ENGINE AND EMISSION CONTROL

CONTENTS

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

WARNING:

(1) 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).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) and GROUP 00 – Maintenance Service, before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

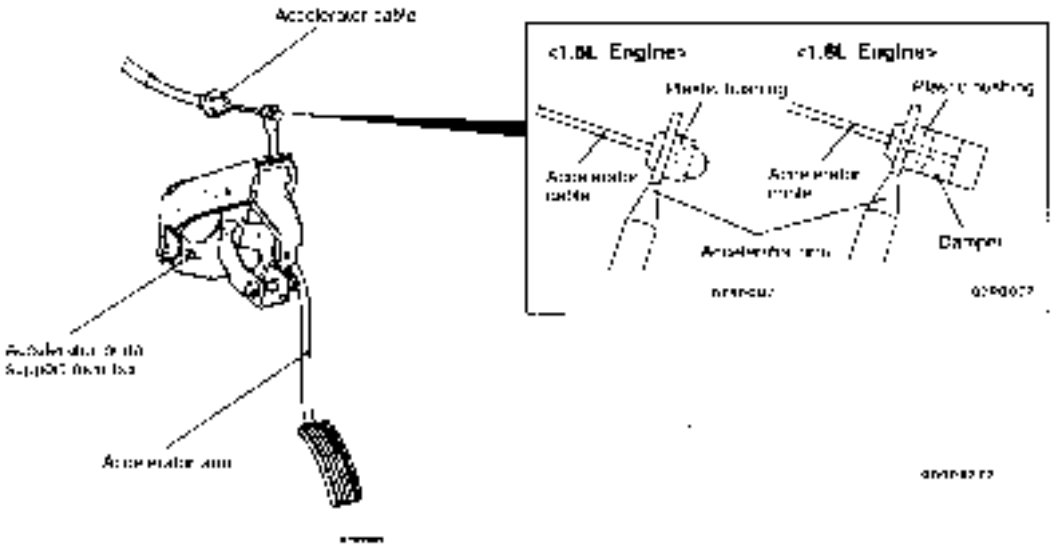
The SRS includes the following components: SRS ECU, SRS warning light, air bag module (driver's and passenger's), and clock spring. Other SRS-related components that may have to be removed or installed in connection with SRS service or maintenance are indicated in the table of contents by an asterisk (*).

ENGINE CONTROL SYSTEM

GENERAL INFORMATION

The accelerator system consists of a cable and pedal. The accelerator pedal side end of the cable has a plastic bushing and damper <1.8L Engine>. They effectively suppress the noise that would result from direct contact of the cable and the accelerator arm.

CONSTRUCTION DIAGRAM

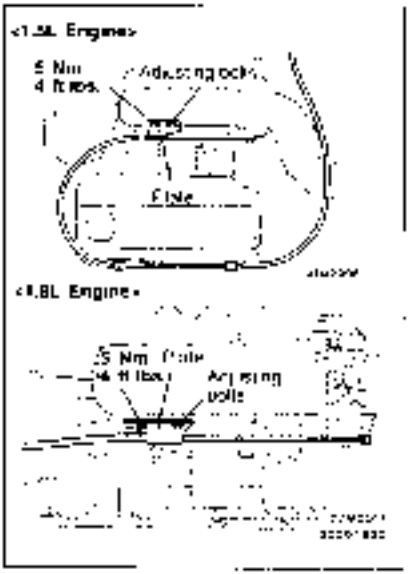


SERVICE SPECIFICATIONS

Items		Standard value
Accelerator cable play mm (in.)		1–2 (.04 – .08)
Engine idle speed r/min	1.5L Engine	750 ± 100
	1.6L Engine	800 ± 100

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Throttle valve will not fully open or close	Misadjusted accelerator cable	Adjust
	Misadjusted auto cruise control cable	Adjust
	Broken return spring	Replace
	Throttle lever malfunction	Replace
Accelerator pedal operation not smooth; lower acceleration	Accelerator pedal wrongly tightened	Repair
	Improper routed accelerator cable	Repair
	Accelerator cable requires lubrication	Lubricate or replace



ON-VEHICLE SERVICE

ACCELERATOR CABLE CHECK AND ADJUSTMENT

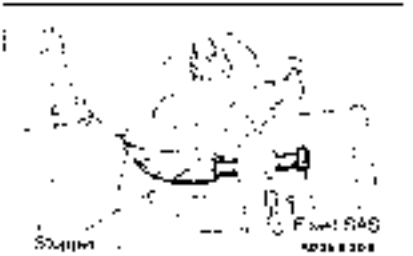
1 Turn off the air conditioning and all lights.
Inspect and adjust at no load.
2 Start the engine and allow to idle until it reaches normal operating temperature.
3 Confirm idle speed is at standard value.

Standard value:
<1.5L Engine> 750 ± 100 r/min
<1.8L Engine> 800 ± 100 r/min

4 Stop engine (ignition switch OFF).
5 Confirm there are no sharp bends in accelerator cable.
6 Check inner cable for correct slack.

Standard value: 1 – 2 mm (.04 – .08 in.)

7 If there is too much slack or no slack, adjust the cable as follows:
(1) Loosen the adjusting bolt to release the cable.
(2) Move the plate until the inner cable play is at the standard value, and then tighten the adjusting bolt to the specified torque.

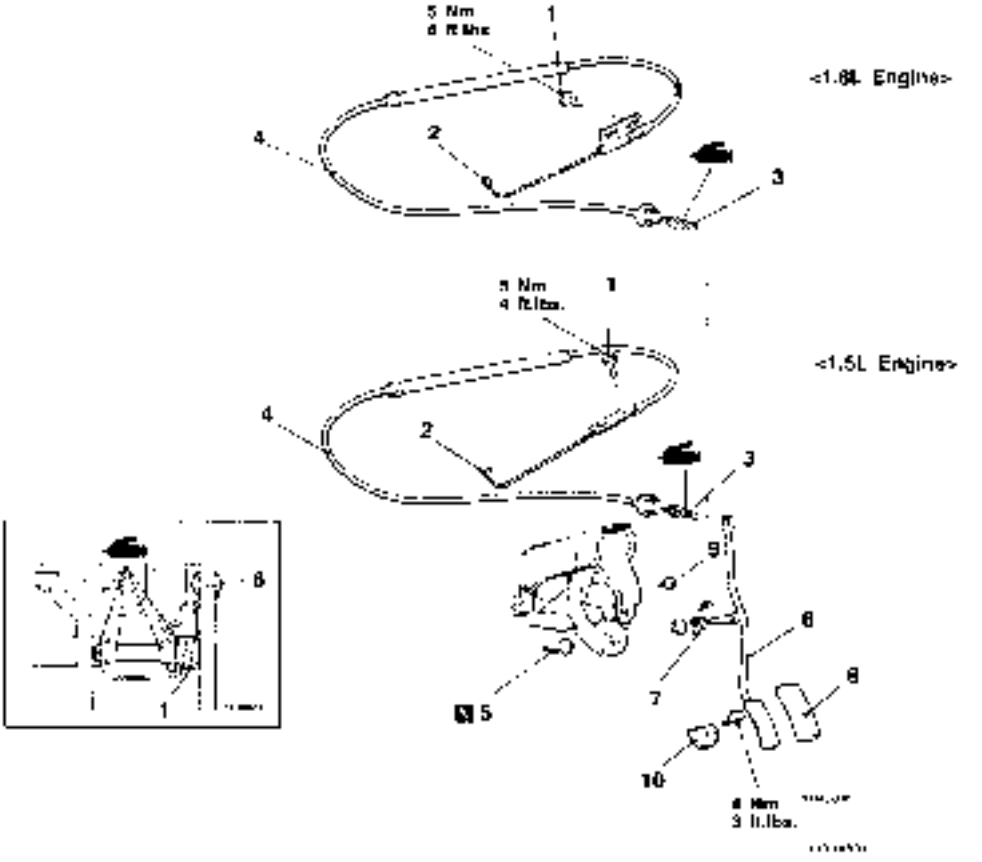


8. Adjust accelerator cable play and confirm throttle lever stopper touches the fixed SAS.

ACCELERATOR CABLE AND PEDAL

REMOVAL AND INSTALLATION

Post-installation Operation
• Adjusting the Accelerator Cable <Refer to P.17-4.>



Removal steps

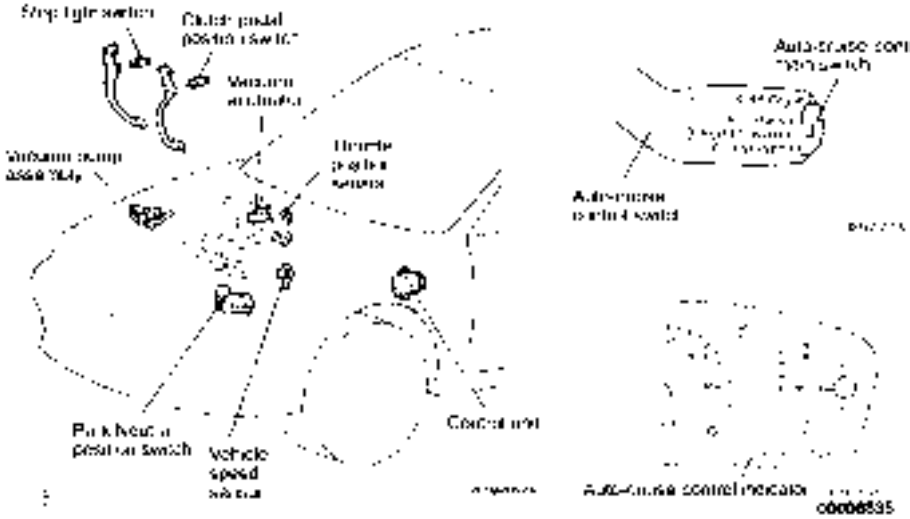
1. Adjusting bolts
2. Inner cable connection (Throttle body side)
3. Inner cable connection (Accelerator pedal side)
4. Accelerator cable
5. Cotter pin
6. Accelerator pedal
7. Spring
8. Pedal pad
9. Stopper
10. Accelerator pedal stopper

AUTO-CRUISE CONTROL SYSTEM

GENERAL INFORMATION

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

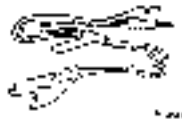
CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

Items	Standard value
Accelerator cable play mm (in.)	1 - 2 (.04 - .08)

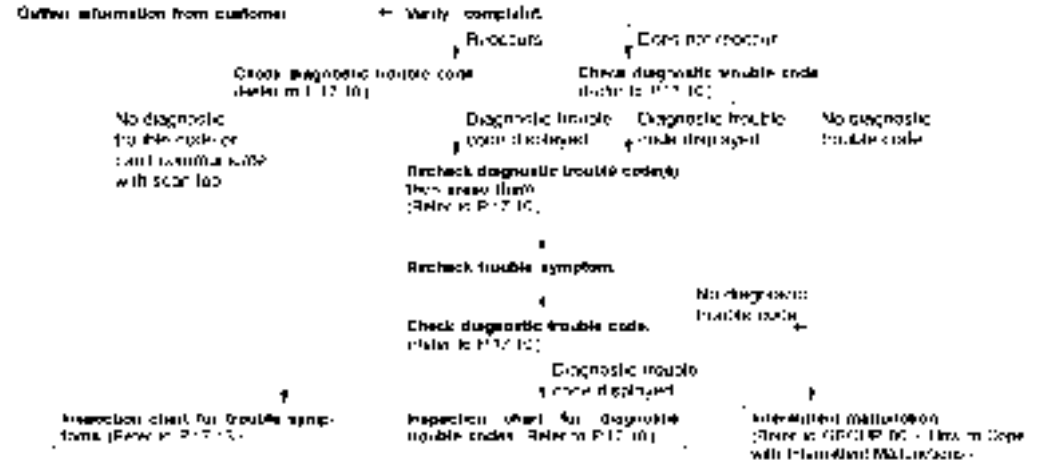
SPECIAL TOOLS

Tool	Tool number and name	Supersession	Application
	MB991502 Scan tool (M.U.T.-II)	MB991496-OD	Diagnostic trouble code check
	MB991529 Diagnostic trouble code check harness	Each harness necessary for scan tool (M.U.T.-II) is available	

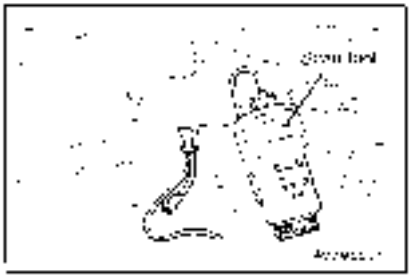
TROUBLESHOOTING

I2300100038

DIAGNOSTIC TROUBLESHOOTING FLOW



NOTE
Before carrying out trouble diagnosis, check to be sure that all of the following items are normal.
1. Is the vacuum hose installed correctly and is the hose not damaged?
2. Is the accelerator cable play at the standard value?



DIAGNOSTIC FUNCTION

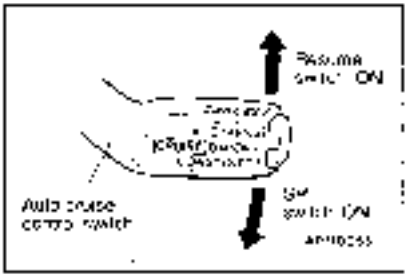
I2302100200

METHOD OF READING THE DIAGNOSTIC TROUBLE CODES

Using the scan tool

Caution
To prevent damaged to the scan tool, make sure the ignition switch is "OFF" before connecting or disconnecting the scan tool.

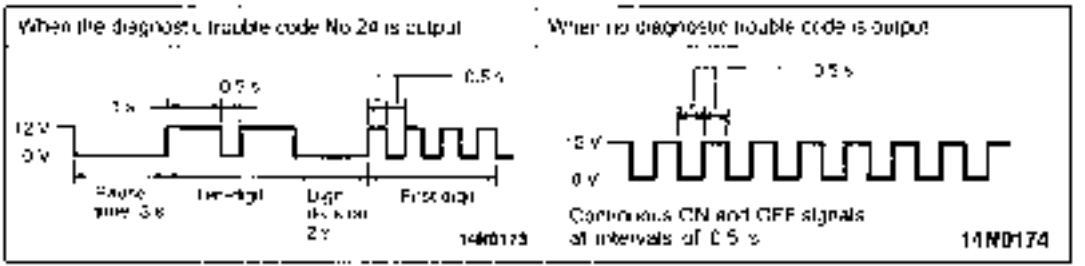
1. Turn the ignition switch "OFF."
2. Connect the scan tool to the data link connector.
3. Use the scan tool to check for auto-cruise control system diagnostic trouble codes.
4. Turn the ignition switch "OFF."
5. Disconnect the scan tool.



Using a auto-cruise control indicator light

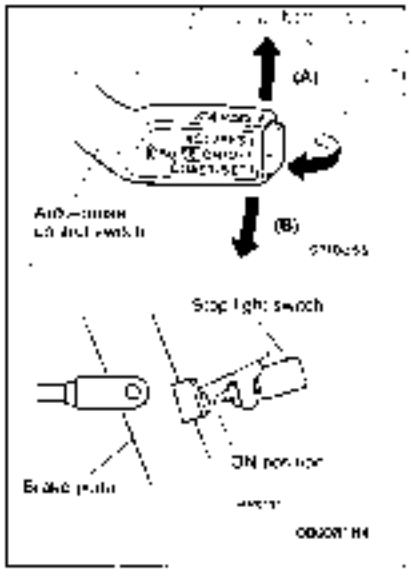
1. Push the main switch to "ON."
2. With the "SET" switch at the "ON" position turn the ignition switch "ON," and within one second after this, turn the "RESUME" switch to "ON."
3. Take a reading of a diagnostic trouble code based on the flashing of the auto-cruise control indicator light in the combination meter.

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



NOTE

Other diagnosis items are also output as voltage waveforms corresponding to diagnosis code numbers



METHOD OF ERASING DIAGNOSTIC TROUBLE CODES

Erase the diagnostic trouble codes with the following procedure.

NOTE
The diagnostic trouble codes will not be erased even if the battery (-) terminal is disconnected.

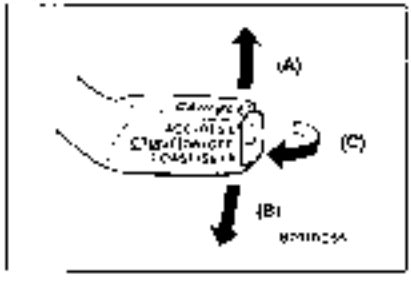
Using the scan tool

Caution
To prevent damage to the scan tool, make sure the ignition switch is "OFF" before connecting or disconnecting the scan tool.

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

Without using the scan tool

1. Turn the ignition switch "ON."
2. Push the auto-cruise control switch in the direction of arrow (B) in the illustration, and within one second after doing this, push the auto cruise control switch back in the direction of arrow (A).
3. Push the auto-cruise control switch again in the direction of arrow (B) in the illustration. While holding the switch in this position, press the stop light switch to the "ON" position for five seconds or more.



INPUT SWITCH CODE CHECK METHOD

1. Connect the scan tool to the data link connector (16-pin) under the instrument panel under cover.
2. Turn the ignition switch to ON.
3. After pushing the auto-cruise control switch in the direction of arrow (B) in the illustration, press the cruise control main switch to the ON position, and within 1 second after doing this, push the cruise control switch back in the direction of arrow (A).
4. Operate each switch listed in the input check table and take a reading of the input switch codes with the scan tool.

Input Inspection Table

Code No.	Input operation	Operation judgement
21	SET switch ON	Auto-cruise control-ECU judges that SET switch is ON
22	RESUME switch ON	Auto-cruise control-ECU judges that RESUME switch is ON
23	Stop light switch (ON when brake pedal depressed)	Auto-cruise control-ECU judges that stop light switch is ON
24	Vehicle speed signal	Auto-cruise control-ECU judges that vehicle speed is 40 km/h (25 mph) or higher
25		Auto-cruise control-ECU judges that vehicle speed is lower than 40 km/h (25 mph)
26	• Clutch pedal position switch <MT> (ON when clutch pedal depressed) • Park/neutral position switch <AT> (ON when select lever in N range)	Auto-cruise control-ECU judges that clutch pedal position switch <MT> or park/neutral position switch <AT> is ON
27	CANCEL switch ON	Auto-cruise control-ECU judges that CANCEL switch is ON
28	Throttle position sensor signal	Auto-cruise control-ECU judges that throttle position sensor voltage is 1.5 V or more
29	Closed throttle position switch	Auto-cruise control-ECU judges that closed throttle position switch is OFF

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

Code No.	On-board diagnostic items	Reference page
11	Auto-cruise vacuum pump drive system	17-11
12	Vehicle speed sensor system	17-11
14	Auto cruise vacuum pump power supply system	17-12
15	Auto cruise control switch	17-12
16	Auto cruise control ECU	17-12
17	Throttle position sensor system	17-13

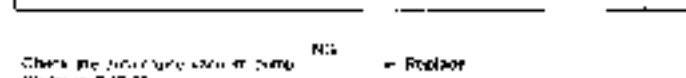
INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

Code No. 11 Auto-cruise vacuum pump drive system

This diagnostic trouble code is output if the following condition occurs: The pulse signal from the auto-cruise vacuum pump drive motor is not input to the auto-cruise control ECU.

Probable cause

- Malfunction of the auto-cruise vacuum pump
- Malfunction of the connector
- Malfunction of the harness
- Malfunction of the auto-cruise control ECU

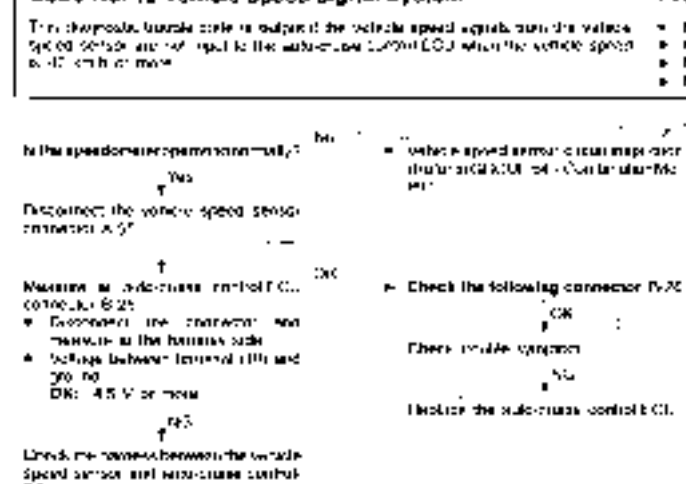


Code No. 12 Vehicle speed signal system

This diagnostic trouble code is output if the vehicle speed signals from the vehicle speed sensor are not input to the auto-cruise control ECU when the vehicle speed is 40 km/h or more.

Probable cause

- Malfunction of the vehicle speed sensor
- Malfunction of the connector
- Malfunction of the harness
- Malfunction of the auto-cruise control ECU

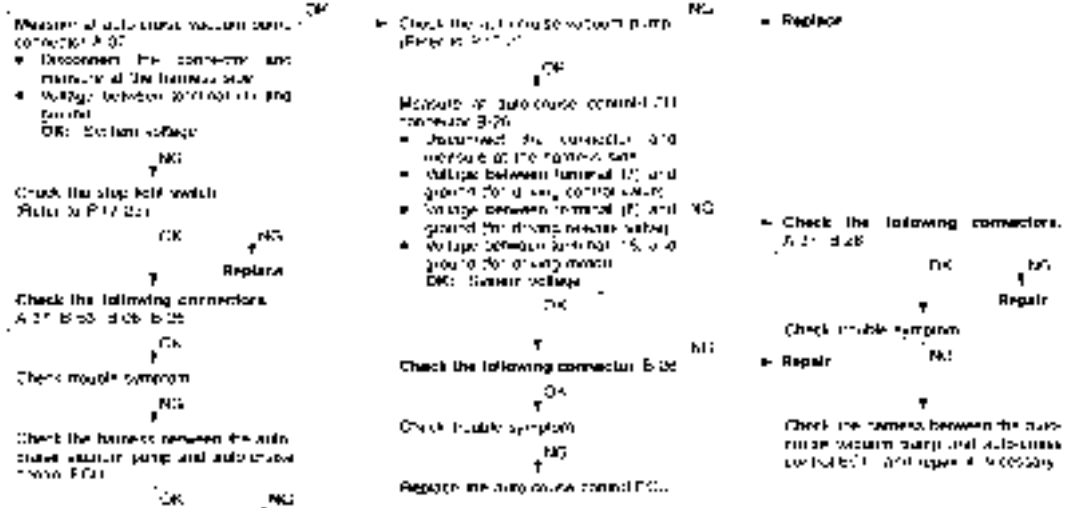


Code No. 14 Auto-cruise vacuum pump power supply system

Probable cause

The diagnostic trouble code is output when one of the following items is detected: stop light switch, vacuum valve and motor of the auto-cruise vacuum pump, servo unit or the auto-cruise control ECU

- Malfunction of the stop light switch
- Malfunction of the connector
- Malfunction of the harness
- Malfunction of the auto-cruise control ECU
- Malfunction of the auto-cruise vacuum pump



Code No. 15 Auto-cruise control switch

Probable cause

The diagnostic trouble code is output if the cruise control RESUME switch, SET switch or CANCEL switch remains ON

- Malfunction of the auto-cruise control switch

Replace the auto-cruise control switch

Code No. 16 Auto-cruise control ECU

Probable cause

The diagnostic trouble code is output if there is an abnormality in the CANCEL hold circuit or the microcomputer memory circuit in the auto-cruise control ECU

- Malfunction of the auto-cruise control ECU

Replace the auto-cruise control ECU

Code No.17 Throttle position sensor system	Probable cause
The output of the code is output if 5 volts or more when the throttle position switch is ON or 0.3 V or less when the throttle position switch is OFF is detected for a continuous period of 4 seconds or more.	• Malfunction of the throttle position sensor • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto cruise control ECU

Scan tool diagnostic trouble code is displayed (code No. 17 output from the engine control module)?

Yes → • Throttle position sensor circuit (Refer to GROUP 13A, On-vehicle service.)

NO ↓

Check the following connectors (Refer to GROUP 13A, On-vehicle service.)

NG → Repair

OK ↓

Check trouble symptom

NG → • Inspect the harness between the throttle position sensor and auto cruise control ECU

NG → Repair

OK ↓

Replace the auto cruise control ECU

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with scan tool is not possible.	Communication with all systems is not possible.	1	17-13
	Communication with auto cruise control ECU only is not possible.	2	17-14
Input switch inspection using the scan tool is not possible. (However, diagnosis inspection is possible.)		3	17-15
Auto-cruise control is not cancelled.	Even if brake pedal is depressed.	4	17-16
	Even if clutch pedal is depressed <M/T>.	5	17-17
	Even if select lever is set to N range <A/T>.	6	17-17
	Even if CANCEL switch is set to ON.	7	17-18
Auto cruise control cannot be set.		9	17-19
Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.		10	17-19
Auto-cruise control indicator light inside combination meter does not illuminate. (However, auto cruise control is normal.)		11	17-21

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

Communication with scan tool is not possible. (Communication with all systems, is not possible.)	Probable cause
The cause is probably a defect in the power supply system including ground for the harness.	• Malfunction of the connector • Malfunction of the harness

INSPECTION PROCEDURE 2 2:1

Communication with scan tool is not possible (Communication with auto-cruise control-ECU only is not possible.)

This occurs probably a malfunction of the auto-cruise control switch circuit or a malfunction of the auto-cruise control-ECU circuit.

Probable cause

- Malfunction of the auto-cruise control switch
- Malfunction of the connector
- Malfunction of the harness
- Malfunction of the auto-cruise control-ECU

Auto-cruise control switch check (Refer to P.17-26.)

NG → Replace

OK

Measure at auto-cruise control switch connector C-10.

- Disconnect the connector and measure at the harness side.
- Voltage between the terminals and body ground
  OK: Battery positive voltage

NG → Check the following connectors. C-02, B-02

OK

Check trouble symptom

NG → Repair

OK

Check the following connector. C-10

OK

Check trouble symptom

NG → Repair

OK

Check the harness between the auto-cruise control switch and ground (between the auto-cruise control switch and body ground).

NG

Repair

OK → Measure at auto-cruise control-ECU connector B-26.

- Disconnect the connector and measure at the harness side.
- Continuity between the terminals and ground
  OK: Continuity

NG → Check the following connectors. B-26, B-22

OK

NG

Repair

Check trouble symptom

NG

Check the harness between the auto-cruise control-ECU and data link connector.

OK

NG

Repair

Replace the auto-cruise control-ECU

Check the harness between the auto-cruise control-ECU (ignition) and fuse.

INSPECTION PROCEDURE 3

Input switch inspection using the scan tool is not possible. (However, diagnosis inspection is possible.)

The cause is probably a malfunction of auto cruise control switch input system.

Probable cause

- Malfunction of the auto cruise control switch
- Malfunction of the clock spring
- Malfunction of the connector
- Malfunction of the harness

Auto cruise control switch (Refer to P.17-26)

↓ OK

* Check spring clock (Refer to OPERATION – Air Bag Module and Clock Spring)

↓ OK

Measure at clock spring connector C-11
* Ground
* Voltage between terminal 2 and ground
OK: system voltage

↓ OK

Check the following connectors
C-10, C-11 and D-20

↓ OK

Check trouble symptom

NG → Replace

NG → Replace

NG → Check the following connectors, E-07, E-07-3-6 and C-11

↓ OK

Check trouble symptom

NG → Repair

NG → Repair

NG → Check the harness between the clock spring and power supply and repair if necessary

INSPECTION PROCEDURE 4

Even if brake pedal is depressed, auto-cruise control is not cancelled.

The cause is probably a malfunction of stop light switch or a malfunction of stop light circuit.

Probable cause

- Malfunction of the stop light switch
- Malfunction of the connector
- Malfunction of the harness
- Malfunction of the auto-cruise control ECU

Does stop light illuminate?

Yes → Check the following connector. R25

NG → Repair

↓ OK

Check trouble symptom

No

↓

Stop light switch check (Refer to 17-25)

OK → NG → Replace

↓ NG

Check the harness between the stop light switch and auto-cruise control ECU.

NG → Repair

↓ OK

Replace the auto-cruise control ECU

↓

Measure at wire side switch connector R25.

- Disconnect the connector and measure at the harness side.
- Voltage between terminal 2 and body

OK: Approx. 12 V

NG → Check the following connector. R 51

NG → Repair

↓ OK

Check trouble symptom

OK → Check the harness between the stop light switch (RH) and stop light switch (LH) and repair if necessary

↓ OK

Check the following connectors. R25, H 25

NG → Repair

↓ OK

Check trouble symptom

NG → Check the harness between the stop light switch and auto-cruise control ECU and repair if necessary

INSPECTION PROCEDURE 5

Even if clutch pedal is depressed, auto-cruise control is not cancelled. <M/T>	Probable cause
The cause is probably a malfunction of clutch pedal position switch or clutch circuit	• Malfunction of the clutch pedal position switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control ECU

Clutch pedal position switch check (Refer to P.17-21)
↓ OK
Malfunction of clutch pedal position switch connector D-02
- Disconnection or connection of connector of the harness side
- Voltage between terminal (2) and ground
OK: 4.5V or more
↓ OK
Check the following connectors
E-22, B-24
↓ OK
Check trouble symptom

NG → Replace

NG → Check the following connector
D-26
↓
Check trouble symptom

NG → Repair

NG → Repair

NG → Repair

NG → Repair the harness between the clutch pedal position switch and auto-cruise control ECU

OK → Replace the auto-cruise control ECU

INSPECTION PROCEDURE 6

Even if select lever is set to N range, auto-cruise control is not cancelled. <A/T>	Probable cause
The cause is probably an abnormality in the neutral signal circuit in N range	• Malfunction of the park/neutral position switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control ECU

Park/neutral position switch check (Refer to P.17-25)
↓ OK
Check the following connectors
B-48, B-45
↓ OK
Repair

NG → Replace

OK → Check trouble symptom
↓ NG
Check the harness between the park/neutral position switch and auto-cruise control ECU
↓ OK
Replace the auto-cruise control ECU

NG → Repair

INSPECTION PROCEDURE 7

Even if auto-cruise control CANCEL switch is set to ON, auto-cruise control is not cancelled.	Probable cause
The cause is probably an open circuit in the circuit inside the CANCEL switch	• Malfunction of the auto-cruise control switch

Replace the auto-cruise control switch

INSPECTION PROCEDURE 9

Auto-cruise control cannot be set.	Probable cause
The cause is probably that the fail-safe function is cancelling auto-cruise control. In this case the scan tool can be used to find the trouble symptom. Search system by inspecting the diagnostic trouble codes. The scan tool can also be used to check if the circuits of each input switch are normal or not by inspecting the input switch codes.	• Malfunction of the auto-cruise control switch • Malfunction of the clock spring • Malfunction of the harnesses or connectors • Malfunction of the short pin or pin position switch (M/T) • Malfunction of the park/neutral position switch (A/T) • Malfunction of the auto-cruise control ECU

Can the auto-cruise control communicate with the scan tool?

No → Inspection for each trouble symptom
(Refer to inspection procedure No. 2 on P.17-15.)

Yes ↓

Are any of scan tool diagnostic trouble code Nos. 11, 12, 13, 14, 15 or 17 output?

Yes → Inspection for each diagnostic trouble code.
(Code No.11: Refer to P.17-[illegible])
(Code No.12: Refer to P.17-[illegible])
(Code No.13: Refer to P.17-[illegible])
(Code No.14: Refer to P.17-[illegible])
(Code No.15: Refer to P.17-[illegible])
(Code No.17: Refer to P.17-[illegible])

No ↓

Is input switch inspection possible with the scan tool?

No → Inspection for each trouble symptom
(Refer to inspection procedure No. 3 on P.17-[illegible])

Yes ↓

Are either of scan tool input switch code Nos. 23 or 25 output?

Yes →
- Stop light switch input circuit system (code No. 23) or CANCEL switch
  (Refer to inspection procedure No. 12 on P.17-[illegible])
- Clutch pedal position switch (M/T) or park/neutral position switch (A/T) input circuit system (code No. 25) or speed sensor
  (Refer to inspection procedure No.13 on P.17-[illegible])

No ↓

Replace the auto-cruise control ECU

INSPECTION PROCEDURE 10

Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.	Probable cause
The cause is possibly a malfunction of vehicle speed sensor or vacuum switch in the motor check vacuum pump or actuator.	• Malfunction of the vehicle speed sensor • Malfunction of the motor vacuum pump • Malfunction of the actuator • Malfunction of the auto cruise control ECU

Vehicle speed sensor check (Refer to GROUP 54 - Combination Meter) — NG → Replace

↓ OK

Auto cruise vacuum pump check (Refer to P.17-25) — NG → Replace

↓ OK

Vacuum actuator check (Refer to P.17-26) — NG → Replace

↓ OK

Replace the auto-cruise control ECU

INSPECTION PROCEDURE 11

Auto-cruise control indicator lamp inside combination meter does not illuminate. (However, auto-cruise control is normal.)	Probable cause
The cause is possibly a malfunction of the wiring or a malfunction of the connector or harness	• Malfunction of the bulb • Malfunction of the harness • Malfunction of the connector • Malfunction of the auto cruise control ECU

Combination meter check — NG → Replace

↓ OK

Measure at auto-cruise control ECU connector C-29:
- Disconnect the connector and measure at the harness side.
- Voltage between terminal (15) and ground

OK: System voltage

NG → Check the following connector: B-37 — NG → Repair

↓ OK

Check trouble symptom

↓ NG

Check the harness between the combination meter (terminal 21) and auto cruise control ECU and repair if necessary.

↓ OK

Replace the auto cruise control ECU

INSPECTION PROCEDURE 12

Stop light switch input circuit system inspection (Code No. 23)

Check the following connectors: B-37, B-115, B-26 — NG → Repair

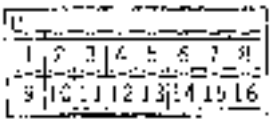
↓ OK

Check for the harness between terminal No. 2 and auto cruise control ECU and repair if necessary.

INSPECTION PROCEDURE 13

Clutch pedal position switch <M/T> or park/neutral position switch <A/T> input circuit system inspection (Code No. 25)

CHECK AT THE ECU TERMINALS



07100S0

Terminal No.	Check item	Check conditions		Normal condition
1	Throttle position sensor input	When accelerator pedal is fully depressed		4.5 – 5.0V
		When accelerator pedal is released		0.3 – 1.0V
2	Closed throttle position switch output	When accelerator pedal is depressed	When closed throttle position switch is OFF	4.5 – 5.5V
		When accelerator pedal is not depressed	When closed throttle position switch is ON	0V
3	A/T control output	No OD-OFF request		System voltage
		OD-OFF request		0V
4	Stop light switch input	When brake pedal is depressed	When stop light switch is "ON"	System voltage
		When brake pedal is not depressed	When stop light switch is "OFF"	0V
5	Pump power supply	Ignition switch : ON Stop light switch : OFF		System voltage
6	ECU power supply	Ignition switch : ON		System voltage
7	Auto cruise vacuum pump release valve and control valve input	When accelerating with the SET switch while driving at constant speed	Control valve open	System voltage
8			Release valve open	0V
7		When canceling constant speed driving with the CANCEL switch	Control valve open	System voltage
8			Release valve open	System voltage
9	Auto cruise control switch input	When main switch ON		Approximately 9.0 V
		When input switch has not been operated	When all switches are OFF	Approximately 4.5 V
		When input switch is pushed down	When SET switch is ON	Approximately 1.5 V
		When input switch is pushed up	When RESUME switch is ON	Approximately 3.0 V
		When input switch is pulled forward	When CANCEL switch is ON	Approximately 0 V
10	Vehicle speed sensor input	When vehicle is moved forwards and backwards, sensor turns ON and OFF repeatedly	When sensor is ON	0V
			When sensor is OFF	4.5V or more
11	Diagnosis control input	When ignition switch is ON		4V or more

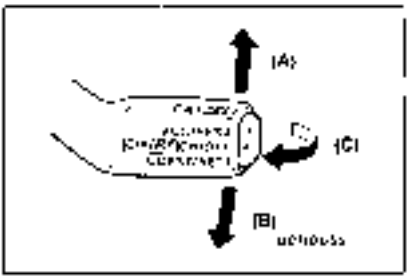
Terminal No.	Check item	Check condition		Normal condition
12	ACC power supply	When ignition switch is in ACC position Main switch ON		System voltage
13	Clutch pedal position switch input <MT>	When pedal is not depressed	When clutch pedal position switch is OFF	4.5V or more
		When pedal is depressed	When clutch pedal position switch is ON	0V
	Park/neutral position switch input <AT>	When select lever is in a position other than N range	When park/neutral position switch is OFF	System voltage
		When select lever is in N range	When park/neutral position switch is ON	0V
14	Ground	At any time		Continuity
15	Indicator input (inside combination meter)	When driving at constant speed	When indicator is illuminated	0V
		When constant-speed driving is cancelled	When indicator is switched off	System voltage
16	Auto-cruise vacuum pump motor input	When driving at constant speed using the SET switch	Motor stopped/running	System voltage/0V
		When accelerating with the RESUME switch while driving at constant speed	Motor stopped/running	System voltage/0V
		When decelerating with the SET switch while driving at constant speed	Motor stopped	System voltage
		When cancelling constant speed driving with the CANCEL switch	Motor stopped	System voltage

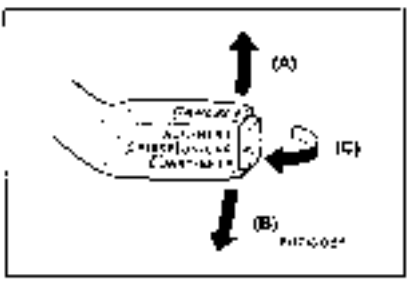
ON-VEHICLE SERVICE

AUTO-CRUISE CONTROL SYSTEM OPERATION CHECK

AUTO-CRUISE CONTROL SWITCH INDICATOR LIGHT

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





AUTO-CRUISE CONTROL SETTING

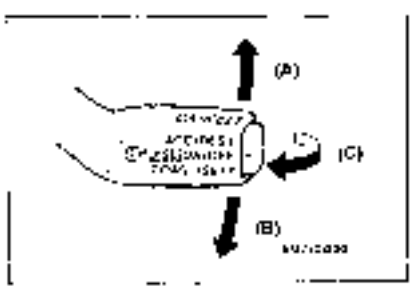
1. Switch ON the main switch.
2. Drive at the desired speed above approximately 40 km/h (25 mph).
3. Push the auto-cruise control switch in the direction of arrow (B).
4. Check to be sure that when the switch is released the speed is the desired constant speed.

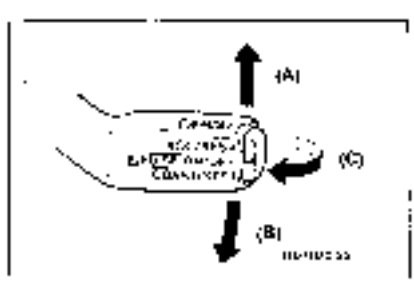
NOTE
If the vehicle's speed decreases to approximately 15 km/h (9 mph) below the set speed because of climbing a hill, for example, the auto-cruise control will be cancelled.

SPEED-INCREASE SETTING

1. Set to the desired speed.
2. Push the auto-cruise control switch in the direction of arrow (A).
3. Check to be sure that acceleration continues while the switch is held, 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 (124 mph)). But the speed when the auto-cruise control switch is released will be recorded as the high-speed limit.





SPEED-REDUCTION SETTING

1. Set to the desired speed.
2. Push the auto-cruise control switch in the direction of arrow (B).
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 (25 mph)) during deceleration, the auto-cruise control will be cancelled.

RETURN TO THE SET SPEED BEFORE CANCELLATION AND AUTO-CRUISE CONTROL CANCELLATION

1. Set the auto-cruise speed control.
2. When any of the following operations are performed while at constant speed during auto-cruise control, check if normal driving is resumed and deceleration occurs.
   a. The auto-cruise control switch is pushed in the direction of arrow (C).
   b. The brake pedal is depressed.
   c. The clutch pedal is depressed. (M/T)
   d. The selector lever is moved to the "N" range. (A/T)

3. At a vehicle speed of 40 km/h (25 mph) or higher, check that when the RESUME switch is switched ON, 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 that normal driving is resumed and deceleration occurs.

AUTO-CRUISE CONTROL COMPONENT CHECK

STOP LIGHT SWITCH

Refer to GROUP 35A - On-vehicle Service

CLUTCH PEDAL POSITION SWITCH <M/T>

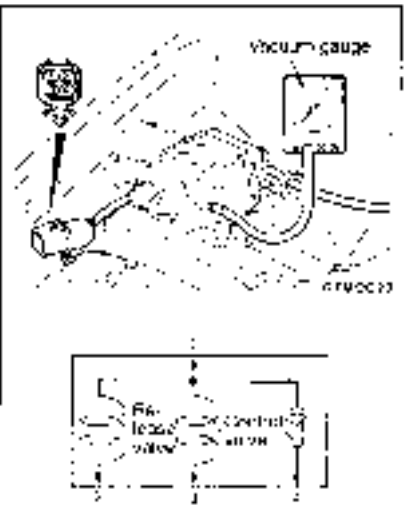
Refer to GROUP 21 - On-vehicle Service

PARK/NEUTRAL POSITION SWITCH ("N" POSITION)

Refer to GROUP 23A - On-vehicle Service

THROTTLE POSITION SENSOR

Refer to GROUP 13A - On-vehicle Service.



AUTO-CRUISE VACUUM PUMP

1. Disconnect the vacuum hose from the auto-cruise vacuum pump and connect a vacuum gauge to the vacuum pump.
2. Disconnect the vacuum pump connector.
3. Check that the reading on the vacuum gauge matches the values in the table below when the battery is connected to each connector terminal.

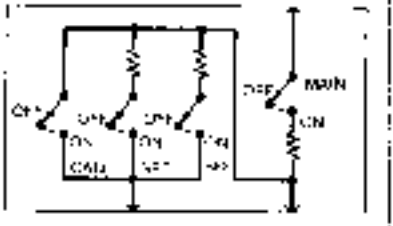
Terminal No.				Valve condition	Vacuum gauge kPa (mm Hg, in Hg)
1	2	3	4		
⊖			⊕	Release valve closed Control valve closed	53 (399, 15.7) or more
	⊖	⊕		Release valve open	20 (150, 5.9) or less
⊖	⊕			Control valve open	

VACUUM ACTUATOR

1. Disconnect the vacuum hose from the vacuum actuator, and connect a hand vacuum pump to the actuator.
2. Check that the throttle lever operates when applying vacuum, and the vacuum is kept.

AUTO-CRUISE CONTROL CHECK

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.



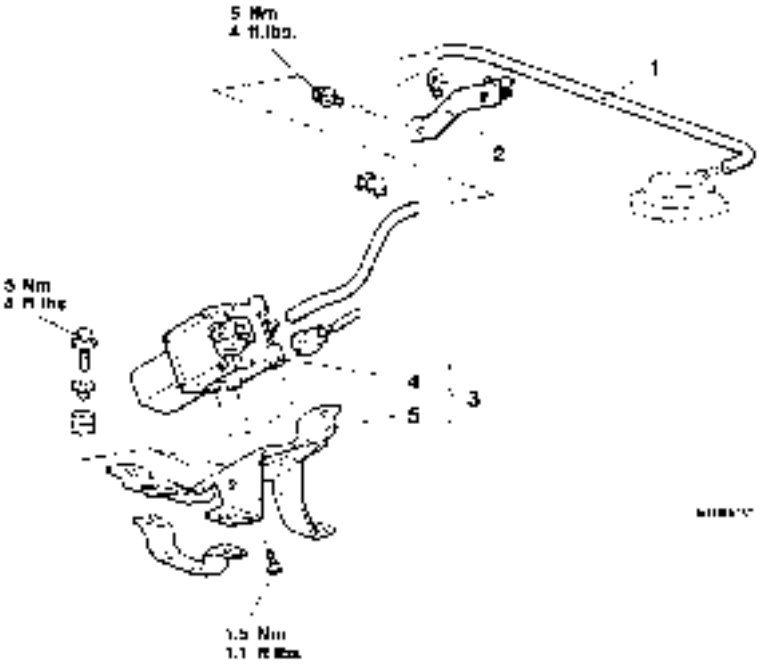
Switch position	Resistance between terminals	
Switch "OFF"	No continuity	
"CANCEL" switch "ON"	Terminals 1 and 3	Approximately 3.3 kΩ
	Terminals 2 and 3	Approximately 0 Ω
"RESUME" switch "ON"	Terminals 1 and 3	Approximately 1.9 kΩ
	Terminals 2 and 3	Approximately 910 Ω
"SET" switch "ON"	Terminals 1 and 3	Approximately 4.1 kΩ
	Terminals 2 and 3	Approximately 220 Ω
"MAIN" switch "ON"	Terminals 1 and 2	Approximately 0.6 kΩ

VEHICLE SPEED SENSOR CHECK

Refer to GROUP 54 - Combination meters.

AUTO-CRUISE CONTROL

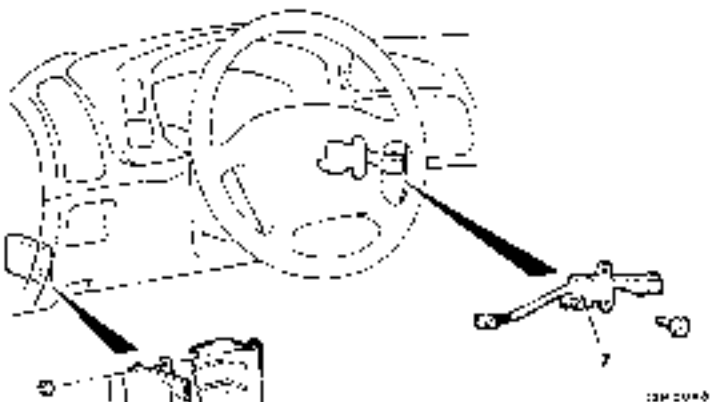
REMOVAL AND INSTALLATION

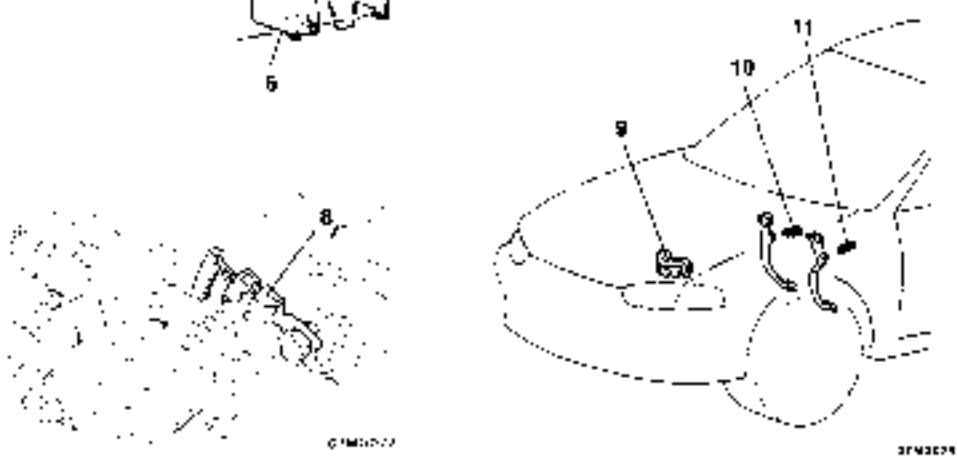


Auto-cruise vacuum pump removal steps

1. Vacuum hose
2. Bracket
3. Auto-cruise vacuum pump and bracket assembly
4. Auto-cruise vacuum pump assembly
5. Pump bracket

CAUTION: SRS
Before removal of the air bag module, refer to the following groups.
GROUP 52B – SRS Service Precautions.
GROUP 52B – Air Bag Modules and Clock Spring.





Control unit removal

6 Auto-cruise control ECU
Control switch removal

Control switch removal

* Air bag module (Refer to GROUP 52B.)
7 Control switch

Sensor removal

8 Throttle position sensor
9 Park/neutral position switch <A/T>
10 Stop light switch
11 Clutch pedal position switch <M/T>

EMISSION CONTROL SYSTEM

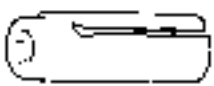
GENERAL INFORMATION

The emission control system consists of the following subsystems:
- Positive crankcase ventilation system
- Evaporative emission control system
- Exhaust emission control system

SERVICE SPECIFICATIONS

Item	Specification
Evaporative emission purge solenoid coil resistance [at 20 °C (68 °F)] Ω	36 – 44
EVAP solenoid coil resistance [at 20 °C (68 °F)] Ω	36 – 44

SPECIAL TOOLS

Tool	Tool number and name	Supersession	Application
	MD998770 Oxygen sensor wrench	MD998770-01 or general service tool	Removal / installation of heated oxygen sensor
	MD998361 Purge flow indicator		Inspection of purge control system

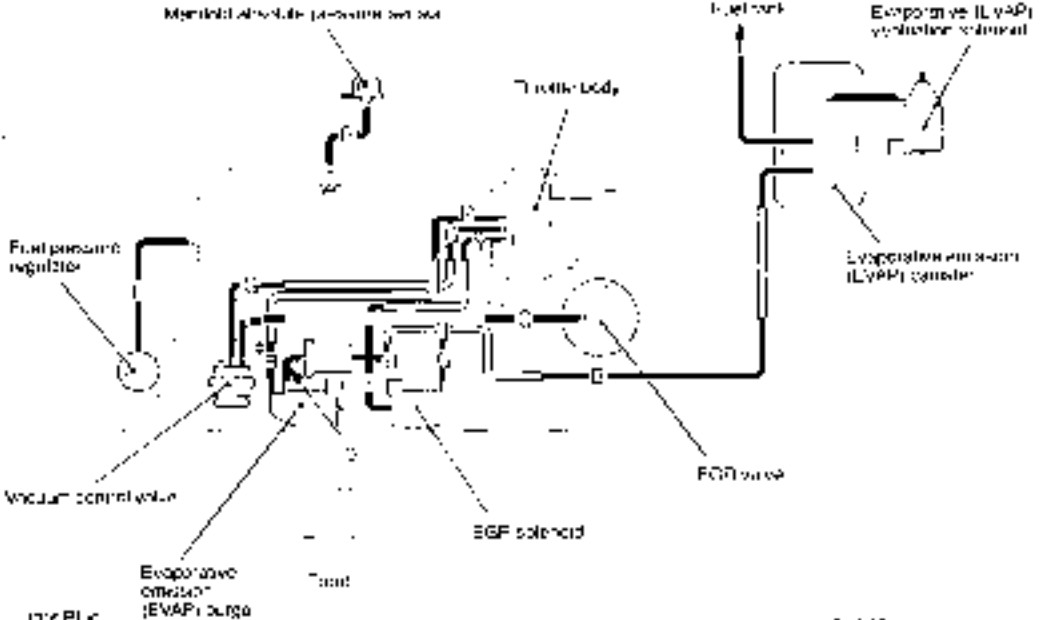
TROUBLESHOOTING

Symptom	Probable cause	Remedy
Engine will not start or hard to start	Vacuum hose disconnected or damaged	Repair or replace
	The EGR valve is not closed	Repair or replace
	Malfunction of the evaporative emission purge solenoid	Repair or replace
Rough idle or engine stalls	The EGR valve is not closed	Repair or replace
	Vacuum hose disconnected or damaged.	Repair or replace
	Malfunction of the positive crankcase ventilation valve	Replace
	Malfunction of the purge control system	Check the system; if there is a problem, check its component parts.
Engine hesitates or poor acceleration	Malfunction of the exhaust gas recirculation system	Check the system; if there is a problem, check its component parts.
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system
Poor fuel mileage	Malfunction of the exhaust gas recirculation system	Check the system; if there is a problem, check its component parts

VACUUM HOSES

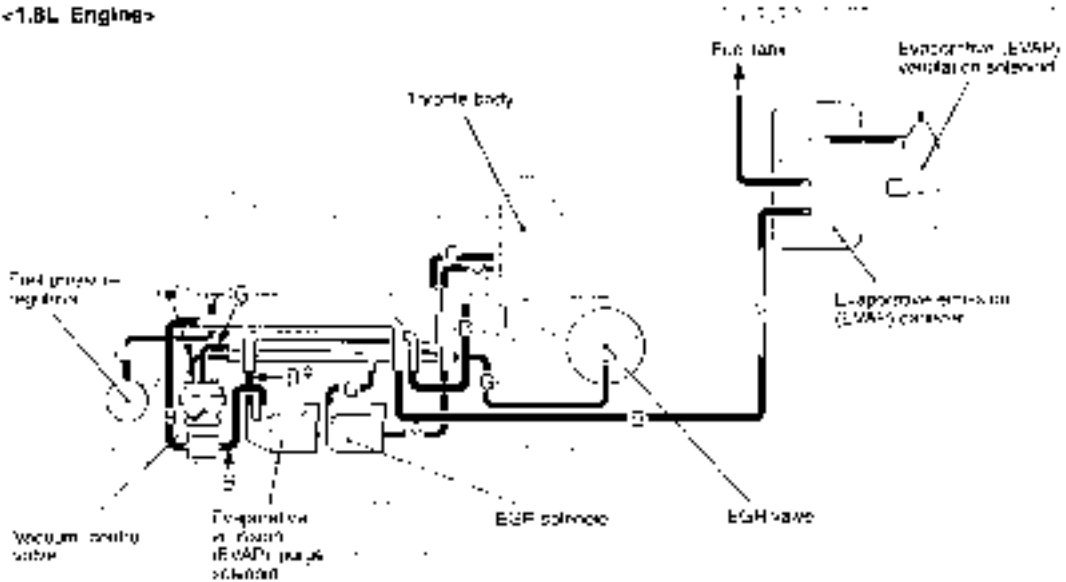
VACUUM HOSE ROUTING

<1.5L Engine>



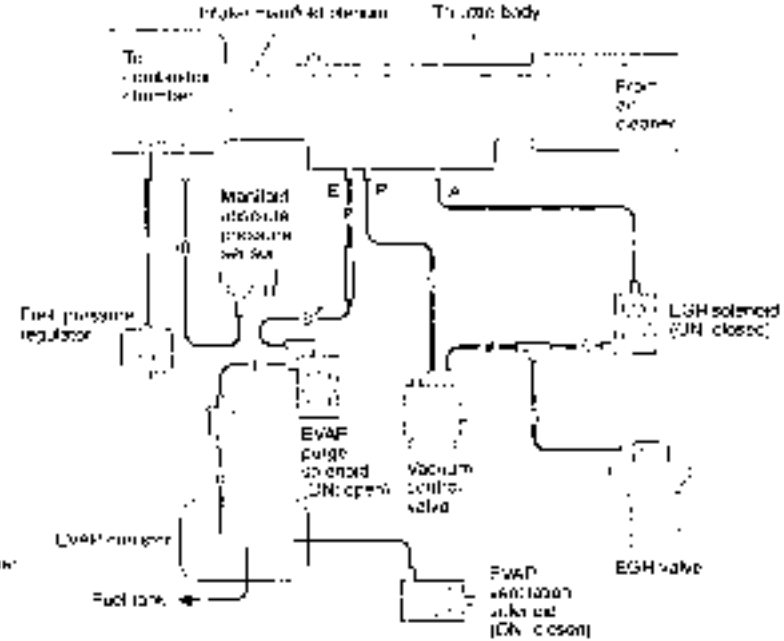
L: Light Blue
R: Red
B: Black
G: Green
Y: Yellow
W: White
* : With engine trunk

<1.8L Engine>

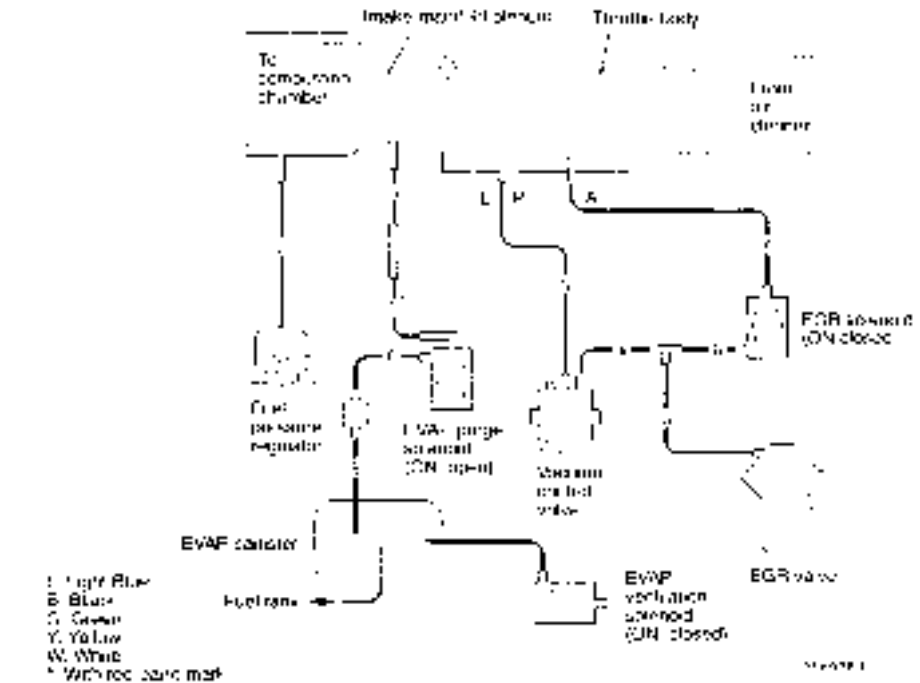

Fuel tank
Evaporative (EVAP) ventilation solenoid
Throttle body
Fuel pressure regulator
Evaporative emission (EVAP) canister
Vacuum sensing valve
Evaporative emission (EVAP) purge solenoid
EGR solenoid
EGR valve
L: Light Blue
B: Black
G: Green
Y: Yellow
W: White
* With red-paint mark
Front

VACUUM CIRCUIT DIAGRAM

<1.6L Engine>



<1.8L Engine>


To combustion chamber
L
P
A
EGR solenoid (ON: closed)
EVAP canister
EVAP ventilation solenoid (ON: closed)
EGR valve
L: Light Blue
B: Blue
G: Green
Y: Yellow
W: White

VACUUM HOSE INSTALLATION

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

VACUUM HOSE CHECK

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

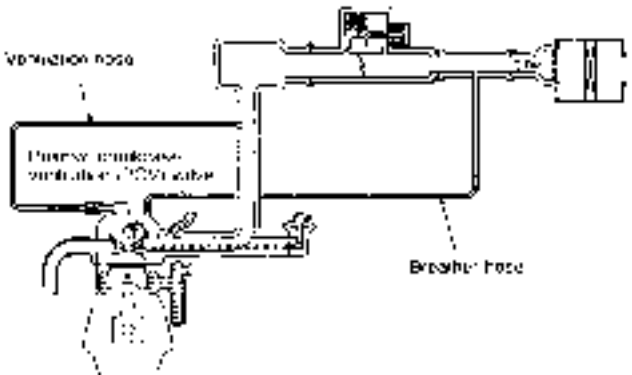
POSITIVE CRANKCASE VENTILATION SYSTEM

GENERAL INFORMATION

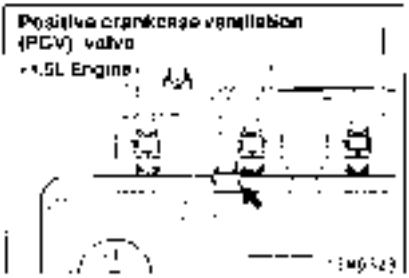
The positive crankcase ventilation system is a system for preventing the escape of blow-by gases from inside the crankcase into the atmosphere. Fresh air is sent from the cleaner into the crankcase through the breather hose to be mixed with the blow-by gas inside the crankcase.
The blow-by gas inside the crankcase is drawn into the intake manifold through the positive crankcase ventilation (PCV) valve.

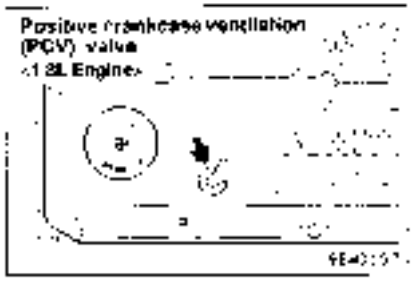
The PCV valve is designed to lift the plunger according to the intake manifold vacuum so as to regulate the flow of blow-by gas properly. In other words, the blow-by gas flow is regulated during low load engine operation to maintain engine stability, while the flow is increased during high load operation to improve the ventilation performance.

SYSTEM DIAGRAM



COMPONENT LOCATION



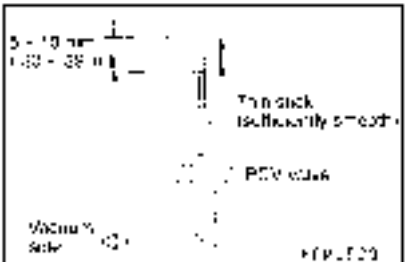


CRANKCASE VENTILATION SYSTEM CHECK

(1) Remove the positive crankcase ventilator (PCV) valve from the rocker cover, then reconnect the PCV valve to the vacuum supply hose.
(2) With the engine idling, put finger on the open end of the PCV valve, and check for negative pressure (vacuum) with finger.

NOTE
At this time, the plunger in the PCV valve should move back and forth as the open end is covered and uncovered.

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



POSITIVE CRANKCASE VENTILATION (PCV) VALVE CHECK

(1) Hold the PCV valve with the vacuum side down. Using light pressure, depress the PCV valve spring with the thin stick 5 - 10 mm (.20 - .39 in). Release pressure on the stick to see if the PCV valve spring will lift the stick to its original position.
(2) If the stick returns quickly to its original position, the PCV valve is OK. If the stick does not return quickly, clean or replace the PCV valve.

EVAPORATIVE EMISSION CONTROL SYSTEM

GENERAL INFORMATION

The evaporative control system prevents fuel vapors generated in the fue tank from escaping into the atmosphere.

Fuel vapors from the fuel tank flow through the fuel tank pressure control valve and vapor pipe/hose to be stored temporarily in the EVAP canister.

When the vehicle is in operation, fuel vapors stored in the EVAP canister flow through the EVAP purge solenoid and purge port and go into the intake manifold plenum to be sent to the combustion chamber.

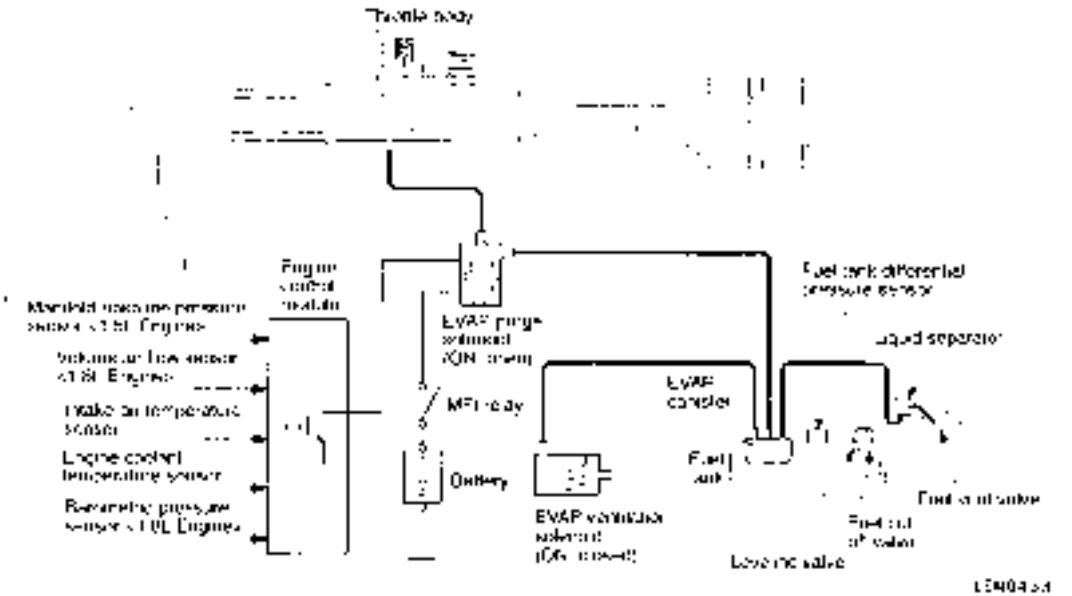
When the engine coolent temperature is low or when the intake air quantity is small (when the engine is at idle for example), the engine control module brings the EVAP purge solenoid into the OFF state to shut off the fuel vapor flow to the intake manifold plenum. This does not only ensure the driveability when the engine is cold or running under low load but also stabilize the emission level.

In addition, the EVAP ventilation solenoid is provided between the EVAP canister and atmospheric air to carry out OBD-II EVAP leak monitor.

This solenoid valve is always off, but if OBD-II EVAP leak monitor is being carried out, the valve will be turned on to prevent atmospheric air from entering the EVAP canister.

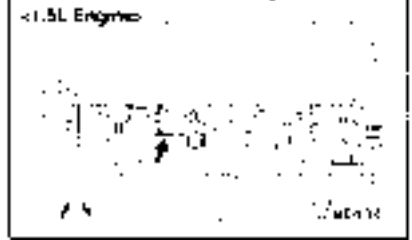
Moreover the fuel vent valve is provided to the fuel filler tube to prevent excessive fuel from entering the fue tank.

SYSTEM DIAGRAM



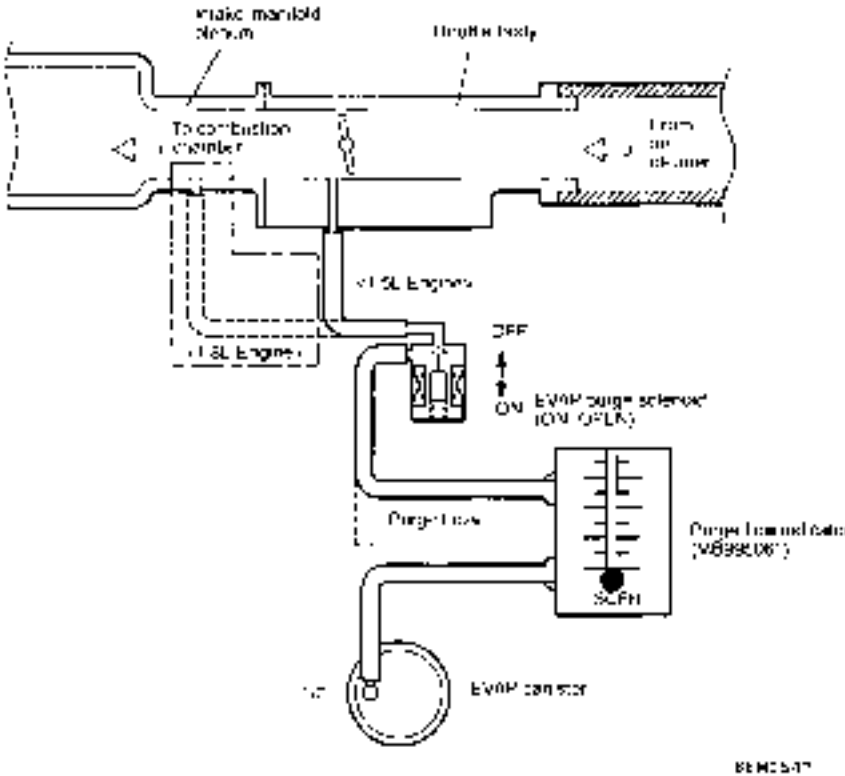
COMPONENT LOCATION

Evaporative emission purge solenoid <1.5L Engine>



Evaporative emission purge solenoid <1.8L Engine>

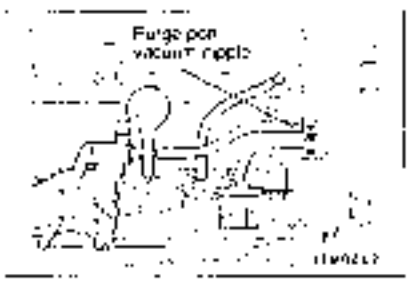
PURGE CONTROL SYSTEM CHECK (PURGE FLOW CHECK)



1. Disconnect the purge hose from the evaporative emission (EVAP) canister, and connect the special tool (purge flow indicator) between the EVAP canister and the purge hose.
2. The vehicle should be prepared as follows before the inspection and adjustment.
   - Engine coolant temperature 80 - 95 °C (176 - 203 °F)
   - Lights, cooling fan, and accessories: OFF
   - Transaxle: Neutral (A/T: for P range)
3. Let the engine run at idle for at least four minutes.
4. Race the engine suddenly several times and check the purge flow rate.

   Standard value:
   momentarily 20 cm³ (2.5 SCFH) or more

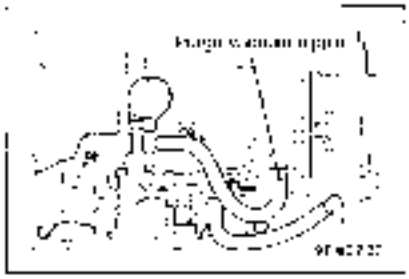
5. If the purge flow rate is below the standard value, disconnect the vacuum hose from the EVAP canister, and check the purge flow rate again.
   If the purge flow rate is below the standard value, check the vacuum port and hose for blockage, or the emission purge solenoid.
   In addition, replace the EVAP canister when the purge flow rate is at the standard value.



PURGE PORT VACUUM CHECK

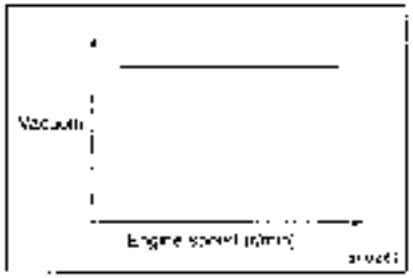
<1.5L Engine>

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



<1.8L Engine>

Disconnect the vacuum hose (black) from the intake air plenum vacuum nipple and connect a hand vacuum pump to the nipple.



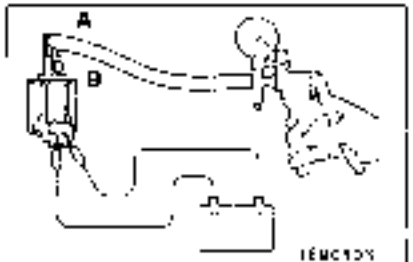
2. Start the engine and check to see that, after raising the engine speed by racing the engine, purge vacuum is kept constant regardless of the increased engine speed.

NOTE
If there is no vacuum created, it is possible that the intake air plenum port may be clogged and require cleaning.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

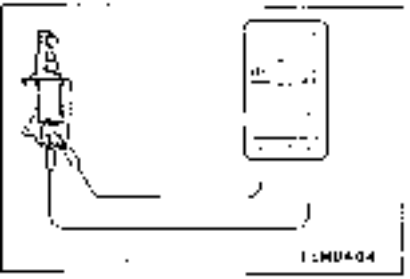
NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at its original position.

1. Disconnect the vacuum hose (black, red stripe) 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: 36 – 44 Ω (at 20°C (68°F))

ENGINE COOLANT TEMPERATURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR CHECK <1.5L Engine>

To check these parts, refer to GROUP 13A – On-vehicle Service.

VOLUME AIR FLOW SENSOR, ENGINE COOLANT TEMPERATURE SENSOR AND INTAKE AIR TEMPERATURE SENSOR CHECK <1.8L Engine>

To inspect these parts, refer to GROUP 13A – On-vehicle Service.

AIR CONDITIONING SWITCH CHECK

To inspect the conditioning switch, refer to GROUP 55 – Air Conditioning Switch.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

GENERAL INFORMATION

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 intake manifold to decrease the air/fuel mixture combustion temperature resulting in reduction of NOx.
The EGR flow rate is controlled by the EGR valve so as not to decrease the driveability.

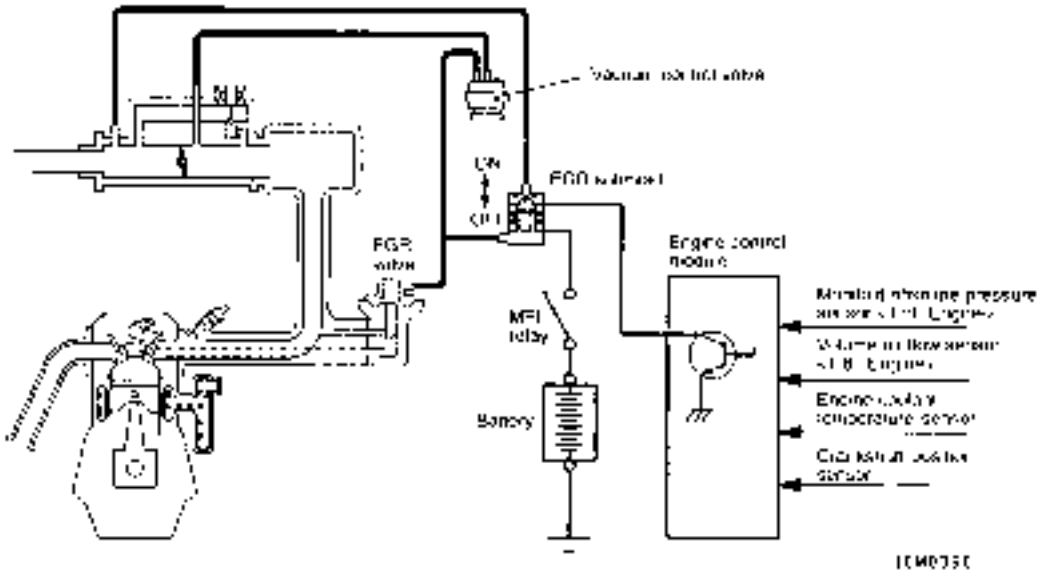
OPERATION

When the engine coolant temperature is low, when the engine is at idle or when a wide open throttle operation is performed, the EGR valve is kept closed, achieving no EGR.

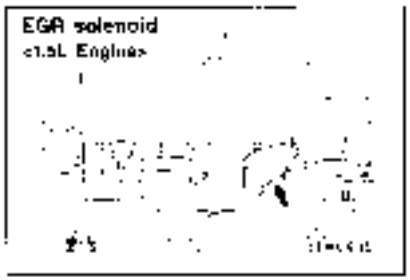
After warming up of the engine, EGR valve is opened.

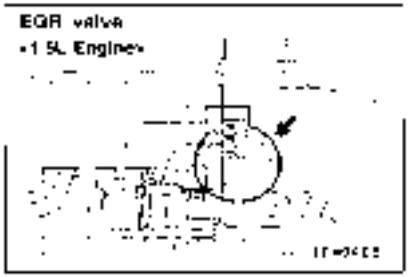
The engine control module monitors the EGR system and illuminates the check engine malfunction indicator lamp to indicate that there is a malfunction.

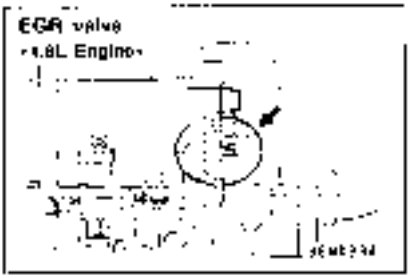
SYSTEM DIAGRAM

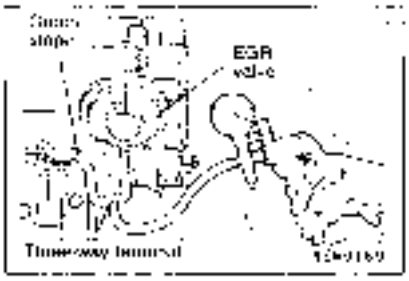


COMPONENT LOCATION









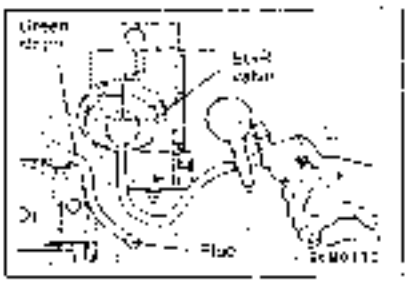
EGR SYSTEM CHECK

1. Disconnect the vacuum hose (green stripe) from the EGR valve, and then connect a hand vacuum pump via the three-way terminal.
2. Regarding the engine in cold and hot conditions, check the condition of vacuum when engine rpm is increased by opening the throttle valve quickly.

When engine is cold

[Engine coolant temperature: 20 °C (68 °F) or less]

Throttle valve	Normal vacuum condition
Open quickly	No vacuum will generate (remained as barometric pressure)

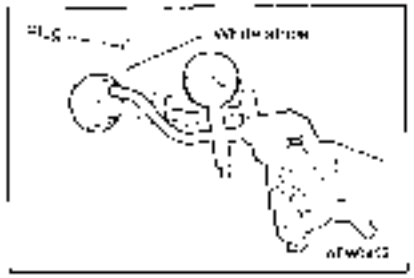


When engine is hot

(Engine coolant temperature: 80 C (176 F) or less)

Throttle valve	Normal vacuum condition
Open quickly	It will momentarily rise over 12kPa (2.9 in. Hg)

3. Disconnect the three-way terminal.
4. Connect the hand vacuum pump directly to the EGR valve.
5. Check whether the engine stalls or the idling is unstable when a vacuum of 29kPa (8.7 in Hg) or higher is applied during idling.



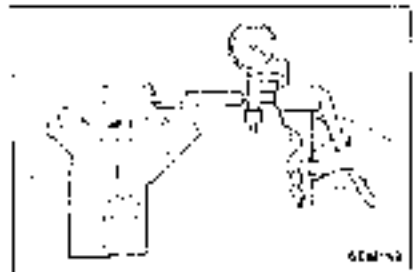
VACUUM CONTROL VALVE CHECK

1. Disconnect the vacuum hose (white stripe) from the vacuum control valve and connect the hand vacuum pump to the vacuum control valve.
2. Plug the end of the removed vacuum hose.
3. Start the engine and run at idle.
4. Check the vacuum condition.

Engine condition	Normal vacuum condition
Idling	Approx. 29kPa (8.7 in Hg)

EGR VALVE CHECK

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.

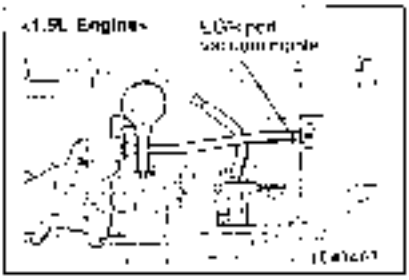


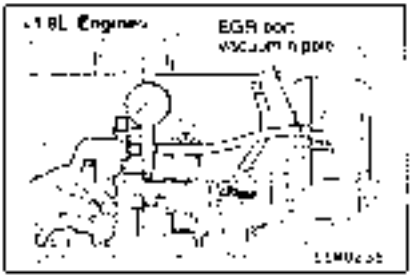
2. Connect a hand vacuum pump to the EGR valve.
3. Apply 67kPa (20 in Hg) of vacuum, and check to be sure that the vacuum is maintained.
4. Apply a vacuum and check the passage of air by blowing through one side of the EGR passage.

Vacuum	Passage of air
5.3kPa (1.6 in Hg) or less	Air is not blown out
29kPa (8.7 in Hg) or more	Air is blown out

5. Reinstall the EGR valve, using a new gasket, and tighten to the specified torque.

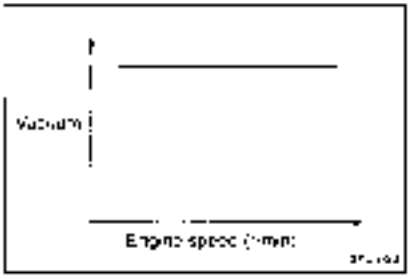
   Tightening torque: 22 Nm (16 ft lbs.)





EGR PORT VACUUM CHECK

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

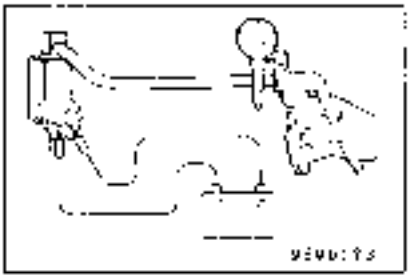


2. Start the engine and check to see that, after rapidly increasing engine rpm, vacuum remains fairly constant.

EGR SOLENOID CHECK

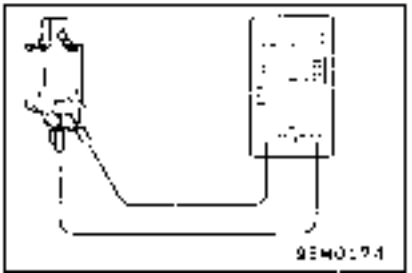
NOTE
When disconnecting the vacuum hose, always make sure that it can be reconnected at original position.

1. Disconnect the vacuum hose (yellow stripe/white stripe) from the solenoid valve.
2. Disconnect the harness connector.



3. Connect a hand vacuum pump to the nipple in which the white-striped vacuum hose was connected
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage

Battery voltage	Normal condition
Not applied	Vacuum leaks
Applied	Vacuum maintained



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

   Standard value: 36 – 44 Ω [at 20°C (68°F)]

CATALYTIC CONVERTER

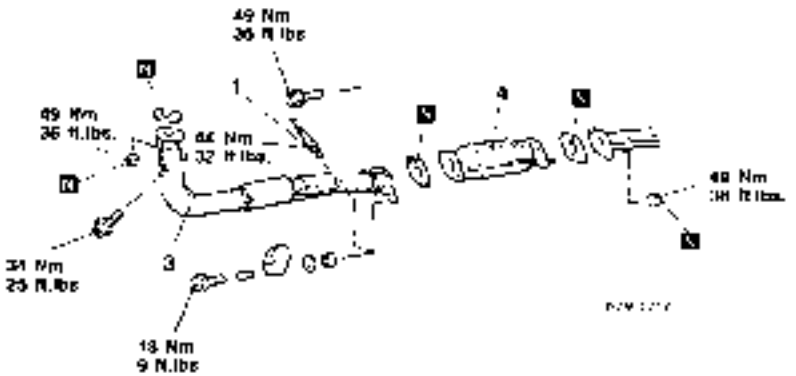
GENERAL INFORMATION

The three-way catalytic converter, together with the closed loop air-fuel ratio control based on the oxygen sensor signal, oxidizes carbon monoxides (CO) and hydrocarbons (HC) and reduces nitrogen oxides (NOx).

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

REMOVAL AND INSTALLATION

<Vehicles for Federal>



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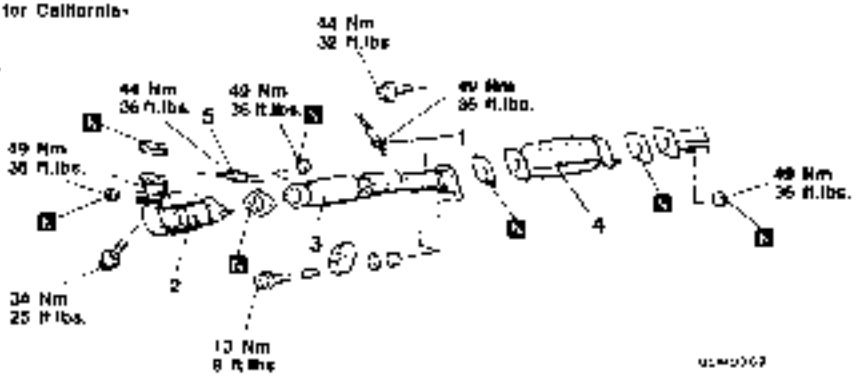
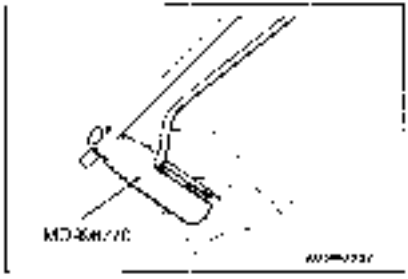


Removal steps

◀A▶ ▶A◀ 1 Heated oxygen sensor
2 Front catalytic converter
3 Front exhaust pipe
4 Rear catalytic converter
◀A▶ ▶A◀ 5 Heated oxygen sensor



REMOVAL SERVICE POINT

◀A▶ HEATED OXYGEN SENSOR REMOVAL

INSTALLATION SERVICE POINT

▶A◀ HEATED OXYGEN SENSOR REMOVAL

INSPECTION

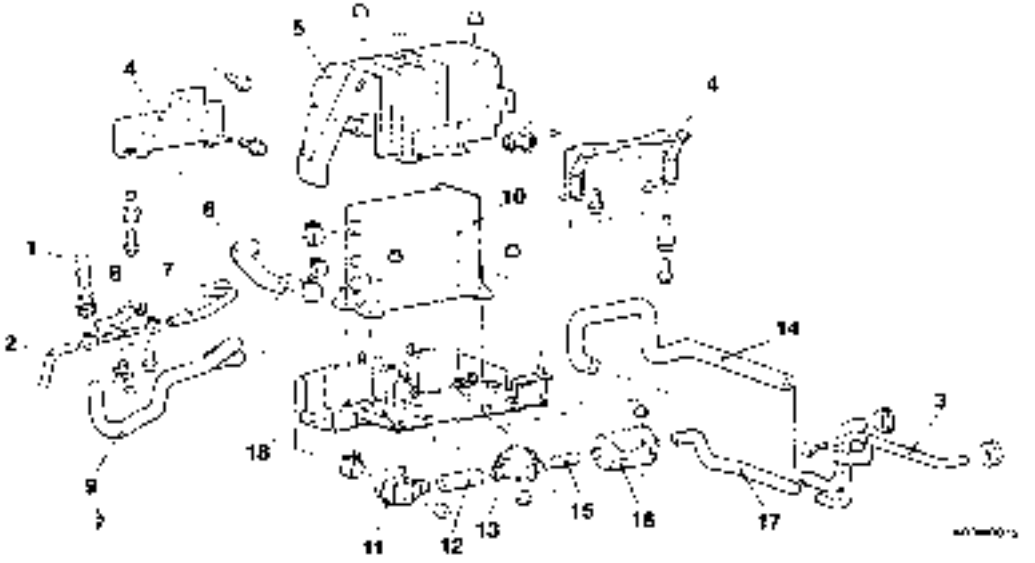
Inspect for damage, cracking or deterioration. Replace if faulty.

Caution

1. Stop the engine immediately if engine misfiring occurs, otherwise an abnormally hot exhaust system will damage the catalytic converter or other underbody parts.
2. Correct and repair the ignition or fuel system if there are malfunctions, otherwise engine misfiring may occur which will damage the catalytic converter.
3. Observe manufacturer's specifications when doing service work.

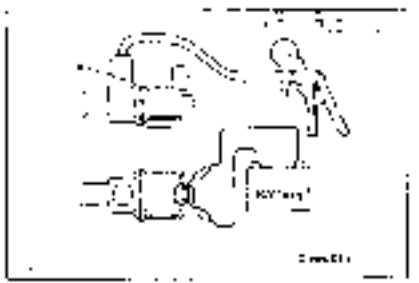
EVAPORATIVE EMISSION CANISTER/AIR FILTER/EVAPORATIVE VENTILATION SOLENOID

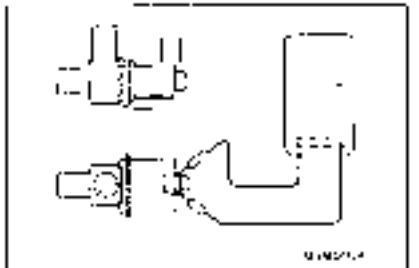
REMOVAL AND INSTALLATION



Removal steps

1. Leveling hose connection
2. Purge hose connection
3. Vent pipe
4. Canister bracket
5. Canister upper cover
6. Vent hose A
7. Purge hose
8. Purge pipe assembly
9. Vapor hose
10. Evaporative emission canister assembly
11. Evaporative emission ventilation solenoid
12. Vent hose B
13. Vent valve
14. Vent hose C
15. Vent hose D
16. Air filter
17. Vent hose E
18. Canister lower cover





INSPECTION

EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

(1) Connect a hand vacuum pump to nipple (A) of the solenoid.

(2) Check airtightness by applying a vacuum with voltage applied directly from the battery to the evaporative emission ventilation solenoid and without applying voltage.

Battery voltage	Normal condition
Applied	Vacuum maintained
Not applied	Vacuum leaks

(3) Measure the resistance between the terminals of the solenoid.

Standard value: 17 – 21 Ω [at 20°C (68°F)]