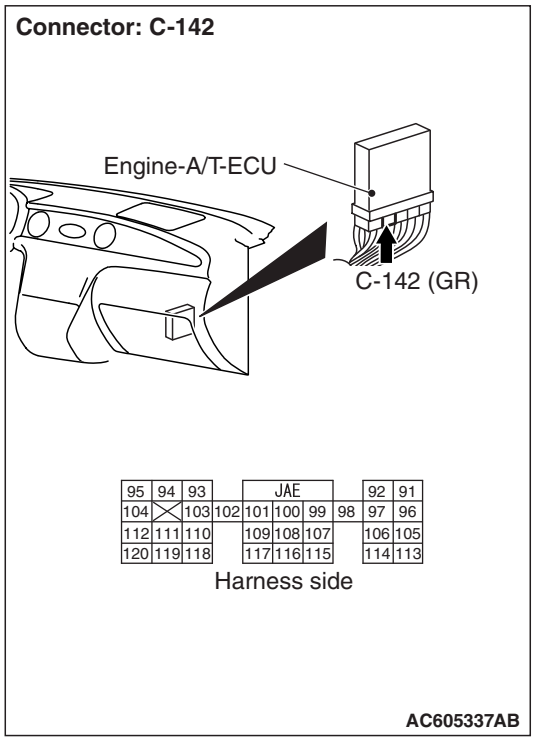
(3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the check result normal?**

**YES : .** Go to Step 6.

**NO : .** Go to Step 4.

**STEP 4. Connector check: C-142 engine-A/T-ECU connector**

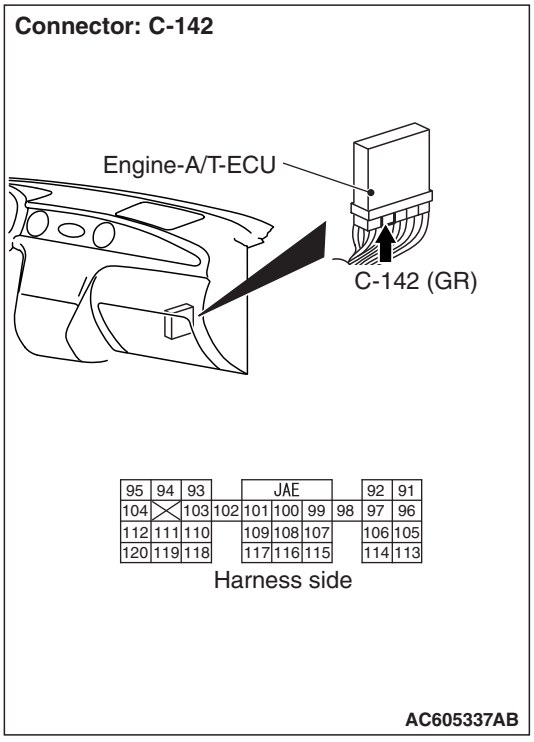



**Q: Is the check result normal?**

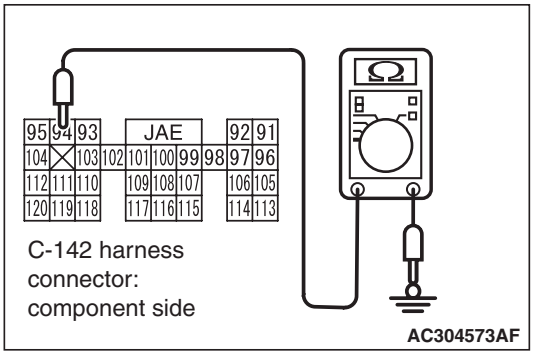
**YES :** Go to Step 5.

**NO :** Repair or replace the faulty connector, and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.

**STEP 5. Check the harness between engine-A/T-ECU connector C-142 terminal No.94 and the auto-cruise control switch connector C-301 terminal No.2.**



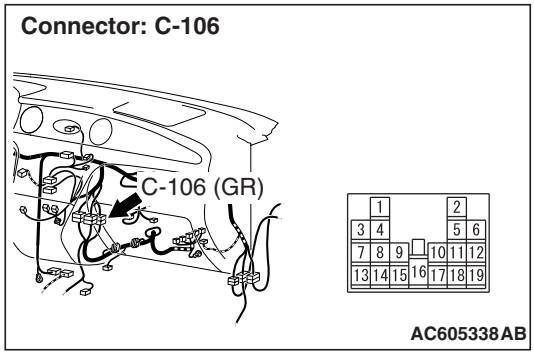

(1) Disconnect engine-A/T-ECU connector C-142 and measure at the harness connector side.
(2) Turn the ignition switch to the "ON" position and the MAIN switch to the "OFF" position.

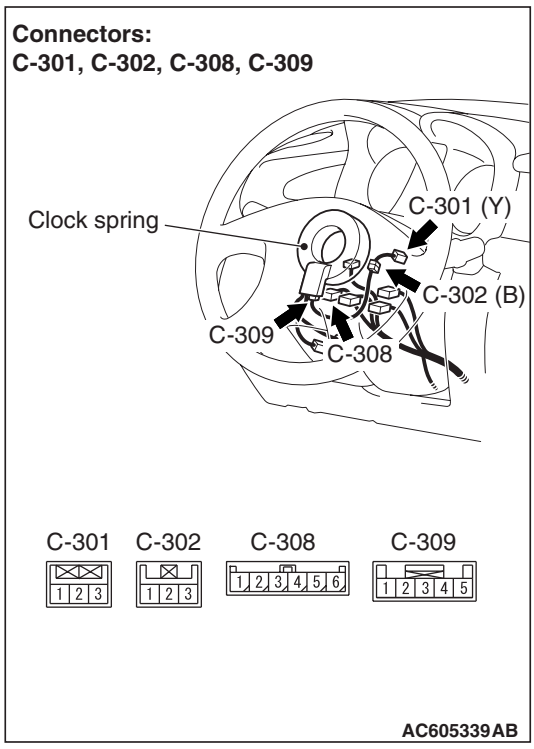



(3) Measure the continuity between engine-A/T-ECU connector C-142 terminal No.94 and earth.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Connect engine-A/T-ECU connector C-142.

**Q: Is the measured continuity open circuit?**
**YES :** Install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 17.
**NO :** Go to Step 6.

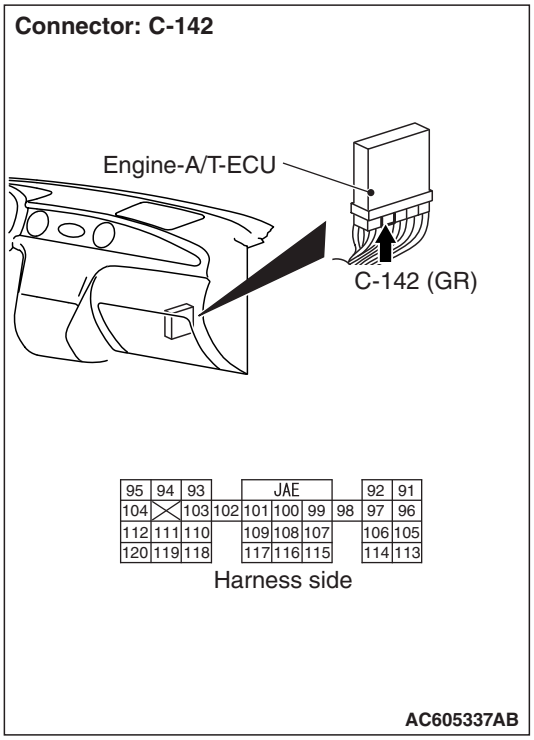
**STEP 6. Connectors check: C-301 auto-cruise control switch connector, C-106 and C-302 intermediate connectors, C-308 and C-309 clock spring connectors**

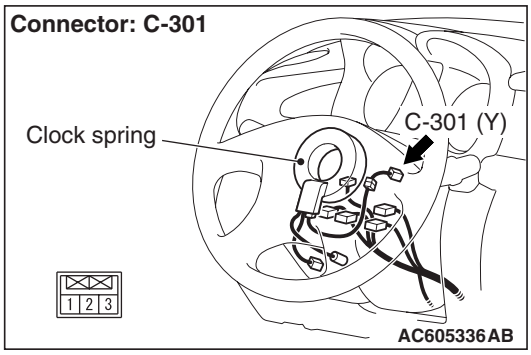



**Q: Is the check result normal?**
**YES :** Go to Step 7.
**NO :** Repair or replace the faulty connector, and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.

**STEP 7. Check the harness between engine-A/T-ECU connector C-142 terminal No.94 and the auto-cruise control switch connector C-301 terminal No.2.**



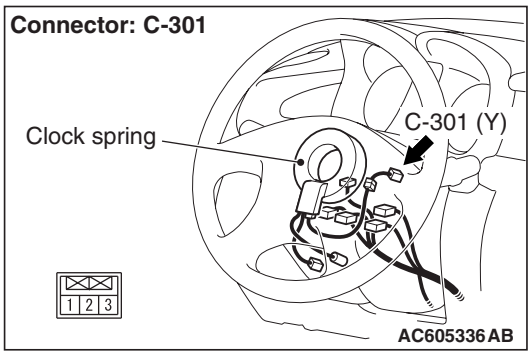



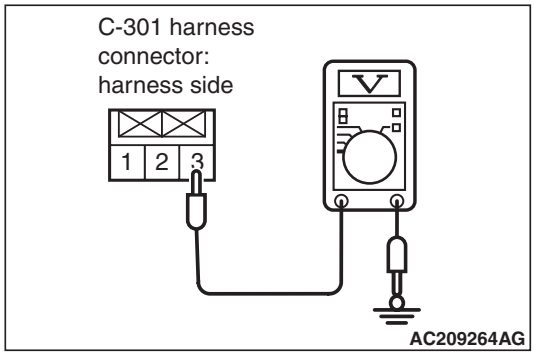

**Q: Is the check result normal?**
**YES :** Go to Step 8.
**NO :** Repair the damaged harness wire, and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.

**STEP 8. Check the clock spring.**
Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136.

**Q: Is the check result normal?**
**YES :** It can be assumed that this malfunction is intermittent, and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.
**NO :** Replace the clock spring and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.

**STEP 9. Measure the voltage at auto-cruise control switch connector C-301.**
(1) Turn the ignition switch to the "ON" position and the MAIN switch to the "ON" position.



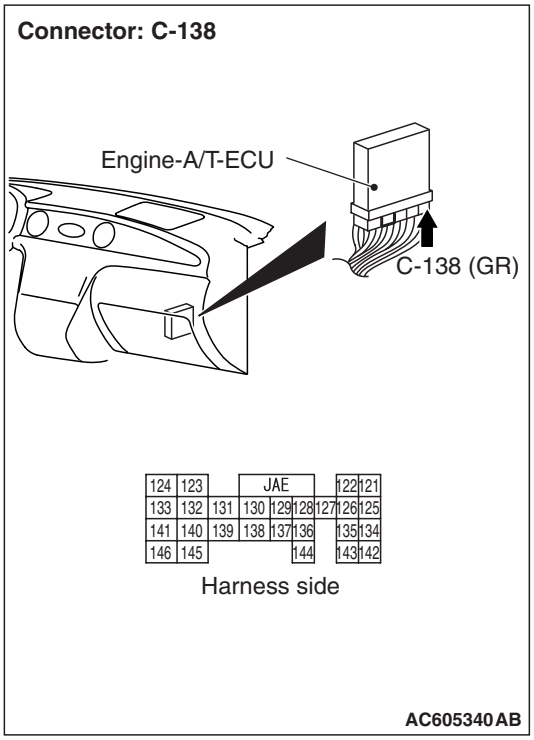



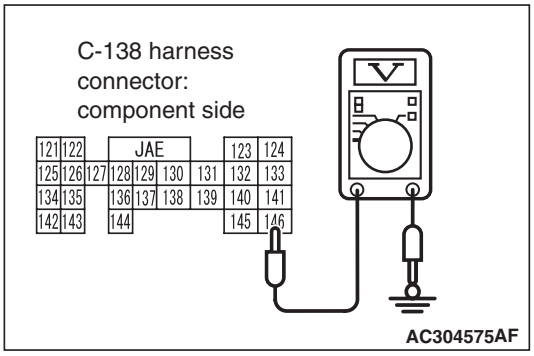

(2) Measure the voltage between connector C-301 terminal No.3 and earth.
**OK: 0.5 V or less**
(3) Turn the MAIN switch to the "OFF" position and the ignition switch to the "LOCK" (OFF) position.

**Q: Is the check result normal?**
**YES :** Go to Step 15.
**NO :** Go to Step 10.

**STEP 10. Measure the voltage at engine-A/T-ECU connector C-138.**

(1) Turn the ignition switch to the "ON" position and the MAIN switch to the "ON" position.




(2) Measure the voltage between engine-A/T-ECU connector C-138 terminal No.146 and earth.

**OK: 0.5 V or less**

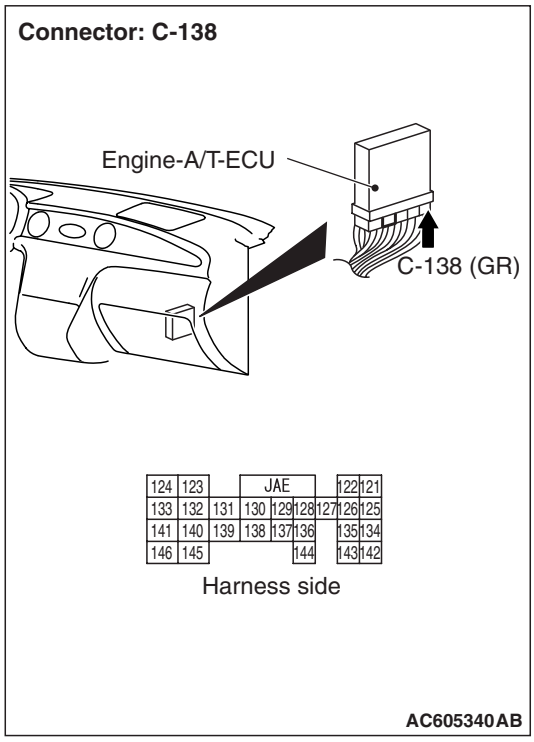
(3) Turn the MAIN switch to the "OFF" position and the ignition switch to the "OFF" position.

**Q: Is the check result normal?**

**YES :** Go to Step 12.

**NO :** Go to Step 11.

**STEP 11. Connector check: C-138 engine-A/T-ECU connector**

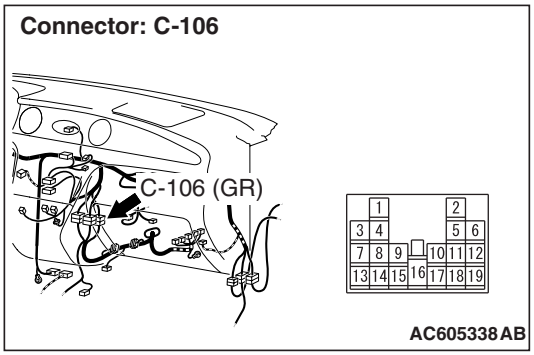


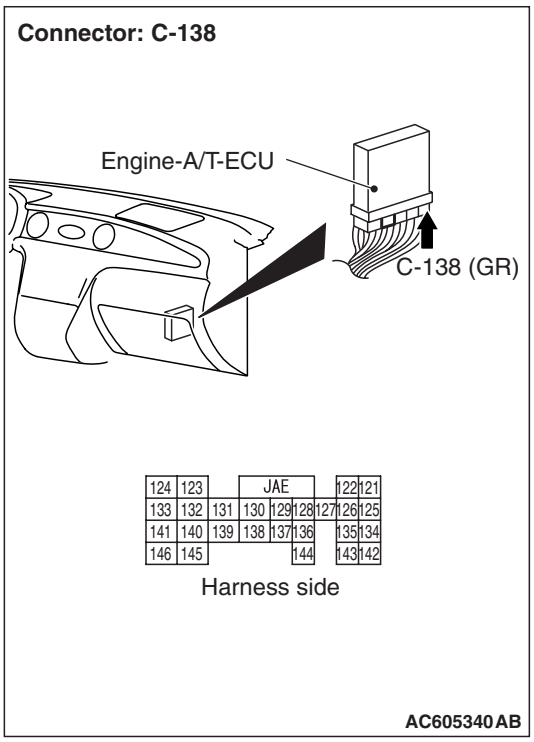

**Q: Is the check result normal?**

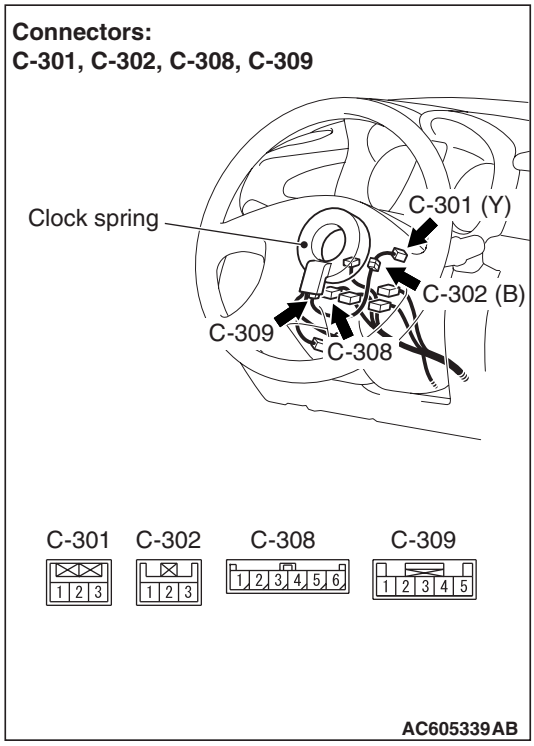
**YES :** Install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 17.

**NO :** Repair or replace the faulty connector, and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.

**STEP 12. Connectors check: C-138 engine-A/T-ECU connector, C-106 and C-302 intermediate connector, C-301 auto-cruise control switch connector, C-308 and C-309 clock spring connectors**



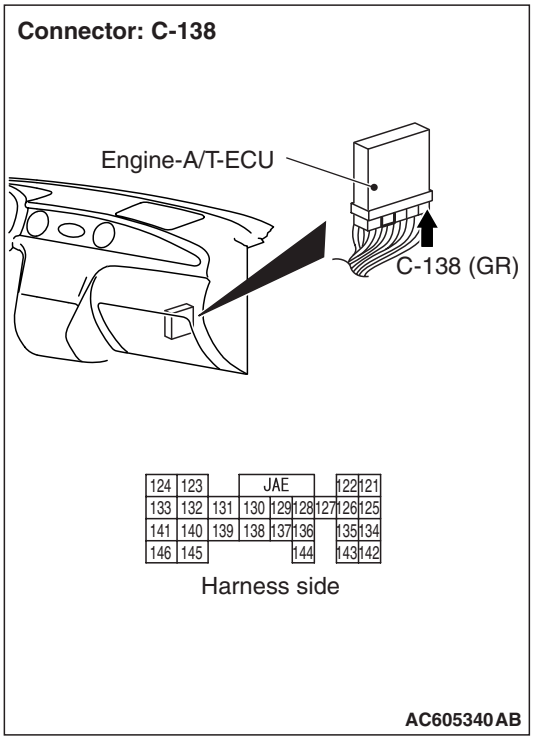



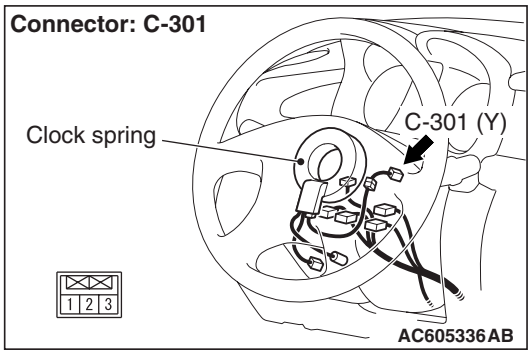

**Q: Is the check result normal?**

**YES :** Go to Step 13.

**NO :** Repair or replace the faulty connector, and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.

**STEP 13. Check the harness between engine-A/T-ECU connector C-138 terminal No.146 and the auto-cruise control switch connector C-301 terminal No.3.**



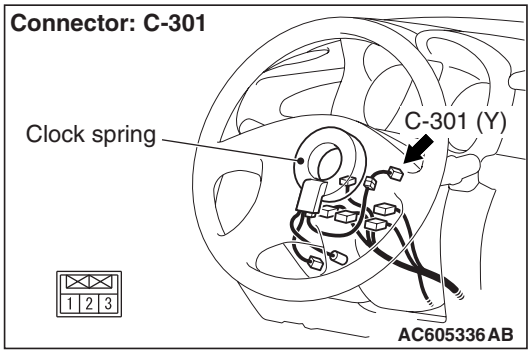




**Q: Is the check result normal?**
**YES :** Go to Step 14.
**NO :** Repair the damaged harness wire, and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.

**STEP 14. Check the clock spring.**
Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136.

**Q: Is the check result normal?**
**YES :** It can be assumed that this malfunction is intermittent, and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.
**NO :** Replace the clock spring and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.

**STEP 15. Connector check: C-301 auto-cruise control switch connector**




**Q: Is the check result normal?**
**YES :** Go to Step 16.
**NO :** Repair or replace the faulty connector, and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.

**STEP 16. Check the auto-cruise control switch.**
Refer to P.17-49.

**Q: Is the check result normal?**
**YES :** Install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 17.
**NO :** Replace the auto-cruise control switch (Refer to P.17-50), and install the air bag module (driver's side) (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136). Then go to Step 18.

**STEP 17. Check the M.U.T.-II/III diagnosis code No.15.**

**Q: Is the M.U.T.-II/III diagnosis code No.15 set?**
**YES :** Replace the engine-A/T-ECU (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECU P.13C-441). Then go to Step 18.
**NO :** It can be assumed that this malfunction is intermittent.

**STEP 18. Check the M.U.T.-II/III diagnosis code No.15.**

**Q: Is the M.U.T.-II/III diagnosis code No.15 set?**
**YES :** Return to Step 1.
**NO :** The procedure is complete.

**Code No.21 Cancel Latch Signal System**

## DIAGNOSIS CODE SET CONDITIONS

The engine-A/T-ECU communicates cancellation retention information between the two microprocessors. This diagnosis code is set when cancellation retention information contains inconsistency.

## POSSIBLE CAUSES

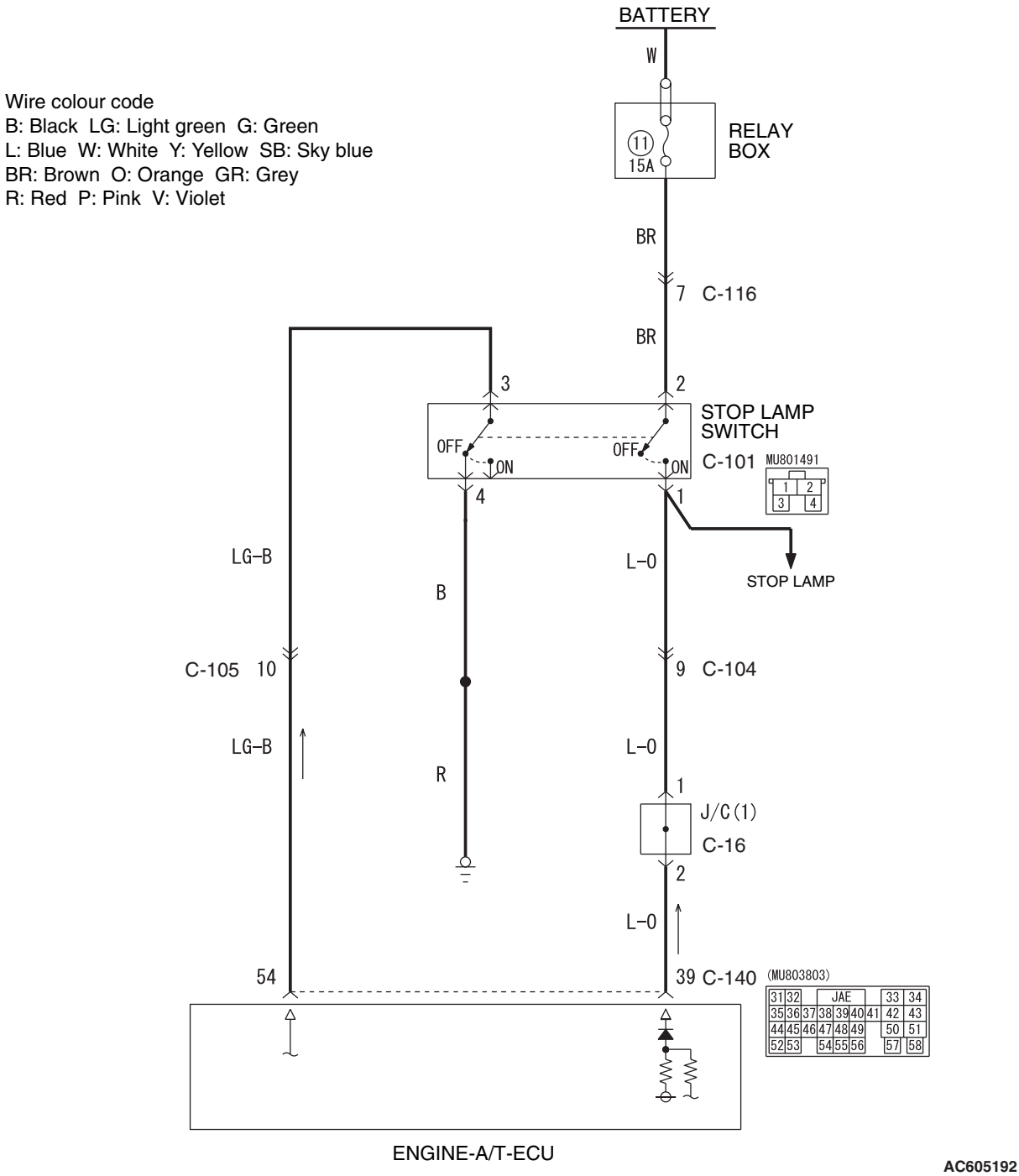
- Malfunction of the engine-A/T-ECU.

## DIAGNOSIS

Replace the engine-A/T-ECU (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECU P.13C-441). Then check that diagnosis code 21 is not set.

## Code No.22 Stop Lamp Switch System

**Stop Lamp Switch System Circuit**




## OPERATION

- Battery positive voltage is supplied to the stop lamp switch (terminal 2 and 4).
- When the brake pedal is depressed, battery positive voltage is applied to the engine-A/T-ECU (terminal 39 and 54).

## DIAGNOSIS CODE SET CONDITIONS

**Check Condition**

- The "CRUISE" indicator light illuminates.

**Judgement Criteria**

- Short in stop lamp switch circuit.
- Open circuit in the brake switch circuit (between engine-A/T-ECU terminal 54 and earth).

## POSSIBLE CAUSES

- Malfunction of the stop lamp switch.
- Damaged harness or connector.
- Malfunction of the engine-A/T-ECU.

## DIAGNOSIS

**STEP 1. M.U.T.-II/III data list**

Item 05: Stop lamp switch (Refer to data list reference table P.17-44).

**Q: Is the check result normal?**

**YES :** Go to Step 14.

**NO :** Go to Step 2.

**STEP 2. Check the stop lamp operation.**

Check the stop lamp operation.

**OK:**

**Brake pedal depressed: Stop lamp will illuminate**

**Brake pedal not depressed: Stop lamp does not illuminate**

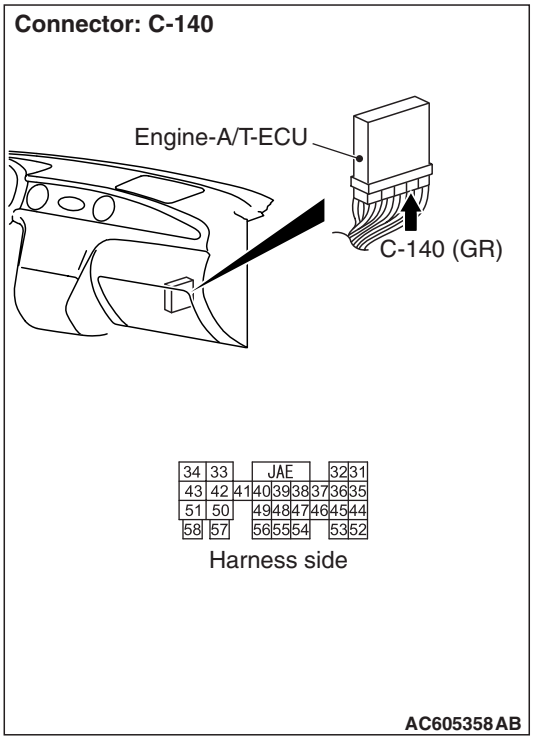
**Q: Is the check result normal?**

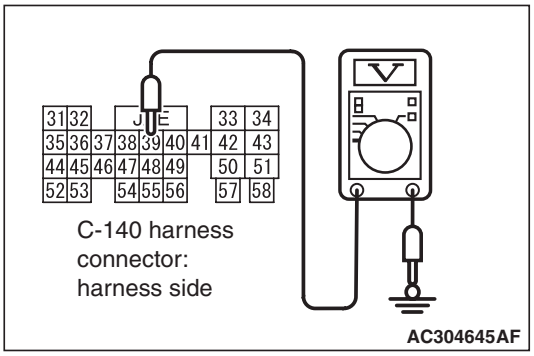
**YES :** Go to Step 3.

**NO :** Go to Step 6.

**STEP 3. Measure the voltage at engine-A/T-ECU connector C-140.**

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




(2) Measure the voltage between engine-A/T-ECU connector C-140 terminal No.39 and earth.

**OK:**

**Brake pedal depressed: System voltage**

**Brake pedal not depressed: 1 V or less**

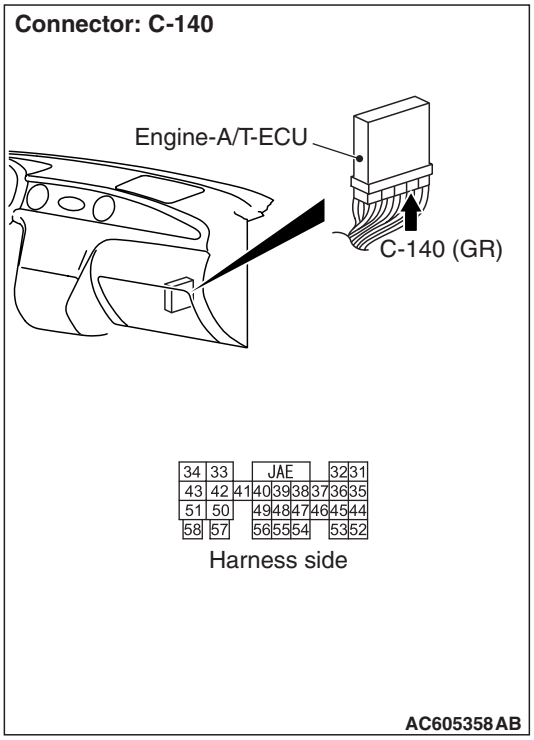
(3) Turn the ignition switch to the "LOCK" (OFF) position.

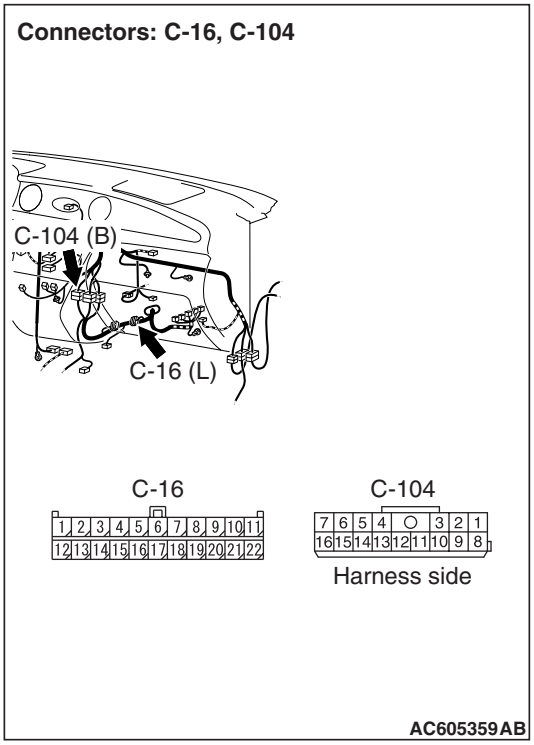
**Q: Is the check result normal?**

**YES :** Go to Step 13.

**NO :** Go to Step 4.

**STEP 4. Connectors check: C-140 engine-A/T-ECU connector, C-16 J/C (1), C-104 intermediate connector**



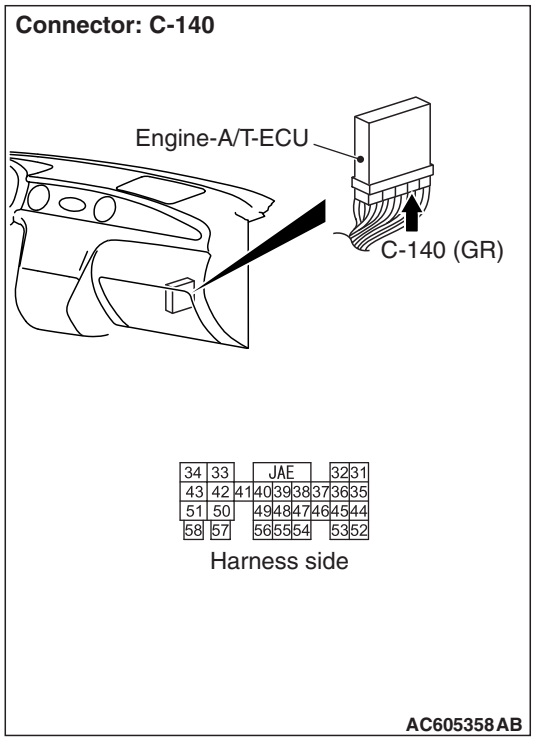



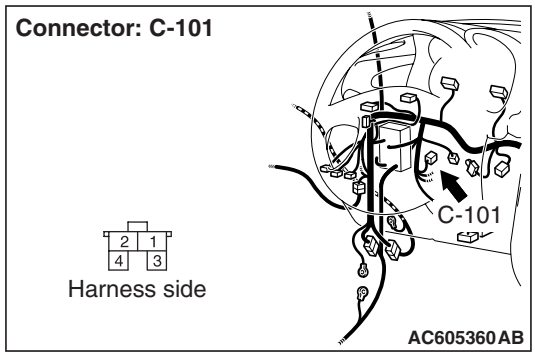

**Q: Is the check result normal?**

**YES :** Go to Step 5.

**NO :** Repair or replace the damaged components. Then go to Step 23.

**STEP 5. Check the harness between engine-A/T-ECU connector C-140 terminal No.39 and stop lamp switch connector C-101 terminal No.1.**



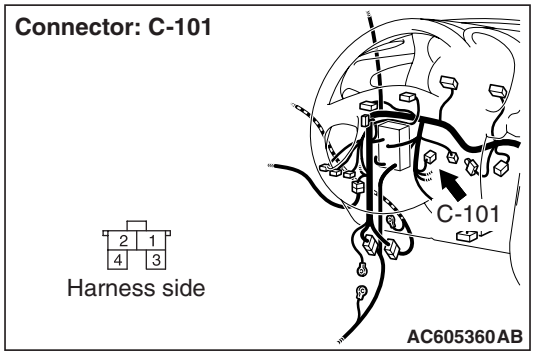




**Q: Is the check result normal?**

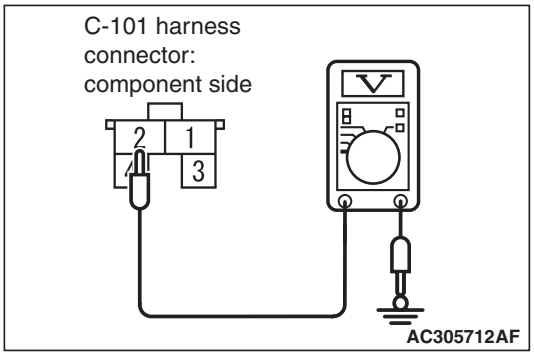
**YES :** Go to Step 13.

**NO :** Repair the damaged harness wire. Then go to Step 23.

**STEP 6. Measure the voltage at stop lamp switch connector C-101.**




(1) Disconnect stop lamp switch connector C-101.



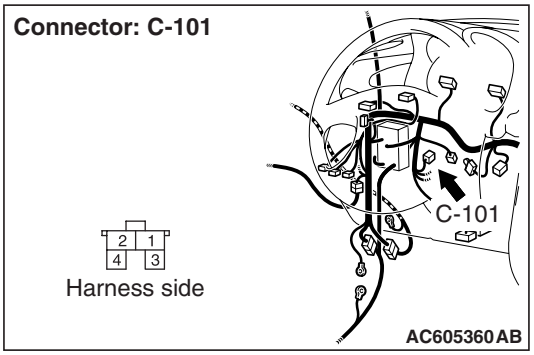

(2) Measure the voltage between stop lamp switch connector C-101 terminal No.2 and earth.

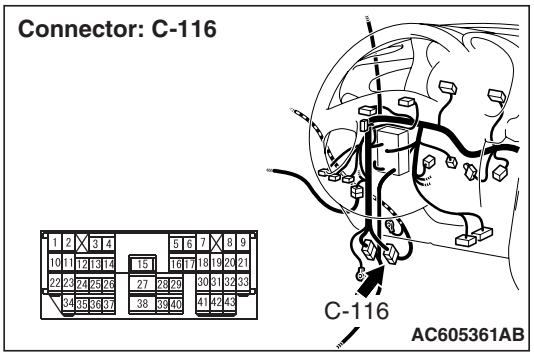
**OK: System voltage**

(3) Connect stop lamp switch connector C-101.

**Q: Is the check result normal?**
**YES :** Go to Step 10.
**NO :** Go to Step 7.

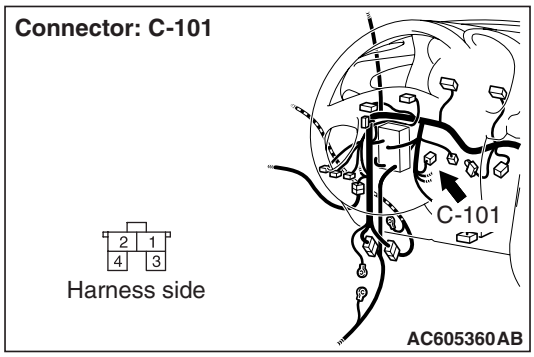
**STEP 7. Connectors check: C-101 stop lamp switch connector, C-116 intermediate connector**

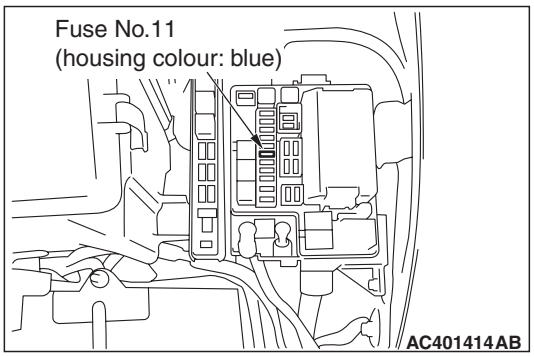



**Q: Is the check result normal?**
**YES :** Go to Step 8.
**NO :** Repair or replace the damaged components. Then go to Step 23.

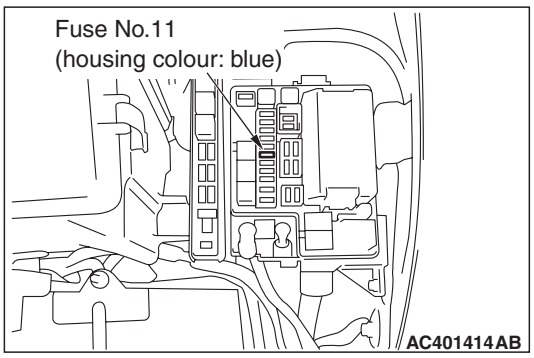
**STEP 8. Check the harness between stop lamp switch connector C-101 terminal No.2 and fuse No.11 at the relay box in engine compartment for damage.**



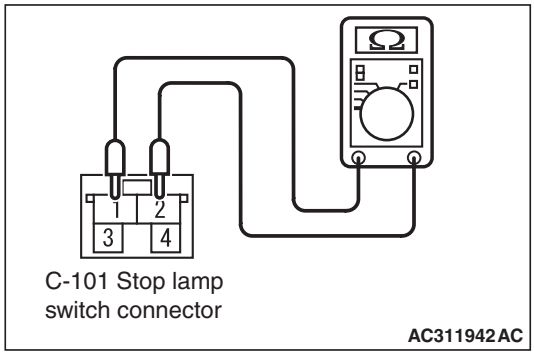

**Q: Is the check result normal?**
**YES :** Go to Step 9.
**NO :** Repair the damaged harness wire. Then go to Step 23.

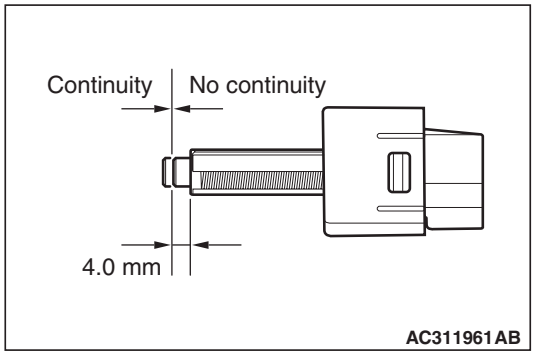
**STEP 9. Check the fuse No.11 at the relay box in engine compartment.**




**Q: Is the check result normal?**
**YES :** Go to Step 10.
**NO :** Check the stop lamp system harness and replace the fuse. Then go to Step 23.

**STEP 10. Check the stop lamp switch.**
(1) Remove the stop lamp switch (Refer to GROUP 35A, Brake Pedal P.35A-12).



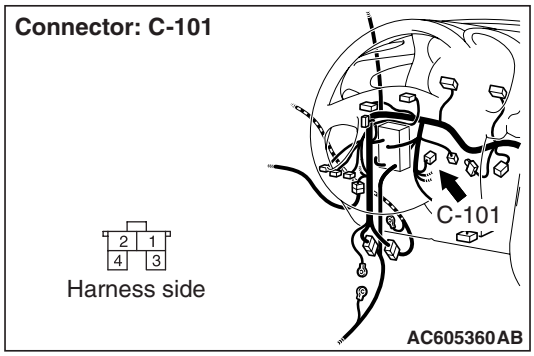



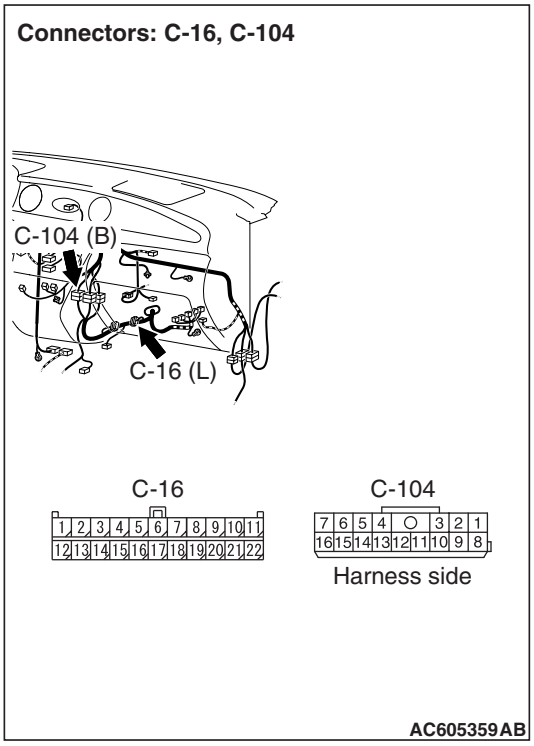

(2) Connect an ohmmeter to the stop lamp switch between terminals 1 and 2.
(3) Check for continuity between the terminals when the plunger of the stop lamp switch is pushed in and when it is released.

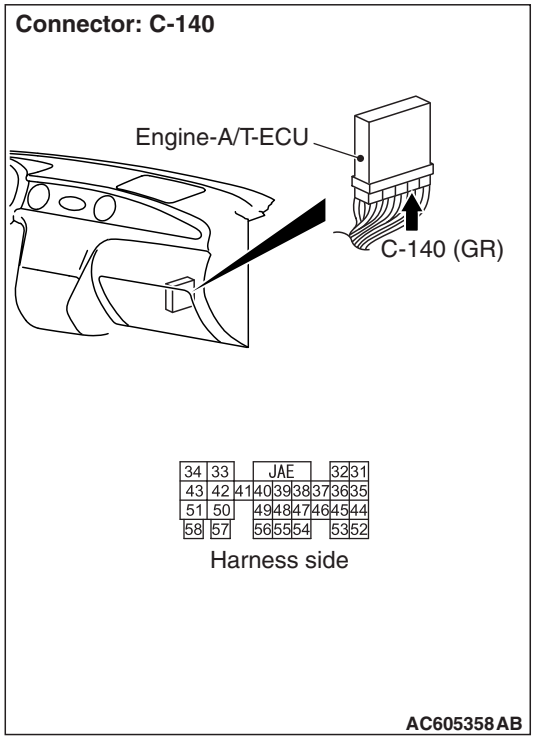
**OK: The stop lamp switch is operating properly if the circuit is open between terminals 1 and 2 when the plunger is pushed in to a depth of within 4.0 mm from the outer case edge surface, and if the resistance value is less than 2 ohms between terminals 1 and 2 when it is released.**

**Q: Is the check result normal?**
**YES :** Install the stop lamp switch (Refer to GROUP 35A, Brake Pedal P.35A-12). Then go to Step 11.
**NO :** Replace the stop lamp switch (Refer to GROUP 35A, Brake Pedal P.35A-12). Then go to Step 23.

**STEP 11. Connectors check: C-101 stop lamp switch connector, C-104 intermediate connector, C-16 J/C (1), C-140 engine-A/T-ECU connector**

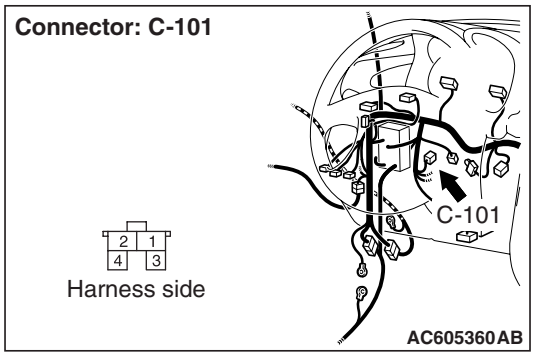


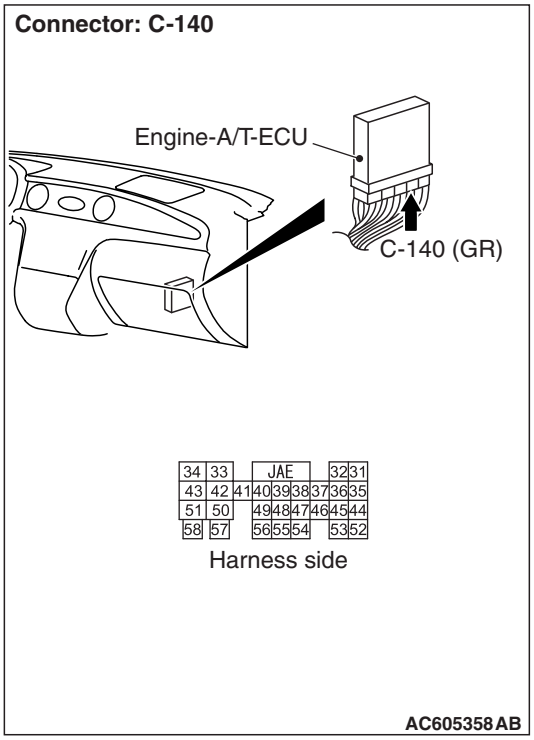




**Q: Is the check result normal?**
**YES :** Go to Step 12.
**NO :** Repair or replace the damaged components. Then go to Step 23.

**STEP 12. Check the harness between stop lamp switch connector C-127 terminal No.1 and engine-A/T-ECU connector C-140 terminal No.39.**




**Q: Is the check result normal?**
**YES :** Go to Step 13.
**NO :** Repair the damaged harness wire. Then go to Step 23.

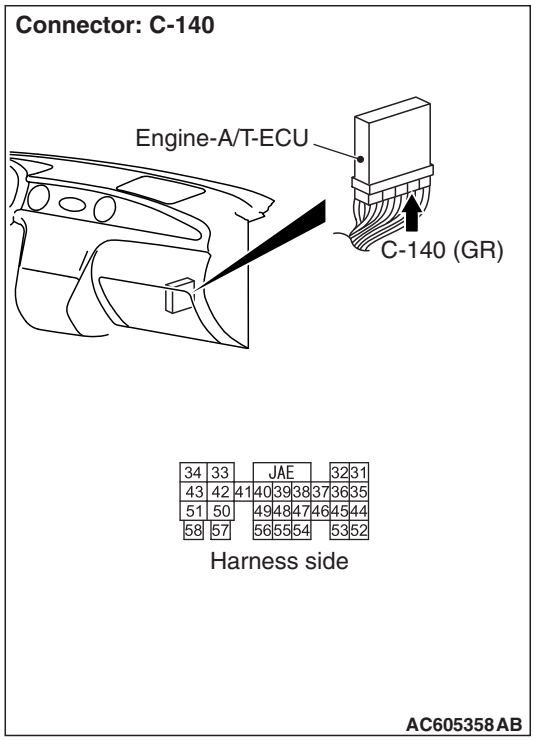
**STEP 13. M.U.T.-II/III data list**
Item 05: Stop lamp switch (Refer to data list reference table P.17-44).

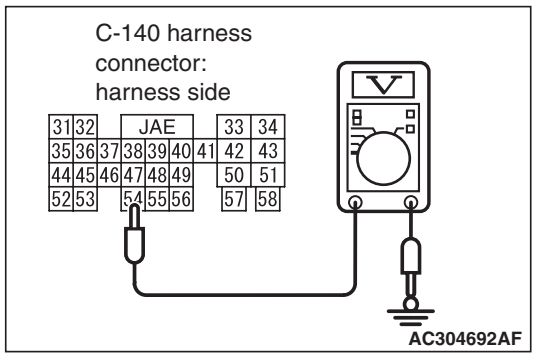
**Q: Is the check result normal?**
**YES :** Go to Step 22.
**NO :** Replace the engine-A/T-ECU (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECU P.13C-441). Then go to Step 23.

**STEP 14. M.U.T.-II/III data list**
Item 06: Brake switch (Refer to data list reference table P.17-44).

**Q: Is the check result normal?**
**YES :** Go to Step 22.
**NO :** Go to Step 15.

**STEP 15. Measure the voltage at engine-A/T-ECU connector C-140.**
(1) Turn the ignition switch to the "ON" position.




(2) Measure the voltage between engine-A/T-ECU connector C-140 terminal No.54 and earth.

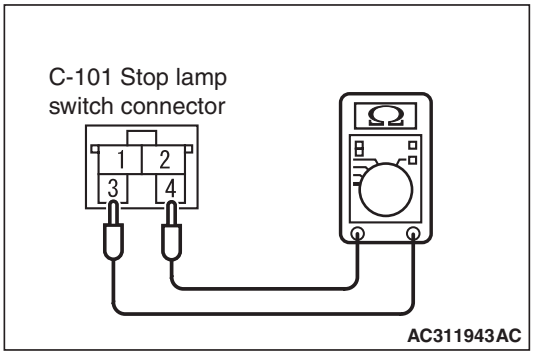
**OK:**
**Brake pedal depressed: System voltage**
**Brake pedal not depressed: 1 V or less**

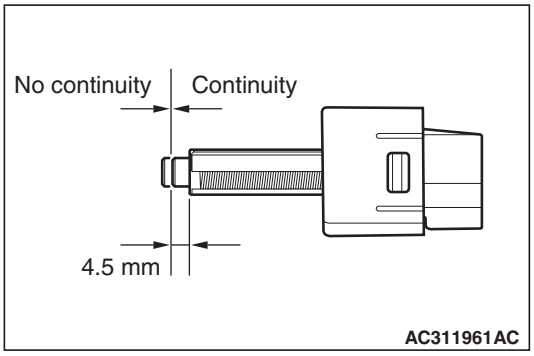
(3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the check result normal?**
**YES :** Go to Step 21.
**NO :** Go to Step 16.

**STEP 16. Check the stop lamp switch.**

(1) Remove the stop lamp switch (Refer to GROUP 35A, Brake Pedal P.35A-12).




(2) Connect an ohmmeter to the stop lamp switch between terminals 3 and 4.

(3) Check for continuity between the terminals when the plunger of the stop lamp switch is pushed in and when it is released.

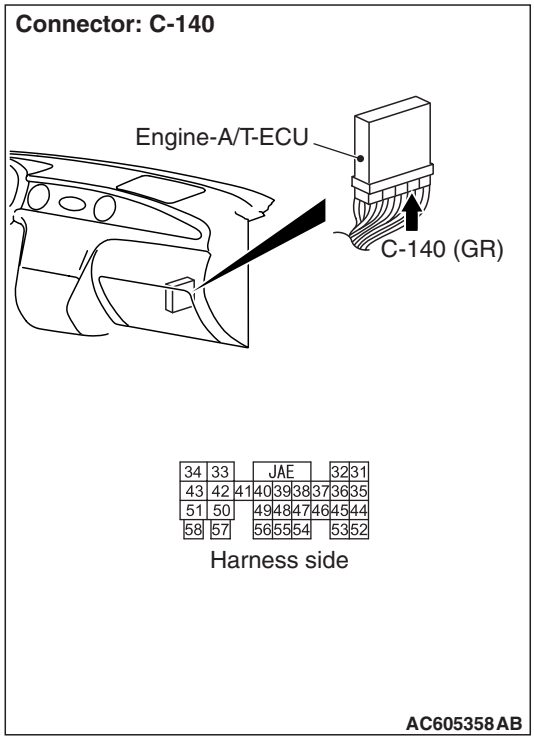
**OK: The stop lamp switch is operating properly if the circuit is open between terminals 3 and 4 when the plunger is released, and if resistance value is less than 2 ohms between terminals 3 and 4 when the plunger is pushed in to a depth of within 4.5 mm from the outer case edge surface.**

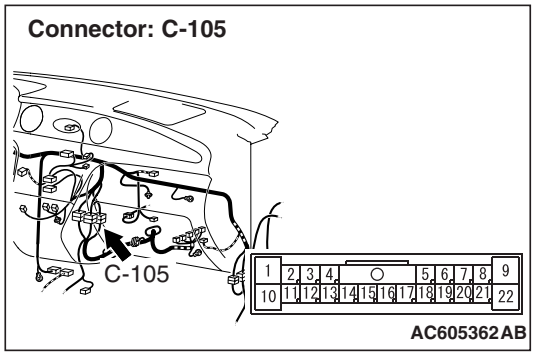
**Q: Is the check result normal?**

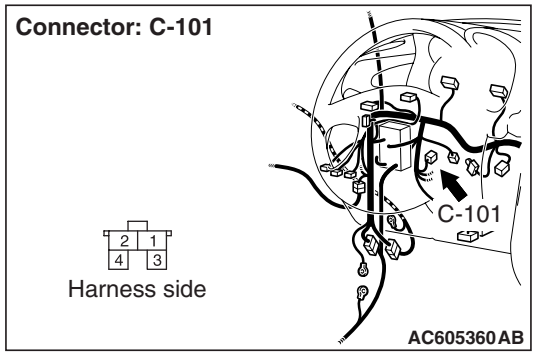
**YES :** Install the stop lamp switch (Refer to GROUP 35A, Brake Pedal P.35A-12). Then go to Step 17.

**NO :** Replace the stop lamp switch (Refer to GROUP 35A, Brake Pedal P.35A-12). Then go to Step 23.

**STEP 17. Connectors check: C-140 engine-A/T-ECU connector, C-105 intermediate connector, C-101 stop lamp switch connector**



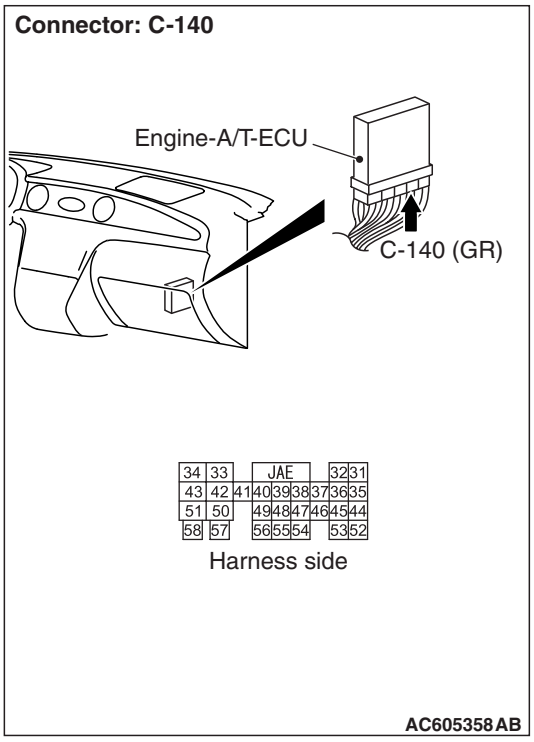



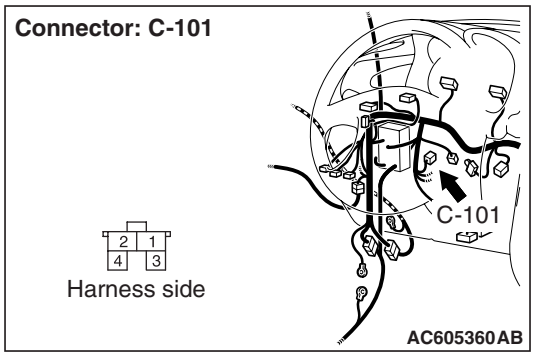

**Q: Is the check result normal?**

**YES :** Go to Step 18.

**NO :** Repair or replace the damaged components. Then go to Step 23.

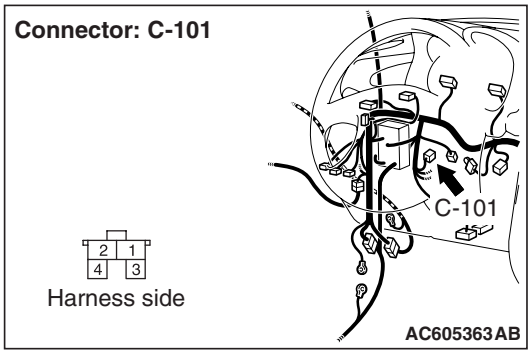
**STEP 18. Check the harness between engine-A/T-ECU connector C-140 terminal No.54 and stop lamp switch connector C-101 terminal No.3.**



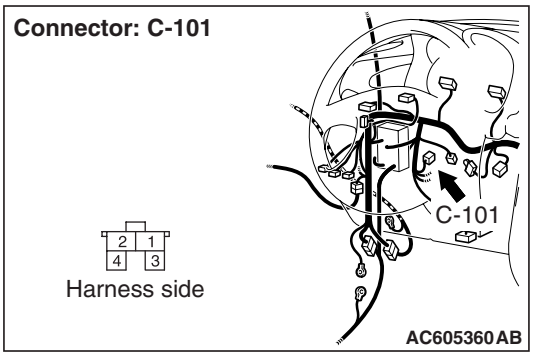

**Q: Is the check result normal?**
**YES :** Go to Step 19.
**NO :** Repair the damaged harness wire. Then go to Step 23.

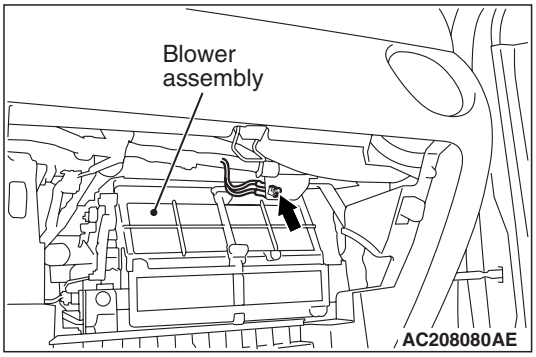
**STEP 19. Connector check: C-101 stop lamp switch connector**




**Q: Is the check result normal?**
**YES :** Go to Step 20.
**NO :** Repair or replace the damaged components. Then go to Step 23.

**STEP 20. Check the harness between stop lamp switch connector C-101 terminal No.4 and earth.**




**Q: Is the check result normal?**
**YES :** Go to Step 21.
**NO :** Repair the damaged harness wire. Then go to Step 23.

**STEP 21. M.U.T.-II/III data list**

Item 06: Brake switch (Refer to data list reference table P.17-44).

**Q: Is the check result normal?**

**YES :** Go to Step 22.

**NO :** Replace the engine-A/T-ECU (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECU P.13C-441). Then go to Step 23 .

**STEP 22. Check the M.U.T.-II/III diagnosis code No.22.**

**Q: Is the M.U.T.-II/III diagnosis code No.22 set?**

**YES :** Replace the engine-A/T-ECU (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECU P.13C-441). Then go to Step 23 .

**NO :** It can be assumed that this malfunction is intermittent.

**STEP 23. Check the M.U.T.-II/III diagnosis code No.22.**

**Q: Is the M.U.T.-II/III diagnosis code No.22 set?**

**YES :** Return to Step 1.

**NO :** The procedure is complete.

## Code No. 23 Engine-A/T-ECU and its related components

## DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set when there is an failure in the engine-A/T-ECU and its related components.

## PROBABLE CAUSE

- Malfunction of the MPI system.
- Malfunction of the A/T system.
- Malfunction of the engine-A/T-ECU.

## DIAGNOSIS

**STEP 1. Check the MPI system diagnosis code.**

**Q: Is any diagnosis code set?**

**YES :** Repair the MPI control system (Refer to GROUP 13C, Troubleshooting – Inspection chart for diagnosis code Trouble Code Chart P.13C-21). Then go to Step 4.

**NO :** Go to Step 2.

**STEP 2. Check the A/T system diagnosis code.**

**Q: Is any diagnosis code set?**

**YES :** Repair the A/T system (Refer to GROUP 23A, Troubleshooting <A/T> – Check chart for diagnosis codes P.23A-18). Then go to Step 4.

**NO :** Go to Step 3.

**STEP 3. Check the M.U.T.-II/III diagnosis code No. 23.**

**Q: Is the M.U.T.-II/III diagnosis code No. 23 output?**

**YES :** Replace the engine-A/T-ECU (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECUP.13C-441). Then go to Step 4.

**NO :** This malfunction is intermittent (Refer to GROUP 00 - How to Use Troubleshooting/Inspection Service Points P.00-6).

**STEP 4. Check the M.U.T.-II/III diagnosis code No. 23.**

**Q: Is the M.U.T.-II/III diagnosis code No. 23 output?**

**YES :** Return to Step 1.

**NO :** This procedure is complete.

## CHECK CHART FOR TROUBLE SYMPTOMS

M1172002300504

| Trouble symptom | | Inspection procedure No. | Reference page |
|---|---|---|---|
| Communication with M.U.T.-II/III is not possible. | Communication with all systems is impossible | - | Group 13C, Symptom Procedures – Inspection Procedure 1 P.13C-282 |
| | Communication with the engine-A/T-ECU only is impossible | - | Group 13C, Symptom Procedures – Inspection Procedure 2 P.13C-285 |
| Auto-cruise control is not cancelled. | Even if brake pedal is depressed | 1 | P.17-36 |
| | Even if select lever is set to N range | 2 | P.17-36 |
| | Even if auto-cruise control CANCEL switch in set to ON | 3 | P.17-36 |
| Auto-cruise control cannot be set. | | 4 | P.17-36 |
| Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed. | | 5 | P.17-37 |
| When the auto-cruise control MAIN switch is turned ON, the auto-cruise control indicator lamp does not illuminate. (However, the auto-cruise control system is normal). | | 6 | P.17-38 |

# SYMPTOM PROCEDURES

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

### COMMENTS ON TROUBLE SYMPTOM
The stop lamp switch circuit is suspected.

### PROBABLE CAUSE
- Malfunction of the connector.
- Malfunction of the harness.
- Malfunction of the stop lamp switch.
- Malfunction of the engine-A/T-ECU.

### DIAGNOSIS
Refer to P.17-25, Diagnosis Trouble Code Procedures – Code No. 22: Stop lamp switch system.

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

### COMMENTS ON TROUBLE SYMPTOM
The inhibitor switch circuit is suspected.

### PROBABLE CAUSE
- Malfunction of the inhibitor switch.
- Malfunction of the connector.
- Malfunction of the harness.
- Malfunction of the engine-A/T-ECU.

### DIAGNOSIS
Refer to GROUP 23A, diagnosis code Procedures – Code No. 27: Inhibitor switch system (Open Circuit) P.23A-50, diagnosis code 28: Inhibitor switch system (Short Circuit) P.23A-55.

## INSPECTION PROCEDURE 3: When the Auto-cruise Control "CANCEL" Switch is Set to ON, Auto-cruise Control is not Cancelled.

### COMMENTS ON TROUBLE SYMPTOM
The cause is probably an open-circuit in the circuit inside the auto-cruise control CANCEL switch.

### PROBABLE CAUSE
Malfunction of the auto-cruise control switch.

### DIAGNOSIS
Replace the auto-cruise control switch (Refer to P.17-50). Then check the malfunction is eliminated.

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

### COMMENTS ON TROUBLE SYMPTOM
The fail-safe function is probably cancelling auto-cruise control. In this case, M.U.T.-II/III can be used to Retest each system by checking the diagnosis trouble codes. The M.U.T.-II/III can also be used to check if the circuits of each input switch are normal or not by checking the input switch codes.

### PROBABLE CAUSE
- Malfunction of the auto-cruise control switch.
- Malfunction of the stop lamp switch.
- Malfunction of the inhibitor switch.
- Malfunction of the engine-A/T-ECU.

### DIAGNOSIS

#### STEP 1. Check the M.U.T.-II/III diagnosis code

**Q: Is any diagnosis code set?**
**YES :** Refer to P.17-15, Check Chart for Diagnosis Codes. Then go to Step 6.
**NO :** Go to Step 2.

**STEP 2. M.U.T.-II/III data list**

Item 04: Cancel switch (Refer to data list reference table P.17-44).

**Q: Is the check result normal?**

**YES :** Go to Step 3.

**NO :** Refer to P.17-36, Symptom Procedures number 3. Then go to Step 6.

**STEP 3. M.U.T.-II/III data list**

- Item 05: Stop lamp switch (Refer to data list reference table P.17-44).
- Item 06: Brake switch (Refer to data list reference table P.17-44).

**Q: Is the check result normal?**

**YES :** Go to Step 4.

**NO :** Refer to P.17-36, Symptom Procedures number 1. Then go to Step 6.

**STEP 4. M.U.T.-II/III data list**

Item 07, Inhibitor switch (Refer to data list reference table P.17-44).

**Q: Is the check result normal?**

**YES :** Go to Step 5

**NO :** Refer to P.17-36, Symptom Procedures number 2. Then go to Step 6

**STEP 5. Check the symptoms.**

**Q: Can auto-cruise control be set?**

**YES :** It can be assumed that this malfunction is intermittent.

**NO :** Replace the engine-A/T-ECU (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECU P.13C-441). Then go to Step 6.

**STEP 6. Check the symptoms.**

**Q: Can auto-cruise control be set?**

**YES :** The procedure is complete.

**NO :** Return to Step 1.

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

### COMMENTS ON TROUBLE SYMPTOM

The output shaft speed sensor signal or the throttle body is suspected.

### PROBABLE CAUSE

- Malfunction of the output shaft speed sensor.
- Malfunction of the throttle body.
- Malfunction of the engine-A/T-ECU.

### DIAGNOSIS

**STEP 1. Check the A/T system diagnosis code.**

**Q: Is any diagnosis code set?**

**YES :** Repair the A/T system (Refer to GROUP 23A, Troubleshooting <A/T> – Check chart for diagnosis codes P.23A-18). Then go to Step 4.

**NO :** Go to Step 2.

**STEP 2. Check the MPI system diagnosis code.**

**Q: Is any diagnosis code set?**

**YES :** Repair the MPI control system (Refer to GROUP 13C, Troubleshooting – Inspection chart for diagnosis code Trouble Code Chart P.13C-21). Then go to Step 4.

**NO :** Go to Step 3.

**STEP 3. Retest the system**

**Q: Does a hunting occur?**

**YES :** Replace the engine-A/T-ECU (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECUP.13C-441). Then go to Step 4.

**NO :** It can be assumed that this malfunction is intermittent.

**STEP 4. Retest the system**

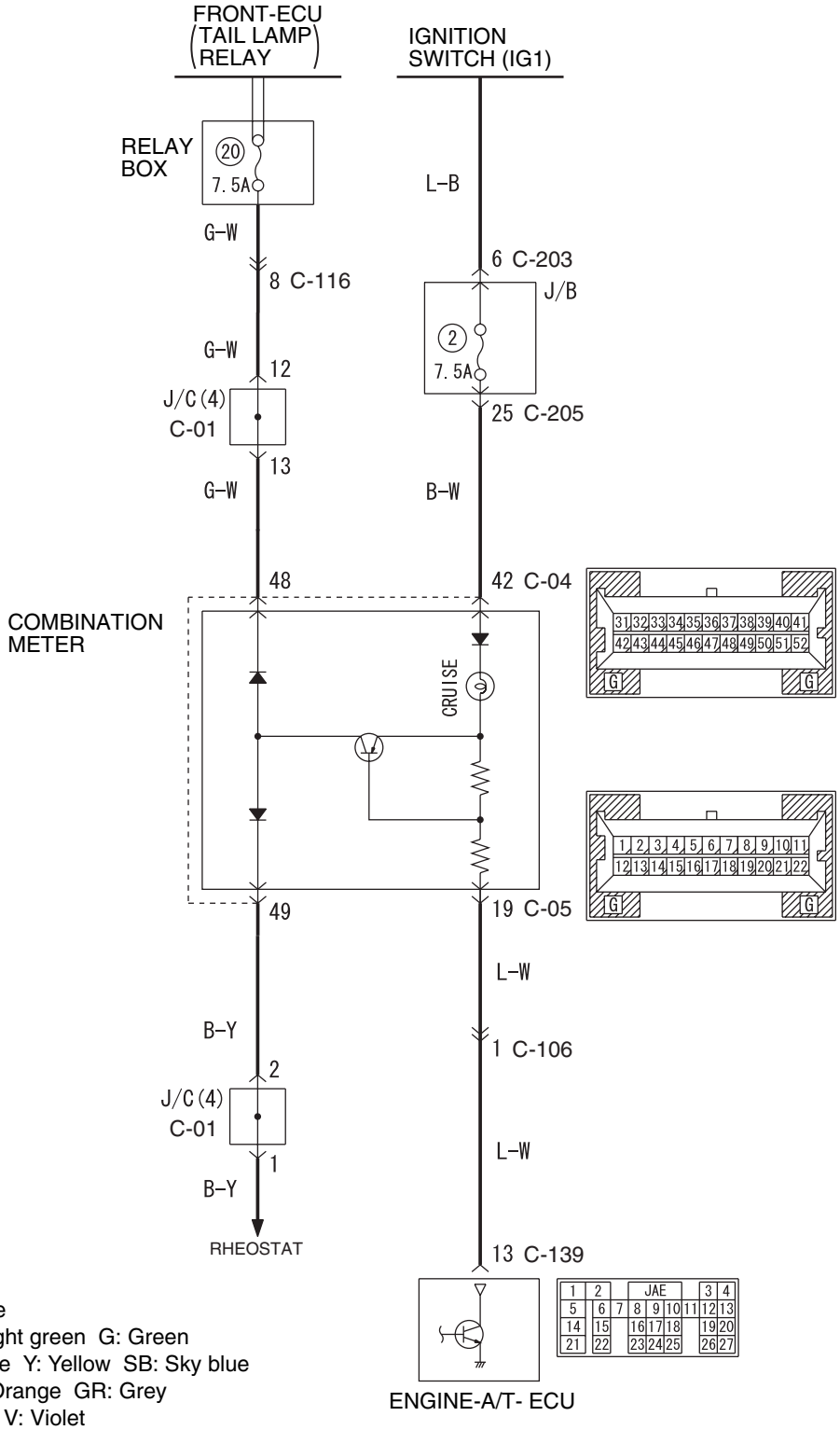
**Q: Does a hunting occur?**

**YES :** Return to Step 1.

**NO :** The procedure is complete.

**INSPECTION PROCEDURE 6: When MAIN Switch is Turned "ON", Auto-cruise Control Indicator Lamp Inside Combination Meter does not Illuminate. (However, Auto-cruise Control is Normal).**

**Auto-cruise Control Indicator Lamp Drive Circuit**




Wire colour code
B: Black LG: Light green G: Green
L: Blue W: White Y: Yellow SB: Sky blue
BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet

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## OPERATION

The engine-A/T-ECU detects MAIN switch "ON" signal to illuminate the auto-cruise control indicator lamp on the combination meter.

## COMMENT ON TROBLE SYMPTOM

Connector(s), wiring harness between the PCM and the combination meter, the combination meter and the engine-A/T-ECU may be defective. The auto-cruise control switch input signal circuit may also be defective.

## PROBABLE CAUSES

- Malfunction of the combination meter
- Malfunction of the connector.
- Malfunction of the harness.
- Malfunction of the engine-A/T-ECU

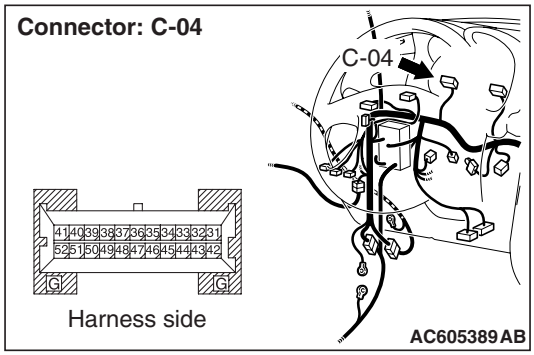
## DIAGNOSIS

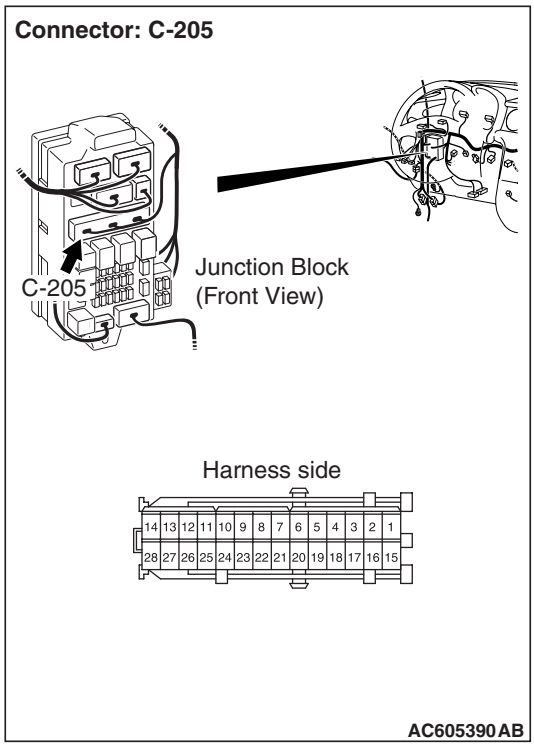
**STEP 1. Check that the indicator light inside the combination meter illuminates.**

(1) Turn the ignition switch to the "ON" position.
(2) Check the indicator lights other than "CRUISE" indicator light illuminate.

**Q: Is the check result normal?**
**YES :** Go to Step 6.
**NO :** Go to Step 2.

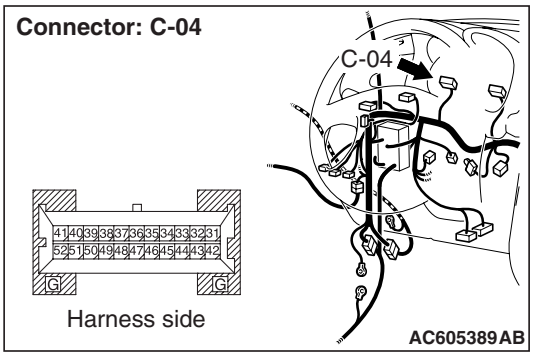
**STEP 2. Connectors check: C-04 combination meter connector, C-205 junction block connector**

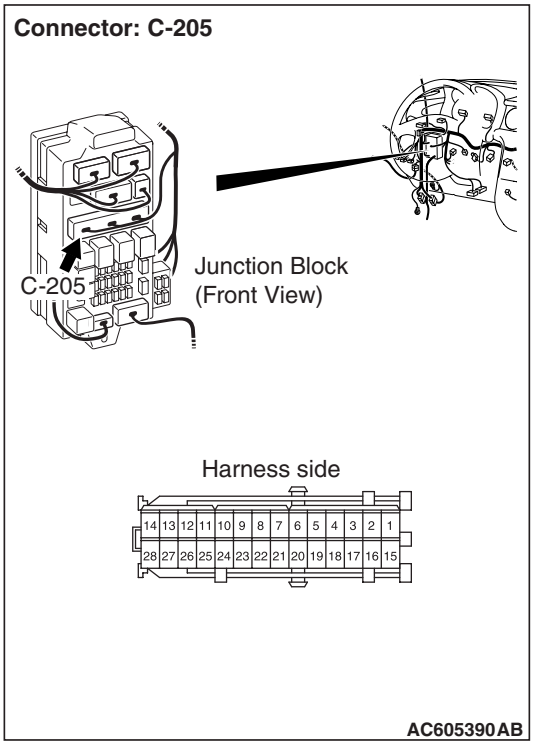



**Q: Is the check result normal?**
**YES :** Go to Step 3.
**NO :** Repair or replace the damaged components. Then go to Step 13.

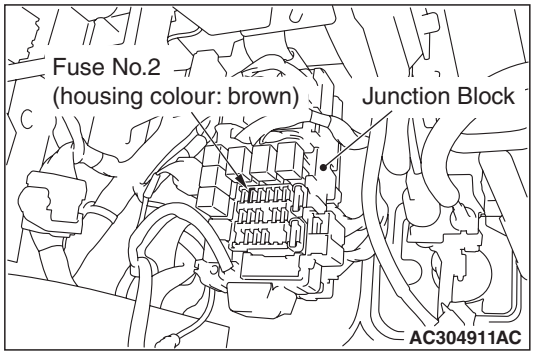
**STEP 3. Check the harness between combination meter connector C-04 terminal No.42 and junction block connector C-205 terminal No.25.**




**Q: Is the check result normal?**
**YES :** Go to Step 4.
**NO :** Repair the damaged harness wire. Then go to Step 13.

**STEP 4. Check fuse number 2 at the junction block.**




**Q: Is the check result normal?**
**YES :** Go to Step 5.
**NO :** Replace the fuse. Then go to Step 13.

**STEP 5. Check that the indicator light inside the combination meter illuminates.**
(1) Turn the ignition switch to the "ON" position.
(2) Check that the indicator light inside the combination meter illuminates.

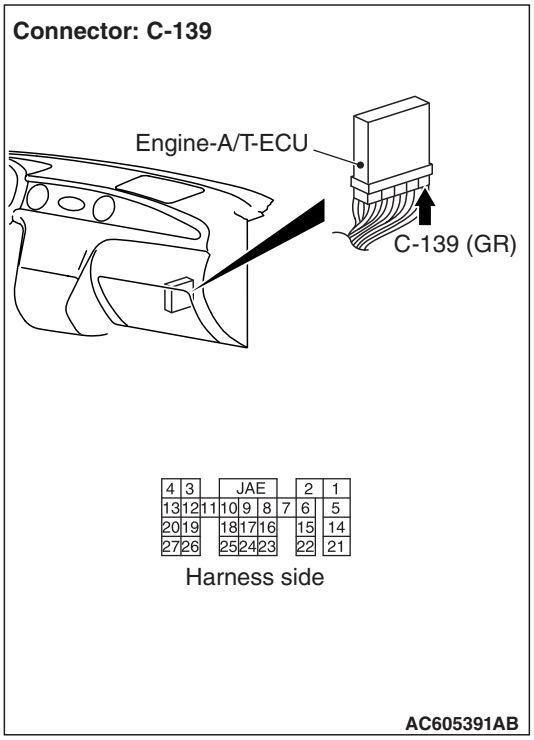
**Q: Is the check result normal?**
**YES :** It can be assumed that this malfunction is intermittent.
**NO :** Replace the combination meter. (Refer to GROUP 54A, Combination meter assembly P.54A-60). Then go to Step 13.

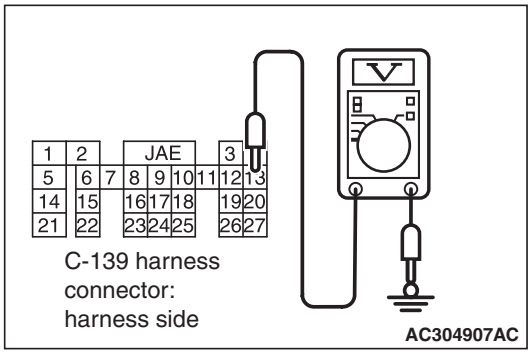
**STEP 6. Check the M.U.T.-II/III diagnosis code No.15.**

**Q: Is the M.U.T.-II/III diagnosis code No.15 set?**
**YES :** Repair the auto-cruise control switch system (Refer to P.17-16, diagnosis code Procedures - Code No.15: Auto-cruise Control Switch System). Then go to Step 13 .
**NO :** Go to Step 7.

**STEP 7. Measure the voltage at engine-A/T-ECU connector C-139.**

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




(2) Measure the voltage between engine-A/T-ECU connector C-139 terminal No.13 and earth.

**OK:**

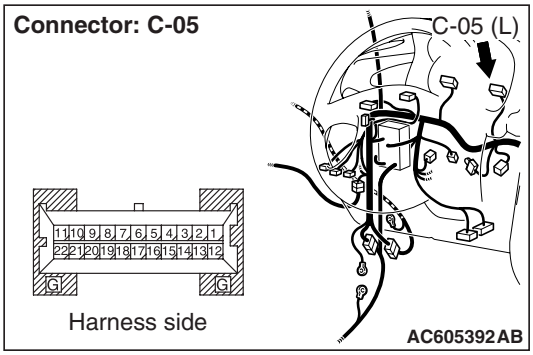
- **MAIN switch "ON": 0.5 V or less**
- **MAIN switch "OFF": system voltage**

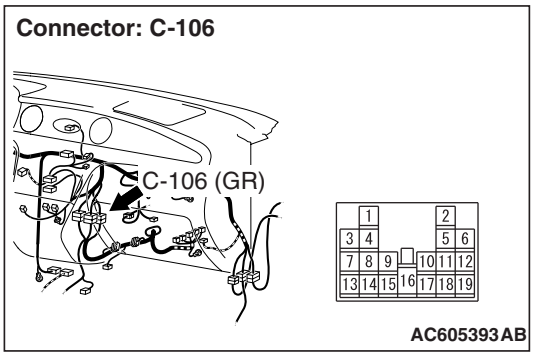
**Q: Is the check result normal?**

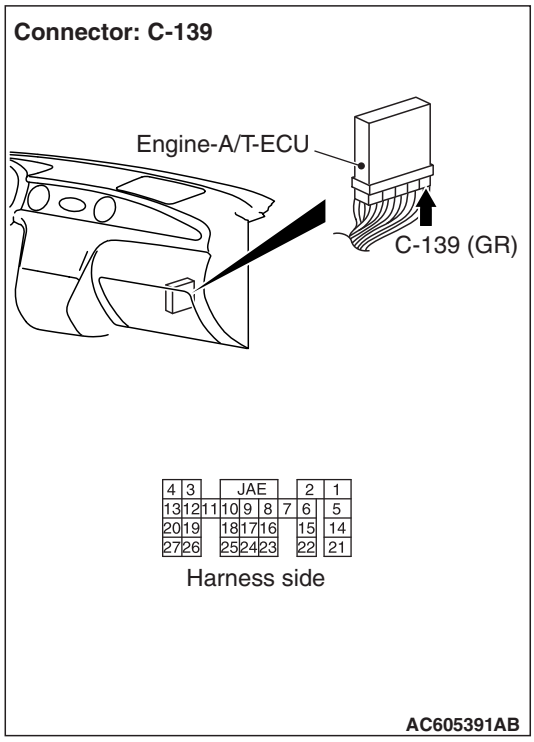
**YES :** Go to Step 12.

**NO :** Go to Step 8.

**STEP 8. Connectors check: C-05 combination meter connector, C-106 intermediate connector, C-139 engine-A/T-ECU connector**



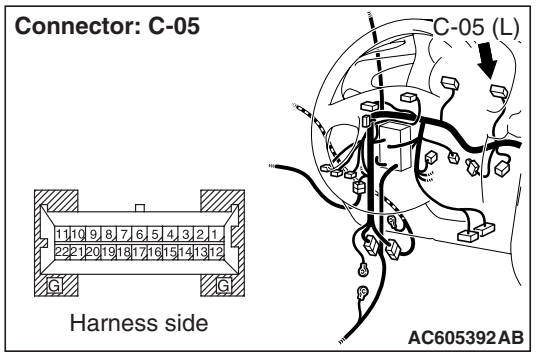



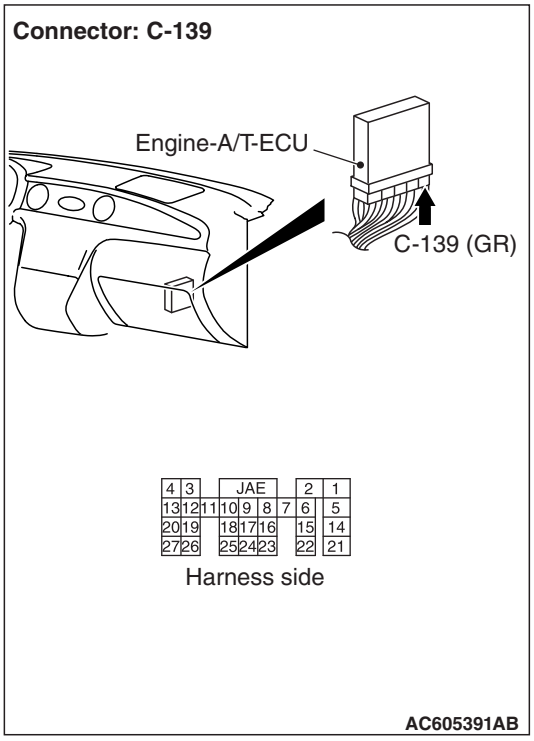

**Q: Is the check result normal?**

**YES :** Go to Step 9.

**NO :** Repair or replace the damaged components. Then go to Step 13.

**STEP 9. Check the harness between combination meter connector C-05 terminal No.19 and engine-A/T-ECU connector C-139 terminal No.13.**




**Q: Is the check result normal?**

**YES :** Go to Step 10.

**NO :** Repair the damaged harness wire. Then go to Step 13.

**STEP 10. Check the auto-cruise control indicator light bulb.**

Remove the combination meter (Refer to GROUP 54 - Combination Meter Assembly P.54A-60), and check the auto-cruise control indicator bulb.

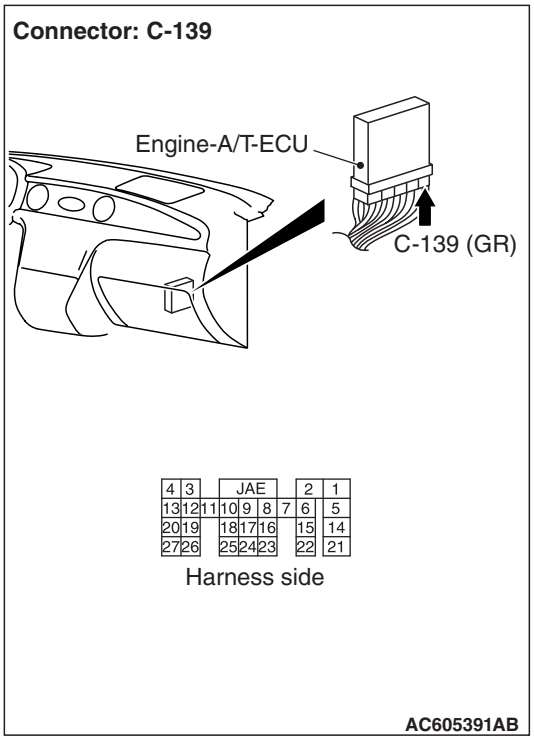
**Q: Is the check result normal?**

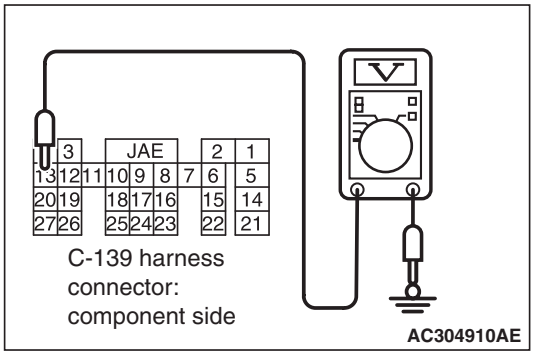
**YES :** Install the combination meter (Refer to GROUP 54A, Combination meter assembly P.54A-60). Then go to Step 11.

**NO :** Replace the bulb and install the combination meter (Refer to GROUP 54A, Combination meter assembly P.54A-60). Then go to Step 13.

**STEP 11. Measure the voltage at engine-A/T-ECU connector C-139.**

(1) Disconnect engine-A/T-ECU connector C-139 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.




(3) Measure the voltage between engine-A/T-ECU connector C-139 terminal No.13 and earth.

**OK:**
- **ignition switch "ON": system voltage**
- **ignition switch "OFF": 0.5 V or less**

**Q: Is the check result normal?**
**YES :** Go to Step 12.
**NO :** Replace the combination meter (Refer to GROUP 54A, Combination meter assembly P.54A-60). Then go to Step 13.

**STEP 12. Retest the system.**

**Q: Does a malfunction take place again?**
**YES :** Replace the engine-A/T-ECU (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECU P.13C-441). Then go to Step 13.
**NO :** It can be assumed that this malfunction is intermittent.

**STEP 13. Retest the system.**

**Q: Does a malfunction take place again?**
**YES :** Return to Step 1.
**NO :** The procedure is complete.

## DATA LIST REFERENCE TABLE

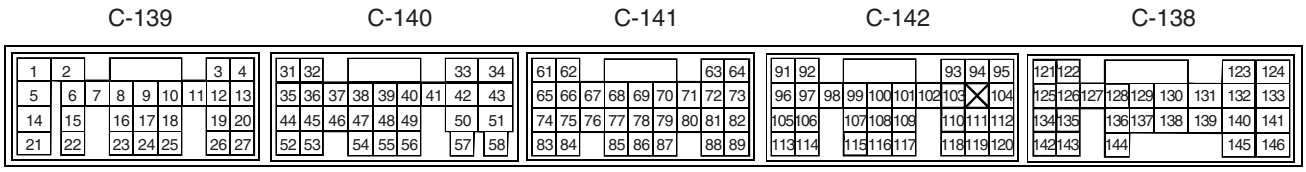
M1172002400448

| Item No. | Check item | | Check condition | | Normal condition |
|---|---|---|---|---|---|
| 01 | Auto-cruise control switch | MAIN | MAIN switch: ON | | ON |
| | | | MAIN switch: OFF | | OFF |
| 02 | | SET/COAST | MAIN switch: ON | SET switch: ON | ON |
| | | | | SET switch: OFF | OFF |
| 03 | | RESUME/ACCELERATING | | RESUME switch: ON | ON |
| | | | | RESUME switch: OFF | OFF |
| 04 | | CANCEL | | CANCEL switch: ON | ON |
| | | | | CANCEL switch: OFF | OFF |
| 05 | Stop lamp switch (for stop lamp circuit) | | Brake pedal: Depressed | | ON |
| | | | Brake pedal: Released | | OFF |
| 06 | Stop lamp switch (for auto-cruise control circuit) | | Brake pedal: Depressed | | ON |
| | | | Brake pedal: Released | | OFF |
| 07 | Inhibitor switch | | Selector lever: N or P position | | ON |
| | | | Selector lever: Other than N or P position | | OFF |
| 08 | Accelerator switch (Idle switch) | | Accelerator pedal: Depressed | | OFF |
| | | | Accelerator pedal: Released | | ON |
| 09 | Auto-cruise control operation | | Auto-cruise control: active | | ON |
| | | | Auto-cruise control: Inactive | | OFF |
| 10 | Vehicle speed signal | | Road test the vehicle | | The speedometer and M.U.T.-II/III display the same value. |
| 11 | Throttle position sensor (main) | | • Remove the intake air hose at the throttle body<br>• Disconnect the electronic-controlled throttle valve connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658.<br>• Ignition switch: ON | Fully close the throttle valve with your finger | 300 – 700 mV |
| | | | | Fully open the throttle valve with your finger | 4,000 mV or more |
| | | | No load | | 520 – 620 mV |
| | | | Selector lever: N to D | | 540 – 640 mV |

| Item No. | Check item | Check condition | | Normal condition |
|---|---|---|---|---|
| 12 | Accelerator pedal position sensor (main) | Ignition switch: ON | Accelerator pedal: Released | 335 – 935 mV |
| | | | Accelerator pedal: Depressed | Increases in response to the pedal depression stroke |
| | | | Accelerator pedal: Fully depressed | 4,000 mV or more |
| 13 | Cancel code | Ignition switch: "ON" | | The cancel code, which set when the auto-cruise control system was cancelled at the last time, is set again. |

## CHECK AT ECU TERMINAL

M1172002700364




AC312699AC

| Terminal No. | Check item | Check conditions | | Normal condition |
|---|---|---|---|---|
| 15 | Throttle valve control servo relay | Ignition switch: "ON" | | System voltage |
| | | Running at 3,500 r/min while engine is warming up after having been started. | | 1 V or less |
| 39 | Stop lamp switch | Ignition switch: "ON" | Depress the brake pedal. | System voltage |
| | | | Release the brake pedal. | 1 V or less |
| 51 | Inhibitor switch: "P" and "N" | Ignition switch: "ON" | Select lever: N or P range | System voltage |
| | | | Select lever: Other than N or P range | 1 V or less |
| 54 | Brake switch | Ignition switch: "ON" | Depress the brake pedal. | System voltage |
| | | | Release the brake pedal. | 1 V or less |
| 57 | Engine control relay | Ignition switch: "ON" | | 1 V or less |
| | | Ignition switch: "LOCK" (OFF) | | System voltage |
| 58 | Engine-A/T-ECU backup power supply | Ignition switch: "LOCK" (OFF) | | System voltage |
| 92 | Accelerator pedal position sensor (main) power supply | Ignition switch: "ON" | | 4.5 – 5.5 V |

| Terminal No. | Check item | Check conditions | | | Normal condition |
|---|---|---|---|---|---|
| 94 | Auto-cruise control switch power supply | Ignition switch: "ON" | All switches: OFF | | 4.7 – 5.0 V |
| | | | "CRUISE" (MAIN) switch: "ON" | | 0 – 0.3 V |
| | | | "COAST/SET" switch: ON | | 2.0 – 2.8 V |
| | | | "ACC/RES" switch: ON | | 3.3 – 4.1 V |
| | | | "CANCEL" switch: ON | | 0.8 – 1.5 V |
| 97 | Sensor impressed voltage | Ignition switch: "ON" | | | 4.9 – 5.1 V |
| 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 | | 0.335 – 0.935 V |
| | | | Depress the accelerator pedal. | | 4.0 V or more |
| 113 | Throttle position sensor (sub) | • Remove the intake air hose at the throttle body<br>• Disconnect the throttle position sensor, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool (MB991658).<br>• Ignition switch: "ON" | | Fully close the throttle valve with your finger | 2.2 – 2.8 V |
| | | | | Fully open the throttle valve with your finger | 4.6 V or more |
| 114 | Accelerator pedal position sensor (main) | Ignition switch: "ON" | Release the accelerator pedal | | 0.335 – 0.935 V |
| | | | Depress the accelerator pedal. | | 4.0 V or more |
| 115 | Throttle position sensor (main) | • Remove the intake air hose at the throttle body<br>• Disconnect the throttle position sensor, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool (MB991658).<br>• Ignition switch: "ON" | | Fully close the throttle valve with your finger | 0.3 – 0.7 V |
| | | | | Fully open the throttle valve with your finger | 4.0 V or more |
| 132 | Engine-A/T-ECU power supply voltage applied to throttle valve control servo | Ignition switch: "ON" | | | System voltage |

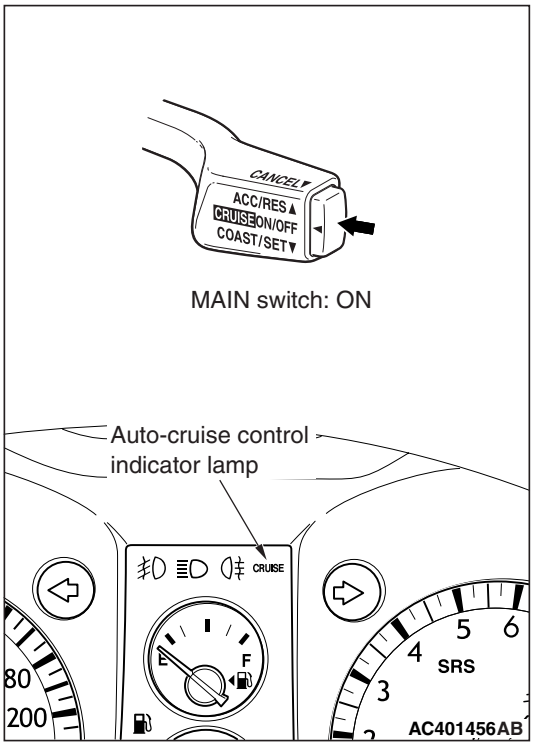
# ON-VEHICLE SERVICE

## AUTO-CRUISE CONTROL SWITCH CHECK

M1172001200117

## AUTO-CRUISE CONTROL MAIN SWITCH CHECK

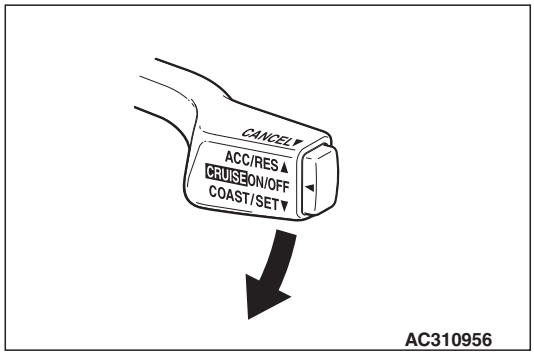
1. Turn the ignition switch to ON position.




2. Check that the auto-cruise control indicator lamp 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 within the range of approximately 40 – 200 km/h.

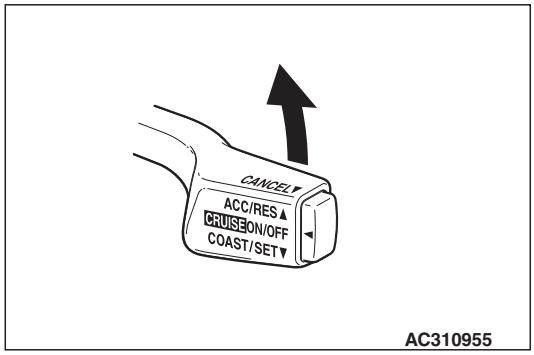



3. Push the auto-cruise control switch in the direction of arrow.
4. Check to be sure that when the switch is released the speed is the desired constant speed.

   *NOTE: If the vehicles speed decreases to approximately 15 km/h 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.

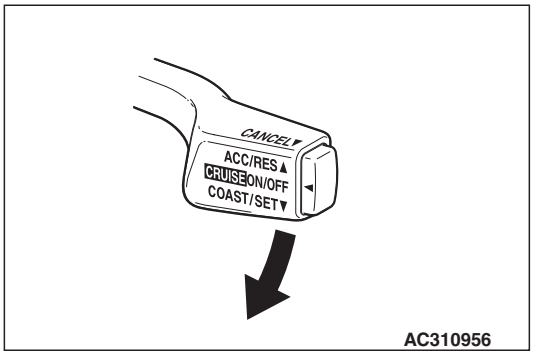



2. Push the auto-cruise control switch in the direction of arrow.
3. Check to be sure that acceleration continues while the switch is hold, and that when it is released the constant speed at the time when it was released becomes the driving speed.

   *NOTE: Acceleration can be continued even if the vehicle speed has passed the high-speed limit (approximately 200 km/h). 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.

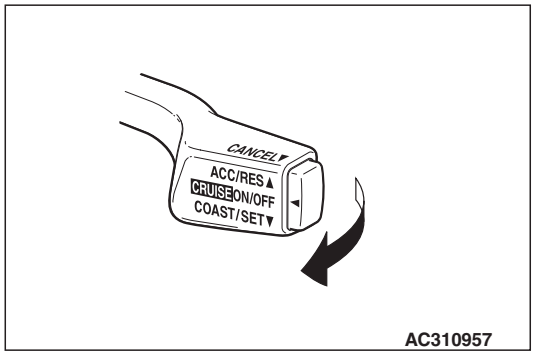



2. Push the auto-cruise control switch in the direction of arrow.
3. Check to be sure that deceleration continues while the switch is pressed, and that when it is released the constant speed at the time when it was released becomes the driving speed.

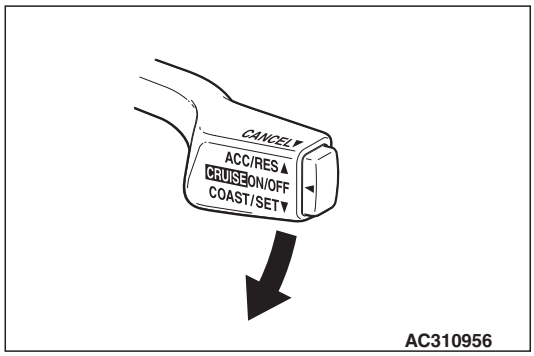
   *NOTE: When the vehicle speed reaches the low limit (approximately 40 km/h) during deceleration, the auto-cruise control will be cancelled.*

## 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 pulled in the direction of arrow.
   (2) The brake pedal is depressed.
   (3) The selector lever is moved to the "N" range.



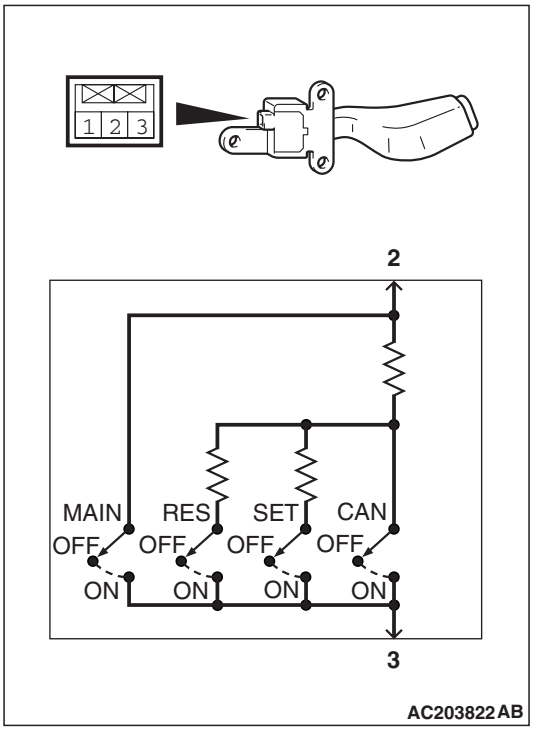

3. When the auto-cruise control switch is pushed in the direction of arrow at a vehicle speed of 40 km/h or higher, check if the vehicle speed returns to the speed before auto-cruise control driving was cancelled, and constant speed driving occurs.
4. When the MAIN switch is turned to OFF while driving at constant speed, check if normal driving is resumed and deceleration occurs.

## AUTO-CRUISE CONTROL SYSTEM COMPONENT CHECK

M1172001700703

## AUTO-CRUISE CONTROL SWITCH CHECK

1. Remove the auto-cruise control switch (Refer to P.17-50).

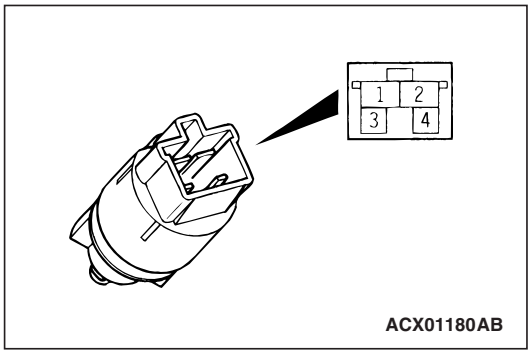



2. Measure the resistance between the terminals when each of the SET, RESUME, CANCEL and MAIN switches is pressed. If the values measured at the time correspond to those in the table below, then there is no problem.

| Switch position | Specified condition |
|---|---|
| MAIN switch: OFF | Open circuit |
| MAIN switch: ON | Continuity (less than 2 Ω) |
| CANCEL switch: ON | Approximately 100 Ω |
| RESUME switch: ON | Approximately 887 Ω |
| SET switch: ON | Approximately 300 Ω |

## STOP LAMP SWITCH

1. Disconnect the connector.




2. Check for continuity between the terminals of the switch.

| Measurement conditions | Terminal connector of tester | Specified condition |
|---|---|---|
| When brake pedal is depressed (for stop lamp circuit). | 1 – 2 | Continuity (less than 2 Ω) |
| | 3 – 4 | Open circuit |
| When brake pedal is not depressed (for auto-cruise control circuit). | 1 – 2 | Open circuit |
| | 3 – 4 | Continuity (less than 2 Ω) |

## INHIBITOR SWITCH ("N" POSITION)

Refer to GROUP 23A, On-vehicle Service – A/T Control Component Check P.23A-128.

## THROTTLE POSITION SENSOR

Refer to GROUP 13C, On-vehicle Service – Throttle Valve Control Servo Check P.13C-436.

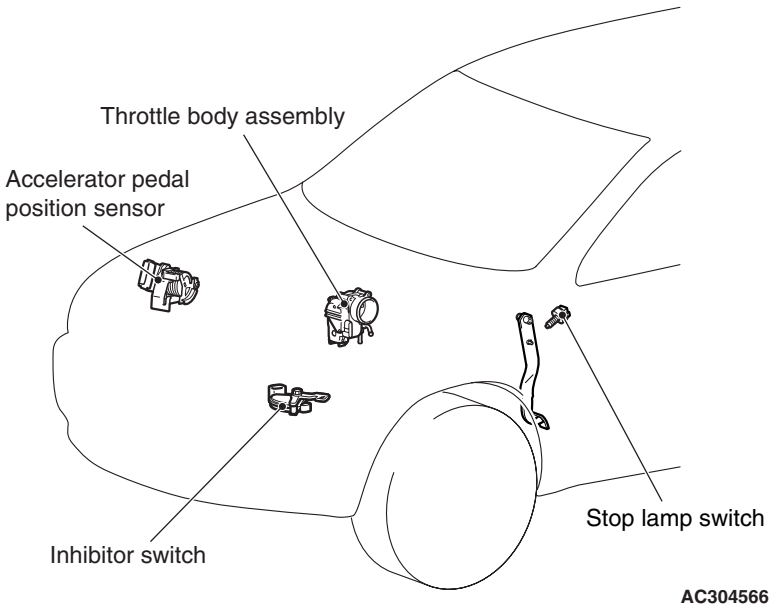
# AUTO-CRUISE CONTROL

## REMOVAL AND INSTALLATION

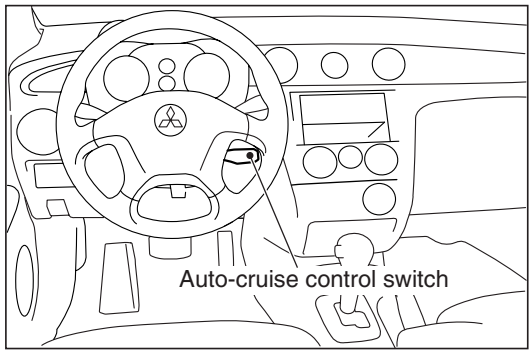
M1172001400694

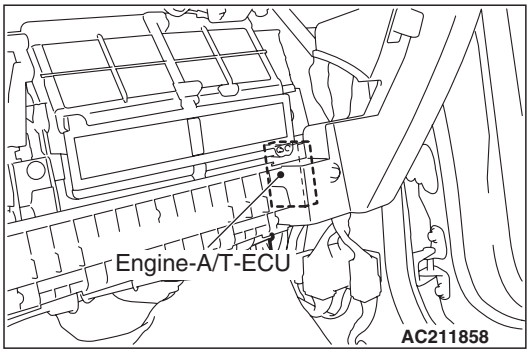
***⚠ WARNING***

- ***Before removal of the air bag module, refer to GROUP 52B, Service Precautions (P.52B-4) and Air Bag Module(s) and Clock Spring (P.52B-136).***
- ***When removing and installing the steering wheel and air bag module assembly, do not let it bump against the air bag module.***




AC304566




AC211858

AC605425AB

**Auto-cruise control switch removal**

- Auto-cruise control switch (Refer to GROUP 52B, Air Bag Module(s) and Clock Spring P.52B-136)

**Control unit removal**

- Engine-A/T-ECU (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECU P.13C-441)

**Sensor removal steps**

- Inhibitor switch (Refer to GROUP 23B, Transmission P.23B-14)
- Accelerator pedal position sensor (Refer to P.17-11)
- Throttle body assembly (Refer to GROUP 13C, Throttle body assembly P.13C-439)
- Stop lamp switch (Refer to GROUP 35A, Brake pedal P.35A-12)

# EMISSION CONTROL <MPI>

## GENERAL INFORMATION

M1173000100615

The emission control system consists of the following subsystems:

- Crankcase emission control system
- Evaporative emission control system
- Exhaust emission control system

| Items | Name | Specification |
|---|---|---|
| Crankcase emission control system | Positive crankcase ventilation (PCV) valve | Variable flow type<br>(Purpose: HC reduction) |
| Evaporative emission control system | Canister<br>Purge control solenoid valve<br>Check valve <4G63-Turbo> | Equipped<br>Duty cycle type solenoid valve<br>Equipped<br>(Purpose: HC reduction) |
| Exhaust emission control system | Air-fuel ratio control device - MPI system | Oxygen sensor feedback type<br>(Purpose: CO, HC, NOx reduction) |
| | Exhaust gas recirculation system <4G63><br>• EGR valve<br>• EGR control solenoid valve | Equipped<br><br>Single type<br>Duty cycle type solenoid valve<br>(Purpose: NOx reduction) |
| | Exhaust gas recirculation system <4G69><br>• EGR valve | Equipped<br><br>Steeper motor type<br>(Purpose: NOx reduction) |
| | Catalytic converter | Monolith type<br>(Purpose: CO, HC, NOx reduction) |

## EMISSION CONTROL DEVICE REFERENCE TABLE

M1173006600254

| Related parts | Crankcase emission control system | Evaporative emission control system | Air/fuel ratio control system | Catalytic converter | Exhaust gas recirculation system |
|---|---|---|---|---|---|
| PCV valve | × | | | | |
| Purge control solenoid valve | | × | | | |
| Check valve <4G63-Turbo> | | × | | | |
| MPI system component | | × | × | | |
| Catalytic converter | | | | × | |
| EGR valve <4G63> | | | | | × |
| EGR control solenoid valve <4G63> | | | | | × |
| EGR valve (Steeper motor) <4G69> | | | | | × |

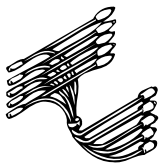
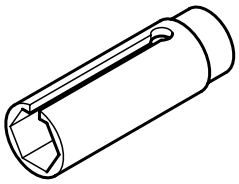
## SERVICE SPECIFICATIONS

M1173000300512

| Items | Standard value |
|---|---|
| Purge control solenoid valve coil resistance (at 20°C) Ω | 30 – 34 |
| EGR control solenoid valve coil resistance (at 20°C) Ω <4G63> | 29 – 35 |
| EGR valve coil resistance (at 20°C) Ω <4G69> | 20 – 24 |

## SPECIAL TOOL

M1173000600201

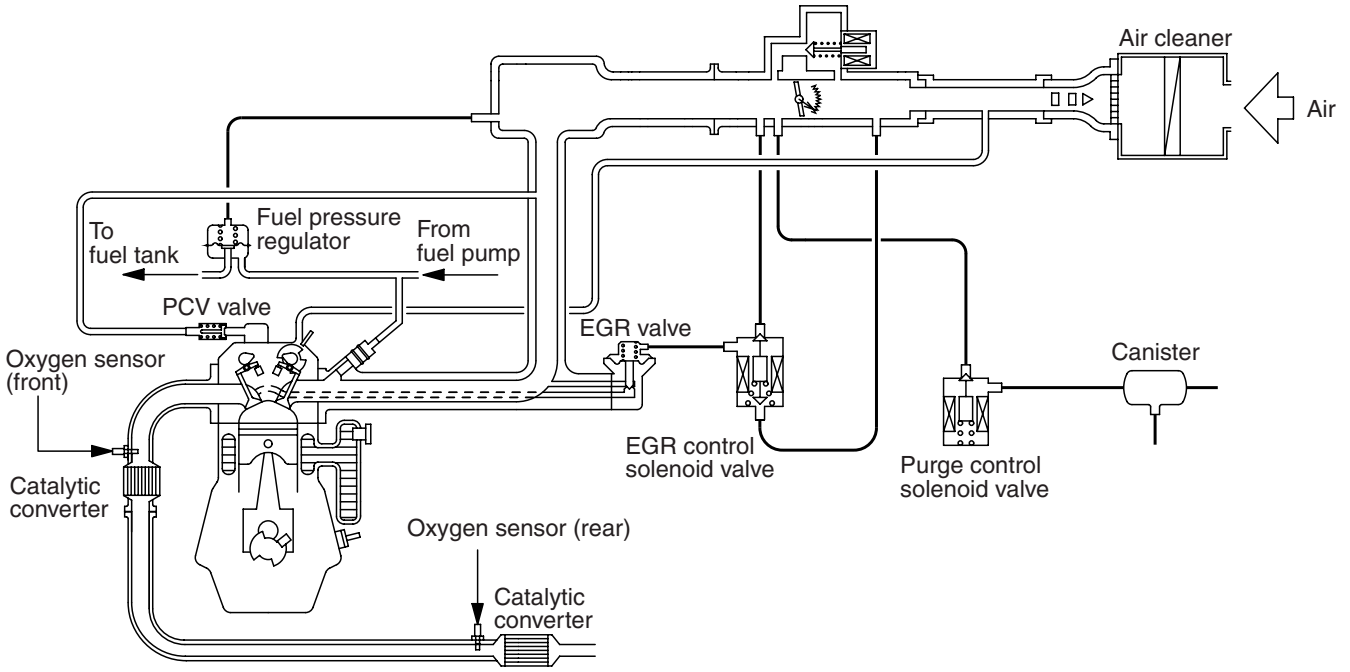
| Tool | Number | Name | Use |
|---|---|---|---|
|  MB991658 | MD991658 | Test harness | EGR valve (Steeper moter) CHECK |
|  | MD998770 | Oxygen sensor wrench | Removal and installation of oxygen sensor |

# VACUUM HOSE

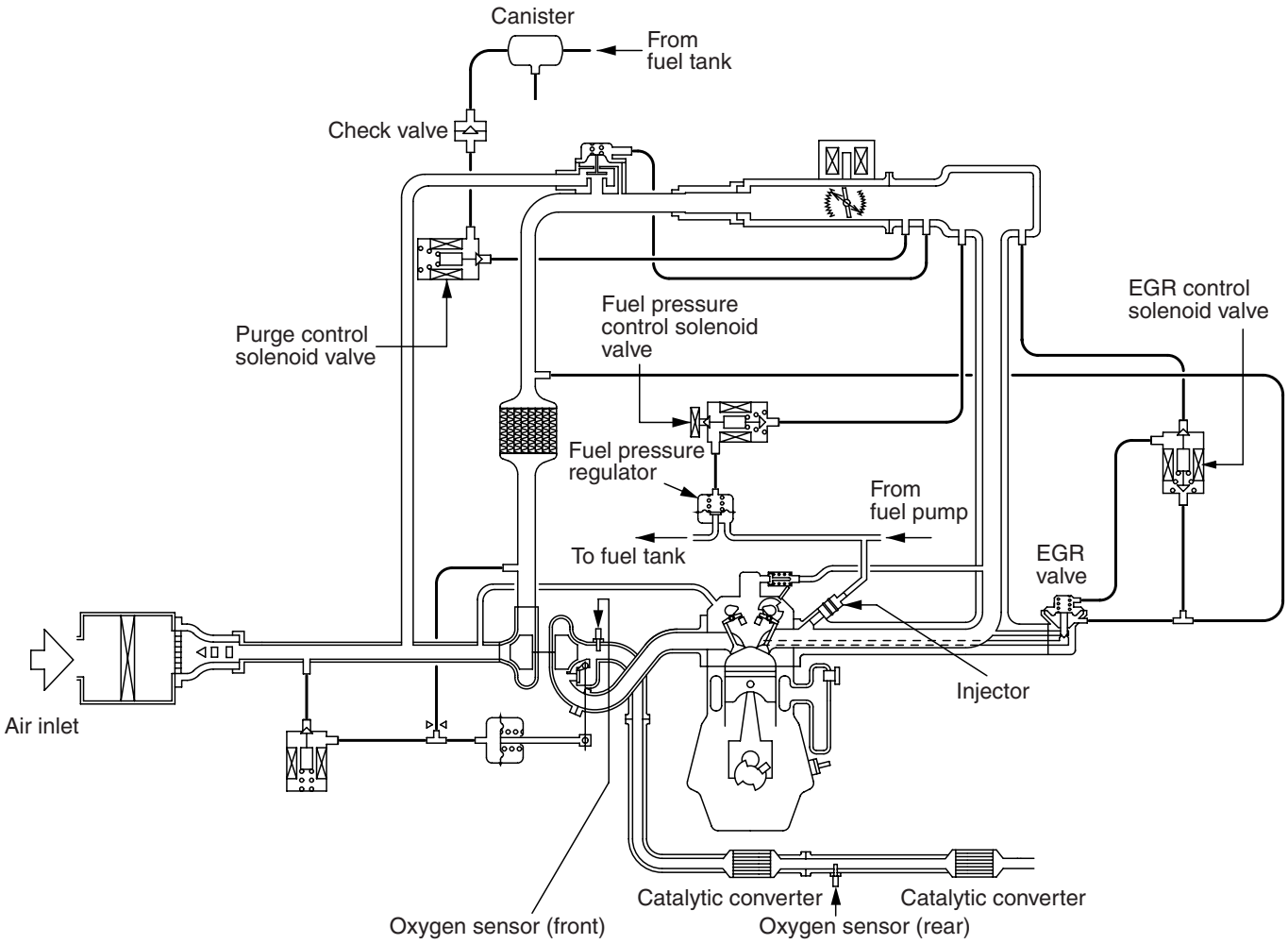
## VACUUM HOSE PIPING DIAGRAM

M1173000900666

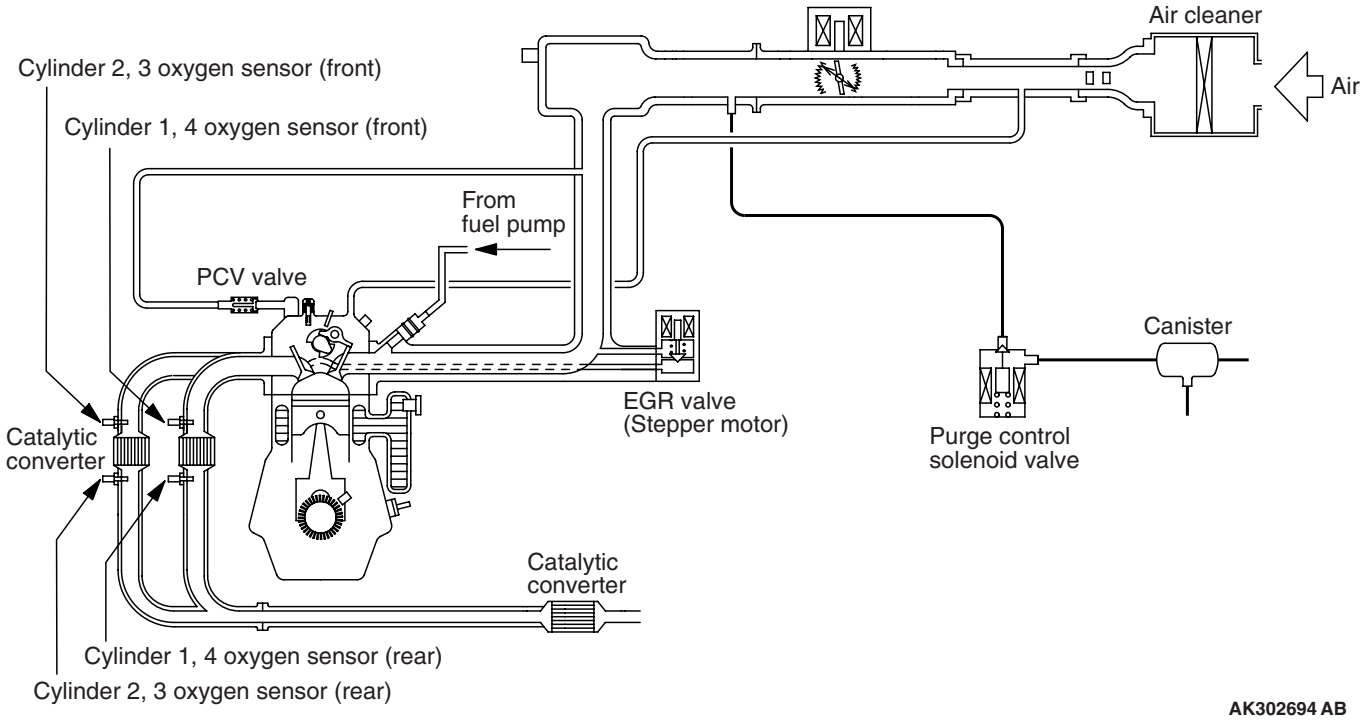
### <4G63-Non-Turbo>



## <4G63-Turbo>


Canister
From fuel tank
Check valve
Purge control solenoid valve
Fuel pressure control solenoid valve
EGR control solenoid valve
Fuel pressure regulator
From fuel pump
To fuel tank
EGR valve
Injector
Air inlet
Catalytic converter
Catalytic converter
Oxygen sensor (front)
Oxygen sensor (rear)
AK306121AB

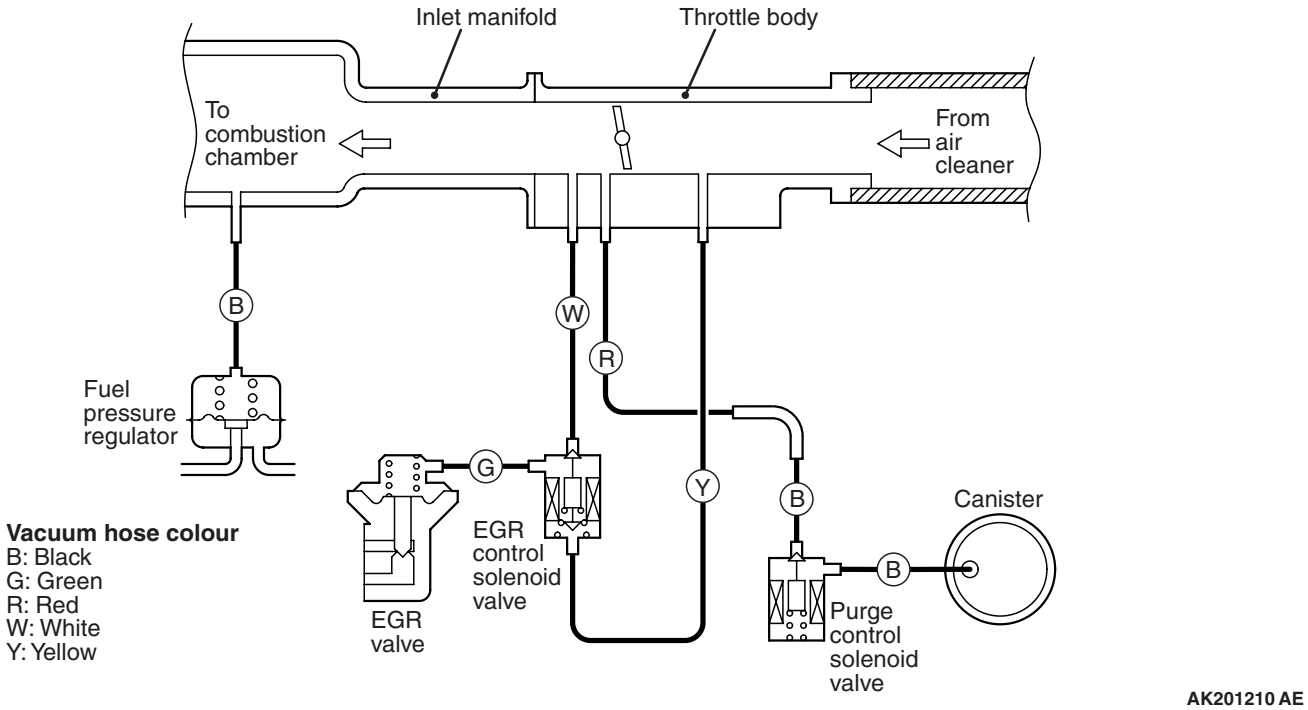
## <4G69>


Air cleaner
Air
Cylinder 2, 3 oxygen sensor (front)
Cylinder 1, 4 oxygen sensor (front)
From
fuel pump
PCV valve
Canister
EGR valve
(Stepper motor)
Purge control
solenoid valve
Catalytic
converter
Catalytic
converter
Cylinder 1, 4 oxygen sensor (rear)
Cylinder 2, 3 oxygen sensor (rear)
AK302694 AB

## VACUUM CIRCUIT DIAGRAM

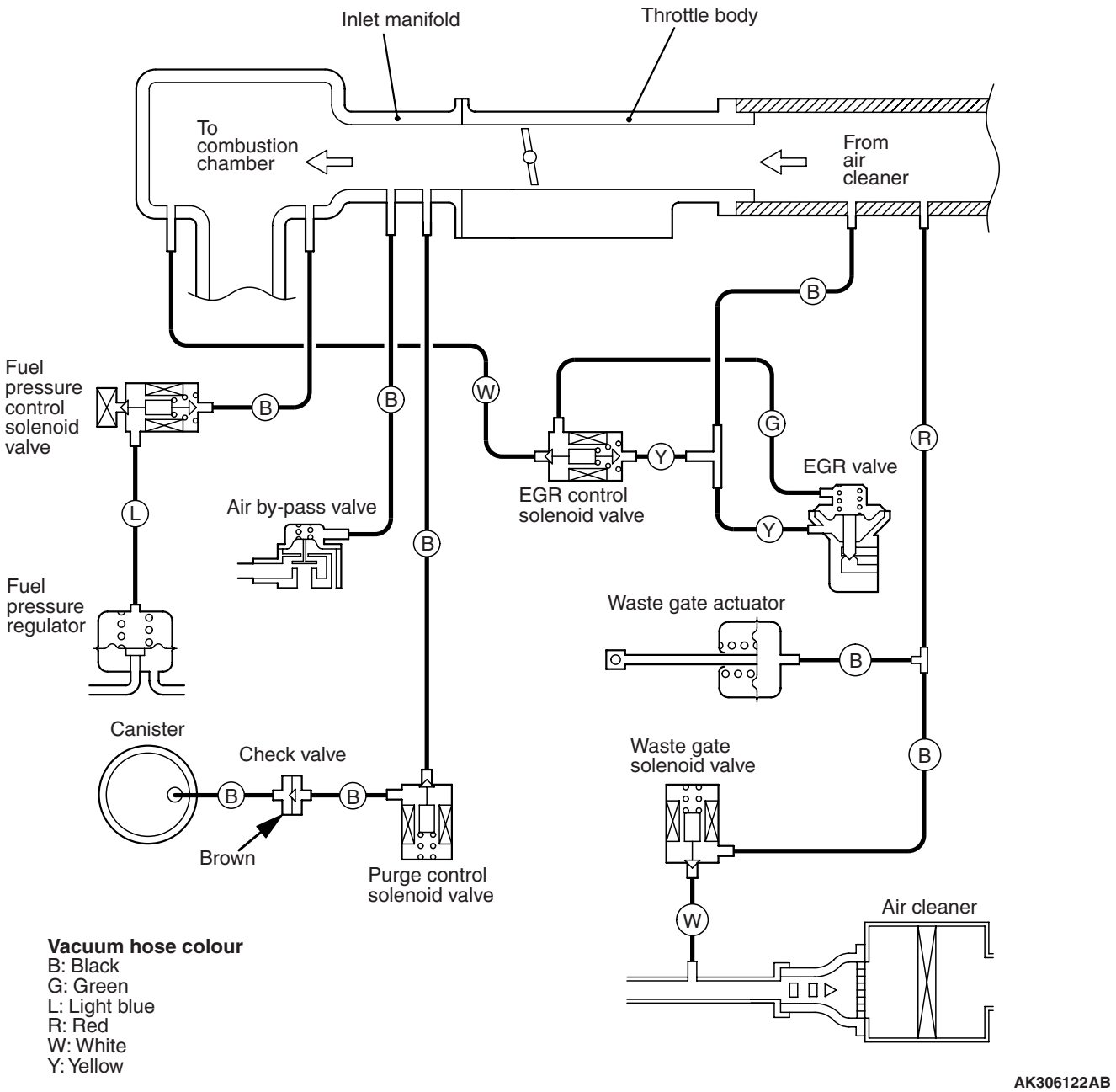
M1173007100490

### <4G63-Non-Turbo>




AK201210 AE

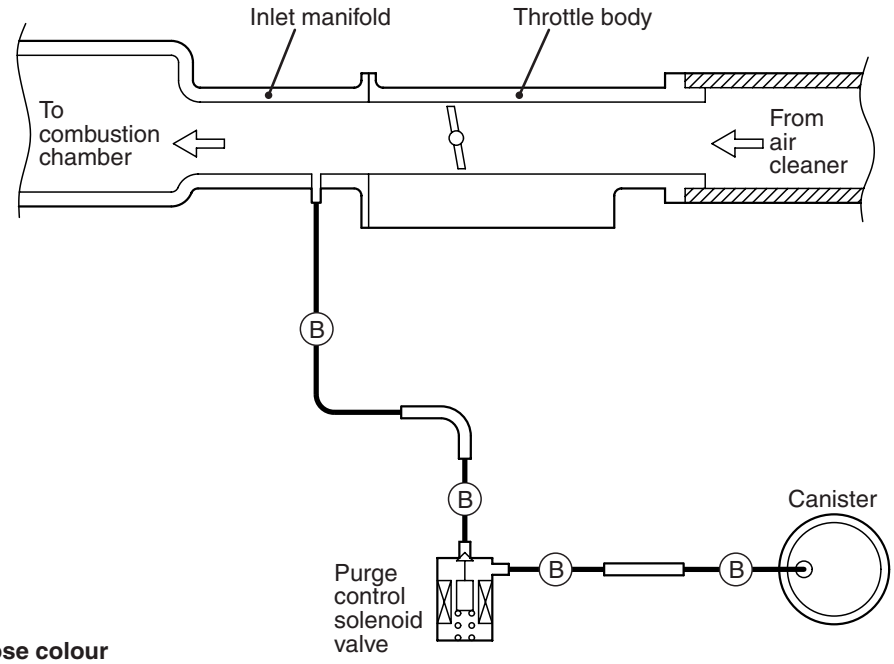
## <4G63-Turbo>




**Vacuum hose colour**
B: Black
G: Green
L: Light blue
R: Red
W: White
Y: Yellow

AK306122AB

**<4G69>**




**Vacuum hose colour**
B: Black

AK302823AC

## VACUUM HOSE CHECK

M1173007300160

1. Using the piping diagram as a guide, check to be sure that the vacuum hoses are correctly connected.
2. Check the connection condition of the vacuum hoses, (removed, loose, etc.) and check to be sure that there are no bends or damage.

## VACUUM HOSE INSTALLATION

M1173007200118

1. When connecting the vacuum hoses, they should be securely inserted onto the nipples.
2. Connect the hoses correctly, using the vacuum hose piping diagram as a guide.

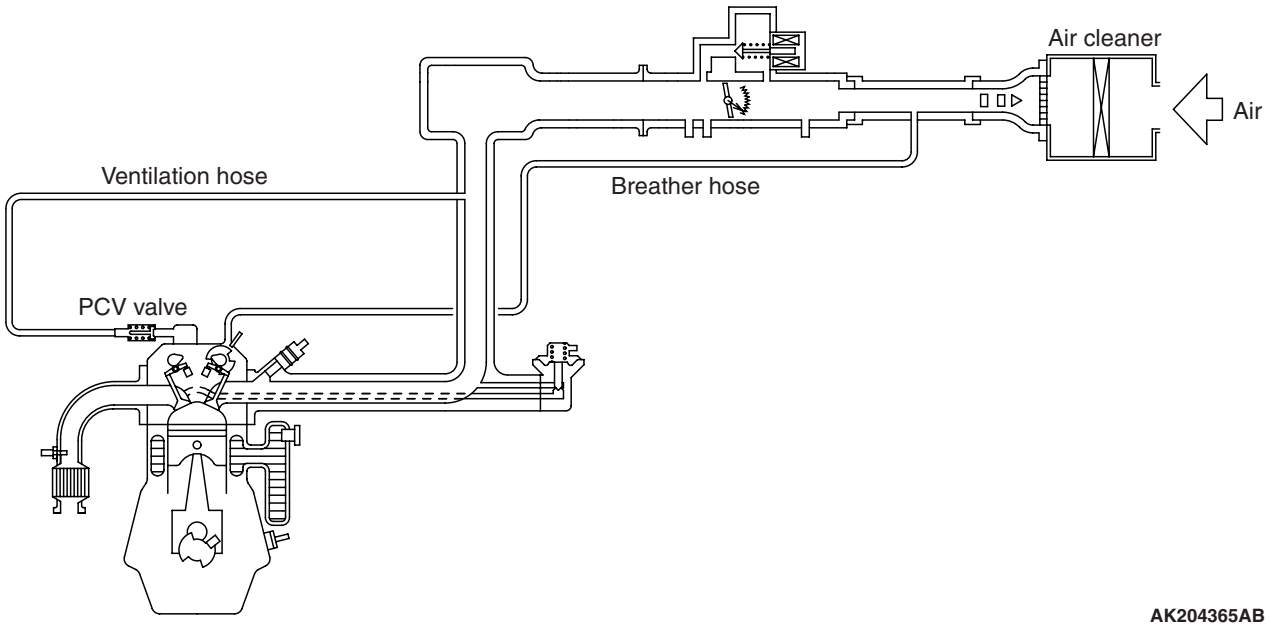
# CRANKCASE EMISSION CONTROL SYSTEM

## GENERAL INFORMATION (CRANKCASE EMISSION CONTROL SYSTEM)

M1173005000550

The crankcase emission control system prevents blow-by gases from escaping inside the crankcase into the atmosphere.
Fresh air is sent from the air cleaner into the crankcase through the breather hose.
The air becomes mixed with the blow-by gases inside the crankcase.
The blow-by gas inside the crankcase is drawn into the inlet manifold through the positive crankcase ventilation (PCV) valve.
The PCV valve lifts the plunger according to the inlet 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.

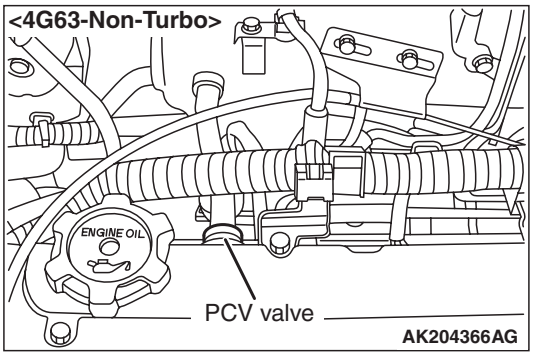
## SYSTEM DIAGRAM

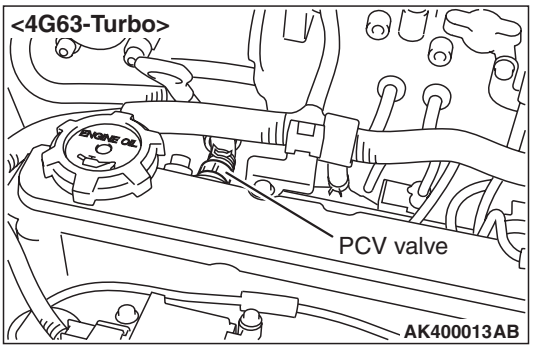


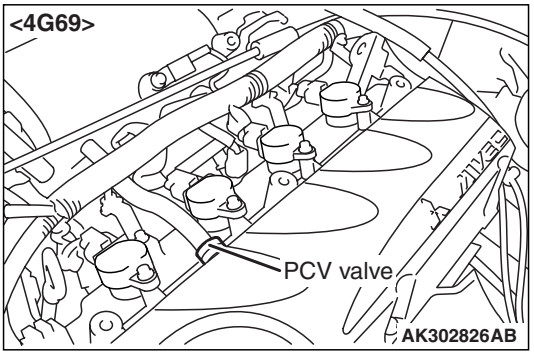

AK204365AB

## COMPONENT LOCATION (CRANKCASE EMISSION CONTROL SYSTEM)

M1173007400350



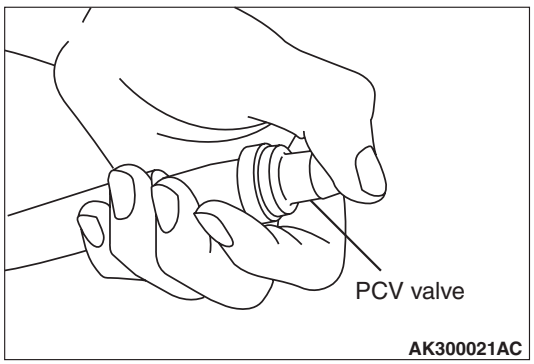




## POSITIVE CRANKCASE VENTILATION SYSTEM CHECK

M1173001100351

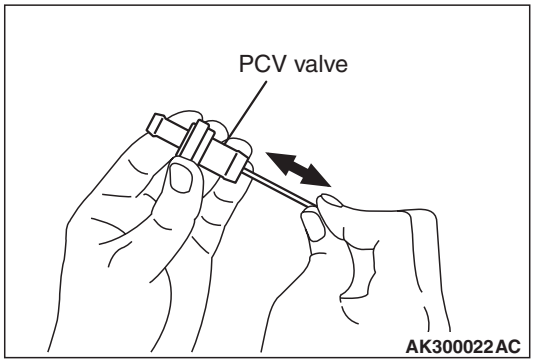
1. Remove the ventilation hose from the PCV valve.
2. Remove the PCV valve from the rocker cover.
3. Reinstall the PCV valve at the ventilation hose.
4. Start the engine and run at idle.




5. Place a finger at the opening of the PCV valve and check that vacuum of the inlet manifold is felt.
   *NOTE: At this moment, the plunger in the PCV valve moves back and forth.*
6. If vacuum is not felt, clean the PCV valve or replace it.

## POSITIVE CRANKCASE VENTILATION (PCV) VALVE CHECK

M1173001200217




1. Insert a thin rod into the PCV valve from the side shown in the illustration (rocker cover installation side), and move the rod back and forth to check that the plunger moves.
2. If the plunger does not move, there is a clogging in the PCV valve. In this case, clean or replace the PCV valve.

# EVAPORATIVE EMISSION CONTROL SYSTEM

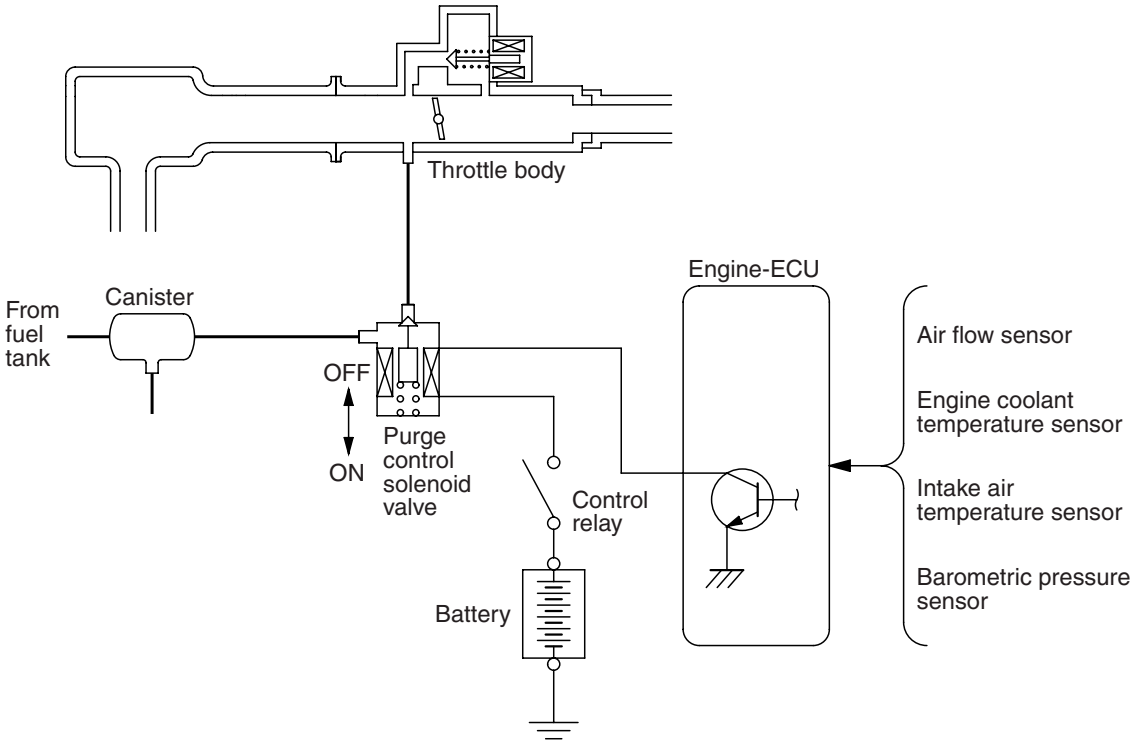
## GENERAL INFORMATION (EVAPORATIVE EMISSION CONTROL SYSTEM)

M1173005100676

The evaporative emission 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 canister.
When driving the vehicle, fuel vapors stored in the canister flow through the gurge control solenoid valve and purge port and go into the inlet manifold to be sent 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 engine control unit turns the purge solenoid off to shut off the fuel vapor flow to the inlet manifold.
This does not only insure the driveability when the engine is cold or running under low load but also stabilize the emission level.

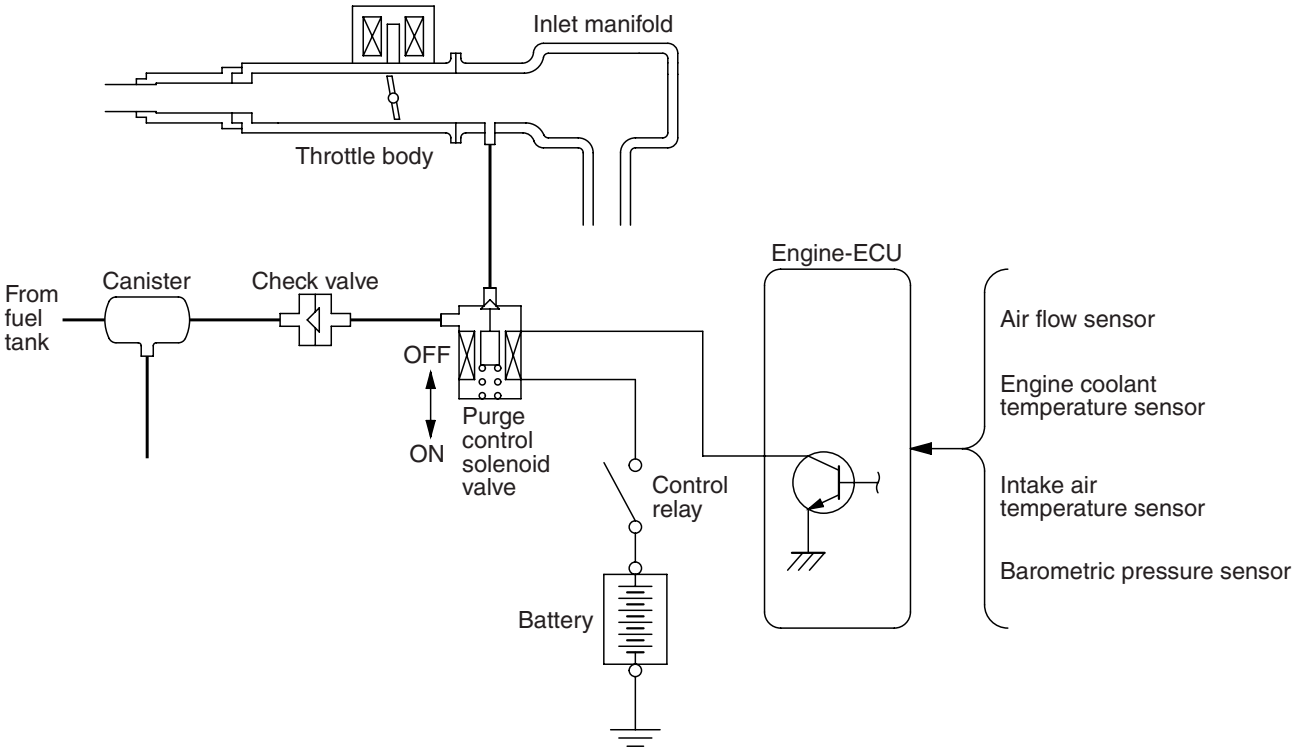
## SYSTEM DIAGRAM

### <4G63-Non-Turbo>



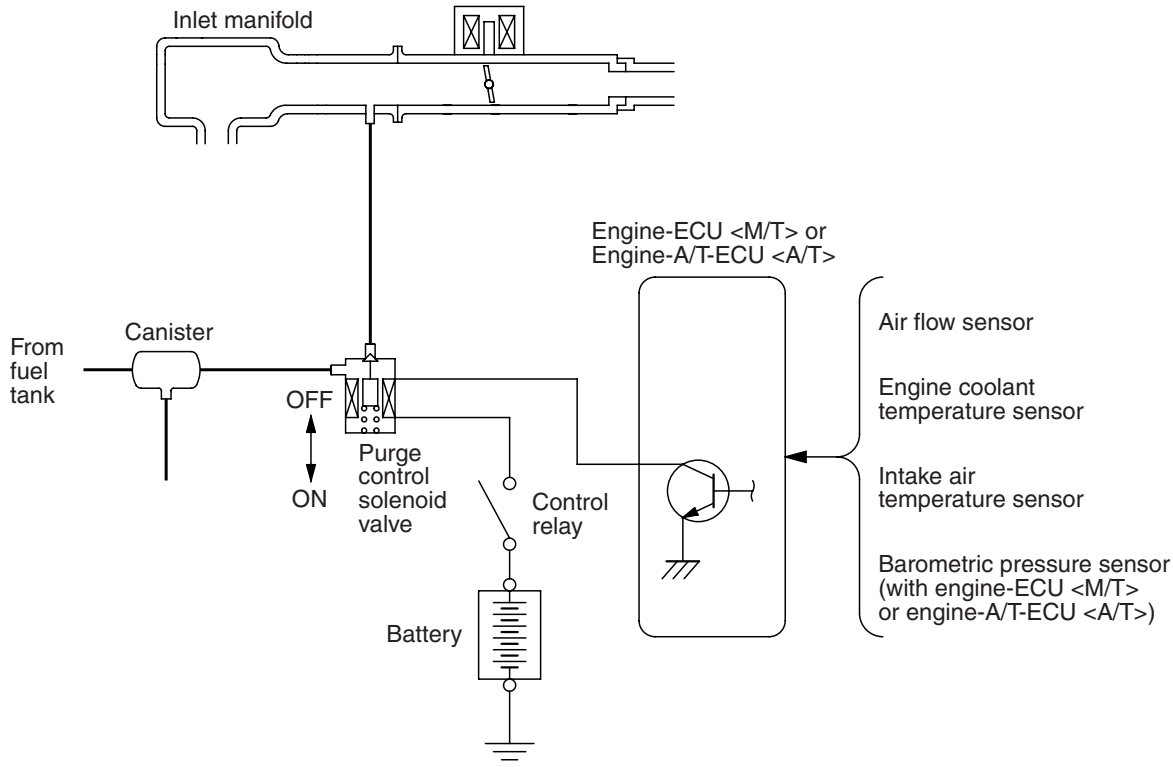

AK204367AD

### <4G63-Turbo>




AK306123AB

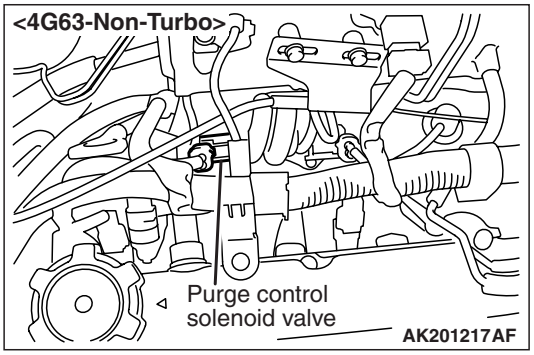
**<4G69>**

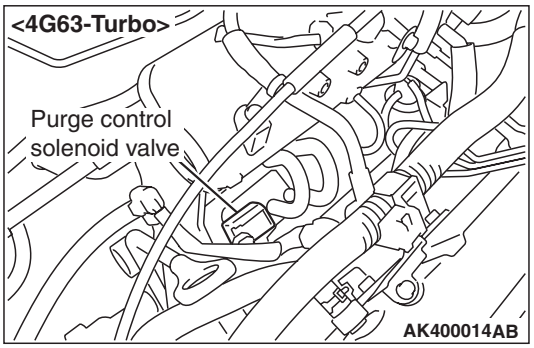


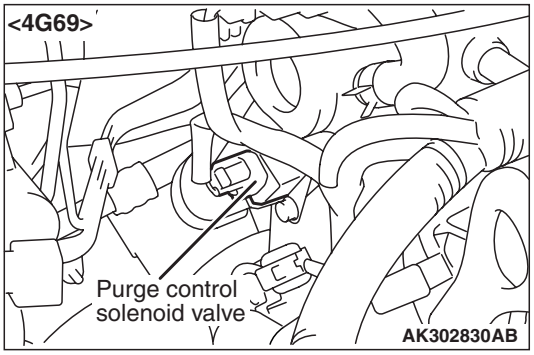

AK302829AD

## COMPONENT LOCATION (EVAPORATIVE EMISSION CONTROL SYSTEM)

M1173007500368



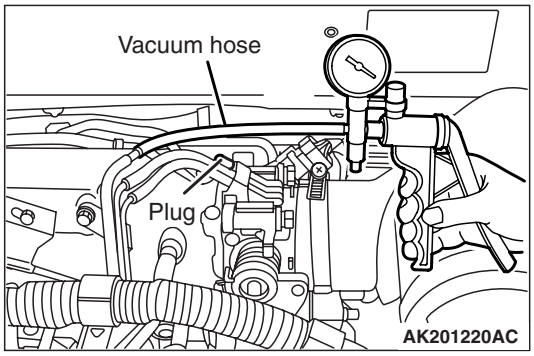



## PURGE CONTROL SYSTEM CHECK

M1173001400578

### <4G63-Non-Turbo>




1. Disconnect the vacuum hose (red stripe) from throttle body and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold or hot, apply a vacuum of 53 kPa, and check the condition of the vacuum.

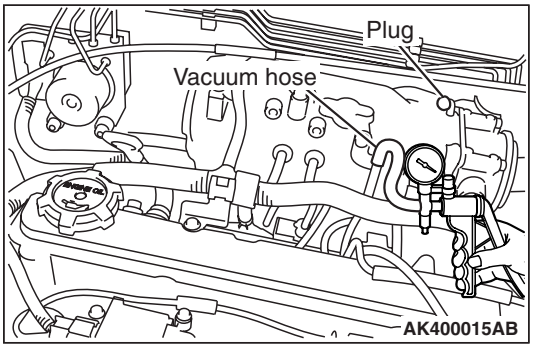
**When engine is cold**
**(Engine coolant temperature: 40°C or less)**

| Engine condition | Normal condition |
|---|---|
| At idle | Vacuum is maintained. |
| 3,000 r/min | |

**When engine is hot**
**(Engine coolant temperature: 80°C or higher)**

| Engine condition | Normal condition |
|---|---|
| 3,000 r/min (within 3 minutes after engine starts) | Vacuum will leak. |

### <4G63-Turbo>




1. Disconnect the vacuum hose (between purge control solenoid valve and inlet manifold) from the inlet manifold and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold or hot, apply a vacuum of 53 kPa, and check the condition of the vacuum.

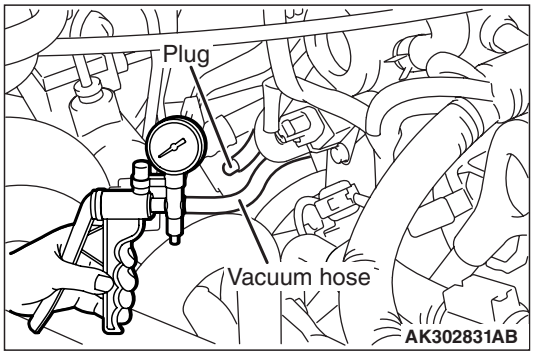
**When engine is cold**
**(Engine coolant temperature: 40°C or less)**

| Engine condition | Normal condition |
|---|---|
| At idle | Vacuum is maintained. |
| 3,000 r/min | |

**When engine is hot**
**(Engine coolant temperature: 80°C or higher)**

| Engine condition | Normal condition |
|---|---|
| 3,000 r/min (within 3 minutes after engine starts) | Vacuum will leak. |

### <4G69>




1. Disconnect the vacuum hose (between purge control solenoid valve and inlet manifold) from purge control solenoid valve and connect a hand vacuum pump to the nipple.
2. Plug the vacuum hose.
3. When the engine is cold or hot, apply a vacuum of 53 kPa, and check the condition of the vacuum.

**When engine is cold**
**(Engine coolant temperature: 40°C or less)**

| Engine condition | Normal condition |
|---|---|
| At idle | Vacuum is maintained. |
| 3,000 r/min | |

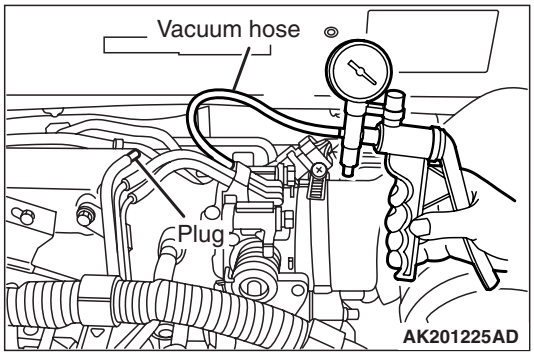
**When engine is hot**
**(Engine coolant temperature: 80°C or higher)**

| Engine condition | Normal condition |
|---|---|
| 3,000 r/min (within 3 minutes after engine starts) | Vacuum will leak. |

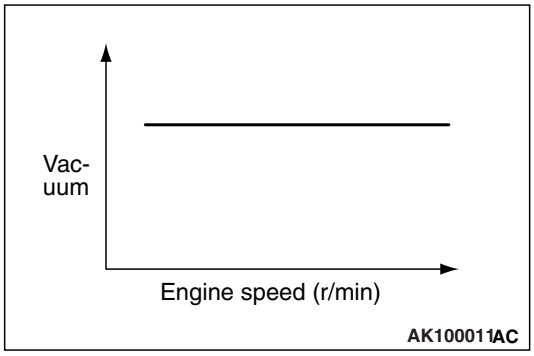
## PURGE PORT VACUUM CHECK

M1173001500348

### <4G63-Non-Turbo>

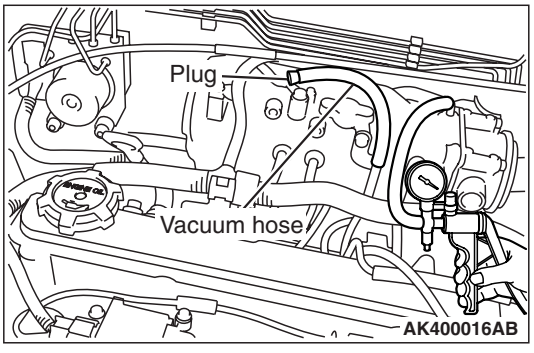



1. Disconnect the vacuum hose (red stripe) from the throttle body and connect a hand vacuum pump to the nipple.
2. Plug the vacuum hose (red stripe).

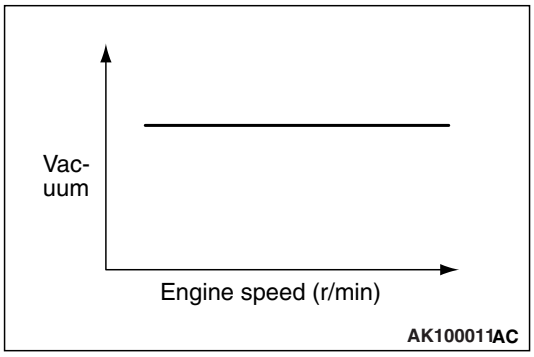



3. Start the engine.
4. Check that a fairly constant negative pressure is generated regardless of the engine speed.
5. If no negative pressure is generated, the port is probably blocked and should be cleaned.

### <4G63-Turbo>

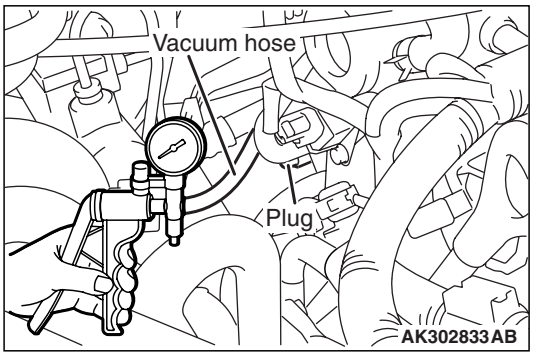



1. Disconnect the vacuum hose (between purge control solenoid valve and inlet manifold) from the inlet manifold and connect a hand vacuum pump to the nipple.
2. Plug the vacuum hose.

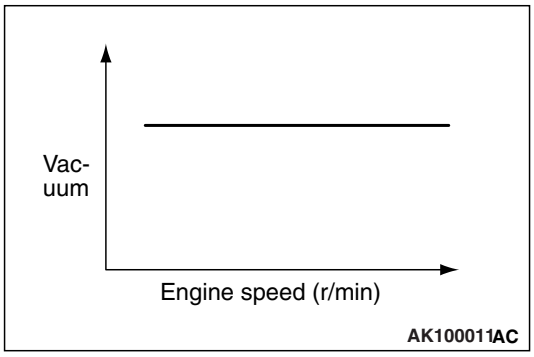



3. Start the engine.
4. Check that a fairly constant negative pressure is generated regardless of the engine speed.
5. If no negative pressure is generated, the port is probably blocked and should be cleaned.

### <4G69>




1. Disconnect the vacuum hose (between purge control solenoid valve and inlet manifold) from the purge control solenoid valve and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.

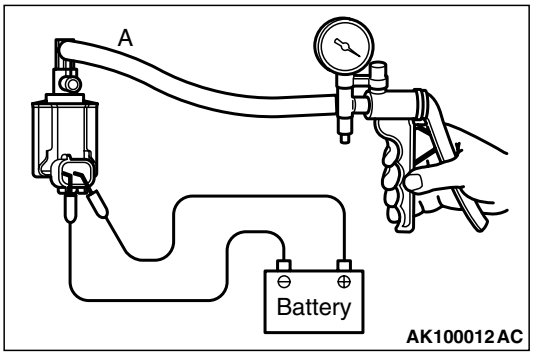


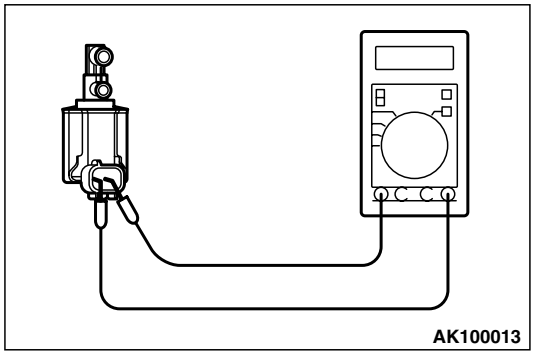

3. Start the engine.
4. Check that a fairly constant negative pressure is generated regardless of the engine speed.
5. If no negative pressure is generated, the port is probably blocked and should be cleaned.

## PURGE CONTROL SOLENOID VALVE CHECK

M1173001700234

*NOTE: When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.*




1. Disconnect the vacuum hose from the solenoid valve.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to nipple (A) of the solenoid valve (refer to the illustration at left).
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the purge control solenoid valve and without applying voltage.

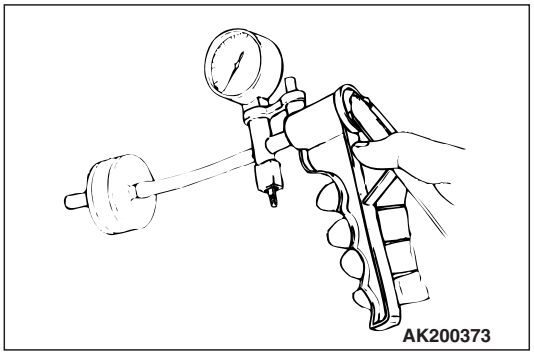
| Battery voltage | Normal condition |
|---|---|
| Applied | Vacuum leaks |
| Not applied | Vacuum maintained |

5. Measure the resistance between the terminals of the solenoid valve.

   **Standard value: 30 – 34 Ω (at 20°C)**

## CHECK VALVE CHECK <4G63-Turbo>

M1173006200115



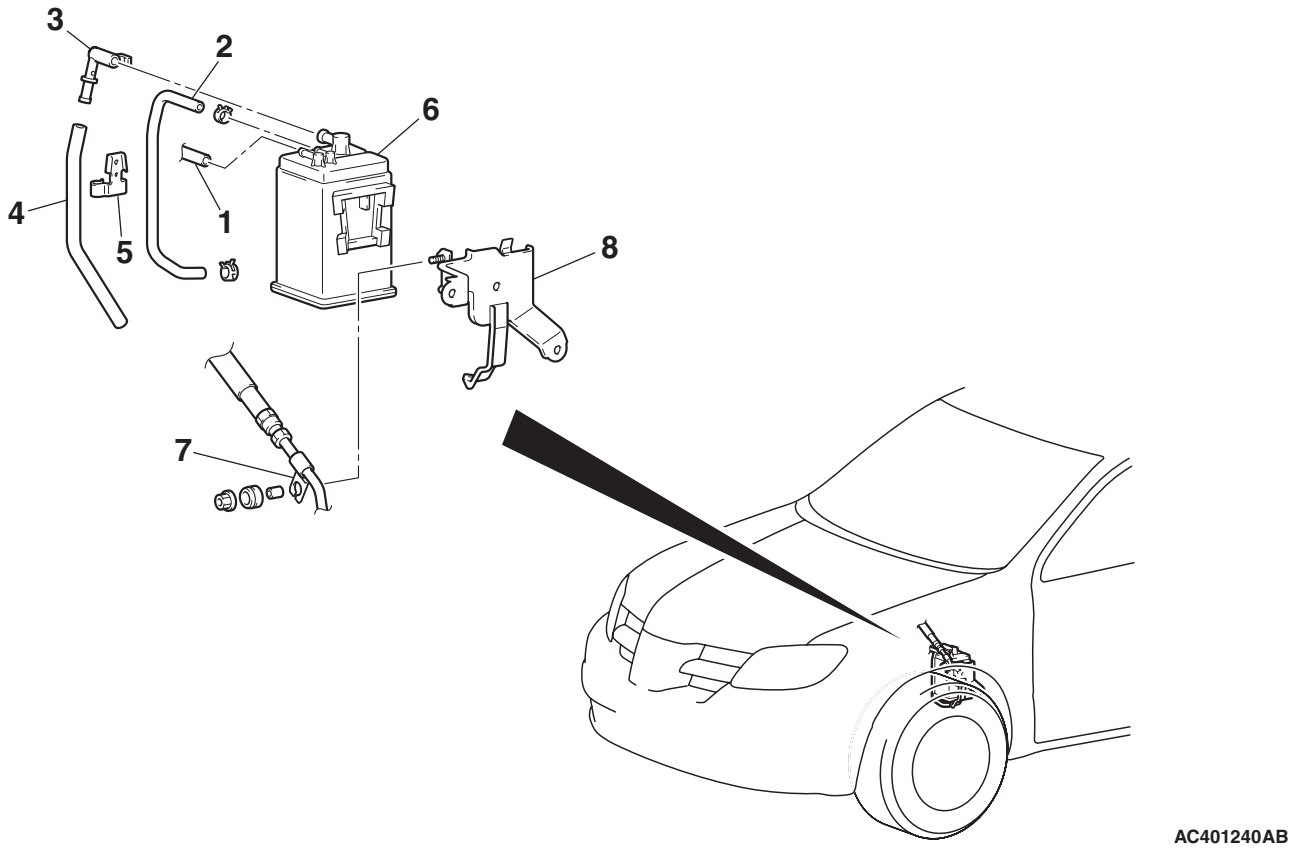

Connect a hand vacuum pump to the check valve, apply negative pressure and check the airtightness.

| Connect nipple colour | Normal condition |
|---|---|
| Black | Negative pressure leaks |
| Brown | Negative pressure is maintained |

# CANISTER REMOVAL AND INSTALLATION

M1173004200249

**Pre-removal and Post-installation Operation**
- Air Cleaner Cover and Air Intake Hose Removal and Installation <4G63-Non-Turbo, 4G69> (Refer to GROUP 15 - Air Cleaner P.15-6 <4G63-Non-Turbo> or P.15-8 <4G69>).
- Battery and Battery Tray Removal and Installation <4G63-Turbo>




AC401240AB

**Removal steps**
1. Purge hose connection
2. Vapour hose
3. Vent connector
4. Vapour hose
5. Hose clamp

**Removal steps (Continued)**
6. Canister
7. Fuel high-pressure hose clamp <4G63>
8. Canister bracket

# EXHAUST GAS RECIRCULATION (EGR) SYSTEM

## GENERAL INFORMATION (EGR SYSTEM)

M1173005200543

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 nitrogen oxides (NOx) is generated in the combustion chamber.
Therefore, this system recirculates part of emission gas from the exhaust port of the cylinder head to the combustion chamber through the inlet manifold to decrease the air/fuel mixture combustion temperature, resulting in reduction of NOx.
The EGR flow rate is controlled by the EGR valve so as not to decrease the driveability.

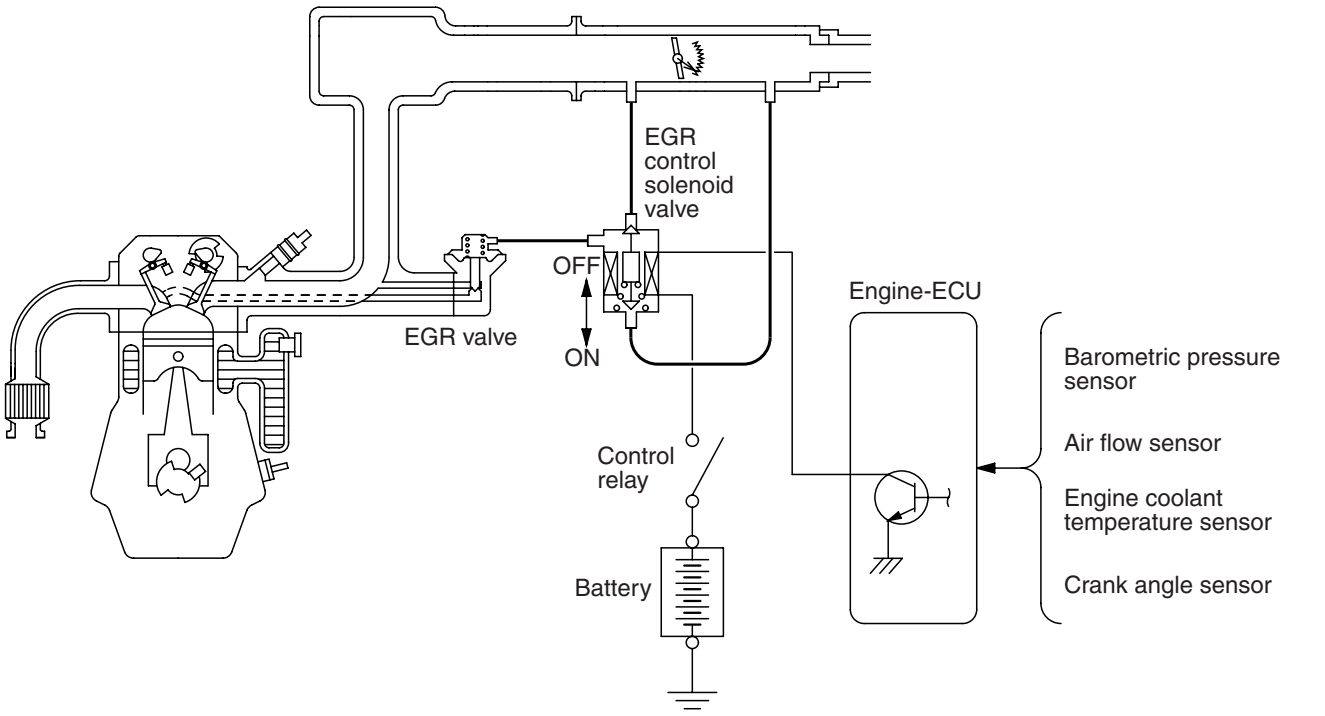
## OPERATION

The EGR valve is being closed and does not recirculate exhaust gases under one of the following conditions.
Otherwise, the EGR valve is opened and recirculates exhaust gases.

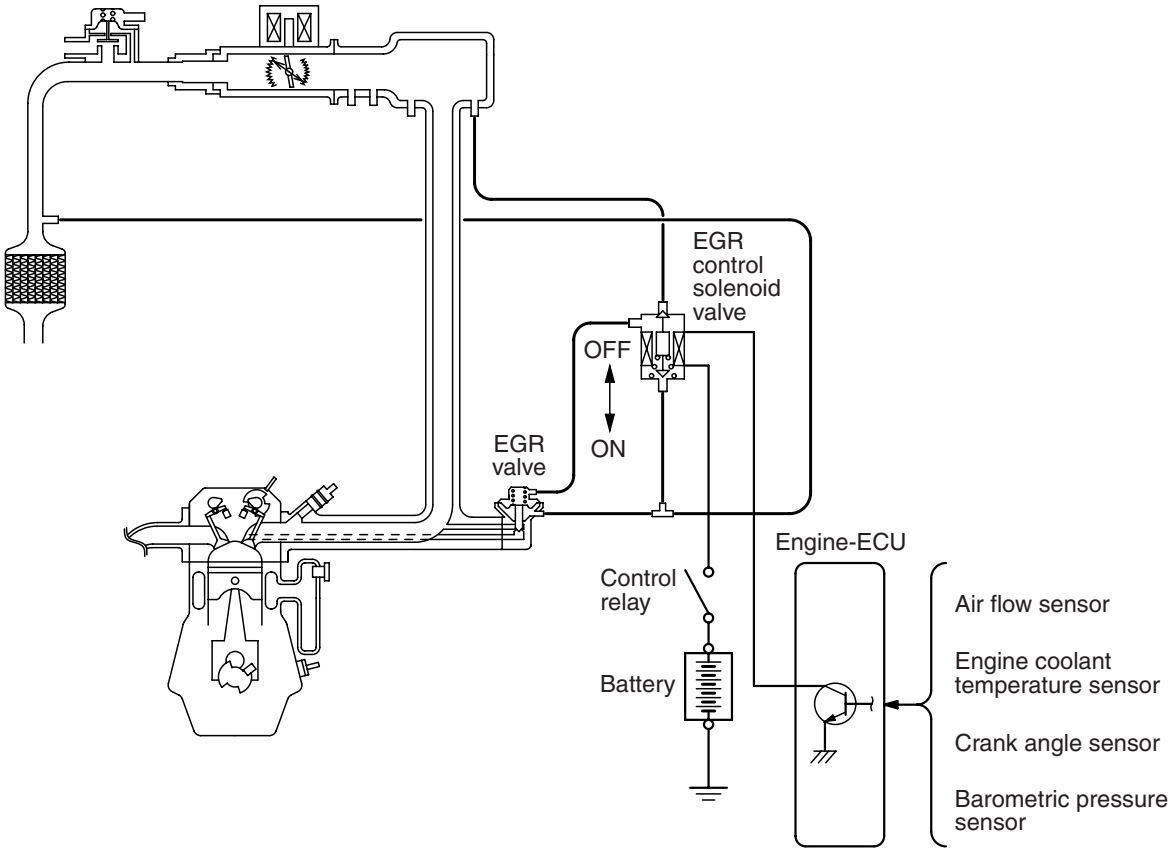
- The engine coolant temperature is low.
- The engine is at idle.
- The throttle valve is widely opened.

## SYSTEM DIAGRAM

### <4G63-Non-Turbo>



## <4G63-Turbo>

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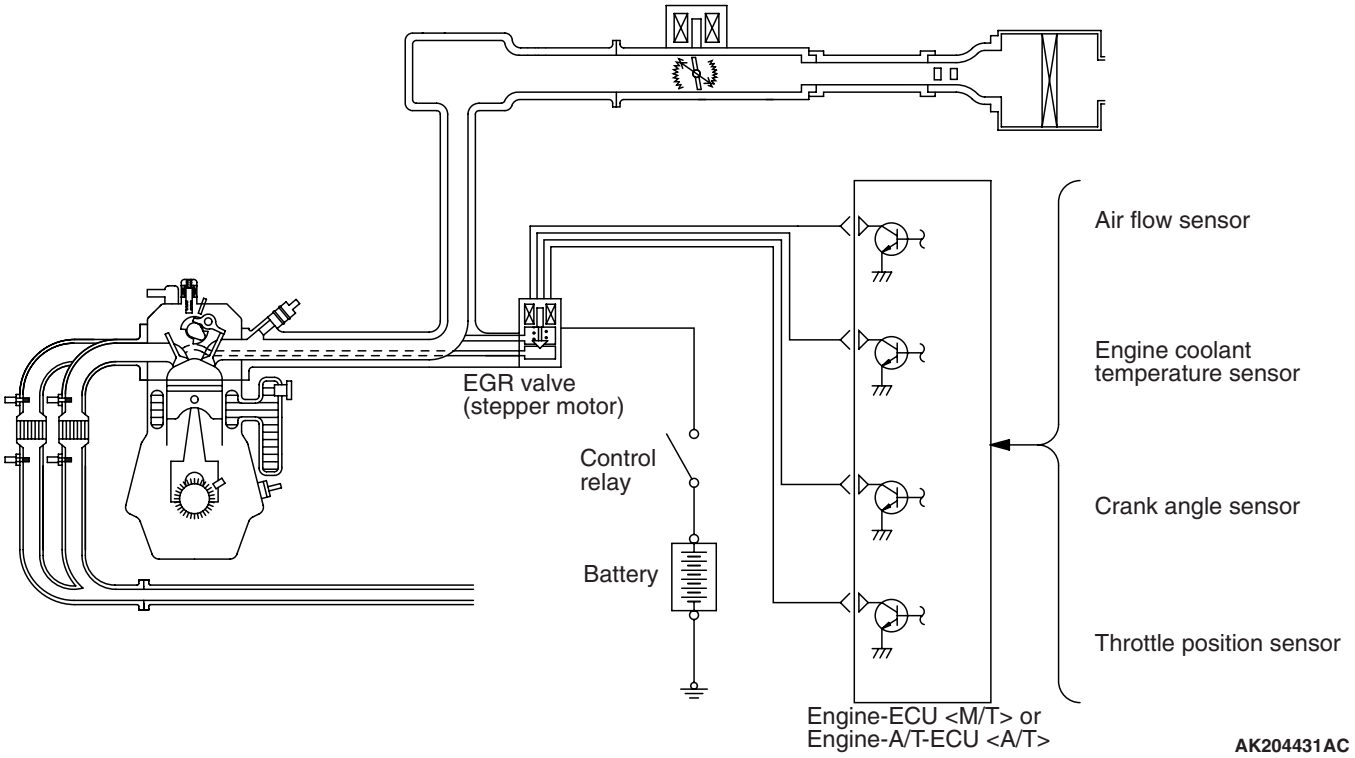
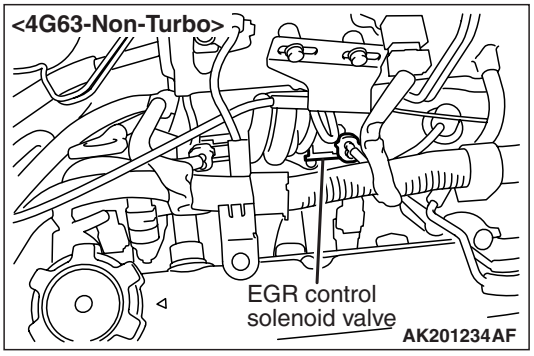
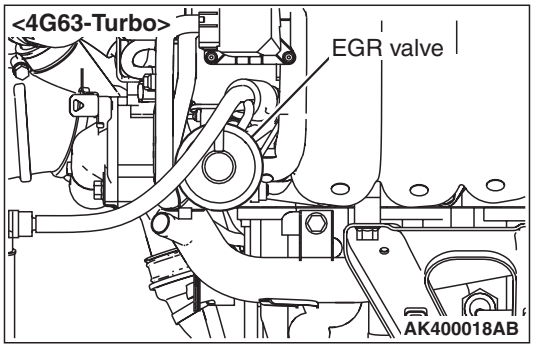
**<4G69>**

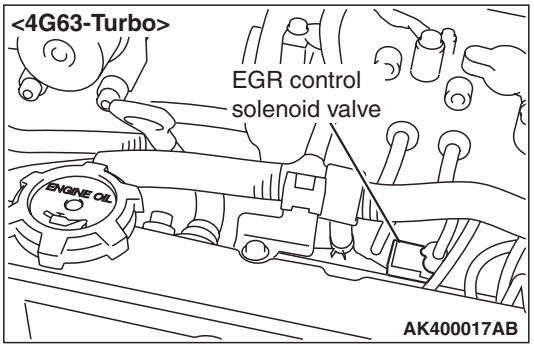


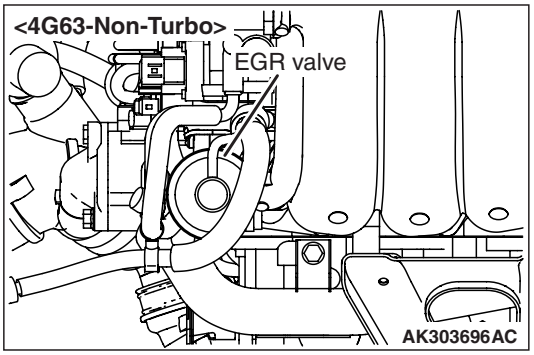

## COMPONENT LOCATION (EGR SYSTEM)

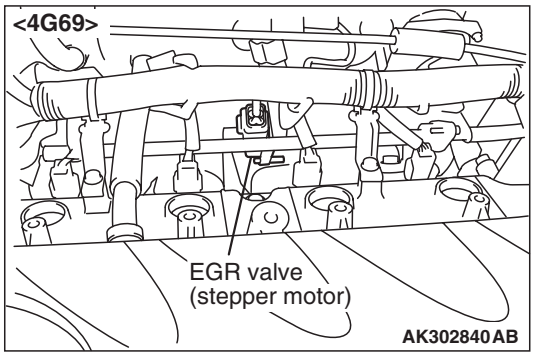
M1173007600354



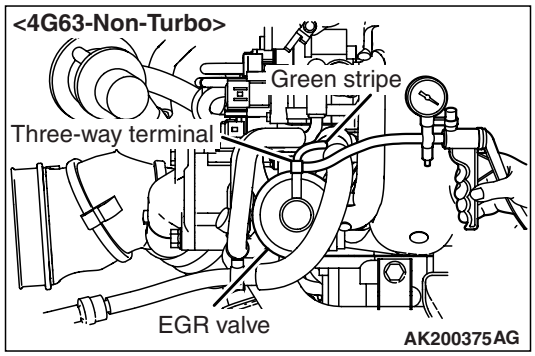



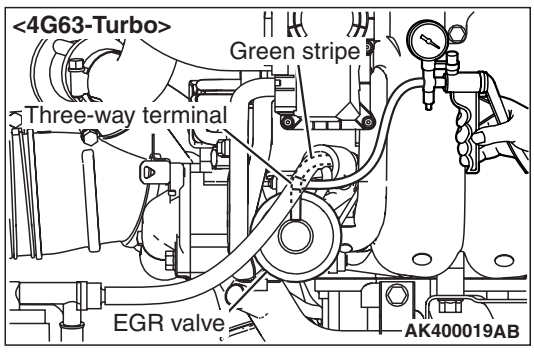






## EGR SYSTEM CHECK <4G63>

M1173002600423




1. Disconnect the vacuum hose (Green stripe) from the EGR valve, and then connect a hand vacuum pump via the three-way terminal.
2. When the engine is hot or cold, check the condition of vacuum by racing the engine.

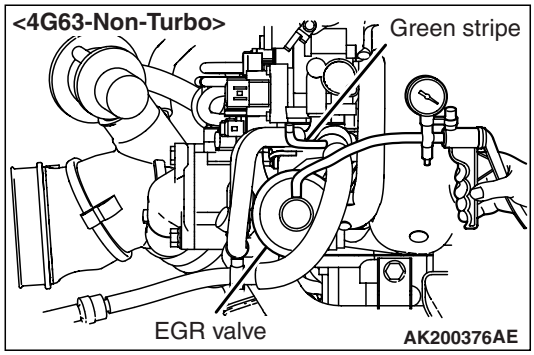
**When engine is cold**
**(Engine coolant temperature: 20°C or less)**

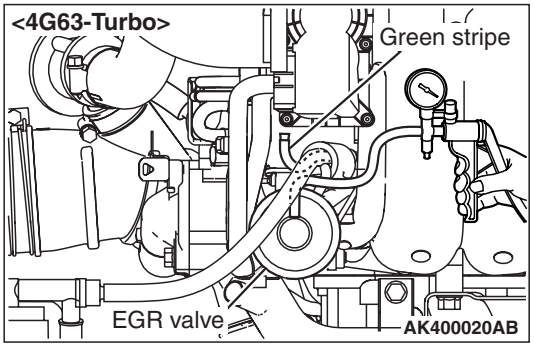
| Throttle valve | Normal vacuum condition |
|---|---|
| Open quickly | No vacuum will generate (the same as barometric pressure.) |

**When engine is hot**
**(Engine coolant temperature: 80°C or higher)**

| Throttle valve | Normal vacuum condition |
|---|---|
| Open quickly | It will momentarily rise over 13 kPa |

3. Disconnect the three-way terminal.



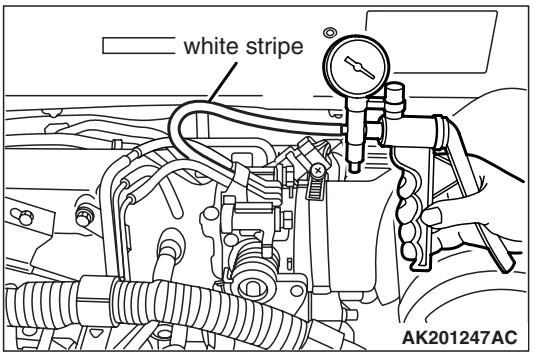




4. Connect the hand vacuum pump to the EGR valve nipple.
5. Check whether the engine stalls or the idling is unstable when a vacuum of 30 kPa or higher is applied during idling.

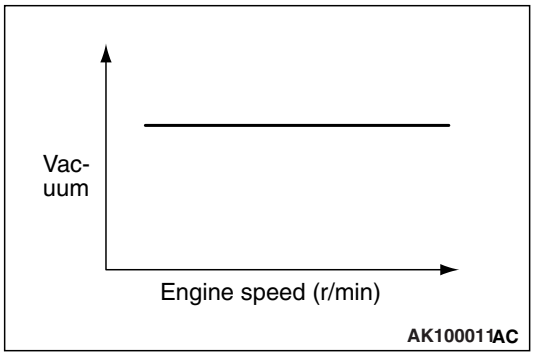
## EGR PORT VACUUM CHECK<4G63>

M1173002900220

### <4G63-Non-Turbo>

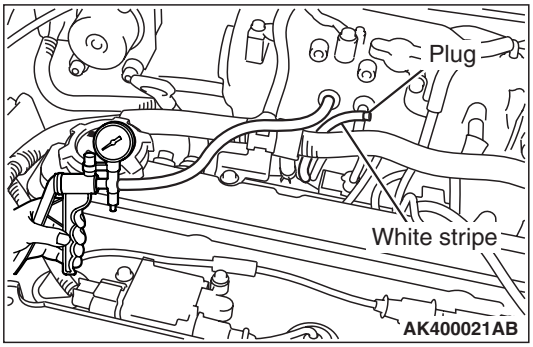



1. Disconnect the vacuum hose (White stripe) from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.
2. Plug the vacuum hose (White stripe).

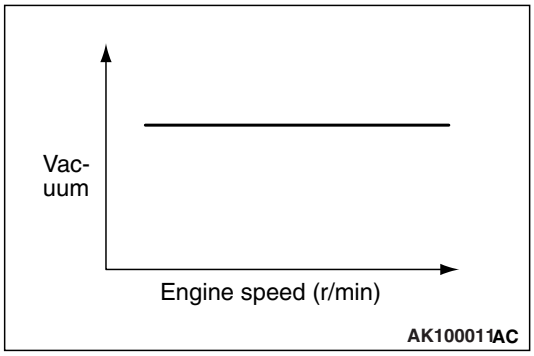



3. Start the engine.
4. Check that a fairly constant negative pressure is generated regardless of the engine speed.
5. If no negative pressure is generated, the port is probably blocked and should be cleaned.

## <4G63-Turbo>




1. Disconnect the vacuum hose (White stripe) from the inlet manifold EGR vacuum nipple and connect a hand vacuum pump to the nipple.
2. Plug the vacuum hose (White stripe).

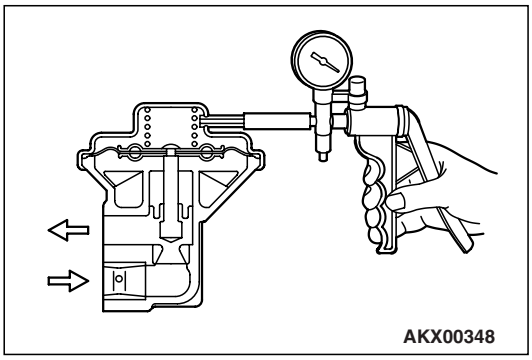



3. Start the engine.
4. Check that a fairly constant negative pressure is generated regardless of the engine speed.
5. If no negative pressure is generated, the port is probably blocked and should be cleaned.

## EGR VALVE CHECK <4G63>

M1173002800289

1. Remove the EGR valve and inspect for sticking, carbon deposits, etc. If found, clean with a suitable solvent so that the valve seats correctly.
2. Connect a hand vacuum pump to the EGR valve.
3. Apply 67 kPa of vacuum, and check that the vacuum is maintained.




4. Apply a vacuum and check the passage of air by blowing through one side of the EGR passage.

| Vacuum | Passage of air |
|---|---|
| 5.3 kPa or less | Air is not blown out |
| 27 kPa or more | Air is blown out |

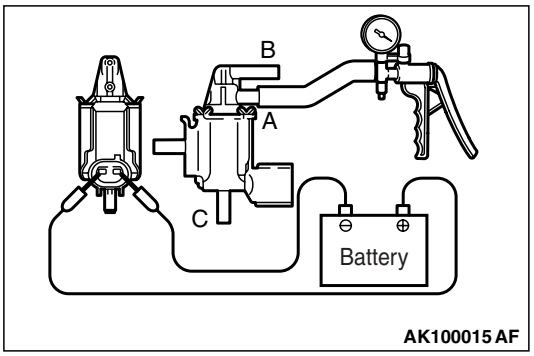
5. Replace the gasket, and tighten to the specified torque.

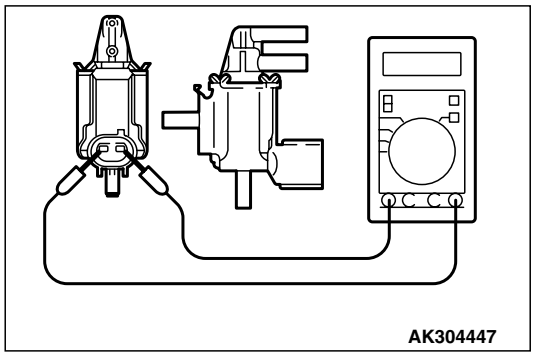
**Tightening torque: 20 ± 2 N·m**

## EGR CONTROL SOLENOID VALVE CHECK <4G63>

M1173003100335

*NOTE: When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.*




1. Disconnect the vacuum hose from the solenoid valve.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to nipple (A) of the solenoid valve (refer to the illustration at left).
4. Check air tightness by applying a vacuum with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage.

| Battery voltage | Nipple condition | Normal condition |
|---|---|---|
| Applied | Both nipples opened | Vacuum leaks |
| | Nipple “B” closed | Vacuum maintained |
| Not applied | Both nipples opened | Vacuum leaks |
| | Nipple “C” closed | Vacuum maintained |

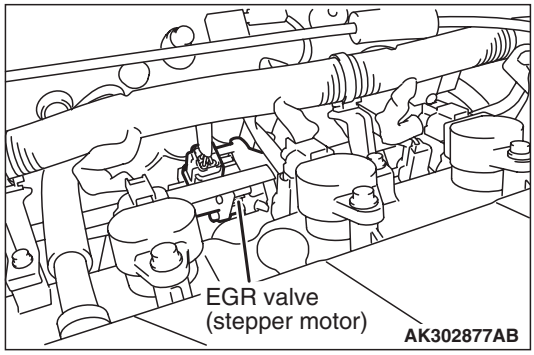
5. Measure the resistance between the terminals of the solenoid valve.

**Standard value: 29 – 35 Ω (at 20°C)**

## EGR VALVE (STEPPER MOTOR) CHECK <4G69>

M1173050200134

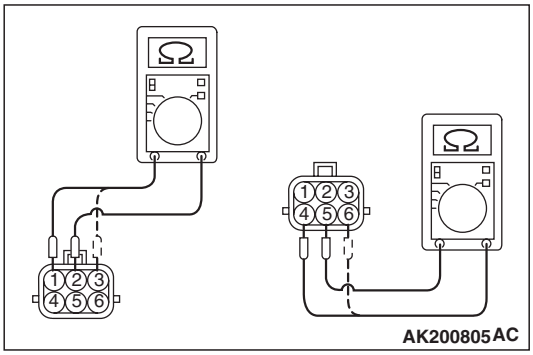
### Checking the Operation Sound




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-ECU <M/T> or engine-A/T-ECU <A/T> may have failed.*

### Checking the Coil Resistance




1. Remove the EGR valve.
2. Measure the resistance between terminal No. 2 and either terminal No. 1 or terminal No. 3 of the connector at the EGR valve.

**Standard value: 20 – 24 Ω (at 20°C)**

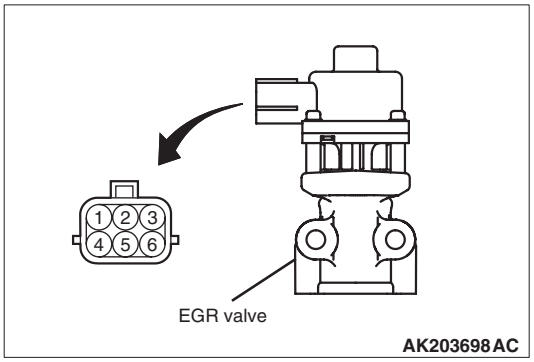
3. Measure the resistance between terminal No. 5 and either terminal No. 6 or terminal No. 4 of the connector at the EGR valve.

**Standard value: 20 – 24 Ω (at 20°C)**

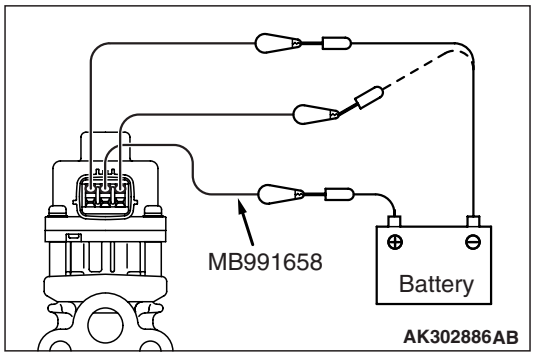
4. Using a new gasket, install the EGR valve by tightening its mounting bolts to the specified torque.

**Tightening Torque: 24 ± 4 N·m**

## Operation Check




1. Remove the EGR valve.
2. Attach a test wiring harness (special tool MB991658) to the connector at the EGR valve.



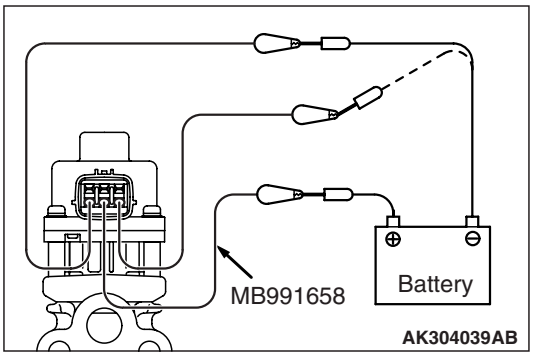

**⚠ CAUTION**

**Connecting battery voltage to the EGR valve for a long term could damage the coil.**

3. Connect the positive (+) terminal of the battery to terminal No. 2.
4. Connect terminals No. 1 and No. 3 to the negative (-) terminal of the battery, in order to test whether the stepper motor vibrates (with a slight shudder), indicating that the stepper motor is operating.

**⚠ CAUTION**

**Connecting battery voltage to the EGR valve for a long term could damage the coil.**




5. Connect the positive (+) terminal of the battery to terminal No. 5.
6. Connect terminals No. 4 and No. 6 to the negative (-) terminal of the battery, in order to test whether the stepper motor vibrates (with a slight shudder), indicating that the stepper motor is operating.
7. If a vibration can be felt during the test, the stepper motor is normal.
8. Using a new gasket, install the EGR valve by tightening its mounting bolts to the specified torque.

**Tightening torque: 24 ± 3 N·m**

## Cleaning the EGR Valve

**⚠ CAUTION**

**Do not use a solvent or detergent, which could enter the motor and cause it to malfunction.**

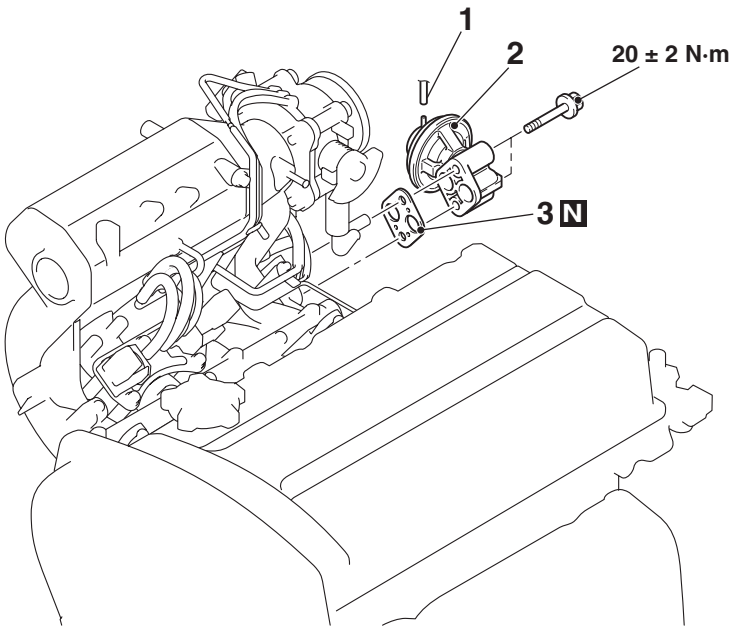
1. Remove the EGR valve and check that the EGR valve is not stuck or clogged with carbon deposits. Use a wire brush to clean the valve if necessary.
2. Using a new gasket, install the EGR valve by tightening its mounting bolts to the specified torque.

**Tightening torque: 24 ± 3 N·m**

# EXHAUST GAS RECIRCULATION (EGR) VALVE REMOVAL AND INSTALLATION <4G63-Non-Turbo>

M1173010500368

**Pre-removal and Post-installation Operation**
Air Cleaner Cover and Air Intake Hose Removal and Installation (Refer to GROUP 15 - Air Cleaner P.15-6).




AC301219AB

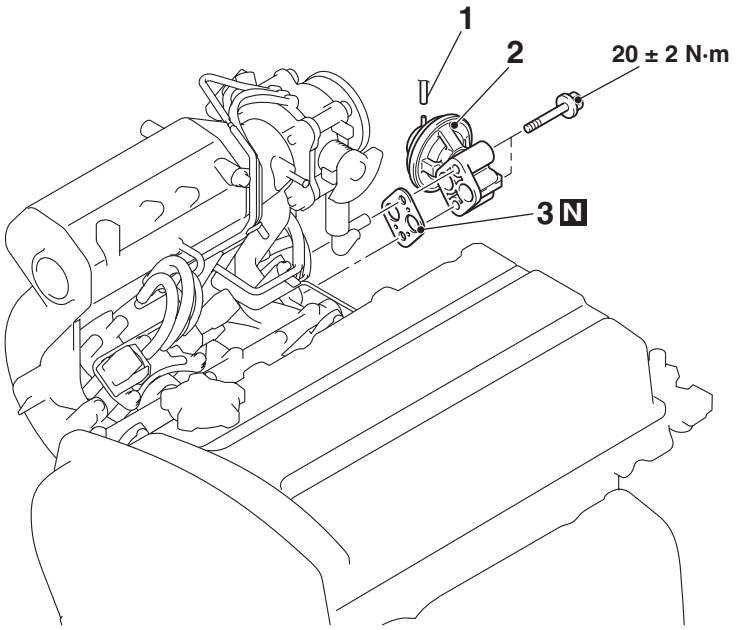
**Removal steps**
1. Vacuum hose connection

**Removal steps (Continued)**
2. EGR valve
3. EGR valve gasket

# EXHAUST GAS RECIRCULATION (EGR) VALVE REMOVAL AND INSTALLATION <4G63-Turbo>

M1173010500357

**Pre-removal and Post-installation Operation**
Battery and Battery Tray Removal and Installation




AC301219AB

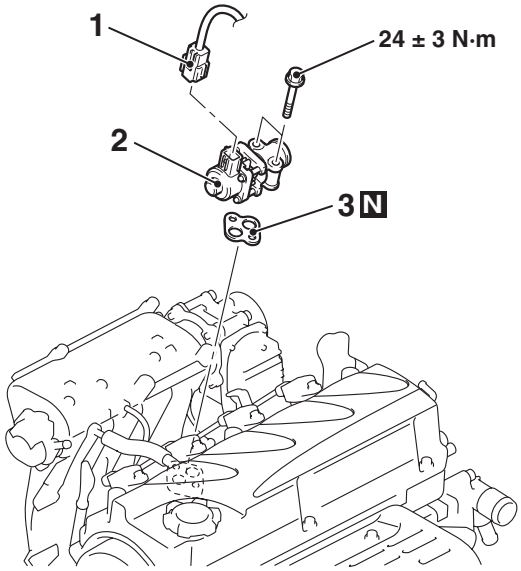
**Removal steps**
1. Vacuum hose connection

**Removal steps (Continued)**
2. EGR valve
3. EGR valve gasket

# EXHAUST GAS RECIRCULATION (EGR) VALVE REMOVAL AND INSTALLATION <4G69>

M1173010500379

**Pre-removal and Post-installation Operation**
Resonator Removal and Installation (Refer to GROUP 15 - Air Cleaner P.15-8).

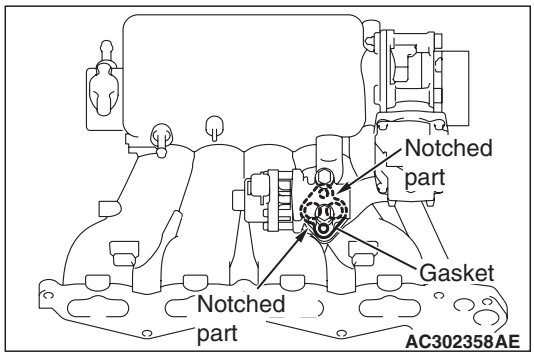



AC302329AE

**Removal steps**
1. EGR valve connector
2. EGR valve
>>A<< 3. EGR valve gasket

## INSTAIIATION SERVICE POINT

## >>A<< EGR VALVE GASKET INSTALLATION



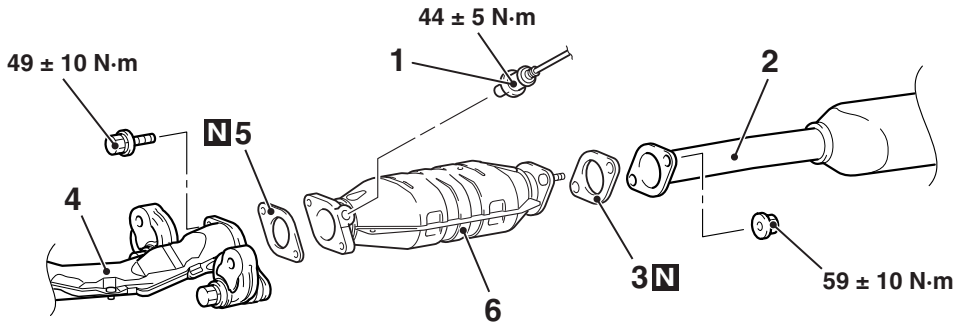

Install the EGR valve gasket as shown in the illustration.

# CATALYTIC CONVERTER

## REMOVAL AND INSTALLATION

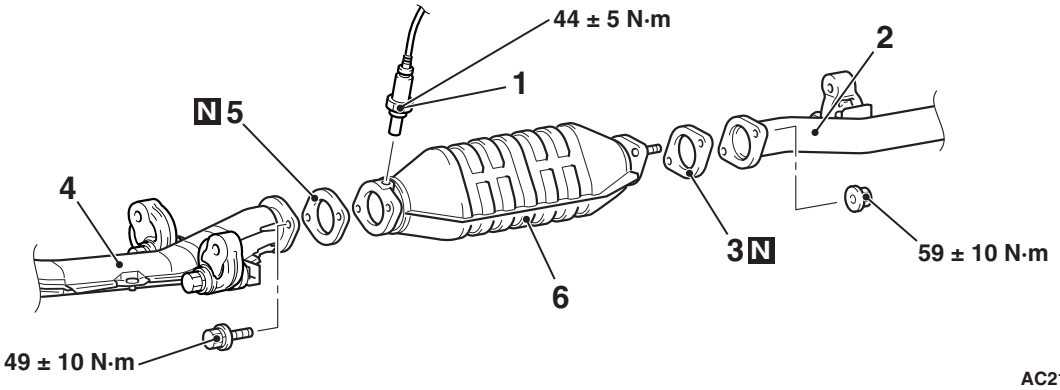
M1173003900579

**<4G63-2WD>**



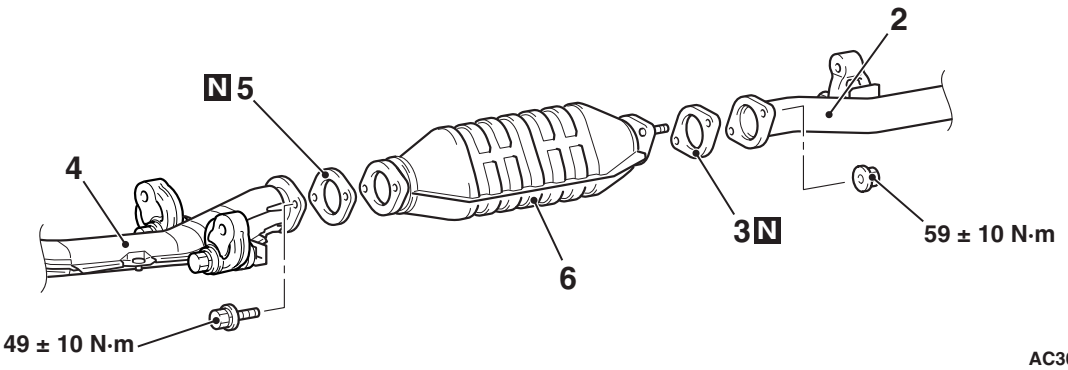

AC212564AC

**<4G63-4WD>**




AC212565AD

**<4G69>**




AC309495AB

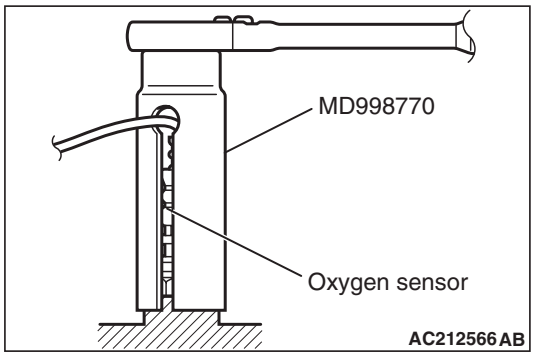
**Removal steps**

<<**A**>> >>**A**<< 1. Oxygen sensor <4G63>
2. Centre exhaust pipe connection
3. Exhaust pipe gasket

**Removal steps (Continued)**

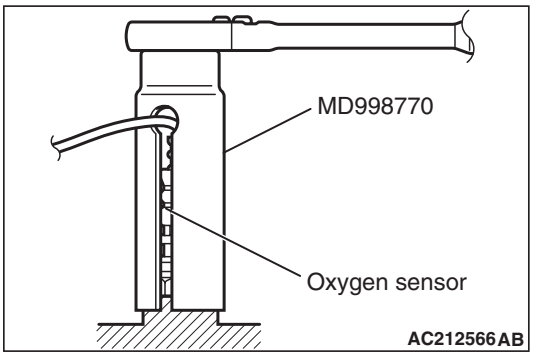
4. Front exhaust pipe connection
5. Exhaust pipe gasket
6. Catalytic converter

## REMOVAL SERVICE POINT
## <<A>> OXYGEN SENSOR REMOVAL




Use special tool oxygen sensor wrench (MD998770) to remove the oxygen sensor.

## INSTALLATION SERVICE POINT
## >>A<< OXYGEN SENSOR INSTALLATION




Use special tool oxygen sensor wrench (MD998770) to install the oxygen sensor.