

# The TS, TR Series Operators Handbook

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## 1. General Information

### 1.1 Introduction

The purpose of this handbook is to lay down operating guidelines for the current TS and TR 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 Using this 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.

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#### **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.*

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#### **WARNING**

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

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#### **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.**

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#### **Note:**

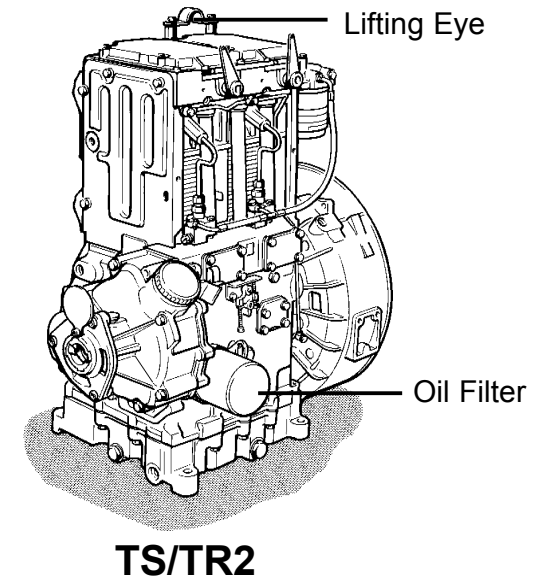
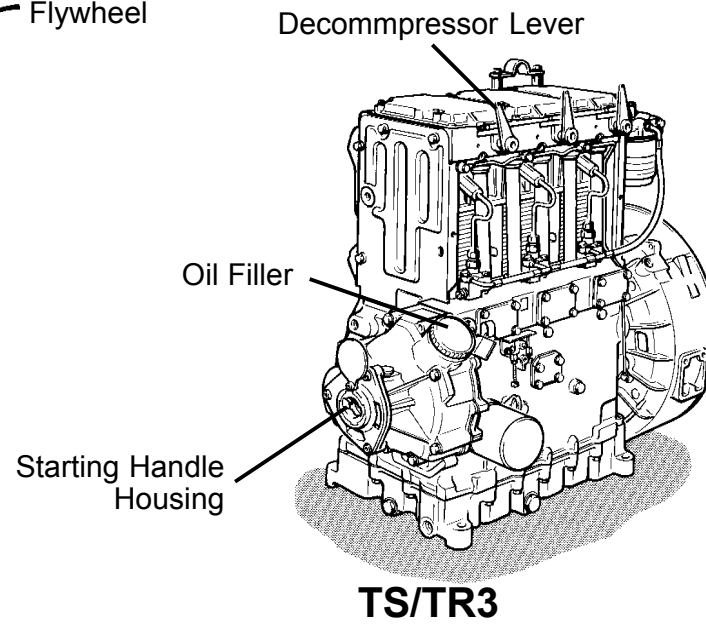
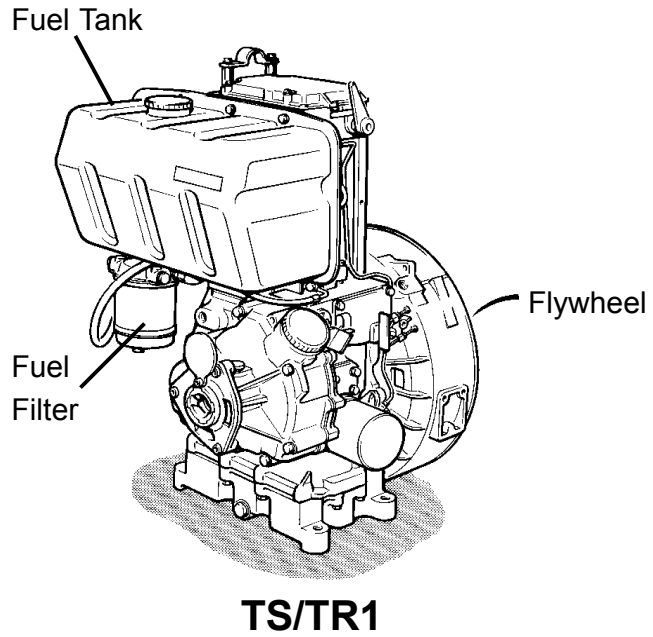
*A note is used to draw your attention to additional or important information.*

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# 1. General Information

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## 1.3 Engine Features



## 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.*

#### **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.

#### **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.*

#### **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. General Information

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## 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.

## 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.

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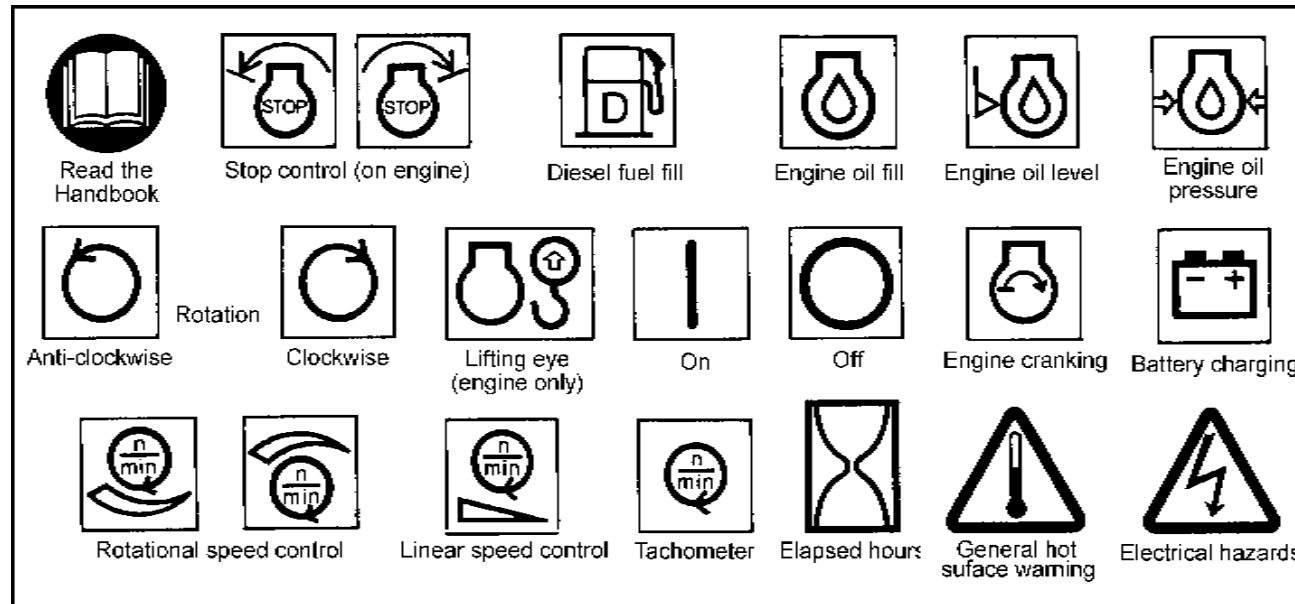
## **WARNING**

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

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## 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 "7.11 Routine Maintenance - schedule hours" 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.

# 1. General Information

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## 1.8 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.

A typical serial number is shown below.

03 00123 TS3 A 01

### Serial Number Code

02 ..... Year of manufacture (03=2003)

00123 ... Consecutive number of engine

TS3 ..... Model

A ..... Anti-clockwise rotation

01 ..... Build of engine

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

## 1.9 Nomenclature

TS and TR - one, two and three cylinder, direct injection, naturally aspirated, flywheel fan 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

The rotation of all engines is anti-clockwise when looking on the flywheel.

## 1.12 Idling Speed

Variable speed engines should be set to idle at 850r/min.

## 1.13 Air Cleaner

Medium and heavy duty dry type cleaners are available for all engines and mounted oil bath air cleaners are available.

### CAUTION

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

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## 1.14 Battery Charging System

A 12 volt system with an engine mounted battery charging facility is available.

## 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

2.0 bar (29.9 lbf/in<sup>2</sup>).

## 1.18 Engine Mounted Fuel Tank Capacity

	litres	pints	US qts
TS/TR1	8.2 13.5	14.5 23.7	8.7 14.2
TS/TR2	13.5	23.7	14.2
TS/TR3	13.5	23.7	14.2



## 1.19 Exhaust

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### **WARNING**

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

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## 1.20 Engine Controls

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### **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.*

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

## 1.21 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

### 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 "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 BREATHE EXHAUST GASES AS THEY CONTAIN CARBON MONOXIDE,*

## 2. Starting and Stopping

*A COLOURLESS, ODOURLESS AND POISONOUS GAS THAT CAN CAUSE UNCONSCIOUSNESS AND DEATH.*

### 2.2 Starting Handle Precautions

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

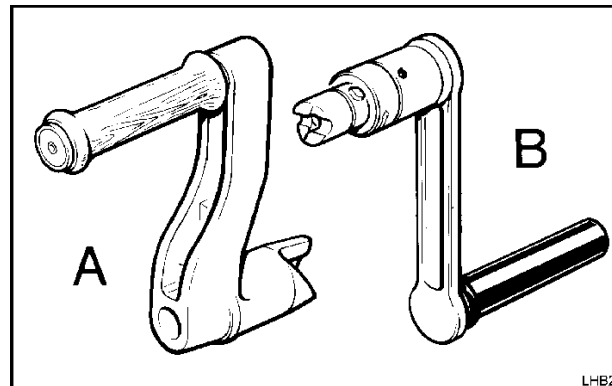


Figure 2.2.1 The Starting Handle

#### **⚠ WARNING**

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

- 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.

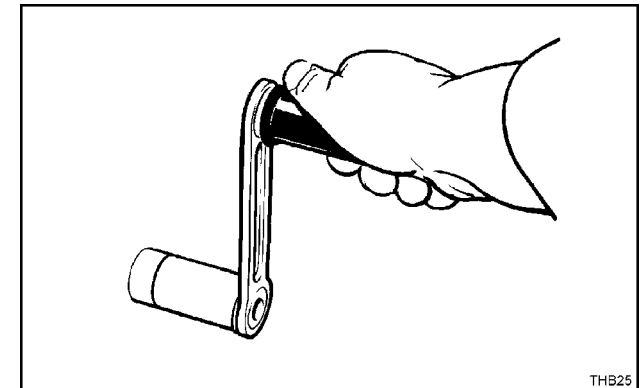


Figure 2.2.2 Holding the Starting Handle

### 2.3 Automatic Excess Fuel Device

The engines are fitted with an automatic excess fuel device which becomes operative, ready for the next start, when the engine is stopped.

If the engine stops other than by the operation of the engine control, the control must be turned anti-clockwise to the 'STOP' position and released before the device can operate.

As the engine runs up to speed the excess fuel device will automatically reset to the normal running position.

### 2.4 Cold Starting Aid

The cold starting aid may be fitted to the combustion air intake ports and is used when the ambient temperature is below  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ).

1. With the fuel turned on, turn the engine for up to 20 revolutions to prime the fuel and lubrication systems.
2. Withdraw the plunger (A) and fill one third of the cup (B) with the same type of lubricating oil as used in the engine

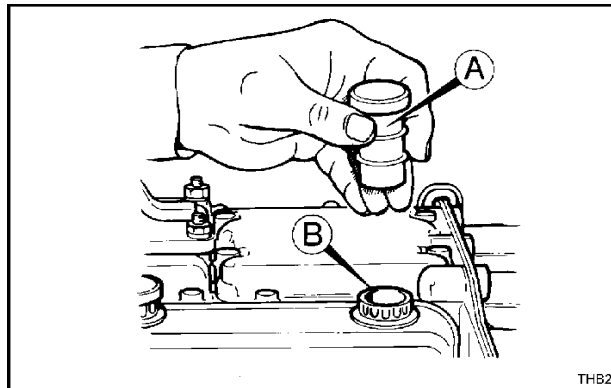


Figure 2.4.1 Cold Start

3. Replace the plunger and inject the oil just before starting the engine.

### **CAUTION**

*The device must not be used more than three times in succession during the same attempt to start the engine.*

### 2.5 Hand Starting

Before attempting to start the engine refer to "2.2 Starting Handle Precautions".

1. Select the excess fuel position by turning the engine control lever anti-clockwise to the 'STOP' position and releasing it.

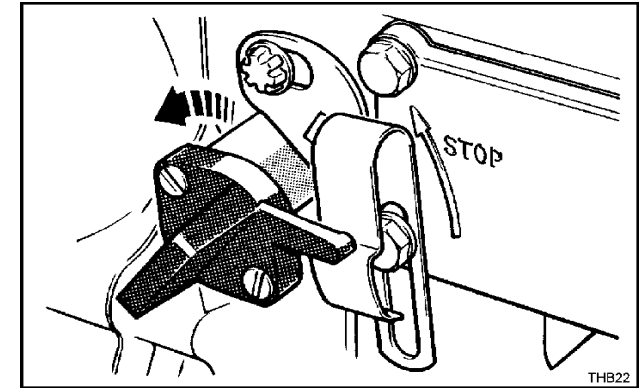


Figure 2.5.1 The Engine Control

2. If a variable speed control lever is fitted move it to the fast position.
3. Move the decompressor lever towards the flywheel.

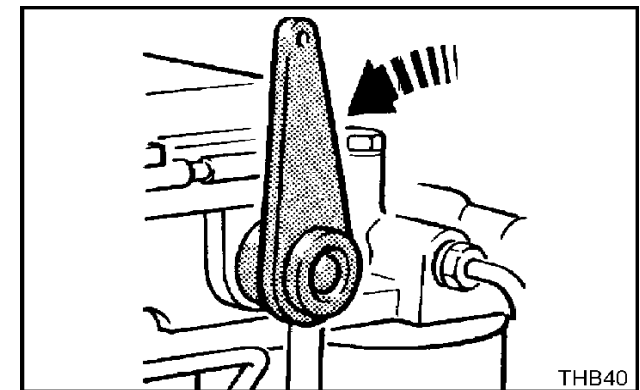


Figure 2.5.2 Decompressor Lever

4. If the ambient temperature is below  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ) refer to "2.4 Cold Starting Aid".

## 2. Starting and Stopping

### 5a. If using a non-limited kick-back handle:

Insert the correct handle, refer to 'A' in 'Figure 2.2.1', into the starting housing.

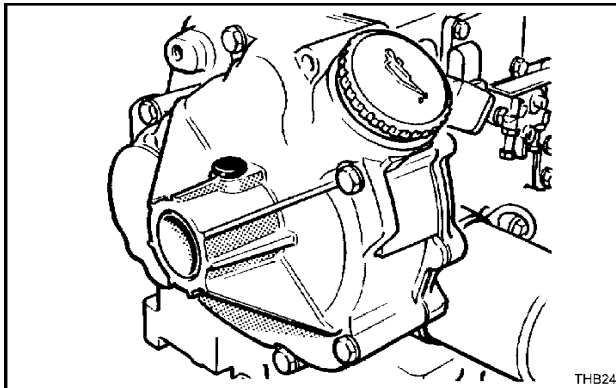


Figure 2.5.3 Starting Handle Housing

Slowly rotate the handle in the direction of cranking until it fully engages.

### 5b. If using a limited kick-back handle:

Swivel the starting handle housing cover (A) to one side and insert the the correct handle, refer to 'B' in 'Figure 2.2.1', into the housing.

Slowly rotate the handle in the direction of cranking until it fully engages.

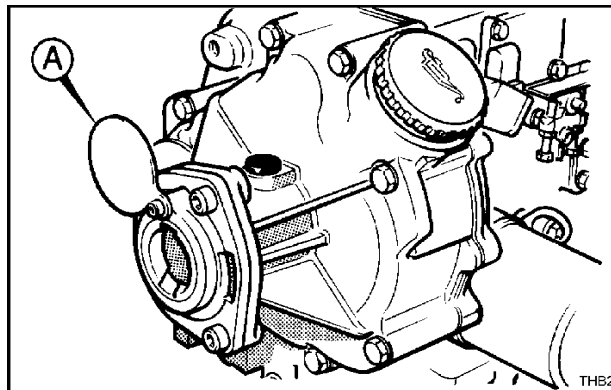


Figure 2.5.4 Starting Handle Housing

6. If the cold starting aid was not used turn the engine slowly for up to 20 turns to prime the combustion chamber and lubricating oil system.
7. Firmly hold the handle grip, with the thumb on top of the grip as shown in 'Figure 2.2.2', and crank the engine really fast, when sufficient speed is obtained move the decompressor lever towards the gear end and continue to crank until the engine fires.

Retaining a firm grip on the handle remove the handle from the housing.

### **⚠ WARNING**

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

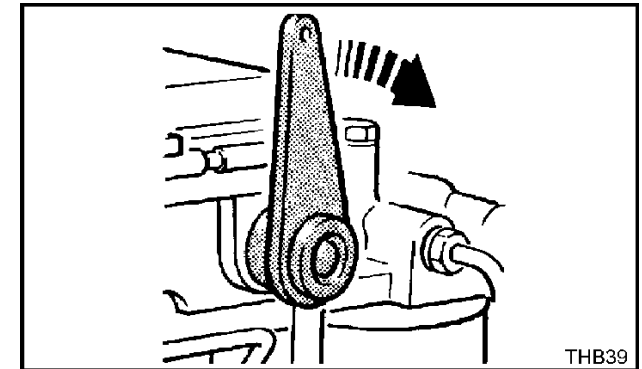


Figure 2.5.5 Decompressor Lever

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

### 2.6 Electric Starting

If an oil pressure switch bypass button is fitted it must be depressed during engine cranking and until the engine attains full speed.

If the engine fails to start within 30 seconds, release the key, or start button, and attempt to restart after allowing sufficient time for all moving parts to stop.

1. Check that the decompressor lever is towards the gear end.

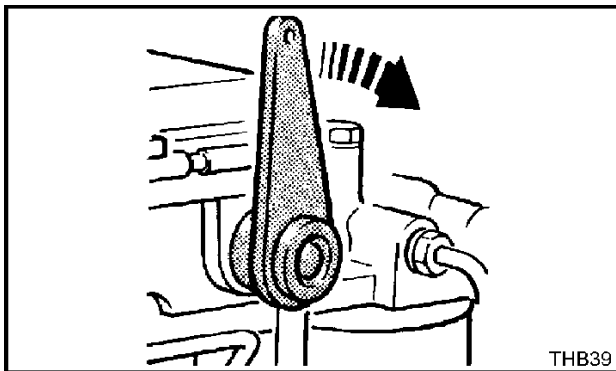


Figure 26.6.1 Decompressor Lever

2. Turn the engine control lever anti-clockwise to the 'STOP' position and release it.

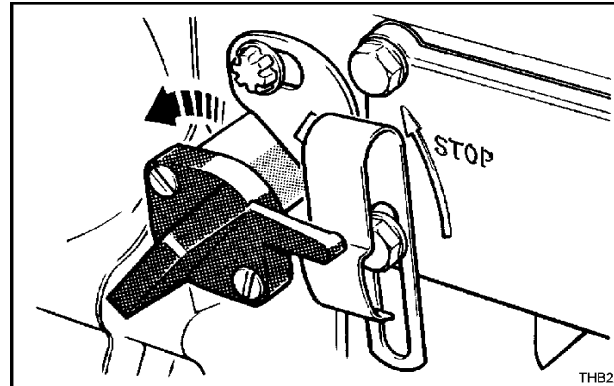


Figure 2.6.2 The Engine Control

3. If a variable speed control lever is fitted move it to the fast position.
4. If the ambient temperature is below -10°C (14°F) refer to items 2. and 3. in "2.4 Cold Starting Aid".
- 5a. **If a start key is being used:**  
Turn the start key clockwise and hold it at position '3', until the engine fires and then release it immediately.

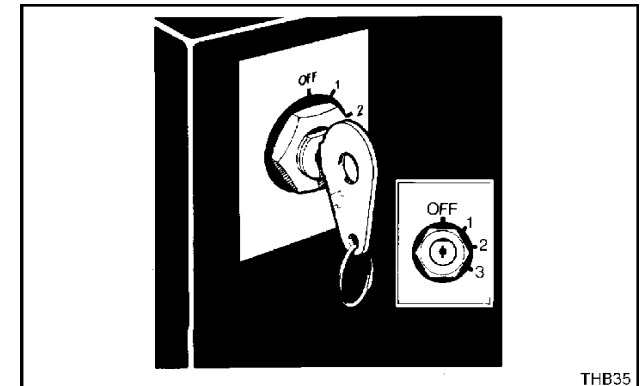


Figure 2.6.3 Start Key

- 5b. **If a starter button is being used:**  
Press the starter button until the engine fires and then release it immediately.
6. Turn the engine control lever anti-clockwise to the 'RUN' position.
7. If a variable speed control is fitted reduce the speed as required.

## 2. Starting and Stopping

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### 2.7 Stopping the Engine

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

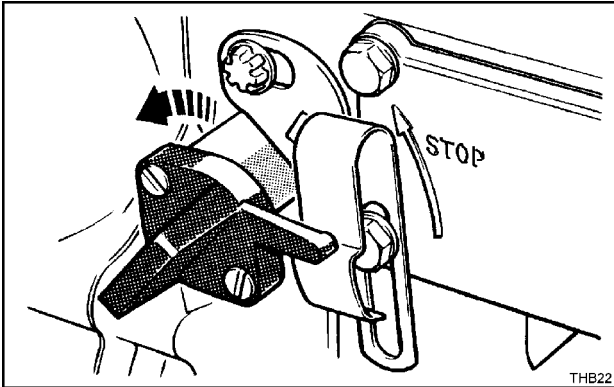


Figure 2.7.1 The Engine Control

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

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#### **⚠ CAUTION**

*Turning the start key to the 'OFF' position will not stop the engine unless an optional fuel control solenoid is fitted.*

2. On engines fitted with a fuel control solenoid turn the key to the 'OFF' position.

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#### **⚠ CAUTION**

*Never stop the engine by operating the decompressor lever or valve damage may occur.*

---

### 3. Oil and Fuel Specifications

#### 3.1 Oil Specification

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

All subsequent oil changes must be as specified in "4.11 Routine Maintenance - schedule hours".

The engines must be run on heavy duty lubricating oils that at least meet the requirements of one of the following:

APICC	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%.*

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.

For engines in long running installations Lister Petter should be consulted.

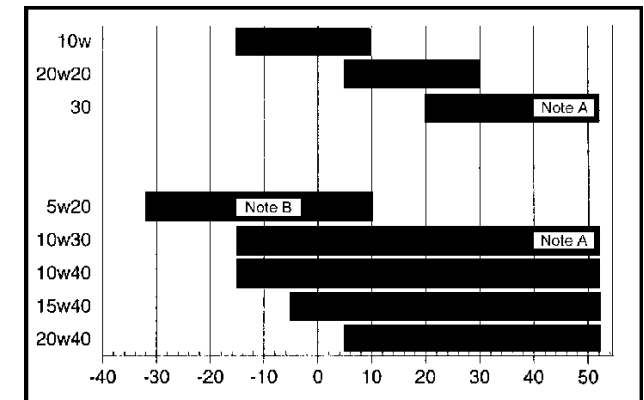
#### **CAUTION**

*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.*

#### 3.2 Oil Viscosity

The following chart shows the recommended oil viscosity ranges for various °C ambient temperatures for cold start to maximum running.

Before selecting a viscosity grade refer to the 'Notes'.



**Notes:**

$$^{\circ}\text{F} = (1.8 \times ^{\circ}\text{C}) + 32.$$

A. Intermittent running.

B. Synthetic oils only

- 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.

## 3. Oil and Fuel Specifications

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*An oil change is recommended immediately if the engine fails to reach its normal cold start cranking speed due to excessive oil viscosity.*

2. *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.*
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### 3.3 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 a loss in engine performance.

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### 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.*

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### 3.4 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.

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### CAUTION

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

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### 4. Routine Maintenance

#### 4.1 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, P027-08221, 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 "4.11 Routine 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, P027-08221.
- 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.*

## 4. Routine Maintenance

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### 4.2 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.

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#### **WARNING**

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

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#### **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.*

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#### **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.*

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### 4.3 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.

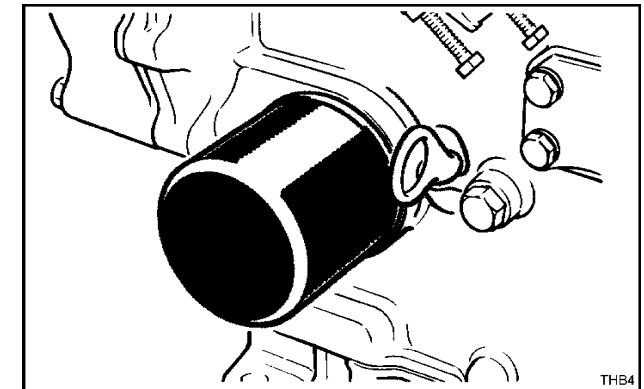
- Adjust the valve clearances, if necessary.
- Check and tighten nuts, bolts and unions paying particular attention to the fuel system.
- Check the lubricating oil level and top up if necessary.
- Observe the exhaust at the normal full load. The exhaust must be free from soot. A black exhaust means that 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 "4.11 Routine Maintenance - schedule hours".

### 4.4 Changing the Oil Filter

A strap wrench must not be used to fit a replacement filter element.

Before changing the filter read "4.2 Precautions for Filters and Elements".

1. Using a suitable strap wrench, unscrew and remove the old filter.
2. Thoroughly clean the crankcase filter housing face.
3. Apply a small amount of clean engine oil to the oil filter sealing joint.
4. Screw on the new oil filter, by hand, until the sealing joint is just touching the crankcase and tighten a further half turn.



*Figure 4.4.1 Changing the Oil Filter*

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

### 4.5 Draining and Filling the Oil Sump

Before draining the oil read "4.2 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 drain plug (A) and drain the sump.

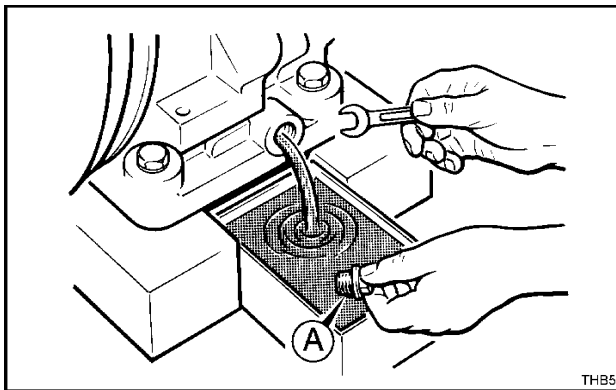


Figure 4.5.1 Oil Drain

4. Clean and coat the threads of the drain plug with Hylomar PL32/M or Three Bond 1110B.

5. Replace the drain plug taking care not to overtighten it.
6. Fill the sump through the oil filler to the top mark on the dipstick (B).

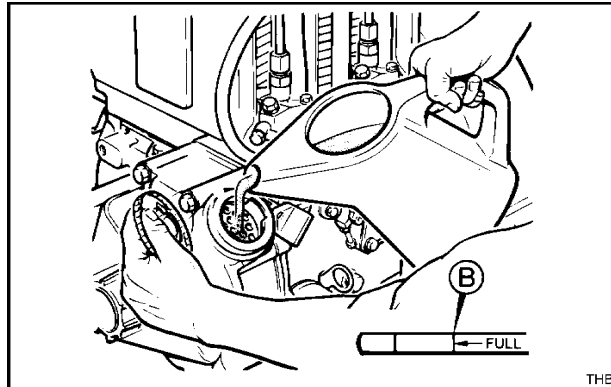


Figure 4.5.2 Oil Filler

### Oil Sump Capacity

	litres	pints	US qts
TR1	2.7	4.7	2.8
TR2	4.0	7.0	4.2
TR3	6.0	10.5	6.3

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

### 4.6 Changing the Fuel Tank Filter

The fuel filter is an essential part of the engine and it must never be run without a filter and the element should be renewed every 500 hours, or more frequently if for any reason the fuel is known to be dirty.

Before changing the filter element read "4.2 Precautions for Filters and Elements".

1. Remove the retaining plug (A).
2. Remove the old element (B) and the joints (C).

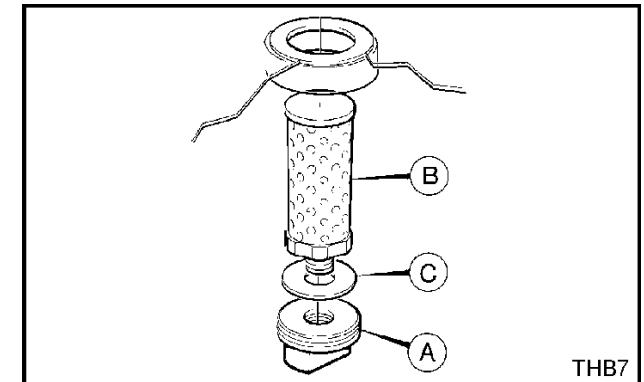


Figure 4.6.1 Fuel Tank Internal Filter

3. Fit a new element and new joints.
4. Replace and tighten the retaining plug (A).
5. Prime the fuel system.

## 4. Routine Maintenance

### 4.7 Cartridge Agglomerator

The cartridge agglomerator is an essential part of the engine and should be renewed every 500 hours, or more frequently if for any reason the fuel is known to be dirty. Water is drained from the agglomerator by unscrewing the drain tap (C) sufficiently to allow the water to drain.

A strap wrench is required to remove the agglomerator from the engine but it must not be used to fit a replacement.

Before changing the agglomerator read "4.2 Precautions for Filters and Elements".

1. Using a suitable strap wrench unscrew the cartridge (A) from the head (B).
2. Screw a new cartridge onto the head and hand tighten it.

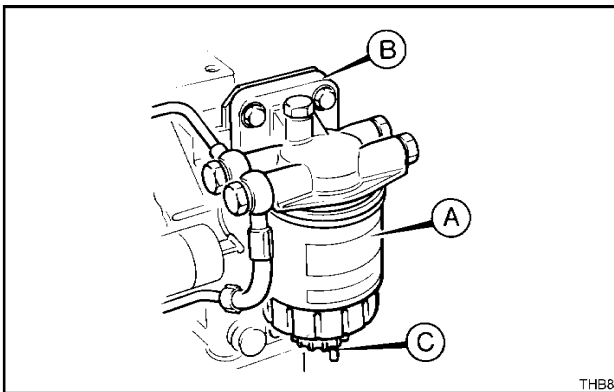


Figure 4.7.1 The Cartridge Agglomerator

### 4.8 Valve Clearance Adjustment

The valve clearance for both inlet and exhaust valves must be set with the engine cold.

	GO	NOT GO
mm	0.15	0.20
in	0.006	0.008

1. Remove the cylinder head cover.
2. Ensure the cylinder head nuts are correctly tightened.
3. Turn the engine until the piston is at TDC position on the firing stroke for the cylinder being worked on.
4. Slacken the locknut (A) and adjust the screw (B) until the correct clearance has been obtained.

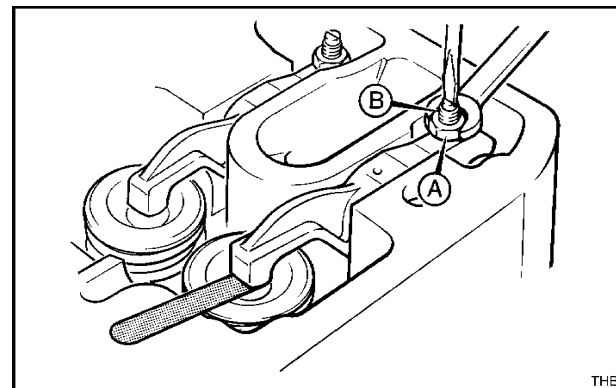


Figure 4.8.1 TS/TR Valve Clearance

5. Tighten the locknut whilst restraining the adjusting screw and re-check to ensure that the clearance is correct.
6. Repeat for the remaining valve.
7. Replace the rocker cover taking care to ensure the decompressor lever, if fitted, is vertical.

### 4.9 Decompressor Adjustment

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

1. Remove the cylinder head cover.
2. Turn the engine until the piston is at T.D.C. firing stroke for the cylinder being worked on.

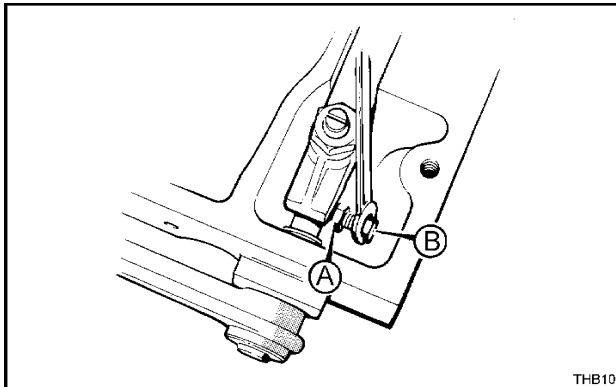


Figure 4.9.1 Decompressor Lever

3. Slacken the locknut (A) and adjust the screw (B) until it just touches the exhaust valve rocker when the lever is vertical.
4. Turn the screw half a turn clockwise so that it travels towards the rocker.
5. Tighten the locknut whilst restraining the adjusting screw.
6. Replace the rocker cover taking care to ensure the decompressor lever is vertical.

### 4.10 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.  
To prevent freezing 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.**

## 4. Routine Maintenance

### 4.11 Routine Maintenance - schedule hours

Change the lubricating oil and filter for the first time after 100 hours and then as specified below.

#### Daily

Check the fuel and lubricating oil levels.

Check for fuel and oil leaks.

Clean or replace the air cleaner element under very dusty conditions.

#### Every 125 Hours

The above and the following items.

Check the condition of the battery, if fitted.

Clean or replace the air cleaner element under moderately dusty conditions.

#### Every 250 Hours

The above and the following items.

Drain the sump and refill with new oil.

Renew the oil filter element.

Clean or replace the injectors if the exhaust is dirty.

Renew the fuel filter element if the fuel being used is not perfectly clean.

Check the drive belt tension, if fitted.

#### Every 500 Hours

The above and the following items.

Replace the air cleaner element.

Examine the exhaust and induction systems for leaks, damage or restrictions.

Renew the fuel filter element.

Check the battery charge winding system; refer to the Workshop Manual.

#### Every 1000 Hours

The above and the following items.

Check the valve clearances.

Decarbonise if the engine performance has deteriorated...

Check the drive belt condition; replace if necessary.

#### Every 2000 Hours

The above and the following items.

Decarbonise

Replace the drive belt irrespective of its condition.

Check the fuel pump timing.

#### Every 6000 Hours

The above and carry out a major overhaul.

#### Every Year - Marine

Change the lubricating oil, oil filter and air cleaner elements if these were not changed at the prescribed intervals.

## 4. Routine Maintenance

### 4.12 Fault Finding

This section is intended as a guide only and any rectification of faults should be in accordance with the Workshop Manual 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.

Engine Stops
Lack of fuel.
Air in the fuel system.
Choked fuel filter.
Excessive overload.
Overheating.
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.

### 4.13 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.*

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- 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.



## 5. Parts and Service

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### 5. Parts and Service

#### **5.1 Associated Publications**

Master Parts Manual ..... P027-08030  
Workshop Manual ..... P027-08221  
Technical Information ..... P027-09212  
Arrangement Drawings ..... P027-08035

Various wall charts and technical/sales leaflets are available.

Please contact Lister Petter for details.

#### **5.2 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 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.

#### **5.3 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 on the back cover.



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**CALIFORNIA**

**Proposition 65 Warning**

Diesel engine exhaust and some of its constituents  
are known to the State of California to cause cancer,  
birth defects, and other reproductive harm.

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