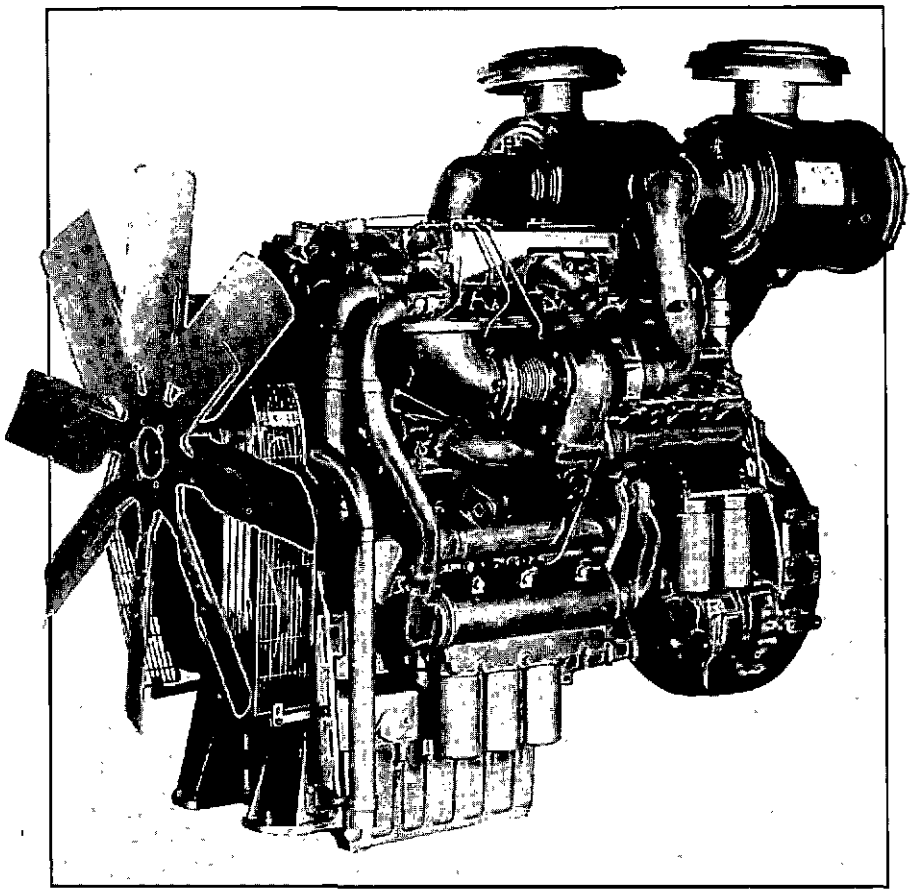
Perkins

POWER SERVICE

USER'S HANDBOOK



3012/CV12 Industrial Engines

Perkins

Equipment registration/application	**Date of purchase**
Engine number	**Date of installation**
Owner's or operator's name and address	**Perkins distributor's name and address**

Perkins

3000 SERIES

3012/CV12 Industrial Engines

USER'S HANDBOOK

The contents of this manual are applicable to both the 'CV12' and 3000 Series - 3012 engines.

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Perkins Power Sales and Service Limited,
Shrewsbury, Shropshire SY1 4DP.

General information 1

Engine identification

The engine number is stamped on the data plate which is fastened to the left side of the crankcase.

A typical engine number is 6A27487U 59426U which is a series identification as indicated below:

6A = Engine family
27487 = Engine specification number
U = Country of origin
59426 = Build line number
U = Year of manufacture

If you need parts, service or information for your engine, you must give the complete engine number to your Perkins distributor.

Perkins companies

Australia
Perkins Engines Australia Pty. Limited,
Suite 2, 364 Main Street,
Mornington 3931, Victoria, Australia.
Telephone: 597 51877 Telex: PERKOIL AA 30816
Fax: 597 58793

France
Moteurs Perkins S.A.,
9-11 Avenue Michelet,
93583 Saint Ouen, Cedex, France.
Telephone: (1) 40-10-42-49 Telex: PERKOIL 234924 F
Fax: (1) 40-10-42-45

Germany
Perkins Motoren G.m.b.H.,
Postfach 1180, 8752 Kleinostheim,
West Germany.
Telephone: 6027 5010 Telex: 4188869 PER D
Fax: 6027 501124

Italy
Motori Perkins S.p.A.,
Via Socrate, 8 Loc, Merlese,
22070 Casnate con Bernate (Como), Italy.
Telephone: 031 564625/564633 Telex: 380658 PERKIT I
Fax: 031 249092/564145

Japan
Varity (Japan) K.K.,
Reinanzaka Building, 6th floor,
14-2 Akasaka,
1-chome, Minato-ku, Tokyo 107, Japan.
Telephone: 813 3582 7377 Telex: 2424823 PRKOIL
Cablegrams: Perkoil Tokyo
Fax: 813 3582 1596

Singapore
Perkins Engines Asia Pacific,
4 Kian Teck Drive,
Singapore 2262.
Telephone: 2656333/2653223
Telex: PERKOIL RS 37729
Fax: 2641188

United Kingdom
Perkins Engines (Shrewsbury) Limited,
Lancaster Road,
Shrewsbury, SY1 4DP, England.
Telephone: 0743 212000
Telex: 35171 PESL G
Fax: 0743 69911

United States of America
Detroit Diesel Corporation,
13400 Outer Drive West,
Detroit, Michigan 48239-4001, U.S.A.
Telephone: 313 592 5608
Telex: 544141 PERKENG LAW
Fax: 404 822 3006

Perkins Engines Latin America Inc.,
Suite 620,
999, Ponce de Leon Boulevard,
Coral Gables,
Florida 33134, U.S.A.
Telephone: 305 442 7413
Telex: 32501 PERKEN G
Fax: 305 442 7419

In addition to the above companies, there are Perkins distributors in most countries. Perkins Engines Limited, Peterborough or one of the above companies can provide details.

Engine views 2

Engine views

Introduction

Perkins engines are built for specific applications and the views which follow do not necessarily match your engine specification.

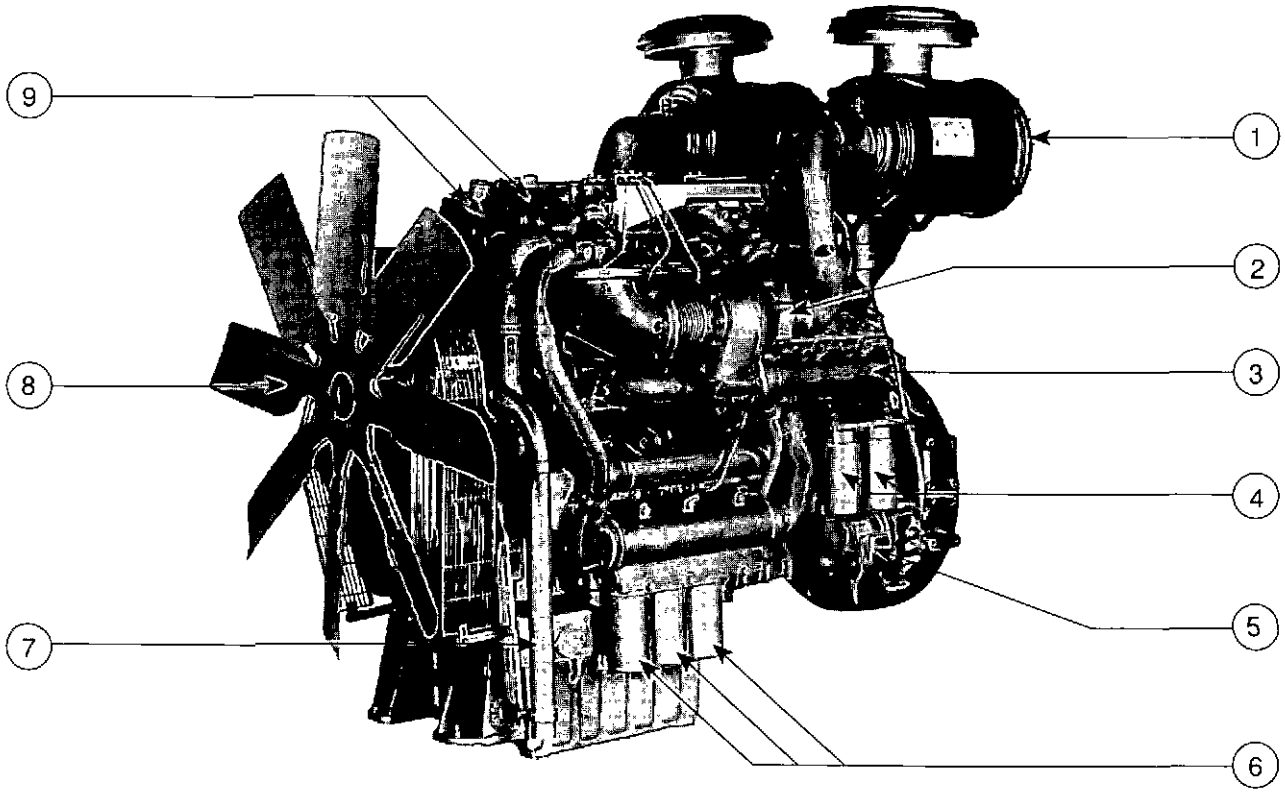
Location of engine parts

Front and left side view of the 3000 Series (3012) engine

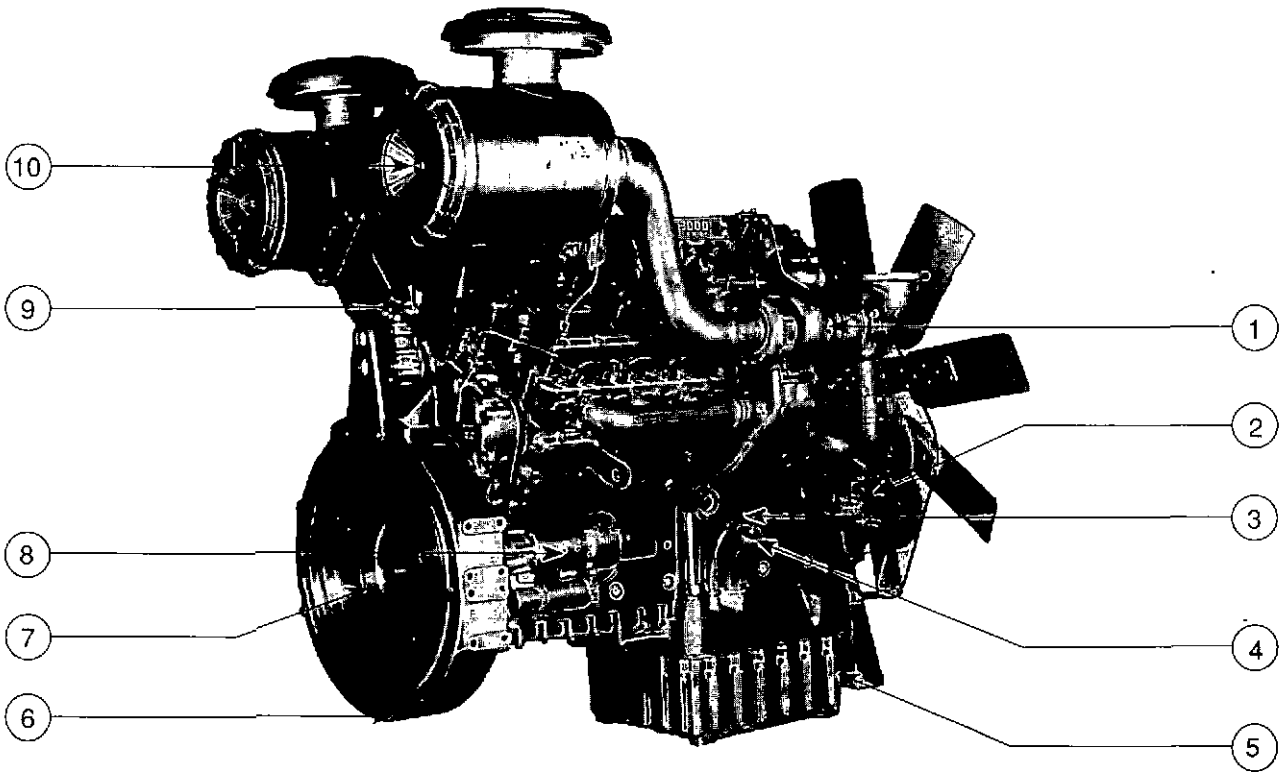
1 'B' bank air cleaner
2 'B' bank turbocharger
3 Exhaust manifold
4 Canisters of the fuel filter
5 Coolant pump
6 Canisters of the lubricating oil filter
7 Crankcase breather
8 Fan
9 Thermostat housings

Rear and right side view of the 3000 Series (3012) engine

1 'A' bank turbocharger
2 Alternator
3 Dipstick
4 Filler cap for lubricating oil
5 Lubricating oil sump
6 Flywheel housing
7 Flywheel
8 Starter motor
9 Fuel lift pump
10 'A' bank air cleaner



Front and left side view of engine



Rear and right side view of engine

Operating instructions 3

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Preventive maintenance

Preventive maintenance periods

These preventive maintenance periods apply to average conditions of operation. Check the periods given by the manufacturer of the equipment in which the engine is installed. If necessary, use the shorter periods. When the operation of the engine must conform to the local regulations, these periods and procedures may need to be adapted to ensure correct operation of the engine.

The service intervals can be reduced for operation in adverse conditions. The intervals must not be extended unless Perkins Engines (Shrewsbury) Limited have approved the changes as indicated in the Perkins Warranty. It is good preventive maintenance to check for leakage and loose fasteners at each service. These maintenance periods apply only to engines that are operated with fuel and lubricating oil which conform to the specifications given in this handbook.

Schedule for engines in normal use

The preventive maintenance operations must be applied at the interval (hours or months) which occurs first.

A - Every 10 hours or daily
B - Every 400 hours or 12 months
C - Every 1200 hours or 24 months

A	B	C	Operation
●			Check the amount of coolant
●			Check the level of the lubricating oil
●			Check the restriction indicators for the air filters and, when necessary, renew the filter elements
●			Drain any water/sediment from the primary fuel filter
	●		Check the condition and the tension of all drive belts
	●		Check the specific gravity and the pH value of the coolant
	●		Renew the lubricating oil
	●		Renew the canisters of the lubricating oil filter
	●		Renew the canister of the main fuel filter
	●		Clean the primary fuel filter
	●		Ensure that the mounting nuts for the turbochargers are tightened securely
	●		Check that the air charge cooler and the radiator are clean and free from debris
		●	Check the timing of the fuel injection pump
		●	Check that the bolts of the drive coupling for the fuel injection pump are tightened to 120 Nm (88 lbf ft)
		●	Ensure that the fuel injectors are checked and corrected or renewed, if necessary*
		●	Ensure that the tappet clearances are checked and adjusted, if necessary*

In addition to the operations listed above, the operations listed below must be applied at 12 month intervals:

- Drain and flush the coolant system and renew the coolant mixture.
- Check the turbochargers, maintain if required*
- Ensure that the alternator is checked and corrected, if necessary*

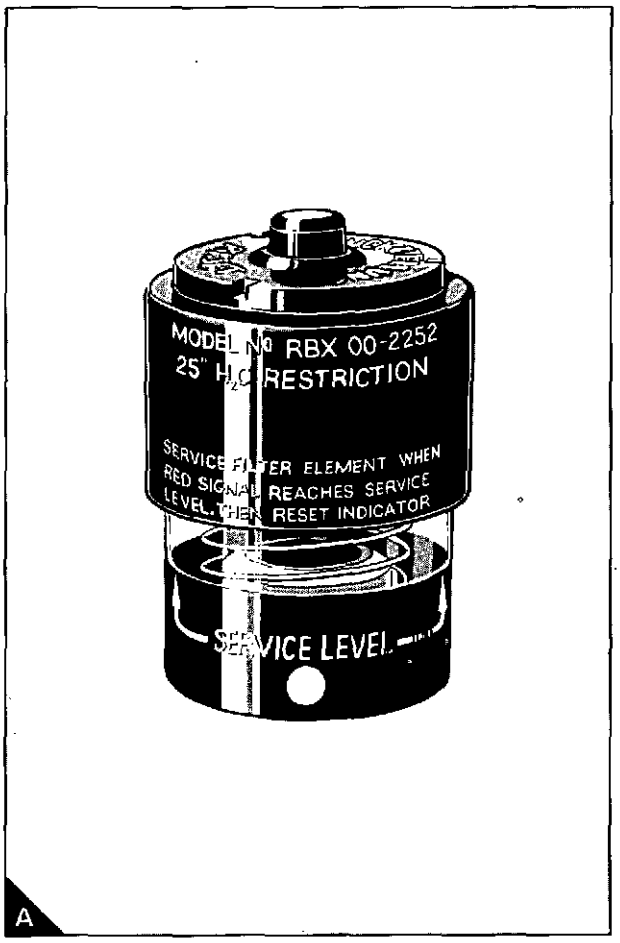
* By a person who has had the correct training.

Restriction indicator

Each air filter is fitted with an indicator (A) which gives a visual warning when the filter needs a service.

When the red warning indicator is seen through the clear panel after the engine has stopped, the air filter element must be renewed.

After a clean element has been fitted, press the reset button on the restriction indicator.



A

How to renew the elements of the air filters

The two Donaldson Cyclopac air filters (B) contain paper elements. These must not be washed. Renew the paper elements as follows:

1 *Loosen the clamp and remove the end cover* (B1). Remove the wing nut (B2), remove and discard the filter element (B3).

2 Clean thoroughly the inside of the casing of the air filter. Fit a new filter element and fit the end cover.

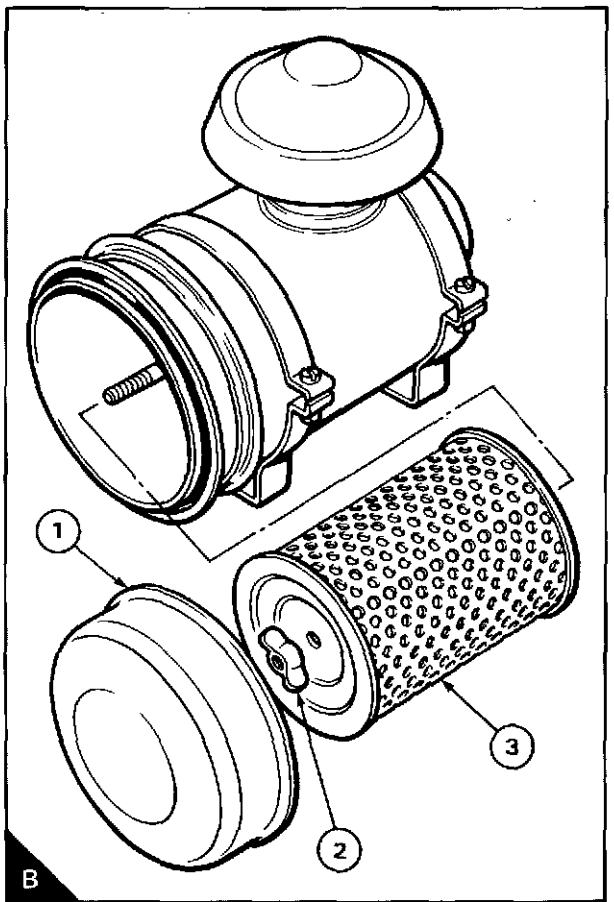
3 *Reset the restriction indicator.*

Repeat this procedure for the other air filter.

How to drain the primary fuel filter

1 Remove the drain plug from the base of the filter bowl and allow any water or sediment to drain from the filter.

2 Fit the drain plug and tighten it securely.



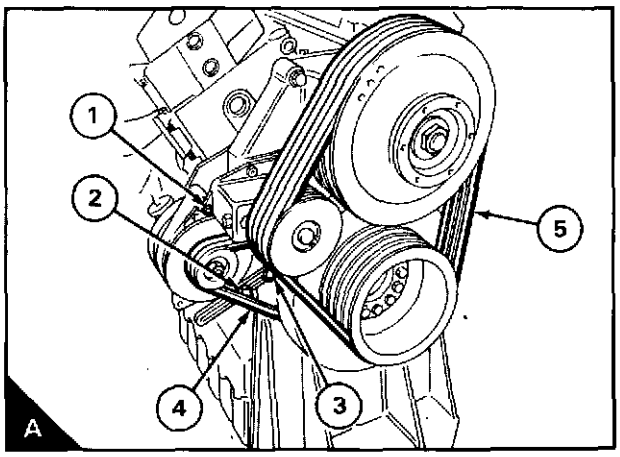
B

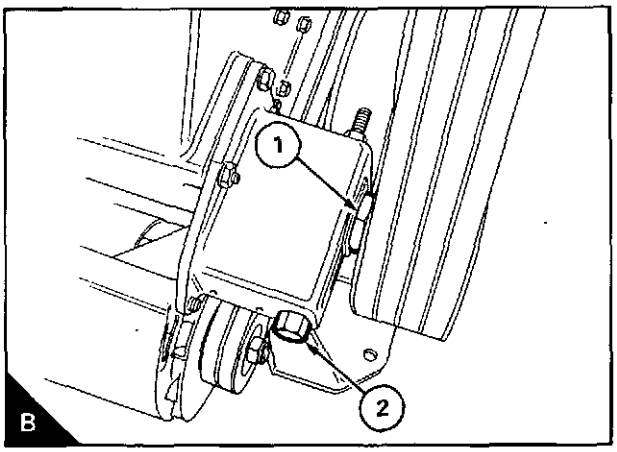
How to check the drive belts

Renew a belt if it is worn or damaged. Where more than one belt is used on a series of pulleys, all of the belts must be renewed together.

To ensure maximum belt life, it is recommended that a belt tension gauge is used to check the tension of the belt. Fit the gauge at the centre of the longest free length (A4 or A5) and check the tension. If a "Gates" gauge is used, the correct tension is 200 to 250 N (45 to 56 lbf). When new belts are fitted the tension must be set between 250 and 300 N (56 and 67 lbf).

Where more than one belt is used on a series of pulleys, check/adjust the tension on the tightest belt.





How to adjust the tension of the alternator belt

1 Loosen the alternator pivot bolt (A1), the adjustment link bolt (A2) and the adjustment bolt (A3). Move the alternator to obtain the correct belt tension and tighten the bolts.

2 Run the engine for 15 minutes and then check the belt tension again. The tension must not be below 200 N (45 lbf). Check the tension of new belts every week for four weeks. Then check the tension at the intervals specified in the service schedule.

How to adjust the tension of the fan belts

1 To adjust the tension of the fan belts, loosen the lock nuts on the adjustment bolt. Loosen the large lock nut (B1) on the belt tensioner and turn the adjustment bolt (B2) until the correct belt tension is obtained. Tighten the lock nuts and check the tension of the belts again. If the tension is correct, tighten the large lock nut.

How to renew the fan belts

1 To renew the fan belts, remove the six bolts that fasten the fan to the pulley and push the fan forward into the radiator cowl.

2 Release the tension on the belts and remove the old belts. Ensure that the pulley grooves are free from grease and dirt. Fit a new set of belts.

3 Fit the fan and tighten the bolts securely. Adjust the fan belts to the correct tension.

Note: If a "Gates" gauge is not available, the deflection of the belt must be 12,5mm (0.5 in) when the belt is pressed down with the thumb at the centre of the longest free length of the belt.

How to renew the alternator belt

1 Remove the fan belts from the crankshaft pulley as described on this page.

2 Loosen the adjustment bolts to release the tension on the alternator belts and remove the old belts. Check that both of the pulley grooves are clean and fit the new belts. Adjust the belts to a tension of between 250 N and 300 N (56 and 67 lbf). Fit the fan belts and adjust to the correct tension as described on this page.

How to check the specific gravity of the coolant

Drain some coolant from the cooling system after the engine has been stopped and before the formation of sediment. Proceed as follows:

1 Mixtures which contain inhibited ethylene glycol:

(a) Put a hydrometer, and a reliable thermometer, into the antifreeze mixture and check the readings on both instruments.

(b) Compare the readings obtained with the chart and adjust the strength of the mixture as necessary.

2 Mixtures which contain inhibited propylene glycol:

(a) Open the cover of the refractometer, check that the clear panel is clean and use a small syringe to apply a few drops of the coolant mixture to the clear panel.

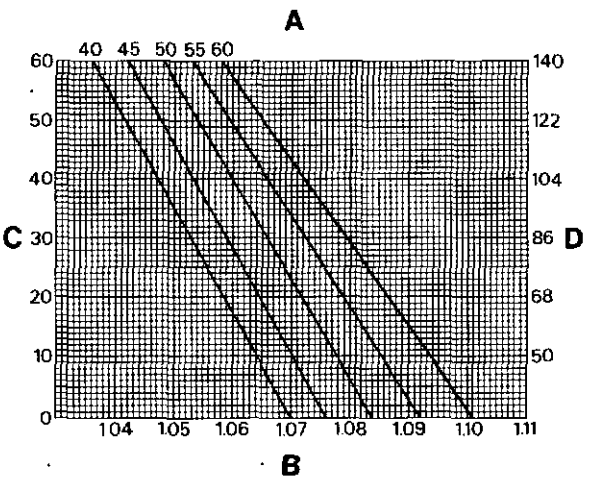
(b) Spread the coolant over the full area of the clear panel and close the cover. Hold the refractometer horizontal with the clear panel up and inspect the sample through the viewer.

(c) Compare the reading with the chart in the instructions; adjust the strength of the mixture as necessary.

Attention: The clear panel must be thoroughly cleaned before use. Some of the fluid which was tested before can remain on the clear panel and this will affect the reading of the sample.

Protection against frost is as follows:

Antifreeze/water (% by volume)	Protection down to (°C)
50/50	-35
60/40	-40



Specific gravity chart

A = Percentage anti-freeze by volume
B = Specific gravity
C = Mixture temperature in Centigrade
D = Mixture temperature in Fahrenheit

How to check the pH value of the coolant

The pH value of the coolant must not be less than pH7 or more than pH9.5. The pH value can be determined by use of a pH meter or test papers, which are available from pharmaceutical manufacturers.
If these limits are exceeded the pH value may be adjusted by the addition of corrosion inhibitor to the same specification as that already in use. If this is not possible, the cooling system must be drained, flushed and filled with new coolant.

How to renew the engine lubricating oil

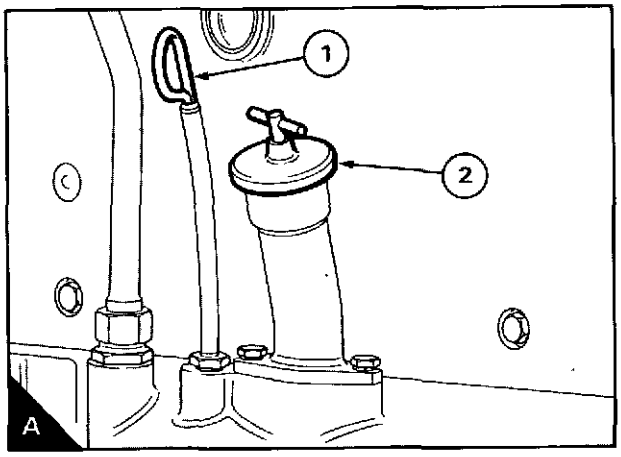
1 Operate the engine until it is warm.

2 Stop the engine, remove the sump drain plug and drain the lubricating oil from the sump. Fit the drain plug and a new sealing washer and tighten the plug to a torque of 47 Nm (35 lbf ft). If the plug is fitted into a steel insert, tighten to a torque of 115 Nm (85 lbf ft).

3 Renew the three oil filter canisters as given below.

4 Clean the area around the oil filler cap (A2) and remove the cap. Fill the sump to the H mark on the dipstick (A1) with clean new lubricating oil of an approved grade as given on page 5.02. Do NOT overfill.

5 Operate the engine and check for leakage from the filter canisters. When the engine has cooled, check the oil level on the dipstick and put more oil into the sump, if necessary.



How to renew the canisters of the oil filter

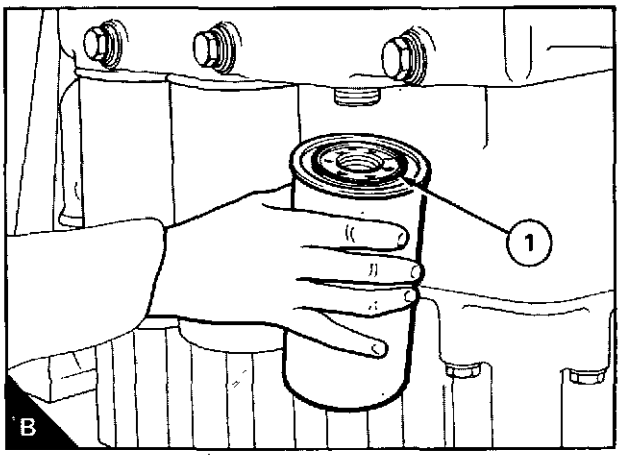
Three screw-on type canisters are fitted to the filter head which is integral with the bottom of the engine oil cooler.

1 Put a tray under the filters to retain the spilt lubricating oil. Use a strap wrench to remove each canister.

2 Check that new sealing rings (B1) are correctly fitted to the new canisters and clean the contact faces of the filter head.

3 Lubricate the top of each canister seal with clean engine lubricating oil and fill each canister with the approved grade of lubricating oil.

4 Fit the new canisters to their threaded adaptors and tighten each canister until the seal just comes into contact with the filter head. Continue to tighten each canister, by a further 1¼ turns. Do NOT overtighten.



How to clean the primary fuel filter

1 Remove the three bolts (A1) and remove the filter bowl (A2).

2 Clean all of the components with paraffin and dry them with a compressed air jet.

3 Fit the bowl to the filter head, together with a new sealing ring. Align the clamp ring (A3) and fasten it with the three bolts.

Early engines can be fitted with filters that have elements which can be cleaned. These elements should be removed, cleaned with fuel oil and dried with compressed air at low pressure.

How to renew the canisters of the main fuel filter

The main fuel filter is at the rear of the engine on the 'B' bank side and has twin canisters. Both canisters must be renewed at the same time.

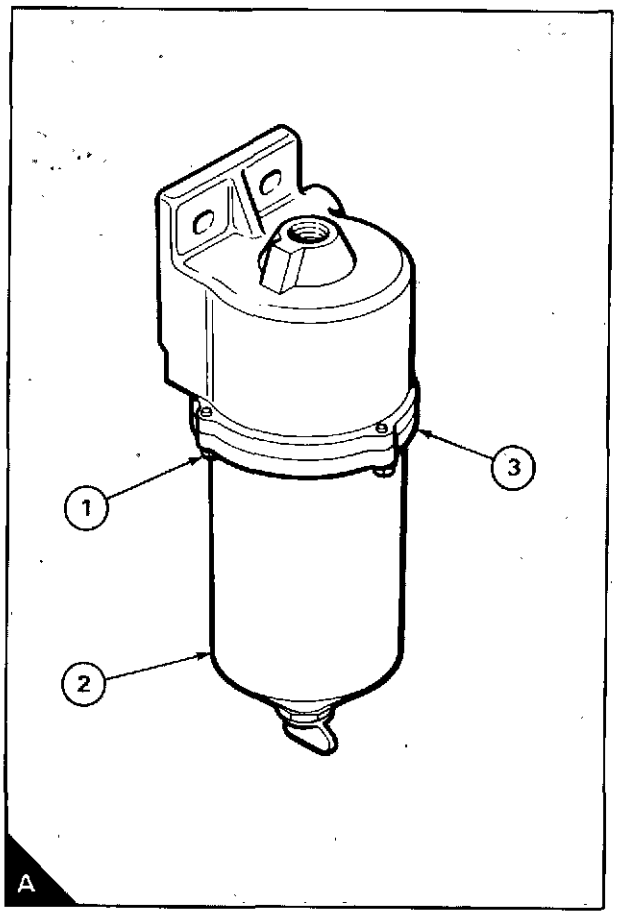
1 Clean the outside surfaces of the filter and remove the fuel filter canister. If necessary, use a strap wrench. Discard the canister.

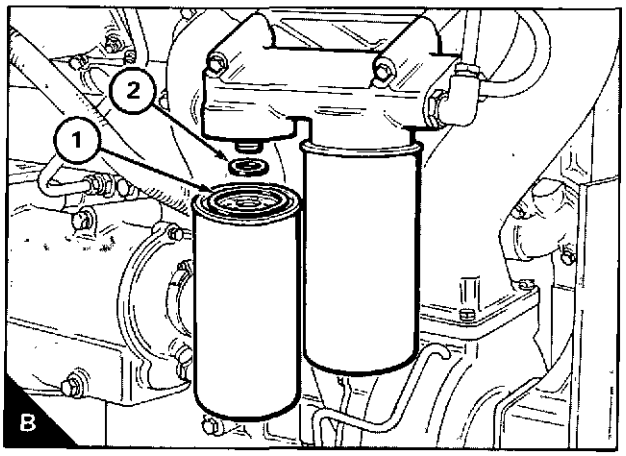
2 Check that a new sealing ring (B1) is fitted correctly to each new canister and clean the contact face of the filter head.

3 Lubricate the top of the canister seal (B1) with clean fuel oil and renew the sealing ring (B2) on the adaptor.

4 Fit the new canisters to their threaded adaptors and tighten each canister until the seal just comes into contact with the filter head. Continue to tighten each canister, by hand a further 1¼ turns. Do NOT overtighten.

After the fuel filter canister(s) have been renewed, eliminate air from the low pressure fuel system as given on page 4.13.





How to check/adjust the timing of the fuel injection pump

If it becomes necessary to check and adjust the timing of the fuel injection pump, the procedure that follows is recommended:

1 Ensure that the stop control is in the "STOP" position.

2 Remove the high pressure fuel pipes and the rocker cover from the cylinder head for A4, A5 and A6 cylinders.

3 Remove the cover on the flywheel housing as shown (A).

4 Turn the crankshaft by hand, in the normal direction of rotation, until the relevant number for injection timing (see the engine data plate), aligns with the timing pointer, with the valves on A6 cylinder closed, i.e. 'A6' piston at TDC on its compression stroke.

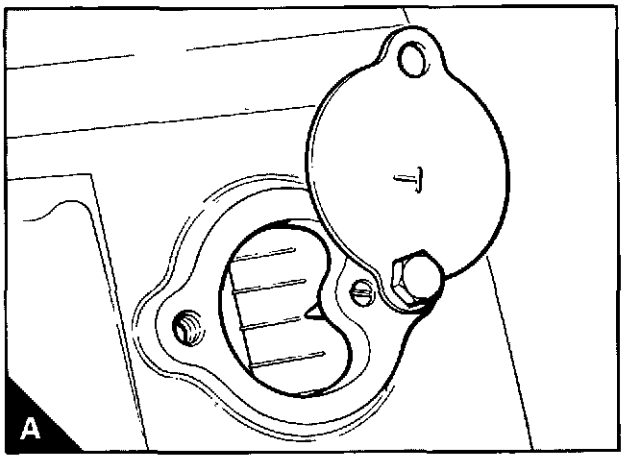
5 Check that the timing mark (B1), on the hub of the fuel injection pump, aligns with the pointer (B2).

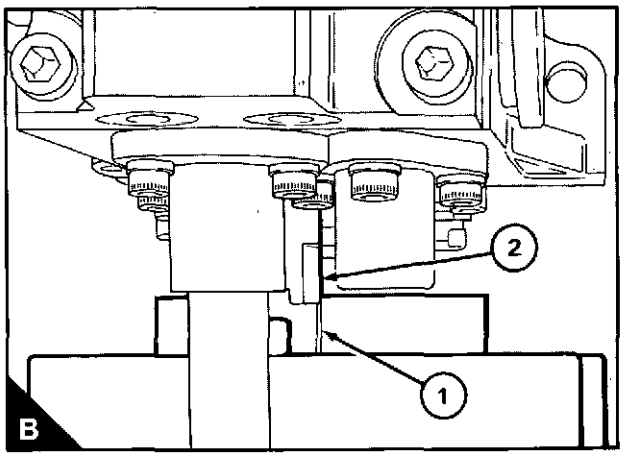
6 If the timing mark (B1) does not align with the pointer, check that the fuel pump drive shaft and the coupling are secure and are not damaged, then proceed as follows.

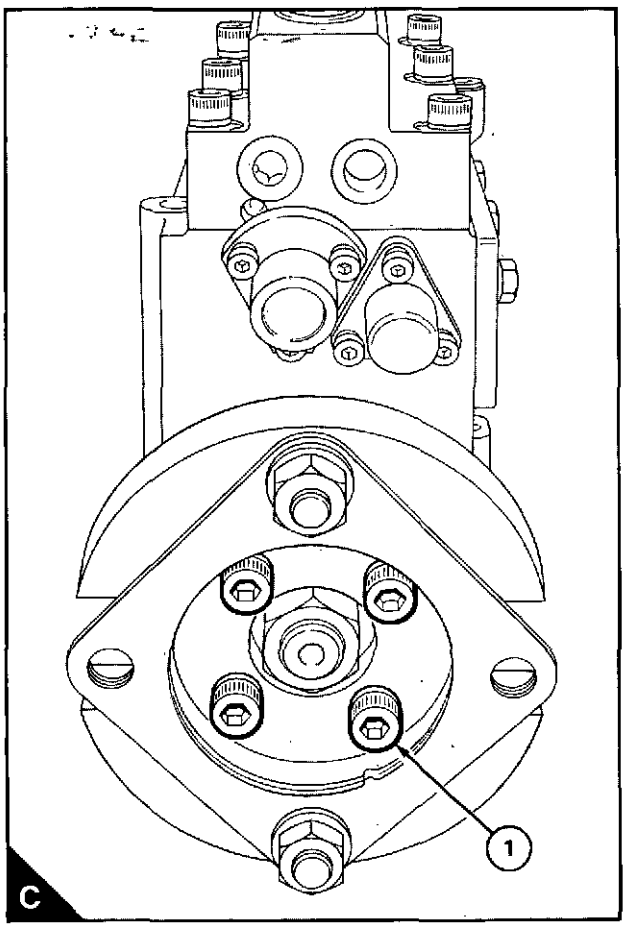
7 Set the timing position as in operation 4 above, and loosen the four cap screws (C1) on the injection pump adjustable coupling.

8 Turn the hub in the normal direction of rotation by hand, to just past the timing position. Then turn the hub back until the timing mark and pointer align; tighten the socket cap screws.

9 Turn the engine in reverse direction for a quarter of a revolution and then forward, in the normal direction of rotation, until the flywheel timing pointer is again aligned with the correct timing point (stamped on the engine data plate). Check that the timing marks of the fuel injection pump are correctly aligned.







How to check the tappet clearances

The tappet clearance is measured between the rocker levers and the top of the valve bridge pieces. See page 9.01 for the correct clearances.

Check and adjust the tappet clearances in the sequence that follows, while the injectors are removed for maintenance.

Attention: Numbers A1 and B1 cylinders are at the front of the engine.

1 Remove the air filters, and the high pressure pipes to the injectors and the leak-off pipes.

2 Remove the rocker covers.

3 Turn the crankshaft in the normal direction of rotation until the inlet valve of number A1 cylinder has just opened and the exhaust valve of the same cylinder has not closed completely. Check and, if necessary, adjust the clearances of the valves that follow:

Inlet: A2, A4, A6, B1, B3, B5
Exhaust: A3, A5, A6, B1, B4, B5

Note: When viewed from the side of the engine, the inlet valves are the two valves at the left of each set of four.

4 Turn the crankshaft 360°, in the normal direction of rotation until the inlet valve of number A6 cylinder has just opened and the exhaust valve of the same cylinder has not closed completely. Check and, if necessary, adjust the clearances of the valves that follow:

Inlet: A1, A3, A5, B2, B4, B6
Exhaust: A1, A2, A4, B2, B3, B6

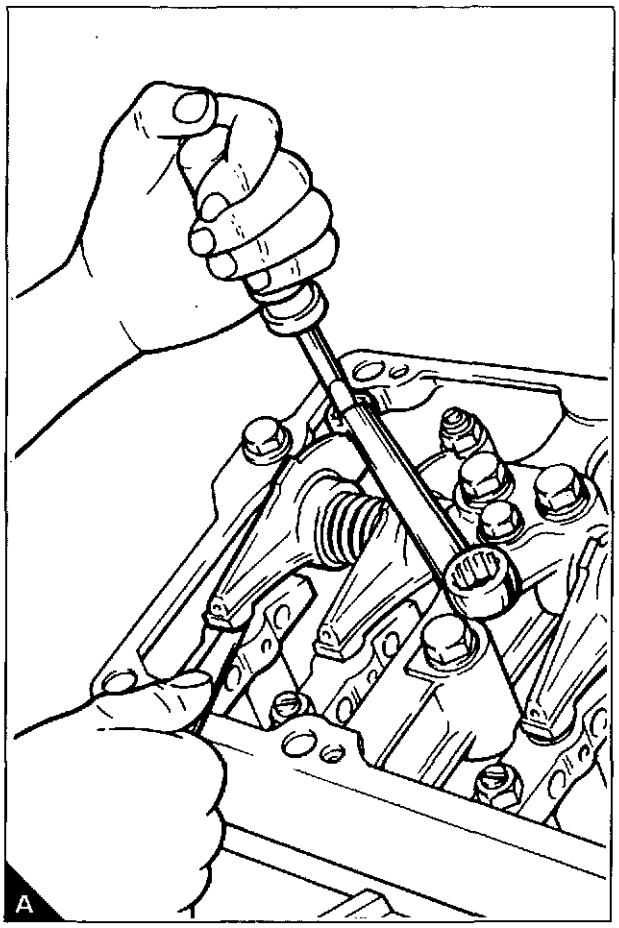
5 Fit the rocker covers, the air filters, the high pressure pipes and the leak-off pipes.

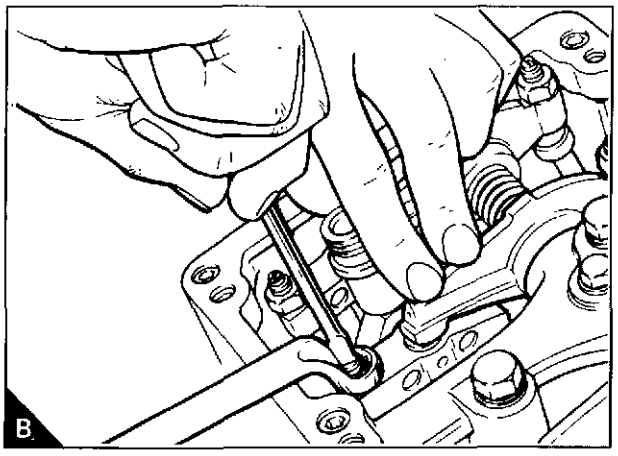
The valve bridge pieces do not normally require adjustment between each service, but if adjustment is necessary, use the procedure that follows:

6 With the valves closed (as for tappet clearance adjustment), loosen the lock nut and the adjustment screw on the faulty unit. Use the rocker lever to apply pressure to the bridge piece, then turn the adjustment screw until it is just in contact with the tip of the valve stem (B). Hold the adjustment screw in this position with a screwdriver and tighten the lock nut to a torque loading of 40 Nm (30 lbf ft). Use a torque wrench with a ring spanner adaptor. Note that the reading on the torque wrench must be adjusted to compensate for the extra length caused by the ring spanner adaptor.

7 Check the tappet clearances after the bridge pieces have been adjusted.

8 Apply oil to the rocker levers, to the valve bridges and to the valve springs. Fit the rocker covers, the fuel pipes and the air filters.





Turbochargers

At the periods specified in the service schedule, disconnect and remove the pipes from between the air filters and the turbochargers. Turn rapidly the rotor assembly in each turbocharger, check that the rotor turns freely and that there is no interference.

Deposits must not be removed from the turbine wheel nor the compressor wheel or the balance of the assembly will be adversely affected.

Alternator

At the periods specified in the service schedule clean the outside of the alternator and ensure that the ventilation holes are clean. Contamination near to the diodes can cause sparks and must be removed with an approved cleaning fluid. A recommended fluid is Electronic Cleaning Fluid, Grade 8-23, available in aerosol containers or in larger quantities from Applied Chemicals Limited, Uxbridge, Middlesex.

The alternator must be checked and corrected, if necessary, at the periods given in the service schedule, by a person who has had the correct training.

How to drain the coolant system

Drain and flush the coolant system every 12 months or less. The system must be drained as soon as possible after the engine is stopped and before any deposits in the coolant have fallen to the bottom.

1 Ensure that the engine is level.

2 Carefully remove the header tank filler cap, especially if the engine is hot.

Use care during removal of the filler cap as the coolant system will be under pressure.

3 Remove the coolant drain plugs from the front left side and the rear right side of the engine. Ensure that the drain holes are not restricted.

4 Flush the system with clean water.

5 Fit the engine drain plugs.

6 Fit a 'coolant drained' label if the coolant system is not to be filled immediately.

How to clean the coolant system

The coolant system must be drained and flushed through with clean water until it flows clear from all of the drain taps.

If the system has become contaminated, it must be cleaned. Use clean water with 1% of Symperonic 'N'. This is equivalent to 10ml/litre or 45ml/UK gallon.

1 Fill the system with clean water, at the same time add the necessary amount of Symperonic 'N' at the filler cap.

2 Operate the engine until the coolant reaches the normal temperature of operation, then operate the engine at maximum rated speed for 10 minutes. See 'Attention' at the end of this section.

3 Stop the engine and drain immediately the coolant from all of the drain taps or plugs.

4 Allow the engine to cool, then fill the system with clean water. Allow a minimum of 5 litres (1 UK gallon) to drain from the system before the drain taps are closed.

5 Operate the engine as in operation 2, but maintain maximum speed for 5 minutes only.

6 Repeat operations 3, 4 and 5.

7 Drain the system completely and close the drain taps. Fill the system with the correct coolant mixture.

Attention: In very cold ambient conditions, the thermostats may not open to allow full circulation of the cleaning fluid. If this occurs the engine must be operated on load. The thermostats are open when the pipes between the thermostat housings and the radiator are hot. If the pipes are cool, the thermostat valves are closed.

How to fill the coolant system

Fill the system slowly, with the approved coolant mixture, until the coolant is just in contact with the bottom of the filler extension tube in the radiator. Operate the engine until the coolant reaches the normal temperature of operation. Stop the engine, check the coolant level and, if necessary, add more coolant.

On a hot engine release the filler cap carefully as the system will be under pressure.

Engine fluids 5

Remainder of the world

Manufacturer of lubricating oil	Mono-grade oils for continuously operated industrial engines	Preferred multi-grade oils which conform to CCMC D5, API-CE	Acceptable multi-grade oils which conform to API-CE/CD MIL-L-2104D
AGIP		Sigma Turbo 15W/40	Super Diesel 15W/40
BP	Vanellus C3 30 Vanellus C3 40	Vanellus C3 Extra 15W/40 Vanellus FE 10W/30	Vanellus C3 15W/40
CALTEX	RPM Delo 400 SAE 30 (Advanced) RPM Delo 400 SAE 40 (Advanced)	RPM Delo 450 15W/40	RPM Delo 400 15W/40 (Advanced)
CASTROL	RX Super 30 RX Super 40	Turbomax 15W/40	RX Super Plus 15W/40
CENTURY	Centlube Superb 30 Centlube Superb 40	Centurion 15W/40	Hypafleet 15W/40 Superby 15W/40
	MIDDLE EAST, FAR EAST AND AUSTRALIA		
CHEVRON	Delo 1000 Marine SAE 30 or 40	Delo SHP 15W/40	
DALTONS	Ashford 30 and 40	Turbolene D Plus 15W/40	Ashford 15W/40
	AVAILABLE MIDDLE EAST ONLY		
ELF	Disola MT 30 and 40 Disola M 30 and 40		Disola W 15W/40
ESSO	Essolube XD-3 30 Essolube XD-3 40	Super Diesel Oil TD 15W/40	Essolube XD-3+ 15W/40 Essolube XD-3 15W/40
KUWAIT	Q8T 400 30 Q8T 400 40	Q8T 700	Q8T 800 Q8T 400
MILLERS	Maxifleet MP 30 and 40 Turbo M30 and 40	AVAILABLE ONLY BY SPECIAL ORDER	
MOBIL	Delvac 1430 Delvac 1330	Delvac XHP 15W/40	Delvac Super 15W/40 Delvac 1300 Super 15W/40
MORRIS	XHD 30 or 40 HD 30 or 40	XHD Plus 15W/40	XHD 15W/40 Duplex CDX 15W/40
	AVAILABLE MIDDLE EAST AND BY SPECIAL ORDER ONLY		
PETROFINA	Fina Kappa TD 30 and 40	Fina Kappa LDO 15W/40	Fina Kappa TD 15W/40
SHELL	Rimula X 30 Rimula X 40	Myrina M 15W/40	Rimula X 15W/40 Rotella T 15W/40
SUN	Sunoco Super HPO SAE 40		
TEXACO	URSA Super LA 30 and 40 URSA Super Plus 30 URSA Super Plus 40		URSA Premium 15W/40 URSA Super Plus 15W/40
VEEDOL	Dieselstar 30 Dieselstar 40	Turbostar 15W/40	Dieselstar Plus 15W/40 Dieselstar 15W/40 Ultistar 25W/40

Warranty
The engine must be operated with the approved fuel, lubricant and coolant, and maintained in accordance with the service schedule or the warranty can become invalid.

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Engine preservation 7

Engine preservation

Introduction

The recommendations indicated below are designed to prevent damage to the engine when it is withdrawn from service for a prolonged period. Use these procedures after the engine is withdrawn from service. Where necessary protect the engine against frost damage.

Short period storage

Up to seven days:
No treatment necessary.

Up to three months:
Each week, operate the engine until the normal temperature of operation is reached. If the engine cannot be operated, turn the crankshaft by hand, in the normal direction of rotation (counter-clockwise when seen from the rear), a minimum of three revolutions.

Long period storage

If it is necessary to put an engine in storage for a period of between three and twelve months, use this procedure:

1 Remove the thermostats from their housings and carefully clean. Apply a silicone grease, such as MS4, to the valve stems of the thermostats and operate the valves by hand to ensure that the grease enters the glands. Fit the thermostats into their housings.

2 Operate the engine until the normal temperature of operation is reached. Stop the engine and immediately drain the lubricating oil from the sump and from the canisters of the oil filter (see 'Attention' on page 7.03).

3 Fill the canisters of the oil filter with PX4 corrosion inhibitor and fit the canisters to the filter head (see 4.09).

4 Fill the sump, to the correct oil level, with PX4 corrosion inhibitor and, once again, run the engine until the normal temperature of operation is reached.

5 Stop the engine, disconnect the fuel supply pipe between the fuel tank and the lift pump and connect the pipe to a supply of PX4 corrosion inhibitor. Start the engine, while it is still hot, and operate the engine, with no load, for ten minutes. Stop the engine.

6 Disconnect the supply of PX4 corrosion inhibitor from the fuel system and seal the end of the pipe. Drain the fuel filters (see 'Attention' on page 7.03).

Fasten a label, at a position where it will be seen, to indicate that the fuel system has been disconnected.

7 Remove the fuel injectors and put the injectors in a container of PX4 corrosion inhibitor.

8 Set the stop control lever to the **STOP** position, remove the rocker covers and disconnect the air inlet pipes from the induction manifolds

9 Operate the starter motor, at the same time, spray PX4 corrosion inhibitor into the manifolds until vapour is seen from each injector opening. Connect the air inlet pipes.

10 Spray 40cc of PX4 corrosion inhibitor into each cylinder, through the fuel injector openings. Fit the injectors.

Attention: The crankshaft must NOT be turned after this operation. Fasten a label, at a position where it will be seen, to indicate that the crankshaft must not be rotated.

11 Spray PX4 corrosion inhibitor around the valves and around the rocker assemblies. Refit the rocker covers.

12 Drain the PX4 corrosion inhibitor from the engine sump and from the oil filter canisters. Fit a **NO OIL** label to the oil filler cap.

13 Drain the cooling system and fill with the recommended coolant mixture (see page 5.02).

Attention: The mixture must NOT contain less than 50% inhibited ethylene glycol or propylene glycol, and may contain up to 90% by volume.

14 Wait for 15 minutes, then drain completely the coolant. Fit a **NO COOLANT** label to the radiator filler cap.

15 Disconnect the exhaust pipes at the turbocharger outlets. Inject 2 grammes of VPI 260 powder into the turbocharger outlets and fit a blanking plug. Do NOT connect the exhaust pipe.

16 Disconnect the air pipes between the air filters and the turbochargers.

17 Inject 2 grammes of VPI 260 powder into the turbochargers.

18 Inject 2 grammes of VPI 260 powder into each paper element type air filter. Other types of air cleaners may be sprayed inside with PX4 corrosion inhibitor or with VPI 260 powder. Fit the air pipes.

19 Spray Crodafluid PM47 onto areas of the engine and auxiliary equipment which are not protected by paint. Ensure that the fuel control linkage is sprayed with Crodafluid PM47.

Do NOT spray PM47 into the vent holes of the alternator.

20 Cover, completely, the alternator and the starter motor in mouldable wax wrapping, and seal with adhesive tape.

21 Seal the air filter inlets, the crankcase breather and all other openings with mouldable wax wrapping and adhesive tape.

22 Remove all drive belts, apply French chalk to the belts and put them in a plastic bag and seal the bag. Fasten the bag to the engine.

23 *Fasten a label to the engine to indicate:*

(a) That the exhaust system has been sealed.

(b) The dates when corrosion inhibitor was applied to the engine and when it must be applied again.

If the engine is to remain in storage for more than one year, the above procedure must be repeated at the end of each period of twelve months.

Removal from storage

To prepare the engine for use, after it has been in storage, refer to Section 3 - Instructions for operation. The information given applies to new engines and to those removed from storage.

***Attention**: The canisters of the oil and fuel filters are* designed so that when fitted upside down, the lubricating oil or fuel does not drain from the canister, when the engine is stopped.

To drain a canister, hold the canister over a suitable container, insert a small tool into one of the inlet openings and carefully press open the rubber, non-return seal. During this operation, do not damage the rubber seal or the element of the filter.

Approved products for engine preservation

Component	Product	Manufacturer
Thermostat	MS4 silicone grease	Ambersil Limited Whitney Road Basingstoke Hampshire
Lubrication system	PX4 corrosion inhibitor	Croda Chemicals Limited Churchill Road Doncaster Yorkshire
Fuel system	PX4 corrosion inhibitor	Croda Chemicals Limited
Cooling system	Inhibited ethylene glycol or inhibited propylene glycol	Various
Induction/exhaust system	PX4 corrosion inhibitor and VPI 260 powder	Croda Chemicals Limited Shell Chemicals Limited Stanlow Terminal Ellesmere Port Cheshire
Engine and auxiliaries - *outer casings*	Crodafluid PM47 Mouldable wax wrapping	Croda Chemicals Limited Carrs Paper Limited Shirley Solihull West Midlands

Parts and service

Introduction

If problems occur with your engine or with the components fitted onto it, your Perkins distributor can make the necessary repairs. Your Perkins distributor will ensure that only the correct parts are fitted and that the work is done correctly.

Certain components can be supplied by your Perkins distributor through the Perkins POWER EXCHANGE System. These will enable you to reduce the cost of certain repairs.

Service literature

Workshop manuals and other service publications are available from your Perkins distributor at a nominal cost.

Training

A five day course on the service and the overhaul of the CV range of engines is available at the Factory. For details, apply to: The Chief Instructor, Customer Training Centre, Perkins Engines (Shrewsbury) Limited, Shrewsbury, Shropshire.

Service Bulletins

Service procedures and engine design are checked continuously at Perkins. As a result of this development work, it may become necessary to alter the information in manuals and other service publications. Between revisions of the literature, all relevant personnel are provided with full details of changes as they occur. The information is produced as a Service Bulletin; these are supplied to distributors for distribution as necessary.

Changes to engine design and service procedures are published as Service Bulletins for addition to any relevant Manuals.

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Engine data

3012 Diesel Engine

General

Number of cylinders	12
Cylinder arrangement	60 degree included angle 'V'
Cycle	Four stroke
Induction system	Turbocharged and intercooled
Combustion system	Direct injection
Nominal bore	135mm (5.315 in)
Stroke	152mm (5.984 in)
Compression ratio	14.5 : 1
Cubic capacity	26,11 litres (1593 in3)
Firing order	A1, B6, A4, B3, A2, B5, A6, B1, A3, B4, A5, B2
Tappet clearances (hot or cold)	
Engines before 'build line number' 8281 (6C27437/29):	
Inlet	0,4mm (0.016 in)
Exhaust	0,5mm (0.020 in)
Engines from 'build line number' 8281 (6C27437/29):	
Inlet	0,2mm (0.008 in)
Exhaust	0,5mm (0.020 in)
Direction of rotation	Counter-clockwise: From the rear of the engine
Injection timing	As stamped on engine data plate
Dry weight of engine	Electropak: 2365kg (5214lb)
(Approximate)	Engine only: 2080kg (4586lb)

Cooling system

Coolant pump	Centrifugal, gear driven unit
Capacities of coolant system	
Engine and pipework	68 litres (15 UK gallons)
Engine and radiator pack	164 litres (36 UK gallons)
Coolant system pressure (at normal working temperature)	50 to 70 kN/m² (7 to 10 lbf/in²)
Temperature (normal)	70 to 100°C
Thermostats	Two, Behr Thomson, single element sleeve thermostats

Fuel system

Type	Low-pressure supply to injection pump with through flow return to tank
Injection pump	CAV - 12 element, in-line unit
Governor	CAV-CS Governor, integral with fuel injection pump
Lift pump	Bosch FP/KD 22P
Fuel supply pressure	140 to 210 kN/m² (20 to 30 lbf/in²)
Fuel injectors	Bosch or OMAP, low spring type
Injection pressure	240 bar
Main fuel filter	Two screw-on type canisters

Lubrication system

Type	Wet sump
Lubricating oil pressure	
Normal load conditions	415 kN/m² (60 lbf/in²)
Minimum at rated speed	*207 kN/m² (30 lbf/in²)
Capacity of lubricating oil sump	
Maximum	45 litres (9.9 UK gallons)
Minimum	27 litres (5.9 UK gallons)
Total capacity of lubricating oil system	65 litres (14.2 UK gallons)
Pump	Spur gear type, gear driven
Pressure relief valve	Spring loaded plunger, not adjustable
Opening pressure	445 to 552 kN/m² (65 to 80 lbf/in²)
Lubricating oil cooler	Serck, multiple tube type
Filters	Three screw-on type canisters
Maximum recommended temperature of sump oil	120°C.

Induction/exhaust system

Aspiration	Garret AiResearch T51 turbocharger
Air charge cooler (if fitted)	
TAG	Two, air-to-air type, integral with radiator
TWG	Two, air-to-coolant type, integral with induction manifold
Air filters	Two Donaldson Cyclopac, paper element type

Electrical equipment

Alternator	Butec A 3024, with integral regulator
Starter motor	Single Butec MS6, 24 volt - flange fitted
Stop control	SEM, energised to RUN
Engine protection switches	VDO coolant temperature switch, set to stop the engine at 106°C VDO oil pressure switch, set to stop the engine at 124 kN/m² (18 lbf/in²)

* Important for the protection of turbocharger bearings

Perkins Power Sales and Service Limited
Lancaster Road, Shrewsbury,
Shropshire SY1 4DP, England
Telephone: 0743 212000 Telex: 35171 PESL G
Fax: 0743 69911

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POWER SERVICE

All information in this publication is substantially correct at the time of printing but may be changed subsequently by the Company without notice.

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Perkins Group of Companies, Peterborough, PE1 5NA, England