THE 'A' SERIES OPERATORS HANDBOOK

HANDBOOK CONTENTS

1. GENERAL INFORMATION

CONTENTS

1.1 Introduction

The purpose of this handbook is to lay down operating guidelines for the current AC1 and AD1 industrial engine ranges.

The specification details given apply to a range of engines and not to any one particular engine, in cases of difficulty the user should consult the local Lister-Petter Distributor or Dealer for further advice and technical assistance.

The information, specifications, illustrations, instructions and statements contained within this publication are given with our best intentions and are believed to be correct at the time of going to press.

Our policy is one of continued development and we reserve the right to amend any technical information with or without prior notice.

Whilst every effort is made to ensure the accuracy of the particulars contained within this publication neither the Manufacturer, Distributor or Dealer shall in any circumstances be held liable for any inaccuracy or the consequences thereof.

The information given is subject to the Company's current Conditions of Tender and Sale, and is for the assistance of users and is based upon results obtained from tests carried out at the place of manufacture. This Company does not guarantee that the same results will be obtained elsewhere under different conditions.

1.2 How to use this Operators Handbook

It is recommended the individual steps contained in the various maintenance or repair operations are followed in the sequence in which they appear.

When a diesel engine is operating or being overhauled there are a number of associated practices which may lead to personal injury or product damage.

Your attention is drawn to the symbols shown and described below which are applied throughout this publication.

⚠ CAUTION

This caution symbol draws attention to special instructions or procedures which, if not correctly followed, may result in damage to or destruction of equipment.

⚠ WARNING

This warning symbol draws attention to special instructions or procedures which, if not strictly observed, may result in personal injury.

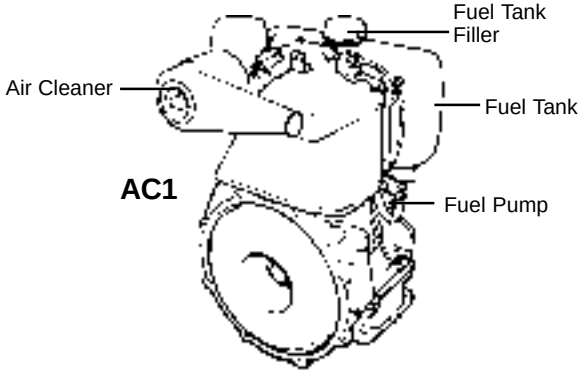
⚠ WARNING

A WARNING SYMBOL WITH THIS TYPE OF TEXT DRAWS ATTENTION TO SPECIAL INSTRUCTIONS OR PROCEDURES WHICH, IF NOT STRICTLY OBSERVED, MAY RESULT IN SEVERE PERSONAL INJURY, OR LOSS OF LIFE.

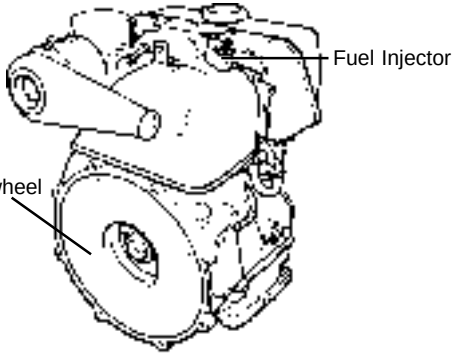
Note:

A note is used to draw your attention to additional or important information.

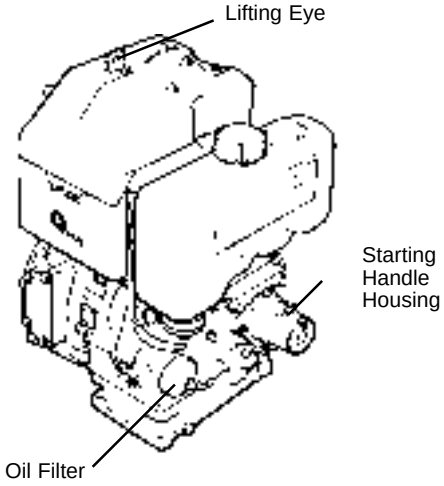
1.3 Engine Features



AC1



AD1



AC1 'Q' Build

1.4 Safety Precautions

The following safety precautions are of a general nature more specific precautions appear where they are relevant.

⚠ WARNING

Starting any diesel engine can be dangerous in the hands of inexperienced people. Engine operators must be instructed in the correct procedures before attempting to start any engine.

1.4.1 Before Starting Precautions

- Ensure the engine is free to turn without obstruction.
- Check that the lubricating oil level is correct.

  The oil sump must be filled to the 'full' or 'max' mark on the dipstick; do not overfill.
- Check that the fuel supply is adequate and the system is primed.
- Ensure that the battery is connected, fully charged and serviceable.
- Where possible, disengage the driven equipment while starting.

1.4.2 Alternator Precautions

The following points must be strictly observed when charge windings are fitted otherwise serious damage can be done.

- Never remove any electrical cable while the battery is connected in the circuit.
- Only disconnect the battery with the engine stopped and all switches in the OFF position.
- Always ensure that cables are fitted to their correct terminals.

  A short circuit or reversal of polarity will ruin diodes and transistors.
- Never connect a battery into the system without checking that the voltage and polarity are correct.
- Never flash any connection to check the current flow.
- Never experiment with any adjustments or repairs to the system.
- The battery and charge windings must be disconnected before commencing any electric welding when a pole strap is directly or indirectly connected to the engine.

⚠ WARNING

Starting engines that are fitted with charge windings which have been disconnected from the battery will cause irreparable damage unless the stator leads from the rectifier/regulator have been removed.

1.4.3 Starter Battery Precautions

- Do not smoke near the batteries.
- Keep sparks and flames away from the batteries.
- Batteries contain sulphuric acid - if the acid has been splashed on the skin, eyes or clothes flush it away with copious amounts of fresh water and seek medical aid.
- Keep the top of the battery well ventilated during charging.
- Disconnect the battery negative (earth) lead first and reconnect last.
- Switch off the battery charger before disconnecting the charger leads.
- Never 'flash' connections to check current flow.
- Never experiment with adjustments or repairs to the system.
- A damaged or unserviceable battery must never be used.

1.4.4 General Precautions

- Ensure the engine is securely mounted.
- Ensure that there is a generous supply of cooling and combustion air available.
- Keep the engine and surrounding area clean.
- Keep all safety guards in position.
- Keep the body and clothing clear of all moving or hot parts.
- Never allow any part of the body to come into contact with high pressure fuel oil, for example when testing fuel injection equipment.
- Thoroughly clean any lubricating or fuel oil from the skin as soon as practicable after contact.
- Rectify all fuel and oil leaks as soon as practicable and clean any spillages when they occur.
- Engine lifting eyes must not be used to lift the complete plant.

1.4..5 Lifting Precautions

The following points must be considered before attempting to lift the engine.

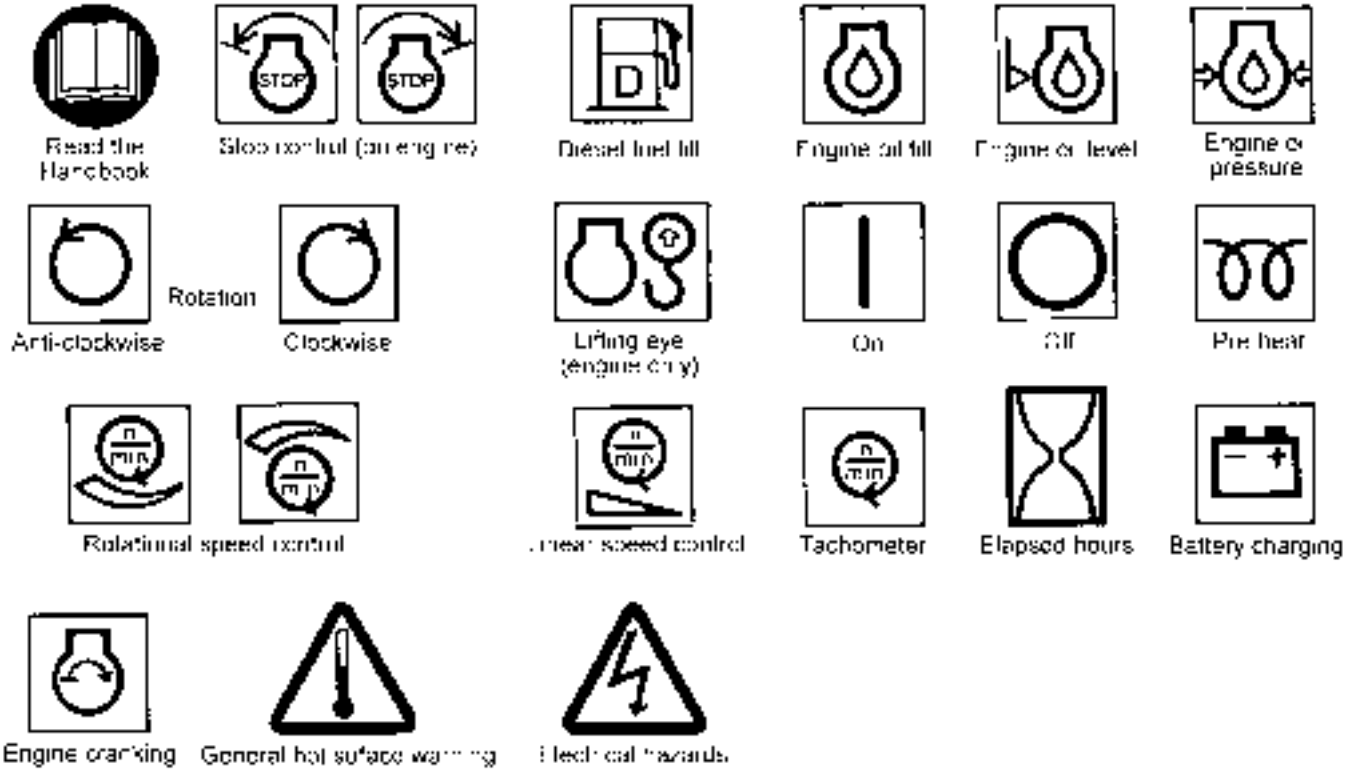
- Ensure the lifting equipment to be used has the correct capacity to lift the engine.
- Single lifting equipment must only be used when a single lifting eye is fitted.
- When two engine lifting eyes are fitted suitable lifting equipment designed to give two vertical lifts from directly above the engine lifting eyes must be used.
- Check that the engine lifting eyes are not damaged and that they are secure.
- To prevent damage to the cylinder head cover ensure that there is clearance between the lifting equipment hooks and the cover.

⚠ WARNING

Engine lifting eyes must not be used to lift the complete plant.

1.5 Safety Symbols

This section identifies the ISO 8999 symbols currently used by Lister-Petter.



1.6 Caring for Your new Engine

This handbook has been supplied with your new engine to help assist you in the correct operation and maintenance of your engine.

To obtain the best performance from your engine you must ensure that all the instructions given in "3.16 Maintenance Schedule" are correctly carried out at the prescribed intervals.

Some maintenance work can only be carried out if the necessary hand and service tools are available.

When the user has insufficient tools, experience or ability to carry out adjustments, maintenance and repairs then this work should not be attempted.

1.7 Running-in

A gradual running-in of a new engine is not necessary. Extended light load running early in the life of the engine may cause detrimental damage to the cylinder bore allowing lubricating oil to enter the exhaust system.

Maximum load can be applied to the engine as soon as it enters service.

To help assist engine running-in, all engines are despatched with an initial fill lubricating oil which must be changed after 100 hours.

⚠ WARNING

Starting any diesel engine can be dangerous in the hands of inexperienced people.

Before attempting to start any engine the operator should read the "1.4 Safety Precautions" and be conversant with the use of the engine controls and the correct starting procedures.

1.8 Engine Serial Number

The engine serial number is stamped on a plate attached to the air shield on the manifold side of the engine. It is necessary to identify the type and build of each engine to enable the correct maintenance procedures, as described later in this publication, to be carried out.

Serial Number Code

48 ..... Year of manufacture code
00123 ..... Consecutive number of engine
AC1 ..... Model
A ..... Anti-clockwise rotation
C ..... Clockwise rotation
01 ..... Build of engine

For future reference write your engine serial number in the box below.

1.9 Nomenclature

AC and AD - single cylinder, direct injection, naturally aspirated air cooled diesel engines.

1.10 Builds

The engines within each range have been assembled to pre-determined configurations. Where the build number is preceded by a 9 this indicates that the engine is either of a non-standard configuration, or contains non-standard parts or accessories.

When new parts are required for such a build it is suggested that reference be made to Lister-Petter to determine the exact engine specification and which parts are non-standard.

1.11 Rotation

Looking on the flywheel:

AC - dependant on the Build and reference should be made to the serial number plate.

AD - clockwise.

1.12 Idling Speed

AC and AD ..... 1000r/min.

1.13 Air Cleaner

Engine mounted medium duty dry type air cleaners are available for all engines.

⚠ CAUTION

Under no circumstances must the engine be run without an air cleaner.

1.14 Battery Charging System

A 12 volt system with an engine mounted battery charging facility is available for the AC and AD engines.

1.15 Lifting the Engine

The lifting plates/eyes fitted to the engine are designed to lift the engine plus fitted accessories and must not be used to lift the complete plant.

1.16 Guards

Special accessories may require special guards which must be supplied and fitted by the purchaser.

1.17 Lubricating Oil Pressure

Minimum ..... 2.4 bar (35.0 lbf/in^2).

1.18 Exhaust

⚠ WARNING

Unprotected skin and combustible materials must not be allowed to come into contact with the exhaust system.

⚠ WARNING

DO NOT BREATH EXHAUST GASES AS THEY CONTAIN CARBON MONOXIDE, A COLOURLESS, ODOURLESS AND POISONOUS GAS THAT CAN CAUSE UNCONSCIOUSNESS AND DEATH.

It is important to ensure that exhaust gases are not sucked in by the air cleaner or the cooling fan otherwise premature choking will occur.

1.19 Engine Controls

⚠ WARNING

After prolonged running, metal parts of the stop control may become hot; it is advisable to use suitable hand protection when stopping the engine.

Remote or engine mounted variable, two speed and stop controls are available for all engines.

1.20 Ambient Temperature

From the aspect of engine performance, the temperature of the air entering the engine is the only criterion of ambient temperature.

The power developed by the engine, depends on the temperature of the combustion air measured at the air manifold inlet (or the air cleaner), and the temperature of the cooling air as measured at the cooling air inlet.

The higher of these two temperatures is taken as being the “Ambient Temperature” as far as engine ratings are concerned.

The engines are able to run satisfactorily at Ambient Temperatures up to 25°C (77°F) without derating. Above this temperature the rated power must be reduced in accordance with the relevant ISO, BS or DIN Standards.

The maximum temperature is 52°C (125°F) and if it is desired to run at higher temperatures the local Lister-Petter Distributor or Dealer should be consulted.

2. STARTING AND STOPPING

CONTENTS

2.1 Preliminary Instructions

The following operating instructions are of a general nature and should be read in conjunction with, or substituted by, the equipment manufacturers instructions.

⚠ WARNING

Starting any diesel engine can be dangerous in the hands of inexperienced people.
Before attempting to start any engine the operator should read the "1.4 Safety Precautions" and be conversant with the use of the engine controls and the correct starting procedures.

⚠ CAUTION

ETHER BASED COLD START AIDS IN AEROSOL CANS MUST NOT BE USED UNDER ANY CIRCUMSTANCES.
Systems may be fitted to allow a measured quantity to be injected into the inlet manifold, but these must be used in accordance with the manufacturers instructions.

⚠ WARNING

DO NOT BREATH EXHAUST GASES AS THEY CONTAIN CARBON MONOXIDE, A COLOURLESS, ODOURLESS AND POISONOUS GAS THAT CAN CAUSE UNCONSCIOUSNESS AND DEATH.

2.2 Rope Start

⚠ WARNING

When using a rope start, do not wind the rope around the hand or wrist and ensure the rope is not tangled, frayed or contaminated with fuel or oil.

Rope starting is not recommended at temperatures below -4°C (25°F).

1. Move the decompressor away from its stop and hold it in this position.

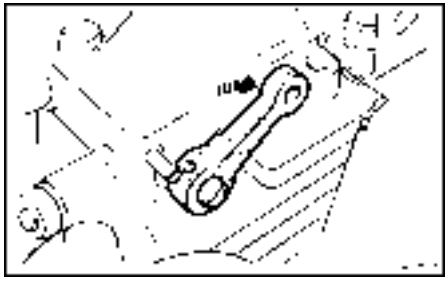


Figure 2.2.1 Decompressor Lever

2. Move the engine control, (A) to the 'RUN' position.

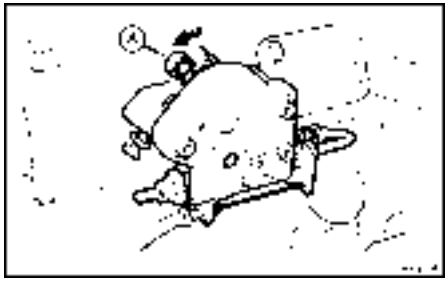


Figure 2.2.2 Engine Control

3. If a variable speed control is fitted move the speed control lever towards the fast position.
4. Turn the starting pulley against rotation until resistance is felt.
5. On a cold engine bounce the pulley vigorously against the resistance until the injector operates several times.
6. Wind the rope two turns around the pulley in the direction of rotation.
7. Pull the rope sharply until it unwinds from the pulley.
8. If a variable speed control is fitted reduce the speed as required.

2.3 Starting Handle Precautions

⚠ WARNING

Do not attempt to use a handle if it is damaged in any way.

A non-limited kick-back handle (A) or limited kick-back handle (B) system may be fitted to the engine.

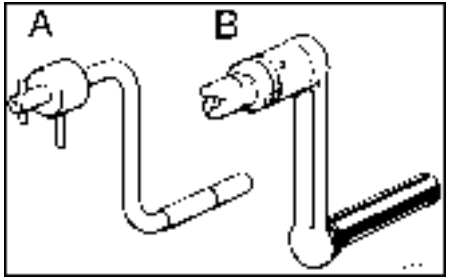


Figure 2.3.1 Starting Handles

- The two types of handle are not interchangeable and care must be taken to ensure the correct type is retained with the engine.
- Always use the correct starting handle which has been designed for the engine.
- Ensure there are no burrs on that part of the handle which fits onto the engine.
- Ensure the handle grip is clean, dry and free to turn on its shaft.
- Clean and lightly oil that part of the handle which fits onto the engine.
- Firmly hold the handle grip, ***with the thumb on top of the grip***, during the starting procedure.

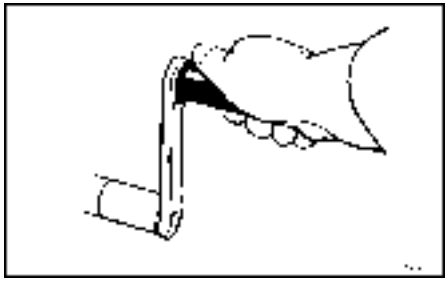


Figure 2.3.2 Holding the Starting Handle

2.4 Hand Starting

Before attempting to start the engine refer to "2.3 Starting Handle Precautions".

1. Move the decompressor lever towards its stop and hold it in this position.

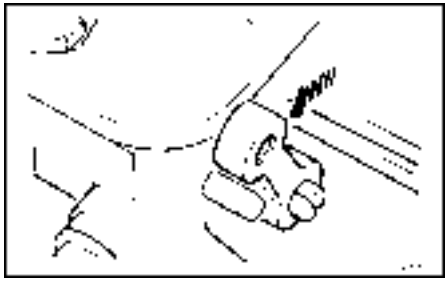


Figure 2.4.1 Decompressor Lever

2. Move the engine control (A) to the 'RUN' position.

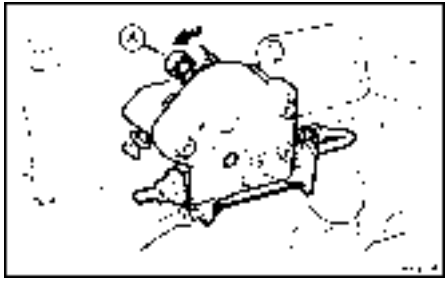


Figure 2.4.2 Engine Control

3. If a variable speed control is fitted move the speed control lever towards the fast position.
4. **If using a non-limited kick-back handle.**
   Place the handle (C) in the starting housing (D).
5. Engage the dog into the shaft and rotate the support collar (E) ***in the opposite direction of cranking*** until the collar pin (F) locates in its slot in the housing.

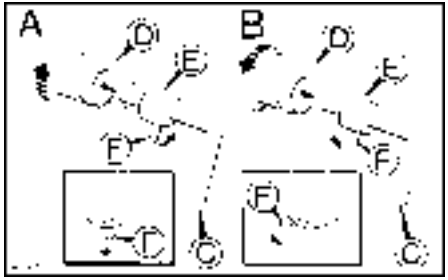


Figure 2.4.3 Starting Handle
A - Clockwise Builds
B - Anti-clockwise Builds

6. Crank the engine as fast as possible and move the decompressor lever into the running position while continuing to crank briskly until the engine starts.

⚠ WARNING

Do not pull the starting handle away from the engine while cranking.

7. Retain a firm grip on the handle and release it from the starting handle housing.
8. If a variable speed control is fitted reduce the speed as required.
9. **If using a limited kick-back handle.**
   Swivel the starting handle housing cover (G) to one side, lift the spring loaded plunger (H) and insert the handle into the housing.

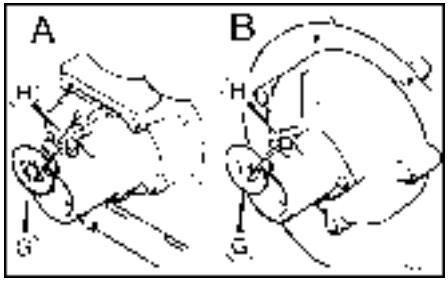


Figure 2.4.4 Starting Handle Housing
A - Gear End
B - Flywheel End

10. Slowly rotate the handle in the direction of cranking until the handle fully engages.
11. Crank the engine as fast as possible and move the decompressor lever into the running position while continuing to crank briskly until the engine starts.

⚠ WARNING

Do not pull the starting handle away from the engine while cranking.

12. Retain a firm grip on the handle and release it from the housing by lifting the spring loaded plunger (H).
13. If a variable speed control is fitted reduce the speed as required.

2.5 Electric Key Start

1. Ensure the decompressor lever is in the running position.

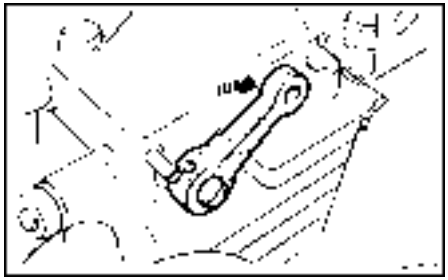


Figure 2.5.1 Decompressor Lever

2. Move the engine control (A) to the 'RUN' position.

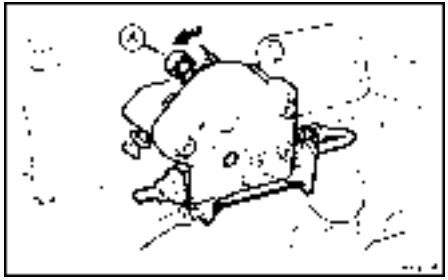


Figure 2.5.2 Engine Control

3. If a variable speed control is fitted select the fast position.
4. If a heater plug is fitted turn the starter key clockwise to the HEAT position and hold it there for 20 seconds.
5. Turn the starter key clockwise to the 'START' position and release it immediately after the engine fires.

   Do not operate the starter key for more than 30 seconds at a time.

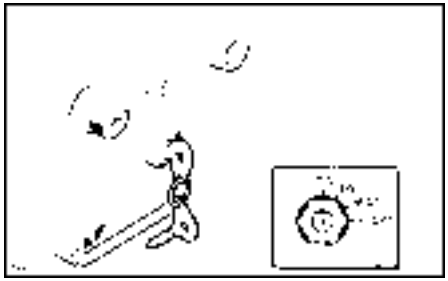


Figure 2.5.3 Start Key

6. If a variable speed control is fitted reduce the speed as required.

2.6 Stopping the Engine

⚠ CAUTION

Turning the starter key to the 'STOP' position will not stop the engine unless an optional fuel control solenoid is fitted.

⚠ CAUTION

Never stop the engine by using the decompressor lever.

1. On engines not fitted with a fuel control solenoid turn the engine control clockwise to the 'STOP' position and hold it there until the engine comes to rest.

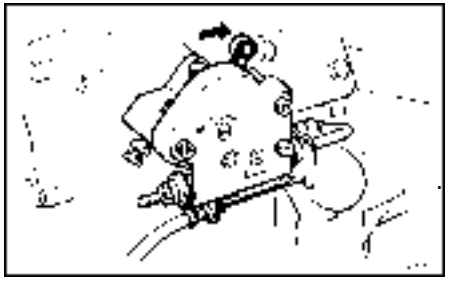


Figure 2.6.1 Engine Control

After the engine has stopped turn the start key, if fitted, to the 'STOP' position.

2. If a fuel control solenoid is fitted turn the starter key to the 'STOP' position.

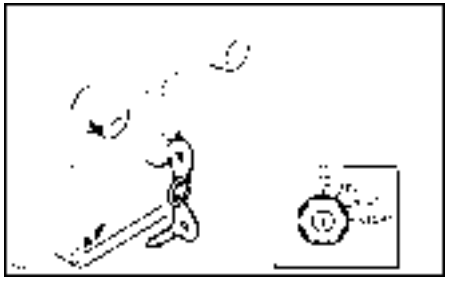


Figure 2.6.2 Start Key

3. ROUTINE MAINTENANCE

CONTENTS

3.1 Preliminary Instructions

These recommendations and instructions cover several engine models, therefore, they are of a general nature.

The engines are assembled to pre-determined builds and individual engines may include optional equipment not specifically covered in this book.

More detailed information can be found in the Workshop Manual, 027-09202, or any Lister-Petter Distributor or Dealer may be consulted.

The handbook is designed primarily for use by qualified technicians with mechanical experience.

This work can only be carried out if the necessary hand and service tools are available. When the user has insufficient tools, experience or ability to carry out adjustments, maintenance and repairs this work should not be attempted.

Where accurate measurements or torque values are required they can only be made using calibrated instruments.

Under no circumstances should makeshift tools or equipment be used as their use may adversely affect safe working procedures and engine operation.

- The engine should receive regular attention during the first 50 hours of its life from new and after a major overhaul.
- Long periods of light or 'no load' running early in the engine's life may lead to cylinder bore glazing and high oil consumption.
- The instructions given in "3.16 Maintenance Schedule" are based on average operating conditions and cover the minimum requirements to keep an engine running at peak performance with trouble free operation.
- Under very dusty conditions, air cleaners, lubricating oil and fuel filters will require more frequent attention.
- Decarbonising may be required more often if the engine has been running on light loads for long periods.
- Before carrying out any maintenance work on an engine it is advisable to remove the battery.

  The battery and charge windings must be disconnected before commencing any electric welding when a pole strap is directly or indirectly connected to the engine.
- It is essential to ensure that nuts and bolts are tightened to the torques specified in the Workshop Manual, 027-09202.
- The fuel injector can only be checked and set off the engine using suitable specialist test equipment.

⚠ WARNING

ON NO ACCOUNT ALLOW ANY UNPROTECTED SKIN TO COME INTO CONTACT WITH THE INJECTOR SPRAY AS THE FUEL MAY ENTER THE BLOOD STREAM WITH FATAL RESULTS.

⚠ WARNING

SOME ENGINES MAY BE FITTED WITH SEALS OR 'O' RINGS MANUFACTURED FROM 'VITON' OR A SIMILAR MATERIAL.

WHEN EXPOSED TO ABNORMALLY HIGH TEMPERATURES, IN EXCESS OF 400°C (752°F), AN EXTREMELY CORROSIVE ACID IS PRODUCED WHICH CANNOT BE REMOVED FROM THE SKIN.

IF SIGNS OF DECOMPOSITION ARE EVIDENT, OR IF IN DOUBT, ALWAYS WEAR DISPOSABLE HEAVY DUTY GLOVES.

3.2 Precautions for Filters and Elements

- Particular attention is drawn to the instructions given later in this section for replacing filters.
- Used liquid filters and elements contain some of the filtered liquid and should be handled and disposed of with care.
- After handling new or used elements, the users hands should be thoroughly washed, particularly before eating.

⚠ WARNING

Fuel and new or used lubricating oil may cause skin irritation.

⚠ WARNING

The materials used in the manufacture and treatment of some filters and elements may cause irritation or discomfort if they come into contact with the eyes or mouth and they may give off toxic gases if they are burnt.

⚠ WARNING

Care must be taken to ensure that waste fuel, oil, filter elements and acid, where applicable, are disposed of in accordance with local regulations to prevent contamination.

3.3 Initial Attention

To help assist engine running-in, all engines are despatched with an initial fill lubricating oil **which must be changed after 100 hours**.

It is recommended that the following receive attention after the engine has run 25 hours and again after 250 hours.

- Adjust the valve clearances if necessary.
- Check and tighten nuts, bolts and unions paying particular attention to the fuel system.
- Check the lubricating oil level and top up if necessary.
- Observe the exhaust at the normal full load. The exhaust must be free from soot. A black exhaust means that the engine is overloaded or that the injection equipment is out of order.

  Do not allow the engine to run with a dirty exhaust without investigating the cause as this may result in an engine breakdown.
- Following the initial attention, the normal routine maintenance must be carried out as given in "3.16 Maintenance Schedule".

3.4 Valve Clearance Adjustment

The valve clearance for both inlet and exhaust valves, set with the engine cold, is 0.10mm (0.004in).

1. Remove the valve rocker box cover.
2. With the piston at TDC on the firing stroke, slacken the locknut (A) on the adjusting screw (B) and turn the screw until the correct clearance has been obtained.

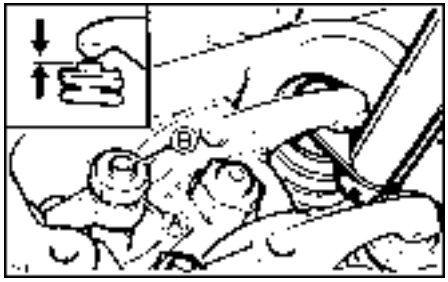


Figure 3.4.1 Valve Clearance

3. Hold the adjusting screw and tighten the locknut.
4. Re-check the clearance.
5. Repeat the procedure for the second valve.

3.5 Decompressor Adjustment

This adjustment should only be made when the valve clearance is correctly adjusted.

1. Remove the valve rocker box cover.
2. Turn the decompressor lever (A) to the vertical position.

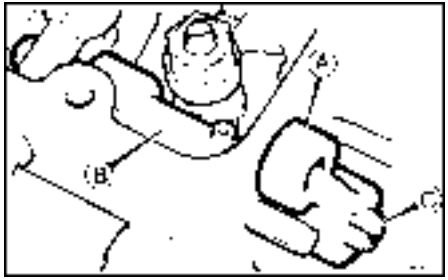


Figure 3.5.1 Decompressor Adjustment

3. With the piston at TDC on the firing stroke, turn the spindle (B) anti-clockwise using a suitable screwdriver in slot (C) until the pin just touches the exhaust valve rocker.

3.6 Changing the Oil Filter

Before changing the filter read "3.2 Precautions for Filters and Elements".

1. Unscrew the retaining screw (A) and lift out the oil filter housing (B) and element (C).
2. Remove the 'O' ring (D) from the crankcase recess.
3. Clean the crankcase 'O' ring housing face.

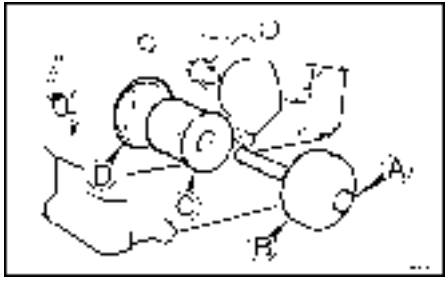


Figure 3.6.1 Oil Filter

4. Fit a new 'O' ring into the crankcase.
5. Fit a new filter element and the filter housing.
6. Replace the retaining screw and torque it to 14.0Nm (10.0lbf ft).

⚠ CAUTION

The retaining screw must not be over tightened.

7. Run the engine and check for any oil leaks.
8. Stop the engine, allow the oil to settle and check the level on the dipstick.
9. Add more oil if necessary.

3.7 Draining and Filling the Oil Sump

Before changing the filter read "3.2 Precautions for Filters and Elements".

CAUTION

Do not overfill with lubricating oil as this may have a detrimental effect on engine performance.

1. If possible, run the engine immediately before draining the oil.
2. Place a suitable container under the drain plug.
3. Remove the plug and drain the sump.

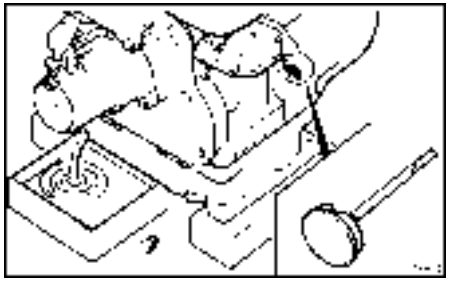


Figure 3.7.1 Draining the Sump

4. Replace the plug taking care not to over tighten it.
5. Fill the sump through the oil filler to the 'H' mark on the dipstick.

Sump Capacity

	litres	pints	US qts
AC, AD	2.7	4.75	2.85

Capacity Between Dipstick Marks

	litres	pints	US qts
AC, AD	0.65	1.2	0.7

6. Start the engine, run it for a few minutes and check that the drain plug does not leak.
7. Stop the engine, allow the oil to settle and check the level on the dipstick.
8. Add more oil if necessary.

3.8 Changing the Air Cleaner

1. Release the clips (A) and lift off the cover (B).
2. Remove the element (C) from the cleaner body.

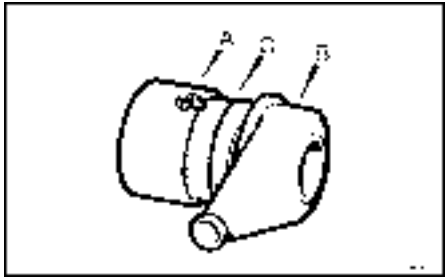


Figure 3.8.1 Dry Air Cleaner

3. Clean the cleaner body and snout of all the dust.
4. Fit a new element and joint if necessary.
5. Replace the snout ensuring that the inlet is horizontal across the air cowling.

3.9 Removing the Injector

1. Slacken and remove the pump to injector fuel pipe (A) and hold the fuel pump delivery valve holder with a spanner to prevent it turning.
2. Disconnect the leak-off pipe (B) from the injector.
3. Remove the two injector holding down nuts (C).
4. Lift off the injector clamp (D).
5. Lift out the injector (E) and the sealing washer (F).

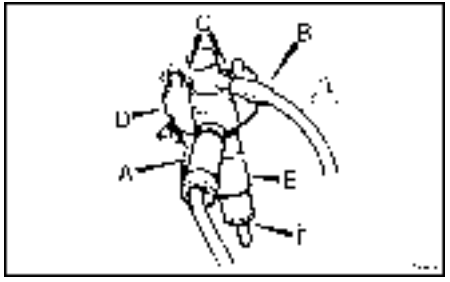


Figure 3.9.1 Fuel Injector

5. If the injector cannot easily be removed use the Service Tool 317-50027 and Adaptor 317-50095.

⚠ WARNING

Care must be taken to ensure that any part of the hand is not likely to become trapped between the two parts of the tool while it is being used.

3.10 Injector Setting

The injector must only be set on a test rig to 203bar (200atmos; 2950lbf in²).

3.11 Replacing the Injector

1. Ensure the seatings in the cylinder head are clean and smooth.
2. Fit the sealing washer onto the Injector with the dimple facing towards the Injector.
3. Replace the Injector into the cylinder head.
4. Place the Injector clamp over the Injector with the cut out section facing outwards.
5. Replace the two clamp nuts leaving them finger tight.
6. Replace the fuel pump to injector pipe and tighten the unions finger tight.
7. Tighten the unions a ***further half turn with a spanner.***
8. Torque load the injector nuts to 3.0Nm (6.0lbf ft).
9. Replace the leak-off pipe.
10. After the initial run following an injector replacement, re-torque the two clamp nuts.

3.12 Changing the Fuel Tank Filter

Before changing the filter read "3.2 Precautions for Filters and Elements".

⚠ CAUTION

Care should be taken to ensure the jubilee clip fitted to the polypropylene fuel tank is not slackened or removed.

1. Remove the fuel pipe from the tank and drain the tank.
2. Unscrew the plug (A) from the tank and remove the plug and element from the bottom of the tank.

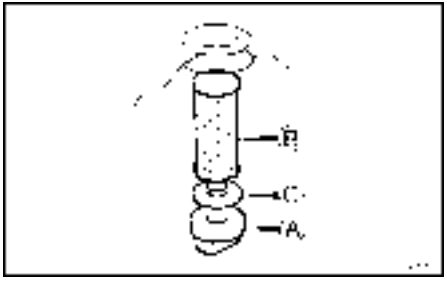


Figure 3.12.1 Tank Mounted Filter

3. Unscrew the element (B) from the plug and discard it.
4. Discard the joint (C).
5. Fit a new joint over the element screw

spigot.

6. Screw the new element onto the plug; ***use the nut section of the element only.***
7. Screw the plug and element into the bottom of the tank and torque it to:

   Polypropylene tank - 8.0Nm (6.0lbf ft).

   Steel tank - 40.0Nm (30.0lbf ft).
8. Replace the fuel pipe.
9. Fill the fuel tank and prime the fuel system.

3.13 Changing the Remote Mounted Fuel Filter

Before changing the filter read "3.2 Precautions for Filters and Elements".

1. Unscrew and remove the retaining bolt (A) from the element bowl.
2. Remove the element (B) and discard it.

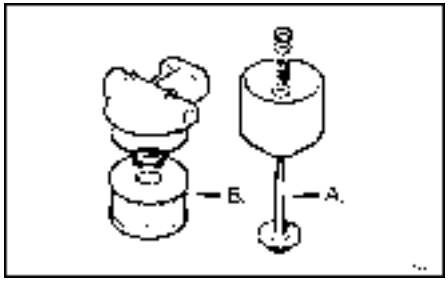


Figure 3.13.1 Remote Filter

3. Discard the four joints.
4. Clean the element bowl.
5. Fit a new joint to the element adaptor, the retaining bolt, the filter head and below the element.
6. Place the new element onto the adaptor.
7. Replace the element bowl and retaining bolt.
8. Fill the fuel tank and prime the filter.

3.14 Fuel Tank Capacity

	litres	pints	US qts
AC, AD	5.1	8.7	5.2
AC Build 05	9.0	15.8	7.4

3.15 Priming the Fuel System

If the engine is fitted with a self-bleed fuel system, the following procedure will not be necessary.

1. Fill the fuel tank.
2. Move the engine control lever to the RUN position.
3. Vent the pump through the bleed screw (A) until a full air free flow of fuel is obtained.

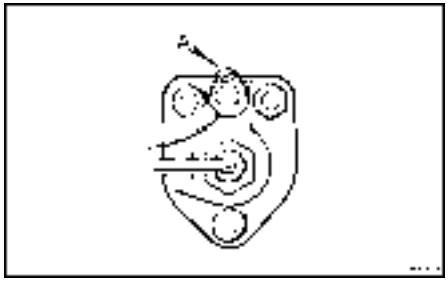


Figure 3.15.1 Pump Bleed Screw

3.16 Maintenance Schedule

Drain the lubricating oil for the first time after 100 hours and then as specified

Daily
Check the supply and level of the fuel.
Check the level and condition of the lubricating oil.
Clean the air cleaner under very dusty conditions.

Every 125 Hours
The previous and the following items.
Clean the air cleaner under moderately dusty conditions.
Check for fuel and lubricating oil leaks.
Check the serviceability of the battery.

Every 250 Hours
The previous and the following items.
Check all external nuts, bolts and unions for tightness.
Check and adjust the valve clearances with the engine cold.
Check and adjust the decompressor setting.
Renew the oil filter element.
On all engines except AC1 Build 05, drain the sump and refill with new oil of the correct type and specification.
Clean the carbon deposit from the exhaust system.
Clean the fuel tank cap air vent.
Test and clean the fuel injector and fit with a new washer.
Remove the hand start sprag clutch assembly, clean and inspect the oil seals and bearing. Refit the assembly and lubricate it.

Every 500 Hours
The previous and the following items.
On all AC1 Build 05 engines drain the sump and refill with new oil of the correct type and specification.
Renew the air cleaner element.

Every 1000 Hours
The previous and the following items.
Drain and flush the fuel tank.
Change the fuel filter element.
Clean the cylinder and cylinder head fins under dusty conditions.
Ensure that all guards are firmly attached and not damaged.
Decarbonise if the engine power has deteriorated.

Every 5000 Hours
The previous items and give the engine a major overhaul, if necessary.

3.17 Fault Finding

This section is intended as a guide only and any rectification of faults should be in accordance with the Workshop Manual, 027-09202, or after consulting the local Lister-Petter Distributor or Dealer.

Difficult Starting
Stop/start lever in the wrong position.
Decompressor lever in the wrong position.
Incorrect type of fuel or oil.
No fuel in the tank.
Choked fuel filter or air cleaner.
Air lock in the fuel system.
Incorrect decompressor clearance.
Battery not serviceable.
Loose electrical connection.
Load not disconnected.
Turning the crankshaft the wrong way.
Lack of fuel.
Air in the fuel system.
Choked fuel filter.
Excessive overload.
Overheating.
Loss of compression.
Loss of oil.

Engine Stops
Lack of fuel.
Air in the fuel system.
Choked fuel filter.
Excessive overload.
Loss of compression.
Loss of oil.

Loss of Power

Incorrect tappet clearance.
Choked air cleaner or fuel filter.
Choked exhaust system.

Failure to Attain Normal Speed
Engine started on overload.
Fuel system not correctly primed.
Insufficient fuel.

Knocking

Loose coupling or pulley.
Engine loose on its mounting.
Incorrect specification of fuel.

Exhaust Smoke
White smoke - generally as a result of water in the fuel.
Faint blue smoke - appears with light load.
Heavy blue smoke - caused by lubricating oil passing the piston rings due to stuck, worn or broken rings or a worn cylinder.
Black smoke due to incomplete combustion of the fuel can be caused by overload, choked air filter, inlet air temperature too high or incorrect specification of fuel.

Overheating

Air inlet obstructed.
Overload
Lubricating oil level too low.

Hunting

Air in the fuel system.

3.18 Laying-up Procedure

The following routine should be carried out when it is known that the engine will not be required for some months.

If the procedure is not carried out the engine should be run on full load for approximately 45 minutes once a month.

⚠ CAUTION

As a direct result of combustion, the lubricating oil may contain harmful acids. It should not be left in the sump if it is known that the engine will not be used for extended periods.

a. Replace the fuel in the tank with a small supply of suitable inhibition fluid.

b. Drain the lubricating oil from the sump and refill with new oil.

c. Run the engine for a period to circulate the oil through the system and to ensure the inhibition fluid is passed through the fuel pumps and injectors.

d. Stop the engine and drain the lubricating oil from the sump.

   The crankshaft should NOT be turned until the engine is again required for service.

   The inhibition fluid should be left in the fuel system.

e. Seal all openings on the engine with tape.

f. Remove the batteries and store them fully charged after coating the terminals with petroleum jelly.

g. Grease all external bright metal parts and the speed control linkage.

h. Tie labels on the engine clearly stating what steps have been taken to inhibit the engine during storage.

4. OIL AND FUEL SPECIFICATIONS

CONTENTS

4.1 Oil Specification

To help assist engine running-in, all engines are despatched with an initial fill lubricating oil which must be changed after 100 hours.

All subsequent oil changes must be as specified in "3.16 Maintenance Schedule".

⚠ CAUTION

Some of the following classifications may not be available in your country. In cases of difficulty, it is suggested contact be made with a reputable oil supplier or any Lister-Petter Distributor.

Note:
Also refer to '"4.2 Engine Oil Classification System"'.

1. The temperatures mentioned in the tables are the ambient temperatures at the time when the engine is started. However, if monograde oils are used and running ambient temperatures are significantly higher than starting temperatures, a higher viscosity oil should be selected subject to satisfactory starting performance. Multigrade oils may be used to overcome the problem.
2. Where it is not practical to continually change oils to suit varying ambient temperatures, a suitable multigrade oil is recommended to ensure adequate starting performance at the lowest temperature likely to be encountered.
3. 'A' Series engines must be run on heavy duty lubricating oils that at least meet the requirements of one of the following:

API CC	MIL-L-46152B
DEF2101D	MIL-L-2104B

   Straight mineral oils are not suitable, neither are oils of less detergency than specified.

Note:
Higher specification oils meeting API CD, API CE and API CF-4 are more commonly available than API CC. The use of these oils in new engines is acceptable for topping up the 'first fill' and following the first 100 hours when running-in has been completed.
These oils are particularly suited to engines running at a high load factor, or in conjunction with high ambient temperatures. They must also be used where the sulphur content of the fuel exceeds 0.5%.

⚠ CAUTION

API CD, API CE, API CF-4 or MIL-L-2104C/D/E oils can inhibit the running-in process in new or reconditioned engines and are not suitable for engines running on low duty cycles.

4. The oil must be suitable for 250 hour oil changes without undue degradation, with sump temperatures reaching 150°C (302°F) under severe tropical conditions, and 120°C (248°F) under normal conditions.
5. For engines in long running installations Lister-Petter should be consulted.

4.2 Engine Lubricating Oil Classification System

The information contained in this section has been extracted from "Lubricant and Fuel Performance", with the permission of 'The Lubrizol Corporation'.

⚠ CAUTION

Some of the following classifications may not be available in your country. In cases of difficulty, it is suggested contact be made with a reputable oil supplier or any Lister-Petter Distributor.

Note:
US 'S' grade oils are for gasolene engines and are not recommended for Lister-Petter diesel engines.

Past and current US API grade oils are described below.

API Service Category CA:

Service typical of diesel engines operated in mild to moderate duty with high-quality fuels; occasionally has included gasoline engines in mild service.

Oils designed for this service provide protection from bearing corrosion and ring-belt deposits in some naturally aspirated diesel engines when using fuels of such quality that they impose no unusual requirements for wear and deposit protection.

They were widely used in the 1940s and 1950s but should not be used in any engine unless specifically recommended by the equipment manufacturer.

API Service Category CB:

Service typical of diesel engines operated in mild to moderate duty, but with lower quality fuels, which necessitate more protection from wear and deposits; occasionally has included gasoline engines in mild service.

Oils designed for this service were introduced in 1949. They provide necessary protection from bearing corrosion and from high-temperature deposits in naturally aspirated diesel engines with higher sulphur fuels.

API Service Category CC:

Service typical of certain naturally aspirated diesel engines operated in moderate to severe-duty service, and certain heavy-duty gasoline engines.

Oils designed for this service provide protection from high-temperature deposits and bearing corrosion in diesel engines, and also from rust, corrosion, and low-temperature deposits in gasoline engines. These oils were introduced in 1961.

API Service Category CD:

Service typical of certain naturally aspirated, turbocharged or supercharged diesel engines where highly effective control of wear and deposits is vital, or when using fuels with a wide quality range (including high-sulphur fuels).

Oils designed for this service were introduced in 1955 and provide protection from high-temperature deposits and bearing corrosion in these diesel engines.

API Service Category CD-11:

Severe duty two-stroke

Service typical of two-stroke cycle diesel engines requiring highly effective control of wear and deposits.

Oils designed for this service also meet all performance requirements of API Service Category CD.

API Service Category CE - 1983:

Service typical of certain turbocharged or supercharged heavy-duty diesel engines, manufactured since 1983 and operated under both low speed, high load and high speed, high load conditions.

Oils designated for this service may also be used when API Service Category CD is recommended for diesel engines.

API Service Category CF-4 -1990:

Service typical of high-speed, four-stroke cycle diesel engines.

API CF-4 oils exceed the requirements for the API CE category, providing improved control of oil consumption and piston deposits.

These oils should be used in place of API CE oils. They are particularly suited for on-highway, heavy-duty truck applications. When combined with the appropriate 'S' category, they can also be used in gasoline and diesel powered personal vehicles - i.e., passenger cars, light trucks, and vans - when recommended by the vehicle or engine manufacturer.

API Service Category CF:

Indirect injection

Service typical of indirect-injected diesel engines and other diesel engines that use a broad range of fuel types, including those using fuel with high sulphur content; for example, over 0.5% weight.

Effective control of piston deposits, wear and copper-containing bearing corrosion is essential for these engines, which may be naturally aspirated, turbocharged or supercharged.

Oils designated for this service have been in existence since 1994 and may be used when API Service Category CD is recommended.

API Service Category CF-2:

Severe duty, two-stroke cycle

Service typical of two-stroke cycle diesel engines requiring highly effective control over cylinder and ring-face scuffing and deposits.

Oils designed for this service have been in existence since 1994 and may also be used when API Engine Service Category CD-11 is recommended.

These oils do not necessarily meet the requirements of API CF or CF-4 unless they pass the test requirements for these categories.

API Service Category CG-4 - 1994:

Severe duty

API Service Category CG-4 describes oils for use in high-speed fourstroke-cycle diesel engines used in both heavy-duty on-highway (0.05% weight sulphur fuel) and off-highway (less than 0.5% weight sulphur fuel) applications.

CG-4 oils provide effective control over high-temperature piston deposits, wear, corrosion, foaming, oxidation stability, and soot accumulation.

These oils are especially effective in engines designed to meet 1994 exhaust emission standards and may also be used in engines requiring API Service Categories CD, CE, and CF-4. Oils designed for this service have been in existence since 1994.

European Oil Specifications:

ACEA specifies the following:

Gasolene Engines
A1-96, A2-96, A3-96.

Light Duty Diesel Engine Operation
B1-96, B2-96, B3-96.

Heavy Duty and Commercial Vehicle Diesel Engine Operation
E1-96, E2-96, E3-96.

4.3 Oil Viscosity

The following chart shows the correct oil viscosities at various °C ambient temperature ranges for cold start to maximum running.

Before selecting a viscosity grade refer to Notes:

Notes:

a. Intermittent running.

b. Synthetic oils only.

°F = (1.8 x °C) + 32.

1. *SAE 5W-20 oils are recommended on the basis that they are fully synthetic, and are technically suitable for use up to 25°C (77°F). Non synthetic oils at very low temperatures will suffer from wax crystallisation.*
   Monograde SAE 5W is not normally available as a synthetic oil and therefore is not quoted.
2. *In order to maintain the cold starting characteristics of any recommended grade, it is essential that oil changes are made within the Lister-Petter recommendations.*
   An oil change is recommended immediately if the engine fails to reach its normal cold start cranking speed due to excessive oil viscosity.
   Fuel dilution of the lubricating oil will adversely affect cold starting and oil consumption.
3. *SAE 30 and 10W-30 oils may be used at up to 52°C (126°F) but oil consumption may be affected.*
   10W-40, 15W-40 and 20W-40 multigrades are recommended for continuous full load operation at this temperature.
4. *Monograde SAE 40 oils are not recommended.*

4.4 Fuel Specification

The engine must only be used with diesel fuel oil which conforms to one of the following:-

a. BS 2869:1988 Class A2.

b. BS EN590:1995 Class A1.

c. USA Specification ASTM D-975-77 Grades No.1-D and 2-D.

d. BSMA 100 Class M1 for marine use.

The fuel must be a distillate, and not a residual oil or blend. Vaporising oils are not suitable as fuels for these diesel engines.

The user is cautioned that although the engines may operate on fuels outside the above specifications, such operation may well result in excessive wear and damage.

CAUTION

The fuel injection equipment is manufactured to very accurate limits and the smallest particle of dirt will destroy its efficiency.
Fuel, free from water and contaminants is of the utmost importance.

4.5 Low Temperature Fuels

Special winter fuels are often available for use at ambient temperatures below 0°C (32°F).

These fuels have a lower viscosity and limit the formation of wax at low ambient temperatures.

CAUTION

Wax formation can rapidly reduce the flow of fuel through the fuel filter element.

5. PARTS AND SERVICE

CONTENTS

5.1 Associated Publications

Master Parts Manual 027-08028
Workshop Manual 027-09202
Technical Information 027-09212
Arrangement Drawings 027-08106

Various wall charts and technical/sales leaflets are available.

Please contact Lister-Petter for details.

5.2 Data on CD Rom

The Master Parts Manual, Technical Bulletins, issued since June 1988, and parts information is available on CD Rom.

Please contact Lister-Petter for details.

5.3 Training

Comprehensive training in the correct operation, service and overhaul procedures of engines is available at the Lister-Petter International Product Training Centre.

Please contact Lister-Petter for details.

5.4 If Problems Occur

If problems occur with your engine, or any of the Lister-Petter approved accessories fitted to it, your local Lister-Petter Distributor should be consulted.

There are Lister-Petter Distributors in most countries of the world and details for these can be obtained from any one of the companies listed.

5.5 The Importance of Using Genuine Parts

Parts that have not been approved by the Lister-Petter organisation cannot be relied upon for correct material, dimensions or finish.

This Company cannot therefore, be responsible for any damage arising from the use of such parts and the guarantee may be invalidated.

When purchasing parts or giving instructions for repairs users should, in their own interests, always specify Genuine Lister-Petter Parts.

5.6 Lister-Petter Companies

United Kingdom

Lister-Petter Limited
Dursley
Gloucestershire
GL11 4HS
England
Tel: +44 (0)1453 544141
Fax: +44 (0)1453 546732
E-mail: sales@lister-petter.co.uk
http://www.lister-petter.co.uk

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Fax: +1 913 764-5493
E-mail: lpinfo@lister-petter.com
http://www.lister-petter.com

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Fax: +33 (0)1 34195760
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