SERVICE MANUAL

DATSUN 240Z
MODEL S30 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION ET

ET

ENGINE TUNE-UP

BASIC MECHANICAL SYSTEM

CONTENTS

ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCE

Valve clearance adjustment is impossible when the engine is in operation:

1. Loosen pivot locking nut and turn pivot screw until the specified clearance is obtained while cold.

After adjustment, tighten pivot nut securely with special tool, and recheck the clearance.

2. Warm up engine for at least several minutes and stop it. Measure valve clearance while hot. If out of specifications, adjust as necessary.

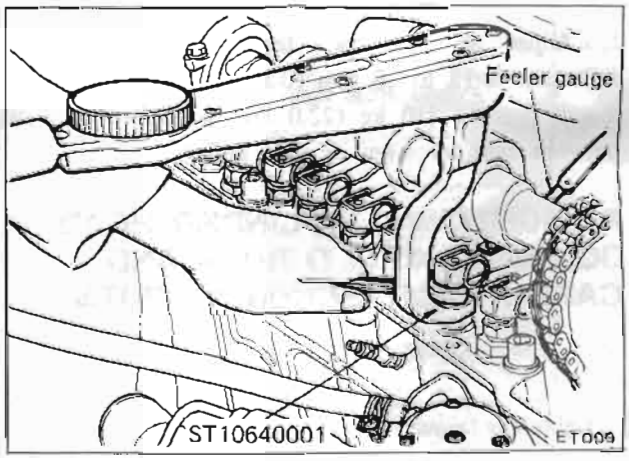


Fig. ET-1 Adjusting valve clearance

Valve clearance

Unit: mm (in)

Cold	Intake	0.20 (0.008)
	Exhaust	0.25 (0.010)
Warm	Intake	0.25 (0.010)
	Exhaust	0.30 (0.012)

CHECKING AND ADJUSTING DRIVE BELTS

Fan belt

1. Check for cracks or damage. Replace if necessary.

2. Adjust fan belt tension. It is correct if deflection is 8 to 12 mm (0.315 to 0.472 in) when thumb pressure [10 kg (22.0 lb)] is applied midway between fan pulley and alternator pulley.

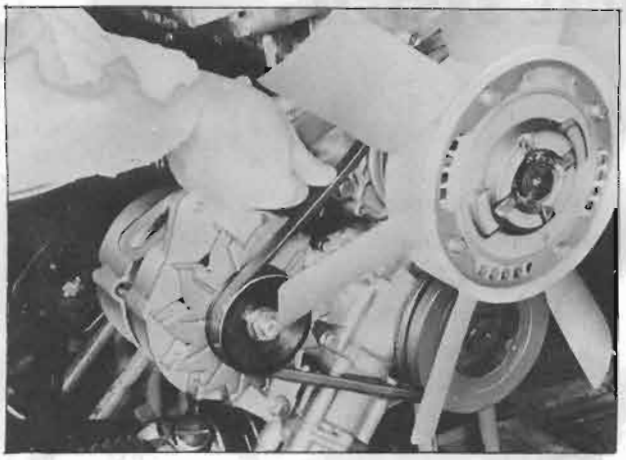


Fig. ET-2 Fan belt tension

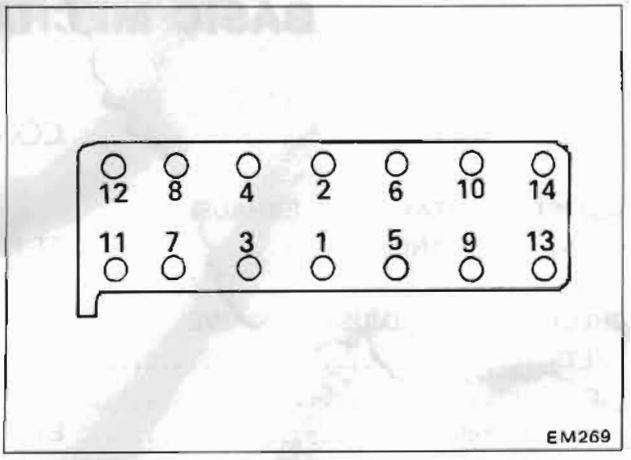


Fig. ET-3 Tightening sequence of cylinder head

Air pump belt

1. Check air pump belt for cracks or damage. Replace if necessary.

2. Adjust air pump belt tension. It is correct if deflection is 15 to 20 mm (0.591 to 0.787 in) when thumb pressure [10 kg (22.0 lb)] is applied midway between crank pulley and air pump pulley.

RETIGHTENING CYLINDER HEAD BOLTS, MANIFOLD NUTS AND CARBURETOR SECURING NUTS

Tightening torque:

Cylinder head bolts

1st turn
4.0 kg-m (28.9 ft-lb)
2nd turn
6.0 kg-m (43.4 ft-lb)
3rd turn
6.5 to 8.5 kg-m (47.0 to 61.5 ft-lb)

Manifold nuts

1.2 to 1.6 kg-m (8.7 to 11.6 ft-lb)

Carburetor nuts

0.5 to 1.0 kg-m (3.6 to 7.2 ft-lb)

CHANGING ENGINE OIL

1. Check if oil is diluted with water or gasoline. Drain and refill oil if necessary.

Notes: a. A milky oil indicates the presence of cooling water. Isolate the cause and take corrective measure.
b. An oil with extremely low viscosity indicates dilution with gasoline.

2. Check oil level. If below the specified level, raise it up to the H level.

Engine oil capacity (including oil filter)

Maximum (H level)

5.0 ℓ (5¼ U.S. qts., 4⅜ Imper. qts.)

Minimum (L level)

4.0 ℓ (4¼ U.S. qts., 3½ Imper. qts.)

REPLACING OIL FILTER

Oil filter is of a cartridge type. Oil filter can be removed using Oil Filter Wrench ST19320000.

1. Check for oil leaks past gasketed flange. If any leakage is found, retighten just enough to stop leakage. If retightening is no longer effective, replace filter as an assembly.

2. When installing oil filter, tighten by hand.

Note: Do not overtighten oil filter, lest leakage should occur.

CHANGING ENGINE COOLANT

Nissan long life coolant (L.L.C.)

The L.L.C. is an ethylene glycol base product containing chemical inhibitors to protect the cooling system from rusting and corrosion. The L.L.C. does not contain any glycerine, ethyl or alcohol. It will not evaporate or boil away and can be used with either high or low temperature thermostats. It flows freely, transfers heat efficiently, and will not clog the passages in the cooling system. The L.L.C. must not be mixed with other product. This coolant can be used throughout the seasons of the year.

Whenever any coolant is changed, the cooling system must be flushed and refilled with a new coolant. Check the level.

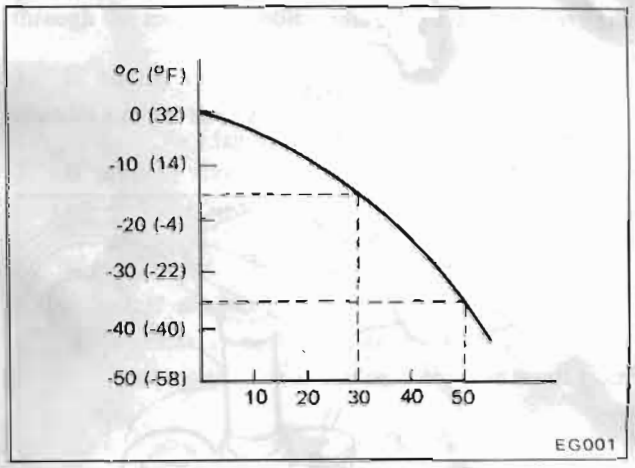


Fig. ET-4 Protection concentration

Percent concentration	Boiling point		Freeze protection
	Sea level	0.9 kg/cm^2 cooling system pressure	
30%	106°C (221°F)	124°C (255°F)	−15°C (5°F)
50%	109°C (228°F)	127°C (261°F)	−35°C (−31°F)

CHECKING COOLING SYSTEM HOSES AND CONNECTIONS

Check hoses and fittings for loose connections and deterioration. Retighten or replace if necessary.

Inspection of radiator cap

Apply reference pressure [0.9 kg/cm^2 (12.8 psi)] to radiator cap by means of a cap tester to see if it is satisfactory. Replace cap assembly if necessary.

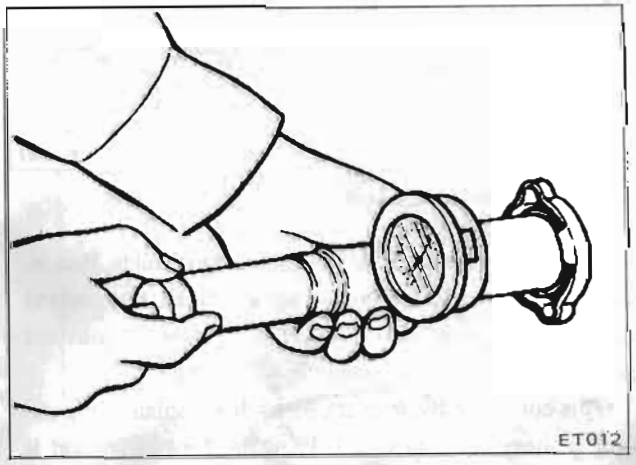


Fig. ET-5 Testing radiator cap

Cooling system pressure test

With radiator cap removed, apply reference pressure [1.6 kg/cm^2 (23 psi)] to the cooling system by means of a tester to defect any leakage.

Water capacity (with heater):

8.0 ℓ (2⅛ U.S. gal., 1¾ Imper. gal.)

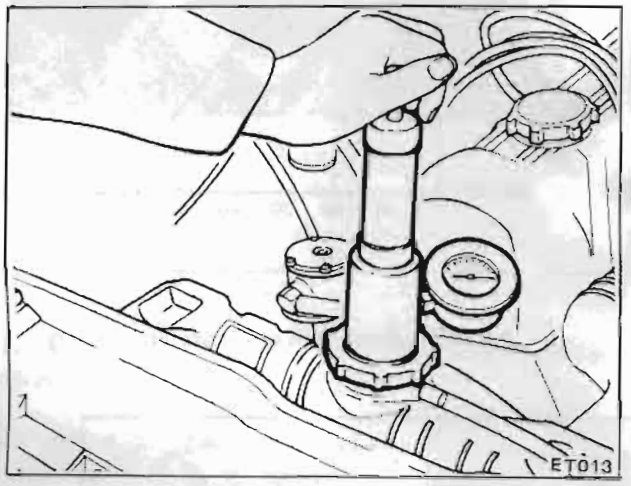


Fig. ET-6 Cooling system pressure test

Checking carburetor water control valve

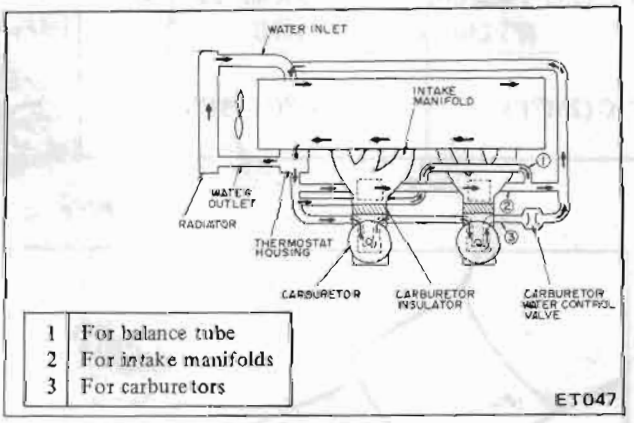


Fig. ET-7 Carburetor water control valve

This device operates in the following manner; that is, the engine is quickly warmed-up and then the coolant through front and rear carburetors is kept in constant temperature at various car speeds.

This control valve is shut down when coolant temperature is above 55°C (131°F). Then the flow of coolant is stopped in the carburetor water line. Check control valve for operation as follows:

1. Immerse valve in hot water of 55°C (131°F) or above for a few minutes and blow in low-pressure air 0.11 to 0.21 kg/cm^2 (1.5 to 3.0 psi) from the carburetor side. Little or no bubbles from the manifold side indicates normality.

2. When immersed in cold water, it is normal that the air passes through valve easily. If operation is improper, replace it with a new valve.

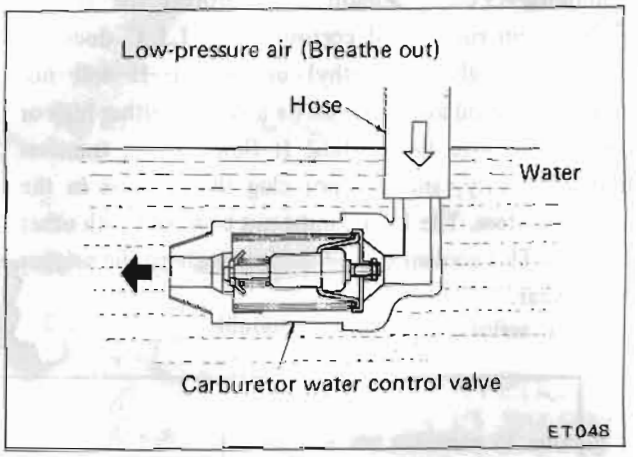


Fig. ET-8 Checking carburetor water control valve

CHECKING SU-CARBURETOR DAMPER OIL LEVEL

Check oil level to make an accurate carburetor operation. Oil level should be maintained into proper range on filler cap indicator. Do not overfill. See Figure ET-15.

CHECKING VACUUM FITTINGS, HOSES, AND CONNECTIONS

Check fittings and hoses for loose connections or any other defects. Retighten loose parts or replace defective parts.

CHECKING ENGINE COMPRESSION

When it becomes necessary to check cylinder compression, it is essential to remove all spark plugs. The purpose of this test is to determine whether there is excessive leakage past piston rings, head gasket, etc. To test, engine should be heated to the operating temperature and throttle and choke valves opened.

Cylinder compression in cylinders should not be less than 80% of the highest reading. Different compression in two or more cylinder usually indicates an improperly seated valve or broken piston ring.

Low compression in cylinders can result from worn piston rings. This trouble may usually be accompanied by excessive fuel consumption.

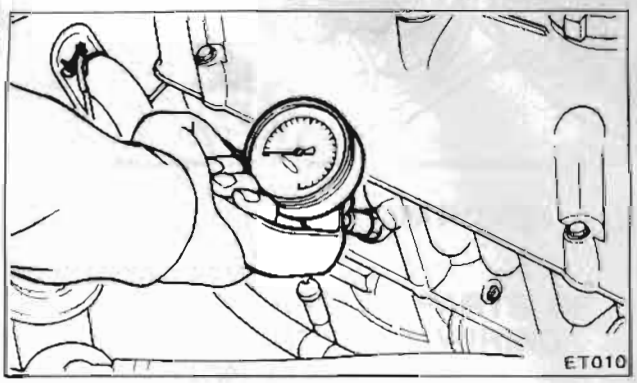


Fig. ET-9 Testing compression pressure

Test result

If cylinder compression in one or more cylinders is low, pour a small quantity of engine oil into cylinders through the spark plug holes and retest compression.

1. If adding oil helps the compression pressure, the chances are that rings are defective.

2. If pressure stays low, the likelihood is that valve is sticking or seating improperly.

3. If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression, this could be leakage past the gasketed surface.

Oil and water in combustion chambers can result from this trouble.

Compression pressure kg/cm^2 (psi)/at rpm

12.0 to 13.0 (171 to 185)/300 to 400

IGNITION AND FUEL SYSTEM

CONTENTS

CHECKING BATTERY

Check electrolyte level in each battery cell.

1. Unscrew each filler cap and inspect fluid level. If the level is low, add distilled water to bring the level up approximately 10 to 20 mm (0.394 to 0.787 in) above the plates. Do not overfill.

2. Measure the specific gravity of battery electrolyte.

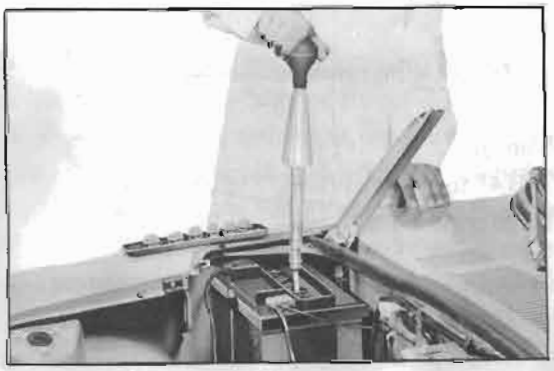


Fig. ET-10 Checking specific gravity of battery electrolyte

	Permissible value	Full charge value [at 20°C (68°F)]
Frigid climates	Over 1.22	1.28
Tropical climates	Over 1.18	1.23
Other climates	Over 1.20	1.26

Clean top of battery and terminals with a solution of baking soda and water. Rinse off and dry with compressed air. Top of battery must be clean to prevent current leakage between terminals and from positive terminal to hold-down clamp.

In addition to current leakage, prolonged accumulation of acid and dirt on top of battery may cause blistering of the material covering connector straps and corrosion of straps. After tightening terminals, coat them with petrolatum (vaseline) to protect them from corrosion.

CHECKING OR REPLACING DISTRIBUTOR BREAKER POINTS, CONDENSER AND SPARK PLUGS

Distributor breaker points

Check the distributor breaker points for abnormal pitting or wear. Replace if necessary. Make sure they are in correct alignment for full contact and that point dwell and gap are correct. Clean and apply distributor grease to the cam and wick.

Note: Do not apply grease excessively.

Point gap

0.45 to 0.55 mm (0.0177 to 0.0217 in)

Dwell angle

35 to 41 degrees (With manual transmission)

33 to 39 degrees (With automatic transmission)

Refer to Page ET-14, dual point distributor.

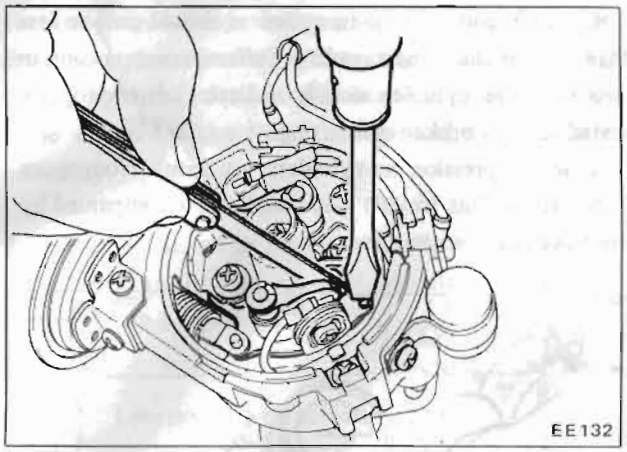


Fig. ET-11 Checking distributor point gap

Condenser

1. Clean outlet of condenser lead wire, and check for loose set screw. Retighten if necessary.

2. Check condenser capacity with a capacity meter. Condenser insulation resistance may be also checked using a tester by adjusting its range to measure large resistance value. When condenser is normal, the tester pointer swings largely and rapidly, and moves gradually back to the infinite side. When the pointer does not stay still or it points zero in resistance, replacement is necessary.

Condenser capacity

Retard side 0.05 μ F

(Micro Farad)

Advance side 0.22 μ F

(Micro Farad)

Condenser insulation resistance

5MΩ (Mega ohms)

Spark plugs

Remove and clean plugs in a sand blast cleaner. Inspect each spark plug. Make sure that they are of the specified heat range. Inspect insulator for cracks or chips. Check both center and ground electrodes. If they are excessively worn, replace with new spark plugs. File center electrode flat. Set the gap to 0.8 to 0.9 mm (0.032 to 0.036 in) using the proper adjusting tool. Tighten plugs to 1.5 to 2.0 kg-m (11.0 to 15.0 ft-lb) torque.

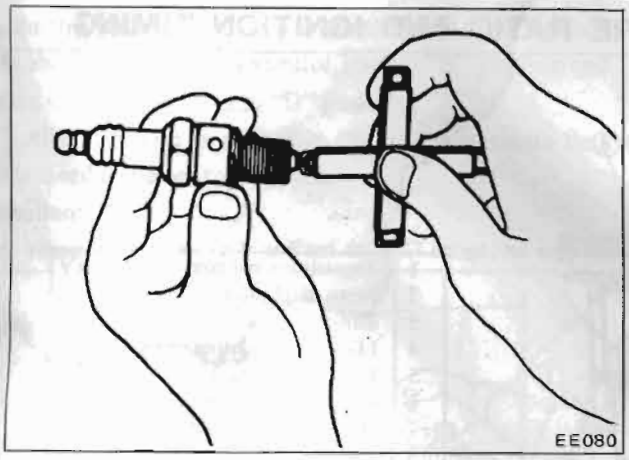


Fig. ET-12 Checking spark plug point gap

CHECKING OPERATING PARTS OF DISTRIBUTOR, IGNITION WIRING AND IGNITION COIL

Distributor

Check the centrifugal mechanical parts for loose connection, sticking of spring, or excessive or local wear.

If found to be in good condition, then check advance characteristics using a distributor tester. For test procedure and reference data, refer to item "Distributor" in Section EE.

If vacuum advance unit fails to operate properly, check the following items and correct as necessary:

1. Check vacuum inlet for leakage at connection. If necessary, retighten or replace with a new one.

2. Check vacuum diaphragm for air leak.
   If leak is found, replace diaphragm with a new one.

3. Inspect breaker plate for smooth operation.
   If plate does not move smoothly, this could be due to sticky steel balls or pivot. Apply grease to steel balls or, if necessary, replace breaker plate as an assembly. Refer to Section EE, Distributor as to vacuum advance characteristics.

High tension cable

Use an ohmmeter to check resistance on high tension cables. Disconnect cables from spark plugs and remove distributor together with high tension cables. Do not remove cables from cap. Connect the ohmmeter between cable terminal on the spark plug side and the corresponding electrode inside cap.

If the resistance is more than 30,000 ohms, remove cable from cap and check the cable resistance only. If resistance is still more than 30,000 ohms, replace cable assembly.

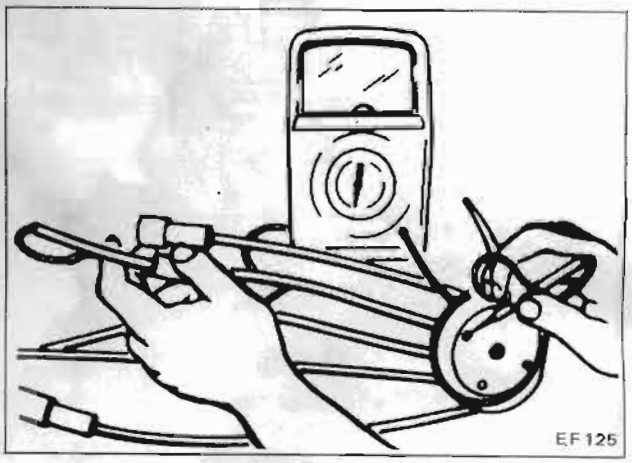


Fig. ET-13 Checking high tension cable

Ignition coil

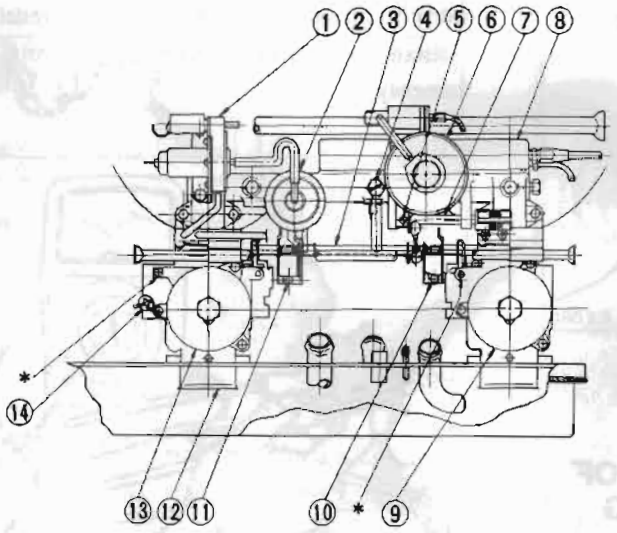
Check ignition coil for appearance, oil leak or sparking performance. Refer to Section EE, Ignition coil.

CHECKING DISTRIBUTOR CAP AND ROTOR

Note: This operation is to be performed while checking distributor points. Inspect distributor cap for cracks and flash over.

External surfaces of all parts of secondary system must be cleaned to reduce possibility of voltage loss. All wires should be removed from distributor cap and coil so that terminals can be inspected and cleaned. Burned or corroded terminals indicate that wires are not fully seated, which causes arcing between end of wire and terminal. When replacing wires in terminal, be sure they are fully seated before pushing rubber nipple down over tower. Check distributor rotor for damage, and distributor cap for cracks.

ADJUSTING ENGINE IDLE RPM, MIXTURE RATIO AND IGNITION TIMING



1	Throttle opener control valve ass'y
2	Servo diaphragm
3	Throttle shaft
4	Idle speed adjusting screw
5	Fast idle setting screw
6	E.G.R. control valve
7	Auxiliary throttle shaft
8	Balance tube
9	Rear carburetor
10	Balance adjusting screw
11	Throttle opener adjusting screw
12	Air horn
13	Front carburetor
14	Idle mixture adjusting screw (Idle limiter cap)

Fig. ET-14 Carburetor linkage

Notes: a. Idle limiter cap equipped with idle mixture adjusting screw must not be removed.
b. As marked * screws and fast idle adjusting screw are properly adjusted at factory, do not change this adjustment.

1. Warm up engine by driving car more than 20 minutes at a speed about 48 km (30 mph).

2. Remove air cleaner cover and oil damper cap, raise suction piston with a suitable soft bar. Make sure that suction piston can be raised smoothly.

3. Check damper oil level and add oil (MS #20 or 10W-30) if insufficient.

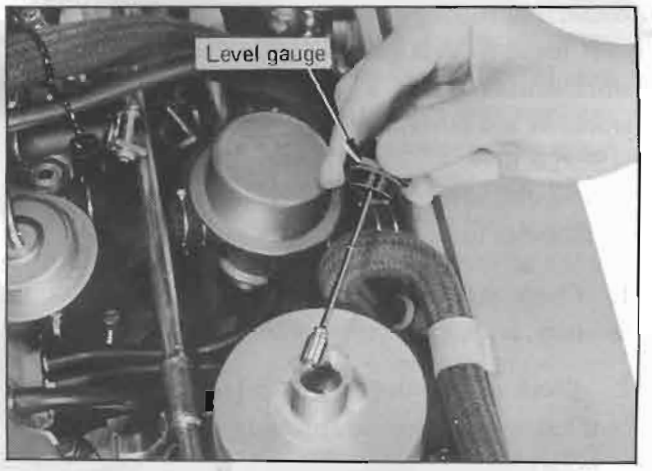


Fig. ET-15 Checking damper oil level

4. Loosen balance adjusting screw and throttle opener adjusting screw completely.

Notes: a. Make sure that front carburetor is separated from rear one in operation.
b. When the engine idling speed is being adjusted, do not touch fast idle setting screw, because this screw has already been adjusted at the factory.

5. Connect engine tachometer and timing light in proper position.

6. Adjust idling speed to 750 rpm by turning idle speed

adjusting screw. On automatic transmission model, adjust to about 750 rpm with selector lever in "N" position and then shift selector lever in "D" position.

After the lever is shifted in "D" position, insure that idle speed decreases to 600 rpm.

Caution:

a. When selector lever is shifted to "D" range, be sure to apply parking brake and to block both front and rear wheels with chocks.

b. Hold brake pedal while stepping down on accelerator pedal. Otherwise car will rush out dangerously.

c. After engine idling has been made for one or two minutes or more, race engine at least two times.

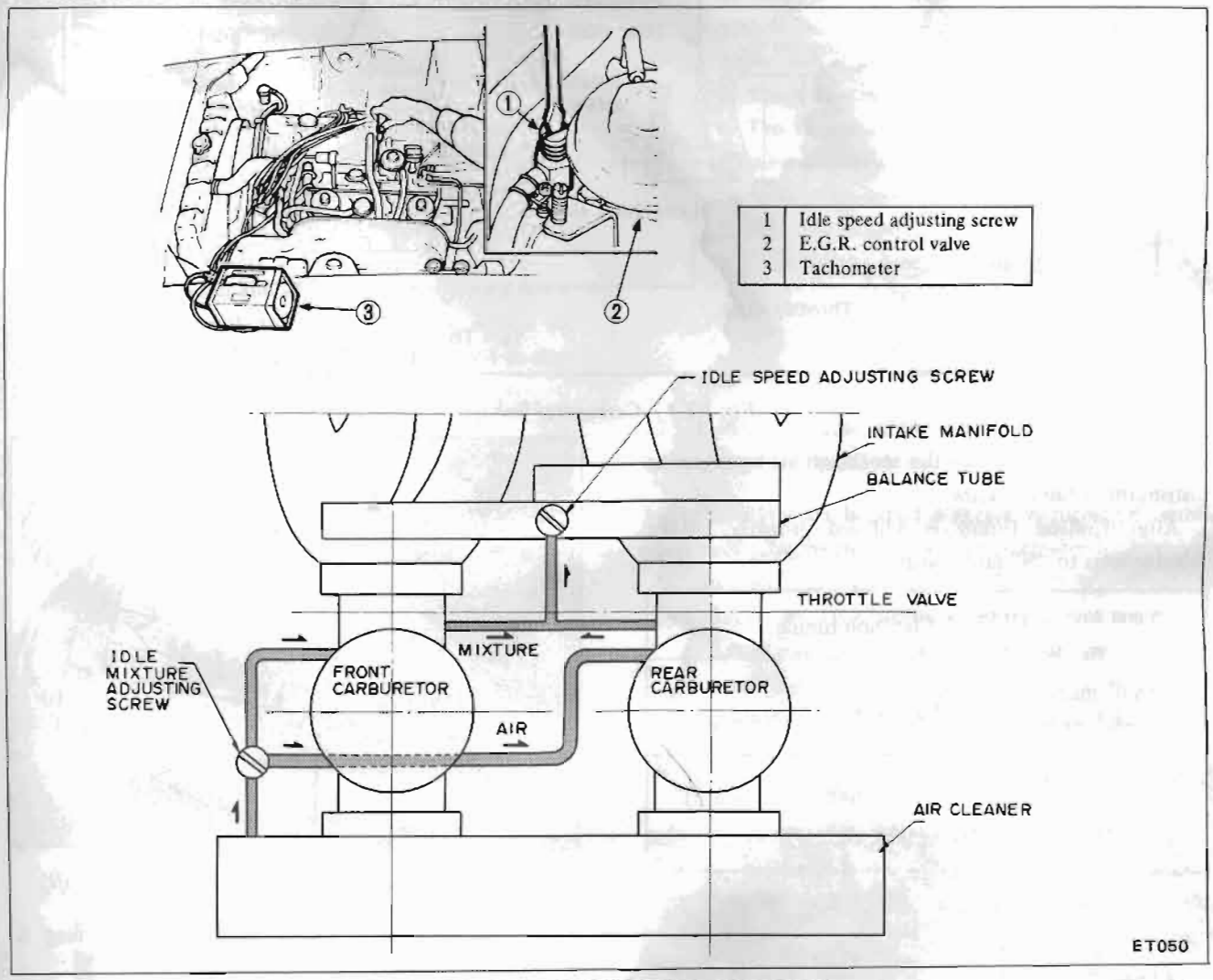


Fig. ET-16 Adjusting idle speed adjusting screw

Notes: a. When idle speed adjusting screw is turned clockwise, idling speed decreases, and it increases when the screw is turned counterclockwise.

b. When idle speed adjusting screw is turned fully clockwise during the above adjustment and engine speed cannot be reduced below 750 rpm, other adjusting screws such as throttle opener adjusting screw, fast idle setting screw and balance adjusting screw must have been tightened excessively or the accelerator linkage must have been adjusted incorrectly. Under the normal condition, the auxiliary throttle shaft and throttle shaft should have a slight play during engine operation under the idling speed. In other words, the auxiliary throttle shaft should be provided with a play "θ" which corresponds to the clearance Ta = Tb as shown in Figure EC-17.

c. When adjusting in idling condition for 1 to 2 minutes or more, make sure to race the engine beforehand.

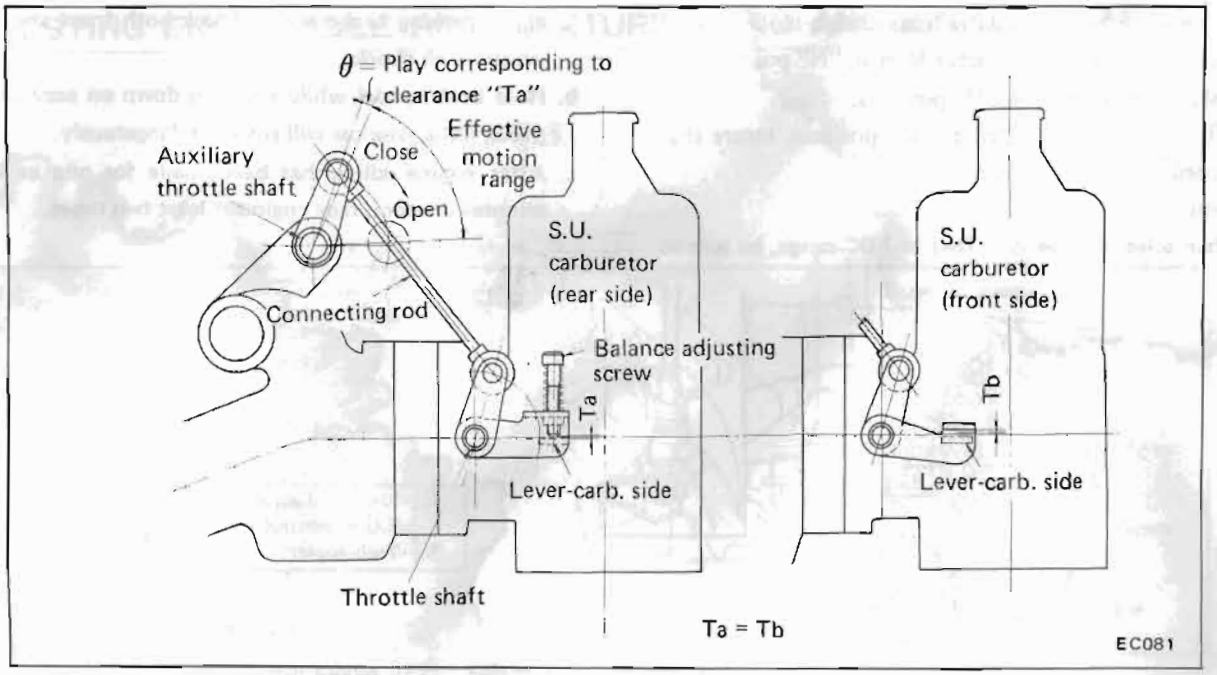


Fig. ET-17 Carburetor linkage

7. Set ignition timing to the specifications by adjusting distributor as shown below.

After ignition timing is adjusted properly, return selector lever to "N" range position.

	Ignition timing
With manual transmission	7° B.T.D.C./750 rpm
With automatic transmission (in "D" range)	5° B.T.D.C./600 rpm (Retard) 15° B.T.D.C./600 rpm (Advance)

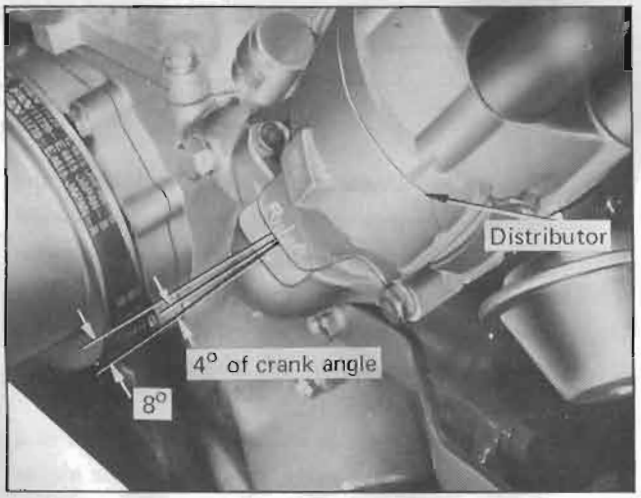


Fig. ET-18 Checking ignition timing (Distributor)

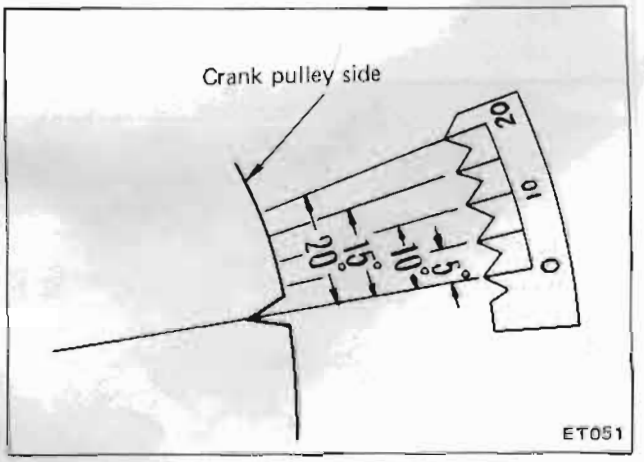


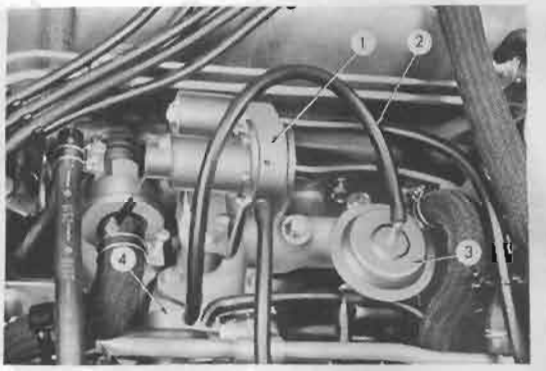
Fig. ET-19 Checking ignition timing (Crankshaft)

8. If engine speed changes after ignition timing is adjusted, repeat steps 6 to 7 above.

9. Disconnect vacuum hose connecting to vacuum control valve from servo diaphragm and also disconnect vacuum hose connecting to vacuum control valve from intake manifold.

10. Connect servo diaphragm to intake manifold connector directly with another suitable hose without laying through vacuum control valve.

11. Turn in throttle opener adjusting screw until engine speed is set at approx. 1,400 rpm.

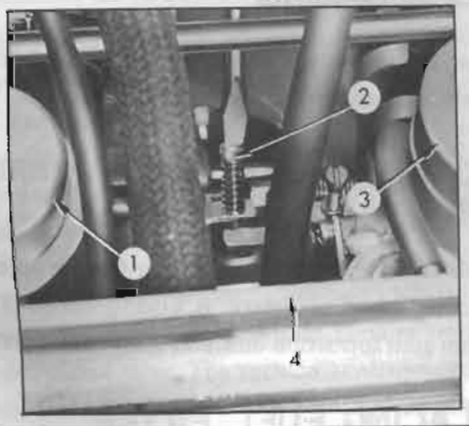


1	Control valve	3	Servo diaphragm
2	Connecting hose	4	Intake manifold

Fig. ET-20 Connecting servo diaphragm to intake manifold with a hose

12. Use a flow meter and adjust balance adjusting screw properly so that front and rear carburetor intake air volume is balanced under the condition described in step 10 above.

Fig. ET-21 Setting flow meter



1	Anti-backfire valve	3	Carburetor
2	Balance adjusting screw	4	Air cleaner

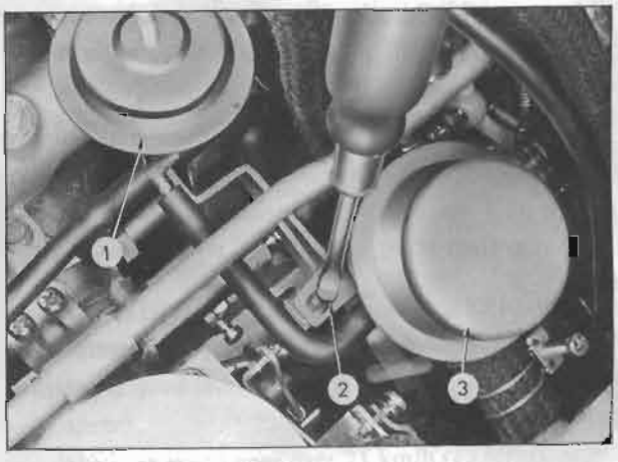
Fig. ET-22 Adjusting balance screw

Notes: a. Apply flow meter to the front side air horn of air cleaner, turn air flow adjusting screw of flow meter, align the upper end of float in glass tube to scale.
Then apply flow meter to the rear side air horn of air cleaner. (Do not move air flow adjusting screw of flow meter.) If flow meter float is not aligned with front carburetor scale, turn balance adjusting screw and align float with front carburetor scale.
b. Stand flow meter float vertically.
c. The flow meter is used to hinder engine from intaking air, it is therefore recommended that the flow meter be used for a very short period of time (one to two seconds).
It should not be used continuously.

13. Connect vacuum motor to temperature sensor with vacuum hose and install air cleaner cover in position.

14. Raise engine speed to 1,400 rpm by turning throttle opener adjusting screw.

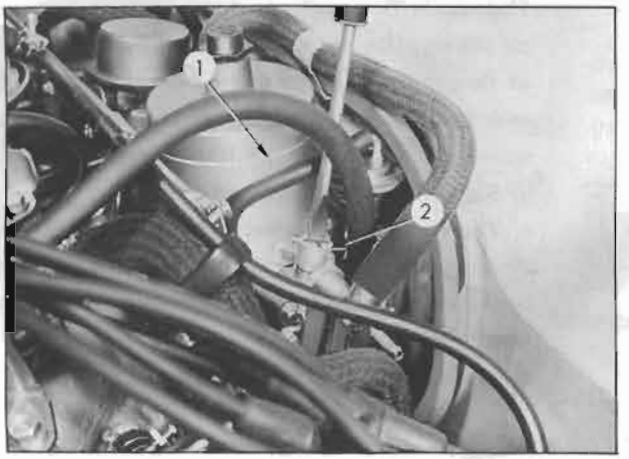
Note: Before adjusting engine speed, once race engine at 3,000 rpm. And raise again the engine speed to 1,700 rpm with opener adjusting screw, then gradually decrease the engine speed to 1,400 rpm.



1	Servo diaphragm
2	Throttle opener adjusting screw
3	Anti-backfire valve

Fig. ET-23 Adjusting throttle opener adjusting screw

15. First, disconnect check valve inlet hose and plug check valve. Using "CO" meter, adjust "CO" percentage to specifications by turning idle mixture adjusting screw.



1	Carburetor
2	Idle mixture adjusting screw

Fig. ET-24 Adjusting idle mixture adjusting screw

With manual transmission	1.0 to 1.6%
With automatic transmission (in "N" range)	0.6 to 1.2%

Note: When idle mixture adjusting screw is turned clockwise, "CO" percent becomes rich, and it becomes lean when idle mixture adjusting screw is turned counterclockwise.

16. Disconnect servo diaphragm vacuum tube for two or three seconds and then connect it to its position again. At this time, make sure that engine speed is increased to 1,400 rpm from idling speed. If not, repeat steps 11 to 15 above.

17. Connect servo diaphragm and opener control valve vacuum hoses and check valve inlet hose to original position.

18. Measure "CO" percent at idle speed using CO-meter. Ascertain that it is below 3.0%.

This measurement should be under the operation of air injection.

Idle limiter cap

Idle limiter cap is attached to idle mixture adjusting screw.

Do not remove this idle limiter cap unless necessary. If this unit is removed, it is necessary to re-adjust it at the time of installation.

To adjust, proceed as follows:

1. Make sure that the percentage of CO contents satisfies the specifications.

2. Install idle limiter cap in position, making sure that the adjusting screw can further turn 1/8 rotation in the "CO-RICH" direction.

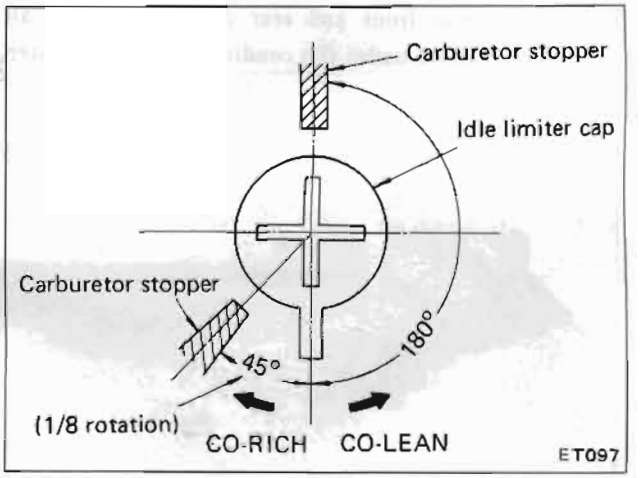


Fig. ET-25

CHECKING CARBURETOR RETURN SPRING

Check throttle return spring for cracks, squareness or deformation. If necessary, replace with a new one.

CHECKING CHOKE MECHANISM (CHOKE VALVE AND LINKAGE)

Check choke valve and mechanism for free operation. Clean or replace if necessary. A binding can result from petroleum gum formation on choke shaft or from damage.

REPLACING FUEL FILTER

Check for a contaminated element, and water deposit. Fuel strainer is a replaceable cartridge type.

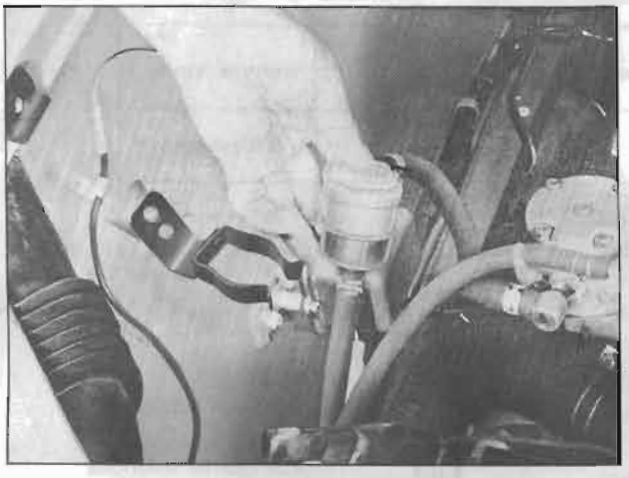


Fig. ET-26 Fuel strainer

CHECKING FUEL LINES (HOSES, PIPINGS, CONNECTIONS, etc.)

Check fuel lines for loose connections, cracks and deterioration. Retighten loose connections and replace any damaged or defective parts.

THROTTLE OPENER CONTROL SYSTEM

CONTENTS

OPERATION

The function of the throttle opener is to open the throttle valve of carburetor slightly in vehicle deceleration. During deceleration, manifold vacuum rises and a quantity of mixture in the engine is not sufficient so that a normal combustion can not continue, and a great amount of unburned HC is emitted. While throttle opener is operating, the carburetor supplies the engine with an adequate charge of combustible mixture to keep proper combustion during deceleration, resulting in remarkable reduction of HC emission.

The operation of the throttle opener is as follows. A schematic drawing of the system is shown in Figure ET-27 and ET-28.

At the moment when the manifold vacuum increases upon deceleration, the control valve opens to transfer the manifold vacuum to the servo diaphragm chamber and the throttle valve of the carburetor opens slightly. As the car speed decreases [about 21 km/h (13 MPH) for manual transmission only], the manifold vacuum lowers to the predetermined value. The vacuum control valve begins to close gradually, keeping the manifold vacuum at the predetermined value.

As a result, both low HC emission and normal engine brake during deceleration are obtained.

The altitude corrector is provided with a slight preload to compensate the variation of the atmospheric pressure.

Throttle opener solenoid

The purpose of this control is to return the speed of engine to the precribed idling positively. To be accurate, the control prevents the throttle opener from taking normal operation when car speed is below 21 km/h (13 MPH) for manual transmission equipped model, or when transmission is placed in "N" or "P" position for automatic transmission equipped model. Current flows through the solenoid when car speed falls below 21 km/h (13 MPH) on manual transmission equipped model, or when the transmission is placed in "N" or "P" position on automatic transmission equipped model.

As this takes place, the needle valve is lifted off its seat, directing air from the air chamber to the servo-diaphragm. This releases the operation of the throttle opener.

When car speed goes over 21 km/h (13 MPH), or when transmission is placed in a position other than "N" or "P" position, the solenoid is deenergized, allowing the throttle opener to take normal action to reduce HC emission to a minimum.

Car speed	Speed switch	Throttle opener solenoid	Throttle opener
Below 21 km/h (13 MPH)	ON	ON	Not actuated
Above 21 km/h (13 MPH)	OFF	OFF	Actuated

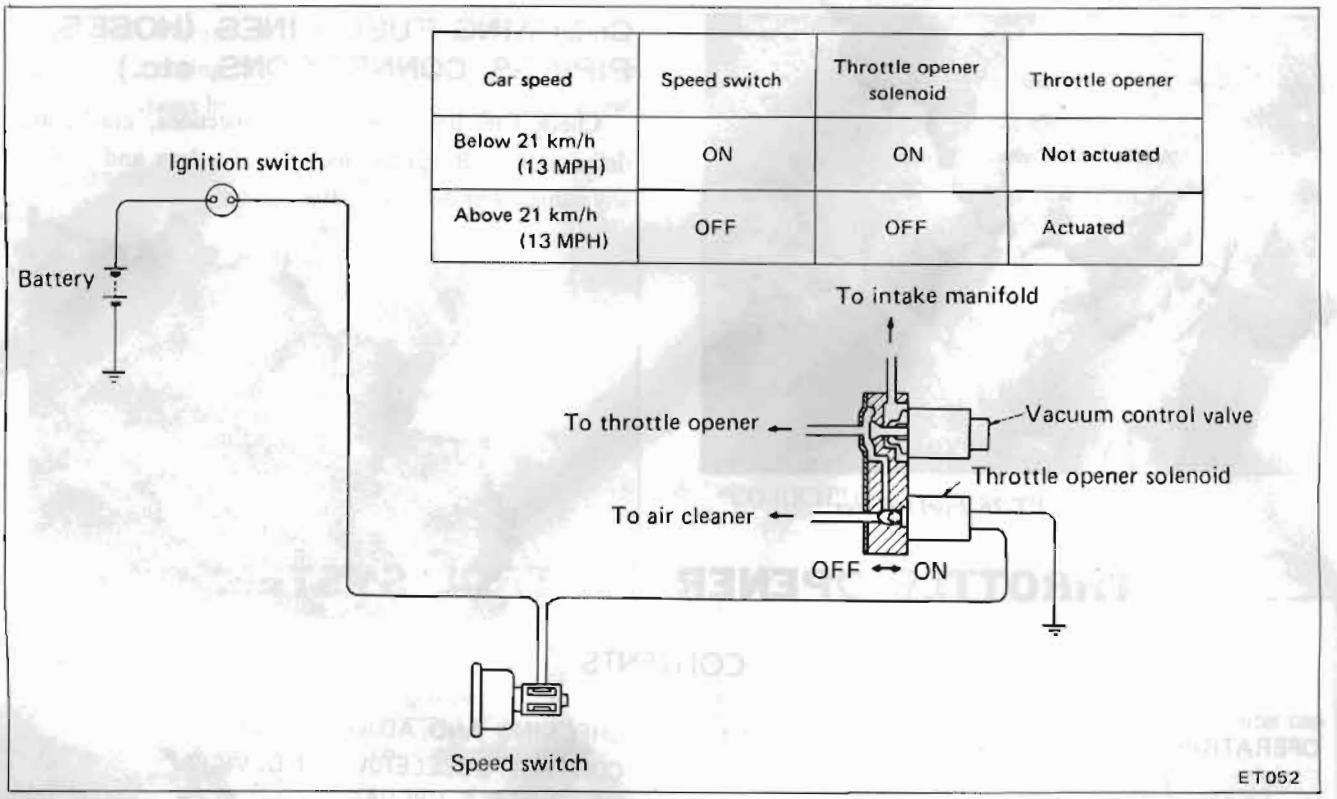


Fig. ET-27 Schematic drawing of throttle opener control system (L24 engine with manual transmission)

Transmission	Throttle opener solenoid	Throttle opener
"N" or "P" range	ON	Not actuated
The other ranges	OFF	Actuated

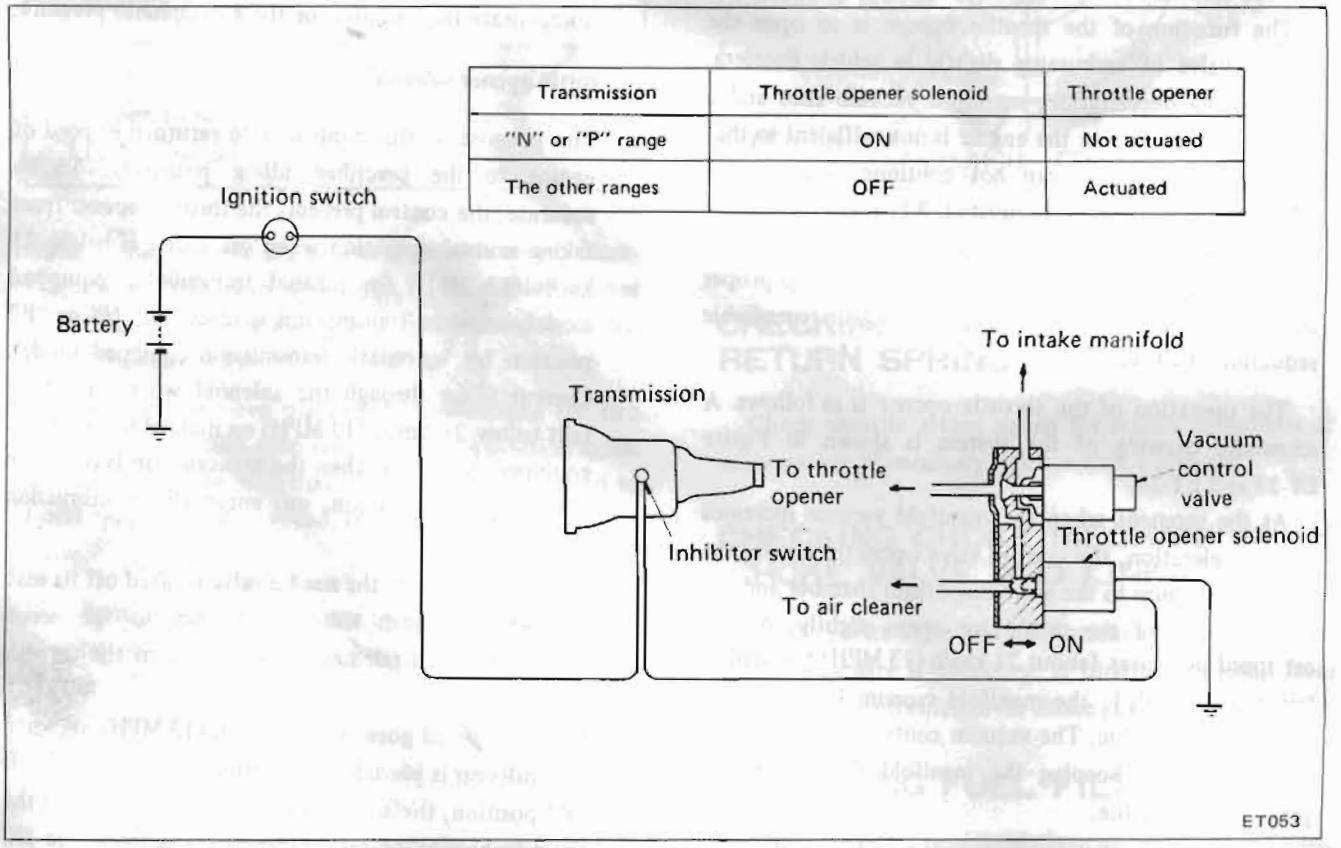


Fig. ET-28 Schematic drawing of throttle opener control system (L24 engine with automatic transmission)

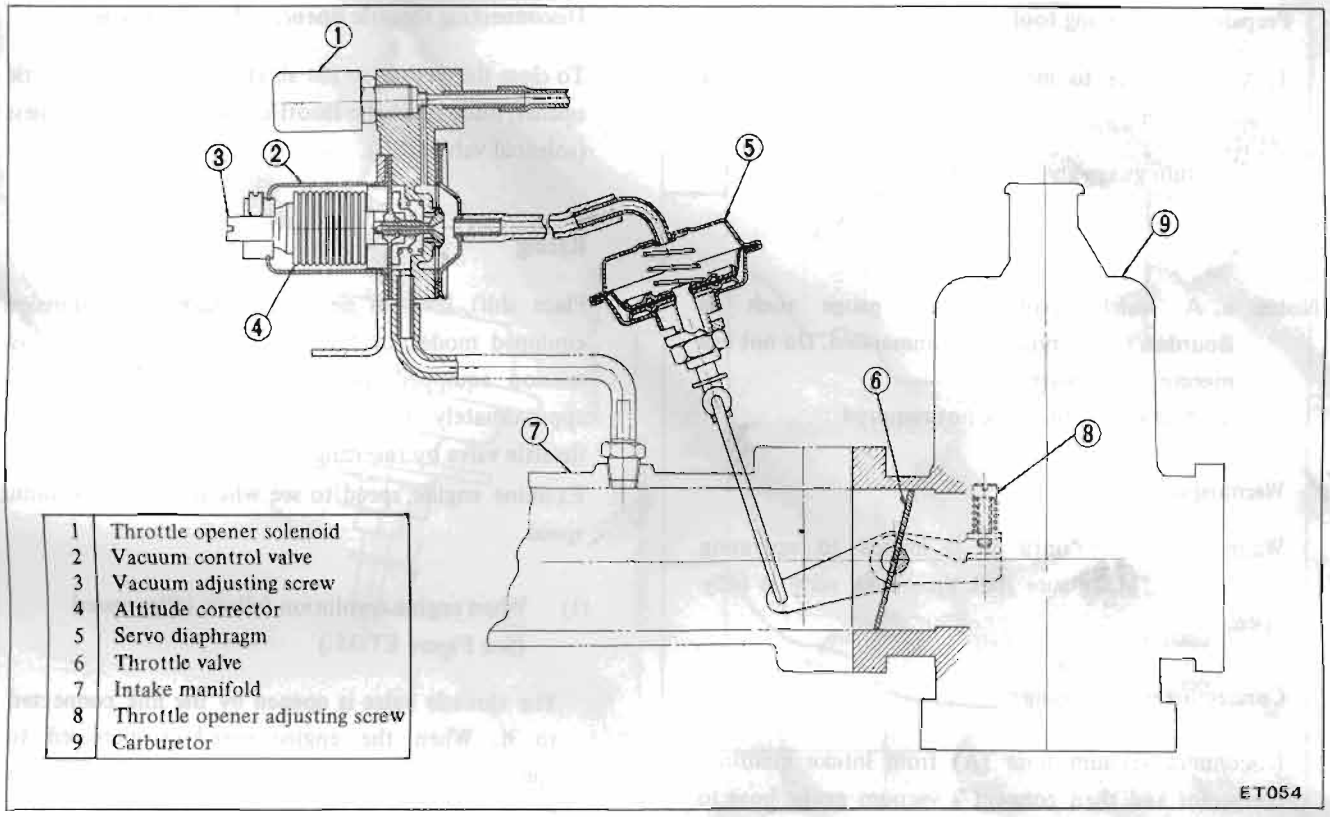


Fig. ET-29 Throttle opener control system

Manual transmission equipped model

The operation of the solenoid is by means of the movement of the speedometer needle.

When car speed falls below 21 km/h (13 MPH), the needle movement produces a signal, which in turn is amplified to actuate the solenoid.

Car speed	Speed switch	Throttle opener solenoid	Throttle opener
Below 21 km/h (13 MPH)	ON	ON	Not actuated
Above 21 km/h (13 MPH)	OFF	OFF	Actuated

Automatic transmission equipped model

The solenoid is operated by an inhibitor switch which actuates the solenoid only when the transmission is placed in the "N" or "P" position.

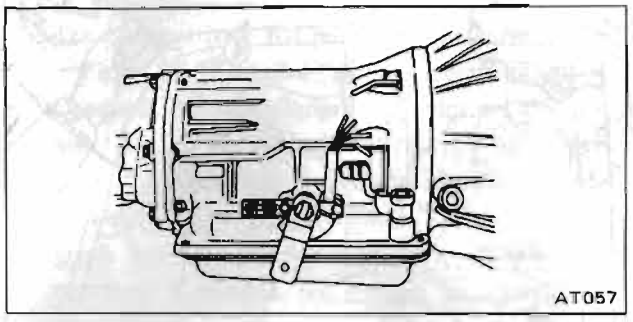


Fig. ET-30 Inhibitor switch installation

CHECKING AND ADJUSTING BOOST CONTROL DECELERATION DEVICE OR TROTTLE OPENER

Principally, it is unnecessary to adjust the throttle opener, however, if there is any requirement, the adjustment procedure is as follows:

Only throttle opener except boost control deceleration device is provided for L24 engine.

Prepare the following tools:

1. A tachometer to measure the engine speed and a screwdriver.
2. A vacuum guage and connecting hose.

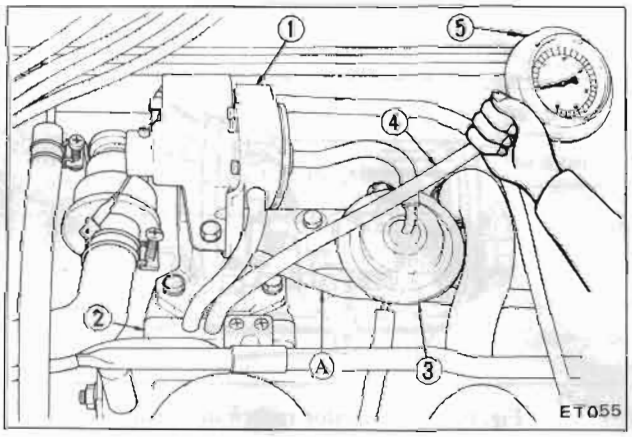
Notes: a. A quick-response boost gauge such as Bourdon's tube type is recommended. Do not use mercury manometer.
b. Any special tools are not required.

Warming-up

Warm up engine until it is heated to operating temperature. Make sure that the choke valve is fully open.

Connecting vacuum gauge

Disconnect vacuum hose (A) from intake manifold connector and then connect a vacuum gauge hose to intake manifold connector as shown in Figure ET-31.



1	Throttle opener control valve	3	Servo diaphragm
2	Intake manifold	4	Vacuum gauge hose
		5	Vacuum gauge

Fig. ET-31 Connecting vacuum gauge to intake manifold

Disconnecting throttle opener solenoid harness

To close the passage to the air cleaner from the throttle opener, disconnect the throttle opener solenoid harness (solenoid valve OFF).

Racing

Place shift lever in neutral for manual transmission equipped model, or "N" or "P" for automatic transmission equipped model. Raise engine speed up to approximately 3,000 rpm under no-load, and close throttle valve by releasing it from hand.
Examine engine speed to see whether it falls to idling speed.

(I) **When engine revolution falls to idling speed (See Figure ET-35.)**

The throttle valve is opened by the link connected to it. When the engine speed is increased to approximately 3,000 rpm and decreased from this speed, changes in servo diaphragm link stroke, manifold vacuum, and engine speed are as shown in Figure ET-32.

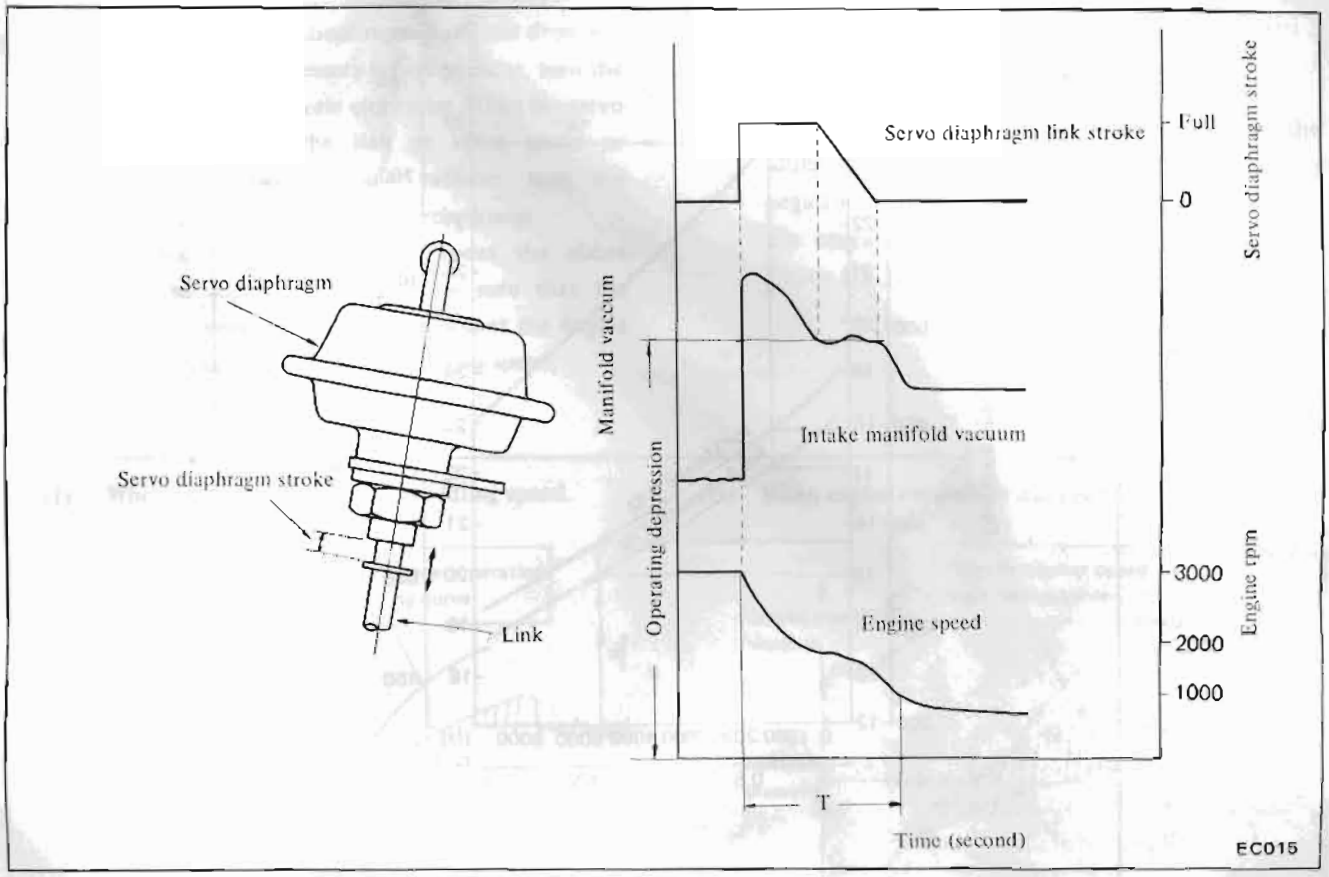


Fig. ET-32 Changes in servo diaphragm link stroke, intake manifold vacuum and engine speed

As the engine speed lowers, negative pressure generated in the intake manifold also lowers. However, dropping of negative pressure in the intake manifold is suspended for a few seconds by operating the servo diaphragm and vacuum control valve. (In the graph shown in Figure ET-32 curve is comparatively flat.) Thus, HC emission emitted under these conditions is controlled by these devices.

The comparatively flat portion of the curve shown in Figure ET-32 is called "Operating pressure." Operating pressure changes depending on altitude, and thus, servo diaphragm and control valve operations are adjusted in coincidence with the altitude at which the vehicle is driven automatically. The graph shown in Figure ET-33 indicates change in operating depression for changes in atmospheric pressure and altitude.

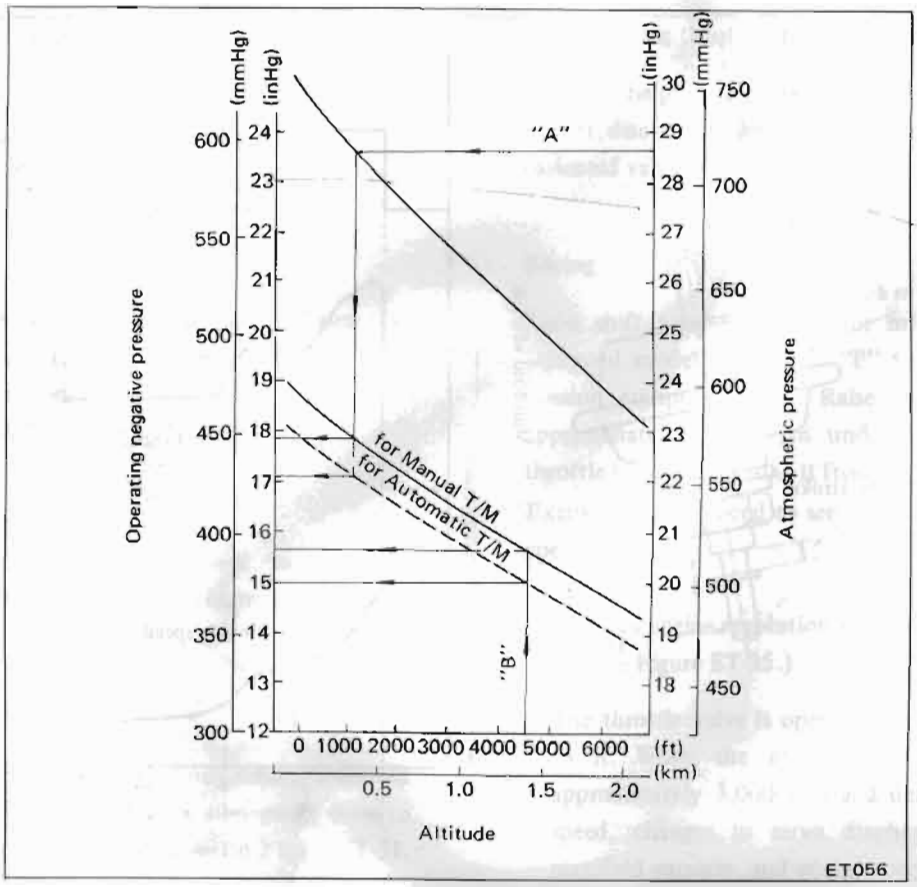
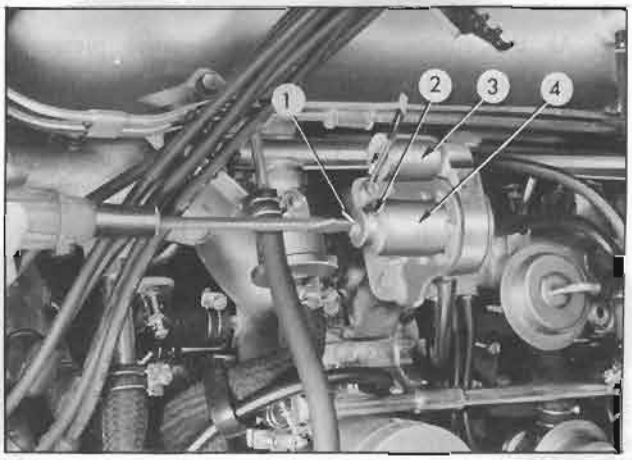


Fig. ET-33 Changes in operating pressure for changes in atmospheric pressure and altitude

How to read Figure ET-33 (Determining operating pressure) and adjustment of vacuum control valve:

1) When atmospheric pressure is known, operating pressure is found by following the arrow line "A." When altitude is known, operating pressure is found by following the arrow line "B."

2) Turn the adjusting screw of the vacuum control valve (See Figure ET-34.) and adjust the vacuum control valve so that negative pressure in the intake manifold is suspended for a few seconds at the value of operating pressure found as described in 1) above while the engine speed decreases from 3,000 to 1,000 rpm.



1	Vacuum adjusting screw	3	Solenoid
2	Lock screw	4	Control valve

Fig. ET-34 Adjusting vacuum control valve

Notes: a. When turning the vacuum adjusting screw, do not depress the screw with a screwdriver.
b. When measuring operating pressure, be sure to tighten the lock screw of the vacuum control valve first.

c. When the servo diaphragm does not draw the link or operating pressure is high vacuum, turn the vacuum adjusting screw clockwise. When the servo diaphragm draws the link at idling speed or operating pressure is low vacuum, turn the vacuum adjusting screw counterclockwise.
Set lock screw stationarily, repeat the above described adjustment, and make sure that the operating pressure is correct and that the engine speed settles down at the rated idling speed.

(II) When engine revolution does not fall to idling speed (See Figure ET-35.)

When the engine revolution does not fall to the idling speed, it is necessary to reduce the idling negative pressure of the intake manifold lower than the operating pressure of the throttle opener. See Figure ET-35 [case of (II)].

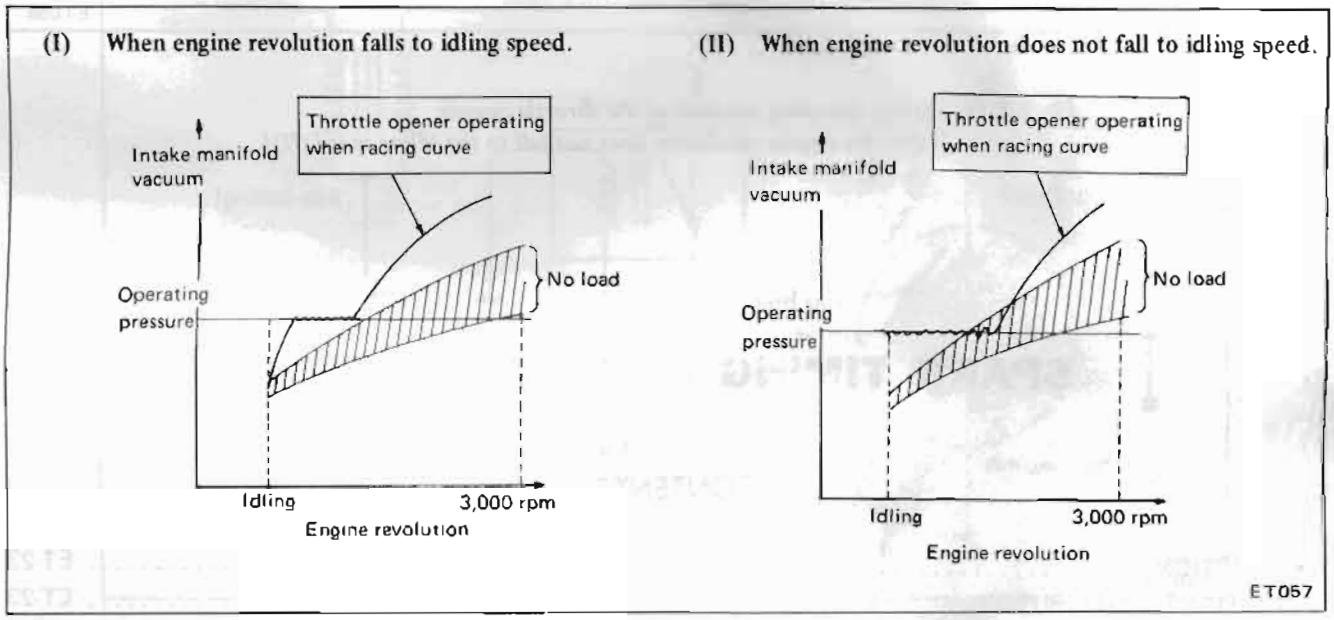


Fig. ET-35 Characteristic curves of throttle opener

In this case (II), it is necessary to labour the engine on road (1), by chassis dynamometer (2) or by raising rear axle by stand (3). The car should then be accelerated from 64 to 80 km/h (40 to 50 MPH) in top gear for manual transmission equipped model or "D" position for automatic transmission equipped model. After the above procedure has been completed, the accelerator pedal is released.

During the testing, measure the throttle opener operating pressure to see whether it is in the predetermined value or not. See Figure ET-36.

Adjustment is exactly the same as that in the case **(I) "When engine revolution falls to idling speed."**

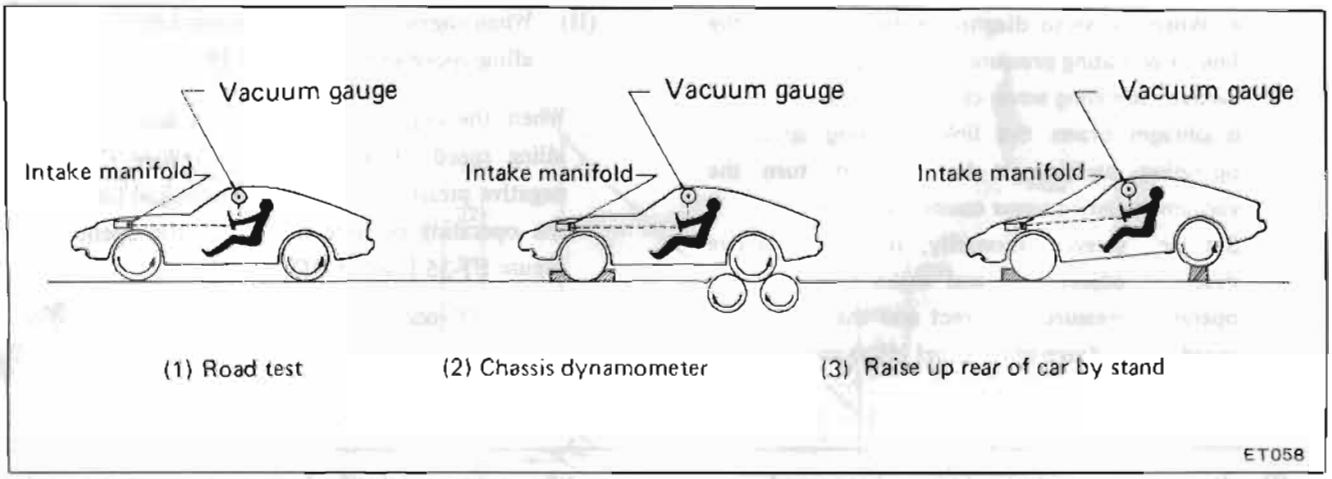


Fig. ET-36 Testing operating pressure of the throttle opener [when the engine revolution does not fall to the idling speed (II)]

SPARK TIMING CONTROL SYSTEM

CONTENTS

DESCRIPTION

The spark timing control system for automatic transmission models consists of a thermo-switch, relay and a dual point distributor.

On manual transmission models, it consists of a single point distributor only.

DUAL POINT DISTRIBUTOR (Automatic transmission only)

Dual point distributor provides two spark timings; "Advanced" and "Retarded" as shown in Figure ET-38.

These can be used independently by electrical means. Between these two timings there is a phase difference of 10 crank-degrees.

The "Advanced" timing is used to give earlier timing in the cycle for optimum engine performance at low temperature. The "Retarded" position is used in the usual application and helps reduce the emission of harmful pollutants to a minimum.

The retard and advance breaker points work under the following conditions.

Distributor	Thermo-switch	Temperature in passenger room
Retarded	OFF	Above 5 to 11°C (41 to 52°F)
Advanced	ON	Below −1°C (30°F)

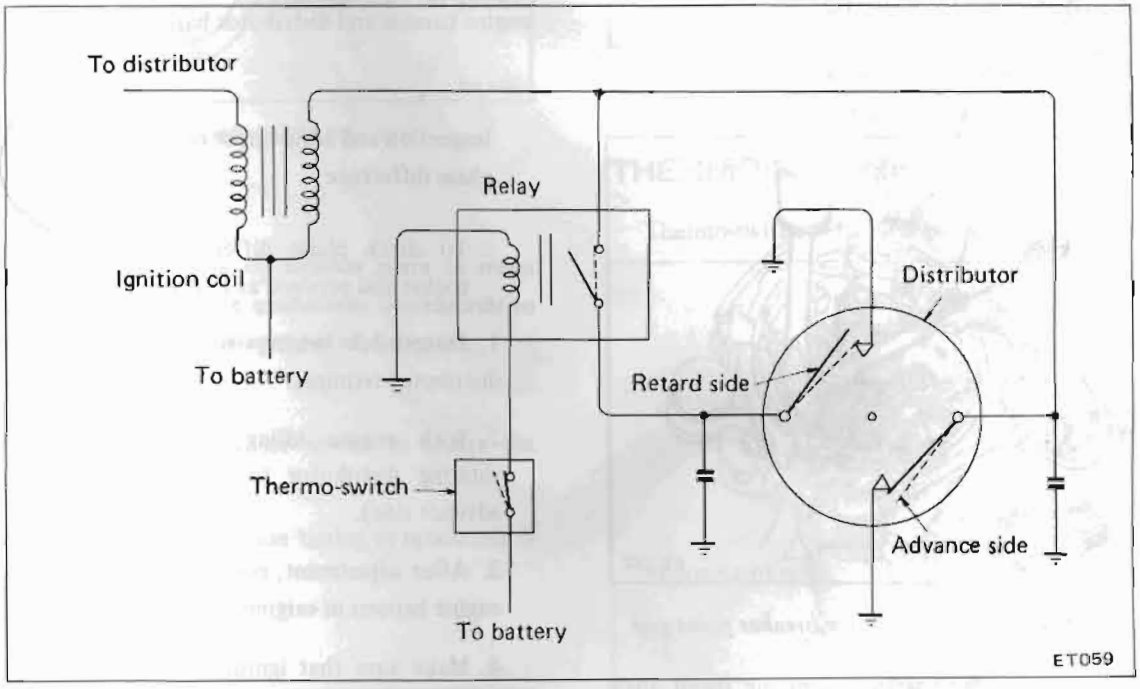


Fig. ET-37 Wiring diagram of dual point distributor

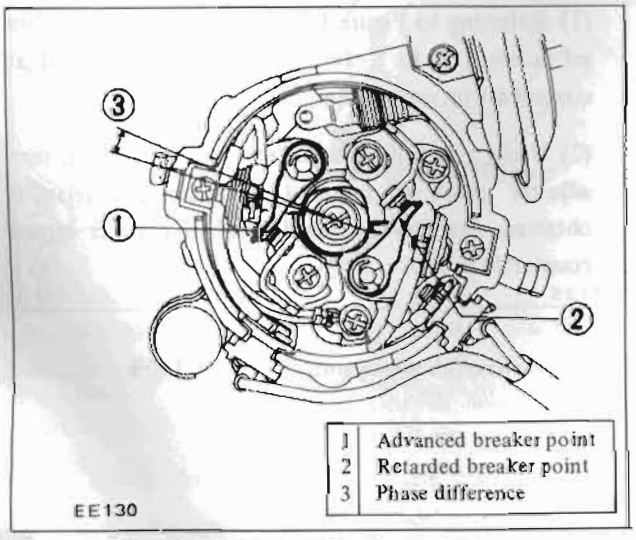


Fig. ET-38 Dual point distributor

CHECKING ELECTRIC ADVANCE CONTROL SYSTEM (Dual point distributor)

Cap and rotor head

Cap and rotor head must be inspected at regular intervals. In addition, remove cap and clean all dust and carbon deposits from cap and rotor from time to time. If cap is cracked or is leaking, replace with a new one.

Point

Standard gaps of both points are 0.45 to 0.55 mm (0.0177 to 0.0217 in). If the gap is off the standard, adjustment must be made by loosening point screws. Gap gauge is required for adjustment.

Both gaps must be checked from time to time.
When point surface is rough, take off any irregularities with fine sand paper of No. 500 or 600 or with oil stone.
At this time, grease must be supplied to cam-shaft and cam heel. (Do not apply excessively.) When wear on each breaker point is noticeable, replace points together with contact arm.

Point gap:
0.45 to 0.55 mm (0.018 to 0.022 in)
Dwell angle:
35° to 41° (With manual transmission)
33° to 39° (With automatic transmission)

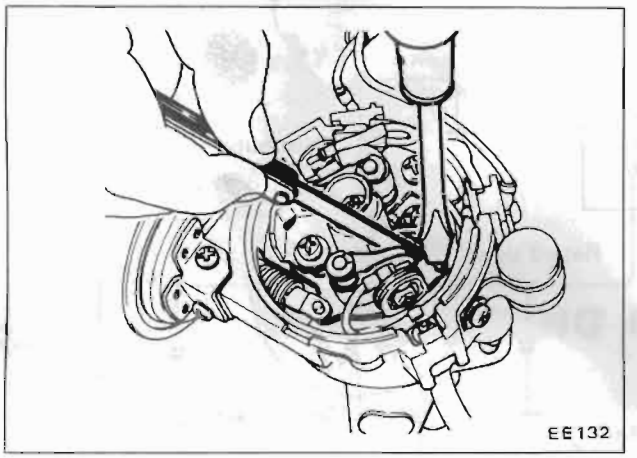


Fig. ET-39 Checking of distributor breaker point gap

If point gap is adjusted by examining dwell angle, install distributor on engine and proceed as follows:

1. Disconnect wiring harness of distributor from engine harness.

2. Using a lead wire, connect engine harness and distributor harness (advance side).

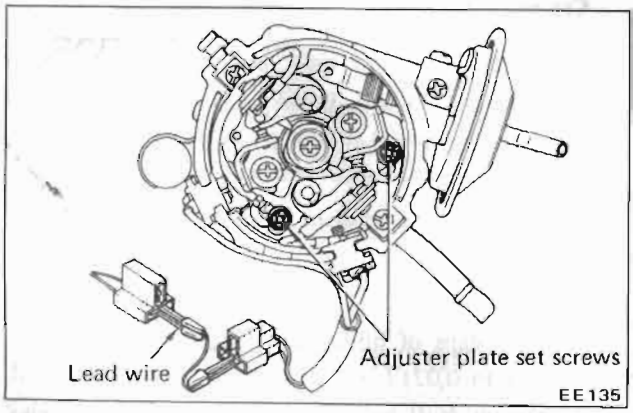


Fig. ET-40 Connect lead wire

3. Adjust dwell angle of advance side by loosening point screw.

4. Disconnect lead wire from distributor harness (advance side) and then connect it to distributor harness (retard side).

5. Adjust dwell angle of retard side by loosening point screw.

6. After adjustment, disconnect lead wire, then connect engine harness and distributor harness securely.

Inspection and adjustment of phase difference

To check phase difference, install distributor on engine and proceed as follows:

1. Disconnect wiring harness (retard side) from distributor terminal.

2. With engine idling, adjust ignition timing by rotating distributor to specifications (15°/600 rpm advance side).

3. After adjustment, connect distributor harnesses and engine harness in original positions securely.

4. Make sure that ignition timing is 5°/600 rpm (in idling speed).

5. If correct ignition timing is not obtained, proceed as follows:

(1) Referring to Figure ET-41, turn out adjuster plate set screw 1/2 to 2 turns. The screw is located at contact set on retard side.

(2) Using a notch in adjuster place as a hold, turn adjuster plate as required until correct delay is obtained. Ignition is retarded when plate is turned counterclockwise.

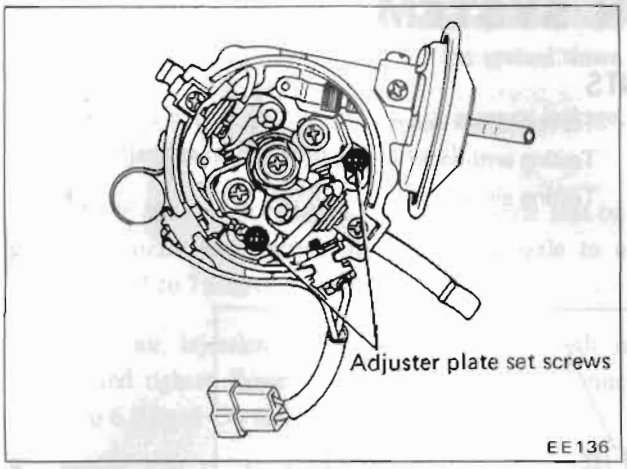


Fig. ET-41 Adjuster plate set screws

Note: Refer to graduations on breaker plate to make adjustment easier. One graduation corresponds to crankshaft angular displacement of 4 degrees.

(3) Tighten adjuster plate set screws to secure the adjustment.

(4) Make sure that the ignition timing of retard side is the specifications.

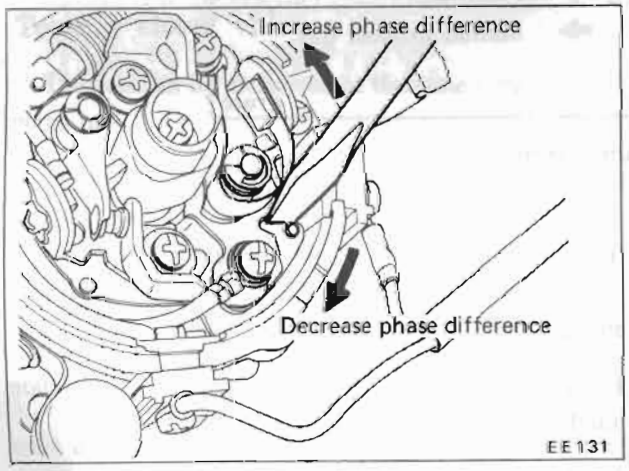


Fig. ET-42 Adjusting phase difference

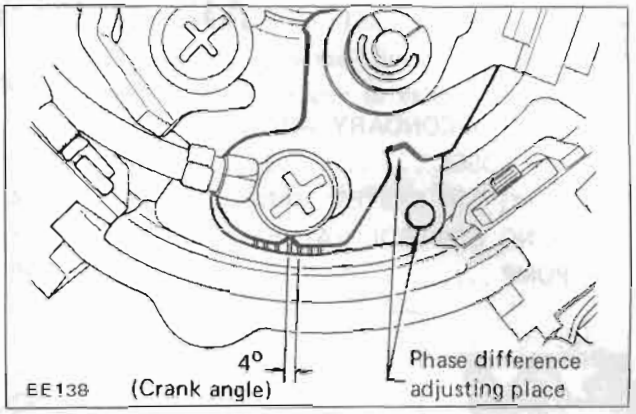


Fig. ET-43 Phase difference adjusting scale

THERMO-SWITCH

Thermo-switch is located on the right side dash finish.

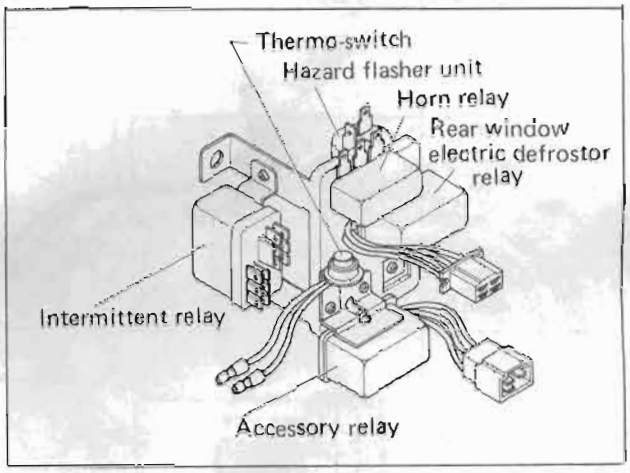


Fig. ET-44 Thermo-switch

Testing of thermo-switch

1. Make sure of insulation between lead wire terminal of thermo-switch and thermo-switch body.

2. Disconnect lead wires at switch and connect ohmmeter to terminals.

3. Ohmmeter should indicate zero when temperature inside the passenger compartment is above 13°C (55°F).

4. If it does not work properly in step 3, replace thermo-switch with a new one.

AIR INJECTION SYSTEM

CONTENTS

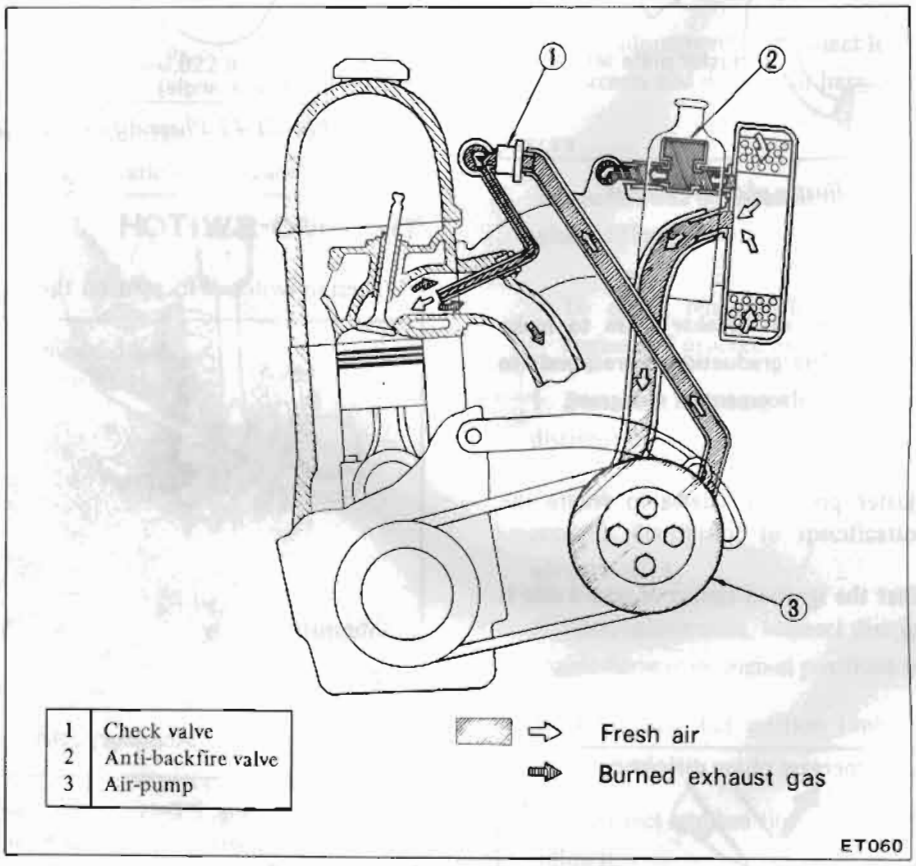


Fig. ET-45 Air injection system

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 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 nozzle seat on 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 air gallery to a torque of 5.0 to 6.0 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 normal 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.

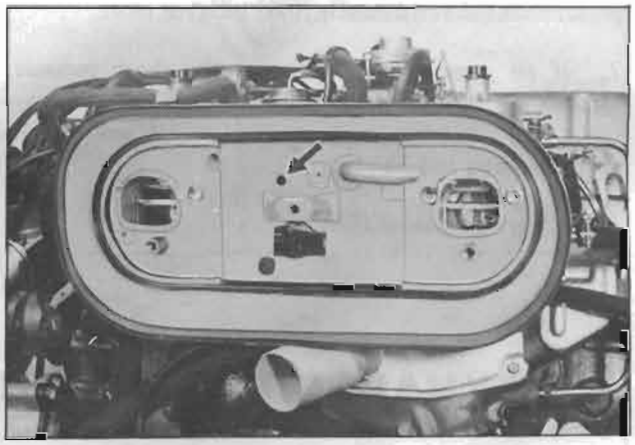


Fig. ET-46 Air inlet hole of anti-backfire valve

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 air injection pump.

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

4. Disconnect air supply hose at check valve.

5. Insert open 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 air blast emitted through drilled pipe plug will be harmlessly dissipated.

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

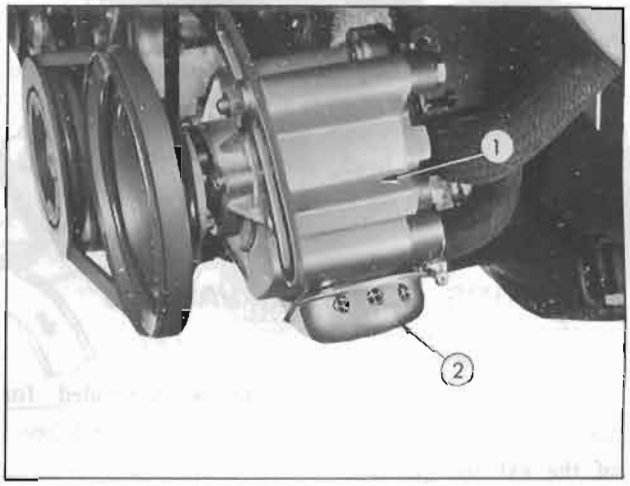
7. If air pressure does not meet the above pressure, proceed as follows:

(1) Repeat 2 and 3 above.

(2) Check air cleaner filter.

(3) With engine speed at 1,500 rpm, close 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. ET-47 Air pump relief valve

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

CONTENTS

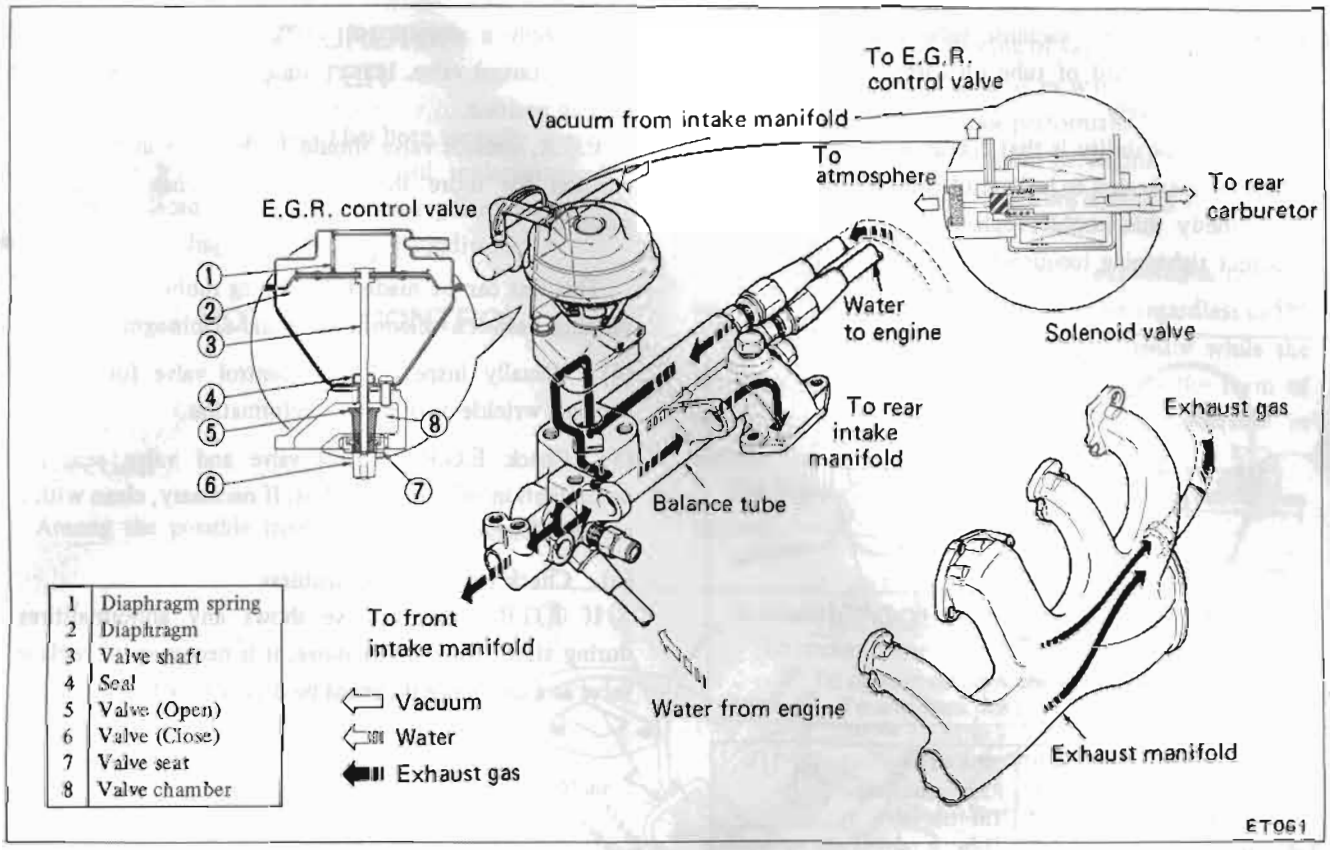


Fig. ET-48 Exhaust gas recirculation system (E.G.R.)

CHECKING E. G. R. CONTROL VALVE

1. 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 valve is properly wired. [Room temperature is above 13°C (55°F)].

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

(2) Disconnect solenoid valve 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.

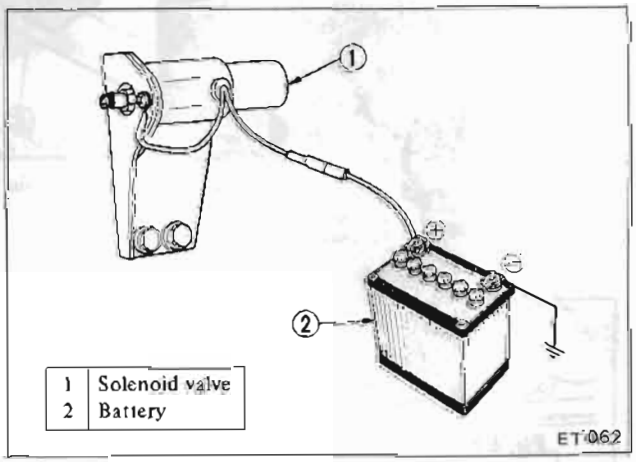


Fig. ET-49 Inspecting solenoid valve

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

2. Checking E.G.R. control valve parts

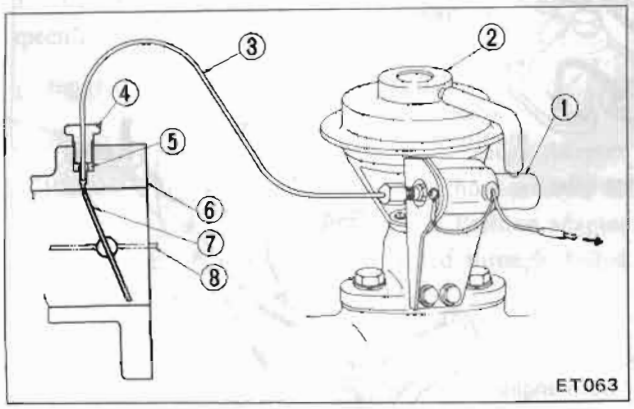
To inspect parts, it is necessary first to remove E.G.R. control valve from engine.

(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 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 vlave	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. ET-50 Checking olive nut

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

Fig. ET-51 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 valve 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 carbon or dust. If necessary, clean with a soft wire brush.

(6) Check valve seat for tightness.

If E.G.R. control valve shows any abnormalitires during steps (3) thru (6) 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 carbon or dust and other accumulations.

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

AUTOMATIC TEMPERATURE CONTROL AIR CLEANER (A.T.C. AIR CLEANER)

CONTENTS

REPLACING CARBURETOR AIR CLEANER FILTER

Paper element (viscous type) has been specially treated, to eliminate bother of cleaning until replacement. It should be replaced with a new one at regular intervals, or more often according to the operating conditions.

CHECKING HOT AIR CONTROL VALVE

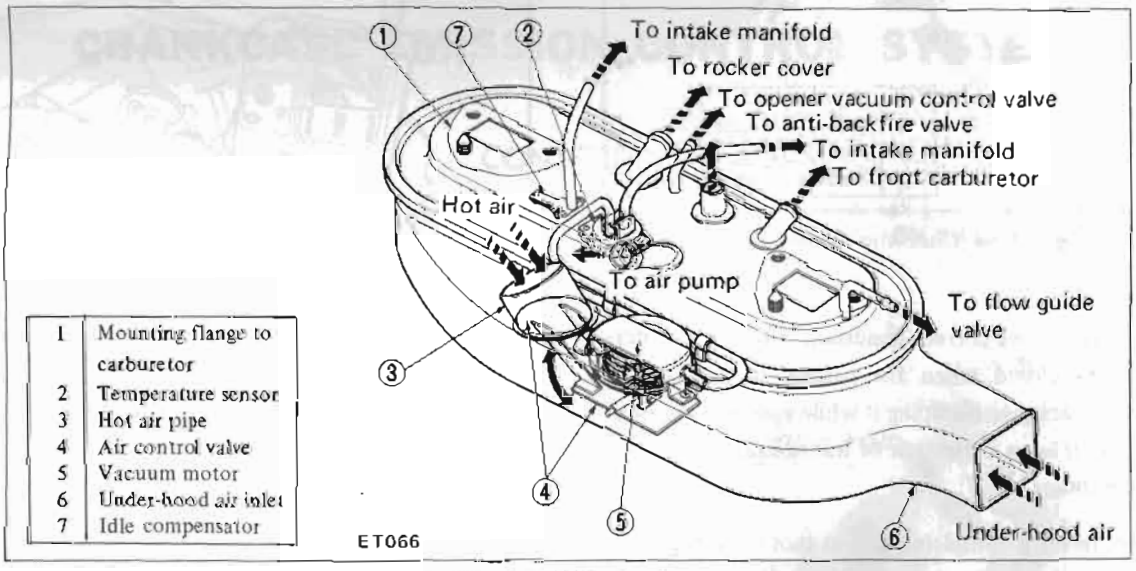
Inspection

Among the possible troubles of this device, the most liable is the permanent opening of valve.

This trouble is not noticed in warm weather, but in cold weather appears as poor performance of engine, such as tardy acceleration, hesitation or engine stall. In such case, first inspect this device before checking the carburetor.

Another trouble which might be expected is that the underhood-air is kept closed by the valve regardless of the temperature of suction air around the sensor while the engine is running. This trouble appears in the form of extremely excessive fuel consumption or decrease in power.

The inspection of this device should be proceeded as follows:



1	Mounting flange to carburetor
2	Temperature sensor
3	Hot air pipe
4	Air control valve
5	Vacuum motor
6	Under-hood air inlet
7	Idle compensator

Fig. ET-52 A.T.C. air cleaner

Appearance

1. First inspect whether vacuum hoses are connected to correct positions.

2. Inspect hoses for cracks, distortion or plugging.

Checking vacuum motor

1. With engine shut down, remove air cleaner cover. Do not lift cover upward.

2. Inspect the position of air control valve. The valve is correct if it keeps the inlet of under-hood air open and that of hot air closed. Otherwise, inspect the linkage of valve.

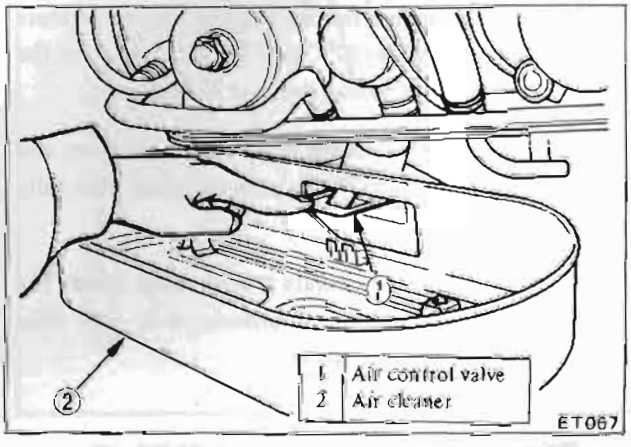


Fig. ET-53 Inspecting valve position

3. Disconnect hose at vacuum motor inlet, and directly apply vacuum of manifold to vacuum motor by connecting another hose; sucking by mouth may be substituted for this process. If underhood-air inlet is closed by valve, valve is in good condition. Inspect linkage if found otherwise. And then no defect is found even in linkage, it signifies the trouble of vacuum motor.

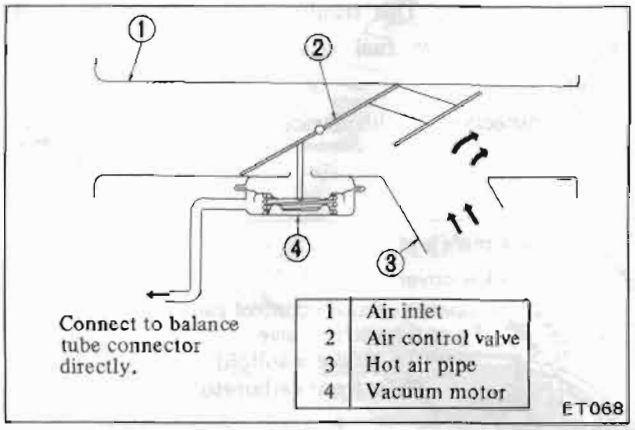


Fig. ET-54 Checking vacuum motor

4. The valve shows correct condition if it keeps underhood-air inlet closed when the passage in the hose is stopped by twisting or clamping it while applying vacuum. If otherwise, it is an indication of leakage taking place in the vacuum motor.

5. When defect is found in vacuum motor through this check, replace the air cleaner assembly.

Checking temperature sensor

1. Perform the engine test by keeping the temperature around the sensor below 30°C (86°F). Make sure that the engine is cooled down before that test is conducted.

2. Before starting the engine, open air cleaner cover and make certain that the valve on underhood-air side fully opens.

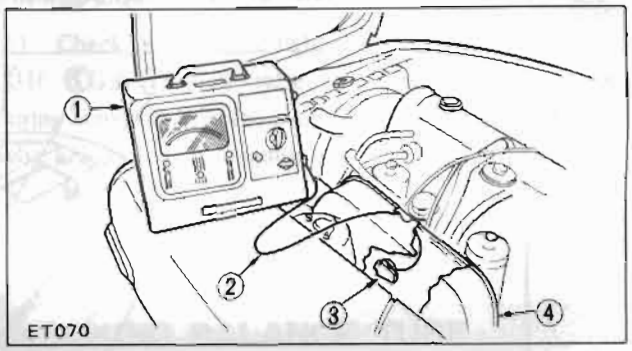
3. Start the engine and operate it at an idling speed. The valve is in good condition if underhood-air side fully closes immediately after starting.

Note: It is good practice not to leave air cleaner open. Open it only when checking.

4. Carefully watch the valve to ascertain that it gradually begins to open as the engine warms up. But, when the ambient temperature is low, it takes considerable length of time for the valve to begine to open, or in some case it hardly opens. This should not, however, be regarded as trouble.

If the valve does not operate satisfactorily or if the condition of the valve is questionable, further conduct the following test:

5. Open the air cleaner cover, and put a thermister or a small thermometer as close to the sensor as possible with adhesive tape. Install the air cleaner cover again.



1	Thermister	3	Temperature sensor
2	Cord	4	Air cleaner

Fig. ET-55 Checking temperature sensor

6. Start the engine and continue idling as described under paragraphs (1), (2), and (3) above. When several minutes have passed and the valve is partially opened, read the thermister indication. It is correct if the reading falls between 38°C (100°F) and 55°C (130°F). If the reading is abnormal, replace the sensor.

IDLE COMPENSATOR

The idle compensator is essentially a thermostatic valve to compensates for excessive enriching of the mixture as a result of high idle temperatures. When the under-the-hood temperatures are high, the bimetal located in the air cleaner is heated by intake hot air and lifts the valve to open. This permits additional fresh air that is properly calibrated by the 3 mm (0.118 in) dia. orifice compensates for the increased richness of into the intake manifold and the air-fuel mixture in order to maintain smooth idle engine operation.

The idle compensator thermostatic valve opens at 60 to 70°C (140 to 158°F).

Never attempt to disassemble this unit since it is sealed for tightness and properly adjusted for valve timing.

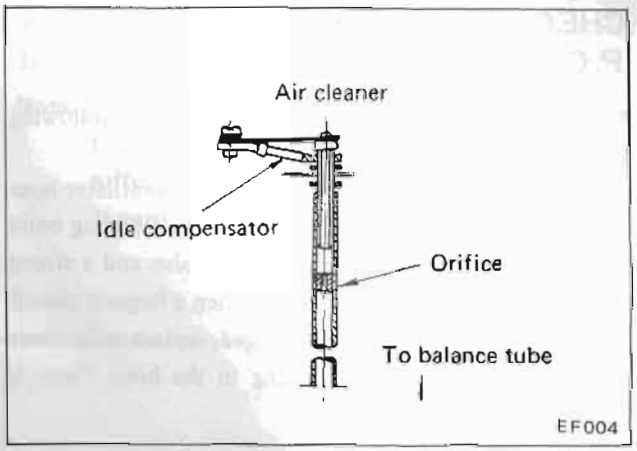


Fig. ET-56 Schematic of idle compensator

CRANKCASE EMISSION CONTROL SYSTEM

CONTENTS

This system returns blow-by gas to both the intake manifold and carburetor air cleaner.

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 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 the clean side of the carburetor air cleaner, through the tube connecting carburetor air cleaner 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. In cars with an excessively high blow-by, some of the flow will go through the tube connection to the carburetor air cleaner under all conditions.

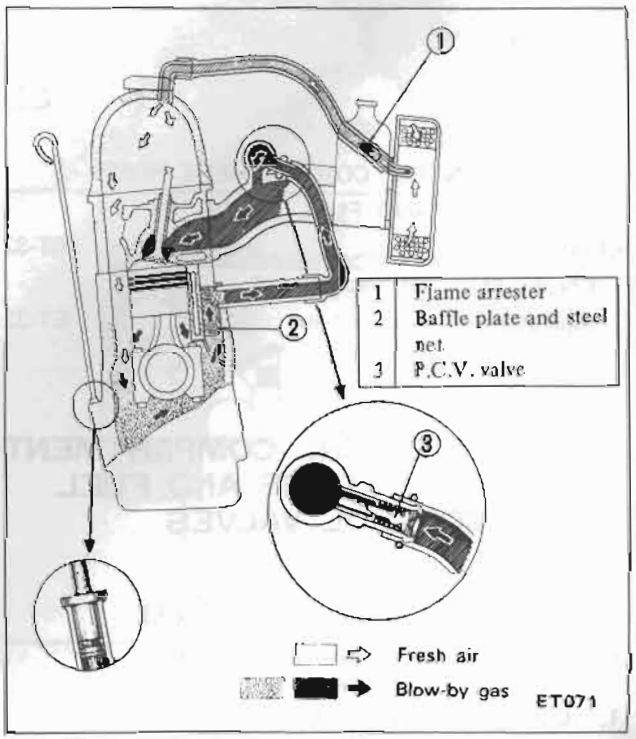


Fig. ET-57 Crankcase emission control system (closed type)

CHECKING AND REPLACING P.C.V. VALVE

Test P.C.V. valve in accordance with the following method.

With engine running at idle, remove the ventilator 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. If the valve is plugged, replace with a new valve. Check for deposit plugging in the hose. Clean if necessary.

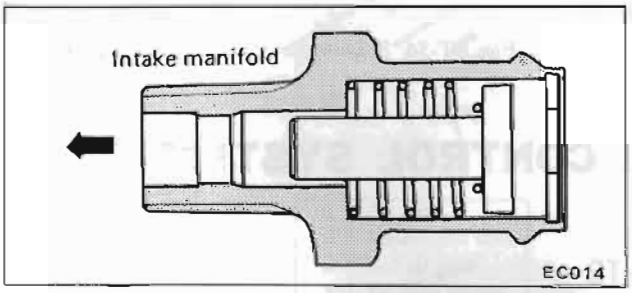


Fig. ET-58 Cross-sectional view of P.C.V. valve

CHECKING VENTILATION HOSES

1. Check hoses and hose connections for leaks.

2. Disconnect all hoses and blow them out with compressed air.

If any hose cannot be free of obstructions, replace with a new one.

Insure that the flame arrester is surely inserted in the hose, between air cleaner and rocker cover.

EVAPORATIVE EMISSION CONTROL SYSTEM

CONTENTS

CHECKING ENGINE COMPARTMENT HOSE CONNECTIONS AND FUEL VAPOR CONTROL VALVES

Checking fuel tank, vapor-liquid separator and vapor vent line

1. Check all hoses and fuel tank filler cap.

2. Disconnect the vapor vent line connecting flow guide valve to vapor-liquid separator.

3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way change cock) to the end of the vent line.

4. Supply fresh air into the vapor vent line through the cock little by little until the pressure becomes 368 mm (14.5 in) Aq.

5. Shut the cock completely and leave it that way.

6. After 2.5 minutes, measure the height of the liquid in the manometer.

7. Variation of height should remain within 25 mm (1.0 in) Aq.

8. When the 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 the filler cap is removed, it is the cause of the stuffy hose.

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

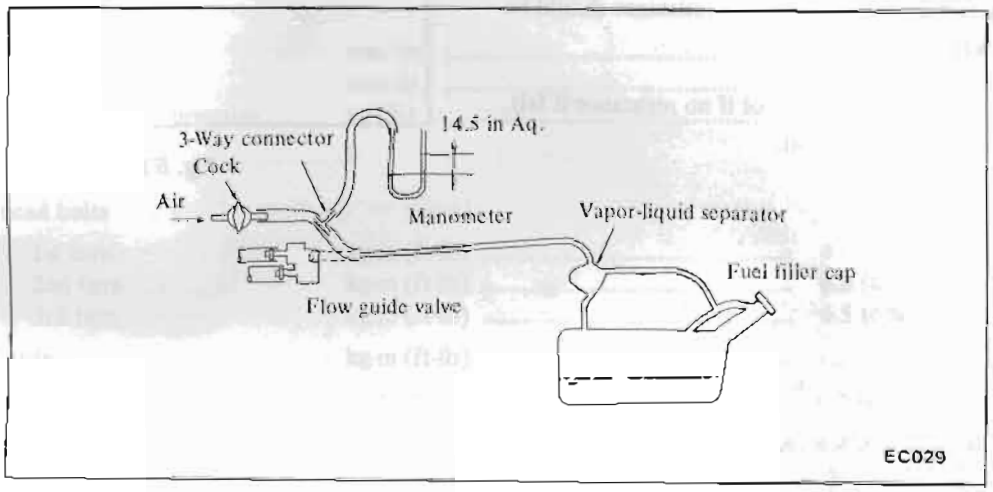


Fig. ET-59 Checking evaporative emission control system

Checking flow guide valve

1. Disconnect all hoses connected to the flow guide valve.

2. While lower pressure air is pressed into the flow guide valve from the ends of vent line of fuel tank side, the air should go through the valve and flow to crankcase side. If the air does not flow the valve should be replaced. But when the air is blown from crankcase side, it should never flow to the other tow vent lines.

3. While the air is pressed into the flow guide valve from the carburetor air cleaner side, if flows to the fuel tank side and/or crankcase side.

4. This valve opens when the inner pressure becomes 10 mmHg (0.4 inHg). In case of improper operations or breakage, replace it.

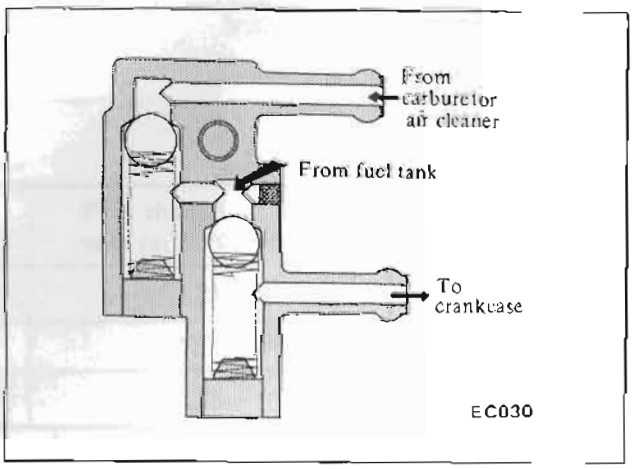


Fig. ET-60 Flow guide valve

CHECKING FUEL TANK VACUUM RELIEF VALVE OPERATION

Remove fuel filler cap and see it functions properly as follows;

1. Wipe clean valve housing and have it in your mouth.

2. Inhale air. A slight resistance accompanied by valve indicates that valve is in good mechanical condition. Note also that, by furhter inhaling air, the resistance should be disappeared with valve clicks.

3. If valve seems to be clogged, or if no resistance is felt, replace cap as an assembled unit.

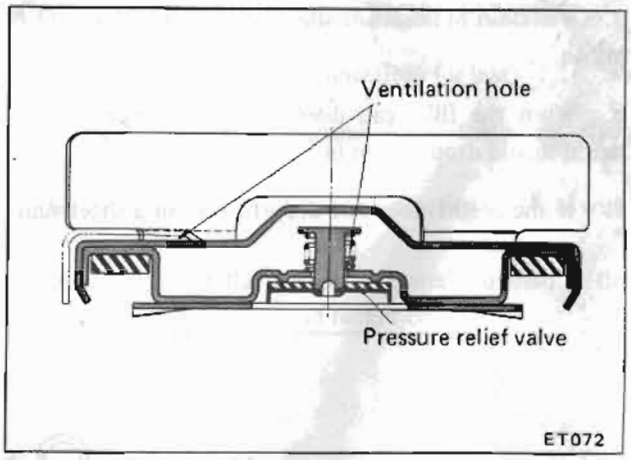


Fig. ET-61 Fuel filler cap

SERVICE DATA AND SPECIFICATIONS

Valve clearance			
Hot	Intake	mm (in)	0.25 (0.010)
	Exhaust	mm (in)	0.30 (0.012)
Cold	Intake	mm (in)	0.20 (0.008)
	Exhaust	mm (in)	0.25 (0.010)
Drive belt tension			
	Fan belt	mm (in)	8 to 12 (0.315 to 0.472)
	Air pump belt	mm (in)	15 to 20 (0.591 to 0.787)
	When thumb pressure	kg (lb)	10 (22) is applied
Tightening torque			
Cylinder head bolts			
	1st turn	kg-m (ft-lb)	4.0 (28.9)
	2nd turn	kg-m (ft-lb)	6.0 (43.4)
	3rd turn	kg-m (ft-lb)	6.5 to 8.5 (47.0 to 61.5)
Manifold nuts		kg-m (ft-lb)	1.2 to 1.6 (8.7 to 11.6)
Carburetor nuts		kg-m (ft-lb)	0.5 to 1.0 (3.6 to 7.2)
Spark plugs		kg-m (ft-lb)	1.5 to 2.0 (11.0 to 15.0)
Engine oil capacity (including oil filter)			
Maximum		ℓ (U.S.qts., Imper.qts.)	5.0 (5¼, 4⅜)
Minimum		ℓ (U.S.qts., Imper.qts.)	4.0 (4¼, 3½)
Cooling water capacity (with heater)		ℓ (U.S.gal., Imper.gal.)	8.0 (2⅛, 1¾)
Radiator cap pressure test		kg/cm^2 (psi)	0.9 (12.8)
Cooling system pressure test		kg/cm^2 (psi)	1.6 (23.0)
Compression pressure at rpm		kg/cm^2 (psi)	12.0 to 13.0/300 to 400 (171 to 185)
Carburetor water control valve			
Closing temperature		°C (°F)	55 (131)

Battery specific gravity

	Permissible valve	Fully charged valve (at 20°C, 68°F)
Frigid climates	Over 1.22	1.28
Tropical climates	Over 1.18	1.23
Other climates	Over 1.20	1.26

Ignition and idling adjustment		
Manual transmission	degree/rpm	7° B.T.D.C./750
Automatic transmission ("D" range)	degree/rpm	5° B.T.D.C./600 (Retarded) 15° B.T.D.C./600 (Advanced)

Distributor		
Point gap	mm (in)	0.45 to 0.55 (0.0177 to 0.0217)
Dwell angle	degrees	35 to 41 (With manual transmission) 33 to 39 (With automatic transmission)
Condenser capacity	μF	Retard side 0.05 Advance side 0.22
Condenser insulation resistance	MΩ	5
Spark plug gap	mm (in)	0.8 to 0.9 (0.032 to 0.036)
Setting "CO" percent at 1,400 rpm (Without air injection)		
Manual transmission model	%	1.0 to 1.6
Automatic transmission model ("N" range)	%	0.6 to 1.2
Checking "CO" percent at idle speed (With air injection)		
Manual transmission model	%/rpm	Below 3.0/750
Automatic transmission model ("D" range)	%/rpm	Below 3.0/600
Throttle opener (at sea level)		
Setting vacuum pressure		
Manual transmission	mmHg (inHg)	− 470 (18.5)
Automatic transmission	mmHg (inHg)	− 450 (17.7)
Setting engine speed (no load)		
Manual transmission	rpm	1,400
Automatic transmission	rpm	1,400
A.T.C. air cleaner		
Operating temperature	°C (°F)	38 to 55 (100 to 130)
Flow guide valve		
Operating pressure	mmHg (inHg)	10 (0.4)

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
CANNOT CRANK ENGINE OR SLOW CRANKING	Improper grade oil.	Replace with proper grade oil.
	Discharged battery.	Charge battery.
	Defective battery.	Replace.
	Loose fan belt.	Adjust.
	Trouble in charge system.	Inspect.
	Wiring connection trouble in starting circuit.	Correct.
	Defective ignition switch.	Repair or replace.
	Defective starter motor.	Repair or replace.

(Trouble-shooting procedure on starting circuit)
Switch on the starting motor with light "ON."

When light goes off or dims considerably,

a. Check battery.
b. Check connection and cable.
c. Check starter motor.

When light stays bright,

a. Check wiring connection between battery and starter motor.
b Check ignition switch.
c. Check starter motor.

ENGINE WILL CRANK NORMALLY BUT WILL NOT START

In this case, the following trouble causes may exist, but in many cases ignition system or fuel system is in trouble.

Ignition system in trouble
Fuel system in trouble
Valve mechanism does not work properly
Low compression

(Trouble-shooting procedure)
Check spark plug firstly by following procedure.
Disconnect high tension cable from one spark plug and hold it about 10 mm (0.3937 in) from the engine metal part and crank the engine.

Good spark occurs.

a. Check spark plug.
b. Check ignition timing.
c. Check fuel system.
d. Check cylinder compression.

No spark occurs.

Check the current flow in primary circuit.

Very high current.

Inspect primary circuit for short.
Check breaker point operation.

Condition	Probable cause	Corrective action
	Low or no current.	Check for loose terminal or disconnection in primary circuit. Check for burned points.
Ignition system in trouble	Burned distributor point.	Repair or replace.
	Improper point gap.	Adjust.
	Defective condenser.	Replace.
	Leak at rotor cap and rotor.	Clean or replace.
	Defective spark plug.	Clean, adjust plug gap or replace.
	Improper ignition timing.	Adjust.
	Defective ignition coil.	Replace.
	Disconnection of high tension cable.	Replace.
	Loose connection or disconnection in primary circuit.	Repair or replace.
Fuel system in trouble	Lack of fuel.	Supply.
	Dirty fuel strainer.	Replace.
	Dirty or clogged fuel pipe.	Clean.
	Fuel pump will not work properly.	Repair or replace.
	Carburetor choke will not work properly.	Check and adjust.
	Improper adjustment of float level.	Correct.
	Improper idling.	Adjust.
	Dirty or clogged carburetor.	Disassemble and clean.
	Clogged breather pipe of fuel tank.	Repair and clean.
Low compression	Incorrect spark plug tightening or defective gasket.	Tighten to normal torque or replace gasket.
	Improper grade engine oil or low viscosity.	Replace with proper grade oil.
	Incorrect valve clearance.	Adjust.
	Compression leak from valve seat.	Remove cylinder head and lap valves.
	Sticky valve stem.	Correct or replace valve and valve guide.
	Weak or defective valve springs.	Replace valve springs.
	Compression leak at cylinder head gasket.	Replace gasket.
	Sticking or defective piston ring.	Replace piston rings.
	Worn piston ring or cylinder.	Overhaul engine.
(Trouble shooting procedure) Pour the engine oil from plug hole, and then measure cylinder compression.		
	Compression increases.	Trouble in cylinder or piston ring.
	Compression does not change.	Compression leaks from valve, cylinder head or head gasket.

Condition	Probable cause	Corrective action
IMPROPER ENGINE IDLING		
Fuel system in trouble	Clogged or damaged carburetor jets.	Clean or replace.
	Incorrect idle adjustment.	Adjust.
	Clogged air cleaner filter.	Replace element.
	Defective manifold gaskets or carburetor insulator.	Replace gasket or insulator.
	Improper float level adjustment.	Adjust.
	Loose air hoses or air-fuel mixture hoses of carburetor.	Check for loose connections.
Low compression		Previously mentioned.
Others	Incorrect valve clearance.	Adjust.
	Extremely low revolution.	Adjust.
	Defect or malfunction of the ignition system (spark plug, high tension cable, breaker point, ignition coil, etc.).	Replace.
	Incorrect basic ignition timing.	Adjust.
	Malfunction of choke valve or linkage.	Adjust.
	Malfunction of vacuum motor, sensor or hoses of air cleaner.	Check for loose hoses. Replace system components if necessary.
	Incorrect idle adjustment.	Adjust idle speed.
	Clogged air cleaner filter.	Replace air cleaner filter.
	Defective carburetor water control valve.	Replace.
	Malfunction of idle compensator of air cleaner.	Replace.
	Malfunction of E.G.R. control valve.	Clean or replace.
	Loose manifold and cylinder head bolts.	Retighten bolts.
High engine idle speed.	Dragged accelerator linkage.	Check and correct accelerator linkage.
	Incorrect idle adjustment.	Adjust idle speed.
	Malfunction of throttle opener system.	Check for loose vacuum hose and harness connections. Adjust or replace if necessary.
	Malfunction of speed switch, inhibitor switch, and harness.	Check for loose connections. Repair or replace if necessary.
	Loose air hoses or air-fuel mixture hoses of carburetor.	Check for loose connections.

Condition	Probable cause	Corrective action
ENGINE POWER NOT UP TO NORMAL		
Low compression		Previously mentioned.
Ignition system in trouble	Incorrect ignition timing.	Adjust.
	Defective spark plugs.	Clean, adjust or replace plugs.
	Defective distributor points.	Dress, or replace points. Also check condenser.
Fuel system in trouble	Malfunction of choke system.	Adjust.
	Clogged fuel pipe or floating valve.	Clean.
	Dirty or clogged fuel strainer.	Replace.
	Fuel pump will not work properly.	Repair or replace.
	Clogged carburetor jets.	Disassemble and clean.
Air intake system in trouble	Clogged air cleaner.	Replace element.
	Air inhaling from manifold gasket or carburetor gasket.	Replace gasket.
Overheating	Insufficient coolant.	Replenish.
	Loose fan belt.	Adjust fan belt.
	Worn or defective fan belt.	Replace.
	Defective thermostat.	Replace.
	Defective water pump.	Replace.
	Clogged or leaky radiator.	Flush, repair or replace.
	Defective radiator filler cap.	Replace.
	Air in cooling system.	Retighten each part of cooling system.
	Improper engine oil grade	Replace with proper grade oil.
	Incorrect ignition timing.	Adjust.
	Defective carburetor (lean mixture).	Overhaul carburetor.
Overcooling	Defective thermostat.	Replace.
Others	Improper octane fuel.	Replace with specified octane fuel.
	Improper tire pressure.	Inflate to specified pressure.
	Dragging brake.	Adjust.
	Clutch slipping.	Adjust.
NOISY ENGINE		
Car knocking	Overloaded engine.	Use right gear in driving.
	Carbon knocking.	Disassemble cylinder head and remove carbon.
	Timing knocking.	Adjust ignition timing.
	Fuel knocking.	Use specified octane fuel.
	Preignition (misusing of spark plug).	Use specified spark plug.

Condition	Probable cause	Corrective action
Mechanical knocking		
Crankshaft bearing knocking.	This strong dull noise increases when engine is accelerated. To locate the place, cause a misfire on each cylinder. If the noise stops by the misfire, this cylinder generates the noise.	This is caused by worn or damaged bearings, or unevenly worn crankshaft. Renew bearings and adjust or change crankshaft. Check lubrication system.
Connecting rod bearing knocking.	This is a little higher-pitched noise than the crankshaft knocking, and also increases when engine is accelerated. Cause a misfire on each cylinder and if the noise deminishes almost completely, this crankshaft bearing generates the noise.	Same as the case of crankshaft bearings.
Piston and cylinder noise.	When you hear an overlapping metalic noise which increases its magnitude with the revolution of engine and which decreases as engine is warmed up, this noise is caused by piston and cylinder. To locate the place, cause a misfire on each cylinder.	This may cause an abnormal wearing of cylinder and lower compression which in turn will cause a lower out-put power and excessive consumption of oil. Overhaul engine.
Piston pin noise.	This noise is heared at each highest and lowest dead end of piston. To locate the place, cause a misfire on each cylinder.	This may cause a wear on piston pin, or piston pin hole. Renew piston and piston pin assembly.
Water pump noise.	This noise may be caused by worn or damaged bearings, or by the uneven surface of sliding parts.	Replace water pump with a new one.
Air pump noise	Defective air pump.	Repair or replace.
Others.	An improper adjustment of valve clearance.	Adjust.
	Noise of timing chain.	Adjust the tension of chain.
	An excessive end-play on crankshaft.	Disassemble engine and renew main bearing.
	Note: This noise will be heared when clutch is disengaged.	
	Wear on clutch pilot bushing.	Renew bush and adjust drive shaft.
	Note: This noise will be heared when clutch is disengaged.	
ABNORMAL COMBUSTION (back fire, after fire run-on etc.)		
Improper ignition timing	Improper ignition timing.	Adjust ignition timing.
	Improper heat range of spark plugs.	Use specified spark plugs.

Condition	Probable cause	Corrective action
Fuel system in trouble	Damaged carburetor or manifold gasket. (back fire, after fire)	Replace them with new parts.
	Defective carburetor jet.	Disassemble carburetor and check it.
	Improper function of the float.	Adjust the level, and check needle valve.
	Uneven idling. (Run on)	Adjust.
Defective cylinder head, etc.	Improperly adjusted valve clearance.	Adjust.
	Excess carbon in combustion chamber.	Remove head and get rid of carbon.
	Damaged valve spring (backfire, afterfire).	Replace it with a new one.
Others	Malfunction of A.T.C. air cleaner.	Check for loose vacuum hoses. Replace if necessary.
	Defective carburetor water control valve.	Replace.
	Defective anti-backfire valve.	Replace.
	Defective E.G.R. control valve.	Replace.
EXCESSIVE OIL CONSUMPTION		
Oil leakage	Loose oil drain plug.	Tighten it.
	Loose or damaged oil pan gasket.	Renew gasket or tighten it.
	Loose or damaged chain cover gasket.	Renew gasket or tighten it.
	Defective oil seal in front and rear of crankshaft.	Renew oil seal.
	Loose or damaged locker cover gasket.	Renew gasket or tighten it (but not too much).
	Improper tightening of oil filter.	Renew gasket and tighten it with the proper torque.
	Loose or damaged oil pressure switch.	Renew oil pressure switch or tighten it.
Excessive oil consumption	Cylinder and piston wear.	Overhaul cylinder and renew piston.
	Improper location of piston ring gap or reversely assembled piston ring.	Remount piston rings.
	Damage piston rings.	Renew rings.
		Repair or renew piston and cylinder.
	Worn piston ring groove and ring.	Renew piston and piston ring.
	Fatigue of valve oil seal lip.	Replace seal lip with a new one.
	Worn valve stem.	Renew valve or guide.
Others	Inadequate quality of engine oil.	Use the designated oil.
	Engine overheat.	Previously mentioned.

Condition	Probable cause	Corrective action
POOR FUEL ECONOMY		
See the explanation of the power decrease		
Others	Exceeding idling revolution.	Adjust it to the designated rpm.
	Defective acceleration recovery.	Adjust it.
	Fuel leakage.	Repair or tighten the connection of fuel pipes.
TROUBLE IN OTHER FUNCTIONS		
Decreased oil pressure	Inadequate oil quality.	Use the designated oil.
	Overheat.	Previously mentioned.
	Defective function of oil pump regulator valve.	Disassemble oil pump and repair or renew it.
	Functional deterioration of oil pump.	Repair or replace it with a new one.
	Blocked oil filter.	Renew it.
	Increased clearance in various sliding parts.	Disassemble and replace the worn parts with new ones.
	Blocked oil strainer.	Clean it.
	Troubles in oil gauge pressure switch.	Replace it with a new one.
Excessive wear on the sliding parts	Oil pressure decreases.	Previously mentioned.
	Defective quality or contamination of oil.	Exchange the oil with proper one and change element.
	Defective air cleaner.	Change element.
	Overheat or overcool.	Previously mentioned.
	Improper fuel mixture.	Check the fuel system.
Scuffing of sliding parts	Decrease of oil pressure.	Previously mentioned.
	Insufficient clearances.	Readjust to the designated clearances.
	Overheat.	Previously mentioned.
	Improper fuel mixture.	Check the fuel system.

SERVICE JOURNAL OR BULLETIN REFERENCE

DATE	JOURNAL or BULLETIN No.	PAGE No.	SUBJECT