SERVICE MANUAL

DATSUN 240Z
MODEL S30 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EC

EMISSION CONTROL DEVICE

EC

EMISSION CONTROL DEVICE

GENERAL DESCRIPTION

There are three types of emissions to be controlled. The control systems are;

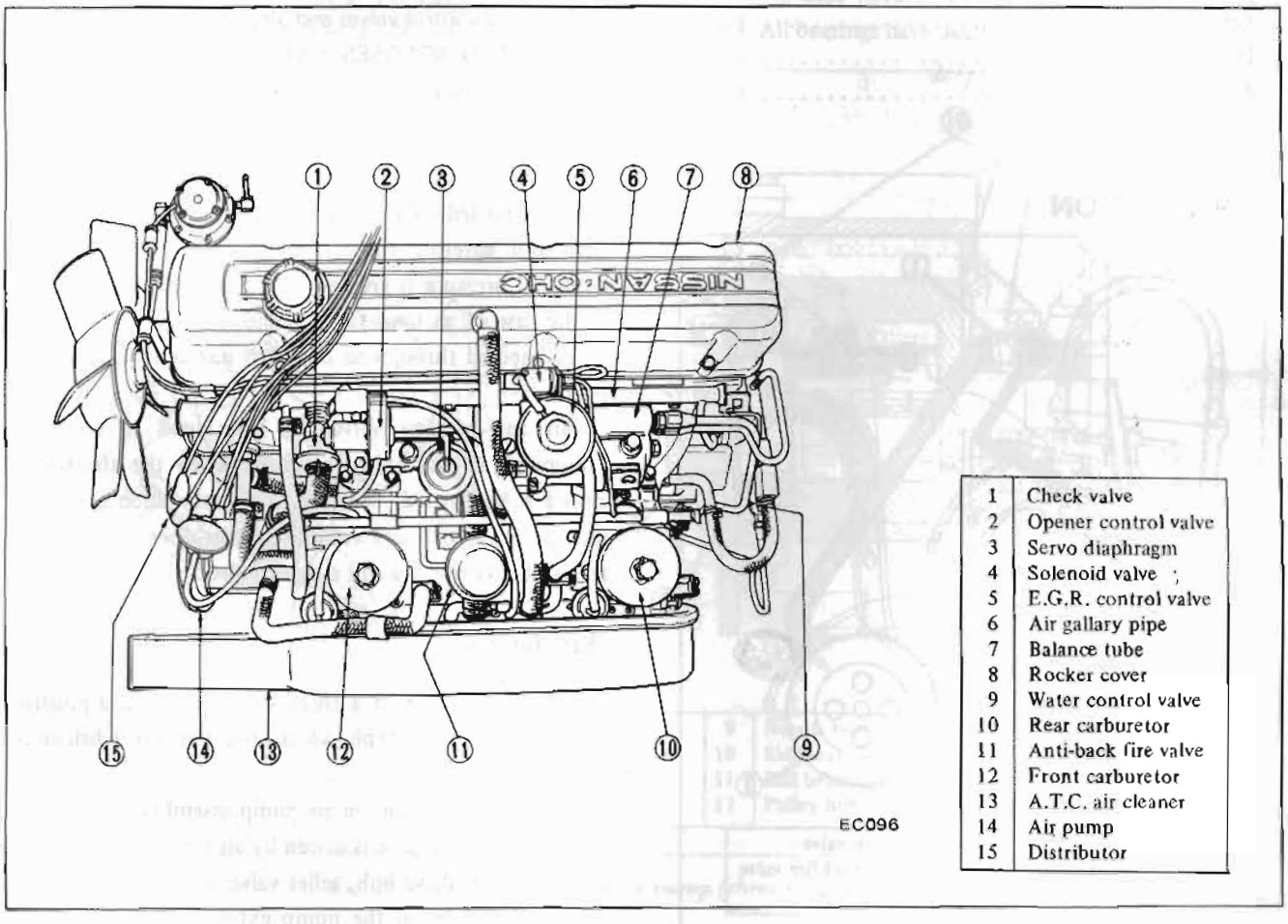
1. Closed type crankcase emission control system.
2. Exhaust emission control system.

   Air injection system (A.I.S.)

   Exhaust gas recirculation system (E.G.R.)

3. Evaporative emission control system.

Periodic inspection and required servicing of these systems should be carried out at the recommended intervals to reduce harmful exhaust gas emissions to a minimum.



1	Check valve
2	Opener control valve
3	Servo diaphragm
4	Solenoid valve
5	E.G.R. control valve
6	Air gallary pipe
7	Balance tube
8	Rocker cover
9	Water control valve
10	Rear carburetor
11	Anti-back fire valve
12	Front carburetor
13	A.T.C. air cleaner
14	Air pump
15	Distributor

Fig. EC-1 Emission control system

AIR INJECTION SYSTEM

CONTENTS

DESCRIPTION

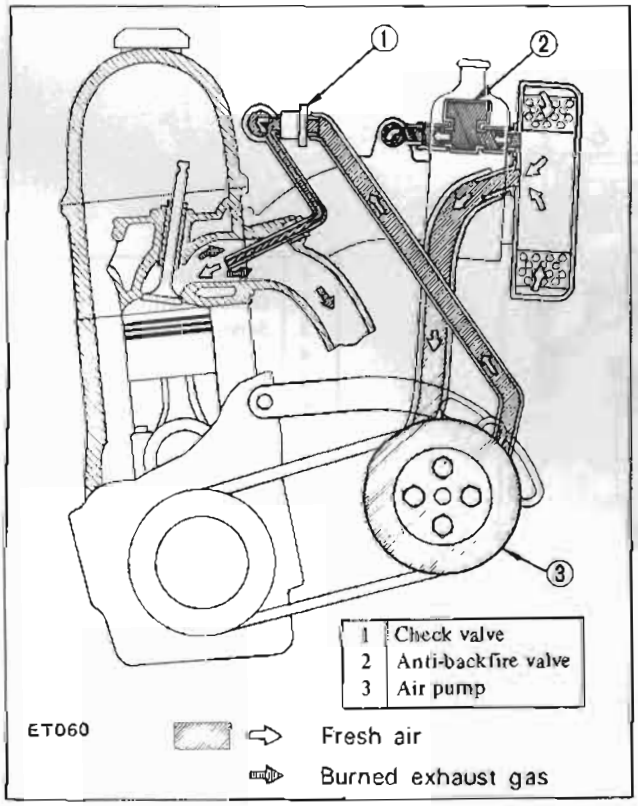


Fig. EC-2 Air injection system

The air injection pump receives clean air through a hose, connected to a fitting attached to the carburetor air cleaner.

This rotary vane type pump has been designed to draw air in and compress it to produce maximum air flow with quiet operation. A fresh air line from the air injection pump is routed to a check valve, which prevents exhaust gas from entering the air pump in the event exhaust manifold pressure is greater than air injection pressure, or in the case of an inoperative pump. The compressed fresh air is injected through an injection nozzle to the exhaust ports.

An anti-backfire valve has been used to eliminate "popping" in the exhaust system when the throttle is closed at high speed "coasting." Controls which have been incorporated to assure reliable system operation include an anti-backfire valve and a check valve.

Air pump

The air pump is of a three-vane type. It is a positive displacement vane type which requires no lubricating service.

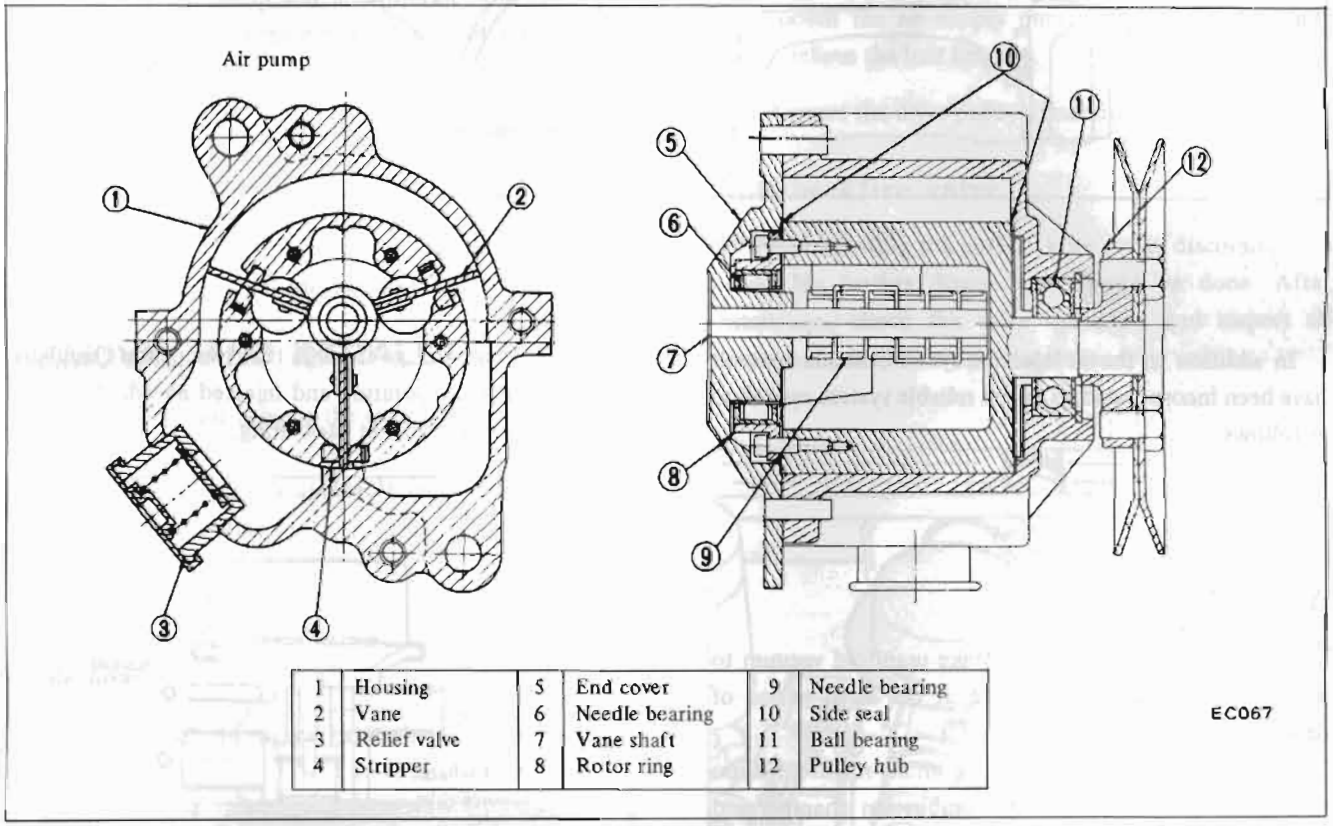
The die-cast aluminum air pump assembly attached to the front of the engine is driven by an air pump drive belt. A rotor shaft, drive hub, relief valve and inlet and outlet tubes are visible on the pump exterior. A rotor, vanes, carbon shoes, and shoe springs make up the rotating unit of the pump. The rotor located in the center of the pump is belt-driven. The vanes rotate freely around the off-center pivot pin, and follow the circular-shaped pump bore. In the three-vane type, the vanes from three chambers in the housing. Each vane completes a pumping cycle in every revolution of the rotor. Air is drawn into the inlet cavity through a tube connected to the air cleaner. Air is sealed between the vanes and moved into a smaller cavity (the compression area).

After compression, the vanes pass the outlet cavity. The vanes subsequently pass the stripper, a section of the housing that separates the outlet and inlet cavities. Continuing the cycle, the vanes again enter the inlet cavity to repeat its pumping cycle. The relief valve, located in the outlet cavity, consists of a preloaded spring, seat, and pressure-setting plug. Its function is to relieve the outlet air flow when the pressure exceeds a preset value.

Carbon shoes support the vanes from slots in the rotor. The shoes are designed to permit sliding of the vanes and to seal the rotor interior from the air cavities. Leaf springs which are behind the follower-side of the shoes compensate for shoe wear and vane operating sound. The rotor is further sealed by flexible carbon seals which are attached to each end. The plates also seal off the housing and end cover to confine the air to the pump cavities.

The rotor is a steel ring and bolted to the rotor end. This ring prevents the rotor from spreading at high speed, and also positions and holds the rear bearing and the carbon seal.

The front and rear bearings which support the rotor are of two types. The front bearing uses ball bearings and the rear bearing uses needle bearings. The vane uses needle bearings. All bearings have been greased.



1	Housing	5	End cover	9	Needle bearing
2	Vane	6	Needle bearing	10	Side seal
3	Relief valve	7	Vane shaft	11	Ball bearing
4	Stripper	8	Rotor ring	12	Pulley hub

Fig. EC-3 Sectional view of air pump (three valve type)

Air injection into each exhaust port

Fresh air from the air pump is injected into the individual exhaust ports of the cylinder head located near the exhaust valve.

Pressurized air is transmitted through hoses and air distribution manifold.

A schematic of the exhaust port is shown in Figure EC-4.

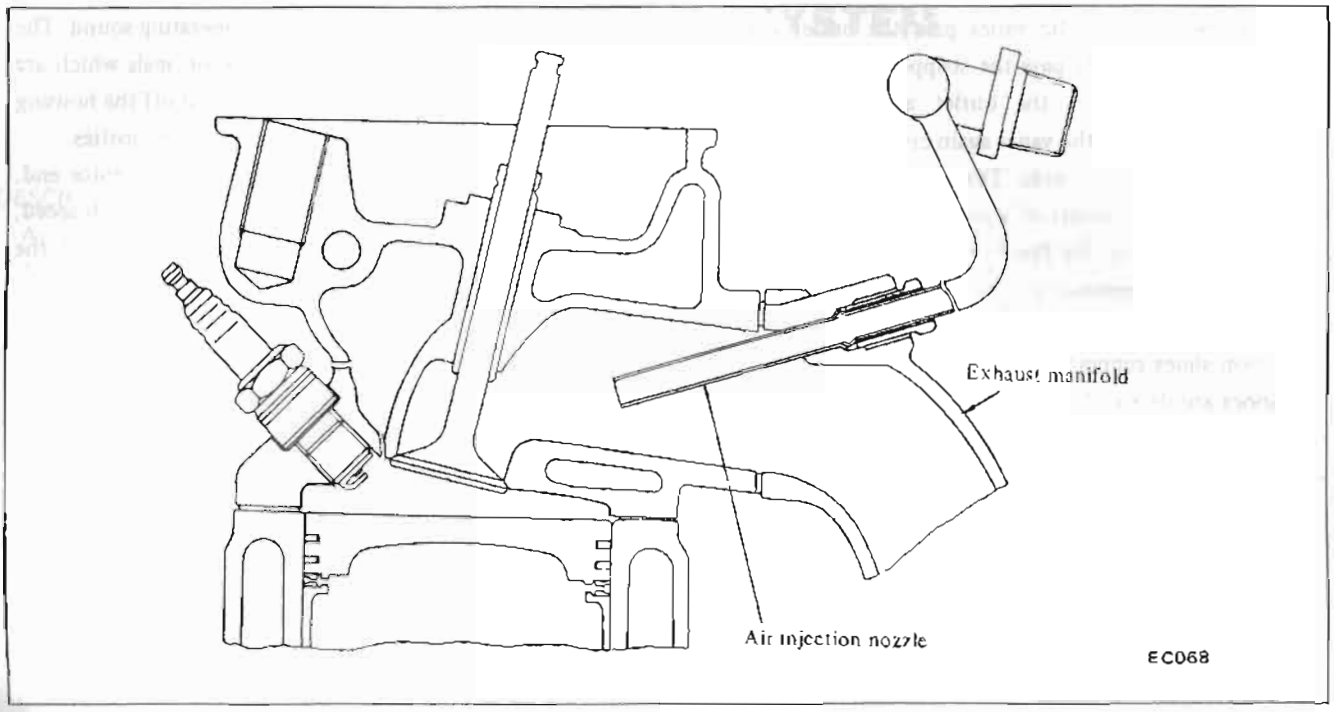


Fig. EC-4 Air injection into exhaust port

In addition to the air injection system, certain controls have been incorporated to assure reliable system operation as follows.

Anti-backfire valve

This valve is controlled by intake manifold vacuum to prevent exhaust system backfire at the intial period of deceleration.

At that time, the mixture in the intake manifold is too rich to ignite and burn in the combustion chamber and burns easily in the exhaust system with injected air in the exhaust manifold.

The anti-backfire valve is used to provide a supply of air into the intake manifold, thereby making the air-fuel mixture leaner to prevent backfire.

A schematic drawing of the anti-backfire valve is shown in Figure EC-5.

The inlet of the anti-backfire valve is connected to the air cleaner and the outlet to the balance tube.

The correct function of this valve reduces hydrocarbon emission during deceleration.

If the valve does not work properly, the extremely rich air-fuel mixture will go through the combustion chambers and meet high-temperature and injected air which ignites the mixture and results in back-firing.

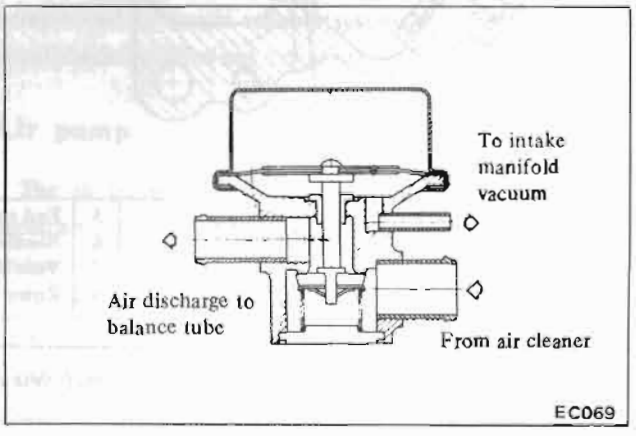


Fig. EC-5 Anti-backfire valve

Check valve

A check valve is located in the air pump discharge lines. The valve prevents the backflow of exhaust gas. Backflow of exhaust gas occurs in one of the following cases.

1. When the air pump drive belt fails.
2. When the spring of relief valve fails.

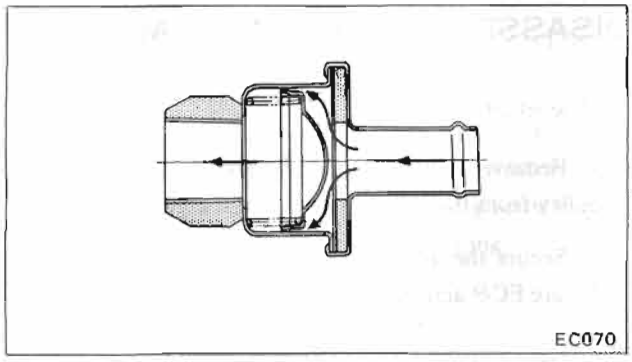


Fig. EC-6 Check valve

Air pump relief valve

The air pump relief valve is mounted in the discharge cavity of the air pump and accomplishes the following functions without affecting effectiveness of the exhaust emission control system.

1. Minimizes exhaust gas temperature rise.

2. Minimizes horsepower losses resulting from air injection into the exhaust system.

3. Protects the pump from excessive back pressure.

REMOVAL AND INSTALLATION

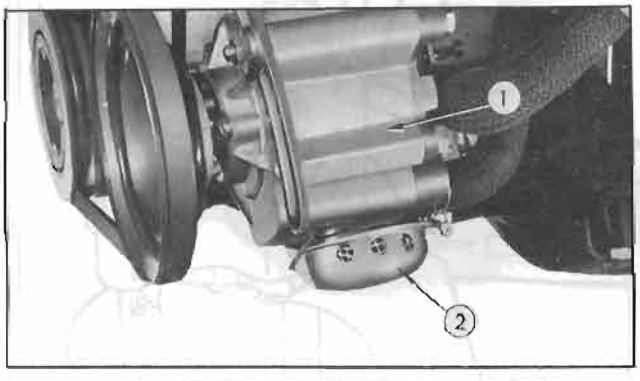
Primarily, do not remove the exhaust emission control system.

When the removal is unavoidable, however, thoroughly inspect before removing.

Air pump

Removal

1. Disconnect the hoses from the air pump housing cover.



1	Air pump	2	Relief valve

Fig. EC-7 Air pump

2. Remove the bolt securing the air pump to the belt adjusting bar (or adjusting bracket).

3. Remove the bolt securing the air pump to the mounting bracket and remove the air pump drive belt.

4. Dismount the air pump assembly from the vehicle.

Installation

Reinstall the air pump in reverse sequence of removal. Adjust the belt tension so that it has about 12.7 mm (0.5 in) of slack under thumb pressure.

Drive pulley

1. Loosen the air supply pump adjusting bar nut and bolt to relieve the belt tension.

2. Remove the drive pulley attaching bolts.

Anti-backfire valve

When removing the anti-backfire valve, disconnect the hoses. No further disassembly should be done. After installation, check the valve operation and inspect all hoses and hose connections for leaks.

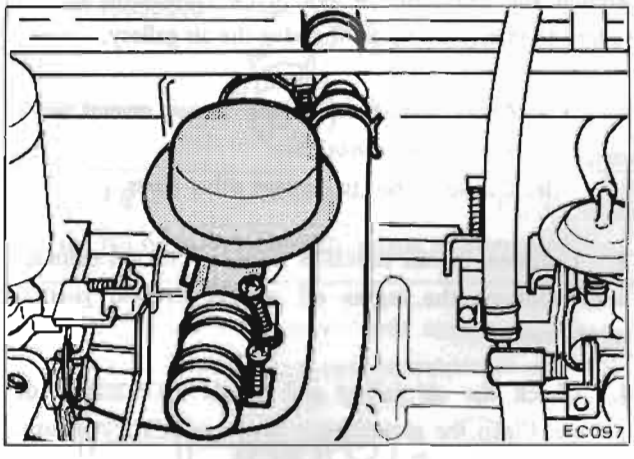


Fig. EC-8 Anti-backfire valve

Check valve

1. Disconnect the air supply hose.

2. Remove the check valve from the air gallery pipe holding the flange of air gallery pipe with a wrench.

Notes: a. Be careful not to damage the air gallery pipe.
b. No further disassembly should be done.

3. Reinstall the check valve in reverse sequence of removal.

Note: Tightening torque is 9.0 to 10.5 kg-m (65 to 76 ft-lb).

4. After installation, check the valve, hoses and hose connections for air leakage.

Air gallery pipe and injection nozzles

It is very difficult to remove the air gallery from the exhaust manifold without bending the pipe, which could result in fractures or leakage. Therefore, the removal of the air gallery pipe and injection nozzles should be done only when they are damaged.

1. Lubricate around the connecting portion of the air injection nozzle and air gallery with engine oil.

2. Hold the air injection nozzle hexagon head with a wrench and unfasten the flare screw connecting the air gallery to injection nozzle. Remove the air gallery.

Notes: a. Apply engine oil to the screws several times during the above work.
b. Be careful not to damage other parts.

3. Unfasten the air injection nozzle from the cylinder head applying the engine oil to the screwed portion several times.

4. Check the air gallery and nozzle for fractures or leakage. Clean the air injection nozzle with a wire brush.

5. At the time of installation, assemble the nozzle seat on the injection nozzle and tighten the air injection nozzle to a torque of 5.7 to 7.6 kg-m (41 to 55 ft-lb).

6. Hold the air injection nozzle .exagon head with a wrench and tighten the flange screw of the air gallery to a torque of 5.0 to 5.9 kg-m (36 to 43 ft-lb).

7. Check the cylinder head, air injection nozzle and air gallery for leaks with the engine running.

DISASSEMBLY AND ASSEMBLY

Disassembly

1. Remove four pulley drive bolts and remove the pulley from the hub.

2. Secure the air pump drive hub in a vise, as shown in Figure EC-9 and remove four end cover bolts.

Note: Never clamp on the aluminum housing.

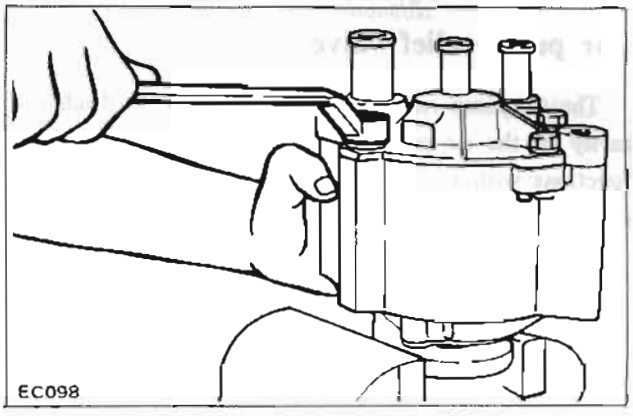


Fig. EC-9 Removing cover

3. Remove the end cover by carefully tapping the surrounding of the large dowel pin with a plastic mallet and lifting up straight.

4. Put match marks "O" on the rotor ring and side of rotor to ensure correct reassembly, and remove six screws that retain the rotor ring to the rotor, using a hexagonal wrench (special tool ST19810000).

Note: Generally, match marks are indicated on both rotor ring and rotor by the manufacturer.

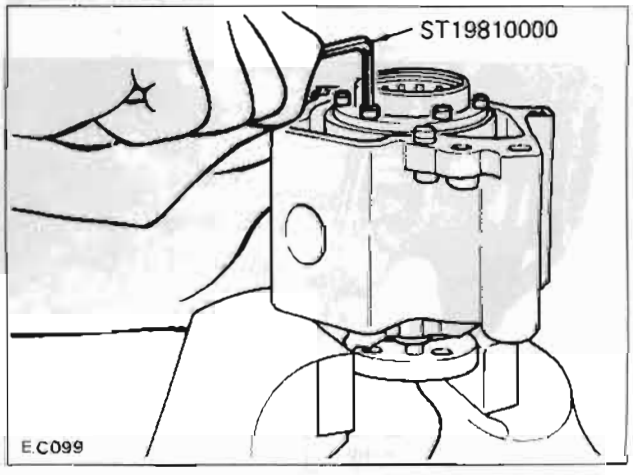


Fig. EC-10 Removing rotor ring

5. Remove the rotor ring and side carbon seal from the rotor.

6. In the three-vane type, if it is necessary to replace the rear bearing, it may be pressed out of rotor ring on a press using a support fro disassembling rotor ring and attachment for pushing out needle bearing.

Special tool

Support for disassembling rotor ring:
STECP ST19820000

Attachment for pushing out needle bearing:
STECP ST19830000

Note: Support rotor ring carefully to avoid distortion.

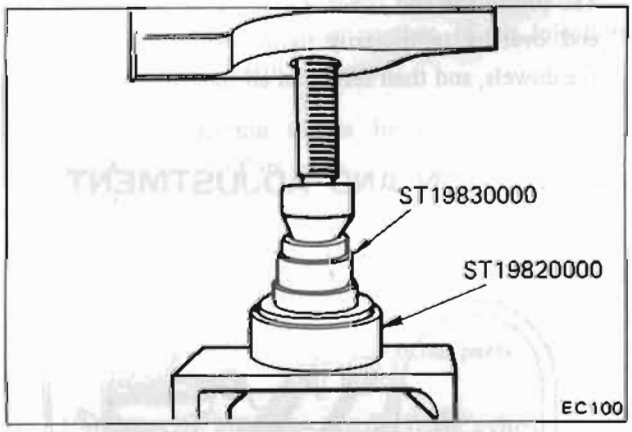


Fig. EC-11 Removing rear rotor bearing

7. Remove vanes from the rotor.

8. Remove three sets of carbon shoes and three shoe springs (two sets of carbon shoes and two shoe springs for the two-vane) using a pair of tweezers or needle nose pliers.

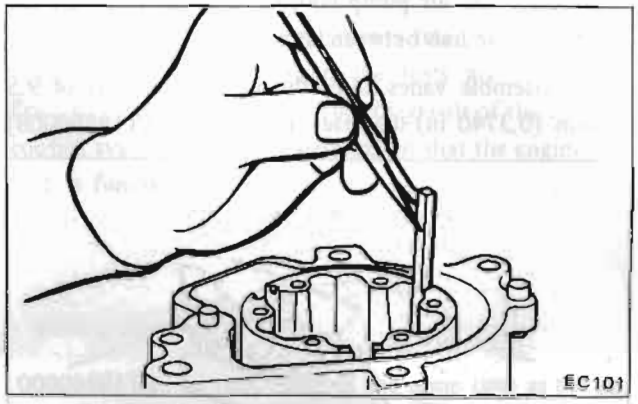


Fig. EC-12 Removing carbon shoe

9. In the three-vane type air pump, if it is necessary to replace the relief valve, use bridge for pulling out relief valve (special tool ST19850000) and standard puller.

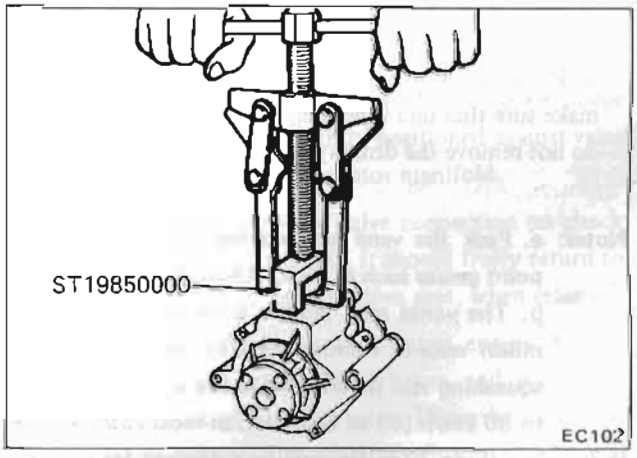


Fig. EC-13 Removing relief valve air pump

10. No further disassembly should be attempted.

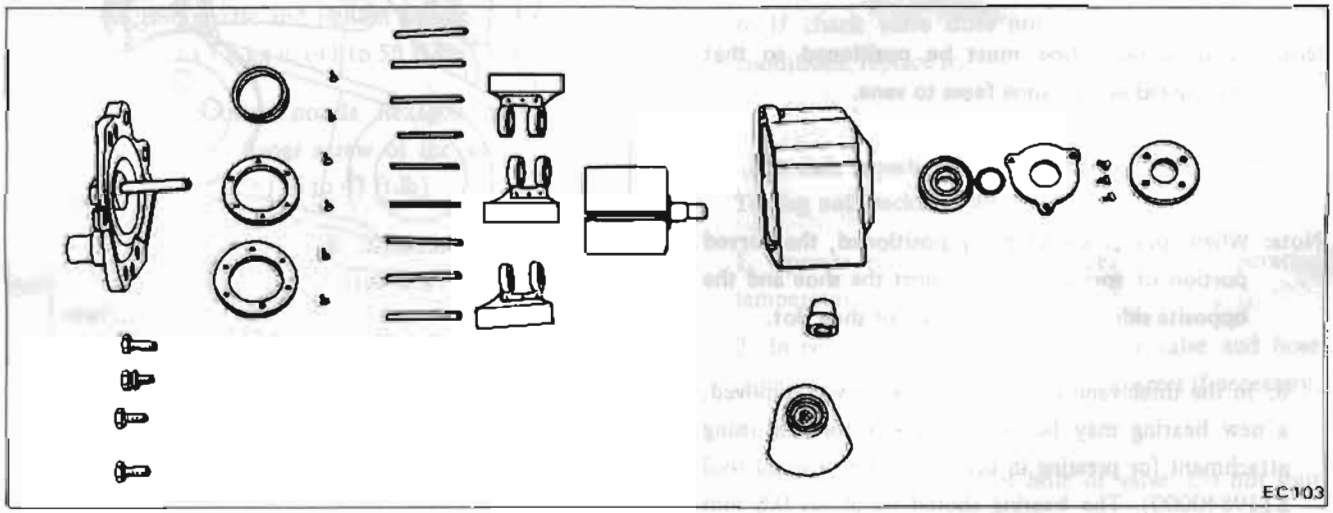


Fig. EC-14 Components of three-valve type air pump

Assembly of air pump

1. Place the air pump housing in a vise, clamping the pump drive hub between jaws.

2. Assemble vanes correctly on dummy shaft of 9.5 mm (0.3740 in) diameter. (special tool ST19860000)

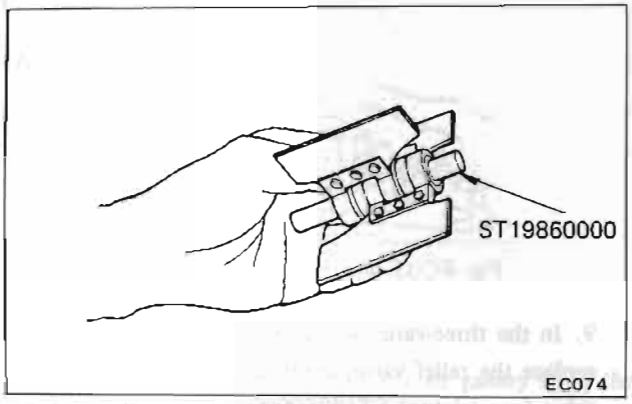


Fig. EC-15 Vane assembly

3. Place vanes into rotor. With the three-vane type make sure that one vane is against housing stripper, and do not remove the dummy shaft at this time.

Notes: a. Pack the vane hub bearing with high melting point grease such as ESSO ANDOK 260.
b. The vanes may require 6 to 16 km (5 to 10 miles) wear-in running time. In the event a slight squeaking still persists, drive the vehicle about 64 to 80 km/h (40 to 80 MPH). In most cases 6 to 16 km (5 to 10 miles) will be sufficient for wear-in.

4. Insert one carbon shoe on each side of every vane.

Note: Each carbon shoe must be positioned so that chambered end of shoe faces to vane.

5. Insert the shoe spring into each deeper shoe slot.

Note: When springs are properly positioned, the curved portion of spring will be against the shoe and the opposite side will be against wall of shoe slot.

6. In the three-vane type, if rear bearing was removed, a new bearing may be pressed into rotor ring using attachment for pressing in needle bearing (special tool ST19840000). The bearing should be about 0.8 mm (0.0315 in) below rotor ring surface.

Note: Press only on lettered end of the bearing surface and support rotor ring to prevent its distortion.

7. Position new side seal on rotor ring so that holes line up.

8. Position the rotor ring so that the marks "O" on rotor ring and side of rotor line up.

9. Apply thread locking material to rotor ring retaining screws and tighten them to 0.3 to 0.5 kg-m (2.2 to 3.6 ft-lb).

10. Remove the dummy shaft from vanes and insert vane shaft into vane bearings. Do not force cover on since it will distort vane bearings and/or vane bearing alignment.

11. Install the end cover. First, set the position of the end over by temporarily tightening bolts adjacent to the dowels, and then retighten all the four bolts.

INSPECTION AND ADJUSTMENT

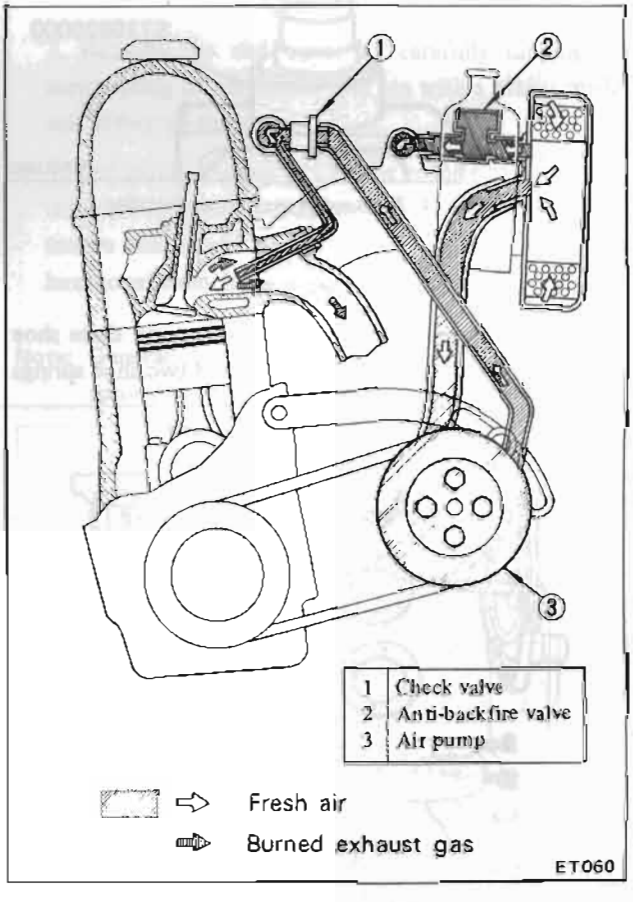


Fig. EC-16 Air injection system

Checking secondary air injection system hoses

Check air system hoses and fittings for loose connections, cracks or deterioration. Retighten or replace if necessary.

Checking air system manifold

Check air gallery pipe and injection nozzles for loose connections and cracks. Retighten or replace if necessary.

It is very difficult to remove air gallery from exhaust manifold without bending the pipe, which could result in fractures or leakage. Therefore, the removal of air gallery pipe and injection nozzles should be done only when they are damaged.

1. Lubricate the connecting portion of air injection nozzle and air gallery with engine oil.

2. Hold air injection nozzle hexagon head with a wrench and unfasten flare screw connecting the air gallery to injection nozzle. Remove air gallery.

Notes: a. Apply engine oil to the screws several times during the above work.
b. Be careful not to damage other parts.

3. Unfasten air injection nozzle from cylinder head applying engine oil to the screwed portion several times.

4. **Check air gallery and nozzle** for fractures or leakage. Clean **air injection nozzle with** a wire brush.

5. **At the time of installation**, assemble the nozzle seat on the injection nozzle and tighten air injection nozzle to a torque of 5.7 to 7.6 kg-m (41 to 55 ft-lb).

6. Hold air injection nozzle hexagon head with a wrench and tighten flange screw of the air gallery to a torque of 5 to 5.9 kg-m (36 to 43 ft-lb).

7. Check cylinder head, air injection nozzle and air gallery for leaks with the engine running.

Checking control valves and air pump

The following procedures are recommended for checking and/or ascertaining that the various components of the exhaust emission control system are operating properly.

The engine and all components must be at normal operating temperatures when the tests are performed. Prior to performing any extensive diagnosis of the exhaust control system, it must be determined that the engine as a unit is functioning properly.

Testing check valve

This test can be performed at the same time as the air pump test.

1. Operate engine until it reaches normal operating temperature.

2. Inspect all hoses and hose connectors for obvious leaks, and correct, if necessary, before checking the valve operation.

3. Visually inspect the position of valve plate inside valve body. It should be lightly positioned against valve seat away from the air distributor manifold.

4. Insert a probe into the valve connection on check valve and depress valve plate. It should freely return to the original position, against valve seat, when released.

5. Leave hose disconnected and start engine. Slowly increase engine speed to 1,500 rpm and watch for exhaust gas leakage at check valve. There should not be any exhaust leakage. The valve may flutter or vibrate at idle speed, but this is normal due to exhaust pulsations in manifold.

6. If check valve does not meet the recommended conditions, replace it.

Testing anti-backfire valve

1. Operate engine until it reaches manual operating temperature.

2. Inspect inlet and outlet hoses of valve and hose connections for obvious leaks, and correct if necessary.

3. Remove air cleaner cover.

4. Place a finger on inlet hole of valve. Do not shut inlet hole off.

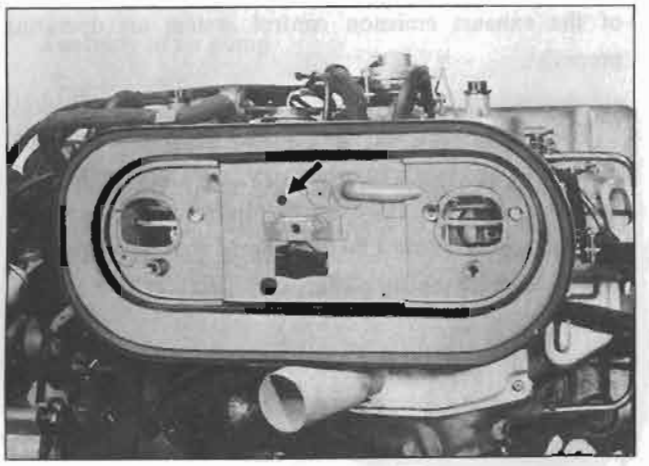


Fig. EC-17 Air inlet hole of anti-backfire valve

5. Raise engine speed to 3,000 to 3,500 rpm from idle speed gradually by the manual operation of throttle valve linkage.

6. Release the linkage suddenly. If air flow through valve inlet is felt at this time, valve is correct for operation.

7. If air flow through valve inlet is not felt, or constant gulping air is observed, replace valve with a new one.

Notes: a. Anti-backfire valve cannot be disassembled.
b. Anti-backfire valve must be installed with its diaphragm chamber upward.

Testing air pump

1. Operate engine until it reaches normal operating temperature.

2. Inspect all hoses, hose connections and air gallery for leaks, and correct, if necessary, before checking the injection pump.

3. Check air injection pump belt tension and adjust to specifications fi necessary.

4. Disconnect air supply hose at check valve.

5. Insert open pipe end of Air Pump Test Gauge Adapter ST19870000 in air supply hose. Clamp hose securely to adapter to prevent it from blowing out. Position adapter and test gauge so that the air blast emitted through drilled pipe plug will be harmlessly dissipated.

6. Install a tachometer on the engine. With engine speed at 1,500 rpm, observe the pressure produced at the gauge.
Air pressure should be 16 mmHg (0.63 inHg) or more.

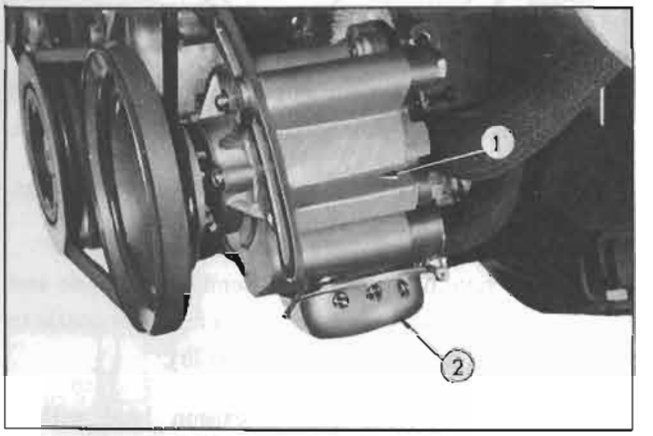
7. If air pressure does not meet the above pressure, proceed as follows:

(1) Repeat 2 and 3 above.

(2) Check air cleaner filter.

(3) With engine speed at 1,500 rpm close the hole of test gauge by finger. If a leaking sound is heard or leaking air is felt by finger at relief valve, relief valve is malfunctioning. Relief valve should be replaced or repaired.

(4) If air injection pump does not meet the minimum requirement of the pressure test, it should be replaced.



1	Air pump
2	Relief valve

Fig. EC-18 Air pump relief valve

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Excessive belt noise	Loose belt. Seized pump.	Tighten belt. Replace pump.
Excessive pump noise	Leak in hose. Loose hose. Pump mounting fasteners loose. Pump failure.	Locate source of leak and correct. Reassemble and replace or tighten hose clamp Retorque all mounting screws. Replace pump.
No air supply	Loose belt. Leak in hose. Leak at hose fitting. Check valve failure. Pump failure.	Tighten belt. Locate source of leak and correct. Reassemble and replace or tighten hose clamps. Replace valve. Replace pump.

EXHAUST GAS RECIRCULATION SYSTEM

CONTENTS

DESCRIPTION

The Exhaust Gas Recirculation System has exhaust gases recirculate into the combustion chamber and reduces the combustion temperature so as to reduce NOx produced in combustion process.

This system is composed of a balance tube, control valve, solenoid valve, thermo switch, E.G.R. tube, vacuum hose and water hose. Refer to Figure EC-19.

The exhaust gases are sent out from the exhaust manifold through the E.G.R. tube into the rear end of the balance tube and to the E.G.R. control valve.

The exhaust gases which have passed through the E.G.R. control valve go through the center of the balance tube to be distributed to the front and rear intake manifolds.

The exhaust gases passing through the balance tube are cooled by the engine coolant. Refer to Figure EC-19.

Operation of control valve

This valve is operated by negative pressure produced in the rear carburetor, and opens or closes the exhaust gas passage. At idling, the control valve does not operate and the exhaust gases do not recirculate. When the throttle valve of the carburetor opens to increase the negative pressure in the intake manifold this valve starts to operate and the exhaust gases recirculate.

However, when the throttle valve is fully opened and the negative pressure is decreased below −50.8 mmHg (−2.0 inHg), this valve will close again.

Operation of solenoid valve

To improve the starting ability and driveability of the engine in the cold condition, the thermo switch detects the temperature inside the passenger compartment and operates the solenoid valve fitted to the control valve.

The solenoid valve intermittently shuts off the vacuum passage which leads from the carburetor to the control valve.

When the temperature inside the passenger compartment is below $-1^{\circ}C$ ($30^{\circ}F$), the current flows through the solenoid and so operates the solenoid valve as to shut off the vacuum passage. This prevents the exhaust gases from recirculating.

When the temperature inside the car room is over $11^{\circ}C$ ($52^{\circ}F$), the current does not flow through the solenoid, and the vacuum passage is left open.

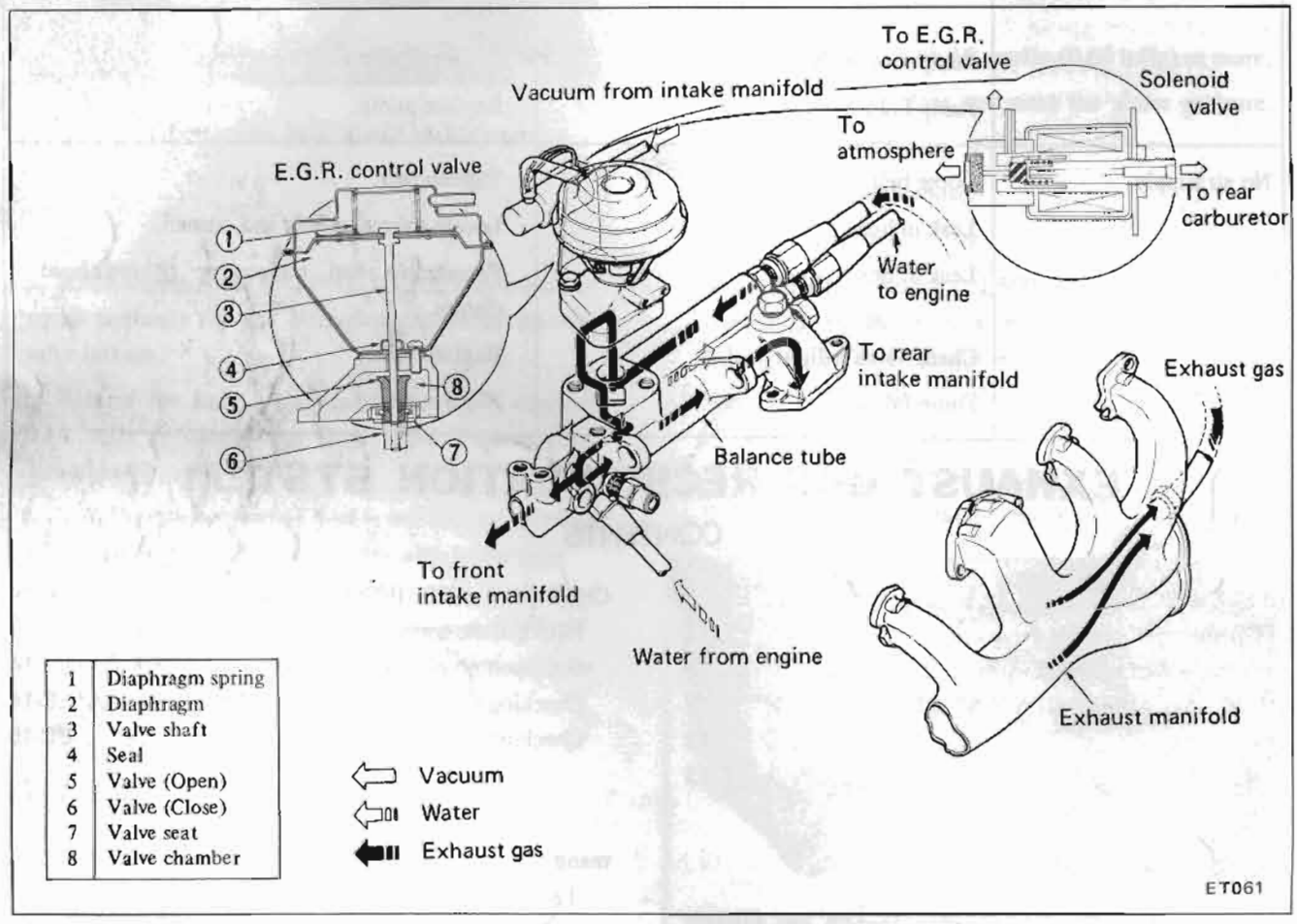


Fig. EC-19 Exhaust gas recirculation system (E.G.R.)

REMOVAL AND INSTALLATION

E.G.R. Control valve is installed on upper side of Balance tube for easy servicing. Removing and installation can be done in a few steps.

However, this E.G.R. system requires a regular maintenance, especially cleaning.

Remove and install E.G.R. system as follows:

Removal

STEP 1. Removal of control valve

1. Disconnect vacuum tube-E.G.R. solenoid valve to carburetor-at solenoid valve side.

Note: Do not unscrew at carburetor side unnecessarily, as a special olive nut is used there (See page EC-20).

Fig. EC-20 Disconnecting vacuum tube

2. Remove E.G.R. Control valve by unscrewing two bolts. Be careful not to damage gasket.

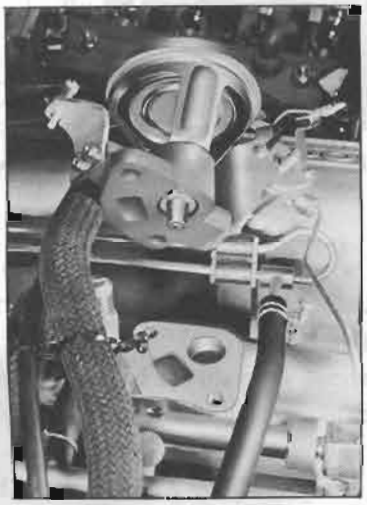


Fig. EC-21 Removing E.G.R. control valve

STEP 2. Removal of balance tube

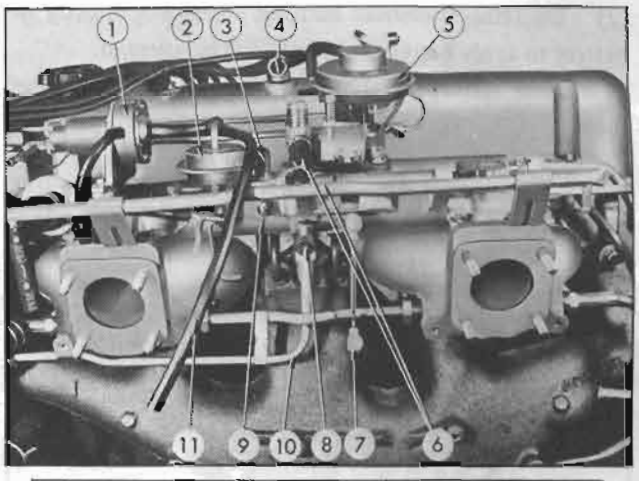
3. Disconnect fuel hose to rear carburetor.

4. Disconnect hose-air cleaner to rocker cover.

5. Disconnect hose-anti-backfire valve to balance tube.

6. Disconnect hose-crankcase to balance tube.

7. Disconnect vacuum lines-balance tube to air cleaner, intake manifold to throttle opener control valve and throttle opener control valve to air cleaner.



1	Throttle opener control valve	6	Air-fuel mixture by-pass tube
2	Servo-diaphragm	7	To throttle shaft
3	To anti-backfire valve	8	To crankcase
4	To air cleaner	9	To air cleaner
5	E.G.R. control valve	10	Water pipe
		11	To air cleaner

Fig. EC-22 Disconnecting rubber hoses and vacuum lines

8. Remove throttle opener control valve and servo diaphragm.

9. Disconnect water tube-balance tube to thermostat housing.

10. Remove exhaust gas return tube.

11. Remove water outlet rubber hose.

12. Disconnect throttle shaft linkage at the joint.

13. Remove balance tube by taking off four bolts.

14. Disconnect hose-idle speed adjusting screw block to air-fuel mixture by-pass tube.

Installation

Install E.G.R. balance tube and control valve in the reverse sequence of the removal.

CHECKING AND INSPECTION

With E.G.R. control valve equipped on engine

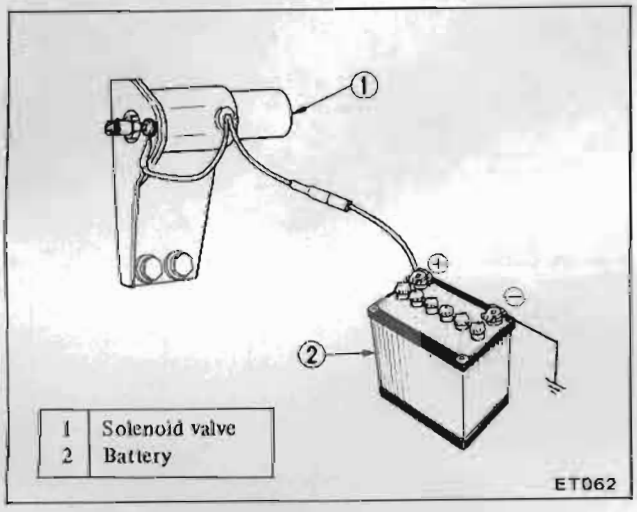
When it becomes necessary to inspect E.G.R. control valve, first check to be sure that solenoid is properly wired. [Room temperature is above 13°C (55°F)].

(1) Increase engine speed from idling to 3,000 to3,500 rpm, noting if plate of E.G.R. control valve diaphragm and valve shaft move upward as speed is increased.

(2) Disconnect solenoid harness; connect it directly to battery to apply battery voltage (12V) to solenoid.

Without disturbing above setup, again race engine as above.

E.G.R. control valve should be kept stationary.



1	Solenoid valve
2	Battery

Fig. EC-23 Inspecting solenoid valve ratio

(3) With engine running at idle, push up by hand on bottom dish of E.G.R. control valve diaphragm. It is normal if engine loses stability.

Checking E.G.R. control valve parts

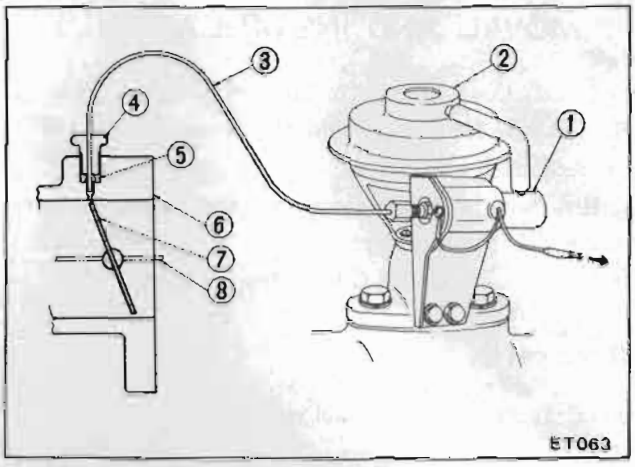
To inspect parts, it is necessary first to remove E.G.R. control valve from engine.

(1) Remove E.G.R. vacuum tube and check to be certain that olive end of tube on carburetor side is not deformed excessively.

If it is, the probability is that E.G.R. control valve is not operated properly due to leakage of vacuum signals.

To remedy this trouble, replace tube with a new one.

Correct tightening torque of tube nut is 0.4 kg-m (3.0 ft-lb).



1	Solenoid valve	5	Olive nut
2	E.G.R. control valve	6	Rear carburetor
3	E.G.R. vacuum tube	7	Throttle valve
4	Attaching nut	8	Throttle valve (Fully opened)

Fig. EC-24 Checking olive nut

(2) Remove E.G.R. control valve from balance tube.

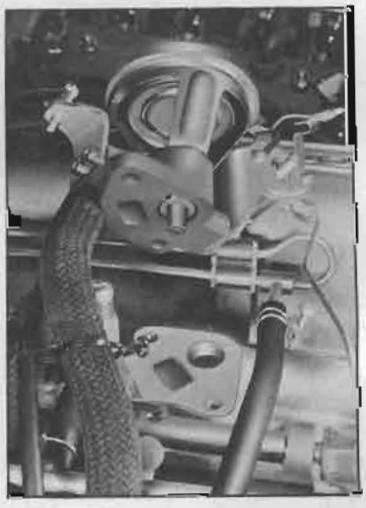


Fig. EC-25 Removing E.G.R. control valve

(3) Apply a vacuum of −152 mmHg (−6.0 inHg) to E.G.R. control valve. It is correct if valve is moved in to Full-up position.

E.G.R. control valve should be kept up in the above position for more than 30 seconds when vacuum is stopped.

This test can be made by pinching rubber hose that is running between solenoid and diaphragm chamber.

(4) Visually inspect E.G.R. control valve for sign of damage, wrinkle or otherwise deformation.

(5) Check E.G.R. control valve and valve seat for accumulation of dust. If necessary, clean with a soft wire brush.

(6) Check valve seat for tightness.

If E.G.R. control valve shows any abnormalities during steps (3) thru (4) above, it is necessary to replace valve as a unit since it cannot be disassembled.

Checking balance tube

Whenever E.G.R. control valve is removed, it is also necessary to remove idle speed adjusting screw block to check for clogging of E.G.R. passage of balance tube.

(1) Visually inspect E.G.R. valve mounting flange and idle speed adjusting screw block to be sure that screw holes and exhaust gas passages are free of dust and other accumulations.

(2) Remove balance tube from intake manifold and clean it if found heavily fouled with dust and dirt or extremely clogged.

SERVICE JOURNAL OR BULLETIN REFERENCE

DATE	JOURNAL or BULLETIN No.	PAGE No.	SUBJECT