SERVICE MANUAL

MODEL
L14, L16 & L18 SERIES
ENGINES

SECTION ET

ENGINE TUNE-UP

ET

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

ENGINE TUNE-UP

CONTENTS

GENERAL DESCRIPTION

A minor tune-up consists of testing battery, cleaning, regapping or replacing, if required, spark plugs and distributor points; adjusting distributor dwell angle, ignition timing, carburetor idle mixture, and hot idle speed.

The complete or major tune-up procedure consists of these basic items plus other ignition, compression, electrical and carburetor checks, and a final road test to ensure continued trouble-free operation.

BASIC PROCEDURE

Connect tune-up equipment

Follow manufacturer recommendations for the use of testing equipment. Figure ET-1 shows a basic schematic for instrumentation which will apply to many types of test equipment and may be used as a rough guide if equipment manufacturer's instructions are not available.

Connections shown in Figure ET-1 are made as follows:

1. Voltmeter
(1) Positive lead to resistor side of coil.
(2) Negative lead to ground.
2. Timing light
(1) Positive lead to positive battery terminal.
(2) Negative lead to ground.
(3) Trigger lead to number 1 spark plug.
3. Tachometer
(1) Positive lead to distributor side of coil.
(2) Negative lead to ground.

Note: Attach pick-up to either number one or four spark plug.

4. Dwell meter
(1) Positive lead to distributor side of coil.
(2) Negative lead to ground.

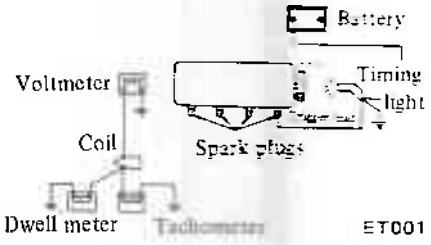

Fig. ET-1 Simple schematic of tune-up instrumentation

Battery inspection

Standard type

Check the electrolyte level in each battery cell once a month.

1. Unscrew each filler cap and inspect fluid level. If the fluid is low, add distilled water to bring the level up approximately 5 mm (0.2 in) above the plates. Do not overfill.
2. Measure the specific gravity of battery electrolyte.

Fig. ET-2 Checking the specific gravity of battery electrolyte

Self-filling battery

In case of self-filling battery.

1. Remove filler cap and inspect the float position. If the float is lower than the normal condition, add distilled water into case attached on battery upper face. The fluid will be equally self-filled for each cell.

After replenishing, install filler cap. Do not overfill over the projections.

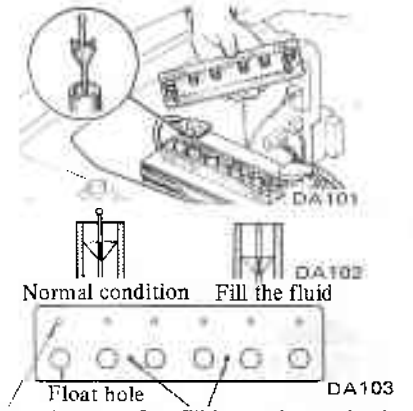

Fig. ET-3 Checking electrolyte level

2. Measure the specific gravity of battery electrolyte as shown in Figure ET-2.

	Permissible value	Fully charged 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 the top of battery and terminals with a solution of baking soda and water. Rinse off and dry with compressed air. The 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 the top of battery may cause corrosion of straps. After tightening terminals, coat them with petrolatum (vaseline) to protect them from corrosion.

Spark plugs-remove and recondition

See that correct spark plugs are used. Spark plug insulators should be thoroughly cleaned to prevent possible flash-over.

Thoroughly clean lower insulator and cavity by blast type cleaner. File both electrodes flat (rounded surfaces increase voltage required to fire plugs) and set gap to 0.8 to 0.9 mm (0.031 to 0.035 in). Tighten plugs to 1.5 to 2.0 kg-m (11.0 to 15.0 ft-lb) torque.

Distributor points cleaning and adjustment

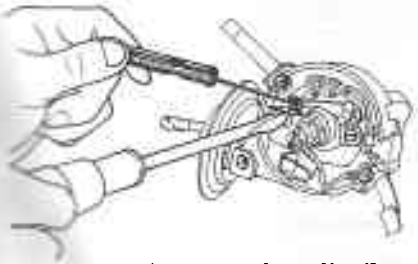

Fig. ET-4 Checking distributor point gap

Remove distributor cap and inspect points for excessive burning or pitting. Replace points if necessary. Use a point file to clean contact area and remove scale from points. Adjust distributor point gap to 0.45 to 0.55 mm (0.0177 to 0.0217 in). Filing is for cleaning purposes only. Do not attempt to remove all roughness. Apply a trace of bearing lubricant to the breaker cam. Adjust distributor dwell angle to 49 to 55 degrees on all engines.

Ignition timing setting

With distributor vacuum line disconnected and vehicle operating at normal idle speed or below, set ignition timing.

The timing can be observed by the stationary markings at front cover and a groove on crankshaft pulley with a device called a stroboscopic light (also referred to as a timing light).

Note that the front cover markings is graduated 5° per scale division in terms of the crank angle. The top dead center is located to the extreme right as viewed from the inspector's side.

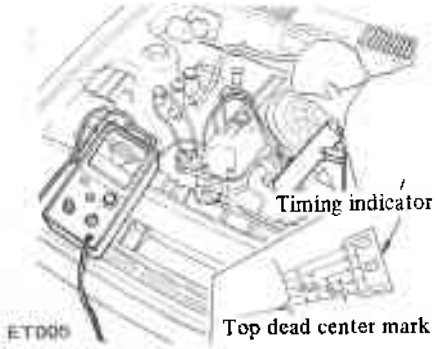

Fig. ET-5 Checking ignition timing

Adjust the timing to the specifications, turning distributor body loosened securing bolts.

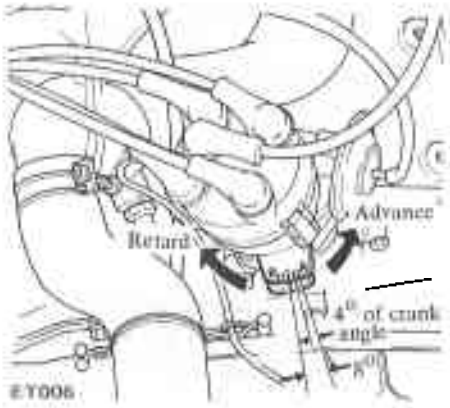

Fig. ET-6 Adjusting ignition timing

Ignition timing

	L14	L16 and L18	L16 and L18
	Single Carb.	Single Carb.	Twin Carb.
Manual transmission	8°/600 rpm	10°/600 rpm	14°/650 rpm
Automatic transmission	—	10°/650 rpm	14°/700 rpm

Fan belt inspection

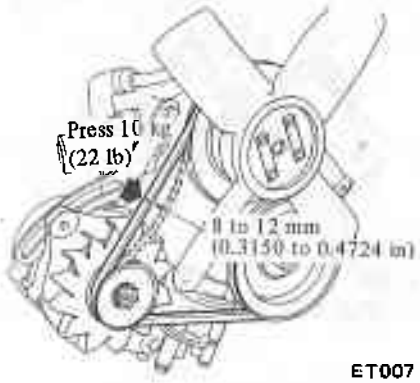

Fig. ET-7 Fan belt tention

1. Check for a cracked or damaged V-belt. Replace if defective.
2. Adjust belt tension, if necessary.

Belt tension is correct if belt can be depressed 8 to 12 mm (0.315 to 0.472 in) midway between fan pulley and alternator pulley by a force 10 kg (22.0 lb).

Engine oil inspection

Oil capacity of engine (including oil filter)

	L14, L16 and L18
Maximum (H level)	4.3 ℓ (4 ½ U.S. qts., 3 ¾ Imper. qts.)
Minimum (L level)	3.3 ℓ (3 ½ U.S. qts., 2 ⅞ Imper. qts.)

1. Check if engine oil has been deteriorated by invading cooling water or gasoline. Drain and refill oil, if necessary.

Notes:

a. A milky oil indicates the presence of cooling water.
Discover the cause for necessary measure.

b. An oil with extremely low viscosity suggests dilution with gasoline.

2. Check oil level, and if it is below the specified level, replenish oil of the same grade up to the H level.

Fig. ET-8 Checking engine oil level

Carburetor overhaul and adjustment

Overhaul

The detailed information for carburetor overhauling is outlined in section EF (ENGINE FUEL SYSTEM).

Overhaul carburetor assembly by referring to section EF.

Adjustment

Adjust carburetor idle speed and mixture to the following specifications.

For details, refer to section EF (ENGINE FUEL SYSTEM).

Engine idling

	L14	L16 and L18	L16 and L18
	Single Carb.	Single Carb	Twin Carb.
Manual transmission rpm	600	600	650
Automatic transmission rpm	–	650	700
Engine manifold at idle speed mmHg/rpm	450/600	450/600	400/650

Valve clearance adjustment

This adjustment is impossible when the engine is in operation. Follow the procedure described below:

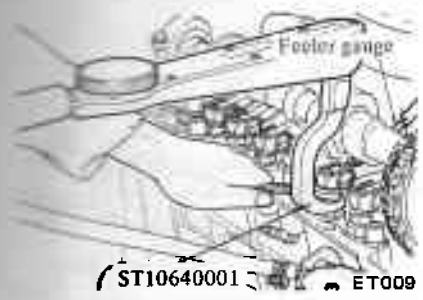

Fig. ET-9 Adjusting valve clearance

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

Using service tool, tighten pivot locking nut securely after adjustment, and recheck the clearance.

2. Warm up engine, and stop it. Then, measure the warm engine valve clearance in the same manner as above. If it deviates from the given warm-engine valve setting value, make necessary adjustment.

Valve clearance

Valve clearance mm (in)	Cold	Intake	0.20 (0.0079)
		Exhaust	0.25 (0.0098)
	Warm	Intake	0.25 (0.0098)
		Exhaust	0.30 (0.0118)

ADDITIONAL PROCEDURE

For diagnosis purposes, it is sometimes necessary to proceed further than the basic tune-up procedure. The following steps plus a road test are included in a complete or major tune and test procedure.

Compression pressure-test each cylinder

Note: If this test is to be performed, it should be done when plugs are removed for service during basic tune-up procedure.

Unless checking for worn rings or for the cause of low speed miss, compression check should not be necessary.

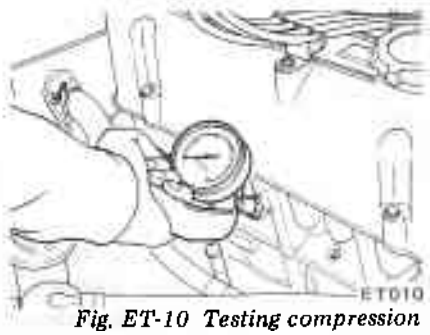

Fig. ET-10 Testing compression pressure

Test compression with engine warm, all spark plugs removed and throttle and choke opened. No cylinder compression should be less than 80% of highest cylinder's. Excessive variation between cylinders, accompanied by low speed missing of the cylinder or cylinders which are low, usually indicates a valve not properly seating or a broken piston ring. Low pressures, even though uniform, may indicate worn rings. This may be accompanied by excessive oil consumption.

Test conclusion

If one or more cylinders read low, inject about one tablespoon of engine oil on top of the pistons in low reading cylinders through spark plug port. Repeat compression check on these cylinders.

1. If compression improves considerably, piston rings are defective.
2. If compression does not improve, valves are sticking or seating properly.
3. If two adjacent cylinders indicate low compression and injecting oil on pistons does not increase compression, the cause may be a cylinder head gasket leak between the cylinders. Engine oil and coolant in cylinder could result from this problem.

Compression pressure kg/cm^2 (lb/sq in) at rpm

	L14, L16 and L18	L16 and L18
	Single Carb.	Twin Carb.
Standard	12.0 (171)/350	12.5 (178)/350
Minimum	9.0 (128)/350	9.0 (128)/350

High tension wires, distributor cap and rotor cleaning and inspection

Note: This operation is to be performed while checking distributor points during the basic tune-up procedure. 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 were 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.

Distributor lubricate

Slightly apply multi-purpose grease on cam lobes when servicing.

Intake manifold and carburetor attaching nuts tightening

Bolts and nuts retaining intake manifold to engines should be tightened to proper torque. Nuts attaching carburetor should be tightened securely. Leaks at these areas can cause rough idle, surging, deceleration popping or deceleration whistle.

Oil filter inspection

1. Check for oil leaks at packing flange. If any leakage is discovered, tighten it a little, or replace oil filter assembly. Do not overtighten.
2. Replace filter at the first oil change.
3. Then replace filter every 10,000 km (6,000 miles) running.

Air cleaner inspection

Viscous type element makes cleaning unnecessary until the engine used for two years, or for 40,000 km (24,000 miles) running; more often under dusty driving conditions.

Fuel strainer inspection

Check for a contaminated element, and water deposit.

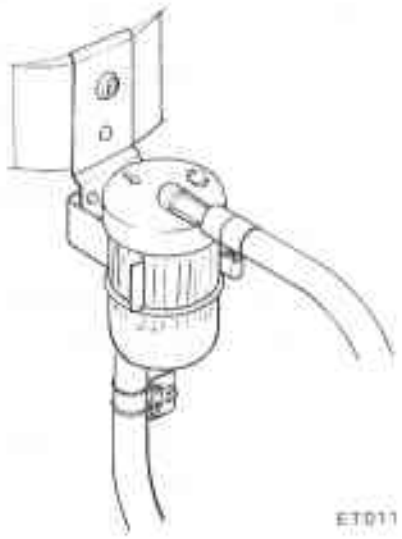

Fig. ET-11 Fuel strainer

All engines use a cartridge type strainer, so if the malfunction is detected, replace as an assembly.

Cooling system inspection

Inspection of radiator cap

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

Fig. ET-12 Testing radiator cap

Cooling system pressure test

With radiator cap removed, apply reference pressure [1.6 kg/cm^2 (22.8 sq in)] to the cooling system by means of a tester to check for leaks at system components. Water capacity 6.0 ℓ (6 3/8 U.S. qts., 5 1/4 Imper. qts.) less heater.

Fig. ET-13 Testing cooling system pressure

SERVICE DATA AND SPECIFICATIONS

Battery specific gravity

	Permissible value	Fully charged 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

Spark plug gap	mm (in)	0.8 to 0.9 (0.031 to 0.035)
Spark plug tightening torque	kg-m (ft-lb)	1.5 to 2.0 (11.0 to 15.0)
Distributor point gap	mm (in)	0.45 to 0.55 (0.0177 to 0.0217)

Ignition timing

	L14	L16 and L18	L16 and L18
	Single carb.	Single carb.	Twin carb.
Manual transmission	8°/600 rpm	10°/600 rpm	14°/650 rpm
Automatic transmission	—	10°/650 rpm	14°/700 rpm

Fan belt tension — mm (in)/kg (lb) ..... 8 to 12 (0.315 to 0.472)/10 (22)

Engine oil capacity (including oil filter)

	L14, L16 and L18
Maximum (H level)	4.3 ℓ (4 ½ U.S. qts., 3 ¾ Imper. qts.)
Minimum (L level)	3.3 ℓ (3 ½ U.S. qts., 2 ⅞ Imper. qts.)

ENGINE TUNE-UP

Engine idling speed

	L14	L16 and L18	L16 and L18
	Single carb.	Single carb.	Twin carb.
Manual transmission rpm	600	600	650
Automatic transmission rpm	—	650	700
Engine manifold vacuum at idling speed mmHg (inHg)/rpm	450 (17.7)/600	450 (17.7)/600	400 (15.7)/650

Valve clearance

Cold:

Intake	mm (in)	0.20 (0.0079)
Exhaust	mm (in)	0.25 (0.0098)

Warm :

Intake	mm (in)	0.25 (0.0098)
Exhaust	mm (in)	0.30 (0.0118)

Compression pressure kg/cm^2 (lb-in^2) at rpm

	L14, L16 and L18	L16 and L18
	Single carb.	Twin carb.
Standard	12.0 (171)/350	12.5 (178)/350
Minimum	9.0 (128)/350	9.0 (128)/350

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 starter 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 starter 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.	Replace element.
	Defective manifold gaskets or carburetor insulator.	Replace gasket or insulator.
	Improper float level adjustment.	Adjust.
Low compression		Previously mentioned.
Others	Incorrect valve clearance.	Adjust.
	Extremely low revolution.	Adjust.
	Poor acceleration above 1,000 rpm (Twin carb.)	Loosen idling adjusting nuts about a half turn.
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.

Condition	Probable cause	Corrective action
	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.
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.
Others.	An improper adjustment of valve clearance.	Adjust.
	Noise of timing chain.	Adjust the tension of chain.

Condition	Probable cause	Corrective action
Others.	An excessive end-play on crankshaft. **Note: This noise will be heared when clutch is disengaged.**	Disassemble engine and renew main bearing.
	Wear on clutch pilot bushing. **Note: This noise will be heared when clutch is disengaged.**	Renew bush and adjust drive shaft.
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.
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 (back fire, after fire).	Replace it with a new one.
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.

Condition	Probable cause	Corrective action
Others	Inadequate quality of engine oil.	Use the designated oil.
	Engine overheat.	Previously mentioned.
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.
	Poor fuel economy (Twin carb.)	Tighten idling adjusting nuts a quarter to a half turn.
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.