SERVICE MANUAL

DATSUN 280Z
MODEL S30 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION ET

ET

ENGINE TUNE-UP

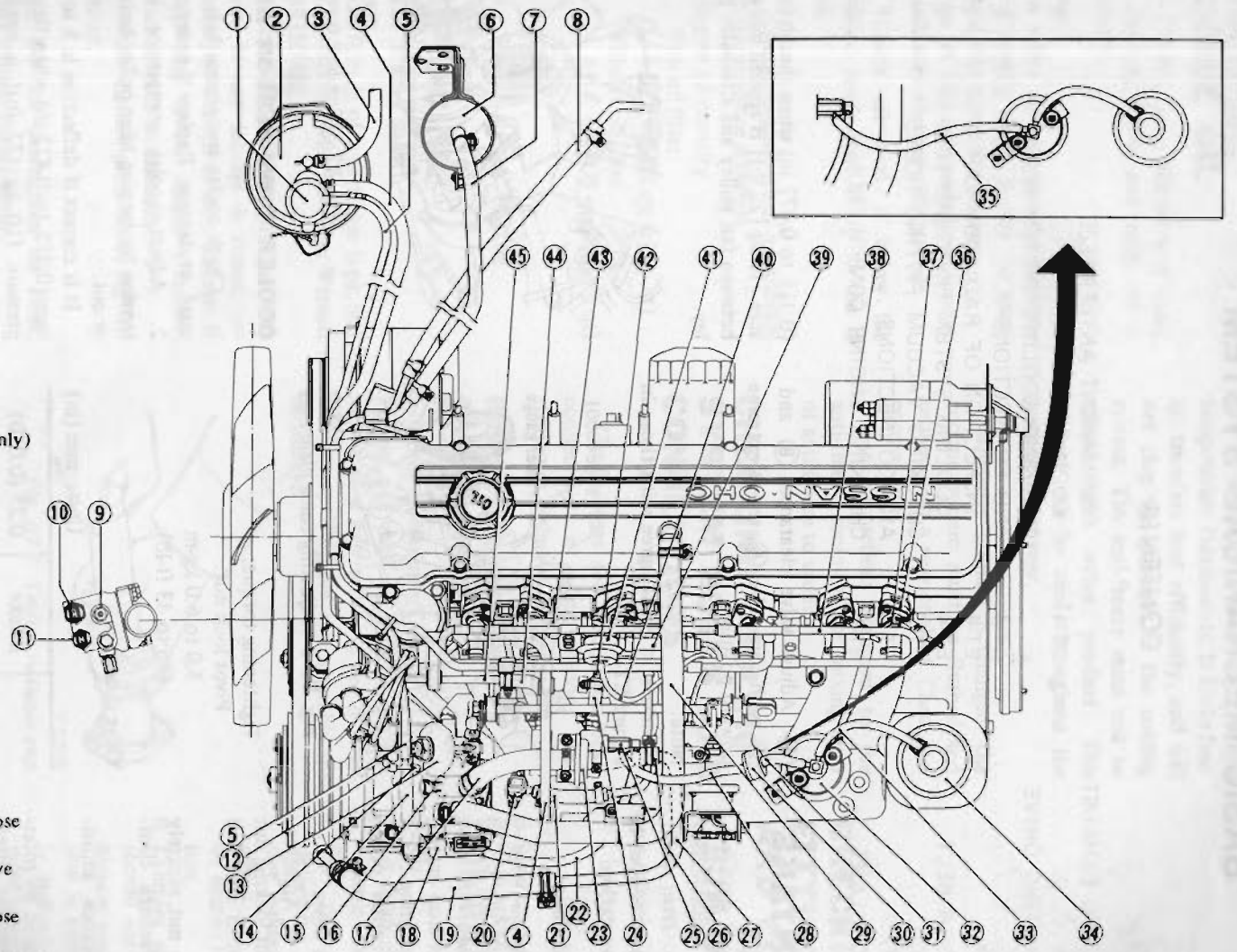
EMISSION CONTROL DEVICES

System name	Device	Engine model	L24				L28			
		Car model	810				280Z			
		Destination	Ⓒ		Ⓝ		Ⓒ		Ⓝ	
		Transmission	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T
Engine proper	Cylinder head exhaust port liner		X	X	X	X	X	X	X	X
B.C.D.D.	With altitude corrector		X	X	–	–	X	X	–	–
	Without altitude corrector		–	–	X	X	–	–	X	X
Altitude compensator (automatic)			X	X	–	–	X	X	–	–
Ignition system	Ignition transistor unit, Distributor		X	X	X	X	X	X	X	X
	T.C.S. (Top detecting switch)		X	–	X	–	–	–	–	–
E.G.R. system	E.G.R. valve (B.P.T. system)		X	X	X	X	X	X	X	X
	T.V.V. (Thermal vacuum valve-E.G.R.)		X	X	X	X	X	X	X	X
	V.D.V. (Vacuum delay valve)		X	X	–	–	X	X	–	–
Catalyzer	Catalytic converter		X	X	–	–	X	X	–	–
	Floor temperature warning system (with floor sensor)		X	X	–	–	X	X	–	–
Others	Carbon canister		X	X	X	X	X	X	X	X
	Fuel filler cap with vacuum relief valve		X	X	X	X	X	X	X	X
	P.C.V. valve		X	X	X	X	X	X	X	X
	Inhibitor switch		–	X	–	X	–	X	–	X
	Speed detecting switch		X	–	X	–	X	–	X	–

Ⓒ : California model
Ⓝ : Non-California model

Remarks:
X : Available
– : Not available

B.C.D.D.: Boost controlled deceleration device
T.C.S.: Transmission controlled vacuum advance system
V.D.V.: Vacuum delay valve
E.G.R.: Exhaust gas recirculation
B.P.T.: Back pressure transducer
T.V.V.: Thermal vacuum valve
P.C.V.: Positive crankcase ventilation



1 Purge control valve
2 Carbon canister
3 Vapor vent line
4 Canister purge line
5 Carbon canister to 3-way connector vacuum hose
6 Fuel filter
7 Fuel feed rubber hose
8 Fuel return rubber hose
9 Thermal transmitter
10 Thermotime switch
11 Water temperature sensor
12 3-way connector to distributor vacuum hose
13 Anti-stall dash pot (Manual Transmission only)
14 3-way connector to throttle chamber vacuum hose
15 Throttle chamber
16 Idle speed adjusting screw
17 Throttle chamber to air regulator rubber hose
18 Throttle valve switch
19 Air duct to air regulator pipe rubber hose
20 Cold start valve
21 Cold start valve to fuel pipe rubber hose
22 Throttle chamber to thermal vacuum valve vacuum hose
23 Air regulator
24 Heater housing to water pipe rubber hose
25 Thermal vacuum valve
26 Air regulator to air regulator pipe rubber hose
27 Air regulator pipe
*28 Thermal vacuum valve to vacuum delay valve vacuum hose
29 Throttle chamber to rocker cover rubber hose
*30 Vacuum delay valve
*31 Vacuum delay valve to B.P.T. valve vacuum hose
32 B.P.T. valve
33 B.P.T. valve to E.G.R. control valve vacuum hose
34 E.G.R. control valve
**35 Thermal vacuum valve to B.P.T. valve vacuum hose
36 Injector holder
37 Injector
38 Fuel pipe
39 Fuel pipe to pressure regulator rubber hose
40 Pressure regulator to intake manifold vacuum hose
41 Pressure regulator
42 Rubber hose to thermostat housing water pipe
43 Pressure regulator to Fuel pipe rubber hose
44 Heater housing to water pipe rubber hose
45 Rubber hose to cylinder head water pipe

* California models only
** Non-California models only

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Fig. ET-1 L28 engine system piping

BASIC MECHANICAL SYSTEM

CONTENTS

ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCE

Note:
Valve clearance adjustment cannot be made while engine is in operation.

To adjust, proceed as follows:

1. Start engine and run it until it reaches operating temperature or, at least, engine oil temperature is more than 80°C (176°F); then stop engine.
2. Rotate crankshaft to bring No. 1 cylinder to top dead center of its compression stroke.
3. Remove valve rocker cover.
4. Using Pivot Adjuster ST10640001, loosen pivot locking nut and turn pivot screw until specified clearance is obtained.

Tighten pivot locking nut securely after adjustment, and recheck clearance.

Order of valve clearance adjustments is as follows.

All valves can be adjusted by rotating crankshaft four complete turns.

Note:
When turning crankshaft with starter, remove high tension cable from ignition coil, then turn it.

(1) Adjust valve clearances ①, ③, ⑦ and ⑪ with cam lobe ① set at extreme upward position.
(2) Adjust valve clearances ④, ⑤ ⑩ and ⑫ with cam lobe ④ set at extreme upward position.
(3) Adjust valve clearances ② and ⑥ with cam lobe ② set at extreme upward position.
(4) Adjust valve clearances ⑧ and ⑨ with cam lobe ⑧ set at extreme upward position.

Note:
Numbers in circle agree with those in Figure ET-2.

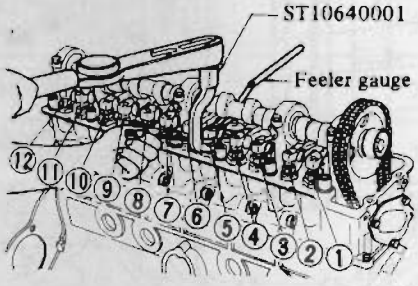

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Fig. ET-2 Adjusting valve clearance

Tightening torque:
Pivot lock nut:
5.0 to 6.0 kg-m
(36 to 43 ft-lb)

Valve clearance

Unit: mm (in)

Hot	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 lb)] is applied midway between fan pulley and alternator pulley.

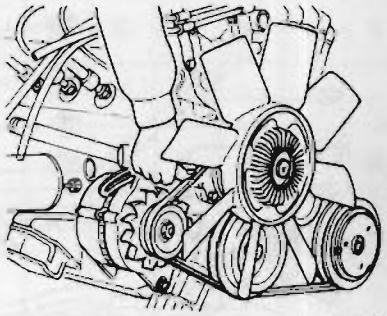
EM612

Fig. ET-3 Fan belt tension

COOLER COMPRESSOR BELT

1. Check cooler compressor belt for crack or damage. Replace if necessary.
2. Adjust cooler compressor belt tension by turning idler pulley bolt in or out.

It is correct if deflection is 8 to 12 mm (0.315 to 0.472 in) when thumb pressure [10 kg (22 lb)] is applied midway between idler pulley and cooler compressor pulley.

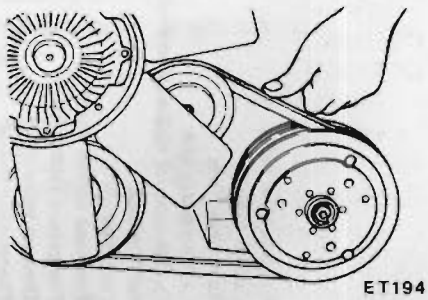
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Fig. ET-4 Cooler compressor belt tension

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.

3. Change engine oil in accordance with maintenance schedule.

Engine oil capacity
With oil filter:
4.5 ℓ (4¾ US qt, 4 Imp qt)
Without oil filter
4.0 ℓ (4¼ US qt, 3½ Imp qt)

REPLACING OIL FILTER

Oil filter is of a cartridge type, and can be removed with 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

PERMANENT ANTI-FREEZE COOLANT

Note:

The permanent anti-freeze coolant is an ethylene glycol base product containing chemical inhibitors to protect the cooling system from rusting and corrosion. The anti-freeze does not contain any glycerine or ethyl 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 anti-freeze must not be mixed with other product. This coolant can be used throughout the seasons of the year.

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

See instructions attached to the anti-freeze container for mixing ratio of anti-freeze to water.

CHECKING COOLING SYSTEM HOSES AND CONNECTIONS

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

INSPECTION OF RADIATOR CAP

Apply reference pressure [0.9 kg/cm^2 (13 psi)] to radiator cap by means of a cap tester to see if it is satisfactory. Replace cap assembly if necessary.

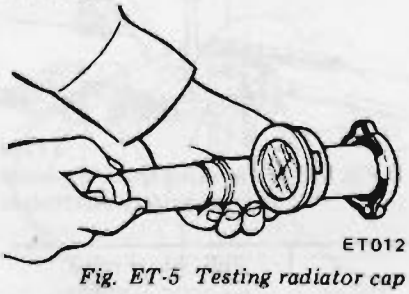


Fig. ET-5 Testing radiator cap

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 detect any leakage.

Water capacity (including heater and reservoir tank):
Manual transmission model:
10.3 liter (10⅞ U.S. qt, 9⅛ Imp. qt)
Automatic transmission model:
10.1 liter (10⅝ U.S. qt, 8⅞ Imp. qt)

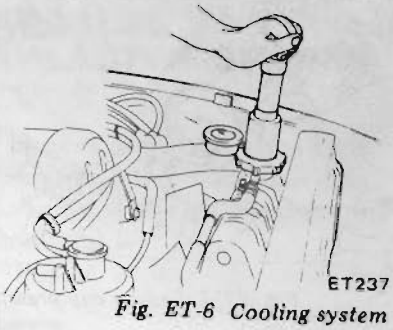


Fig. ET-6 Cooling system pressure test

CHECKING VACUUM FITTING HOSES AND CONNECTIONS

Check fittings and hoses for loose connections or damage. Retighten loose parts or replace parts that are not suitable for further use. See Figure ET-1.

CHECKING ENGINE COMPRESSION

Note:

a. **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.**
b. **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.**
c. **Low compression in cylinders can result from worn piston rings. This problem may usually be accompanied by excessive fuel consumption.**

1. Warm up engine sufficiently.
2. Disconnect all spark plugs.
3. Disconnect cold start valve and all injector connectors.
4. Properly attach a compression tester to spark plug hole in cylinder being tested.
5. Start engine as quickly as possible.

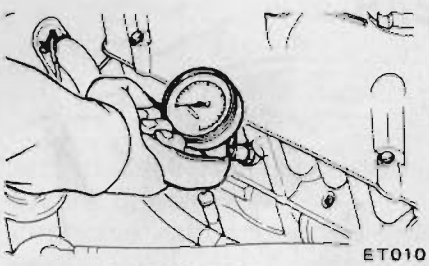


Fig. ET-7 Testing compression pressure

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 piston rings are worn or damaged.
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, there is leakage past the gasketed surface.

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

Compression pressure kg/cm^2 (psi)/at rpm:
11.5 to 12.5 (164 to 178)/ 300 to 400

IGNITION AND FUEL SYSTEM

CONTENTS

CHECKING BATTERY

1. Remove six vent plugs and check electrolyte level in each battery cell. If necessary, pour distilled water.

Fig. ET-8 Checking electrolyte level

2. Measure the specific gravity of battery electrolyte.

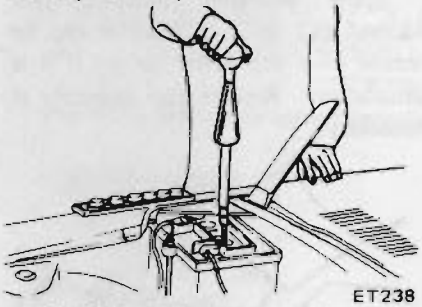


Fig. ET-9 Checking specific gravity of battery electrolyte

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

NOTE:

a. 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.
b. 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.
c. After tightening terminals, coat them with petrolatum (vaseline) to protect them from corrosion.

CAUTION:

a. If it becomes necessary to start the engine with a booster battery and jumper cables, the booster battery voltage must not exceed 12 volts, or the control unit of the fuel injection system and other electric components will be damaged.
b. If the battery cables are disconnected, they should be tightly clamped to the battery terminals to secure a good contact.

CHECKING AND ADJUSTING IGNITION TIMING

1. Check spark plugs for condition.
2. Thoroughly remove dirt and dust from crank pulley at timing mark location and front cover at timing indicator.
3. Warm up engine sufficiently.
4. Connect engine tachometer and timing light in their proper positions.
5. Adjust idling speed to 800 rpm by turning idle speed adjusting screw on manual transmission models.

On automatic transmission models, adjust it to about 700 rpm with selector lever in "D" position.

WARNING:
When selector lever is shifted to "D" position, apply parking brake and block both front and rear wheels with chocks.

6. Check ignition timing with a timing light to ensure that it is adjusted to specifications indicated in the following chart.

	Ignition timing
Manual transmission	10° B.T.D.C./800 rpm
Automatic transmission (in "D" position)	10° B.T.D.C./700 rpm

If necessary, adjust it as follows.
(1) Loosen set screw until distributor can be moved by hand.
(2) Adjust ignition timing to specifications.
(3) Lock distributor set screw, and make sure that timing is correct.

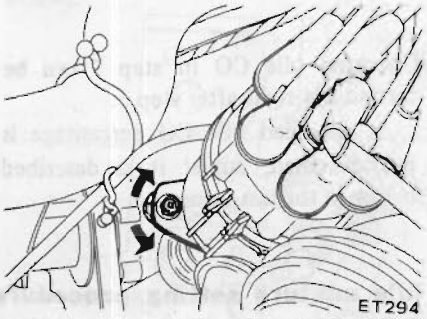


Fig. ET-10 Adjusting ignition timing

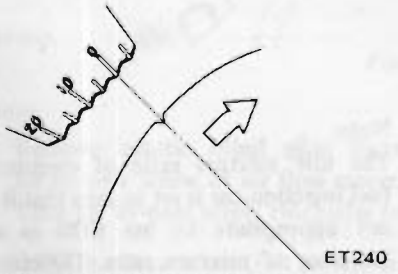


Fig. ET-11 Ignition timing indicator

CHECKING AND REPLACING SPARK PLUGS

1. Remove and clean plugs in a sand blast cleaner. Inspect each spark plug. Make sure that they are of the specified heat range.
2. Inspect insulator for cracks or chips. Check both center and ground electrodes.
3. If they are excessively worn, replace with new spark plugs.
4. Replace spark plugs in accordance with maintenance schedule.

TYPE	Standard	B6ES-11, L45W-11 BR6ES*
	Hot type	B5ES-11, L46W-11 BR5ES*
	Cold type	B7ES-11, L44W-11 BR7ES*
Plug gap	mm (in)	1.0 to 1.1 (0.039 to 0.043) 0.7 to 0.8 (0.028 to 0.031)*
Tightening torque	kg-m (ft-lb)	1.5 to 2.0 (11 to 14)

*For Canada

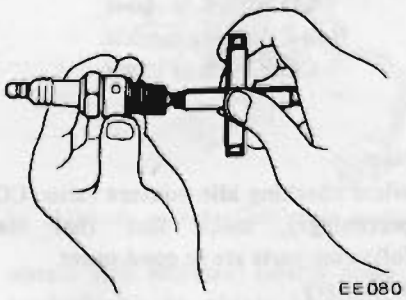


Fig. ET-12 Checking spark plug gap

2. Connect the ohmmeter between cable terminal on the spark plug side and the corresponding electrode inside cap.
3. 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.

CHECKING IGNITION WIRING

Use an ohmmeter to check resistance on high tension cables.
1. Disconnect cables from spark plugs and remove distributor together with high tension cables.

Note:
Do not remove cables from cap.

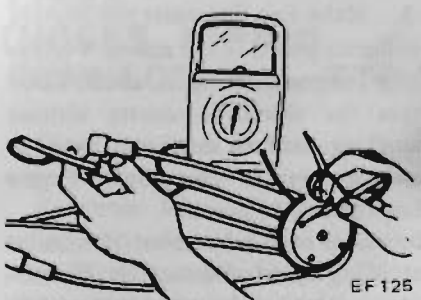


Fig. ET-13 Checking high tension cable

CHECKING AND ADJUSTING ENGINE IDLE RPM AND MIXTURE RATIO

WARNING:
a. On automatic transmission models, checks should be performed with the lever shifted to the "D" position. Be sure to engage parking brake and to lock both front and rear wheels with wheel chocks.
b. Depress brake pedal while accelerating the engine to prevent forward surge of car.
c. After idle adjustment has been made, shift the lever to the "N" or "P" position and remove wheel chocks.

Note:
In air conditioner equipped models, idle inspection should be carried out while the air conditioner is "OFF".

Note:
In air conditioner equipped models, idle inspection should be carried out while the air conditioner is "OFF".

Idle rpm adjusting and mixture ratio checking

Checking idle mixture requires the use of a CO-meter. When preparing to inspect idle mixture, it is essential to have the meter thoroughly warmed up and calibrated.

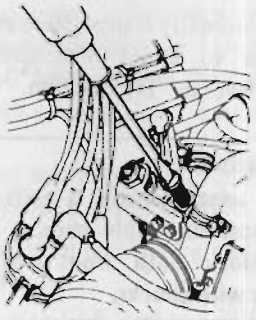
1. Warm up engine until water temperature indicator points to the middle of gauge. The procedure to warm up engine is not specifically recommended. Either driving car or operating engine at no load will be good.
2. Make sure that water temperature indicator points to the middle. Further keep engine running at about 2,000 rpm for about 5 minutes without applying load to engine in order to stabilize engine condition. Engine hood should be open.
3. Run engine for about 10 minutes at idling speed. During this 10 minutes, proceed as described in steps 4 to 6 below.
4. Race engine (1,500 to 2,000 rpm) two or three times under no load, then run engine for one minute at idling speed.
5. Check idle speed. If necessary, adjust it to specifications.

Engine speed:
Manual transmission:
800 rpm

Automatic transmission
(in "D" position):
700 rpm

6. Check ignition timing. If necessary, adjust it to specifications.

This operation need not be carried out at 1,600 km (1,000 miles) service.


ET295
Fig. ET-14 Adjusting idling speed

	Ignition timing
Manual transmission	10° B.T.D.C./800 rpm
Automatic transmission (in "D" position)	10° B.T.D.C./700 rpm

7. At about 10 minutes after engine is run, check CO percentage with CO meter. Specified CO percentage is as follows:

Idle mixture ratio (CO percentage)
California models:
CO = 0.5% or lower
Non-California models:
CO = 1.0% or lower

Note:
When checking idle mixture ratio (CO percentage), make sure that the following parts are in good order.
- **Battery**
- **Ignition system**
- **Engine oil and coolant levels**
- **Fuses**
- **Electronic fuel injection units**
- **Electronic fuel injection harness connectors**
- **Hoses**
- **Oil filler cap and oil level gauge**
- **Valve clearance, engine compression**

8. If specified idle CO percentage is not obtained, repeat procedures as described in steps 4, 5 and 7 above.

Checking idle CO in step 7 can be carried out right after step 5.

If specified idle CO percentage is not obtained, adjust it as described below in the last resort.

Idle mixture setting procedure (Idle mixture ratio adjustment)

Note:
The idle mixture ratio of electronic fuel injection car is set so lean that it is not appropriate to use CO% as an indicator of mixture ratio. Therefore, in order to adjust idle mixture ratio with conventional CO analyzer, a certain amount of enrichment must be temporarily given to idle mixture setting to make it richer.
To enrich the idle mixture, the full load enrichment is forced to function by making a short circuit in that enrichment circuit. The actual procedure to be followed is illustrated below.

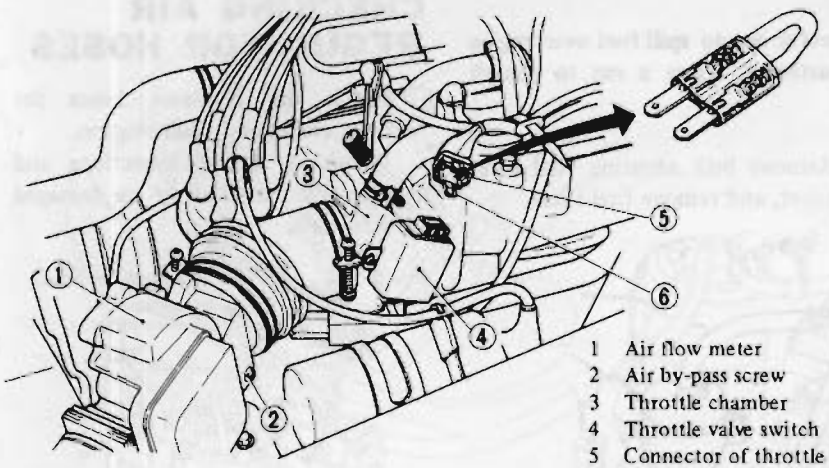


Fig. ET-15 Idle mixture ratio adjustment

1. Remove connector of throttle valve switch harness.
2. Insert a leading wire ⑥ to the No. 3 and No. 18 terminals of connector ⑤.
3. Adjust idle CO to the altitude spefications by turning air by-pass screws.

Note:
When adjusting idle CO percentage at altitudes 750 m (2,500 ft) or more for California models, be sure to disconnect altitude switch connector.

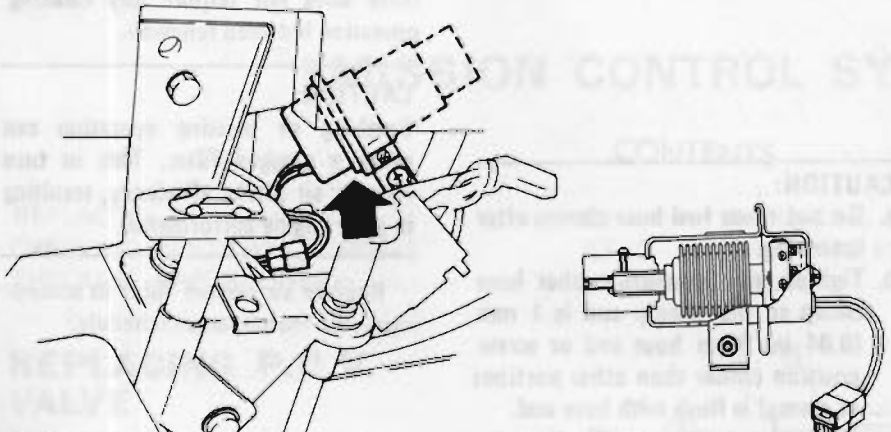


Fig. ET-16 Altitude switch (California models)

Note:

a. **Remove plastic blind plug from air by-pass screw of air flow meter.**
b. **Turn air by-pass screw clockwise to obtain rich mixture; turn it counterclockwise to obtain lean mixture.**

Idle CO specifications: (full enrichment)

Altitude	Idle CO % (full enrichment)
0 to 600 m (0 to 2,000 ft)	3.3%
600 to 1,200 m (2,000 to 4,000 ft)	4.7%
1,200 to 1,800 m (4,000 to 6,000 ft)	5.7%
Above 1,800 m (6,000 ft)	6.7%

4. Race engine (1,500 to 2,000 rpm) two or three times under no load and make sure that specified CO percentage is obtained.
5. Remove the leading wire and connect the harness back to the throttle valve switch.

Note:
After adjusting idle CO percentage for California models, replace altitude switch connector in its original position.

6. Install a new rubber plug (furnished as a service part) on air flow meter.

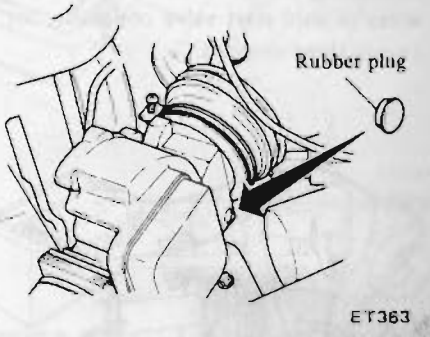


Fig. ET-17 Rubber plug

7. Check idle speed. If necessary, adjust it to specifications.
8. Check CO percentage if it is within specifications.

Idle mixture ratio (CO percentage):
California models:
CO = 0.5% or lower
Non-California models:
CO = 1.0% or lower

CHECKING FUEL LINES (HOSES, PIPING CONNECTIONS, ETC.)

Check fuel hoses for leakage, loose connections, cracks or deterioration.

Retighten loose connections and replace any damaged or deformed parts. Replace any rubber fuel hose whose inner surface is deformed, scratched or chafed. See Figure ET-1.

REPLACING FUEL FILTER

The fuel filter is designed especially for use with the electronic fuel injection system. It should be replaced as an assembly in accordance with maintenance schedule.

1. Disconnect ground cable from battery.
2. Disconnect cold start valve harness connector.
3. Using two jumper wires shown in illustration, connect each terminal to battery positive and negative terminals.
4. Release pressure in fuel system by connecting other terminals of jumper wires to cold start valve connector for two or three seconds.

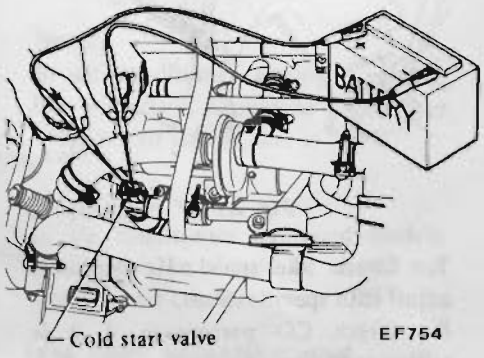


Fig. ET-18 Releasing pressure in fuel system

CAUTION:
Be careful to keep both terminals separate in order to avoid short circuit.

5. Unfasten clamps securing fuel hoses to the outlet and inlet sides of fuel filter, and disengage fuel hoses.

Note:
Be careful not to spill fuel over engine compartment. Place a rag to absorb fuel.

6. Remove bolt securing fuel filter to bracket, and remove fuel filter.

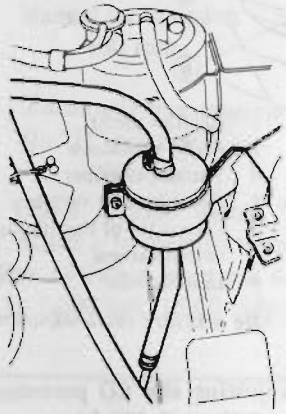


Fig. ET-19 Fuel filter

7. To install fuel filter, reverse the order of removal.

CAUTION:
a. Do not reuse fuel hose clamps after loosening.
b. Tighten high pressure rubber hose clamp so that clamp end is 1 mm (0.04 in) from hose end or screw position (wider than other portions of clamp) is flush with hose end. Tightening torque specifications are the same for all rubber hose clamps.

Tightening torque of fuel hose clamps:
0.10 to 0.15 kg-m
(0.7 to 1.1 ft-lb)

CHECKING AIR REGULATOR HOSES

Check air regulator hoses for leakage, cracks and deterioration.

Retighten loose connections and replace any parts if they are damaged or deformed.

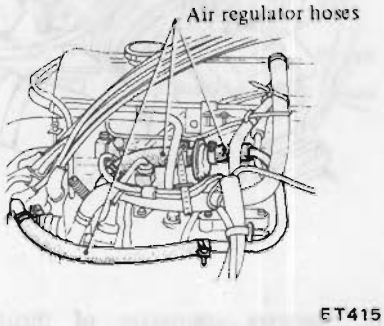


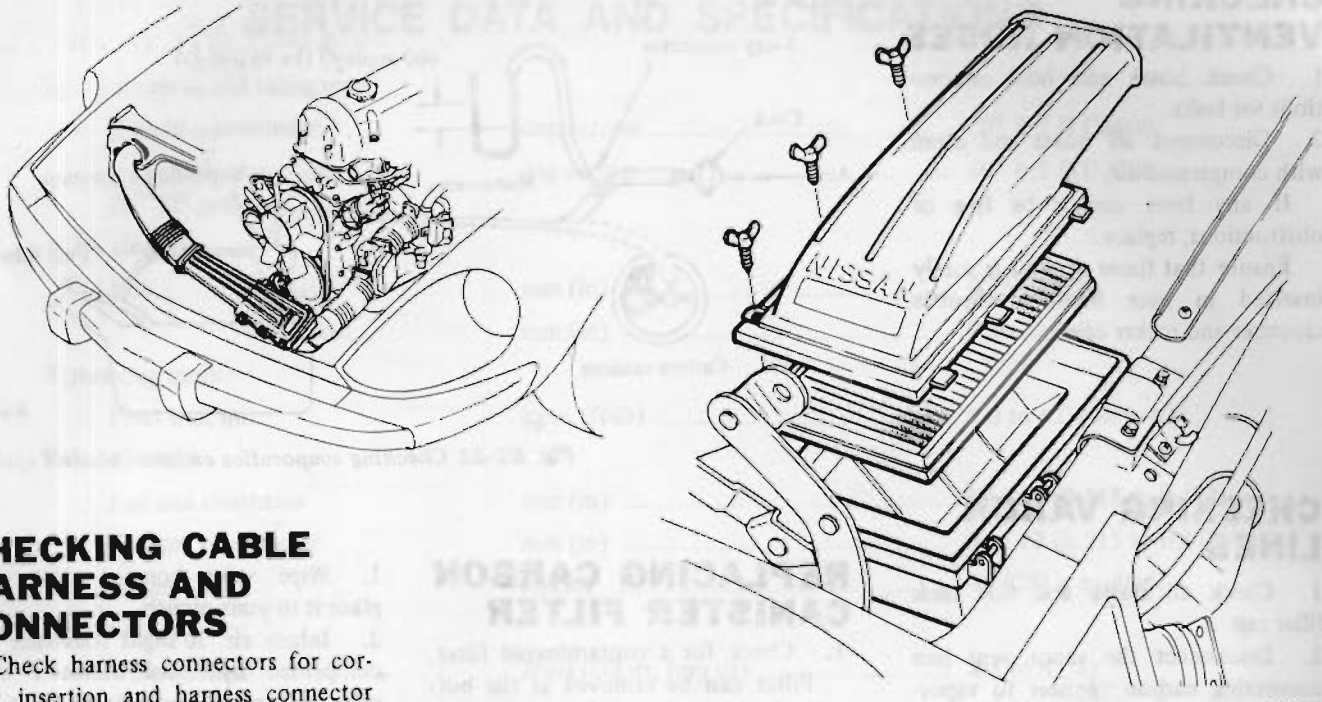
Fig. ET-20 Air regulator hoses

REPLACING AIR CLEANER FILTER

Note:
The viscous paper type air cleaner filter does not require any cleaning operation between renewals.

CAUTION:
Brushing or blasting operation can cause a clogged filter. This in turn reduces air intake efficiency, resulting in poor engine performance.

Replace air cleaner filter in accordance with maintenance schedule.



EF647

Fig. ET-21 Air cleaner filter

CHECKING CABLE HARNESS AND CONNECTORS

Check harness connectors for correct insertion and harness connector terminals for deformation or rust.

Replace faulty parts.

EMISSION CONTROL SYSTEM

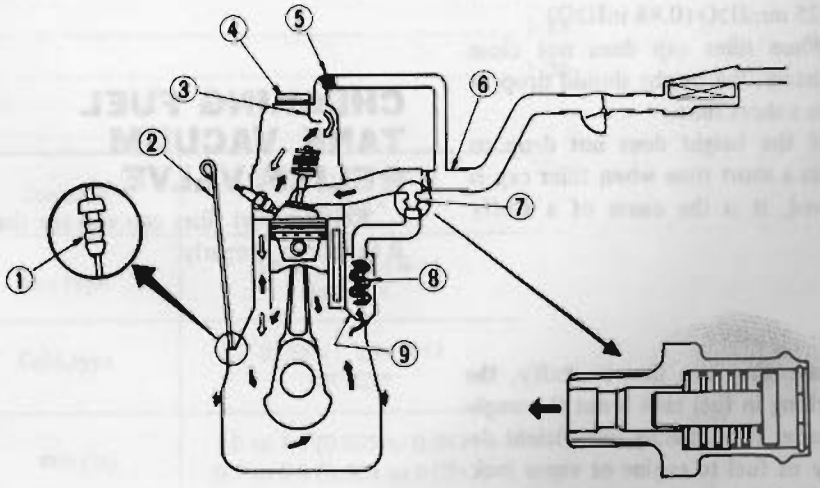
CONTENTS

REPLACING P.C.V. VALVE

1. Check 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.

2. Replace P.C.V. valve in accordance with the maintenance schedule.



⇨ Fresh air
➡ Blow-by gas

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

EC805

Fig. ET-22 Crankcase emission control system

CHECKING VENTILATION HOSES

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

If any hose cannot be free of obstructions, replace.

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

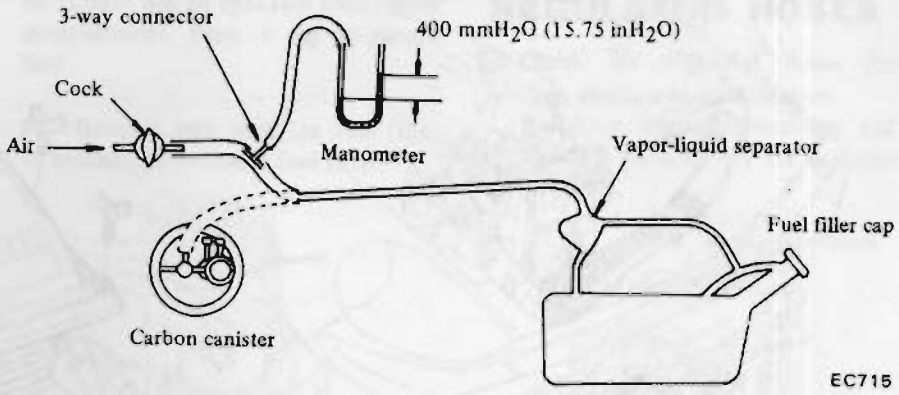


Fig. ET-23 Checking evaporative emission control system

CHECKING VAROR LINES

1. Check all hoses and fuel tank filler cap.
2. Disconnect the vapor vent line connecting carbon canister to vapor-liquid separator.
3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 400 mmH2O (15.75 inH2O).
5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation in height should remain with 25 mmH2O (0.98 inH2O).
8. When filler cap does not close completely, the height should drop to zero in a short time.
9. If the height does not drop to zero in a short time when filler cap is removed, it is the cause of a stuffy hose.

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

REPLACING CARBON CANISTER FILTER

1. Check for a contaminated filter.

Filter can be removed at the bottom of canister.

2. Replace filter in accordance with maintenance schedule.

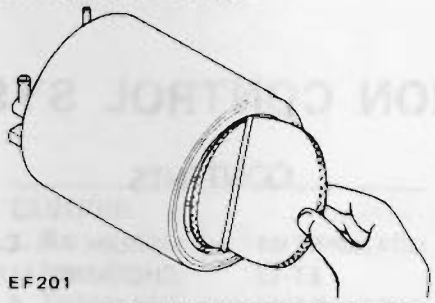


Fig. ET-24 Replacing carbon canister filter

CHECKING FUEL TANK VACUUM RELIEF VALVE

Remove fuel filler cap and see that it functions properly.

1. Wipe valve housing clean and place 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 further inhaling air, the resistance should disappear with valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembly.

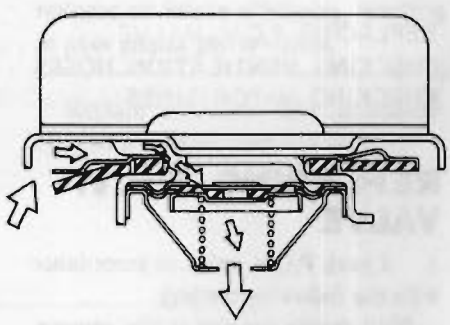


Fig. ET-25 Fuel filler cap

SERVICE DATA AND SPECIFICATIONS

Ignition timing and idling speed

Manual transmission		degree/rpm	10° B.T.D.C./800
Automatic transmission (in "D" position)		degree/rpm	10° B.T.D.C./700

Valve clearance

Hot	Intake	mm (in)	0.25 (0.010)
	Exhaust	mm (in)	0.30 (0.012)

Tightening torque

Pivot lock nut	kg-m (ft-lb)	5.0 to 6.0 (36 to 43)

Belt deflection

Fan and alternator	mm (in)	8 to 12 (0.315 to 0.472)
Air con. compressor	mm (in)	8 to 12 (0.315 to 0.472)
Pressure	kg (lb)	10 (22) is applied.

Engine oil capacity

With oil filter	liters (US qt, Imp qt)	4.5 (4¾, 4)
Without oil filter	liters (US qt, Imp qt)	4.0 (4¼, 3½)

Compression pressure at 300 to 400 rpm

Standard	kg/cm^2 (psi)	12.5 (178)
Minimum	kg/cm^2 (psi)	11.5 (164)

Cooling system

Radiator cap relief pressure	kg/cm^2 (psi)	0.9 (13)
Leakage testing pressure	kg/cm^2 (psi)	1.6 (23)

Engine coolant capacity (including heater and reservoir tank)

Manual transmission model	liters (US qt, Imp qt)	10.3 (10⅞, 9⅛)
Automatic transmission model	liters (US qt, Imp qt)	10.1 (10⅝, 8⅞)

Battery specific gravity at 20°C (68°F)

Frigid climates	1.28
Other climates	1.26

Spark plug

TYPE	Standard	B6ES-11, L45W-11 BR6ES*
	Hot type	B5ES-11, L46W-11 BR5ES*
	Cold type	B7ES-11, L44W-11 BR7ES*
Plug gap	mm (in)	1.0 to 1.1 (0.039 to 0.043) 0.7 to 0.8 (0.028 to 0.031)*
Tightening torque	kg-m (ft-lb)	1.5 to 2.0 (11 to 14)

*For Canada

Checking "CO" percentage at idling speed

California models	%	0.5 or lower
Non-California models	%	1.0 or lower

TROUBLE DIAGNOSES AND CORRECTIONS

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

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

When head lights go off or dim considerably,

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

When head lights stay bright,

a. Check wiring connection between battery and starting motor.
b. Check ignition switch.
c. Check starting 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 (0.39 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 revolution trigger signal.
e. Check cylinder compression.

No spark occurs. — Very high current. — Check the current flow in primary circuit.
Inspect primary circuit for short.
Check distributor pick-up coil operation.
Check transistor ignition system.

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	Malfunctioning distributor pick-up coil.	
	Improper air gap.	Adjust.
	Leak at rotor cap and rotor.	Clean or replace.
	Malfunctioning spark plug.	Clean, adjust plug gap or replace.
	Improper ignition timing.	Adjust.
	Malfunctioning ignition coil.	Replace.
	Disconnection of high tension cable.	Replace.
	Loose connection or disconnection in primary circuit.	Repair or replace.
	Irregular revolution trigger pulse.	Replace transistor ignition control unit.
	Malfunctioning full transistor ignition unit.	Replace.
ENGINE CRANKS NORMALLY BUT WILL NOT START		
Fuel system malfunction	Lack of fuel.	Supply.
	Damaged electronic fuel injection harness or relay.	Replace.
	Malfunctioning fuel pump (Listen to operating sound).	Replace.
	Damaged control unit.	Replace.
	Seized injector (Listen to operating sound).	Replace.
	Seized cold start valve.	Replace.
	Malfunctioning air flow meter.	Replace.
	Damaged water temp. sensor.	Replace.
		For inspection procedures for electronic fuel injection system components, refer to engine fuel section.
	Malfunctioning pressure regulator.	Replace.
	Dirty fuel filter.	Replace.
	Dirty or clogged fuel pipe.	Clean.
	Clogged fuel tank breather pipe.	Repair and clean.
Low compression	Incorrect spark plug tightening or damaged 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 damaged valve springs.	Replace valve springs.
	Compression leak at cylinder head gasket.	Replace gasket.

Condition	Probable cause	Corrective action
Low compression	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.
UNSTABLE ENGINE IDLING		
Ignition system	Incorrect idle adjustment	Adjust.
	Malfunctioning ignition system (spark plug, high tension cable, air gap, full transistor ignition unit, ignition coil, etc.)	Replace.
	Incorrect basic ignition timing.	Adjust.
Engine mechanical system in trouble	Loose manifold and cylinder head bolts.	Retighten bolts.
	Incorrect valve clearance.	Adjust.
Fuel system malfunction	Clogged air cleaner filter.	Replace filter.
	Damaged manifold gaskets.	Replace gasket.
	Intake air leakage at following points: Dipstick Oil filler cap Blow-by hoses Intake air duct–air flow meter to throttle chamber.	Repair or replace.
	Damaged electronic fuel injection harness.	Replace.
	Seized injector (Listen to operating sound).	Replace.
	Malfunctioning air regulator (During warm-up driving only)	Replace.
	Damaged control unit.	Replace.
	Damaged water and air temp. sensor.	Replace.
	Malfunctioning throttle valve switch.	Repair or replace.
	Damaged altitude switch.	Replace.
	Irregular fuel pressure.	Replace pressure regulator.
		For inspection procedures for electronic fuel injection system components, refer to Engine Fuel Section.
Others	Malfunctioning E.G.R. control valve.	Clean or replace.
HIGH ENGINE IDLE SPEED	Dragged accelerator linkage.	Check and correct accelerator linkage.
	Malfunctioning B.C.D.D. system.	If engine idling speed rises above 1,800 to 2,000 rpm, the cause may be a malfunctioning B.C.D.D. system. Check B.C.D.D. system. Repair or replace if necessary.
	Malfunctioning air regulator.	Replace. For inspection procedures for air regulator, refer to engine fuel section.

Condition	Probable cause	Corrective action
HIGH ENGINE IDLE SPEED	Incorrect adjustment of idle speed adjusting screw.	Correct. For inspection procedures, refer to throttle chamber section.
ENGINE POWER NOT UP TO NORMAL		
Low compression		Previously mentioned.
Ignition system in trouble	Incorrect ignition timing.	Adjust.
	Malfunctioning spark plugs.	Clean, adjust or replace plugs.
	Malfunctioning distributor pick-up coil.	Dress, or replace points. Also check condenser.
ENGINE POWER BELOW NORMAL		
Fuel system malfunction	Throttle valve does not open fully.	Adjust.
	Damaged electronic fuel injection harness.	Replace.
	Seized injector (Listen to operating sound).	Replace.
	Malfunctioning air flow meter.	Replace.
	Malfunctioning throttle valve switch.	Repair or replace.
		For inspection procedures for electronic fuel injection system components, refer to Engine Fuel Section.
	Irregular fuel pressure.	Replace pressure regulator if necessary.
	Clogged fuel pipe.	Replace if necessary.
	Dirty or clogged fuel filter.	Replace.
	Fuel pump will not work properly.	Replace.
Air intake system malfunction	Clogged air cleaner filter.	Replace filter.
	Air leaking from manifold gasket.	Replace gasket.
	Intake air leakage at following points: Dipstick Oil filler cap Blow-by hoses Intake air duct—air flow meter to throttle chamber etc.	Repair or replace.
Overheating	Insufficient coolant.	Replenish.
	Loose fan belt.	Adjust fan belt.
	Worn or damaged fan belt.	Replace.
	Malfunctioning thermostat.	Replace.
	Malfunctioning water pump.	Replace.
	Clogged or leaky radiator.	Flush, repair or replace.
	Malfunctioning 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.

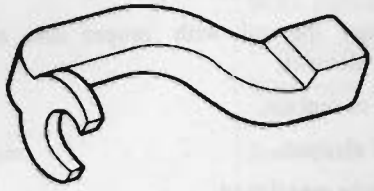
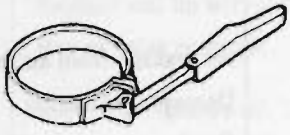
Condition	Probable cause	Corrective action
Overcooling	Malfunctioning thermostat.	Replace.
Others	Improper octane fuel.	Replace with specified octane fuel.
	Improper tire pressure.	Inflate to specified pressure.
	Dragging brake.	Adjust.
	Clutch slipping.	Adjust.
NOISY ENGINE		
Car knocking	Overloaded 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.
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 diminishes almost completely, this crankshaft bearing generates the noise.	Same as the case of crankshaft bearings.
Piston and cylinder noise.	When you hear an overlapping metallic 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.
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.

Condition	Probable cause	Corrective action
Others.	**Note: This noise will be heared when clutch is disengaged.**	
	Wear on clutch pilot bushing.	Renew bushing and adjust drive shaft.
	Note: This noise will be heared when clutch is disengaged.	
ABNORMAL COMBUSTION (backfire, after fire run-on etc.)		
Improper ignition timing	Improper ignition timing.	Adjust ignition timing.
	Improper heat range of spark plugs.	Use specified spark plugs.
Fuel stem malfunction	Intake air leakage at following points: Dipstick Oil filler cap Blow-by hoses Intake air duct–air flow meter to throttle chamber etc.	Repair or replace.
	Damaged electronic fuel injection harness.	Replace. } For inspection procedures for electronic fuel injection system components, refer to Engine Fuel Section.
	Damaged control unit.	Replace.
	Malfunctioning air flow meter.	Replace.
	Damaged water temp. sensor.	Replace.
	Damaged altitude switch.	Replace.
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, after fire).	Replace it with a new one.
Others		Check for loose vacuum hoses. Replace if necessary.
	Malfunctioning 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.
	Damaged 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.

Condition	Probable cause	Corrective action
Excessive oil consumption	Cylinder and piston wear.	Overhaul cylinder and renew piston.
	Improper location of piston ring or reversely assembled piston ring.	Remount piston rings.
	Damaged 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.
POOR FUEL ECONOMY		
Ignition system		
See the explanation of the power decrease		
Others	Exceeding idling revolution.	Adjust it to the designated rpm.
		Repair or tighten the connection of fuel pipes.
Emission control system	Malfunctioning E.G.R. system.	Replace.
Fuel system malfunction	Fuel leakage.	Repair or replace.
	Damaged electronic fuel injection harness.	Replace. } For inspection procedures for electronic fuel injection system components, refer to Engine Fuel Section.
	Damaged control unit.	Replace.
	Malfunctioning air flow meter.	Replace.
	Damaged air temperature sensor.	Replace.
	Malfunctioning throttle valve switch.	Replace.
	Fuel leakage at injector or cold start valve.	Replace damaged part.
	Fuel leakage at rubber fuel hose.	Repair or replace.
	Irregular fuel pressure.	Replace pressure regulator if necessary.
TROUBLE IN OTHER FUNCTIONS		
Decreased oil pressure	Inadequate oil quality.	Use the designated oil.
	Overheat.	Previously mentioned.
	Malfunctioning 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.

Condition	Probable cause	Corrective action
Decreased oil pressure	Increased clearance in various sliding parts.	Disassemble and replace the worn parts with new ones.
	Blocked oil strainer.	Clean it.
	Malfunctioning oil gauge pressure switch.	Replace it with a new one.
Excessive wear on the sliding parts	Oil pressure decreases.	Previously mentioned.
	Damaged quality or contamination of oil.	Exchange the oil with proper one and change element.
	Air leakage from air intake duct.	Repair or replace.
	Damaged 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.

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
ST10640001 Pivot adjuster 	J 25615-01 / Fig. ET-2	ST19320000 Oil filter wrench 	J 25664 / Page ET-5