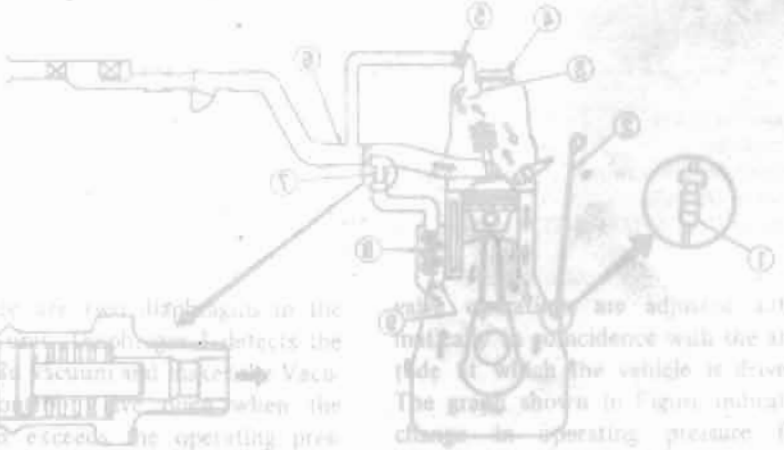
SECTION EC

EMISSION CONTROL SYSTEM

CONTENTS



GENERAL DESCRIPTION

There are three types of emission control system. These are:

1. Closed type crankcase emission control system.
2. Exhaust emission control system.
3. Evaporative emission control system.

Periodic inspection and required servicing of these systems should be carried out to reduce harmful emissions to a minimum.

CRANKCASE EMISSION CONTROL SYSTEM

DESCRIPTION

This system returns blow-by gas to both the intake manifold and throttle chamber.

The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.

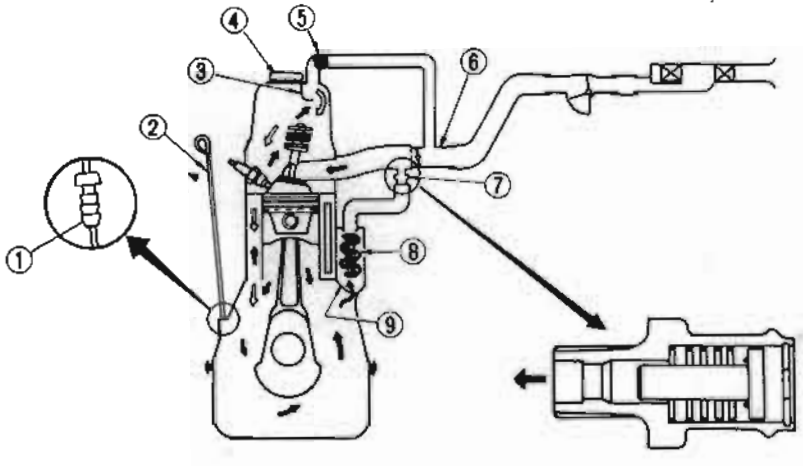
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from throttle chamber, through the tube connecting throttle chamber to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the tube connection in the reverse direction.

On cars with an excessively high blow-by, some of the flow will go through the tube connection to throttle chamber under all conditions.



⇨ Fresh air
➡ Blow-by gas

1 Seal rubber
2 Oil level gauge
3 Baffle plate
4 Oil filler cap
5 Flame arrester
6 Throttle chamber
7 P.C.V. valve
8 Steel net
9 Baffle plate

ET469

Fig. EC-1 Crankcase Emission Control System

INSPECTION

P.C.V. VALVE

With engine running at idle, remove the ventilation hose from P.C.V. valve. If the valve is working, a hissing noise will be heard as air passes through the valve and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

VENTILATION HOSES

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.

If any hose cannot be freed of obstructions, replace.

Ensure that flame arrester is surely inserted in hose between throttle chamber and rocker cover.

EXHAUST EMISSION CONTROL SYSTEM

DESCRIPTION

The exhaust emission control system is made up of the following:

Emission control system	California models	Non-California models	
		Except Canada	For Canada
B.C.D.D. (Boost Controlled Deceleration Device)	Speed Detecting Switch (M/T) Inhibitor Switch (A/T)		
	With Altitude Corrector	Without Altitude Corrector	
E.G.R. (Exhaust Gas Recirculation) Control System	E.G.R. Control Valve T.V.V. (Thermal Vacuum Valve)		
	B.P.T. (Back Pressure Transducer) Valve	B.P.T. (Back Pressure Transducer) Valve	–
	V.D.V. (Vacuum Delay Valve)	–	–
Spark Timing Control System	V.D.V. (Vacuum Delay Valve)	–	V.D.V. (Vacuum Delay Valve)
Catalytic Converter System	Catalytic Converter	–	–

BOOST CONTROLLED DECELERATION DEVICE (B.C.D.D.)

DESCRIPTION

The Boost Controlled Deceleration Device (B.C.D.D.) is employed to reduce HC emissions emitted during coasting. The B.C.D.D., installed under the throttle chamber as a part of it, supplies additional air to the intake manifold during coasting to maintain the manifold vacuum at the proper operating pressure.

There are two diaphragms in the device unit. Diaphragm I detects the manifold vacuum and makes the Vacuum Control Valve open when the vacuum exceeds the operating pressure. Diaphragm II operates the Air Control Valve according to the vacuum transmitted through the Vacuum Control Valve. The Air Control Valve regulates the amount of additional air so that the manifold vacuum can be kept at the proper operating pressure. On California models, the operating pressure changes depending on altitude; thus, diaphragm II and control valve operations are adjusted automatically in coincidence with the altitude at which the vehicle is driven. The graph shown in Figure indicates change in operating pressure for changes in atmospheric pressure and altitude. See Fig. EC-8.

On manual transmission models, this system consists of B.C.D.D., vacuum control solenoid valve, speed-detecting switch and amplifier.

On automatic transmission models, it consists of B.C.D.D., vacuum control solenoid valve and inhibitor switch.

OPERATION

B.C.D.D.

Diaphragm I ⑪ monitors the manifold vacuum; when the vacuum exceeds a pre-determined value, it acts so as to open the vacuum control valve ⑩. This causes the manifold vacuum to be introduced into vacuum chamber II ⑲ and actuates diaphragm II ⑬.

When diaphragm II operates, the air control valve ⑭ opens the passage and introduces the additional air into the manifold.

The amount of air is controlled by the servo-action of the air control valve ⑭ and vacuum control valve ⑩ so that the manifold vacuum may be kept at the pre-determined value.

Vacuum control solenoid valve

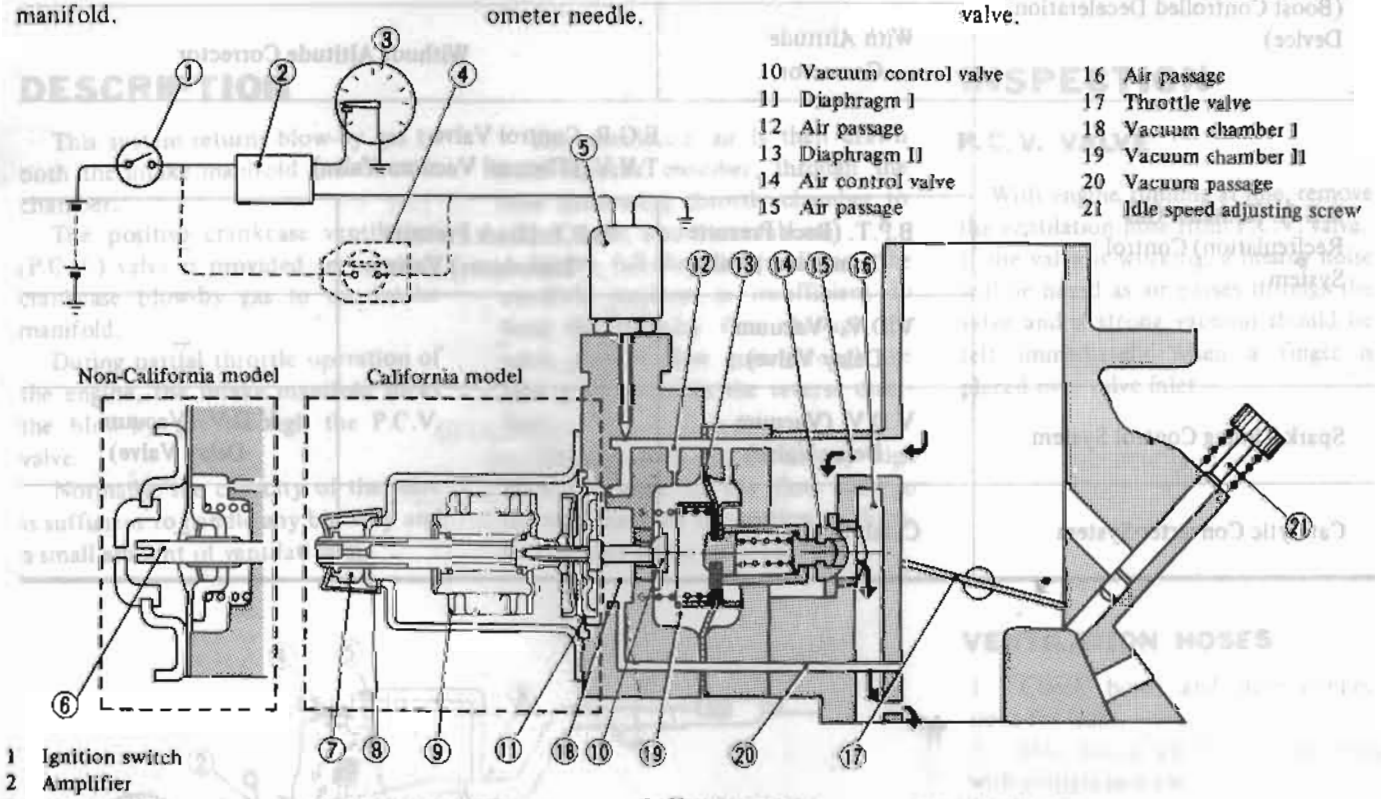
Manual transmission models:

The vacuum control solenoid valve is controlled by a speed detecting switch that is actuated by the speedometer needle.

As the car speed falls below 10 M.P.H., this switch is actuated, producing a signal. This signal actuates the amplifier to open the vacuum control solenoid valve.

Automatic transmission models:

When the shift lever is in the "N" or "P" position, the inhibitor switch mounted on the transmission turns on to open the vacuum control solenoid valve.



1 Ignition switch
2 Amplifier
3 Speed detecting switch
Below 16 km/h
(10 MPH): ON (For M/T)
4 Inhibitor switch
"N" or "P" position: ON
(For A/T)
5 Vacuum control solenoid valve
6 Adjusting screw
7 Adjusting nut
8 Lock spring
9 Altitude corrector
10 Vacuum control valve
11 Diaphragm I
12 Air passage
13 Diaphragm II
14 Air control valve
15 Air passage
16 Air passage
17 Throttle valve
18 Vacuum chamber I
19 Vacuum chamber II
20 Vacuum passage
21 Idle speed adjusting screw

EC243A

Fig. EC-2 Schematic Drawing of B.C.D.D.

REMOVAL AND INSTALLATION

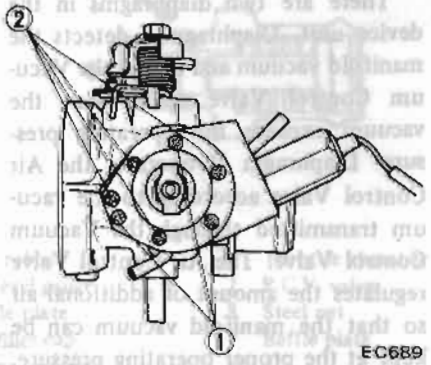
B.C.D.D.

Note:

The B.C.D.D. cannot be disassembled. If it is found to be functioning unsatisfactorily, it must be replaced as an assembly.

1. Remove B.C.D.D. by unscrewing the three securing screw ①.

Do not unscrew the four B.C.D.D. assembly screws ②.



EC689

Fig. EC-3 Removing B.C.D.D.

2. To install, reverse the removal procedure.

Ⓣ Tightening torque:
20 to 40 kg-cm
(17 to 35 in-lb)

Vacuum control solenoid valve

1. Vacuum control solenoid valve can be easily removed with a wrench.
2. To install, reverse the removal procedure.

Ⓣ Tightening torque:
180 to 350 kg-cm
(156 to 304 in-lb)

INSPECTION

Control circuit

To check the control circuit, use the check connector. It is located under the ignition coil at the left front of the engine compartment.

CAUTION:
Do not attach probes of a circuit tester to those other than designated. Refer to Fig. EC-4 and EC-5.

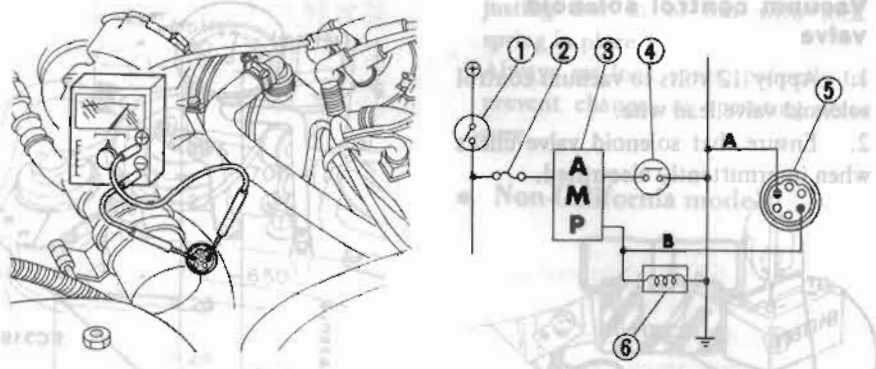
Manual transmission models

Note: Conduct this test by one of the following two methods.

a. **Raise the rear wheels clear of the floor. Block front wheels securely. Use floor stands to support the side member.**
b. Chassis dynamometer test.

1. Connect voltmeter probe to check connector as shown in Fig. EC-4.
2. Measure voltage.

If result is no good, check amplifier, speed detecting switch, harnesses and connectors. Then replace or repair faulty part.



1 Ignition switch
2 Fuse
3 Amplifier
4 Speed detecting switch
Above 16 km/h (10 mph): OFF
Below 16 km/h (10 mph): ON
5 Check connector
6 Vacuum control solenoid valve

EC412A

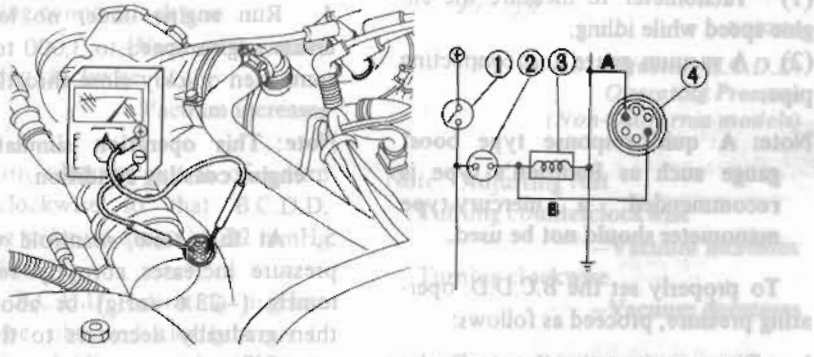
Fig. EC-4 Checking B.C.D.D. Control Circuit (Manual transmission models)

Car speed	Voltmeter	Judgment
Below 16 km/h (10 MPH)	0 V	No Good
	12 V	OK
Above 16 km/h (10 MPH)	0 V	OK
	12 V	No Good

Automatic transmission models

1. Connect voltmeter probe to check connector as shown in Fig. EC-5.
2. Turn ignition switch "ON" and measure voltage.

If result is no good, check inhibitor switch, harness and connectors. Then replace or repair faulty part.



1 Ignition switch
2 Inhibitor switch
N or P position: ON
1, 2, D or R position: OFF
3 Vacuum control solenoid valve
4 Check connector

EC413A

Fig. EC-5 Checking B.C.D.D. Control Circuit (Automatic transmission models)

Selector lever position	Voltmeter	Judgment
"P" and "N"	0 V	No Good
	12 V	OK
"R", "D", "2" and "1"	0 V	OK
	12 V	No Good

Vacuum control solenoid valve

1. Apply 12 volts to vacuum control solenoid valve lead wire.
2. Ensure that solenoid valve clicks when intermittently electrified.

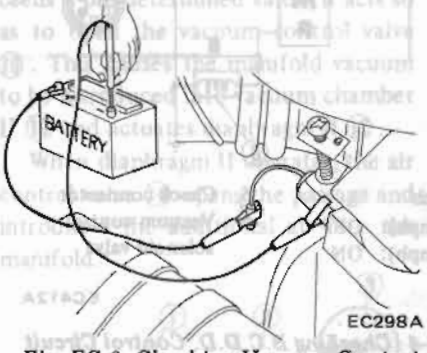


Fig. EC-6 Checking Vacuum Control Solenoid Valve

3. If a click is not heard, replace solenoid valve.

Operating pressure

Generally, it is unnecessary to inspect and adjust the B.C.D.D., however, if it should become necessary to do so, the procedure is as follows:

Prepare the following tools

(1) Tachometer to measure the engine speed while idling.
(2) A vacuum gauge and connecting pipe.

Note: A quick-response type boost gauge such as Bourdon's type is recommended; a mercury-type manometer should not be used.

To properly set the B.C.D.D. operating pressure, proceed as follows:

1. Disconnect vacuum control solenoid valve harness connector.
2. Connect rubber hose between vacuum gauge and intake manifold.

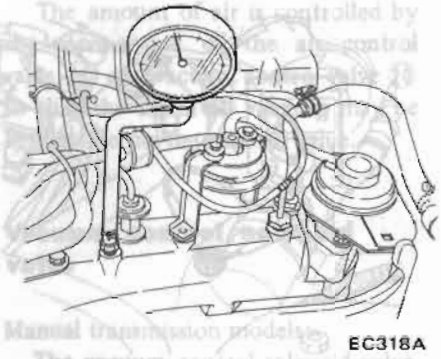


Fig. EC-7 Connecting Vacuum Gauge

3. Start engine and warm up engine until water temperature indicator points to the middle of gauge.

Then adjust idle speed, referring to Checking and Adjusting · Ignition Timing (Section ET) for ignition and fuel system.

Idle speed:
Manual Transmission
800 rpm
Automatic Transmission
(in "D" position)
700 rpm

4. Run engine under no load. Increase engine speed to 3,000 to 3,500 rpm, then quickly close throttle valve.

Note: This operation simulates the engine coasting condition.

5. At that time, manifold vacuum pressure increases abruptly to −600 mmHg (−23.6 inHg) or above and then gradually decreases to the level set at idling.
6. Check that B.C.D.D. operating pressure is within the specified pressure.

B.C.D.D. operating pressure (0 m, sea level and 760 mmHg (29.9 inHg), atmospheric pressure):
−470 ± 10 mmHg
(−18.5 ± 0.4 inHg)

7. If engine speed cannot be decreased to idling when checking B.C.D.D. operating pressure, proceed as follows:

- California models

Note:

a. In the case of California models, the operating pressure varies in proportion to altitude.
b. When atmospheric pressure is known, operating pressure will be found by tracing the arrow line "A". See Fig. EC-8. When altitude is known, operating pressure will be found by tracing the arrow line "B". See Fig. EC-8.
c. When checking the set pressure of B.C.D.D., find the specified operating pressure in Fig. EC-8 from the atmospheric pressure and altitude of the given location.
For example, if the car is located at an altitude of 1,400 m (4,600 ft), the specified operating pressure for B.C.D.D. is 375 mmHg (14.76 inHg).

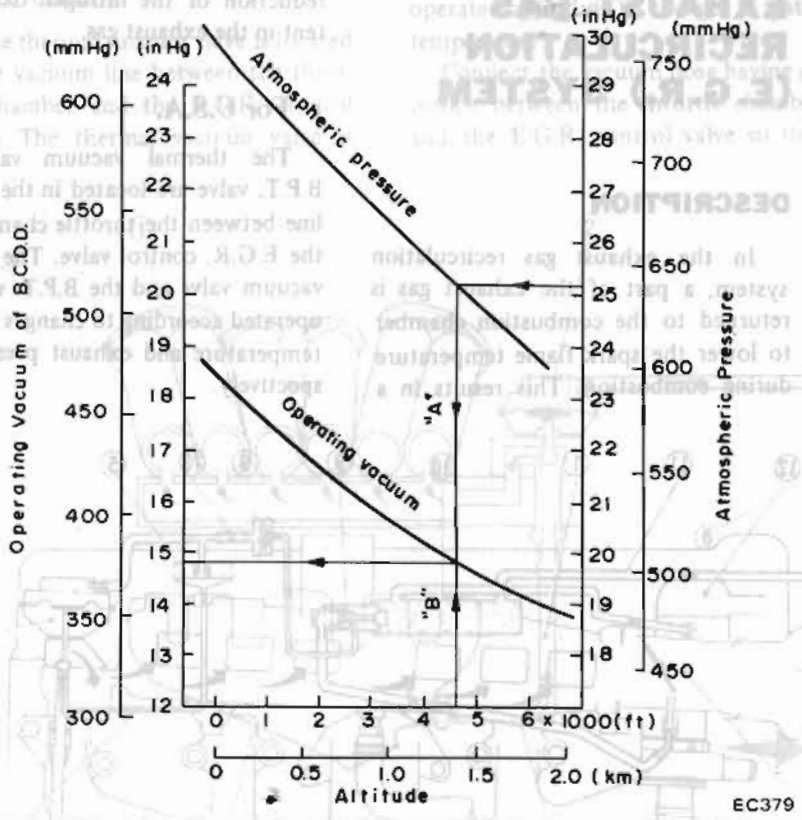
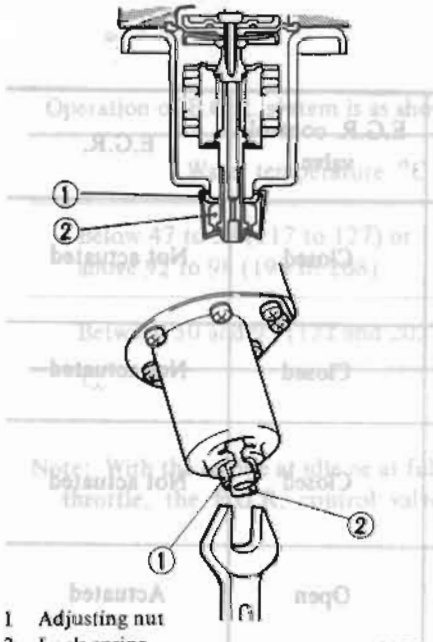


Fig. EC-8 Changes in B.C.D.D. Operating Pressure versus Changes in Atmospheric Pressure and Altitude (California models)

(1) Turn adjusting nut clockwise so that B.C.D.D. operating pressure is on high vacuum side, 32 mmHg (1.26 inHg) away from the specified value.



1 Adjusting nut
2 Lock spring

Fig. EC-9 Adjusting B.C.D.D. Operating Pressure (California models)

Note: Adjusting Nut
Turning counterclockwise
–Vacuum decreases
Turning clockwise
–Vacuum increases

(2) Turn adjusting nut ¼ of a turn counterclockwise so that B.C.D.D. operating pressure drops by 32 mmHg (1.26 inHg).

(3) If B.C.D.D. operating pressure cannot be observed clearly even in steps (1) and (2), proceed as follows:

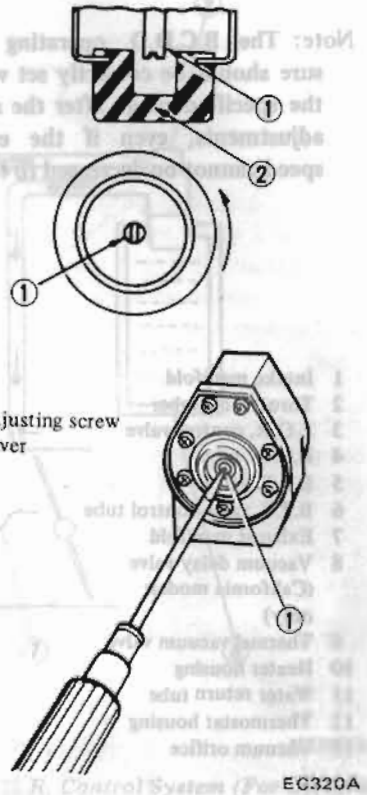
- Turn adjusting nut clockwise so that B.C.D.D. operating pressure is on high vacuum side, 64 mmHg (2.52 inHg) away from the specified value.
- Then turn adjusting nut ½ of a turn counterclockwise.

Note:

a. The B.C.D.D. operating pressure should be correctly set within the specified range after the above adjustments, even if the engine speed cannot be decreased to idling.

b. When adjusting B.C.D.D., turn adjusting nut in or out with lock spring in place.
Always set lock spring properly to prevent changes in operating pressure.

- **Non-California models**



1 Adjusting screw
2 Cover

Fig. EC-10 Adjusting B.C.D.D. Operating Pressure (Non-California models)

Note: Adjusting Nut
Turning counterclockwise
–Vacuum increases
Turning clockwise
–Vacuum decreases

(1) Turn adjusting screw counterclockwise so that B.C.D.D. operating pressure is on high vacuum side, 32 mmHg (1.26 inHg) away from the specified value.

(2) Turn adjusting screw ¼ of a turn clockwise so that B.C.D.D. operating pressure drops by 32 mmHg (1.26 inHg).

(3) If B.C.D.D. operating pressure cannot be observed clearly even in steps (1) and (2), proceed as follows:

- Turn adjusting screw counterclockwise so that B.C.D.D. operating pressure is on high vacuum side, 64 mmHg (2.52 inHg) away from the

specified value.

- Then turn adjusting screw ½ of a turn clockwise.

Note: The B.C.D.D. operating pressure should be correctly set within the specified range after the above adjustments, even if the engine speed cannot be decreased to idling.

EXHAUST GAS RECIRCULATION (E.G.R.) SYSTEM

DESCRIPTION

In the exhaust gas recirculation system, a part of the exhaust gas is returned to the combustion chamber to lower the spark flame temperature during combustion. This results in a reduction of the nitrogen oxide content in the exhaust gas.

- For U.S.A.

The thermal vacuum valve and B.P.T. valve are located in the vacuum line between the throttle chamber and the E.G.R. control valve. The thermal vacuum valve and the B.P.T. valve are operated according to changes in water temperature and exhaust pressure, respectively.

1 Intake manifold
2 Throttle chamber
3 E.G.R. control valve
4 E.G.R. tube
5 B.P.T. valve
6 B.P.T. valve control tube
7 Exhaust manifold
8 Vacuum delay valve (California models only)
9 Thermal vacuum valve
10 Heater housing
11 Water return tube
12 Thermostat housing
13 Vacuum orifice

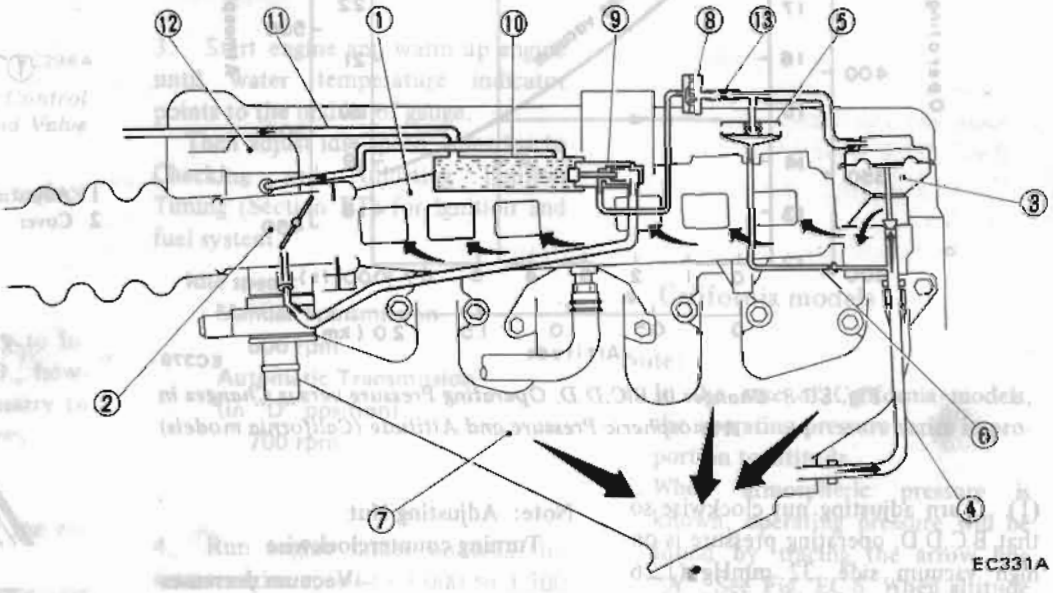


Fig. EC-11 E.G.R. Control System (For U.S.A.)

Operation of E.G.R. system is as shown below.

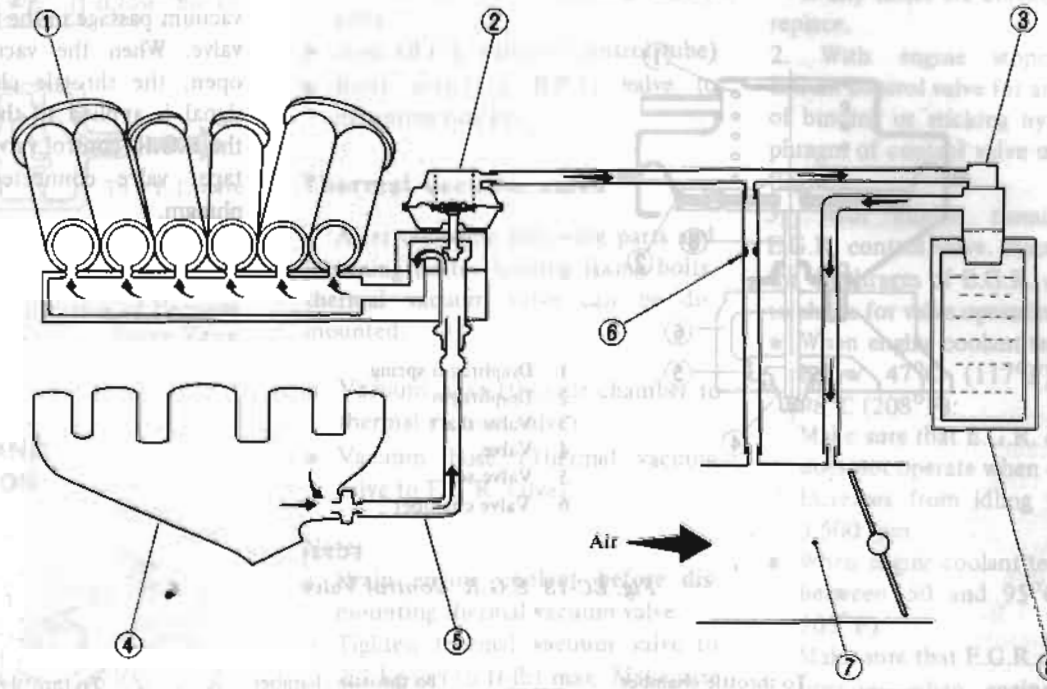
Water temperature °C (°F)	Thermal vacuum valve	B.P.T. valve mmH2O (inH2O)		E.G.R. control valve	E.G.R.
Below 47 to 53 (117 to 127) or Above 92 to 98 (198 to 208)	Closed	Exhaust pressure Below 21 to 33 (0.82 to 1.30)	Open	Closed	Not actuated
		Above 21 to 33 (0.82 to 1.30)	Closed	Closed	Not actuated
Between 50 and 95 (122 to 203)	Open	Exhaust pressure Below 21 to 33 (0.82 to 1.30)	Open	Closed	Not actuated
		Above 21 to 33 (0.82 to 1.30)	Closed	Open	Actuated

Note: With the engine at idle or at full throttle, the E.G.R. control valve closes to deactivate the E.G.R. system regardless of water temperature (operation of the thermal vacuum valve) and B.P.T. valve.

• For Canada

The thermal vacuum valve is located in the vacuum line between the throttle chamber and the E.G.R. control valve. The thermal vacuum valve is operated according to changes in water temperature.

Connect the vacuum hose having an orifice between the throttle chamber and the E.G.R. control valve so that the hose is parallel to the thermal vacuum valve vacuum line. This prevents negative pressure from remaining in the E.G.R. control valve when the thermal vacuum valve is closed.



1 Intake manifold
2 E.G.R. control valve
3 Thermal vacuum valve
4 Exhaust manifold
5 E.G.R. tube
6 Orifice
7 Throttle chamber
8 Heater housing

EC299A

Fig. EC-12 E.G.R. Control System (For Canada)

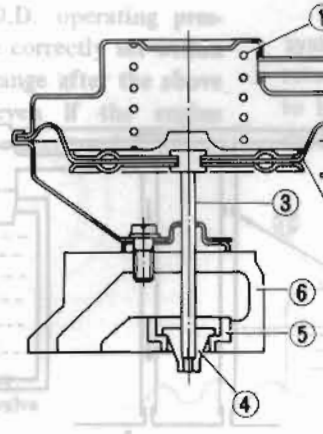
Operation of E.G.R. system is as shown below.

Water temperature °C (°F)	Thermal Vacuum Valve	E.G.R. system
Below 47 to 53 (117 to 127) or above 92 to 98 (198 to 208)	Closed	Not actuated
Between 50 and 95 (122 and 203)	Open	Actuated

Note: With the engine at idle or at full throttle, the E.G.R. control valve closes to deactivate the E.G.R. system regardless of water temperature (Operation of the thermal vacuum valve).

E.G.R. Control valve

The E.G:R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.



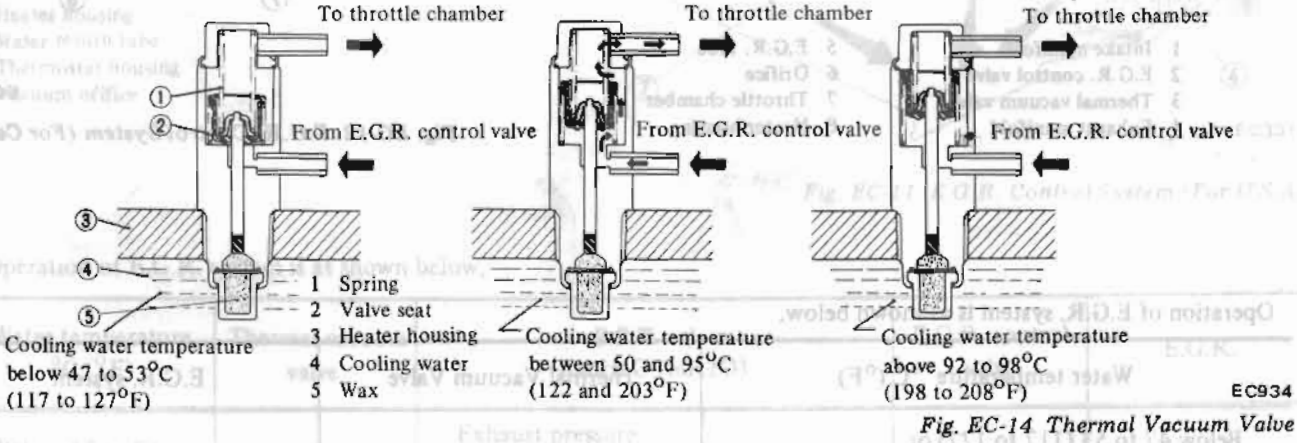
1 Diaphragm spring
2 Diaphragm
3 Valve shaft
4 Valve
5 Valve seat
6 Valve chamber

EC231

Fig. EC-13 E.G.R. Control Valve

Thermal vacuum valve

The thermal vacuum valve is mounted in the heater housing on the intake manifold. It detects engine coolant temperature by means of a wax pallet, and opens or closes the vacuum passage in the thermal vacuum valve. When the vacuum passage is open, the throttle chamber vacuum signal is applied to the diaphragm of the E.G.R. control valve to actuate the taper valve connected to the diaphragm.



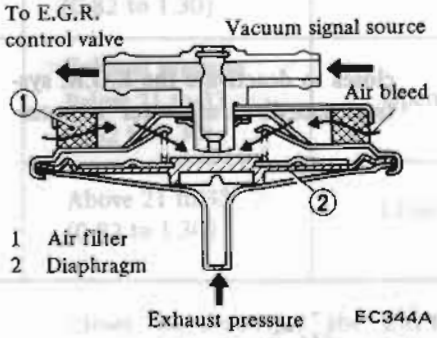
1 Spring
2 Valve seat
3 Heater housing
4 Cooling water
5 Wax

EC934

Fig. EC-14 Thermal Vacuum Valve

B.P.T. valve

The B.P.T. valve monitors exhaust pressure to activate the diaphragm, controlling intake manifold vacuum applied to the E.G.R. control valve. In other words, recirculated exhaust gas is controlled in response to positioning of the E.G.R. control valve or to engine operation.



1 Air filter
2 Diaphragm

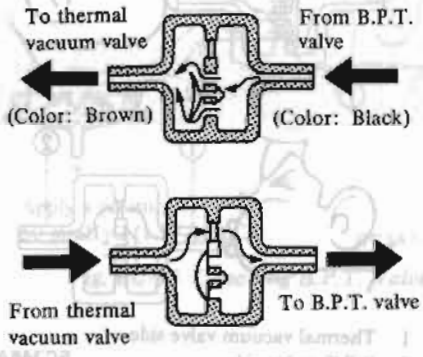
EC344A

Fig. EC-15 B.P.T. Valve

Vacuum delay valve

During rapid acceleration the vacuum delay valve prevents an abrupt escape of vacuum from the line between the throttle chamber and E.G.R. control valve, and increases the length of E.G.R. operation. The valve is designed for one-way operation and consists of a one-way umbrella valve and a sintered steel fluidic restrictor.

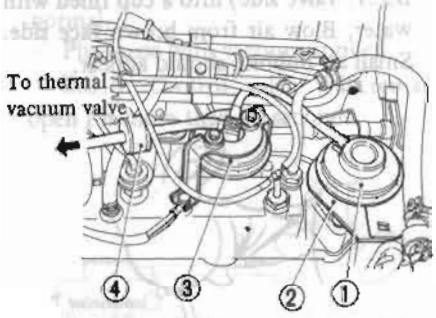
Note: When installing this valve, ensure that it properly oriented.



EC345A

Fig. EC-16 Operation of Vacuum Delay Valve

REMOVAL AND INSTALLATION



1 E.G.R. control valve
2 Heat shield plate
3 B.P.T. valve (For U.S.A.)
4 Vacuum delay valve (California models)

EC333A

Fig. EC-17 E.G.R. Control System

E.G.R. control valve

E.G.R. control valve is installed on intake manifold through a gasket. To dismount E.G.R. control valve, remove the following parts:

- Vacuum hose connecting E.G.R. control valve.
- Heat shield plate for E.G.R. control valve.
- Nuts attaching E.G.R. control valve to intake manifold.

Note: To remove vacuum hose, flatten clip connecting vacuum hose to E.G.R. control valve and remove hose by hand.

B.P.T. valve

The B.P.T. valve is attached to the intake manifold through the mounting bracket.

To dismount B.P.T. valve, remove following parts:

- Vacuum hoses connecting B.P.T. valve
- Hose (B.P.T. valve to control tube)
- Bolts attaching B.P.T. valve to mounting bracket

Thermal vacuum valve

After removing following parts and loosening heater housing fixing bolts, thermal vacuum valve can be dismounted.

- Vacuum hose (throttle chamber to thermal vacuum valve)
- Vacuum hose (Thermal vacuum valve to E.G.R. valve).

Note:

a. Drain engine coolant before dismounting thermal vacuum valve.

b. Tighten thermal vacuum valve to 2.2 kg-m (16 ft-lb) max. Make sure that valve is water-tight after installation.

1 Heater housing
2 Thermal vacuum valve

EC301A

Fig. EC-18 Removing Thermal Vacuum Valve

To install E.G.R. control system components, reverse the order of removal.

Note: When connecting vacuum hoses, ensure that they are properly positioned.

INSPECTION

Entire system

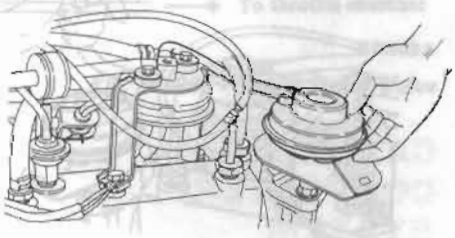
1. Make a thorough visual check of E.G.R. control system. If necessary, wipe away oil to facilitate inspection.

If any hoses are cracked or broken, replace.

2. With engine stopped, inspect E.G.R. control valve for any indication of binding or sticking by moving diaphragm of control valve upwards with finger.

3. With engine running, inspect E.G.R. control valve. Place a finger on the diaphragm of E.G.R. control valve to check for valve operation.

- When engine coolant temperature is below 47°C (117°F) or above 98°C (208°F):
  Make sure that E.G.R. control valve does not operate when engine speed increases from idling to 3,000 to 3,500 rpm.
- When engine coolant temperature is between 50 and 95°C (122 and 203°F):
  Make sure that E.G.R. control valve operates when engine speed increases from idling to 3,000 to 3,500 rpm.



EC336A

Fig. EC-19 Checking E.G.R. Control Valve

4. If E.G.R. control valve does not operate as indicated above, check as follows:

- Engine coolant temperature is between 50 and 95°C (122 and 203°F)
- Increase engine speed from idling to 3,000 to 3,500 rpm.

(1) Thermal vacuum valve.

1) Disconnect one end (E.G.R. control valve side) of vacuum hose.

2) Make sure that thermal vacuum

valve is open, and that throttle chamber vacuum is present at end of vacuum hose.

3) If vacuum is weak or is not present at all, check thermal vacuum valve itself.

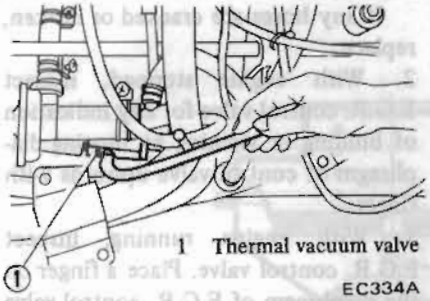


Fig. EC-20 Checking Thermal Vacuum Valve

(2) Vacuum Delay Valve.

Check vacuum delay valve itself.

(3) B.P.T. valve.

1) Disconnect one end (E.G.R. control valve side) of vacuum hose.

2) Make sure that B.P.T. valve is operating, and that throttle chamber vacuum is present at end of vacuum hose.

3) If vacuum is not present at all, check B.P.T. valve itself.

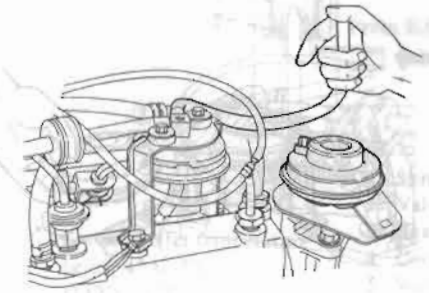


Fig. EC-21 Checking B.P.T. Valve

(4) E.G.R. control valve.

Check E.G.R. control valve itself.

Thermal vacuum valve

Dismount thermal vacuum valve from heater housing.

Note:
Before dismounting, drain engine coolant from engine.

Check to be sure that thermal vacuum valve opens or closes in response to water temperature as specified.

If test results satisfy the following, thermal vacuum valve is properly functioning:

Coolant temperature	Vacuum passage
Below 47°C (117°F)	Closed
50 to 95°C (122 to 203°F)	Open
Above 98°C (208°F)	Closed

CAUTION:
Do not allow water to get inside the thermal vacuum valve.

Fig. EC-22 Checking Thermal Vacuum Valve

Vacuum delay valve

1. Remove vacuum delay valve.
2. Blow air from the port of the B.P.T. valve side. The vacuum delay valve is in good condition if the air flows through the valve.
3. Try again from the opposite side (brown face side) of the valve. The valve is in good condition if the air flow resistance is greater than the step 2 above.

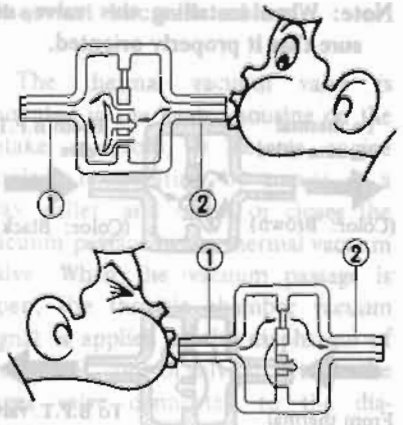


Fig. EC-23 Checking Vacuum Delay Valve

4. If the condition of vacuum delay valve is questionable, dip port (on B.P.T. valve side) into a cup filled with water. Blow air from brown face side. Small air bubbles should appear.

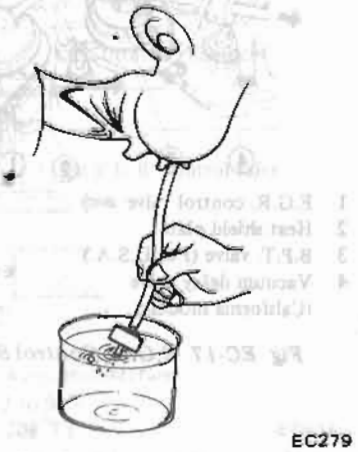


Fig. EC-24 Checking Vacuum Delay Valve

CAUTION:
Be careful to avoid entry of oil or dirt into valve.

B.P.T. valve

Disconnect B.P.T. valve from engine.

1. Apply a pressure above 50 mm H_2O (1.97 inH_2O) to B.P.T. valve and orally suck port back, as shown in Fig. EC-25, to check for leakage. If a leak is noted, replace valve.

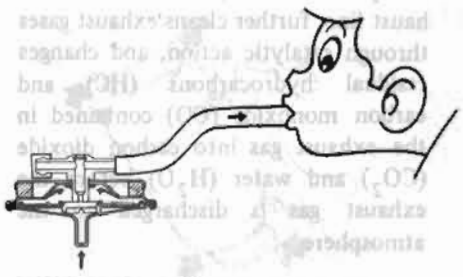


Fig. EC-25 Checking B.P.T. Valve

E.G.R. control valve

Dismount E.G.R. control valve from engine.

1. Apply vacuum to E.G.R. control valve, referring to the following figure. If the valve moves to full position, it is normal.

Plug hose with vacuum applied.

E.G.R. control valve will remain open for more than 30 seconds.

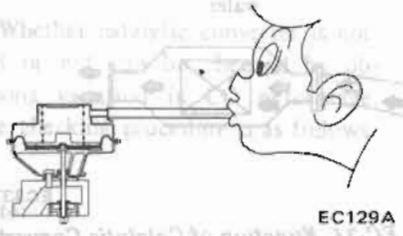


Fig. EC-26 Checking E.G.R. Control Valve

2. Visually check E.G.R. control valve for damage, wrinkle or deformation.
3. Clean the seating surface of E.G.R. control valve with a brush and compressed air, and remove foreign matter from around the valve and port.

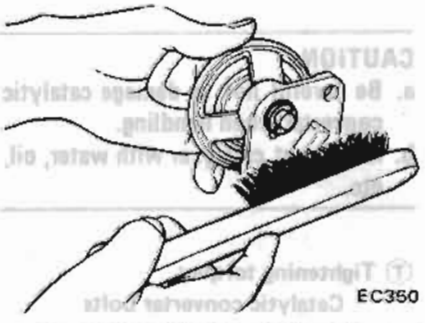


Fig. EC-27 Cleaning E.G.R. Control Valve

SPARK TIMING CONTROL SYSTEM

DESCRIPTION

The spark timing control system is designed to control the distributor vacuum advance during rapid acceleration so as to reduce HC and NOx emissions.

1 Vacuum delay valve
2 Sintered metal disc
3 One-way umbrella
4 Distributor
5 Vacuum advance unit

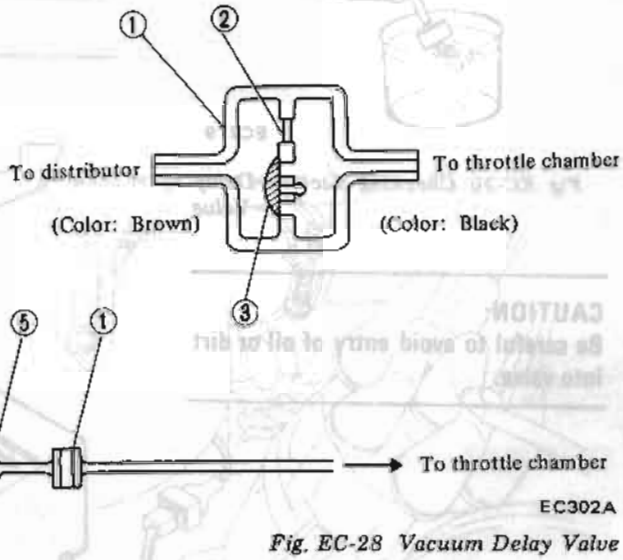


Fig. EC-28 Vacuum Delay Valve

OPERATION

When the throttle valve is opened rapidly, Vacuum Delay Valve (V.D.V.) restricts the air flow in the line to reduce the rate of vacuum change. The V.D.V. is installed in the vacuum control line to the distributor. The reduced rate of vacuum change provides the vacuum advance unit with some delay time.

When the vacuum of the vacuum source decreases, the vacuum advance unit responds normally because a one way function is provided to the valve.

INSPECTION

Vacuum delay valve

1. Remove vacuum delay valve.
2. Blow air from the port of the throttle chamber side. The vacuum delay valve is in good condition if the air flows through the valve.
3. Try again from the opposite side (brown face side) of the valve. The valve is in good condition if the air flow resistance is greater than the step 2 above.

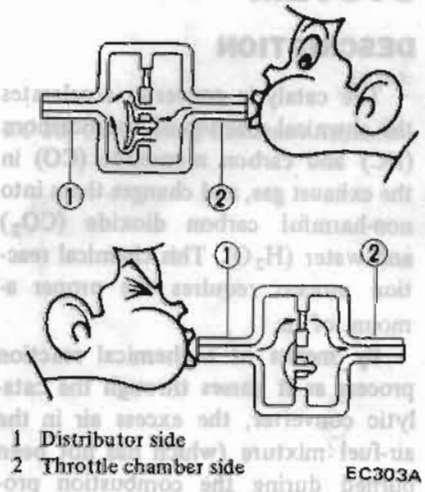


Fig. EC-29 Checking Vacuum Delay Valve

4. If the condition of vacuum delay valve is questionable, dip port (on brown face side) into a cup filled with water. Blow air from brown face side. Small air bubbles should appear.

Fig. EC-30 Checking Vacuum Delay Valve

CAUTION:
Be careful to avoid entry of oil or dirt into valve.

OPERATION

Catalytic converter

The exhaust gas which is left unburned during combustion process is gradually oxidized with excess oxygen, and is converted into harmless carbon dioxide (CO_2) and water (H_2O). The catalytic converter, located in the exhaust line, further cleans exhaust gases through catalytic action, and changes residual hydrocarbons (HC) and carbon monoxide (CO) contained in the exhaust gas into carbon dioxide (CO_2) and water (H_2O) before the exhaust gas is discharged to the atmosphere.

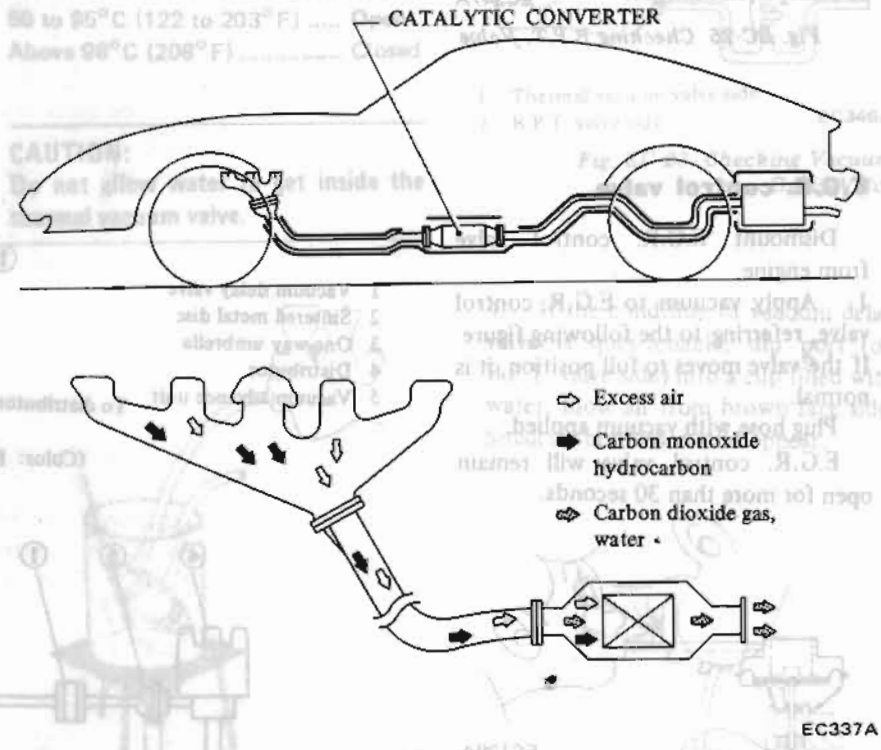


Fig. EC-31 Function of Catalytic Converter

CATALYTIC CONVERTER SYSTEM

DESCRIPTION

The catalytic converter accelerates the chemical reaction of hydrocarbons (HC) and carbon monoxide (CO) in the exhaust gas, and changes them into non-harmful carbon dioxide (CO_2) and water (H_2O). This chemical reaction process requires the proper amount of air.

By means of a chemical reaction process as it passes through the catalytic converter, the excess air in the air-fuel mixture (which has not been burned during the combustion process) is utilized to minimize HC and CO emissions.

REMOVAL AND INSTALLATION

WARNING:
You should not remove catalytic converter until exhaust system has completely cooled off. Otherwise, you may burn yourself.

1. Jack up the car.

Note: Apply parking brake and place wheel chocks.

2. Remove screws securing lower shelter of catalytic converter.

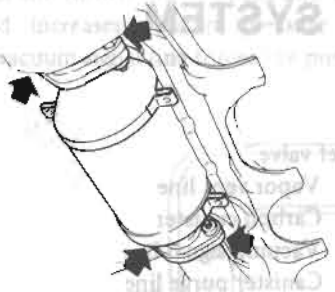
Loosen bolts connecting catalytic converter to front and rear exhaust tubes.

Catalytic converter assembly can then be taken out.

3. Installation is in the reverse sequence of removal.

CAUTION:
a. Be careful not to damage catalytic converter when handling.
b. Never wet catalyzer with water, oil, etc.

Ⓣ Tightening torque:
Catalytic converter bolts
3.2 to 4.3 kg-m
(23 to 31 ft-lb)



EC706

Fig. EC-32 Removing Catalytic Converter

INSPECTION

Preliminary Inspection

Visually check condition of all component parts including hoses, tubes, and wires, replace if necessary.

Catalytic converter

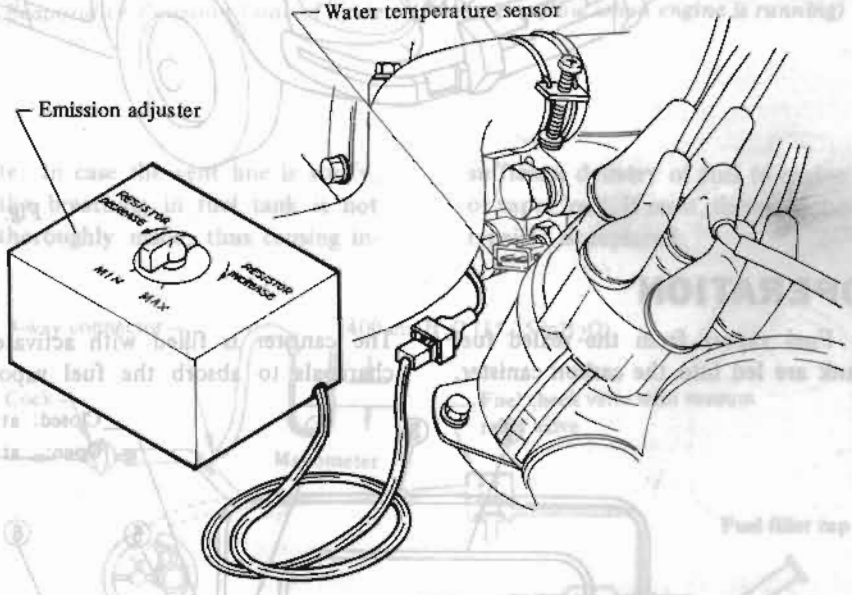
Whether catalytic converter is normal or not can be checked by observing variation in CO percentage. The checking procedure is as follows:

Note:

a. Apply parking brake and place wheel chocks.

b. Shift lever is in Neutral (For manual transmission) and "N" or "P" position (For automatic transmission).

1. Visually check catalytic converter for damage or cracks.
2. Start engine and warm up engine until water temperature indicator points to the middle of gauge.
3. After engine has warmed up, run engine at 2,000 rpm for a few minutes under no load until catalytic converter reaches operating temperature.
4. Stop engine and turn ignition switch to "OFF" position.
5. Remove connector of water temperature sensor.
6. Connect Emission adjuster to harness connector of water temperature sensor. See Fig. EC-33.
7. Insert CO meter probe through exhaust tube end until a minimum insertion length of 500 mm (19.69 in) is reached.
8. Run engine at 2,000 rpm and adjust CO percentage to 3 percent with emission adjuster.
9. Remove injector connector from number six cylinder.
10. Keep engine running at 2,000 rpm with no load.
11. If CO percentage is less than 1 percent, catalytic converter is functioning properly. (If CO percentage is more than 1 percent, catalytic converter must be replaced.)
12. Stop engine and turn ignition switch to "OFF" position.
13. Locate water temperature sensor connector and injector connector in place.



EC707

Fig. EC-33 Connecting Emission Adjuster

EVAPORATIVE EMISSION CONTROL SYSTEM

DESCRIPTION

The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

This system is made up of the following:

1. Fuel tank sealing filler cap.
2. Fuel check valve with vacuum relief valve.
3. Vapor vent line
4. Carbon canister
5. Vacuum signal line
6. Canister purge line

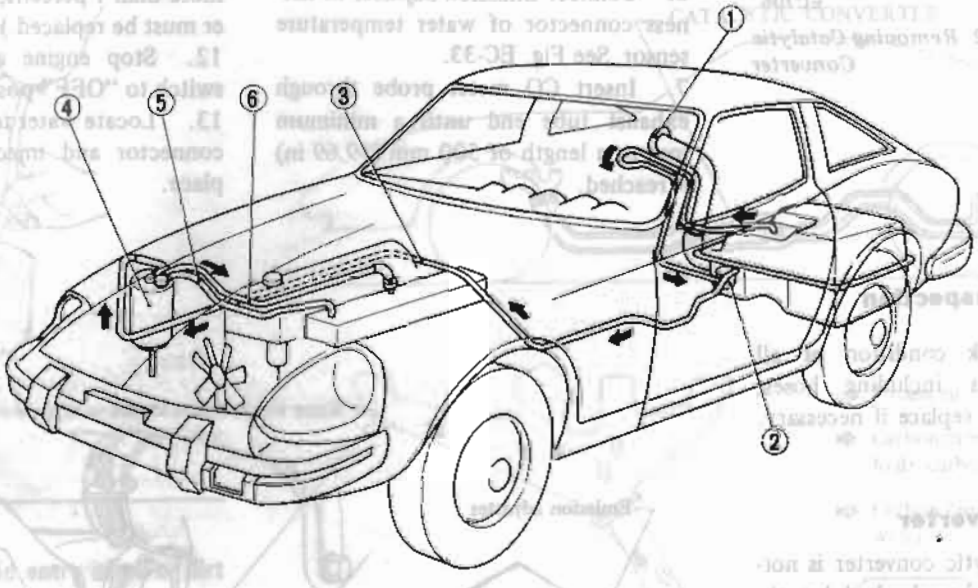
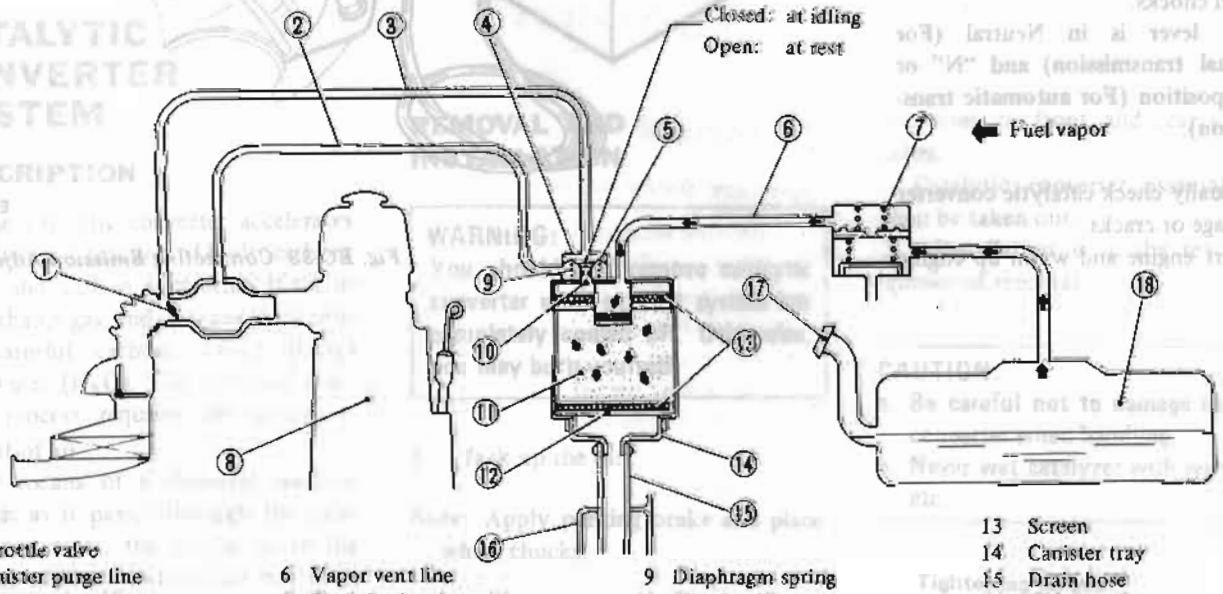


Fig. EC-34 Evaporative Emission Control System

OPERATION

Fuel vapors from the sealed fuel tank are led into the carbon canister. The canister is filled with activated charcoals to absorb the fuel vapors when the engine is at rest or at idling.



1 Throttle valve
2 Canister purge line
3 Vacuum signal line
4 Purge control valve
5 Diaphragm
6 Vapor vent line
7 Fuel check valve with vacuum relief valve
8 Engine
9 Diaphragm spring
10 Fixed orifice
11 Activated carbon
12 Filter
13 Screen
14 Canister tray
15 Drain hose
16 Side member
17 Fuel filler cap
18 Fuel tank

Fig. EC-35 Evaporative Emission Control System (Fuel vapor flow when engine is at rest or at idling)

As the throttle valve opens and car speed increases, vacuum pressure in the vacuum signal line forces the purge control valve to open, and admits an orifice to intake manifold and fuel vapor is then drawn into the intake manifold through the canister purge line.

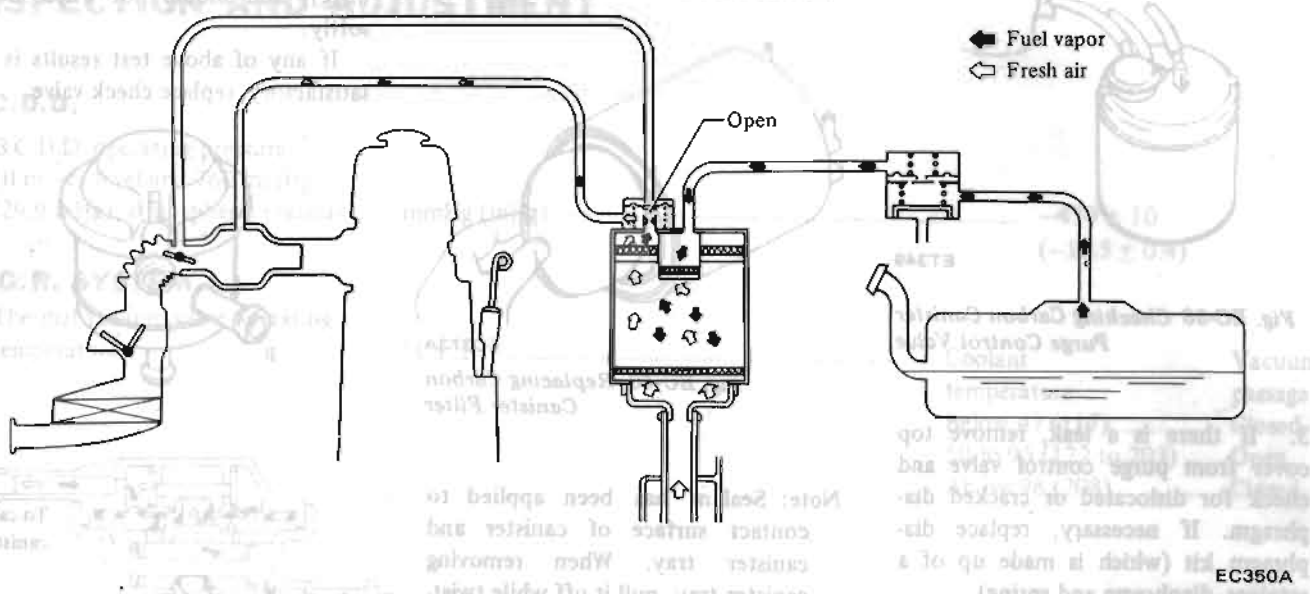


Fig. EC-36 Evaporative Emission Control System (Fuel vapor flow when engine is running)

INSPECTION

VAPOR VENT LINES

1. Check all hoses and fuel tank filler cap.
2. Disconnect vapor vent line connecting carbon canister to check valve.
3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 400 mmH_2O. (15.75 inH_2O).
5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation in height should remain with 25 mmH_2O (0.98 inH_2O).
8. When filler cap does not close completely, the height should drop to zero in a short time.
9. If the height does not drop to zero in a short time when filler cap is removed, it is the cause of a stuffy hose.

Note: In case the vent line is stuffy, the breathing in fuel tank is not thoroughly made, thus causing insufficient delivery of fuel to engine or vapor lock. If must, therefore, be repaired or replaced.

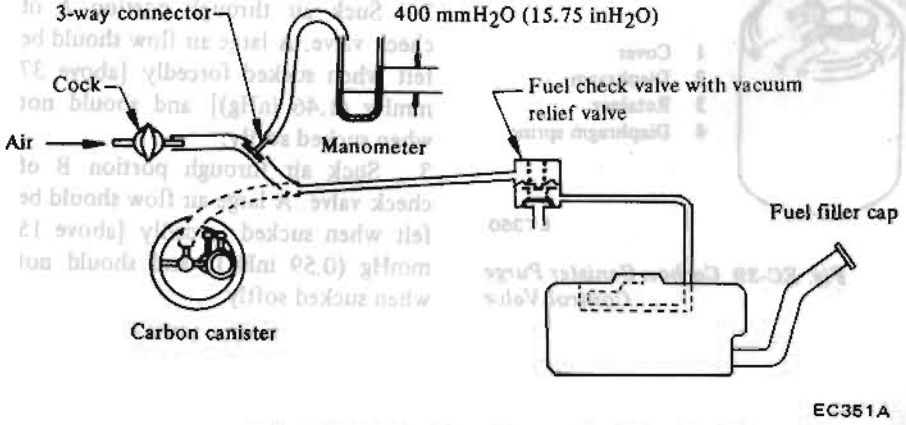


Fig. EC-37 Checking Evaporative Emission Control System

CARBON CANISTER PURGE CONTROL VALVE

Check for fuel vapor leakage, in the distributor vacuum line, at diaphragm of carbon canister purge control valve.

To check for leakage, proceed as follows:

1. Disconnect rubber hose, in the line, between T-connector and carbon canister at T-connector.
2. Inhale air into the opening of rubber hose running to vacuum hole in carbon canister and ensure that there is no leak.

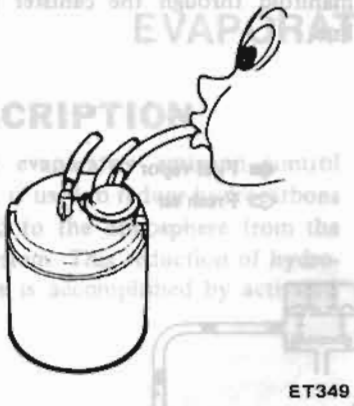


Fig. EC-38 Checking Carbon Canister Purge Control Valve

3. If there is a leak, remove top cover from purge control valve and check for dislocated or cracked diaphragm. If necessary, replace diaphragm kit (which is made up of a retainer, diaphragm and spring).

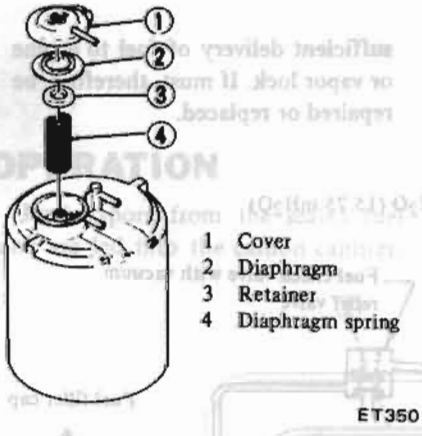


Fig. EC-39 Carbon Canister Purge Control Valve

CARBON CANISTER FILTER

Check for a contaminated filter.

Remove canister tray and remove filter at the bottom of canister.

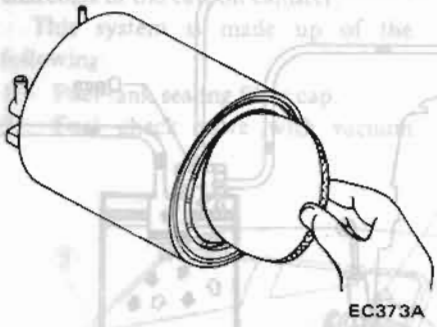


Fig. EC-40 Replacing Carbon Canister Filter

Note: Sealant has been applied to contact surface of canister and canister tray. When removing canister tray, pull it off while twisting.

When reinstalling canister tray, apply sealant to contact surface of canister and canister tray.

FUEL CHECK VALVE WITH VACUUM RELIEF VALVE

1. Remove check valve from car.
2. Suck air through portion A of check valve. A large air flow should be felt when sucked forcedly [above 37 mmHg (1.46 inHg)] and should not when sucked softly.
3. Suck air through portion B of check valve. A large air flow should be felt when sucked forcedly [above 15 mmHg (0.59 inHg)] and should not when sucked softly.
4. Suck air through portion B while closing portion A with finger. A large air flow should be felt when sucked forcedly [above 35 mmHg (1.38 inHg)] and should not when sucked softly.

If any of above test results is not satisfactory, replace check valve.

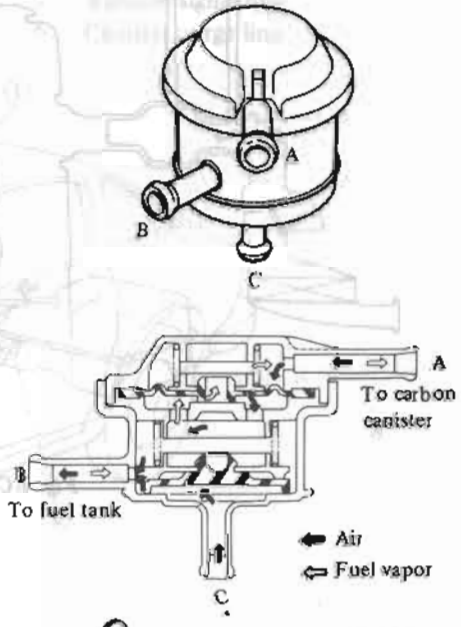


Fig. EC-41 Fuel Check Valve with Vacuum Relief Valve

SERVICE DATA AND SPECIFICATIONS

INSPECTION AND ADJUSTMENT

B.C.D.D.

B.C.D.D. operating pressure [0 m, sea level and 760 mmHg (29.9 inHg), atmospheric pressure]	mmHg (inHg)	−470 ± 10 (−18.5 ± 0.4)

E.G.R. SYSTEM

Thermal vacuum valve operating temperature	°C (°F)	Coolant temperature	Vacuum passage
		Below 47 (117)	Closed
		50 to 95 (122 to 203)	Open
		Above 98 (208)	Closed

TIGHTENING TORQUE

B.C.D.D.	kg-cm (in-lb)	20 to 40 (17 to 35)
B.C.D.D. vacuum control solenoid	kg-cm (in-lb)	180 to 350 (156 to 304)
E.G.R. thermal vacuum valve	kg-m (ft-lb)	Less than 2.2 (16)
Catalytic converter bolt	kg-m (ft-lb)	3.2 to 4.3 (23 to 31)