K Series

Operators' Handbook
K1 64, K1 72 Engines

P027-10504, Issue 2

Associated Publications:
Master Parts Manual.....P027-10506
Workshop Manual.....P027-10505
Technical Handbook P027-10507

Disclaimer
The information, specifications, illustrations, instructions and statements contained within this publication are given with Lister Petter's 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, the Distributor nor the 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, is for the assistance of users and is based upon results obtained from tests carried out at the place of manufacture. The Company does not guarantee that the same results will be obtained elsewhere under different conditions.

Contents

1. Introduction

1.1 Introduction

The purpose of this handbook is to lay down operating guidelines for the K Series 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.

Using 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.

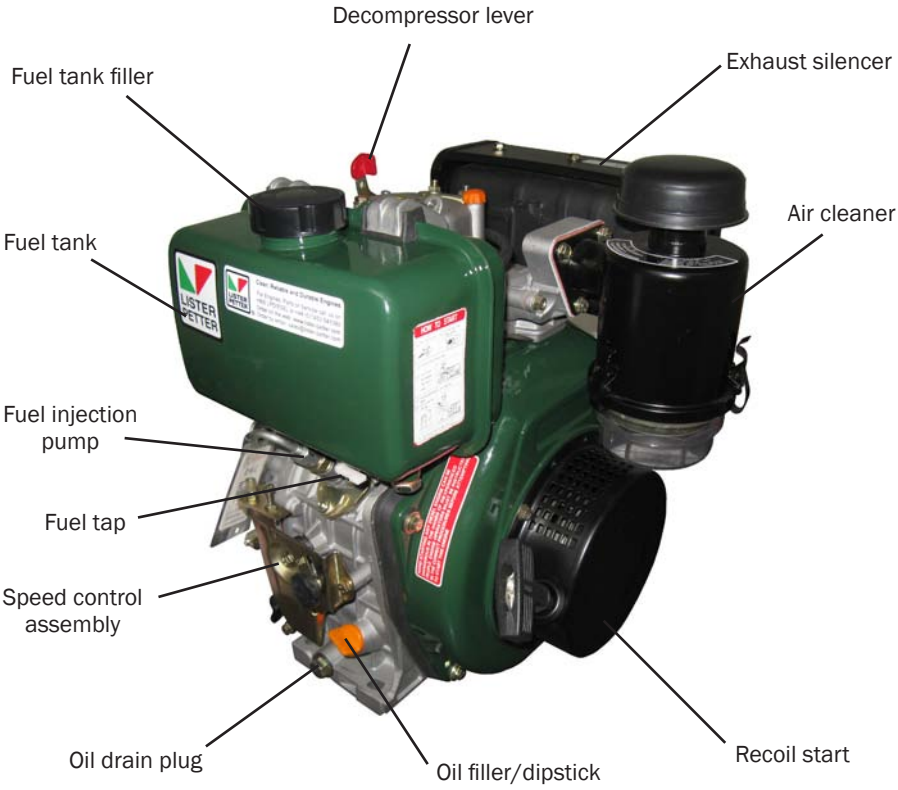
Running-in

A gradual running-in of a new engine is 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.

Associated Publications

Workshop Manual
Master Parts Manual
Technical Handbook

2. Engine Features



K1 72

3. Safety Information and Precautions

3.1 Safety Information, Precautions and Safe Working Practices

Follow All Safety Instructions

a. Carefully read all safety messages in this manual and the safety and informative symbols on your engine and plant.
b. 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.
c. Do not make any unauthorised modifications as these may affect the safe operation of the engine and put the operator at risk.
d. Ensure all starting devices are removed, or isolated, before commencing any work on the engine or plant.

Emergency Considerations

a. Be prepared with suitable equipment, and knowledge, in case a fire starts.
b. Know where to make calls to the emergency services from.
c. Ensure a third party knows where you are working and when you leave the working area.

Handling Fluids Safely

a. When working with fuel or batteries do not smoke or work near to heaters or other fire hazards.
b. Store flammable liquids away from fire hazards.
c. Do not expose pressurised containers to heat and do not incinerate or puncture them.
d. Handle fuel with care and always stop the engine before refuelling. Do not overfill the fuel tank.
e. Thoroughly clean any lubricating or fuel oil from the skin as soon as possible.
f. Rectify all fuel, coolant and oil leaks as soon as practicable and clean any spills when they occur.
g. Remove any build-up of grease, oil or debris.
h. 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.

Personal Safety

a. Tie long hair close to your head.
b. Do not wear a necktie, scarf, loose clothing or necklace when working close to a running engine.
c. It is advisable to remove rings and other jewellery to prevent possible entanglement in moving parts. These items could also cause an electric short circuit if any part of the electrical system is being worked on.
d. Do not work under any plant that is only held by overhead lifting equipment.

Personal Protective Clothing and Equipment

a. Wear close fitting clothing and personal protective clothing and safety equipment appropriate to the work being done.
b. Wear suitable ear protection to protect against objectionable or uncomfortable loud noise.
   Prolonged exposure to loud noise can cause impairment, or loss of hearing.
c. The use of music or radio headphones could cause a loss of concentration.

Handling Chemical Products Safely

a. Direct exposure to hazardous chemicals can cause serious injury.
b. Potentially hazardous chemicals include such items as lubricants, fuel, coolant concentrate, battery acid, paint and adhesives.
c. Manufacturers Safety Data Sheets will provide specific details of the physical and health hazards, safety and emer-

gency procedures and any necessary personal protection equipment required while working with hazardous materials.

Rotating Machinery

a. Entanglement with any rotating equipment can cause serious injury or death.
b. If unprotected skin comes into contact with rotating equipment severe burns can result.
c. Some accessories may require guards which must be supplied and fitted by the purchaser.

Safe Maintenance Considerations

a. Understand the service procedures before commencing any work.
b. Ensure the work area is clean, dry, well ventilated and has adequate lighting.
c. Isolate the engine starting system before commencing any work on the plant.
d. All persons using equipment or processes in connection with the maintenance of plant and machinery must have received adequate and suitable training.

High Pressure Fluids

a. Never allow any part of the body to come into contact with high pressure hydraulic oil, compressed air or fuel oil, for example when testing fuel injection equipment.
b. Both digested and injested fluids can lead to serious injury, possibly with fatal results in a very short period of time.

Electrical System Considerations

a. Ensure that the battery is of sufficient capacity to start the engine down to its minimum operating temperature taking into account any drag that may be imposed on the engine by the type of transmission that is attached to it.
b. Ensure the battery and all engine wiring cables are of sufficient size to carry the currents required.
c. Check that the engine mounted alternator is of sufficient output to cope with the total electrical load required by the machine to which it is fitted.
d. Ensure engine wiring cables are:
   Bound together in a loom and adequately supported.
   Routed to avoid any hot surfaces, particularly the exhaust system.
   Not in contact with any rough surfaces or sharp corners so as to avoid any possibility of chaffing taking place

Charge Winding Precautions

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

a. Never remove any electrical cable while the battery is connected in the circuit.
b. Only disconnect the battery with the engine stopped and all switches in the OFF position.
c. Always ensure that cables are fitted to their correct terminals.
   A short circuit or reversal of polarity will ruin diodes and transistors.
d. Never connect a battery into the system without checking that the voltage and polarity are correct.
e. Never flash any connection to check the current flow.
f. Never experiment with any adjustments or repairs to the system.
g. 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.

Starter Battery Precautions

⚠ WARNING

Sulphuric acid in battery electrolyte is poisonous, is strong enough to burn skin, eat holes in clothing and cause blindness if splashed into the eyes.

a. Do not smoke near the batteries and keep sparks and flames away from them.
b. 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 immediate medical aid.
c. Keep the top of the battery well ventilated during charging. Switch off the battery charger before connecting or disconnecting the charger leads.
d. Disconnect the battery negative (earth) lead first and reconnect last.
e. Never 'flash' connections to check current flow.
f. A damaged or unserviceable battery must never be used.
g. Do not attempt to charge a frozen battery; it may explode; warm the battery to 16°C (60°F).

Oil Seals Containing Viton

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.

Lifting Precautions

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

⚠ WARNING

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

- Ensure the lifting equipment to be used has the correct capacity to lift the engine and is designed to give a vertical lift from directly above the lifting eyes.
- Check to ensure the engine lifting eyes are not damaged and they are secure.
- Ensure there is clearance between the lifting equipment hooks and the engine.
- The lifting eyes fitted to the engine are suitable for lifting the engine and accessory assemblies originally fitted by Lister Petter.

Waste Disposal Precautions

⚠ WARNING

Extreme care must be taken to ensure that waste oil, fuel, filter elements, coolant concentrate, battery electrolyte, solvents or other toxic wastes are disposed of in accordance with local regulations to prevent contamination.

Fuel System Precautions

a. When priming or checking the fuel injection pump timing, care must be taken to wipe spilled fuel from the outside of the engine.
b. Always fit a new joint when a union has been disturbed.
c. Special care must be taken to see that there is no leakage from the joints of the fuel pipe connection to the pump.
d. When tightening or loosening the fuel injection pump delivery connections, use two spanners to prevent the unsealing of the fuel pump delivery valve holders.
e. When refitting the fuel pipe from the pump to injector, the connection to the injector must be tightened before the connection to the fuel pump.
   This procedure will ensure that there is no leakage from these joints.
f. It is most important that all fuel joints are tight and leak proof.
g. Always fill the fuel tank through a fine strainer, preferably at the end of the engine work period.

If any sediment is stirred up during the process this has time to settle before the engine is used again, this will minimise the risk of condensation contaminating the fuel.

If cans are used, avoid tipping out the last few drops.

h. Funnels are very difficult to keep clean in dusty conditions.
   Wash them before and after use and wrap them up when not required, or fill the tank direct from a small mouthed screw capped fuel can.
i. 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.

General Precautions

a. Ensure the engine is securely mounted.
b. Ensure that there is a generous supply of cooling and combustion air available.
c. Keep the engine and surrounding area clean.
d. Keep all safety guards in position.
e. Keep the body and clothing clear of all moving or hot parts.
f. Never allow any part of the body to come into contact with high pressure fuel oil, for example when testing fuel injection equipment.
g. Thoroughly clean any lubricating or fuel oil from the skin as soon as possible.
h. Rectify all fuel and oil leaks as soon as practicable and clean any spillages when they occur.

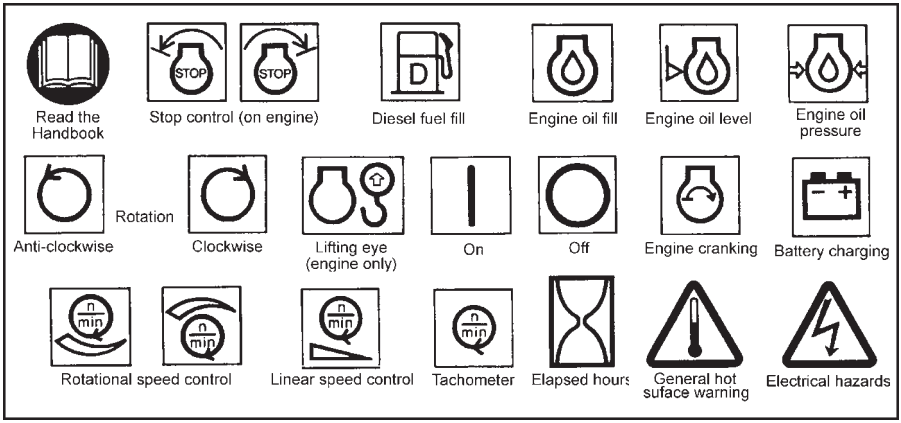
Before Starting Precautions

⚠ 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.

a. Ensure the engine is free to turn without obstruction.
b. Check that the lubricating oil level is correct.
c. The oil sump must be filled to the ‘full’ mark on the dipstick; do not overfill.
d. Check that the fuel is in the 'ON' position.
e. Ensure that the battery is connected, fully charged and serviceable.
f. Where possible, disengage the driven equipment while starting.

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



4. General Information

4.1 Technical Data

Type		K1 64	K1 72
Design		Air-cooled four-stroke diesel engine	
Rotation[1]		Anticlockwise	Anticlockwise
Type of injection		Direct	Direct
Number of cylinders		1	1
Bore x stroke	mm	78 x 64	86 x 72
Displacement	cm^3	305	418
Electrical system[2]		12v negative earth	12v negative earth
Battery charging system[2]		Charge windings	Charge windings
Lubricating oil consumption (after running in period)		0.75% of fuel consumption at full load	
Minimum lubricating oil pressure at 3000r/min	bar ($lbf\ in^2$)	1.5 (21)	
Oil sump capacity	litre	1.1	1.65
	pints	1.95	2.9
	USquarts	1.2	1.75
Capacity between dipstick marks	litre	0.4	0.55
	pints	0.73	1.0
	USquarts	0.45	0.6
Fuel tank capacity	litre	3.5	5.5
	pints	6.1	9.6
	USquarts	3.6	5.7
Net weight	kg	33	47

Notes:
1. Viewed from output shaft end; 2. Fitted as standard on some models.

4.2 Nomenclature

K1 64 - Single cylinder, direct injection, naturally aspirated, flywheel fan air cooled diesel engine.

K1 72 - Single cylinder, direct injection, naturally aspirated, flywheel fan air cooled diesel engine.

4.3 Engine Serial Number

The engine serial number is stamped on a plate attached to 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.

Typical Serial Number

11300123K164C36V

Serial Number Code

11..... Year code (11=2011)
3..... Factory code
00123..... Consecutive number of engine
K164 ..... Model
C..... Camshaft drive PTO (Power Take Off)
36..... Maximum rated speed of 3600rev/min (30 = 3000rev/min)
V ..... Variable speed governor

5. Operating Instructions

5.1 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 "3. Safety Information and 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.

⚠ WARNING

EXHAUST GASES CONTAIN CARBON MONOXIDE WHICH IS A COLOURLESS, ODOURLESS AND POISONOUS GAS THAT CAN CAUSE UNCONSCIOUSNESS AND DEATH.

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 ambient operating temperature is 40°C (104°F) and if it is desired to run at higher temperatures the local Lister Petter Distributor or Dealer should be consulted.

⚠ WARNING

All engines are dispatched dry, i.e. not containing fuel or oil.

5.2 Starting Procedure

⚠ 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.

1. Fill the engine with the correct grade of lubricating oil and fuel as specified in Engine Fluids - Section 6.
2. Open the fuel tap.

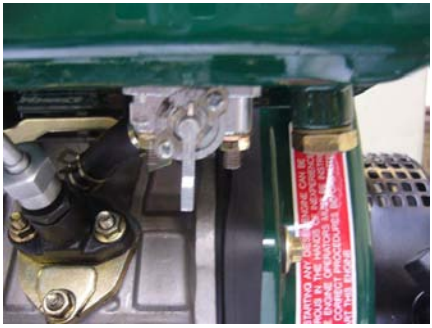


Figure 5.2.1 Fuel Tap (on position)

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

Figure 5.2.2 Engine Control - Fixed Speed

Figure 5.2.3 Engine Control - Variable Speed

4. Pull the rope handle until you feel tension. Let the rope rewind back into the recoil start; in this way the entire length of the starting rope can be used to start the engine.
5. Push the decompressor lever down and it will stay in the down position.

Figure 5.2.4 Decompressor Lever

6. Grip the handle with both hands.
7. Commence pulling the starting cable vigorously (the decompressor lever will return automatically to the run position) and at increasing speed until the engine starts.
8. If the engine does not start repeat process from 3 - 6 again.

5.3 Electric Key Start

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

Figure 5.3.1 Decompressor Lever - Run position

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

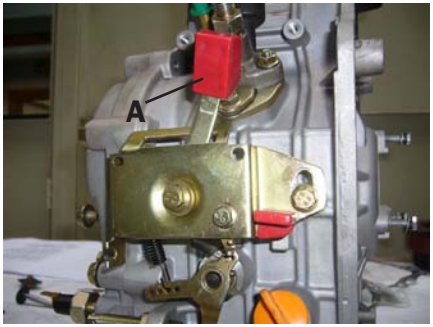


Figure 5.3.2 Engine Control

3. If a variable speed control is fitted select the fast position.
4. Turn the starter key clockwise to the ON position. Any pilot lamps (if fitted) must now light up.
5. If a heater plug is fitted turn the starter key clockwise to the HEAT position and hold it there for 20 seconds.
6. Turn starter key clockwise to the START position and release it immediately after the engine fires.
   Do not operate the starter key for more than 15 seconds at a time.

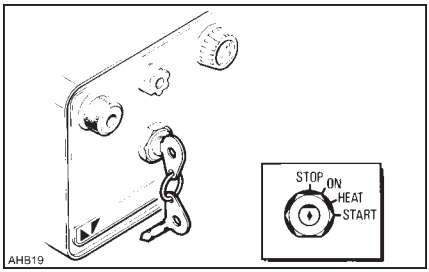


Figure 5.3.3 Start Key

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

5.4 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 fixed speed engines not fitted with a fuel control solenoid press the lever marked B downwards to release the speed control lever.

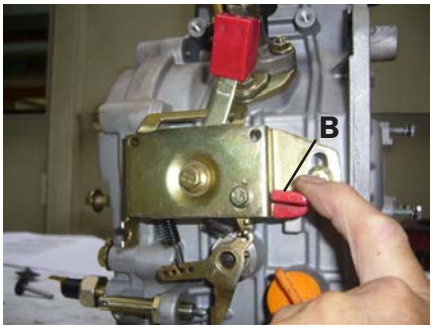


Figure 5.4.1 Engine Control

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 start key to the 'STOP' position.
3. On variable speed engines, release the screw C and move it back to the stop position and hold it there until the engine stops.

6. Engine Fluids

6.1 Oil Specification

All subsequent oil changes must be as specified in "7.14 Maintenance - Schedule hours".

1. The oil specification is shown in the attached table.

Temperature	Lube oil specification	Lube oil type
10 °C - 40 °C	API CD Grade or above	SAE 10w-30 or SAE 15w-40
Below 10 °C		SAE 10w-30

2. The oil must be suitable for 100 hour oil change periods without undue degradation.
3. Monograde SAE40 oils are not recommended.

6.2 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.

6.3 Fuel in Low Temperatures

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 temperature.

⚠ CAUTION

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

7. Engine Servicing

7.1 Preliminary Instructions

These recommendations and instructions cover K Series engines therefore they are of a general nature and may include optional equipment not specifically covered in this book.

More detailed information can be found in the Workshop Manual or any Lister Petter Distributor can be consulted.

- The engine should receive regular attention during the first 20 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 "7.14 Maintenance - Schedule hours" 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.
- When re-assembling an engine lubricate all moving parts with engine oil.
- Renew nuts and bolts that have been taken from high stress locations.

In particular nuts and/or bolts from the connecting rods should be renewed.

- 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.

Before Starting Work

Before starting any dismantling procedure the following should be considered:

- Do you have, or access to, the necessary Lister Petter spare parts before you commence dismantling.
- Do you know and understand the engine and all the related systems?
- Do you have sufficient electrical and mechanical knowledge and skills to understand the symptoms?
- Do you have suitable electrical diagnostic equipment available?

7.2 Precautions for Oil, 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 and filter elements are disposed of in accordance with local regulations to prevent contamination.

7.3 Initial Attention

All engines are dispatched dry, i.e. not containing fuel or oil.

All subsequent oil changes must be as specified in "7.14 Maintenance - schedule hours".

7.4 Priming the Fuel System

The engine is fitted with a self priming fuel system it should not be necessary to prime the system.

7.5 Valve Clearance Adjustment

The valve clearance for both inlet and exhaust valves, set with the engine cold, is 0.15mm (0.006in).

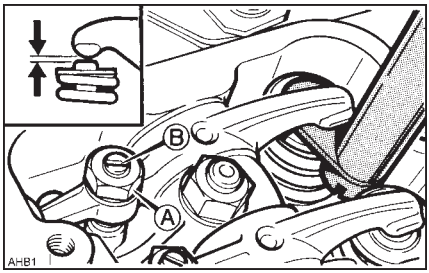


Figure 7.5.1 Valve Clearance

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

7.6 Changing the Air Cleaner Element

1. Remove the centre wing nut and remove the filter housing.

Figure 7.6.1 Air filter housing

2. Remove the anti vibration washer and filter retaining nut.

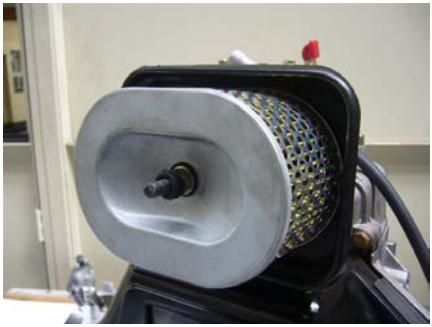


Figure 7.6.2 Air filter element

3. Withdraw the element.

Figure 7.6.3 Element removal

4. Clean the area around the filter ensuring that no dirt falls into the inlet port.

Figure 7.6.4 Air cleaner back plate

5. For re-assembly, reverse the above process.

⚠ WARNING

The engine must not be run without an air cleaner element.

7.7 Draining and Filling the Oil Sump

Before draining the oil, read "7.2 Precautions for Oil, 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 7.7.1 Oil drain plug

4. Replace the plug taking care not to over tighten it. Clean the oil filter, refer to section 7.8.
5. Fill the sump through the oil filler to the top mark on the dipstick. The oil level on the dipstick must be measured without the dipstick being screwed in.

Figure 7.7.2 Oil dipstick

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.

7.8 Cleaning the Oil Filter

1. Before changing the filter, read "7.2 Precautions for Oil, Filters and Elements".
2. Remove drain plug and drain oil into a suitable container.
3. Unscrew the retaining screw (A) and pull out the oil filter from the crankcase.

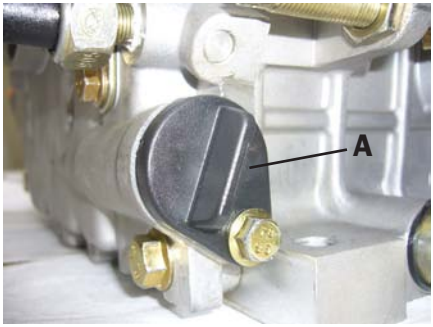


Figure 7.8.1 OIl filter securing bolt

Figure 7.8.2 Oil Filter

4. Clean the oil filter in diesel fuel.
5. Clean the crankcase 'O' ring housing face.
6. Fit a new 'O' ring if damaged.
7. Refit the filter and tighten retaining screw 'A' to 10Nm (7.5lb ft).

⚠ CAUTION

The retaining screw must not be over tightened.

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

7.9 Sump Capacity

Type	litres	pints	US qts
K1 72	1.65	2.9	1.75
K1 64	1.1	1.95	1.2

7.10 Capacity Between Dipstick Marks

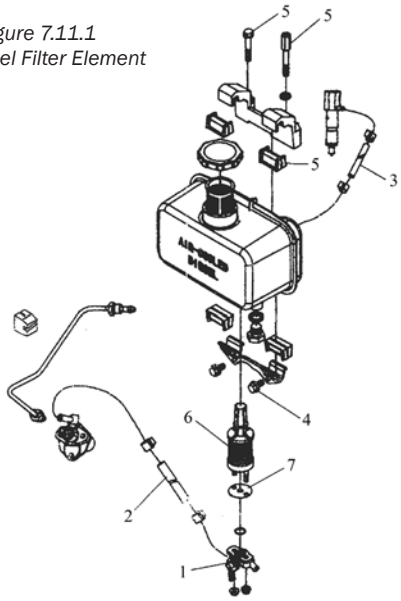
Type	litres	pints	US qts
K1 72	0.55	1.0	0.6
K1 64	0.4	0.73	0.45

7.11 Changing the Fuel Filter

Before changing the filter, read "7.2 Precautions for Oil, Filters and Elements".

1. Drain the fuel tank.
2. Remove the two 6mm nuts which secure the fuel tap assembly.

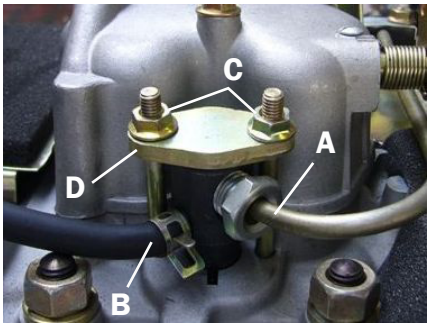
Figure 7.11.1
Fuel Filter Element



3. Remove the filter through the tank filler.
4. Insert new filter with sealing gasket into tank.
5. Fit fuel tap assembly and tighten retaining screws.
6. Turn the fuel tap ON.
7. Refill the fuel tank. Bleeding of the fuel injection system takes place automatically.

7.12 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 and the sealing washer.



7.12.1 Injector Setting

The injector must only be set on a test rig to 203 bar (200atmos; 2950lbf in^2).

7.12.2 Replacing the injector

1. Ensure the seatings in the cylinder head are clean and smooth.
2. Fit the heat insulating washer onto the Injector.
3. Replace the Injector into the cylinder head, ensure dowel pin locates into the slot.
4. Fit injector clamp over the two studs.
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 10-12Nm (7.5-9lbf ft).
9. Replace the leak-off pipe.
10. After the initial run following an injector replacement, re-torque the two clamp nuts.

7.13 Checking the Battery

1. Wear protective gloves and goggles.
2. Clean the top of the battery filler plug area.
3. Remove the filler plugs and check that the electrolyte level is 6.0-9.0mm (0.25-0.37in) above the tops of the separators.
4. If necessary top up with distilled water. In cold weather distilled water should only be added immediately before running the engine.
5. Replace and tighten the filler plugs.
6. Check that the terminal connections are tight; petroleum jelly will help to protect them from corrosion.

⚠ WARNING

BATTERIES CONTAIN SULPHURIC ACID WHICH CAN CAUSE SEVERE BURNS AND PRODUCE EXPLOSIVE GASES.

IF THE ACID HAS BEEN SPLASHED ON THE SKIN, EYES OR CLOTHES FLUSH WITH COPIOUS AMOUNTS OF FRESH WATER AND SEEK IMMEDIATE MEDICAL AID.

7.14 Maintenance Schedule

At all times continiously monitor engine performance.
Observe the correct oil and filter change periods as specified below.

Regular service period / Item	Daily	First month or 20 hours	Third month or 100 hours	200 hours	Sixth month or 500 hours	Yearly or 1000 hours
Check and replenish fuel	○					
Drain out fuel		○				
Check and replenish lub oil	○					
Check for oil leakage	○					
Check and tighten all engine nuts and bolts		○			●Tighten cylinder head nuts	
Change lub oil		○ Initial	○			
Clean oil filter		○	○		○(Change if necessary)	
Replace air filter element				○		
Change fuel filter					○ Replace	
Check fuel injection pump					●	●Change
Check fuel injection nozzle					●	
Check fuel pipes					○(Change if necessary)	
Check and adjust inlet and exhaust valve clearance		●Initial			●	
Check inlet and exhaust valve and seat condition						●
Replace piston rings						●
Check battery electrolyte	Monthly (replenish with distilled water as necessary)					

Note: ● means if you need special tools, please contact your nearest Lister-Petter Distributor

Change the lubricating oil and clean the oil filter for the first time at 20 hours and then as specified in 7.14 Maintenance Schedule.

⚠ CAUTION

Continuous operation under heavy loads in ambient temperatures above 35 °C (95 °F) causes the oil to deteriorate more quickly.

7.15 Long Term Storage

The following routine should be carried out when it is known that the engine will not be required for 6 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.

Preparing the Engine for Storage

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.

Returning the Engine to Service

Refer to the appropriate sections for the relevant detailed instructions as necessary to complete this work.

a. Remove the tie-on labels and all the protective coverings from openings and apertures.
b. Fill the fuel tank.
c. Refill the lubricating oil sump with new oil of the correct specification and viscosity.
d. Remove the batteries from store. If they are still fully charged reconnect them to the engine.
   Coat the terminals with petroleum jelly.
e. Start the engine and check for fuel and oil leaks before applying load.

8. Troubleshooting

8.1. Troubleshooting

Troubleshooting mechanical engine problems can be difficult. This section lists possible engine problems that could be encountered with possible causes. The information given is of a general nature as it covers the basic engine and your particular application may be different.

If you are in any doubt, contact your local Lister Petter distributor.

Before starting any dismantling procedure the following should be considered:

a. Do you have, or access to, the necessary Lister Petter spare parts before you commence dismantling.
b. Do you know and understand the engine and all the related systems?
c. Do you have sufficient electrical and mechanical skills and knowledge to understand the symptoms?
d. Do you have suitable electrical diagnostic equipment available?

Method of Troubleshooting

1. Diagnose the problem by eliminating the easiest things first.
2. Before starting to remove or dismantle any components double check your observations.
3. When electrical troubleshooting always start at the battery first.

Problem	Method of Correction
Difficult starting or failure to start	
Incorrect starting procedure.	Refer to "5. Operating Instructions".
Unsuitable lubricating oil or fuel.	Refer to the specifications in "6. Engine Fluids".
No fuel in the tank or the filter is choked.	Refill the tank or replace the filter.
Fuel tap in OFF position.	Switch to ON position.
Water or dirt in the fuel system.	Drain, flush, refill and prime the fuel system.
Faulty injector or fuel pump.	Replace the injector or pump or have it serviced.
Discharged battery or poor battery connections.	Recharge or replace the battery. Check the terminals are tight.
Overheating	
Overload.	Reduce the load.
Lubricating oil level too low.	Refill the sump.
Recirculation of exhaust gasses or cooling air.	Investigate the cause and rectify.
Cooling air obstructed or restricted.	Investigate the cause and rectify.

Problem	Method of Correction
Engine stops	
Lack of fuel.	Check the system. Refill the tank.
Water in the fuel system.	Drain, flush, and refill the tank.
Choked fuel filter.	Replace the filter.
Choked air filter.	Dismantle and clean or replace the element.
Overload.	Reduce the load.
Overheating.	See the 'Overheating' section.
Loss of compression.	Check the piston rings and the valves.
Lack or loss of power.	
Loss of compression.	Check the piston rings and the valves.
Choked air filter.	Dismantle and clean or replace the element.
Choked exhaust system.	Dismantle and clean.
Overload.	Reduce the load.
Choked fuel filter.	Replace the filter.
Worn engine.	Give the engine a major overhaul.

8. Troubleshooting

Problem	Method of Correction
Undercharging	
Excessive electrical load from added accessories.	Remove accessories.
Poor electrical connections to charge windings or battery.	Inspect, clean and rectify the cause.
Faulty battery.	Test, recharge or replace.
Faulty charge windings.	Refer to the Workshop Manual.
Overcharging	
Faulty charge windings	Refer to the Workshop Manual.
Battery requires excessive amounts of water	
Battery case leaking.	Clean surrounding area an replace the battery.
Defective battery.	Test or replace the battery.
Charging rate is too high.	Refer to the Workshop Manual.
Battery will not charge	
Loose or corroded connections.	Clean and tighten the connections.
Worn out battery.	Replace the battery.
Faulty charge windings.	Refer to the Workshop Manual.
Starter motor does not operate	
Loose or corroded connections.	Clean and tighten the connections.
Worn out battery.	Replace the battery.
Faulty starter panel or connections.	Check the connections or replace the panel.

9. Maintenance Record

Your Lister Petter engine must be properly maintained using the timings and procedures described in this manual. You must be familiar with the routine tasks set out in *7. Engine Servicing,* and their correct frequency as described in *7.14 Maintenance Schedule*. Details of the maintenance work carried out on the engine during the first 1000 hours, except the daily checks, must be recorded in the spaces allocated in this section: pages 25—31 for routine maintenance and pages 32—35 for records of non-routine maintenance.

Hours run	Work done by	Details of service	Distributor/Dealer Stamp	Date

9. Maintenance Record: Routine Servicing

Hours run	Work done by	Details of service	Distributor/Dealer Stamp	Date

Hours run	Work done by	Details of service	Distributor/Dealer Stamp	Date

9. Maintenance Record: Routine Servicing

Hours run	Work done by	Details of service	Distributor/Dealer Stamp	Date

Hours run	Work done by	Details of service	Distributor/Dealer Stamp	Date

9. Maintenance Record: Routine Servicing

Hours run	Work done by	Details of service	Distributor/Dealer Stamp	Date

Hours run	Work done by	Details of service	Distributor/Dealer Stamp	Date

9. Maintenance Record: Non-Routine Servicing

Hours run	Work done by	Details of non-routine service	Distributor/Dealer Stamp	Date

Hours run	Work done by	Details of non-routine service	Distributor/Dealer Stamp	Date

9. Maintenance Record: Non-Routine Servicing

Hours run	Work done by	Details of non-routine service	Distributor/Dealer Stamp	Date

Hours run	Work done by	Details of non-routine service	Distributor/Dealer Stamp	Date

10. Warranty

On receipt of your engine please fill in the section on page 37. This information will be required in the event of a claim under your one-year warranty, according to the conditions set out below.

10.1 Standard Warranty Cover

The standard warranty is one year/1000-hour cover for all non-serviceable[1] components, parts and labour, beginning on the date of delivery to the original retail purchaser, and is transferable. It is subject to the conditions set out below in *10.2 Conditions of Warranty* and the limitations set out in *10.3 Limitations of Warranty*.

10.2 Conditions of Warranty

For the warranty to be valid, servicing must be carried out in accordance with *7. Engine Servicing* and with the timings set out in *7.14 Maintenance Schedule*. Detailed records of servicing must be kept; see *9. Maintenance Record*. Servicing must be by approved dealers or competent engineers. The conditions of warranty are:

- The maintenance record must be completed.
- Oils and other fluids must be to the specifications/grades given in *6. Engine Fluids* or as instructed in the Workshop Manual.
- Only genuine Lister Petter service parts must be used.
- When Lister Petter parts are purchased from a dealer, this must be noted, with the dealer's stamp, in *9. Maintenance Record*, and receipts for the parts must be retained. The dealer is authorised to stamp the maintenance record only following the sale of genuine parts, to a competent engineer, intended to be used on the warrantable Lister Petter engine.
- Evidence will be required of engine hours run and should be entered in *9. Maintenance Record*. Evidence of equipment used to record engine hours may be requested in the event of a warranty claim. If no hour recorder is fitted, twelve hours per calendar day will be used as a basis for the hours-run calculation.
- The installation should be in accordance with data supplied by the Lister Petter Applications Department.
- Long-term light-load and cold-engine running will invalidate the warranty.

10.3 Limitations of Warranty

- The seller does not accept responsibility for any business costs or other losses which may result from the warrantable failure.
- The seller is not responsible for failures resulting from misapplication, abuse or neglect, including: operating with inadequate cooling; the use of non-approved or contaminated fuels or lubricants; lack of, or incorrect, maintenance; incorrect repair; improper storage; incorrect starting, stopping or operating procedures; the use of non-approved parts; fair wear and tear; and serviceable items (see note 1).

Continued

Notes:

1. Serviceable items (unless defective) include, but are not limited to: air filters, fuel filters, oil filters, injector nozzles, drive belts and lubricants (unless used on an authorised repair).

2. This warranty gives the purchaser specific legal rights; the purchaser may also have other rights, which vary by country or state.

Notes: see overleaf.

10.4 Purchase and Registration Details of your Engine

Please fill in the section below with your purchase and registration details. This information will be required in the case of a claim under warranty.

10.5 Repairs under Warranty

- Lister Petter must be contacted and authorisation given before any warrantable work is commenced.

10.6 Contacting Lister Petter

Lister Petter Limited, Dursley GL11 4HS, England; telephone +44 (0)1453 546732; website *www.lister-petter.co.uk*.

Engine Serial Number: .....

Purchased from: .....

.....

.....

Purchase Date: .....

Date Registered with Lister Petter: .....

Plant Type: .....

Plant Number: .....

11. Index

California Proposition 65 Warning
Engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

K Series Engine Operators' Handbook
Publication P027-10504, January 2011

UK
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;
www.lister-petter.co.uk

UAE
Lister Petter FZE, Dubai Silicon Oasis Headquarters, PO Box 341077, Dubai, UAE
Tel: +971 4 372 4331; Fax: +971 4 372 4318
E-mail: sales@listerpettergroup.com;
www.lister-petter.co.uk