

Mermaid



1.5 & 1.8 Litre Leyland Engines

Meermin & Minuet

Operator's Handbook

Important

Use of Non-Mermaid Genuine parts will
invalidate Warranty.

In your own interest, therefore, specify:
GENUINE MERMAID PARTS

Mermaid Marine

The Mews, 14-17 West Quay Road, Poole, Dorset BH15 1JD

Tel: 01202 677776 Fax: 01202 677777

www.mermaid-marine.co.uk sales@mermaid-marine.co.uk

FOREWORD

This Handbook provides an introduction to your Leyland engine, together with information on the care and periodic maintenance required to combine trouble-free operation with minimal running costs.

Your new engine has been manufactured to high standards of design and reliability.

Please note that references to right- or left-hand in this Handbook are made when viewing the engine from the rear of the flywheel housing.

It is advised that the appropriate sections of this Handbook are read before attempting to use the engine/equipment.

**FAILURE TO OBSERVE THE PROCEDURES IN THIS HANDBOOK
MAY INVALIDATE THE FACTORY WARRANTY.**

NOTE: The requirements of Classification Societies and similar organizations may invalidate some of the information given in this Handbook.

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RUNNING INSTRUCTIONS

Starting the engine Check that the gear lever is in the neutral position, fully open the throttle and operate the starter switch. Release the starter switch and close the throttle as soon as the engine is running. For cold starting proceed as for normal starting, but before operating the starter switch, switch on the heater plugs for a period of between 15 and 30 seconds. Release the heater plug switch as soon as the engine starts. The heater plug elements will be rapidly destroyed if they are kept switched on while the engine is running.

NOTE: The use of ether starting aids is not recommended.

Starter Do not operate the starter for more than one minute at a time. If the engine has failed to start after 30 seconds' pre-heat and one minute cranking, wait three minutes before again attempting to start the engine.

Stopping the engine Operate the stop control to cut off the supply of fuel to the injection pump, then the engine will cease firing.

Running-in The following instructions should be strictly adhered to during the first 25 hours' running:

Do not exceed 2,500 rev/min.

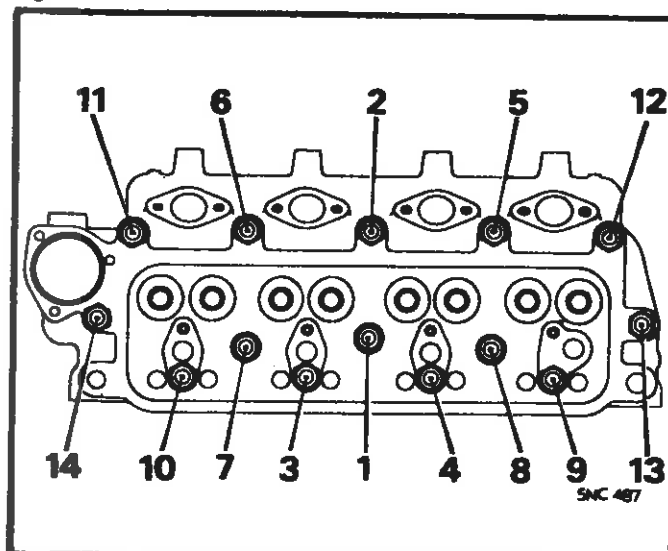
Do not operate at full load at any speed.

Between 25 and 50 hours gradually increase the load and speed up to the full rating for the engine.

After 50 hours' running change the engine oil and oil filter, see page 12 and 1-8 diesel only: Retorque the cylinder head nuts to 102 Nm (72 lbf ft, 10.4 kgf m) in the sequence shown (see Fig. 1), using service tool 18G 694 A.

Check the valve rocker clearances, see page 13.

Fig. 1



NOTE: In the case of pump, generator and other constant speed applications, if the engine has not been run-in by the equipment manufacturer, gradually increase the load on the engine during the first 25 to 40 hours; or run the engine for short periods, starting at 15 minutes, gradually increasing up to constant running at 30 to 40 hours.

Warming up Run the engine at a fast idling speed (approx. 1,500 rev/min) until the engine attains its normal working temperature. Do not allow the engine to idle slowly.

Avoid prolonged idling or high no-load engine speeds.

Check the engine oil pressure and coolant temperature frequently.

COOLING SYSTEM

Frost precautions Water expands when it freezes, and if precautions are not taken there is considerable risk of bursting the radiator or cylinder block; it is therefore essential to use anti-freeze in the cooling system in freezing conditions.

We recommend the use of **UNIPART universal** anti-freeze to protect the cooling system.

If **UNIPART universal** is not available any anti-freeze conforming to specification B.S. 3151 or B.S. 3152 may be used. Anti-freezes to these specifications are compatible with **UNIPART universal** and can be used with it. **UNIPART universal** should not be mixed with other universal anti-freezes.

After filling with anti-freeze solution, attach a warning label to a prominent position stating the type of anti-freeze contained in the cooling system to ensure that the correct type is used for topping-up.

Anti-freeze can remain in the cooling system for two years provided that the specific gravity of the coolant is checked periodically and anti-freeze added as necessary. After the second year the system should be drained and flushed by inserting a hose in the filling orifice and allowing water to flow through until clean. Make sure that the cooling system is water-tight, examine all joints and replace any defective hose with a new one. Refill with the appropriate anti-freeze solution.

The recommended solutions of anti-freeze, are given below.

<i>Solution</i>	<i>Commences to freeze</i>		<i>Frozen solid</i>	
	<i>°C</i>	<i>°F</i>	<i>°C</i>	<i>°F</i>
25	-13	9	-26	-15
33½	-19	-2	-36	-33
50	-36	-33	-48	-53

Draining To drain the cooling system, remove the plug or open the tap located in the right-hand side of the cylinder block and disconnect the lowest hose in the cooling system.

ELECTRICAL

Alternator **NOTE: The alternator needs no maintenance attention apart from external cleaning and must not be lubricated.**

Polarity. Ensure that the correct battery polarity is maintained at all times. Reversed battery or charger connections will damage the alternator rectifiers.

Battery connections. The battery must never be disconnected while the engine is running.

Testing semi-conductor devices. Never use an ohmmeter of the type incorporating a hand-driven generator for checking the rectifiers or the transistors.

Welding. If arc welding is to be carried out on the vehicle, the alternator and battery must be disconnected. When welding, brazing or soldering ensure that any heat is kept away from the alternator.

FUEL SYSTEM

Fuel oils Fuel oils suitable for use in this diesel engine are generally known as Diesel fuel oil, distillate Diesel fuel, automotive gas oil or Derv fuel. Users are recommended to obtain their supplies from a source which can be depended upon to maintain a consistent standard of quality. Waste or residual oils of any sort are to be avoided. It is recommended that the fuel should conform to British Standard 2869: 1967, Class A1 or A2.

Air cleaner element Unscrew the wing nut, remove the cover and discard the element. Thoroughly clean the container, fit a new element, replace the cover, ensure the sealing ring is in good condition and replace the air cleaner, fit the fibre washer and tighten the nut.

NOTE: These instructions apply to vehicle type paper elements. For other air cleaner types refer to the equipment manufacturer.

Roadside adjustment
Fig. 1 Do not undertake any dismantling of the injectors or injection pump at the roadside. Renewing an injector (1) is the only servicing of this nature which can be carried out at the roadside (see 'Fuel injectors', page 10). To locate a faulty injector, slacken the feed pipe union nut (2) on the suspect injector and run the engine slowly. If there is no change in the engine performance or if a faulty condition, such as a smoky exhaust, has disappeared, it can be assumed that the injector is faulty.

Heater plugs
Fig. 2 Remove the electrical leads (1) and unscrew each plug (2) from the cylinder head. Insert a twist drill (3) of 4.37 mm ($\frac{1}{4}$ in) diameter into the screwed holes (4) in the head and turn the drill by hand to remove the carbon build-up. Withdraw the drill and remove any particles of carbon from the conical seatings in the cylinder head. Refit the heater plugs and electrical leads.

Fig. 1

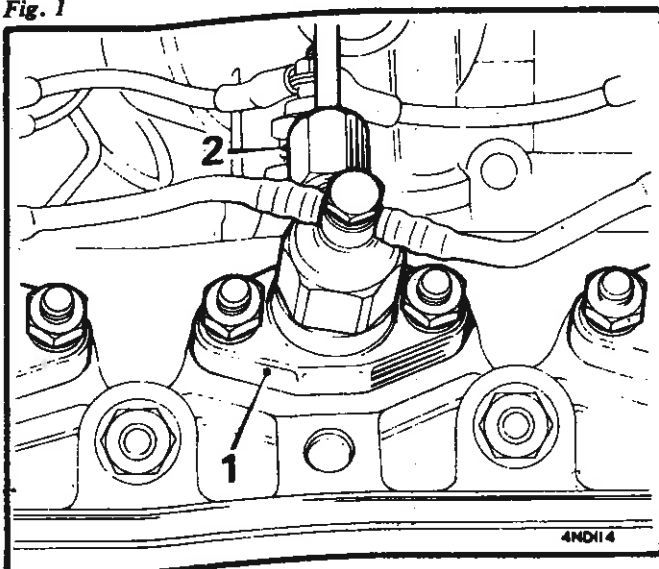
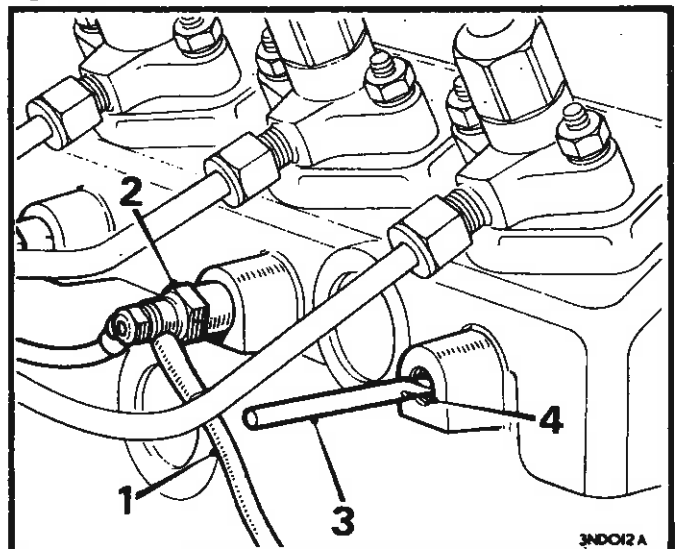


Fig. 2



Bleeding the fuel system

Fig. 3

Air can enter the fuel system if any part of the system is dismantled or through an air leak in the system. This can result in failure to start or erratic engine acceleration.

To rectify, bleed the system as follows:

- (a) Slacken the blanking plug (1) and the screw union (2) on the filter head.
- (b) Slacken the union nut (3) and the air bleed screws (4, 5 and 6).
- (c) Slacken the union nuts at the injector end of the high-pressure pipes.
- (d) Operate the lift pump manual priming lever until the fuel flowing from the blanking plug (1) is free from air bubbles; tighten the plug.
- (e) Continue operating the priming lever until the fuel flowing from screws (2, 3, 4 and 5) are free from air bubbles; tighten each screw in turn.
- (f) Crank the engine until the fuel flowing from the screw (6) is free from air bubbles; tighten the screw.
- (g) Continue cranking the engine until the fuel from at least two injectors is free from air bubbles; tighten the injector unions.
- (h) Start the engine, and allow it to run until it is firing on all cylinders.

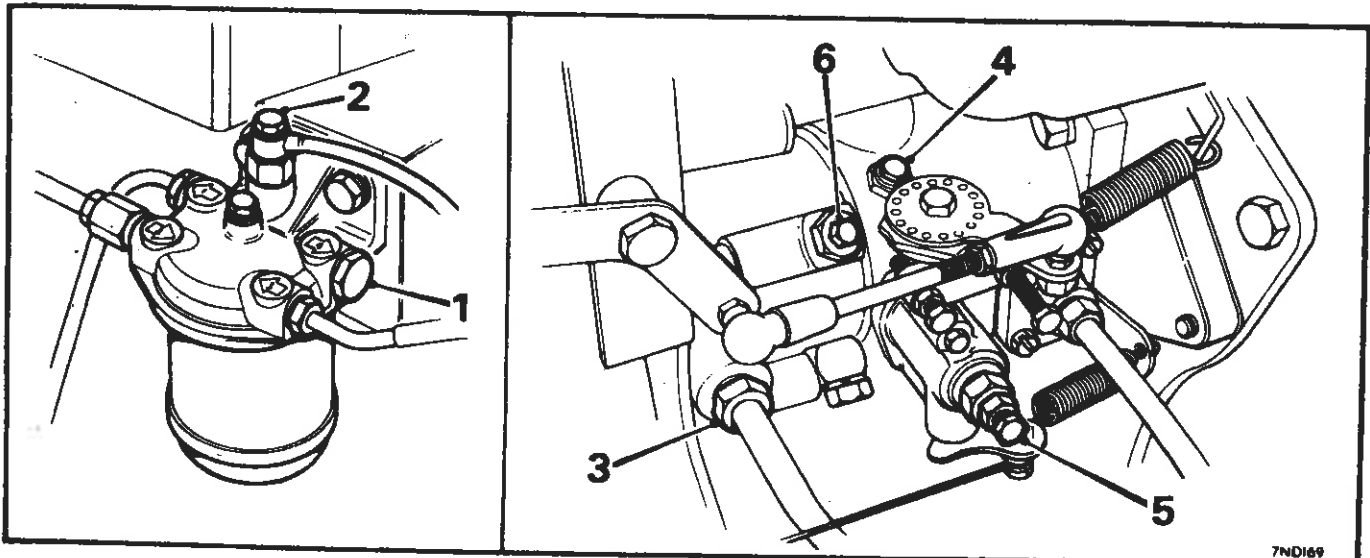
NOTE: Bleed point (6) is not fitted to some engine specifications.

After renewing the fuel filter element, it will only be necessary to bleed the fuel filter points (1 and 2) provided that the engine has not been cranked while the filter is dismantled.

WARNING: Do not attempt to bleed the system by towing a vehicle in gear as this would result in serious damage to the injection pump.

Accelerator Lubricate the accelerator control linkage.

Fig. 3



7ND169

Fuel System

Fuel injectors Fig. 4
Injector cleaning and spray testing can only be carried out with specialized equipment. To remove an injector, disconnect the high pressure pipe (1) from the individual injector (2), and the leak-off pipe unions (3) from all the injectors. Note the seal washer either side of each banjo. Remove the two injector retaining nuts (4) and withdraw the injector. Extract the corrugated sealing washer (5) from inside the nozzle heat shield (6). Before refitting an injector fit a new sealing washer (5) as illustrated, and inspect the injector joint gasket (7) for serviceability. Tighten the two injector retaining nuts evenly and to the correct torque tightness (see 'GENERAL DATA'). Refit the high pressure feed pipe and leak-off pipes.

Main fuel filter Fig. 5
To remove the filter element (1) unscrew the centre bolt (2) and support the filter base (3). Detach the base and twist the element to remove it from the filter head (4). Remove the three sealing washers (5) from the head and base. Clean the filter base, and reassemble the filter unit using a new filter element and sealing washers. The fuel system must be bled of air after dismantling and reassembling the filter unit.

Governor speeds
These should only be adjusted by a qualified person and should be resealed after setting.

NOTE: Unauthorized adjustment of the fuel injection pump settings may invalidate the factory warranty.

Fuel injection equipment
NOTE: Further information and overhaul instructions for fuel injection equipment can be obtained from the maker's local agents (C.A.V./Simms), or from:
C.A.V. & Simms Service
C.A.V. Limited
P.O. Box 36
Warple Way
LONDON W3 7SS

Quote on application:

- (a) Engine type and serial number.
- (b) Fuel pump type and serial number.

Fig. 4

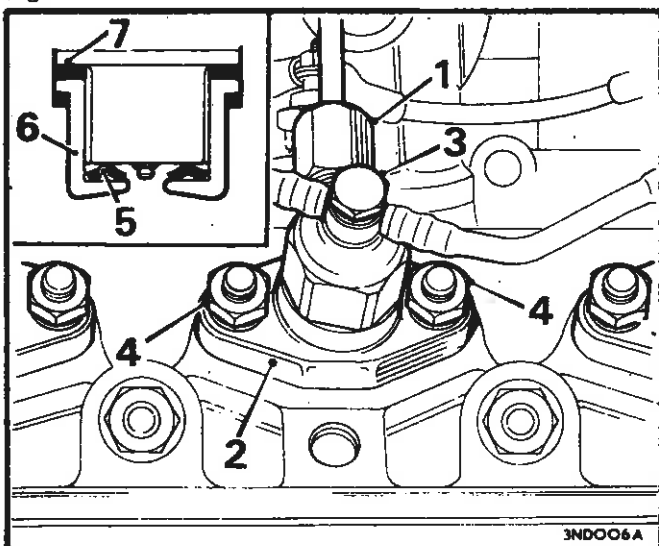
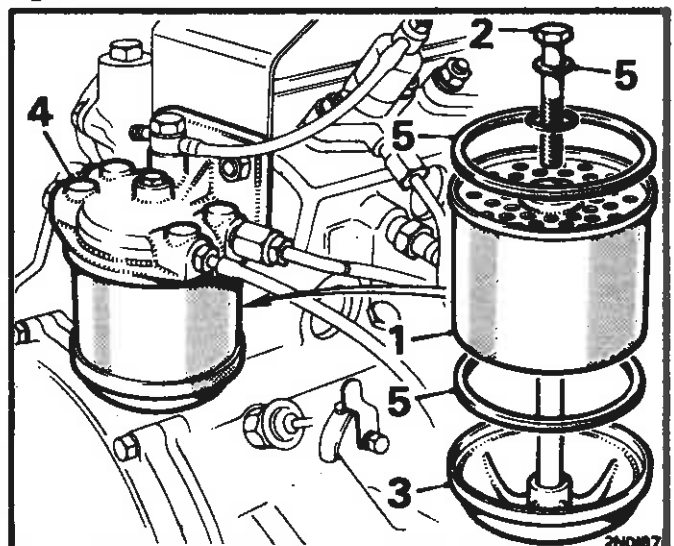


Fig. 5



ENGINE

Lifting When removing or refitting the engine always use an engine lifting bar (1) through the lifting eye brackets or by two long chains and a spreader bar.
Fig. 1

Lubrication Check the sump oil level by removing the dipstick (1). Maintain the level between the 'MAX' and 'MIN' marks and never allow it to fall below the 'MIN' mark. To drain the sump oil remove the plug (2). Clean the plug before replacing it. Turn the oil filler cap (3) anti-clockwise to remove. Fill the sump with new oil until the dipstick registers the correct level. The sump is best drained when the engine is warm.

The oil filler cap incorporates a filter for the closed-circuit crankcase breathing intake. The cap and filter are renewed only as a complete assembly.

Fig. 1

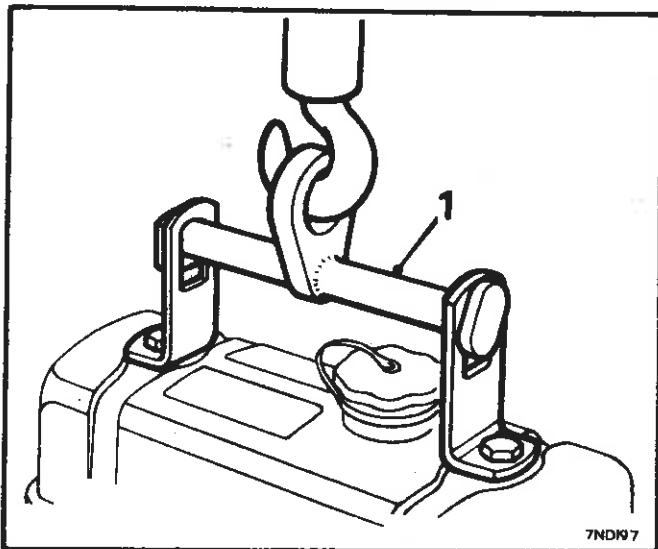


Fig. 2 1.5 Litre Engine

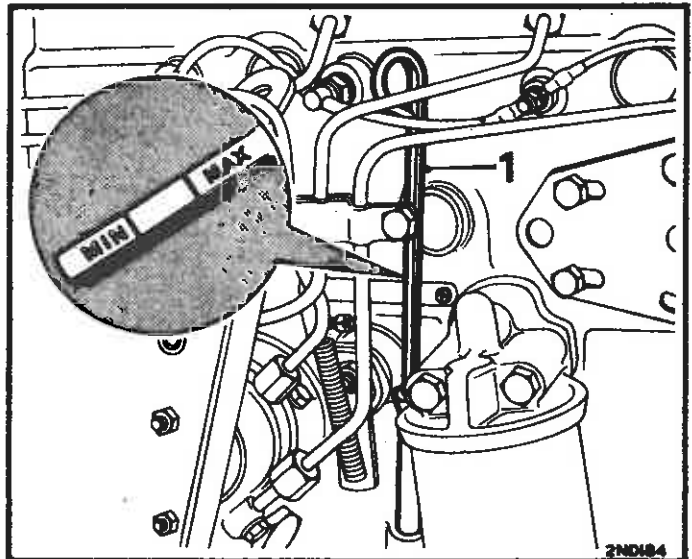


Fig. 3 1.8 Litre Engine

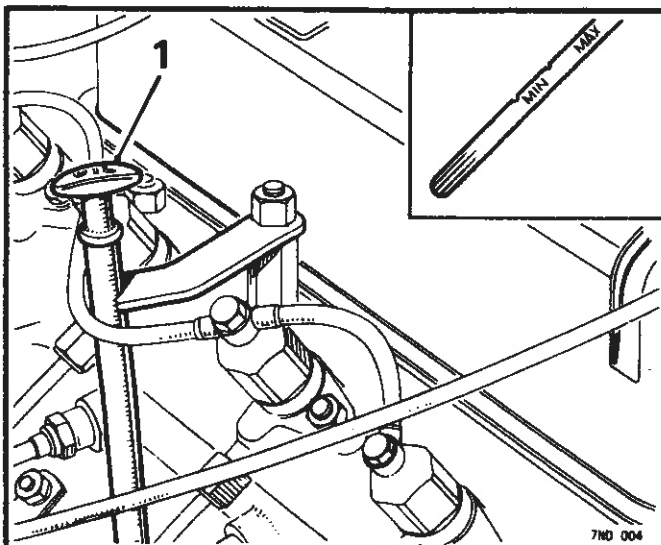
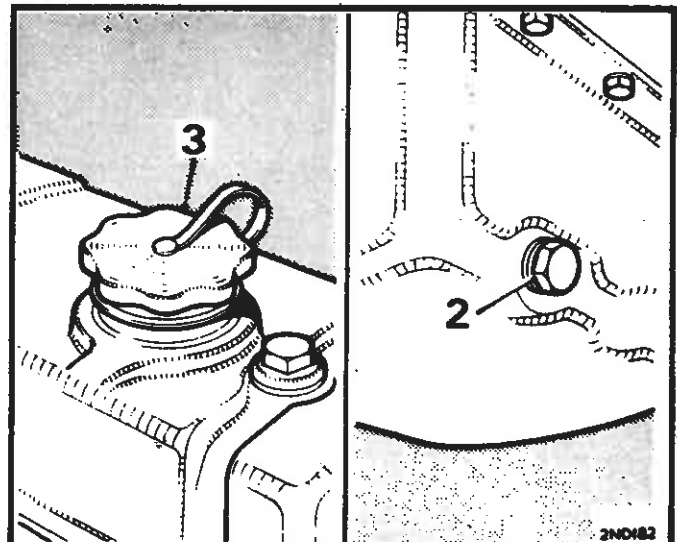


Fig. 4



Engine

Injection pump driving gears Fig. 5

1.5 Litre Engine: Withdraw the driving gear lubricator (1) and filter gauze (2) and clean in petrol (gasoline). Use a stiff brush to clean the gauze, and blow out the lubricator with compressed air. Refit, ensuring that the copper joint washers (3) are serviceable. Check for oil leaks after running the engine.

Oil filter Fig. 6

1.5 Litre Engine: Remove the central bolt (1) and lower the bowl (2). Remove and discard the filter element (3). Clean out the bowl with petrol (gasoline), allow to dry, fit a new element, and reassemble the bowl to the filter head (4). Note the order of assembly of the components, as illustrated. Ensure that the bowl sealing gasket (5) is serviceable.

Fig. 7

1.8 Litre Engine: Unscrew the old filter cartridge (1) from the filter head (3) and discard it. Smear the seal (2) of the new filter cartridge with oil and locate on the filter head. Screw on and tighten the cartridge with the hands only.

DO NOT USE A SPANNER TO TIGHTEN: DO NOT OVERTIGHTEN.

Fig. 5

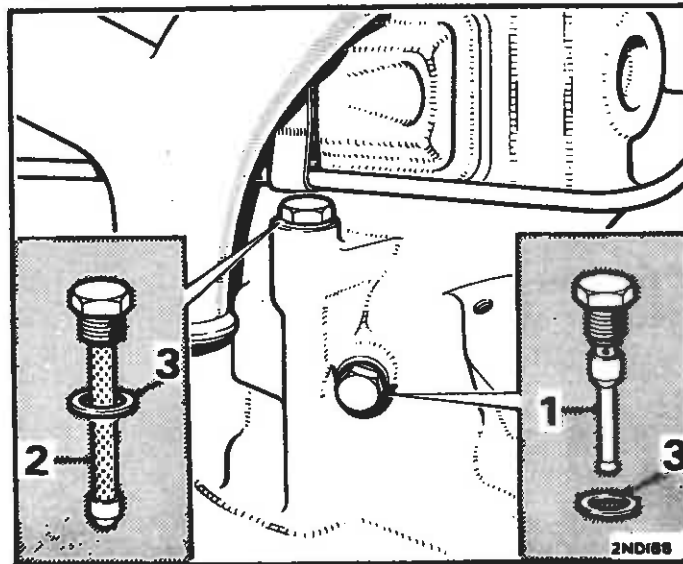


Fig. 6

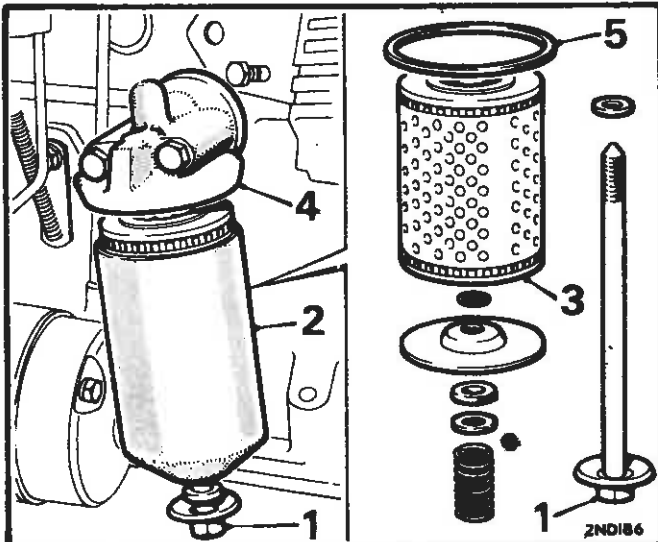
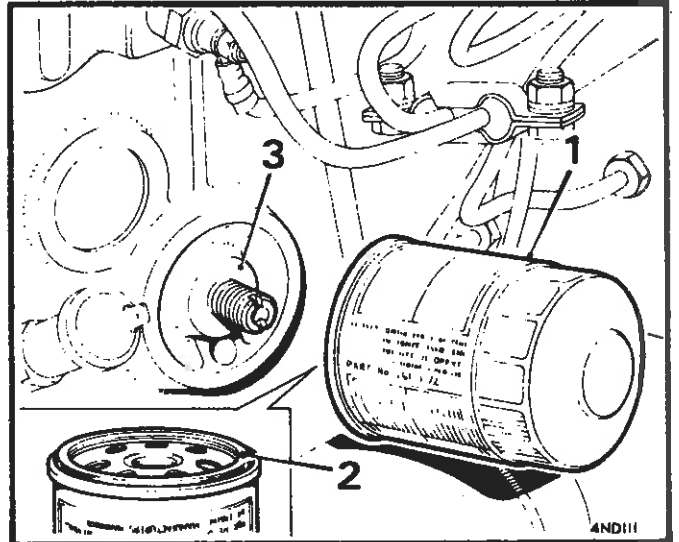


Fig. 7



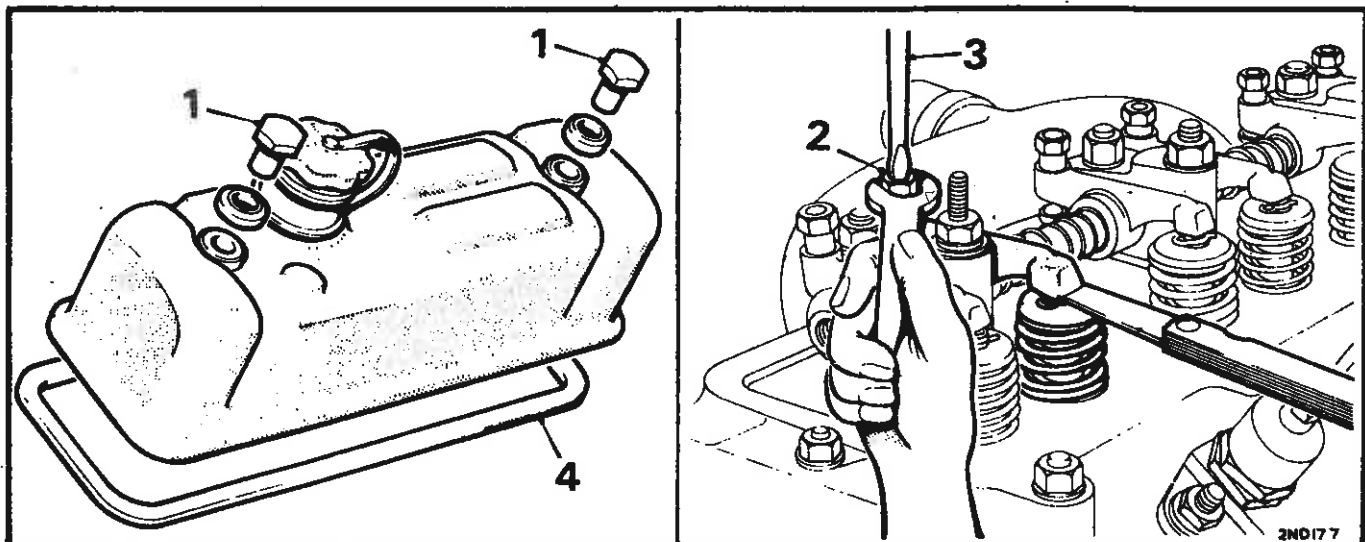
Valve rockers The correct clearance between the valve rockers and the valve stem is given in **Fig. 8** 'GENERAL DATA'. Unscrew the rocker cover retaining nuts (1) and lift off the cover.

Check the clearance at the position illustrated and in the order as follows:

Check No. 1 valve with No. 8 fully open. Check No. 8 valve with No. 1 fully open.
 " " 3 " " " 6 " " " " 6 " " " 3 " "
 " " 5 " " " 4 " " " " 4 " " " 5 " "
 " " 2 " " " 7 " " " " 7 " " " 2 " "

Adjust, if necessary, by slackening the locking nut (2) and turning the adjusting screw (3) until the clearance is correct. Hold the screw against rotation and tighten the locking nut. Refit the rocker cover, checking that its cork gasket (4) is serviceable.

Fig. 8



Engine

Alternator Use one of the following methods of checking the belt tension:

*Fig. 9 and
Fig. 10*

- (a) Use a torque spanner to apply a load of 14.9 to 15.6 Nm (11 to 11.5 lbf ft, 1.5 to 1.6 kgf m) in a clockwise direction to the alternator pulley retaining nut. If the belt tension is correct the belt will slip at this torque loading.
- (b) Apply a load of 33.4 to 36.4 N (7.5 to 8.2 lbf, 3.3 to 3.6 kgf) at right angles to the belt midway between the pulleys. The belt should deflect 6 mm (0.25 in).

NOTE: Fit a new belt with a moderate degree of tension, run the engine for five minutes at 1,000 rev/min, stop the engine, then set the belt to the correct tension.

Do not apply leverage to any part of the alternator other than the drive end bracket.

Clean the slip-ring end cover ventilating apertures indicated by the arrow.

To adjust the belt tension, slacken the three alternator mounting bolts (1) and the nut (2) securing the adjusting link to the engine. Pull the alternator (3) outwards until the belt is correctly tensioned, then tighten the adjusting link nut and the three mounting bolts.

'Laying up' a marine engine

If a marine engine is not to be used at least once a month during the winter, it is strongly advised that the following procedure be adopted, or the current practice of the country concerned:

- (a) Run the engine until normal operating temperature is reached, then stop the engine and change the engine oil and oil filter.
- (b) Run the engine for two minutes at 1,500 rev/min with no load and stop the engine.
- (c) Remove the injectors and pour 60 cc ($\frac{1}{2}$ pint) of engine oil into each cylinder. Rock the crankshaft backwards and forwards about a quarter turn each way to distribute the oil.
- (d) Check the injectors, and renew if necessary, using new crimp washers under the injectors.
- (e) Drain the cooling system (see page 6), leaving the hose disconnected.

Fig. 9 1.5 Litre Engine

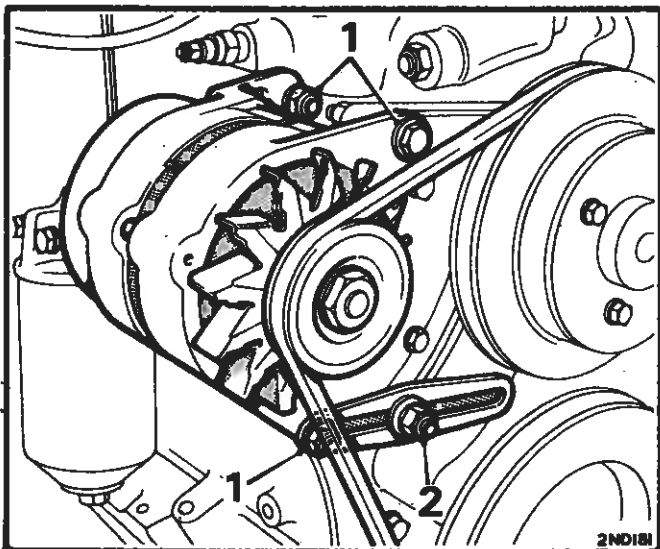
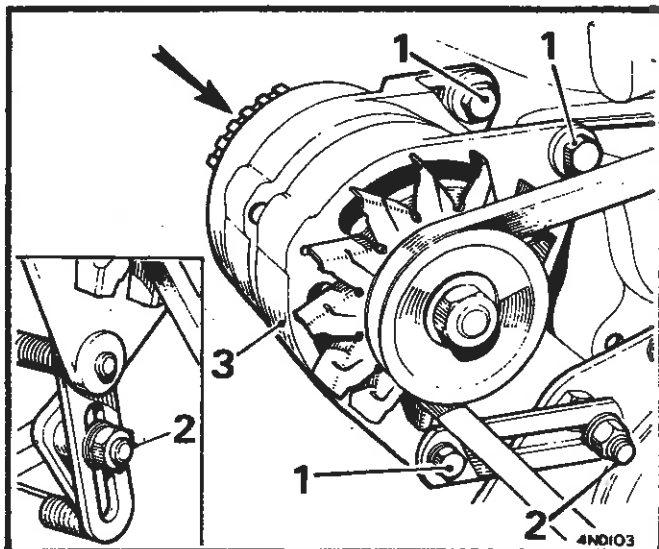


Fig. 10 1.8 Litre Engine



- (f) Drain the raw water system including the impeller housing of the raw water pump.
- (g) Seal all external outlets, the exhaust, air inlet, crankcase breather, etc.
- (h) Turn off the fuel at the tank and the fuel return.
- (i) Lubricate all the engine/gearbox controls, and lightly spray the power unit with oil or preservative.
- (j) Remove the battery to a dry storage area and re-charge monthly.
- (k) Apply waterproof grease to all electrical connections, and cover the alternator ventilation slots.
- (l) It is advisable to fill the fuel tank before storage.

NOTE: If an engine is not 'laid up' and freezing conditions are possible, then a suitable anti-freeze mixture must be used in the cooling system (see page 6).

Recommissioning a 'laid-up' engine

It is important that this procedure is followed, otherwise severe damage to the engine may result.

- (a) Clean the outside of the power unit with a suitable degreaser.
- (b) Lubricate all linkages and controls.
- (c) Remove all seals, covers and protective parts.
- (d) Fit the batteries, which should have been freshly charged, ensuring they are connected correctly.
- (e) Fill the cooling system after closing taps and re-connecting any hoses.
- (f) Check drive belt tensions and conditions, renew or adjust as necessary.
- (g) Check the engine oil level.
- (h) Drain the fuel tank sediment trap completely.
- (i) Open the fuel feed tap and return tap and drain the fuel line sedimenter.
- (j) **Rotate the engine slowly by hand and ensure the oil put in the cylinders before storage has drained down. If any strong resistance is present, remove the injectors, rotate by hand and check for the presence of excessive oil in the cylinders.**

If any oil is present, turn over by hand at least 10 times, then crank using the starter motor to remove excess oil via the injector holes.

NOTE: the oil will be removed with considerable pressure and precautions should be taken to contain the oil discharged.

It is advisable to remove the injector heat shields before cranking.

Replace the injectors, ensuring new crimp washers and the injector heat shields are in place, see page 10.

- (k) Crank the engine for a few seconds with the stop control in the off position and no pre-heat, apply a full 30 to 40 seconds pre-heat and start the engine in the normal manner.
- (l) Check for oil pressure and raw water flow. Run the engine for 10 minutes at 1,500 rev/min at a light load.
- (m) Stop the engine, check the oil levels, drive belt tensions, engine coolant level, fuel line, sedimenter, etc.

Engine

Storing an Industrial Engine

Where an engine is not to be used for at least two hours per month it should be stored as detailed below, or according to the current practice of the country concerned.

Engines on standby duty should be run for at least two hours per month under normal operating conditions. Where freezing conditions may be encountered always use anti-freeze mixture in the cooling system (see page 6).

- (a) Run the engine until normal operating temperature is reached, then stop the engine and change the engine oil and oil filter.
- (b) Run the engine at 1,500 rev/min or normal operating speed, then stop the engine.
- (c) Remove the injectors and pour 60 cc ($\frac{1}{2}$ pint) of engine oil into each cylinder. Rock the crankshaft backwards and forwards about a quarter turn each way to distribute the oil.
- (d) Check the injectors, and renew if necessary, using new crimp washers under the injectors.
- (e) Drain the cooling system (see page 6), leaving the hose disconnected.
- (f) Drain the external water system including the impeller housing of the external water pump, if fitted.
- (g) Seal all external outlets, the exhaust, air inlet, crankcase breather, etc.
- (h) Turn off the fuel at the tank and the fuel return.
- (i) Lubricate all the engine controls and lightly spray the power unit with oil or preservative.
- (j) Remove the battery to a dry storage area and re-charge monthly.
- (k) Apply a waterproof grease to all electrical connections, and cover the alternator ventilation slots.
- (l) It is also advisable to fill the fuel tank before storage.

Recommissioning a stored engine

It is important that this procedure is followed, otherwise severe damage to the engine may result.

- (a) Clean the outside of the power unit with a suitable degreaser.
- (b) Lubricate all linkages and controls.
- (c) Remove all seals, covers and protective parts.
- (d) Fit the batteries, which should have been freshly charged, ensuring they are connected correctly.
- (e) Fill the cooling system after closing taps and re-connecting any hoses.
- (f) Check drive belt tensions and conditions, renew or adjust as necessary.
- (g) Check the engine oil level.
- (h) Drain the fuel tank sediment trap completely.
- (i) Open the fuel feed tap and return tap and drain the fuel line sediment.

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- (j) **Rotate the engine slowly by hand and ensure the oil put in the cylinders before storage has drained down. If any strong resistance is present, remove the injectors, rotate by hand and check for the presence of excessive oil in the cylinders.**

If any oil is present, turn over by hand at least 10 times, then crank using the starter motor to remove excess oil via the injector holes.

NOTE: the oil will be expelled with considerable pressure and precautions should be taken to contain the oil discharged.

It is advisable to remove the injector heat shields before cranking.

Replace the injectors, ensuring new crimp washers and the injector heat shields are in place, see page 10.

- (k) **Crank the engine for a few seconds with the stop control in the off position and no pre-heat, apply a full 30 to 40 seconds pre-heat and start the engine in the normal manner.**
- (l) **Check for oil pressure and coolant flow. Run the engine for 10 minutes at 1,500 rev/min at a light load or normal operating speed.**
- (m) **Stop the engine, check the oil levels, drive belt tensions, engine coolant level, fuel line, sedimenter, etc.**

FAULT DIAGNOSIS

Listed below are various symptoms of irregular engine performance with their possible causes. Should the engine develop any of these faults which cannot be rectified after investigating the possible cause, consult your engine supplier.

Difficult starting

Start with check No. 1 and proceed as directed.

Incorrect idling

Start with check No. 22 and proceed as directed.

Loss of power (Ensure that the vehicle/equipment is not overloaded). Start with check No. 30 and proceed as directed.

Misfiring

Start with check No. 25 and proceed as directed.

Excessive exhaust

Start with check No. 13 and proceed as directed.

Check	Action
1. Is the cranking speed low?	Yes: Check 2. No: Check 6.
2. Is the engine oil of the correct grade?	Yes: Check 3. No: Change the engine oil.
3. Is the battery fully charged and in good condition?	Yes: Check 4. No: Change or re-charge the battery as necessary.
4. Are the connections in the starter circuit satisfactory?	Yes: Remove the starter and check 5. No: Make all starter circuit connections satisfactory.
5. Is the starter motor performance satisfactory on a test bench?	Yes: Investigate the engine for tightness. No: Overhaul or renew the starter motor.
6. Is the fuel reaching the injectors?	Yes: Check 13. No: Check 7.
7. Is the stop control correctly set and is its linkage free?	Yes: Check 8. No: Reset the control position or linkage as necessary.
8. Is there a supply of clean fuel in the tank?	Yes: Check 9. No: Refuel the tank and bleed the fuel system.
9. Are there leaks at fuel pipes or connections?	No: Check 10. Yes: Cure the leaks and bleed the fuel system.
10. Is there a blockage in the fuel system?	No: Check 11. Yes: Clear the blockage or renew the filter element as necessary, then bleed the fuel system.
11. Is the pump delivering fuel?	Yes: Check 12. No: Overhaul or renew the lift pump and bleed the fuel system.

Check	Action
12. Does the fuel system require bleeding?	No: Overhaul the injection pump. Yes: Bleed all air from the fuel system.
13. Are the injector pipes connected in their correct firing order?	Yes: Check 14. No: Correct the firing order and bleed the fuel system.
14. Are the correct injectors correctly fitted?	Yes: Check 15. No: Correct the error and bleed the fuel system.
15. Are the injection pump timing marks correctly aligned?	Yes: Check 16. No: Re-set the injection pump timing.
16. Is the air cleaner or induction system blocked?	No: Check 17. Yes: Clear the blockage or clean and re-oil the air filter.
17. Is the exhaust system restricted?	No: Remove the injectors and check 18. Yes: Clear the restriction.
18. Is the injector opening pressure and performance satisfactory?	Yes: Remove the injection pump and check 19. No: Overhaul or renew the injectors.
19. Is the injection timing pointer correctly positioned when checked with tool MS 67 A?	Yes: Check 20. No: Re-set the injection timing pointer.
20. Is the injection pump performance satisfactory on a test bench?	Yes: Check 21. No: Overhaul, or renew the injection pump.
21. Is the valve/rocker clearance and valve timing correct?	Yes: Investigate the engine for wear or damage causing lack of compression. Conduct a compression test. No: Correct the valve/rocker clearance and/or valve timing.
22. Does the throttle linkage interfere with the idling speed setting?	No: Check 23. Yes: Correct the throttle linkage adjustment.
23. Does the stop control linkage interfere with the position of the stop lever?	No: Check 24. Yes: Set the stop control linkage correctly.
24. Is the idling stop screw setting correct?	Yes: Check 25. No: Adjust the engine idling speed.
25. Is the fuel tank air vent restricted?	No: Check 26. Yes: Clear the fuel tank air vent.
26. Are there leaks at the fuel pipes or connections?	No: Check 27. Yes: Cure the leaks and bleed the fuel system.

Fault Diagnosis

Check	Action
27. Is there a blockage in the fuel system?	No: Check 28. Yes: Clear the blockage or renew the filter element as necessary then bleed the fuel system.
28. Does the fuel system require bleeding?	No: Check 29. Yes: Bleed all the air from the fuel system.
29. Is the lift pump delivery pressure above 36.2 kN/m ² (0.37 kgf/cm ² , 5.25 lbf/in ²)?	Yes: Check 13. No: Overhaul or renew the lift pump.
30. Are the vehicle brakes binding?	No: Check 31. Yes: Adjust the brakes.
31. Is the throttle linkage transmitting full travel to the throttle lever?	Yes: Check 32. No: Adjust or renew the throttle linkage as necessary.
32. Is the maximum speed stop screw setting correct?	Yes: Check 32. No: Adjust the engine maximum speed.

Compression test

The test should only be carried out using diesel test equipment. The figures quoted in 'GENERAL DATA' are for guidance only, and when considering the results of a compression test it is more important to have uniform readings between the cylinders, than the exact figures quoted in 'GENERAL DATA'.

A scatter of 138 kN/m² (20 lbf/in²) is normal.

NOTE: Rocker clearances must be correct before carrying out a compression test.

GENERAL DATA

The engine specification may vary according to market requirements and from model to model. The manufacturers reserve the right to alter specifications with or without notice at any time. The policy of constant product improvement by the manufacturers may involve major or minor changes to the engine specification. Whilst every effort is made to ensure the accuracy of the particulars contained in this Handbook, no liability for inaccuracies or the consequences thereof can be accepted by the manufacturer or the supplier of the Handbook.

1.8 LITRE ENGINE. For engine identification see page 27

Engine	Type	18V
	Number of cylinders	4
	Bore	80.3 mm (3.16 in)
	Stroke	88.9 mm (3.5 in)
	Capacity	1799 cm ³ (109.8 in ³)
	Compression ratio:	
	Engines with early type camshaft ..	21.47 : 1
	Engines with later type camshaft ..	22.3 : 1
	Injection order	1, 3, 4, 2
	Valve rocker clearances (hot or cold):	
	Engines with early type camshaft ..	0.43 mm (0.017 in)
	Engines with later type camshaft ..	0.36 mm (0.014 in)
	Static injection timing	18° B.T.D.C.
	Maximum torque	107.1 Nm, 79 lbf ft, 10.9 kgf m
	Idling speed	650 to 700 rev/min
	Maximum governed light running speed (vehicle)	4,900 rev/min
	Typical compression pressures ..	2,750 to 2,888 kN/m ² (400 to 420 lbf/in ²) engine hot at 280 to 320 rev/min cranking speed
Fuel system	Fuel filter	C.A.V. type FS
	Fuel injection pump	C.A.V.—DPA3247F180
	Fuel injection nozzle	C.A.V.—BDN.OSPC.6651
	Fuel injection nozzle holder	C.A.V.—BKB.35SD.5188
	Nozzle opening pressure	135 Atmospheres
	Heater plugs	Champion type AG 32
	Fuel lift pump	A.C. mechanical
	Fuel lift pump setting	34.50 to 55.00 kN/m ² (5 to 8 lbf/in ²)
	Injector nut tightness	16 Nm, 12 lbf ft, 1.7 kgf m
Electrical equipment	Alternator	Lucas 16 ACR, 18 ACR or 17 ACR—M
	Starter	Lucas M45G pre-engaged
Capacities	Engine (including filter)	4.54 litres (8 pints)
	Filter only	0.43 litre (¾ pint)
Weight	Basic power unit	181.9 kg (400 lb)

General Data

1.5 LITRE ENGINE

Engine	Type	15V
	Number of cylinders	4
	Bore	73.025 mm (2.875 in)
	Stroke	88.9 mm (3.5 in)
	Capacity	1489 cm ³ (90.88 in ³)
	Compression ratio	23 : 1
	Injection order	1, 3, 4, 2
	Valve rocker clearance (hot or cold)	0.38 mm (0.015 in)
	Static injection timing	22° B.T.D.C.
	Idling speed	550 to 600 rev/min
	Maximum governed light running speed (vehicle)	4,400 rev/min
	Typical compression pressures	3,300 to 3,438 kN/m ² (480 to 500 lbf/in ²) engine hot at 280 to 320 rev/min cranking speed
Fuel system	Fuel filter	C.A.V. type FS.5836020
	Fuel injection pump	C.A.V.—DPA.3246F857
	Fuel injection nozzle	C.A.V.—BDN.O.SPC.6389
	Fuel injection nozzle holder	C.A.V.—BKB.35SD.5188
	Nozzle opening pressure	135 Atmospheres
	Heater plugs	KLG type GS103L or Champion AG32A
	Fuel lift pump	A.C. mechanical
	Fuel lift pump setting	34.5 to 55.0 kN/m ² (5 to 8 lbf/in ²)
	Injector nut tightness	16 Nm, 12 lbf ft, 1.7 kgf m
Electrical equipment	Alternator	Lucas 16 ACR, 18 ACR or 17 ACR—M
	Starter	Lucas M45G pre-engaged
Capacities	Engine (including filter)	4.66 litres (8¼ pints)
	Filter only	0.71 litre (1¼ pints)
Weight	Basic power unit	186.4 kg (410 lb)

MAINTENANCE SUMMARY

This page contains a summary of the routine maintenance, and the periods at which it should be carried out, to maintain the efficient and economical running of the engine under normal operating and climatic conditions. Under abnormal conditions it may be necessary to adjust the recommended servicing intervals. The numbers quoted after an item refer to the page on which details of the individual operation will be found.

It is recommended that the 600 hour service be conducted once per year even if the engine has not been run for 600 hours.

Daily

Check/top up engine oil level (11)

Check/top up coolant in radiator

Every 150 hours

Change engine oil and oil filter (12)

Operation	Every 300 hours	Every 600 hours
Check/adjust drive belt tension (14)	X	X
Check/adjust valve clearances (13)	X	X
Renew main fuel filter element (10)	X	X
Change engine oil and filter element (12)	X	X
Test injectors for spray (10).....		X
Remove heater plugs and clean carbon from each plug orifice in cylinder head (8)		X
Renew oil filler cap (11)		X
Clean fuel injection pump driving gear lubricator (1.5 Litre engine only) (12)	X	X
Clean/renew air filter element (7)	X	X
Check governor settings (10)		X
Retorque cylinder head nuts (1.8 Litre engine only)	X	X

NOTE: More frequent air cleaner element servicing may be necessary in dirty/dusty conditions.

LUBRICATION

The lubrication systems of your new engine are filled with high quality oils.

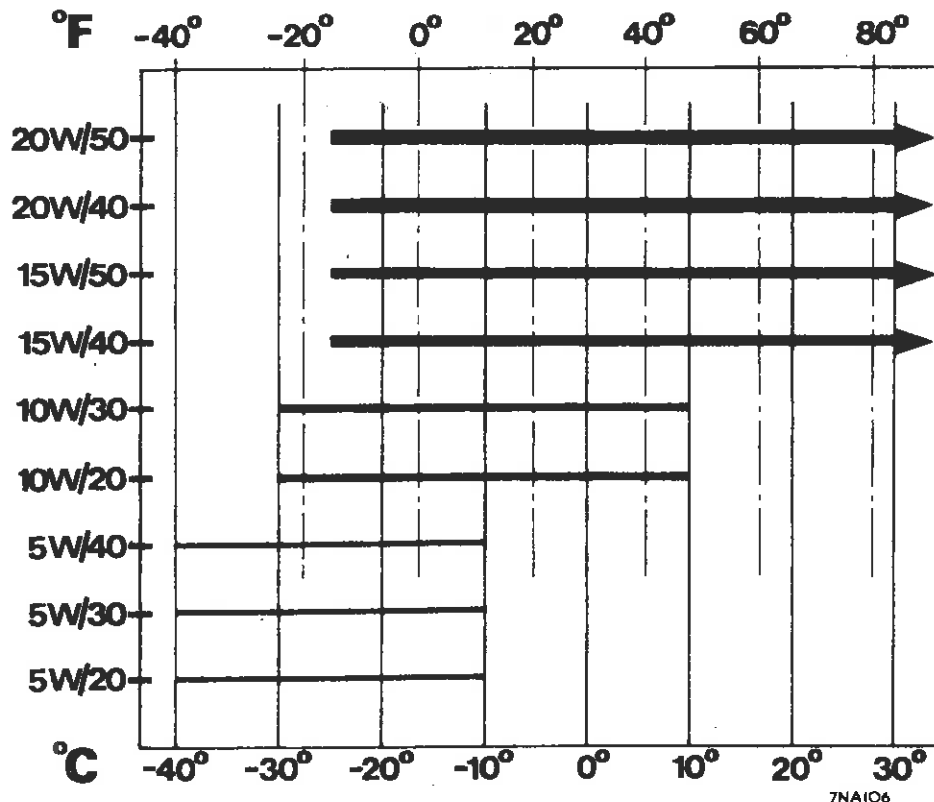
You should always use a high quality multigrade oil of the correct viscosity range in the engine, during subsequent maintenance operations or when topping-up. The use of oils not to the recommended specification can lead to high oil and fuel consumption and ultimately to damage to the engine components.

Oil to the recommended specification contains additives which disperse the corrosive acids formed by combustion and also prevent the formation of sludge which can block oilways. **Additional oil additives should not be used.** Servicing intervals must be adhered to.

Engine Use a well-known brand of oil to MIL-L-46152 or MIL-L-2104B (A.P.I.-CC) quality, with a viscosity band spanning the temperature range of your locality.

Multigrade Oils Viscosity/Temperature Ranges

S.A.E.
viscosity

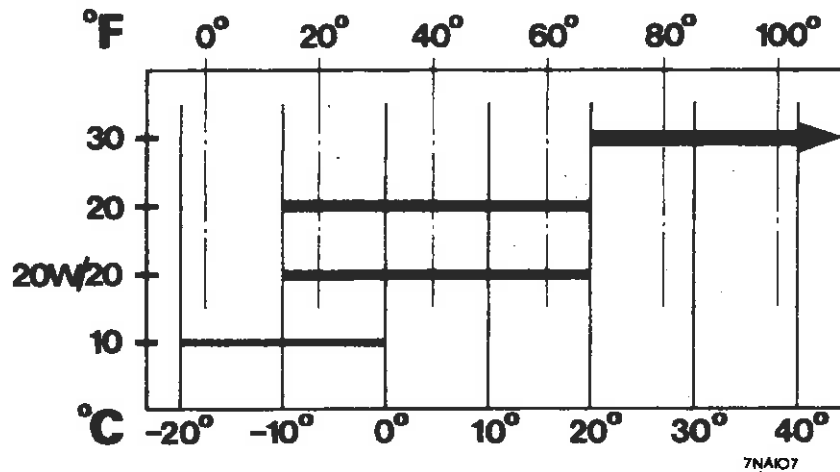


The use of monograde oil is possible, providing that it is of the correct viscosity for the ambient temperature of your locality. It should also be of the same quality MIL-L-46152 or MIL-L-2104B (A.P.I.-CC) as the preferred multigrade oils.

For sustained high speed operation or operation for long periods in a high ambient temperature, the use of a multigrade oil of the correct viscosity and quality is recommended.

Monograde Oils Viscosity/Temperature Ranges

S.A.E.
viscosity



Lubrication

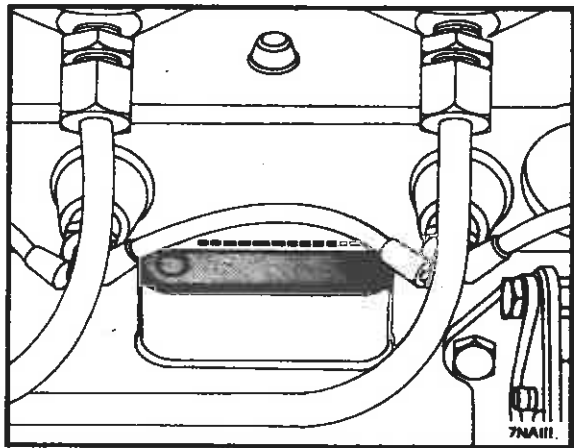
	FORECOURT OILS			FLEET OILS		
Minimum performance level	MIL-L-2104B (A.P.I.-CC) or MIL-L-46152					
Climatic Conditions	Temperatures above -10°C (10°F)	Temperatures -20°C (-5°F) to 10°C (50°F)	Temperatures below -10°C (10°F)	Temperatures above -10°C (10°F)	Temperatures -20°C (-5°F) to 10°C (50°F)	Temperatures below -10°C (10°F)
BP	BP Super Visco-Static 20W/50 BP Vanellus C3 Multi-grade BP Visco 2000*	BP Super Visco-Static 10W/30 or 10W/40*	BP Super Visco-Static 5W/20*	BP Vanellus M 20-50 BP Vanellus C3 Multigrade	BP Vanellus M 10W/30 or 10W/40*	BP Super Visco-Static 5W/20*
CASTROL	Castrol GTX 20W/50 Castrol GTX-2 15W/20	Castrolite 10W/30 or 10W/40 Castrol GTZ 10W/40 (Sweden)	Castrol Super GTX 5W/30 (Canada) Castrol GTZ 5W/40 (Finland)	Castrol Deusol RX Super 15W/40		
DUCKHAMS	Duckhams Q Motor Oil 20W/50	No grades in the U.K.		Fleetol Multi-V 20W/50 Fleetmaster	Fleetol Multilite 10W/30	
ESSO	Esso Uniflo 15W/50	Esso Uniflo 10W/40	Esso Uniflo 5W/40	Essolube HDX Plus 20W/50 Esso Uniflo 15W/50	Essolube HDX Plus 10W/30 Esso Uniflo 10W/40	Essolube MDX Plus 10W/30 Esso Uniflo 5W/40
MOBIL	Mobiloil Super 15W/50	Mobiloil SHC 10W/50	Mobiloil 1 5W/20 Mobiloil 5W/20	Mobil Delvac Super 15W/40 Delvac Special 20W/50	Mobil Delvac Special 10W/30	Mobiloil 5W/20
PETROFINA	Fina Supergrade Motor Oil 20W/50	Fina Supergrade Motor Oil 10W/40		Fina Delta Multigrade 20W/50	Fina Delta Multigrade 10W/30	
SHELL	Shell Super Motor Oil U.K. 20W/50 Europe 15W/50	Shell Super Motor Oil 10W/40 (Norway, Sweden, Canada) 10W/50 (Rest of Europe, U.S.A.)	Shell Super Motor Oil 5W/40 (Finland) 5W/30 (Canada)	Rotella SX Rotella TX 20W/40 Rotella SX 20W/30 (Sweden)	Rotella TX 10W/30 Rotella SX 10W/20 (Sweden)	Rotella TX 5W/20 (Finland, Canada)
TEXACO	Texaco URSA Oil LA 15W/40			Eurotex - Motor oil HD 20W/50	Eurotex Motor oil HD 10W/30	

* Not available in the U.K.

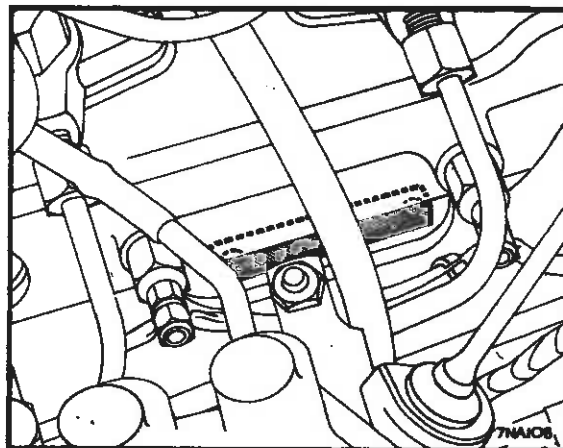
SERVICE

Identification The engine number is stamped on the top face of the cylinder block on the right-hand side between number 2 and 3 cylinders.

1.5 Litre Engine

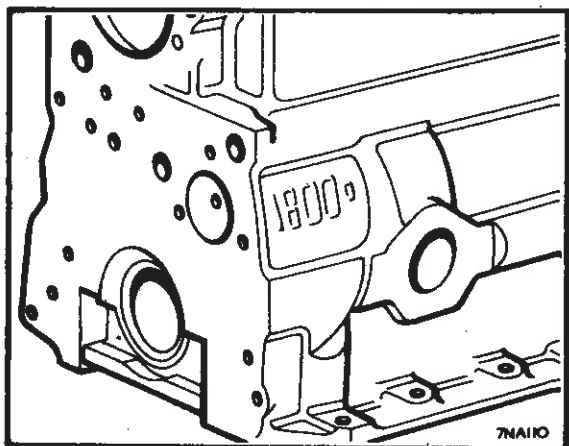


1.8 Litre Engine

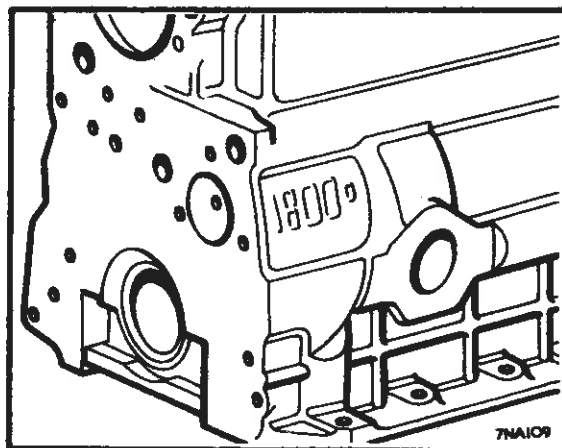


1.8 Litre Engine Identification

Engine with early type camshaft



Engine with later type camshaft



Service parts and accessories Genuine LEYLAND and UNIPART parts and accessories are designed and tested for your engine and have the full backing of the Leyland Factory Warranty. **ONLY WHEN GENUINE LEYLAND AND UNIPART PARTS ARE USED CAN RESPONSIBILITY BE CONSIDERED UNDER THE TERMS OF THE WARRANTY.**

In accordance with the Company's policy of continuing improvement, new items are introduced regularly into the UNIPART range. UNIPART parts should be used when servicing or replacing parts on your engine.

Genuine Leyland and UNIPART parts and accessories are supplied in cartons and packs bearing either or both these symbols.



Safety features embodied in the engine may be impaired if other than genuine parts are fitted. In certain territories, legislation prohibits the fitting of parts not to the engine manufacturer's specification. Owners purchasing accessories while travelling abroad should ensure that the accessory and its fitted location conform to mandatory requirements existing in their country of origin.