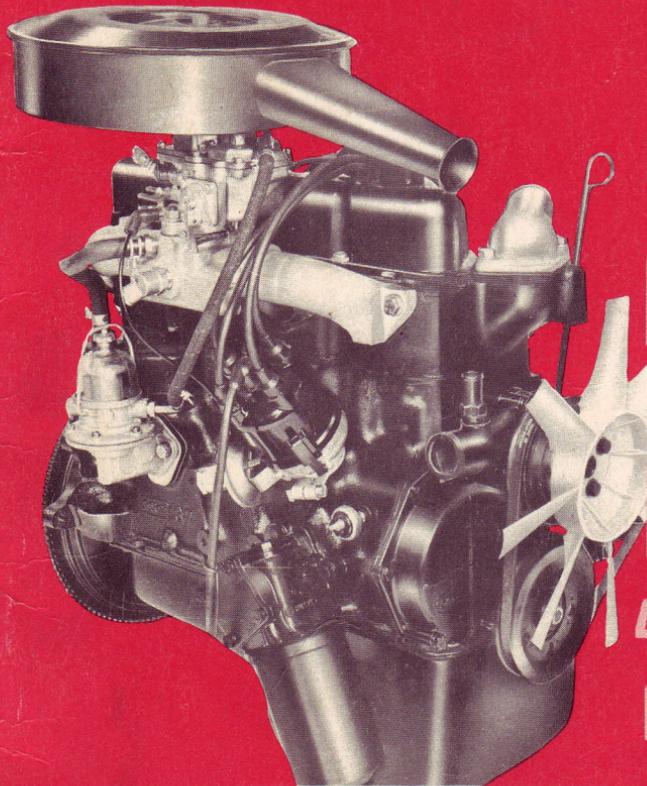


ENGLISH TEXT

OPERATORS INSTRUCTION BOOK

2250 RANGE

4 CYLINDER PETROL
INDUSTRIAL ENGINES



POWER BY 

MANUFACTURED IN ENGLAND BY FORD MOTOR COMPANY LIMITED

OWNER'S INSTRUCTION BOOK

FORD 2250 RANGE PETROL INDUSTRIAL ENGINES

2251.E :- 67.0 cu. in.—1098 cc.

2252.E :- 79.2 cu. in.—1297 cc.

2253.E High Performance (G.T.) :- 79.2 cu. in.—1297 cc.

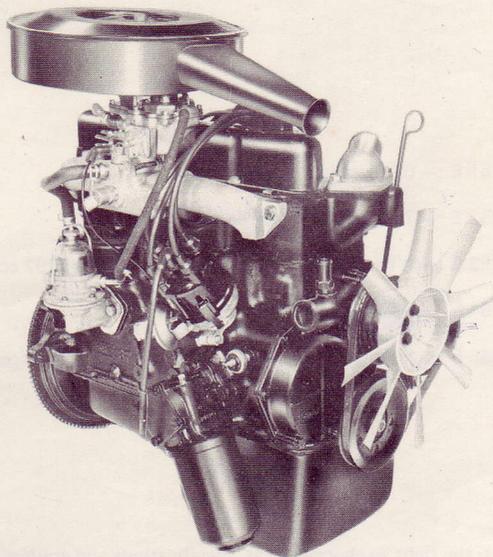
(2254.E :- 97.6 cu. in.—1599 cc.)

2255.E High Performance (G.T.) :- 97.6 cu. in.—1599 cc.

Ford policy is one of continuous improvement, the right to change prices, specifications and equipment at any time without notice is reserved.

Reproduction in any manner, in whole or in part, prohibited without the express permission in writing of Ford Motor Company Ltd., 88, Regent Street, London, W.1, England.

AN ENGINE FROM THE 2250E RANGE



2254E (1600 cc.)
Industrial Engine

FOREWORD

The information in this Handbook should be studied carefully. In it you will find instructions for starting, running in, general operation and maintenance.

The life of your engine unit will depend upon the care it received. It is the operator's responsibility to ensure that the maintenance operations outlined in this book are regularly carried out when the specified hours of operation have been reached.

CONTENTS

	Page		Page
Before Operation	4	General Maintenance	
Running In	4	Cooling System	20
Starting the Engine	5	Lubrication System	21
Lubrication and Maintenance	6	Engine Fault Finding Charts	22
Service Schedule	7	Specification	24
Regular Maintenance Operations	10-19		

BEFORE OPERATION

Before operating a new engine it should be thoroughly inspected to ensure that during transit and installation it has not suffered damage likely to affect its subsequent operation. Controls and instruments should be studied carefully in order that their functions may be thoroughly understood.

Open the cooling system drain cocks and flush the cooling system with clean water. Close the drain cocks and fill the cooling system, preferably with soft water, to minimize depositing. Where freezing is anticipated anti-freeze should be added to the systems as outlined later in this handbook.

Fill the engine sump to the full mark on the dipstick with the correct grade of lubricant. Use only high grade lubricants. 'Cheap' lubricants may prove more costly in the long run.

Where an oil bath air cleaner is fitted fill to the correct level with a light engine oil.

Ensure that the battery is topped up and fully charged.

RUNNING IN

Do not operate your new engine on full load or at high speeds immediately otherwise excessive wear or damage may result.

The following table will serve as a guide to running-in procedures.

Operating Time	Load Conditions
First 3 hours	1/4 load maximum
Next 4 hours	1/2 load maximum
Next 4 hours	3/4 load maximum
After 15 hours	Gradual increase to Full load

When the first 15 hours have been completed, drain the oil whilst the engine is hot and re-fill to the 'FULL' mark on the dipstick. Also tighten the cylinder head bolts to the specified torque and then adjust the valve clearances.

STARTING THE ENGINE

To Start from Cold

1. Open the fuel tank tap.
2. Pull out the choke control to the half-way position and ensure that the throttle or governor control is closed. Only in extremely cold weather need the choke control be pulled right out, and it must be returned to the half-way position as soon as the engine begins to 'hunt' due to an over rich mixture.
3. Close the radiator shutters (if fitted).
4. Switch on the ignition and operate the starter motor. Release the key immediately the engine fires. Push in the choke control as far as possible, but avoid stalling the engine.
5. Allow the engine to idle until warm enough for the choke control to be pushed fully in. If the engine runs irregularly, ease out the choke control again until the operating temperature is sufficiently high for normal running then release.

To Restart when Warm

1. Open the throttle or governor control slightly.
2. Switch on the ignition and operate the starter motor. Release the key immediately the engine fires. If, however, the engine fails to start use the choke control as for normal cold starting.

To Stop

1. Switch off the engine by means of the ignition key.

If the halt is likely to be of some duration the fuel should be turned off at the fuel tank.

NOTE: Do not operate the engine at full speed and/or power immediately from cold—these should be progressively built up.

LUBRICATION AND MAINTENANCE

The importance of correct lubrication, periodic inspection and adjustment cannot be over-emphasised. On it will depend, to a very large extent, the service which the engine will give.

Regular attention to the points mentioned in the next few pages will be amply repaid in long life, reliability and freedom from repair.

Your Authorised Ford Dealer is equipped with specialised equipment and highly trained mechanics and he will be pleased to advise you of the maintenance schemes available.

For convenience, lubrication and maintenance work has been divided into the following periods:-

AUTOMOTIVE USE

INDUSTRIAL USE

A Daily	Daily or Twice Daily as necessary
B at first 600 mls. (1,000 km)	at first 15 hours running
C Weekly	every 50 hours running
D at first 3,000 mls. (5,000) km or 3 months—whichever is reached first	at first 100 hours running

and

and

every subsequent 6,000 mls. (10,000 km)

every subsequent 200 hours running

SERVICE SCHEDULE

SERVICE SCHEDULE

	Automotive	Industrial	Item No.
A	Daily	Daily or twice daily as necessary	1. Check and top up engine oil level. 2. Check and top up radiator level.
B	At first 600 mls. (1,000 km)	At first 15 hours running	3. Tighten cylinder head bolts to the correct torque and check security of manifold bolts. 4. Tighten sump retaining bolts. 5. Check radiator hoses and clips. 6. Check for water and oil leaks. 7. Adjust distributor points and clean cap. 8. Clean sediment from fuel filter. 9. Check and adjust valve clearances. 10. Adjust fan belt tension and tighten generator mounting bolts. 11. Adjust carburettor and ignition. (road test where automotive).
C	Weekly	every 50 hours running	12. Check and top up battery electrolyte level.

SERVICE SCHEDULE

Automotive	Industrial	Item No.
<p>D At first 3000 mls. (5,000 km) or 3 months—whichever is reached first</p> <p style="text-align: center;">and</p> <p>every subsequent 6000 mls. (10,000 km)</p>	<p>At first 100 hours running</p> <p style="text-align: center;">and</p> <p>every subsequent 200 hours running.</p>	<p>Items 7, 8, 9, 10, 11 plus</p> <p>13. Change engine oil and renew oil filter element.</p> <p>14. Clean oil filler cap.</p> <p>15. Lubricate generator rear bearing and distributor.</p> <p>16. Clean sparking plugs and set gaps, renew plugs as necessary.</p> <p>17. Clean air filter—renew element where applicable.</p> <p>18. Check battery condition and connections.</p> <p>19. Clean crankcase emission valve (where fitted.)</p>

The above Service Schedule gives the maximum recommended service periods. Since operating conditions can vary, it may be found advisable to carry out some operations, for example, changing the engine oil at an interim period. Your operating experience is the best guide for determining this time.

NOTE: If a gearbox is fitted, the level should be topped up after the first 600 mls. (1,000 km)—15 hours running, and after every subsequent 6,000 mls. (10,000 km)—200 hours running. The oil should be changed after the first 3,000 mls. (5000 km)—100 hours running.

REGULAR MAINTENANCE OPERATIONS

DAILY ATTENTION

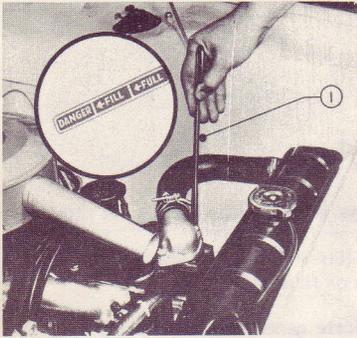


Fig. 1
Checking Engine Oil Level

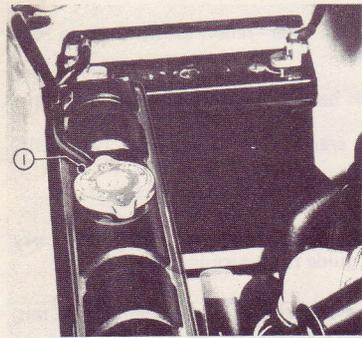


Fig. 2
Radiator Level
1. Filler Cap

Engine oil level item 1

The engine should be standing on level ground and the oil level checked with the dipstick (see Fig. 1). Withdraw the dipstick, wipe it with a clean rag, replace it and again withdraw it. The mark made by the oil on the lower end of the dipstick indicates the level in the sump. If necessary, oil should be added through the oil filler orifice (see Fig. 12).

Do not allow the oil level to rise above the "Full" mark on the dipstick (any extra oil will be wasted). On the other hand the oil level MUST NOT be allowed to fall below the "Fill" mark into the "Danger" sector.

Radiator level item 2

Remove the radiator filler cap and, if necessary top up to a level 1 in. above the top of the tubes.

NOTE: It is dangerous to remove the radiator Cap when the water is hot as the system is pressurised.

Further cooling system information is given later in this handbook.

Cylinder Head Bolts item 3

Tighten bolts in the order illustrated to 65–70 lb./ft. (8.9–9.7 kg./m.). Torque when the engine is hot.

Repeat the tightening sequence in gradually increasing stages until the correct torque is attained.

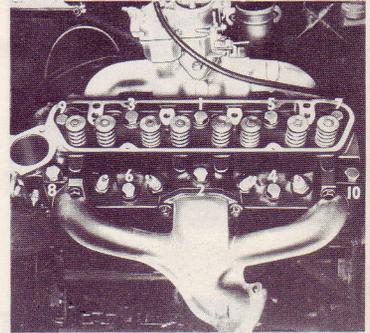
Also check security of manifold bolts.

Tighten Sump Bolts item 4

Check Radiator Hoses and Clips item 5

Check for Water and Oil Leaks item 6

Fig. 3
Cylinder Head Bolts



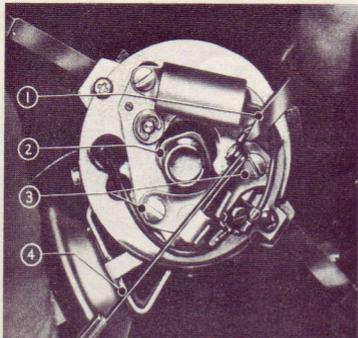


Fig. 4
Distributor Points
 1. Screwdriver in adjuster slot
 2. Cam
 3. Adjusting Screws
 4. Feeler Blade

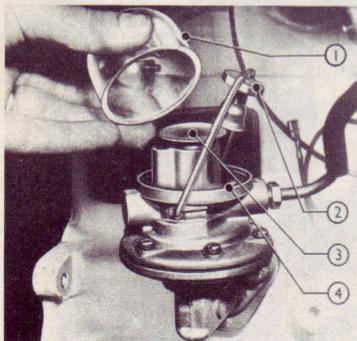


Fig. 5
Fuel Filter
 1. Sediment Bowl
 2. Clamp Nut
 3. Filter
 4. Gasket

First 600 mls. (1,000 km) or first 15 hours running (continued)

Distributor Points item 7

Remove distributor cap and rotor.

To adjust the points gap, slacken adjusting screws and ensure that the moving contact breaker arm heel is on the highest point of cam. Move the fixed contact point to give a clearance of 0.025 in. (0.64 mm), tighten adjusting screws and recheck gap.

Fuel Filter item 8

Unscrew the clamp nut on top of the fuel pump, detach the glass bowl and clean the sediment from the pump body and filter screen using petrol. Check the gasket. Replace the filter screen and glass bowl. Tighten the clamp nut.

First 600 mls. (1,000 km) or first 15 hours running (continued)

Valve Clearance item 9

Check clearances when the engine is hot.

Inlet valve — 0.010 in. (0.25 mm)
Exhaust valve — 0.017 in. (0.43 mm)

(G.T. engine inlet valve is 0.012 in. (0.31 mm)
exhaust valve is 0.002 in. (0.58 mm)

Valves Open	Valves to Adjust
1 ex and 6 in	3 in and 8 ex
3 in and 8 ex	1 ex and 6 in
2 in and 4 ex	5 ex and 7 in
5 ex and 7 in	2 in and 4 ex

Following adjustment, tighten locknut and recheck clearance. Refit rocker cover and check for oil leaks.

Fan Belt Tension item 10

Free movement of ½ in (13 mm) is measured midway between the generator and water pump pulleys. If required adjust by slackening the front and rear lower mounting pulleys and front adjusting bolt. Move the generator to give correct belt tension. Tighten bolts.

Fig. 6

- Valve Clearances
1. Adjusting Screw
 2. Lock Nut
 3. Checking gap
 4. Feeler Blade

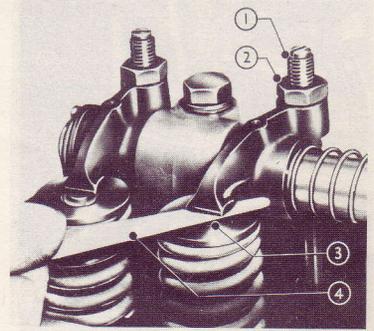
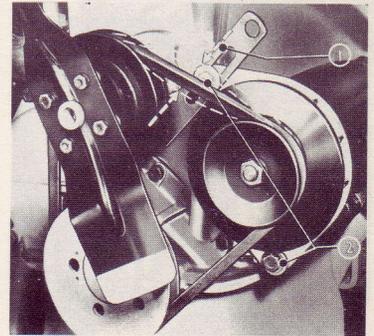


Fig. 7

- Fan Belt Tension
1. ½ in. (13 mm) free movement
 2. Adjusting Bolts



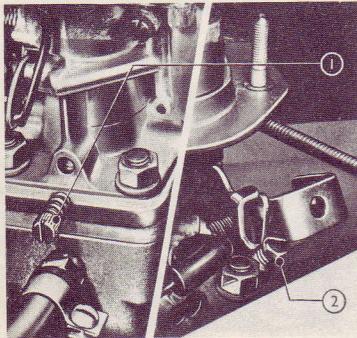


Fig. 8
Carburettor Slow-running
Adjustment

1. Volume Control Screw
2. Slow-running Adjustment Screw

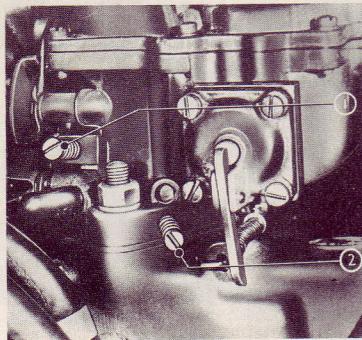


Fig. 9
Carburettor Slow-running
Adjustment (G.T. engine)

1. Slow running Adjustment Screw.
2. Volume Control Screw

First 600 mls. (1,000 km) or first 15 hours running (continued)

Carburettor Slow-running Adjustment item 11

The following adjustments should be carried out for both standard and GT engines. See illustration for adjustment screw identification.

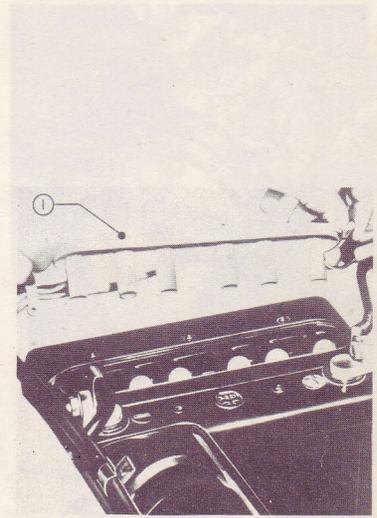
When the engine is at normal operating temperature, adjust the slow-running adjusting screw to obtain a satisfactory idling speed. Now unscrew the volume control adjustment screw until the engine 'hunts'. This can be defined as irregular or lumpy running. Screw in the volume control screw until the engine runs evenly and then readjust the slow-running screw to obtain a suitable engine idling speed. Repeat the operation if necessary, until a satisfactory engine idling speed is obtained.

WEEKLY ATTENTION
or EVERY 50 HOURS RUNNING

Battery item 12

The electrolyte level should be $\frac{1}{4}$ in. to $\frac{3}{8}$ in. (6 to 9 mm) above the tops of the plates. If below this level, remove the trough cover, add distilled water to the filling trough until the trough begins to fill with water. Replace trough cover. Check security of battery and coat the terminals with petroleum jelly.

Fig. 10
Battery Electrolyte Level
1. Trough Cover



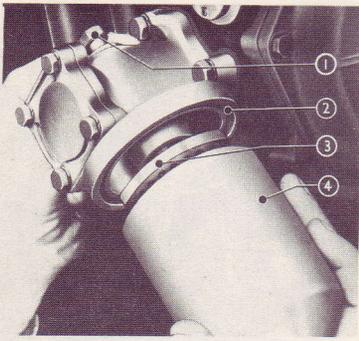


Fig. 11
Oil Filter Element
1. Centre Bolt
2. Sealing Ring
3. Element
4. Body

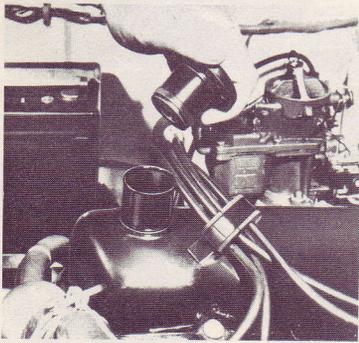


Fig. 12
Oil Filler Cap

AT FIRST 3000 mls. (5,000 km) or 3 MONTHS—whichever is reached first and EVERY SUBSEQUENT 6000 mls. (10,000 km).

or

AT FIRST 100 HOURS RUNNING AND EVERY SUBSEQUENT 200 HOURS RUNNING

Items 7, 8, 9, 10, 11 plus the following:-

Engine Oil Filter Element item 13

Remove the sump drain plug, allow oil to drain and replace plug. Unscrew oil filter centre bolt, remove casing, filter element and rubber sealing ring. Fit a new sealing ring and element then refit cleaned casing and securing bolt. Tighten bolt. Refill the engine with approved oil to the correct level. Replace oil filler cap. Start the engine and check for oil leaks.

Oil Filler Cap item 14

Remove the oil filler cap and wash in petrol. Dry, immerse in clean engine oil, shake out any surplus oil and replace.

Generator and Distributor Lubrication item 15

Apply a few drops of engine oil through the aperture in the centre of the generator rear end plate.

Remove the distributor cap and rotor. Apply two drops of engine oil to the lubricating pad inside the cam body. Apply a very thin film of lithium base grease to the cam faces.

Sparking Plugs item 16

The sparking plugs should be cleaned and the gaps set at 0.023 in. (.0984 mm) although for maximum efficiency it could be advantageous to renew the sparking plugs every 10,000 miles (16,000 km) or every 400 hours running. Ensure that the sparking plug insulators, distributor caps and leads are clean to prevent high tension tracking.

It may also be advantageous to replace worn or pitted contact breaker points when a sparking plug change is contemplated.

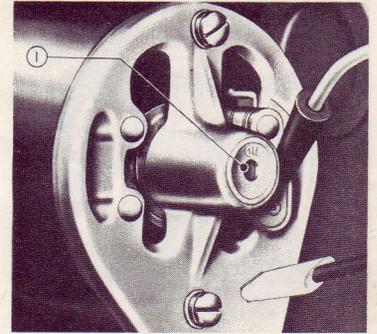


Fig. 13
Generator Lubrication
1. Lubrication Point

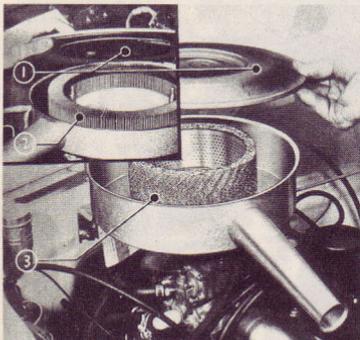


Fig. 14.

Air Filter

- 1. Top Cover
- 2. Paper Element
- 3. Gauze Element

At first 3000 mls. and every subsequent 6000 mls.
 first 100 hrs. and every subsequent 200 hrs. continued

Air Filter **item 17**

Dry Gauze Type—Remove the top cover. Wash the element in petrol, allow to dry, dip in engine oil and shake out surplus. Refit the element, cover and screw.

Paper Element Type—Remove the top cover. Withdraw the element, shake out and replace. Refit the top cover.

NOTE: The paper element should be periodically renewed at an interval dependant upon general operating conditions.

Check Battery Condition **item 18**

The battery should be subjected to a general inspection and, if necessary, bench test. Check security of connections and coat with petroleum jelly.

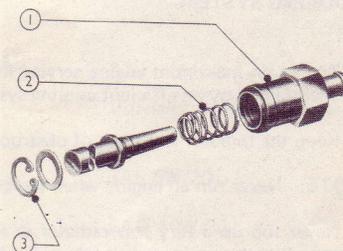
NOTE: If the battery is disconnected at any time, ensure that it is re-connected with the **NEGATIVE** terminal earthed.

At first 3000 mls. and every subsequent 6000 mls.
first 100 hrs. and every subsequent 200 hrs. continued

Crankcase Emission Control Valve (where fitted) item 19

To remove the emission control valve, disconnect the hose and pull the valve out of its grommet. Do not try to run the engine with the hose disconnected from the control valve, as the fuel mixture strength will be excessively weakened. Dismantle the valve by removing the circlip and extract the valve seal, valve and spring. Wash the components in petrol to remove any sludge or lacquer that may be present. Reassemble the components in the reverse order to removal and refit the circlip. Push the valve back into its grommet and reconnect the hose.

Fig. 15
Crankcase Emission
Control Valve
1. Body
2. Spring
3. Circlip



GENERAL MAINTENANCE

The following section outlines some features of general maintenance which will be of value to the operator.

COOLING SYSTEM

To obtain maximum engine service life its operating temperature must be maintained by an efficient cooling system.

Keep the radiator fins clear of obstruction at all times.

NOTE: Never run an engine when the cooling system is empty.

Never top up a very low radiator or re-fill the cooling system with cold water when the engine is hot otherwise damage could be caused.

The radiator is normally equipped with a pressure cap. It is dangerous to remove this when the system is very hot. Remove with caution when the system is hot, allowing all pressure to be relieved and all steam to escape before completely removing the cap.

Protect the cooling system with anti-freeze when operating conditions warrant.

Ford anti-freeze part No. M97B18C has long life characteristics and if the concentration is kept above 30% strength it will provide adequate protection and inhibiting for up to two years.

The following table has been compiled to give the percentage of anti-freeze required to protect the system:-

NOTE: When the following concentrations (less than 30%) are used, the coolant should be drained and the system flushed after every winter season.

Volume of M97B18C in water	Protection	Volume of M97B18C	Protection in water
10%	17°F. (-8°C.)	20%	-3°F. (-19°C.)
15%	7°F. (-14°C.)	25%	-20°F. (-29°C.)

Before putting the mixture into the radiator, the cylinder head bolts should be tightened down to prevent the possibility of any mixture getting into the cylinders or crankcase, where it will cause serious damage. 'Top-up' when the engine is hot: this will prevent loss of the solution via the overflow pipe as would occur when the radiator is filled with the engine cold.

LUBRICATION SYSTEM

The lubrication system should be maintained regularly with the correct grade of lubricant as specified in the maintenance summary. The system is of the force feed type, the lubricating oil being circulated to the engine bearings under pressure by an oil pump driven from the camshaft.

The dipstick (Fig. 1) provides some guide to the oil's condition. An additive type of oil keeps soot in suspension, and even a small amount of soot causes the oil to darken rapidly. However, if the dipstick is found to be heavily coated with sludge, then obviously the oil should be changed. The presence of beads of moisture on the valve rockers, as seen through the oil filler cap aperture, indicates adverse running conditions. When such is the case, more frequent draining and renewal of the oil is highly desirable.

Lubricants

The following lubricants are approved for use in your engine. As a general guide the recommended grade of oil for different temperature ranges is quoted:-

Engine—

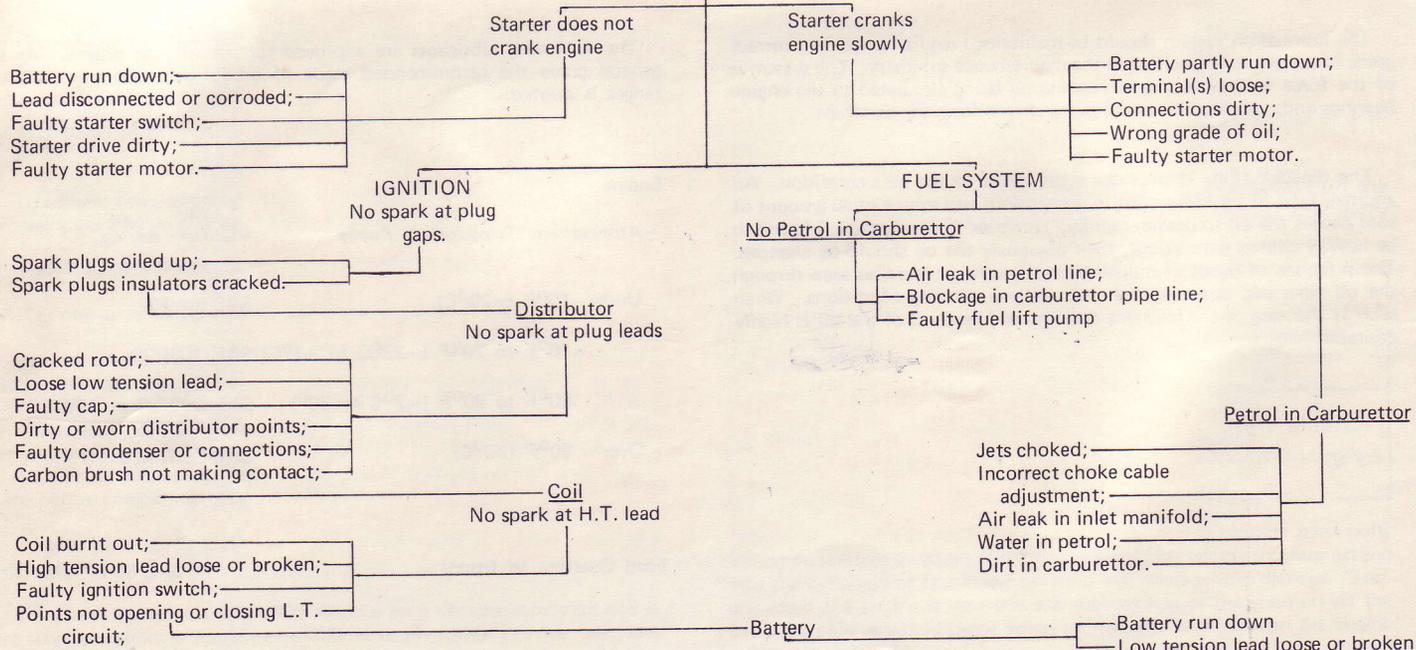
<i>Atmospheric Temperature Range</i>	<i>Viscosity Rating</i>
Under -10°F (-23°C)	SAE 5W/20
-10°F to 20°F (-23°C to -7°C)	SAE 10W/30
20°F to 90°F (-7°C to 30°)	SAE <u>20E/20 or 10W/30</u>
Over 90°F (30°C)	SAE 20W/40 or 30

Ford Gearbox (if fitted) SAE 80 EP Gear Oil

Ford Rear Axle (if fitted) SAE 90 Hypoid Oil

ENGINE FAULT FINDING CHARTS

ENGINE WILL NOT START



ENGINE MISFIRES

Ignition

- High tension leads to spark plugs shorting;
- Incorrect spacing of spark plug points;
- Cracked spark plug insulator;
- Battery connections loose (coil only);
- Faulty of damp cap.

Carburettor

- Water in carburettor;
- Fuel line partly choked;
- Fuel lift pump pressure low;
- Fuel lift pump filter choked;
- Needle valve faulty or dirty.

Mechanical

- Valves sticking;
- Valves burnt;
- Valve spring broken;
- Incorrect valve clearance.

ENGINE STARTS AND STOPS

Ignition

- Low tension connection loose;
- Faulty switch contact;
- Dirty contact points.

Carburettor

- Fuel line blocked;
- Water in fuel;
- Needle valve sticking;
- Fuel lift pump faulty;
- Fuel exhaust;
- Air leaks.

ENGINE RUNS ON FULL THROTTLE ONLY

Carburettor

- Slow-running jet blocked;
- Slow-running adjusting screw incorrectly adjusted.

Mechanical

- Valve sticking;
- Valve burnt;
- Valve spring broken.

ENGINE DOES NOT GIVE FULL POWER

Carburettor

- Fuel supply faulty;
- Air leaks in inlet manifold;
- Jet partly choked.

Mechanical and Ignition

- Ignition retarded;
- High tension lead shorting;
- Valve burnt or bad seating;
- Incorrect valve clearance;
- Faulty distributor cap;
- Wrong distributor fitted.

ENGINE RUNS IMPERFECTLY

- Weak mixture;
- Fuel feed faulty;
- Inlet valve(s) not closing;
- Ignition timing incorrect;
- Carburettor flooding.

Engine knocks

- Timing too far advanced;
- Excessive carbon deposit;
- Loose bearing or pistons;
- Plug leads crossed.

SPECIFICATION

ENGINE	2251 E	2252 E	2252 E High Performance (G.T.)	2254 E	2255 E High Performance (G.T.)
Type	— — — —	4 cyl. in line with direct flow head (combustion chamber in piston)			— — — —
Bore	3.188 in(80.98 mm)	3.188 in(80.98 mm)	3.188 in(80.98 mm)	3.188 in(80.98 mm)	3.188 in(80.98 mm)
Stroke	2.098 in(53.29 mm)	2.480 in(62.99 mm)	2.480 in(62.99 mm)	3.056 in(77.62 mm)	3.056 in(77.62 mm)
Swept Volume	67.0 cu.in(1098 cc)	79.2 cu.in(1297 cc)	79.2 cu.in(1297 cc)	97.6 cu.in(1599 cc)	97.6 cu.in(1599 cc)
Comp. Ratio	8:1 (Low), 9:1 (High)	8:1 (Low), 9:1 (High)	9.2:1	8:1 (Low), 9:1 (High)	9.0:1
Firing Order	1, 2, 4, 3.	1, 2, 4, 3	1, 2, 4, 3.	1, 2, 4, 3.	1, 2, 4, 3.
Valve Clearance (Hot)	inlet:—0.010 in.(0.25 mm) exhaust:—0.017 in.(0.43 mm)	0.010 in.(0.25 mm) 0.017 in.(0.43 mm)	0.012 in.(0.32 mm) 0.022 in.(0.58 mm)	0.010 in.(0.25 mm) 0.017 in.(0.43 mm)	0.012 in.(0.32 mm) 0.022 in.(0.58 mm)
FUEL SYSTEM					
Carburettor	G.P.D. Downdraught	G.P.D. Downdraught	Weber Twin Choke	G.P.D. Downdraught	Weber Twin Choke
Recommended Fuel	89 Octane (8:1 CR) 97 Octane (9:1 CR)	89 Octane (8:1 CR) 97 Octane (9:1 CR)	97 Octane	89 Octane (8:1 CR) 97 Octane (9:1 CR)	97 Octane
LUBRICATION SYSTEM					
Oil Pressure	35 to 40 lb/in ² (2.46 to 2.81 kg/cm ²)		40 lb/in ² (2.81 kg/cm ²)	35 to 40 lb/in ² (2.46 to 2.81 kg/cm ²)	
Oil Filter Capacity	0.68 Pints (0.341 litres)	do	do	do	do
Sump Capacity	— — 5.72 imp. pints or		6.87 U.S. pints or	3.25 litres — — — — —	
COOLING SYSTEM					
Water Capacity	5.5 Pints	5.5 Pints	5.5 Pints	6.2 Pints	6.2 Pints
(Cyl. block and head)	(3.13 litres)	3.13 litres)	(3.13 litres)	3.53 litres)	3.53 litres)
Thermostat	— — Wax type, commences opening 185 ^o to 192 ^o F (85 ^o to 89 ^o C), fully open 210 ^o to 216 ^o F (99 ^o to 102 ^o C) — — — — —				
ELECTRICAL SYSTEM					
Earth	negative	negative	negative	negative	negative
Sparking Plug (Autolite)	AG 22A 14 mm	AG 22A 14 mm	AG 22A 14 mm	AG 22A 14 mm	AG 22A 14 mm
Plug Gap	0.023 in (0.58 mm)	0.023 in (0.58 mm)	0.023 in (0.58 mm)	0.023 in (0.58 mm)	0.023 in (0.58 mm)
Contact Breaker Points Gap	0.025 in (0.64 mm)	0.025 in (0.64 mm)	0.025 in (0.64 mm)	0.025 in (0.64 mm)	0.025 in (0.64 mm)