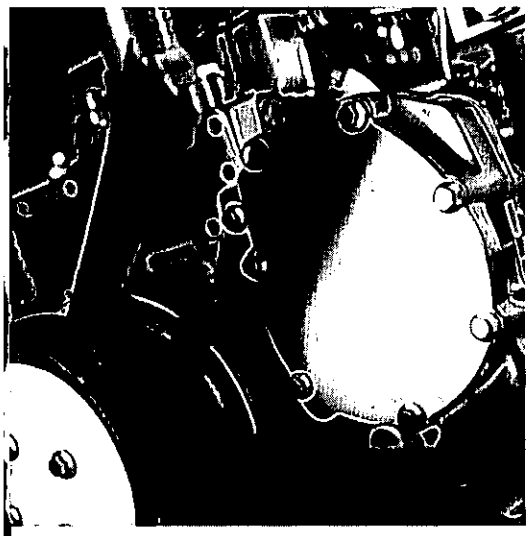
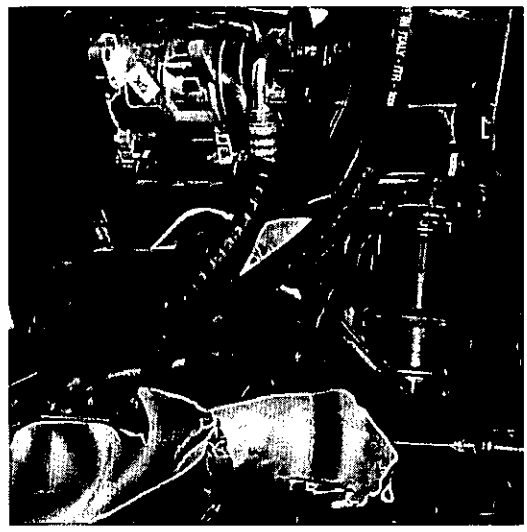
Perkins®

User's Handbook

V8.640 Series





GB

Models V8.640 and TV8.640

TPD1196

USERS HANDBOOK

V8.640 Series Diesel Engines

V8.640 and TV8.640

Publication 201 TPD 0586 1196

May 1986
Perkins Engines Ltd.,
Peterborough, England.


This publication is written in
Perkins Approved Clear English
PACE

Contents

General information

Introduction

This handbook has been written to give you assistance in the correct maintenance and operation of your engine.

To get the best performance and longest life from your engine, you must have the maintenance operations done at the periods shown in Preventive maintenance. If the engine operates in very dusty or other adverse conditions, some maintenance periods will have to be reduced. Keep your engine clean inside by regular filter element and lubricating oil changes.

Ensure that all adjustments and repairs are done by personnel who have had the correct training. Perkins Distributors have these personnel available. You can also get parts and other service from your Perkins Distributor. If you do not know the location of your nearest distributor, check with one of the Perkins companies given on page 8.

The left and right sides of the engine are as seen from the rear.

Read and remember the 'Safety precautions'. These are given for your protection and must be used at all times.

Safety precautions

These safety precautions are important. Reference must also be made to the local regulations in the country of operation.

- Do not use these engines in marine applications.
- Do not change the specification of the engine.
- Do not smoke when you put fuel in the tank.
- Clean away any fuel which has fallen and move material which has fuel contamination to a safe place.
- Do not put fuel in the tank during engine operation (unless really necessary).
- Never clean, lubricate or adjust the engine during operation (unless you have had the correct training when extreme caution must be used to prevent injury).
- Do not make any adjustments you do not understand.
- Ensure the engine is not in a position to cause a concentration of toxic emissions.
- Persons in the area must be kept clear during engine and equipment or vehicle operation.
- Do not permit loose clothing or long hair near parts which move.
- Keep away from parts which turn during operation. Note that fans can not be seen clearly while the engine runs.
- Do not run the engine with any safety guards removed.
- Do not remove the radiator cap while the engine is hot and the coolant is under pressure as dangerous hot coolant can be discharged.
- Do not use salt water in the cooling system or any other coolant which can cause corrosion.
- Keep sparks or fire away from batteries (especially while during charge) or combustion can occur. The battery fluid can burn and is also dangerous to the skin and especially the eyes.
- Disconnect the battery terminals before you make a repair to the electrical system.
- Only one person must be in control of the engine.
- Ensure the engine is only operated from the control panel or operators position.
- If your skin comes into contact with high pressure fuel, get medical assistance immediately.
- Diesel fuel can cause skin damage to some persons. Use protection on the hands (gloves or special skin protection solutions).
- Do not move equipment unless the brakes are in good condition.
- Ensure that the transmission drive control is in 'out of drive' position before the engine is started.
- Fit only correct Perkins parts.

CARECARD

This is a system for operators of equipment fitted with Perkins engines to introduce them to their nearest Perkins distributor where the distributor is responsible for the engine service.

When you get your new vehicle, remove the label (1, fig. 1) from the engine and send it to your Perkins distributor and he will supply you with a **CARE**CARD (2, fig. 1) and full instructions for its use.

Every time you need service or information, give the **CARE**-CARD to your distributor and it will enable him to give you the best service with the use of Perkins parts and will also ensure that you get the best performance from your Perkins engine at all times.

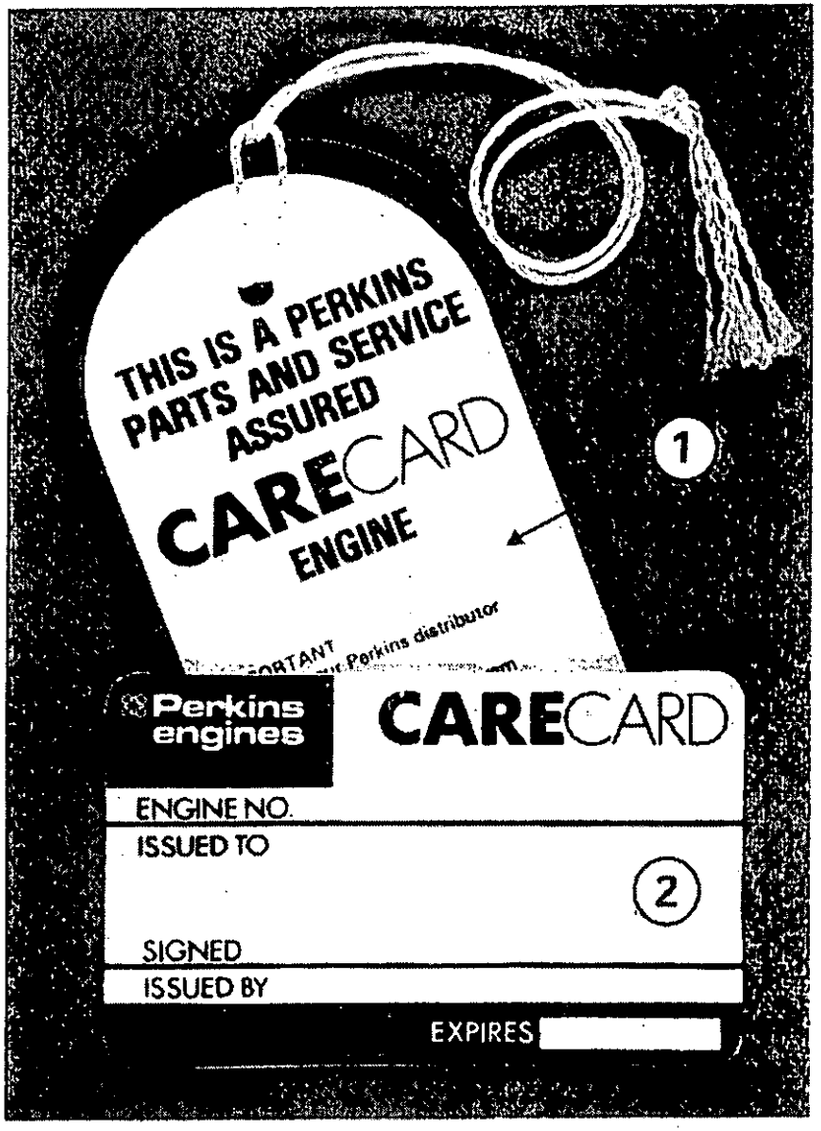


Fig. 1 **CARE**CARD label and **CARE**CARD.

Engine identification

The information given in this handbook applies to the naturally aspirated V8.640 engine and/or the turbo-charged TV8.640 engine.

The first two letters of the engine number give an indication of the engine type as shown below:

ZA – V8.640 engine
ZB – TV8.640 engine

The engine number is stamped on a machined pad on the top of the inside rear end of the left bank of the cylinder block (see fig. 2).

A typical engine number is ZA50081U513731J.

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

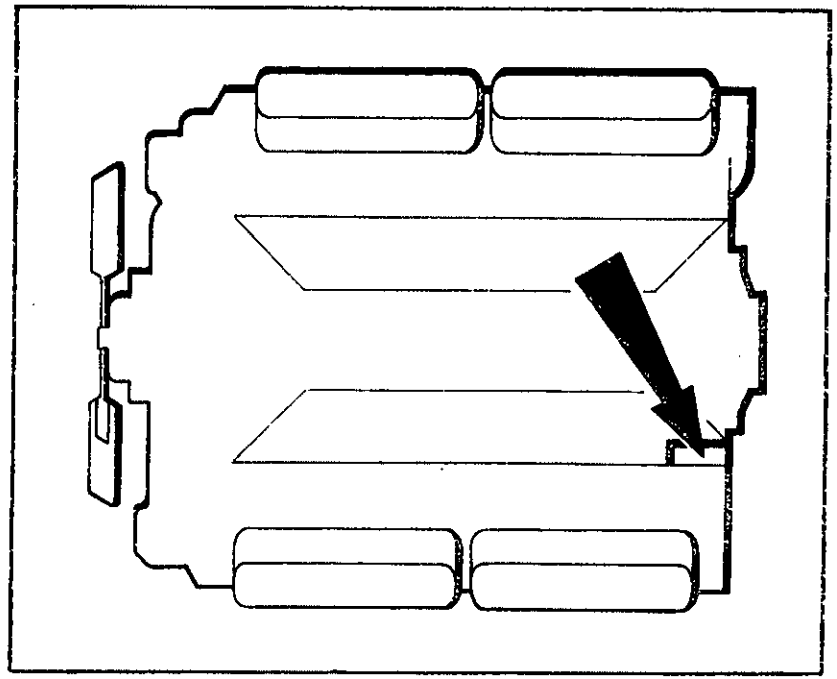


Fig. 2 Engine number position

Perkins companies

Australia
Perkins Engines Australia Pty. Limited,
P.O. Box 156, 22-24 Elliott Road,
Dandenong, Victoria, Australia.
Telephone: 794 6555.
Telex: AA30816.
Cable: 'Perkoil' Melbourne.

France
Moteurs Perkins S.A.,
9-11 Avenue Michelet,
93407 Saint Ouen, Cedex, France.
Telephone: 223 20 00.
Telex: 642924F.
Cable: Perkoil Paris.

Germany
Perkins Motoren G.m.b.H.,
8752 Kleinostheim,
Postfach 1180, West Germany.
Telephone: 06027 5010.
Telex: 4188869A PER D.

Italy
Motori Perkins S.p.A.,
Via Gorizia 15,
P.O. Box 12, 22070 Portichetto/
Luisago (Como), Italy.
Telephone: (031) 927364.
Telex: 380658 Perkit I.
Cable: Perkoil Portichetto.

Japan
Massey Ferguson Perkins Engines K.K.,
Reinanzaka Building, 6th Floor,
14-2 Akasaka, 1-chome, Minato-ku,
Tokyo 107, Japan.
Telephone: (03) 586 7377.
Telex: Perkoil J2424823.
Cable: Perkoil Tokyo
Fax: (03) 582-1596.

Singapore
Perkins Engines Asia Pacific,
549 Upper Thompson Road,
Singapore 2057.
Telephone: 4521841.
Telex: RS 37729.

United Kingdom
Perkins Engines Limited,
Eastfield,
Peterborough PE1 5NA, England
Telephone: (0733) 67474.
Telex: 32501 Perken G.
Cable: 'Perkoil' Peterborough.

Perkins Engines (Shrewsbury) Limited,
Sentinel Works,
Shrewsbury SY1 4DP, England.
Telephone: (0743) 52262.
Telex: 35171/2 PESL G.

U.S.A.
Perkins Engines Inc.,
P.O. Box 697,
32500 Van Born Road, Wayne,
Michigan 48184, U.S.A.
Telephone: (313) 595 9600.
Telex: 234002 Perken Wane,
Cable: Perken Wane.

Perkins Engines Latin America Inc.,
P.O. Box 697,
32500 Van Born Road, Wayne,
Michigan 48184, U.S.A.
Telephone: (313) 595 9600.
Telex: 234002 Perken Wane.
Cable: Perken Wane.

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

Engine views

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

1 Thermostat housing left bank
2 Compressor
3 Fuel filter
4 Induction manifold left bank
5 Rear left engine lift bracket
6 Atomiser
7 Atomiser clamp
8 Flywheel housing
9 Lubricating oil cooler
10 Lubricating oil filter canister
11 Crankshaft manual rotation ring
12 Belt tensioner pulley
13 Water pump pulley
14 Tachometer generator

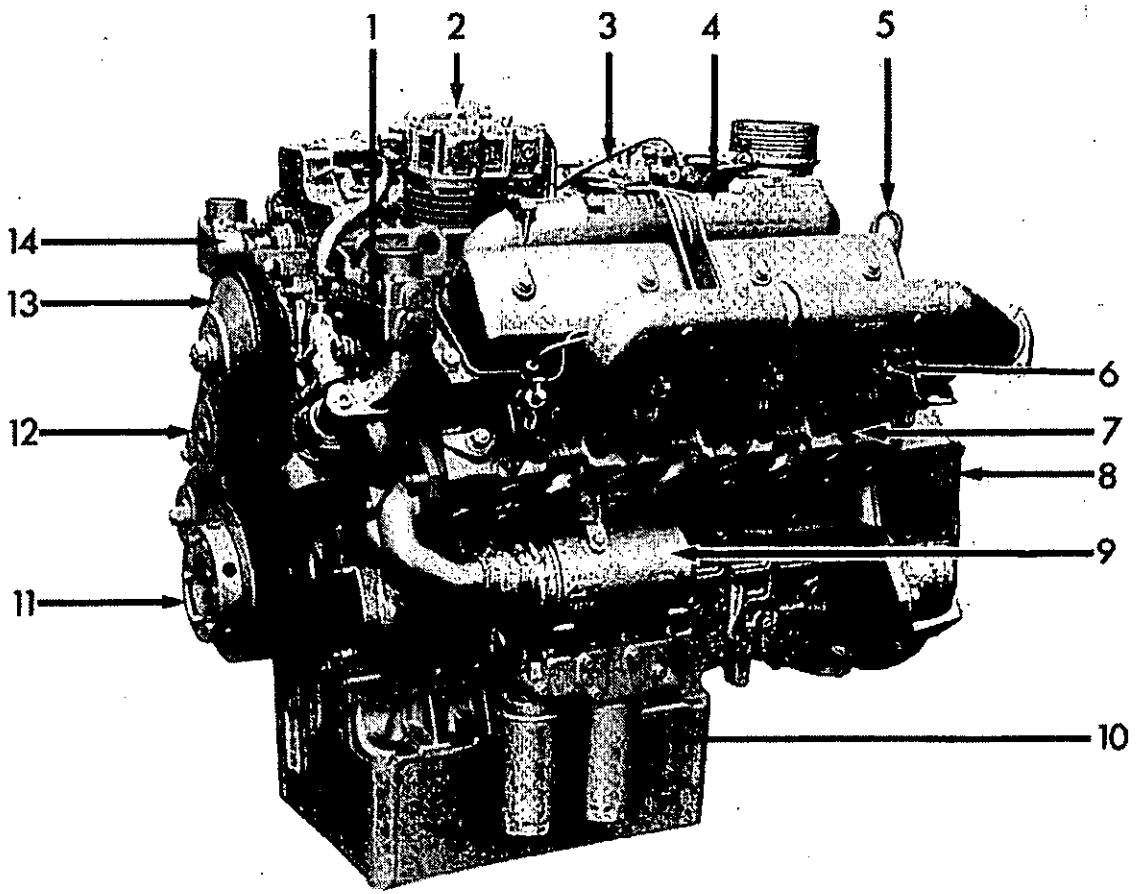


Fig. 3 Front left side of V8.640 engine.

15 Turbocharger
16 Lubricating oil filler
17 Induction crossover pipe
18 Fuel injection pump
19 Fuel lift pump
20 Front right engine lift bracket
21 Rocker cover
22 Exhaust manifold
23 Alternator
24 Starter motor
25 Lubricating oil sump
26 Sump drain plug
27 Flywheel
28 Exhaust outlet

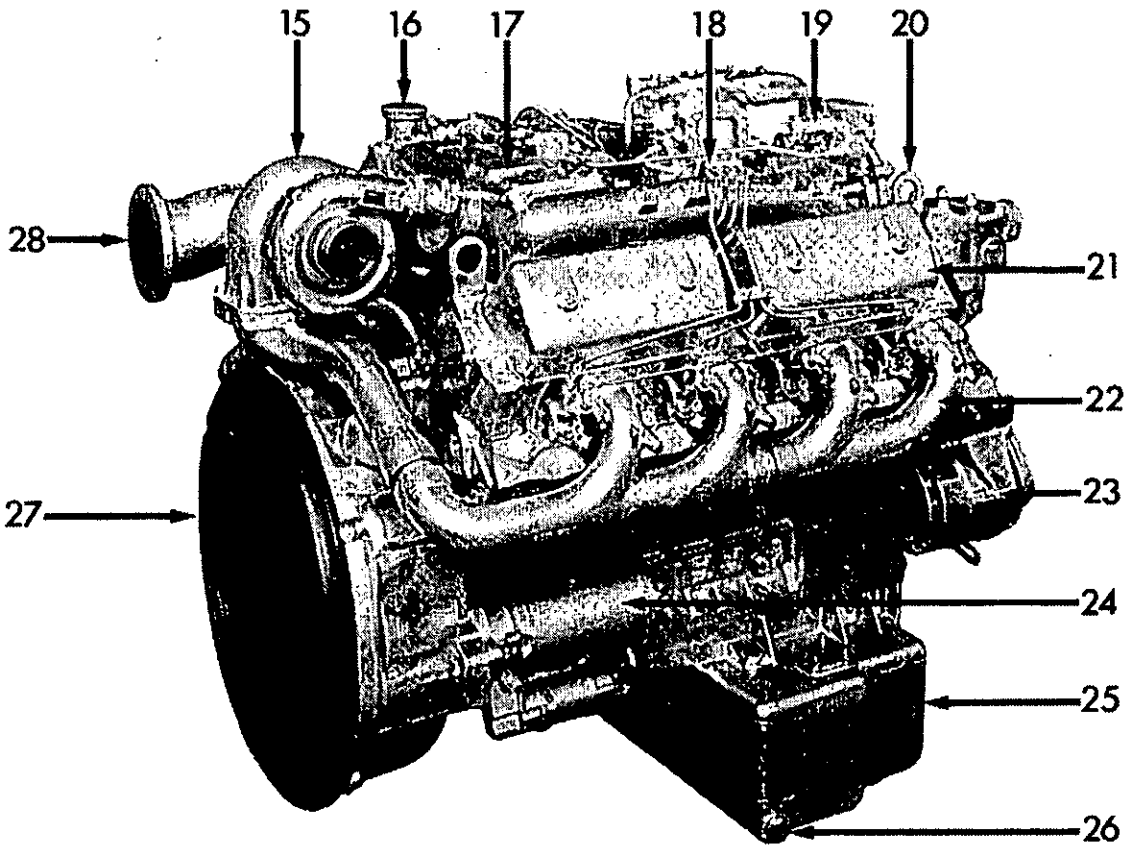


Fig. 4 Rear right side of TV8.640 engine

Engine data

	V8.640	TV8.640
Number of cylinders	Eight	Eight
Cylinder arrangement	Two banks, 90°V	Two banks, 90°V
Cycle	Four stroke	Four stroke
Induction system	Naturally aspirated	Turbocharged
Combustion system	Direct injection	Direct injection
Nominal bore	118 mm (4.63 in)	118 mm (4.63 in)
Stroke	121 mm (4.75 in)	121 mm (4.75 in)
Compression ratio	16.25 : 1	14.95 : 1
Cubic capacity	10,48 litres (640 in^3)	10,48 litres (640 in^3)
Firing order	1, 8, 7, 5, 4, 3, 6, 2	1, 8, 7, 5, 4, 3, 6, 2
Valve tip clearance (set cold)		
Inlet	0,25 mm (0.010 in)	0,25 mm (0.010 in)
Exhaust	0,65 mm (0.025 in)	0,65 mm (0.025 in)
Lubricating oil pressure	310 kN/m^2(45 lbf/in^2) 3,2 kgf/cm^2 minimum at maximum engine speed and normal engine temperature.	
Direction of rotation	Clockwise from the front.	

To start the engine

There are several factors which effect engine start, for example:

The power of the batteries.
Performance of the starter motor.
Viscosity of the lubricating oil.
Installation of a cold start system.

The two types of fuel injection pump that can be fitted to these engines have an integral excess fuel device to supply more fuel to the cylinders during a cold engine start. When the engine starts this supply of extra fuel is stopped automatically.

If these engines are to operate in very cold conditions, an extra cold starting aid will be necessary. Your machine will normally be fitted with the correct equipment for your area of operation.

Different systems of cold starting aids can be installed on Perkins diesel engines and they are:

Thermostart

An electrically operated device which heats the induction air. This device burns a controlled amount of fuel.

Start Pilot

A hand pump discharges the cold start fluid into the induction manifold through an atomiser. The cold start fluid is held in a separate reservoir.

KBi

The cold start fluid is held in an aerosol container. It is released by a push button operated solenoid and sprayed into the induction manifold by a nozzle.

Note: If the engine is fitted with an in line fuel injection pump and has not been run for at least one month, lubricating oil must be added to the pump before the engine is started. Remove one of the large plugs fitted each side of the governor housing (see fig. 5) and add 0,6 litre (1 pint) of clean engine lubricating oil. During normal operation the engine lubrication system automatically lubricates the pump.

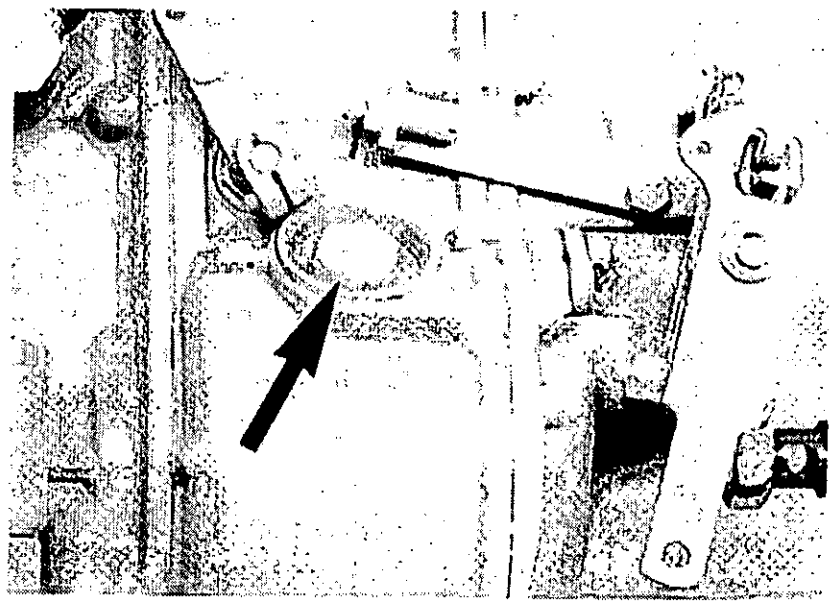


Fig. 5 In line fuel injection pump lubricating oil filler plug

To start a warm engine

1 Ensure that the stop control (where fitted) is in the 'run' position.

2 Adjust the engine speed control to the half open position.

3 Turn the start key to the 'S' or 'HS' position (see fig. 6 or 7) to engage the starter motor.

4 As soon as the engine starts, release the start key to the 'R' position.

5 Adjust the engine speed control.

Always ensure that the flywheel and starter motor are stationary before the starter motor is engaged again.

To start a cold engine with excess fuel

1 Ensure that the stop control (where fitted) is in the 'run' position.

2 Turn the start key to the 'R' position (see fig. 6 or 7).

3 Engines fitted with a rotary fuel injection pump:

Adjust the engine speed control to the fully open position.

Operate the excess fuel control.

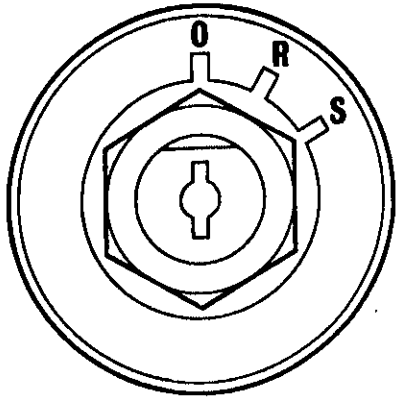
Engines fitted with an in line fuel injection pump:

Move the engine speed control to the fully closed position and then to the fully open position. This operation engages the excess fuel device.

4 Turn the start key to position 'S' or 'HS' to engage the starter motor.

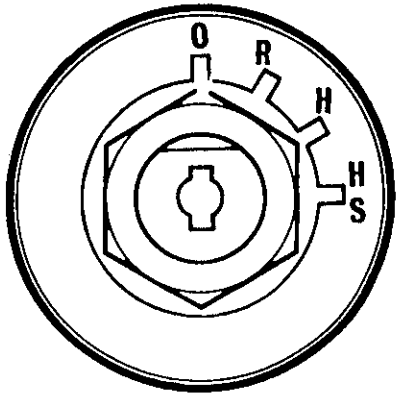
5 As soon as the engine starts, release the start key to position 'R'.

6 Adjust the engine speed control. On engines fitted with an in line fuel injection pump, do not close the engine speed control until the engine runs evenly.



O Off R Run S Start

Fig. 6 Typical start switch



O Off R Run H Heat
HS Heat and start

Fig. 7 Typical heat/start switch

To start an engine with Thermostart

1 Ensure that the stop control (where fitted) is in the 'run' position.

2 Turn the start key to the 'R' position (see fig. 7).

3 Engines fitted with a rotary fuel injection pump:

Adjust the engine speed control to the fully open position.

Operate the excess fuel control.

Engines fitted with an in line fuel injection pump:

Move the engine speed control to the fully closed position and then to the fully open position. This operation engages the excess fuel device.

4 Turn the start key to the 'H' position to operate the heaters and hold it there for 15 to 20 seconds.

5 Turn the start key to the 'HS' position to engage the starter motor. As soon as the engine starts, release the start key to the 'R' position and adjust the engine speed control. On engines fitted with an in line fuel injection pump, do not close the engine speed control until the engine runs evenly.

6 If the engine does not start in 15 seconds, return the start key to the 'H' position for 10 seconds and then engage the starter motor again.

To start an engine with Start Pilot

The Start Pilot hand pump must not be used until the starter motor is engaged. Experience will show how much fluid is needed for each engine start.

1 Where necessary, charge the reservoir with fluid. Raise the cover of the reservoir and press the can, head down, on to the filler plug. Hold the can squarely on the plug until fluid fills the bowl up to the maximum mark.

2 Ensure that the stop control (where fitted) is in the 'run' position.

3 Turn the start key to the 'R' position (see fig. 6).

4 Engines fitted with a rotary fuel injection pump:

Adjust the engine speed control to the fully open position. Operate the excess fuel control.

Engines fitted with an in line fuel injection pump:

Move the engine speed control to the fully closed position and then to the fully open position. This operation engages the excess fuel device.

5 Turn the start key to the position 'S' to engage the starter motor for a maximum of 30 seconds and operate the Start Pilot pump during this period. As soon as the engine starts, release the start key to position 'R' and adjust the engine speed control. On engines fitted with an in line

fuel injection pump, do not close the engine speed control until the engine runs evenly.

6 If the engine does not start during the first 30 seconds, turn the start key to position 'R' for 30 seconds and then engage the starter motor again and operate the Start Pilot pump.

The air filter at the outer end of the pump must be inspected from time to time and, if necessary, it must be washed in kerosene.

The inside surface of the cylinder can be lightly lubricated with a thin lubricating oil.

The nozzle in the induction manifold can be removed and washed in kerosene, when necessary.

Start Pilot equipment must not be used with heat type cold starting aids such as Thermostart.

To start an engine with KBi

1 Where necessary, renew the screw type canister. A safety valve is integral with the container.

2 Ensure that the stop control (where fitted) is in the 'run' position.

3 Turn the start key to the 'R' position (see fig. 6).

4 Engines fitted with a rotary fuel injection pump:

Adjust the engine speed control to the fully open position. Operate the excess fuel control.

Engines fitted with an in line fuel injection pump:

Move the engine speed control to the fully open position and then to the fully open position. This operation engages the excess fuel device.

5 Turn the start key to the position 'S' to engage the starter motor.

6 As the engine turns, press the KBi button for a maximum period of 2 seconds. If the engine does not start after the first 2 second application, keep the starter motor engaged and after 5 seconds press the KBi button again for 2 seconds.

In some conditions, it is necessary to give another application of KBi fluid after the engine has started to ensure that the engine continues to run.

KBi equipment must not be used with heat type cold starting aids such as Thermostart.

To stop the engine

Either turn the engine start key to the 'O' position (see fig. 6 or 7) or operate the separate stop control. Where a separate stop control is used, ensure that the control is returned to the 'run' position after the engine has stopped and the engine start key is turned to the 'O' position:

Let the TV8.640 engine run at a low speed for a few moments before it is stopped.

Engine speed adjustment

The idle or maximum speed settings must not be changed by the engine operator as this can damage the engine or transmission. If the seals on the fuel injection pump are broken during the warranty period by a person who is not approved by Perkins Engines Ltd., it can have an effect on the warranty.

Running-in procedure

A gradual running-in of a new or Power Exchange engine is not necessary. Extended light load operation during the early life of the engine is not recommended.

Full load can be applied to a new or Power Exchange engine as soon as the engine is put into service and the coolant temperature is at a minimum of 60°C (140°F).

Do not run the engine at high no load speeds.

Do not apply an overload to the engine.

Altitude

If the naturally aspirated engine is to operate at an altitude higher than 600 m (2,000 ft), the fuel delivery can be changed to reduce smoke and fuel consumption. Perkins Engines Ltd. can give the percentage of fuel reduction needed if details of engine application and ambient conditions are given. Information for turbocharged engines is available from Perkins Engines Ltd. Any change to the fuel injection pump settings must be made by a Perkins distributor or an approved fuel pump distributor.

Turbocharged vehicle applications

Because of the power characteristics of the turbocharged engine, it is necessary to keep a high engine speed when you drive up a gradient. Do not apply an overload to the engine at low engine speed, change to a lower gear to increase the engine speed.

Engine fluids

Coolant specification

The quality of the coolant used can have a large effect on the efficiency and life of the cooling system. The recommendations given below can be of assistance in the maintenance of a good cooling system with frost and/or corrosion protection.

If the correct procedures are not used, Perkins Engines Ltd. can not be held responsible for any frost or corrosion damage.

1 Where possible, use clean soft water.

2 If an antifreeze mixture, other than Perkins POWERPART, is used to prevent frost damage, it must have an ethanediol (ethylene glycol) base with a corrosion inhibitor. It is recommended that the corrosion inhibitor is of the sodium nitrite/benzoate type. The antifreeze mixture must provide cooling/corrosion protection at least as good as the requirements of the standards below:

United Kingdom: BS.6580:1985: "Specification for corrosion inhibiting, engine coolant concentrate (antifreeze)".

United States of America: ASTM D3306-74: "Ethylene Glycol Base Engine Coolant".

Australia: AS 2108-1977: "Antifreeze Compounds and Corrosion Inhibitors for Engine Cooling Systems".

Perkins POWERPART antifreeze exceeds the requirements of the above standards.

The correct volumes of Perkins POWERPART antifreeze and water, which are necessary for protection at different ambient temperatures, are indicated below.

Lowest temperature of protection needed	Volume of POWERPART antifreeze %	Mixture ratio by volume POWERPART antifreeze: water
−12°C (10°F)	25	1:3
−18°C (0°F)	33	1:2
−25°C (−13°F)	40	1:1.5
−37°C (−34°F)	50	1:1

The quality of the antifreeze coolant must be checked at least once a year, for example, at the start of the cold period.

3 When frost protection is not necessary, it is still an advantage to use an approved antifreeze mixture (see 2 above) as this gives a protection against corrosion and also raises the boiling point of the coolant. A minimum concentration of 25% by volume of antifreeze is necessary, but it is our recommendation that 33% concentration by volume is used.

If an antifreeze is not used, add a correct corrosion inhibitor mixture to the water.

Change the water/corrosion inhibitor mixture every six months or check according to the inhibitor manufacturer's recommendations.

Note: Some corrosion inhibitor mixtures contain soluble oil which can have an adverse effect on some types of water hose.

To drain the cooling system

1 Ensure that the vehicle or machine is on level ground.

2 Remove the radiator filler cap.

3 Remove the drain plug from each side of the cylinder block (see fig. 8) to drain the engine. Ensure that the drain holes do not have any restriction.

4 Open the tap or remove the drain plug at the bottom of the radiator to drain the radiator. If a tap or plug is not fitted to the radiator, disconnect the bottom radiator hose. Remove the lubricating oil cooler drain plug.

5 Where necessary, flush the system with clean water.

6 Fit the drain plugs and radiator cap. Where necessary, close the radiator tap or connect the radiator hose.

7 Put 250 ml ($^1/_2$ pint) of antifreeze, without water, into the oil cooler for protection against frost if water drains down when the machine is moved. The antifreeze can be added through the compressor coolant hose connection at the top of the water pump outlet to the oil cooler. If a compressor is not fitted, remove the plug that is fitted in place of the coolant hose connection to add the antifreeze.

Fuel specification

To get the correct power and performance from your engine, use good quality fuel. The recommended fuel specification for Perkins engines is indicated below:

Cetane number	50 minimum for vehicles 45 minimum for industrial and agricultural applications
Viscosity	2.5/4.5 centistokes at 40°C
Density	0,835/0,855 kg/litre
Sulphur	0.5% of mass, maximum
Distillation	85% at 350°C

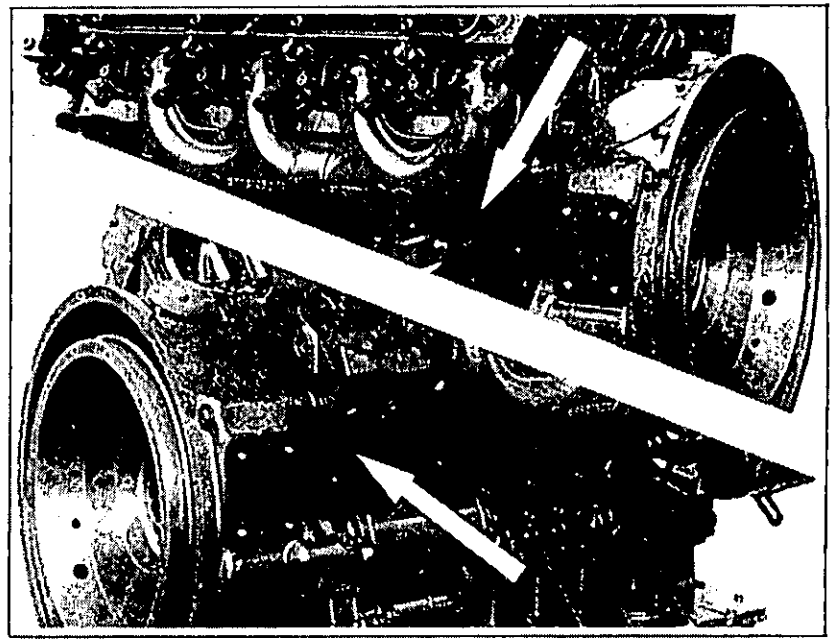


Fig. 8 Coolant drain points.

Cetane number indicates ignition performance. Fuel with a low cetane number can cause cold start problems and affect combustion.

Viscosity is the resistance to flow and, if this is outside the limits, engine performance can be affected.

Density: Lower density will reduce engine power, higher density will increase engine power and exhaust smoke.

Sulphur: High sulphur content (not normally found in Europe, North America or Australasia) can cause engine wear. Where only high sulphur fuels are available, it will be necessary to use a highly alkaline lub-

ricating oil in the engine or to reduce the lubricating oil change interval.

Distillation: This is an indication of the mixture of different hydrocarbons in the fuel. A high ratio of light weight hydrocarbons can affect the combustion characteristics.

Low temperature fuels: Special winter fuels may be available for engine operation at temperatures below 0°C. These fuels have a lower viscosity and also limit the wax formation in the fuel at low temperatures. If wax formation occurs, this could stop the fuel flow through the filter.

Aviation kerosene fuels: These fuels can be used but they can affect engine performance. It is recommended that you consult the Perkins Technical Service Department at Peterborough, especially if JP4 fuel is to be used. Aviation fuels are more flammable than diesel fuel and need careful storage and management.

If you need advice on any adjustment to the engine or to the lubricating oil change periods which may be necessary because of the standard of available fuel, consult your nearest Perkins distributor or the Technical Service Department at one of the addresses on Page 8.

Lubricating oil specification

Use only a good quality lubricating oil to the relevant specification as shown in the table below.

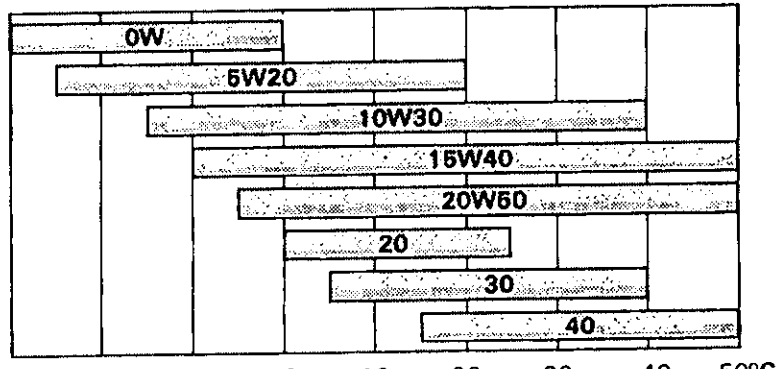
Attention: The type of lubricating oil used may be affected by the quality of the fuel oil which is used. For further details see "Fuel specification" on page 18.

Engine Type	Specifications	
	API CC/SE MIL-L-46152 CCMC D1	API CD/SE MIL-L-2104C CCMC D2
Naturally aspirated	•	• (1)
Naturally aspirated engines in heavy duty earthmoving equipment		•
Turbocharged		•

(1) Not recommended for the first 800/1600 km (500/1000 miles) or 25/50 hours of operation.

Always ensure that the correct viscosity grade of lubricating oil is used for the ambient temperature range in which the engine will run as shown in the chart below.

Recommended SAE viscosity grades



Preventive maintenance

These preventive maintenance periods are general in application. Check the periods given by the manufacturer of the equipment in which the engine is installed and, where necessary, use the shorter periods. These periods and procedures must also be adapted to ensure correct operation for any local vehicle or machine regulations.

Note: On stop/start short distance operation the hours run are more important than the distance.

It is good maintenance to check for leakage and loose fasteners at each service interval.

These maintenance periods are only for engines that are operated with fuel and lubricating oil to the specifications given in this handbook.

Schedules

The schedules which follow must be applied at the interval (kilometres, miles, hours or months) which occurs first.

Daily or every 8 hours

Check amount of coolant.
Check amount of lubricating oil in the sump.
Check lubricating oil pressure (where a gauge is installed).
In extreme dust conditions, clean dust bowl of air filter (where fitted).

Every 20000 km (12,500 miles), 500 hours or 6 months

Renew the lubricating oil.
Renew the lubricating oil filter canisters.
Clean the dust bowl of the air filter.
Check the drive belts.
Check for water in the fuel pre-filter (where fitted).
Clean the compressor air filter (if fitted).

Every 40000 km (25,000 miles) or 1,000 hours

Renew the fuel filter element(s).
Clean or renew the air filter element (if not indicated earlier).
Clean the engine breather.
Check and, if necessary, adjust the valve tip clearances.

Every 80000 km (50,000 miles) or 2,000 hours

Check the atomisers.
Clean the turbocharger impeller and casing.
Have the accessory equipment (compressor, starter motor, etc.) checked.

Every 160000 km (100,000 miles) or 4,000 hours

Renew the alternator and water pump drive belts.
Have the turbocharger checked.
Have the fuel injection pump checked and reset.

Post delivery service

The service procedures given below must be applied at the first 800/1600 km (500/1,000 miles), 25/50 hours of operation.

1 Run the engine until it is warm. Stop the engine and drain the lubricating oil from the sump. Fill the sump to the 'full' mark on the dipstick with clean new lubricating oil to an approved grade.

2 Renew the canisters of the lubricating oil filter.

3 Adjust the valve tip clearances (see page 25).

4 Check the tension of the alternator/water pump drive belts (see page 24).

5 Check that all fasteners are tight.

6 Run the engine and check for fuel, coolant and lubricating oil leakage. Check the lubricating oil supply to the rocker assemblies.

7 If necessary, get a person who has had the correct training to adjust the idle speed.

8 Check the lubricating oil level and add oil as necessary.

Air filter

Environment conditions have an important effect on the frequency at which the dry type air filter will need service.

Some air filters have a separate dust bowl that has to be cleaned at intervals. The amount of dust in the bowl will show if it has been removed at the correct time for the conditions of operation. Do not let the bowl get full of dust as this will reduce the life of the filter element.

Some air filters have automatic dust valves through which dust is discharged from the filter. The rubber dust valve must be kept clean and checked to ensure that the sides of the valves close together, but will come apart freely.

Where a restriction indicator is installed, it will give a positive indication that the air filter element needs service. This will prevent the early removal of the filter element which causes extra cost or late element removal which can cause loss of engine power.

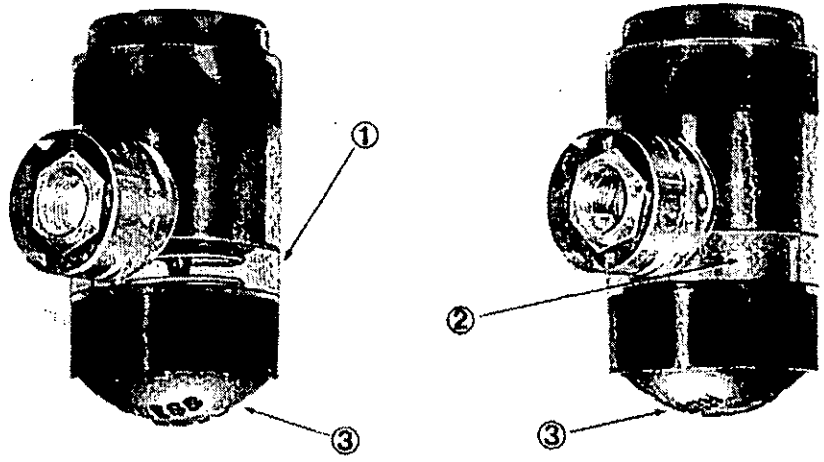
The filter element must be cleaned or renewed according to the manufacturer's recommendations.

Restriction indicator

The restriction indicator for these engines must be the type that operates at a pressure difference of 457 mm (18 in) of water gauge. It is installed on the air filter outlet or between the air filter and the induction manifold.

When the red warning indicator is seen through the clear panel (see fig. 9) after the engine has stopped the air filter element must be removed for service.

After a clean element has been fitted, press the rubber bottom (3) of the restriction indicator to reset the red warning indicator.



1 Clear panel (no restriction)
2 Red panel (filter service needed)
3 Rubber bottom (press to reset)

Fig. 9 Restriction indicator

To renew the lubricating oil filter canisters

1 Put a tray under the filter to hold any lubricating oil drops.

2 Remove the filter canisters (see fig. 10) with a strap wrench or similar tool. Check that the adaptors (1, fig. 10) are secure in the filter head and discard the canisters. Both canisters must be changed at the same time.

3 Clean the filter head.

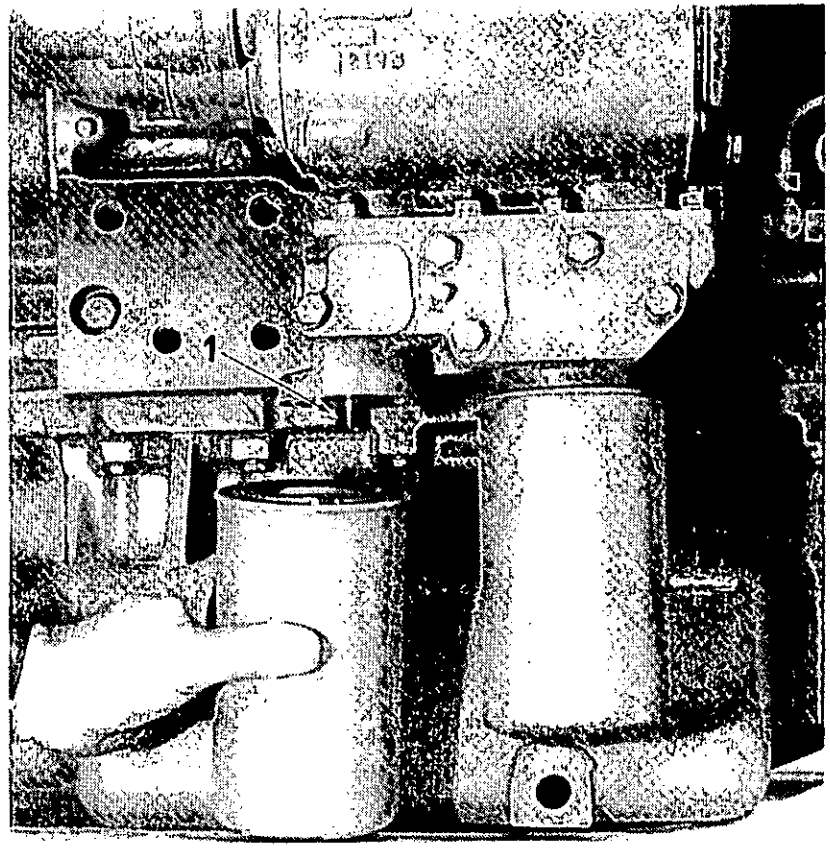
4 Add clean engine lubricating oil to the new canisters. Give the oil time to fill the canister through the filter element.

5 Lubricate the top of the canister seals with clean engine lubricating oil.

6 Install the new canisters and tighten by hand only. Do not use a strap wrench.

7 After lubricating oil has been added to the sump, run the engine and check for leakage from the filter. Do not run the engine at high speeds until lubricating oil pressure is indicated on the gauge or the pressure warning light goes out.

Note: The canisters have a valve inside to ensure that lubricating oil does not drain from the filter and a special tube is fitted, so ensure that the correct Perkins POWERPART canister is used.



1 Screw adaptor

Fig. 10 Lubricating oil filter canister removal

To check the drive belts

Renew a belt if it is worn or damaged. Where double belts are fitted, they must be changed together.

With thumb pressure, press each belt down at the centre of its longest free length and check the movement (see fig. 11). The belt movement must be 10 mm (3/8 in).

To adjust the tension of the separate alternator drive belt or the common water pump and alternator drive belts:

1 Loosen the alternator mounting and adjustment link fasteners.

2 Change the alternator position to give the correct tension and tighten the fasteners.

3 Check the belt tension again to ensure that it is still correct.

To adjust the belt tension where a belt tensioner pulley is used:

1 Loosen the two setscrews that hold the pivot type pulley mounting bracket or loosen the nut at the rear of the pulley shaft of the screw adjustment type tensioner pulley.

2 Change the tensioner pulley position to give the correct tension. On pivot type pulley mountings move the complete assembly and then tighten the two setscrews. On the screw adjustment type turn the adjustment screw to get the correct pulley position and then tighten the nut at the rear of the pulley shaft.

3 Check the belt tension again to ensure that it is still correct.

If a new belt is fitted, the belt tension must be checked again after the first 800 km (500 miles) or 25 hours of operation.

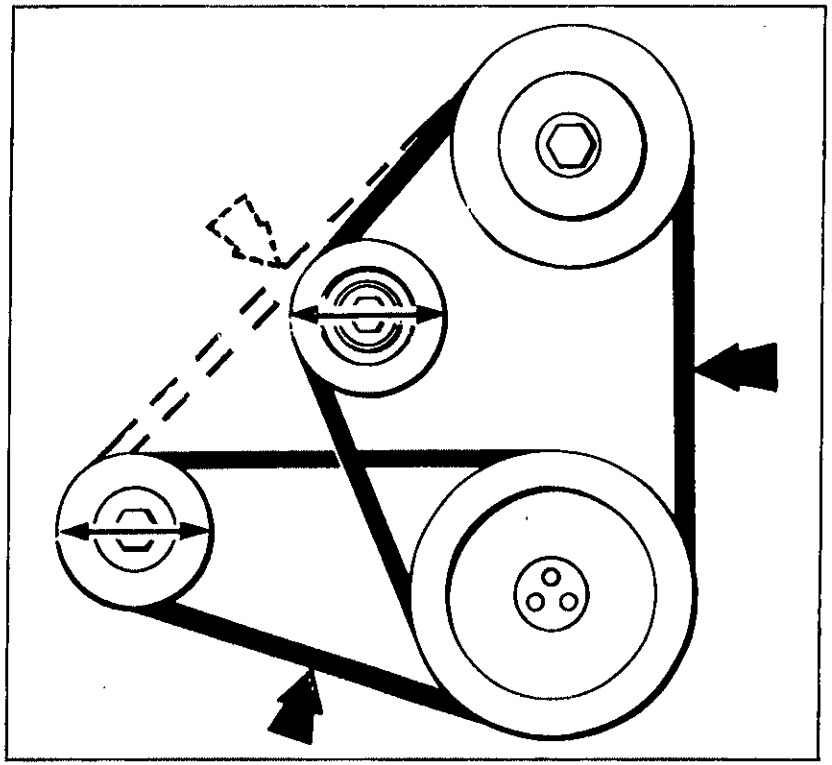


Fig. 11 Drive belt tension adjustment

To check the valve tip clearances

These are checked between the top of the valve stem or valve stem cap and the rocker lever with the engine cold. The correct clearance for the inlet valves is 0,25 mm (0.010 in) and for the exhaust valves it is 0,65 mm (0.025 in).

Left bank (see fig. 12).

1 Turn the crankshaft in the normal direction of rotation, until the inlet valve of No. 4 cylinder has just opened and the exhaust valve of the same cylinder has not fully closed. Check the clearances of No. 1 cylinder valves and adjust if necessary.

2 With No. 6 cylinder valves set as given above for No. 4 cylinder, check/adjust clearances of No. 7 cylinder valves.

3 With No. 2 cylinder valves set, check/adjust clearances of No. 5 cylinder valves.

4 With No. 8 cylinder valves set, check/adjust clearances of No. 3 cylinder valves.

Right bank

5 With No. 3 cylinder valves set, check/adjust clearances of No. 8 cylinder valves.

6 With No. 1 cylinder valves set, check/adjust clearances of No. 4 cylinder valves.

7 With No. 7 cylinder valves set, check/adjust clearances of No. 6 cylinder valves.

8 With No. 5 cylinder valves set, check/adjust clearances of No. 2 cylinder valves.

If necessary, the valve tip clearances can be checked/adjusted in the firing order 1, 8, 7, 5, 4, 3, 6, 2. To do this set the valves of the other cylinders (see fig. 12) to the position given in (1) above in the sequence 4, 3, 6, 2, 1, 8, 7, 5.

Note: Do not turn the crankshaft by the use of a spanner on one of the three setscrews that hold the crankshaft pulley. If a manual rotation ring is not fitted to the crankshaft pulley, fit two suitable studs or setscrews to the pulley and turn the crankshaft with a suitable lever.

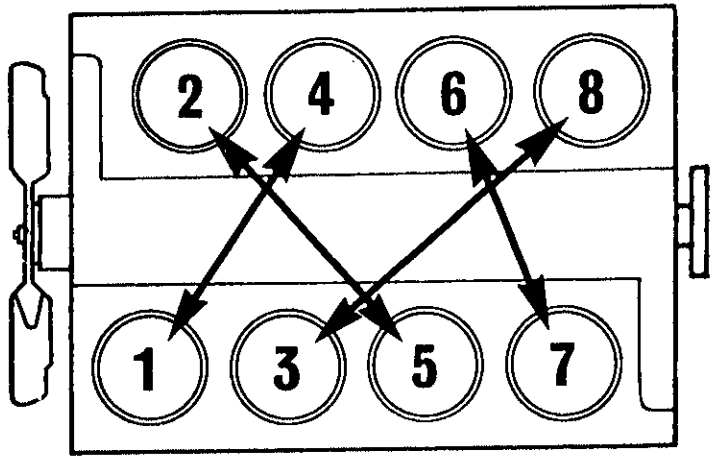


Fig. 12 Respective cylinders for valve tip clearance check.

To renew separate bowl type fuel filter elements

Both elements must be renewed at the same time.

1 Thoroughly clean the outside of the filter assembly. Where drain taps are fitted to the filter bowls, drain the fuel from the filter (see fig. 13).

2 Hold the filter bowls and release the setscrews that are fitted in the filter head above the centre of each filter element. Remove the filter elements and bowls (see fig. 14).

3 Clean the inside of the filter head and bowls.

4 Inspect the sealing rings and renew, where necessary.

5 Put the bowl on the bottom of each element and assemble squarely to the filter head so that the elements fit in the centre of the joints in the filter head. Hold in this position while the setscrews are engaged and tightened.

6 Remove air from the fuel system (see page 28).

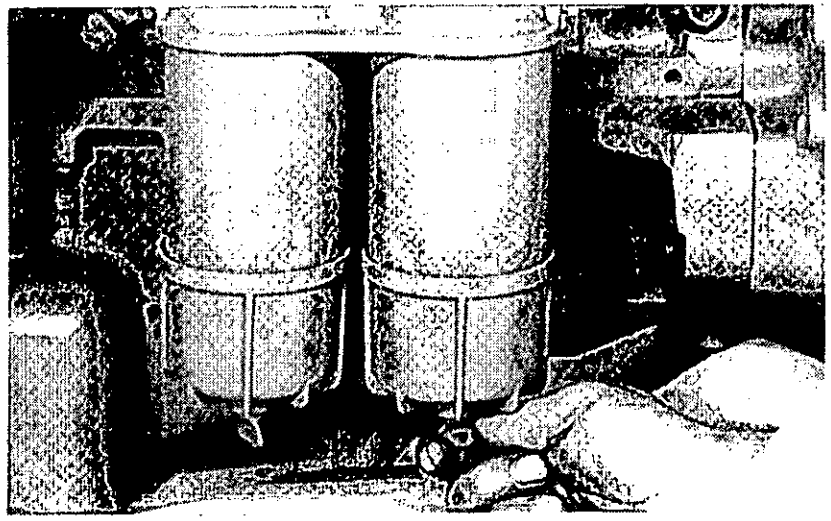


Fig. 13 Fuel filter drain

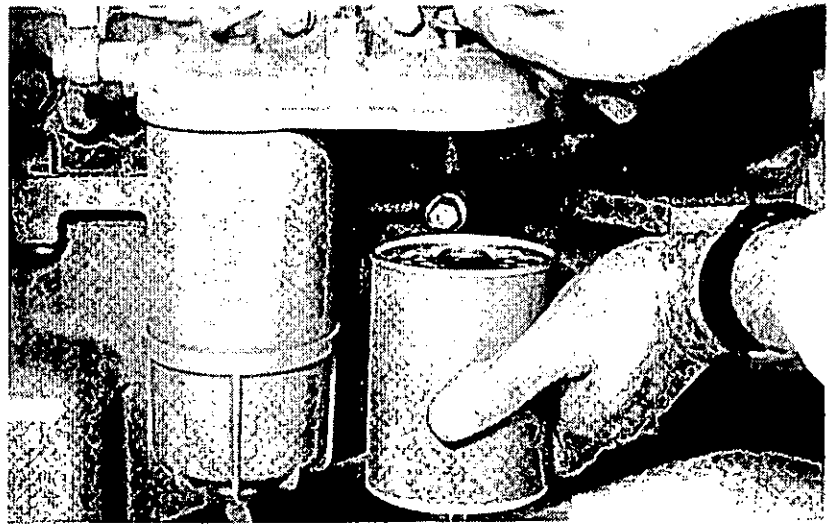


Fig. 14 Fuel filter element removal

To renew canister type fuel filter elements

Both elements (see fig. 15) must be renewed at the same time.

1 Thoroughly clean the outside of the filter assembly.

2 Use a strap wrench or similar tool to release the canisters from the filter head.

3 Ensure that the screw adaptors are secure in the filter head and then discard the used canisters.

4 Clean the inside of the filter head.

5 Lightly lubricate the top seal of the new canisters with clean fuel.

6 Assemble each canister to the filter head until the seal of the canister is in contact with the filter head and then tighten the canister another quarter of a turn by hand only. Do not use a strap wrench or similar tool.

7 Remove air from the fuel system (see page 30).

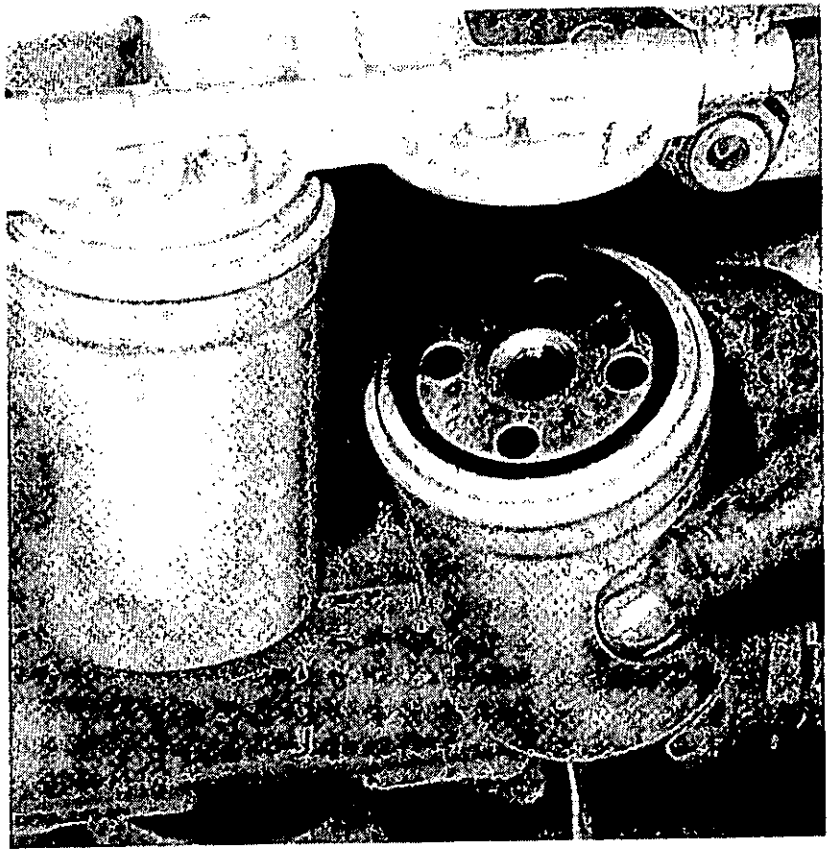


Fig. 15 Fuel filter canister removal

To remove air from the fuel system

If air gets into the fuel system, it must be removed before the engine can be started.

Air can get into the system if:

- The fuel tank is drained during normal operation.
- The low pressure fuel pipes are disconnected.
- Any part of the suction or low pressure fuel system leaks during engine operation.

Fuel system with rotary fuel injection pump

Remove air from the system as follows:

1 Loosen the vent plug on the top of the fuel filter by two or three turns (see fig. 16).

2 According to the application, either release the priming pump plunger from the fuel lift pump (see fig. 17) or release the plunger of the separate priming pump fitted above the fuel filter (see fig. 18). Operate the plunger until fuel, free from air, comes from the filter vent point. Tighten the filter vent plug.

3 Loosen the low pressure vent plug of the fuel injection pump by two or three turns. On earlier pumps this vent plug is on the top of the fuel return connection (1, fig. 19) and

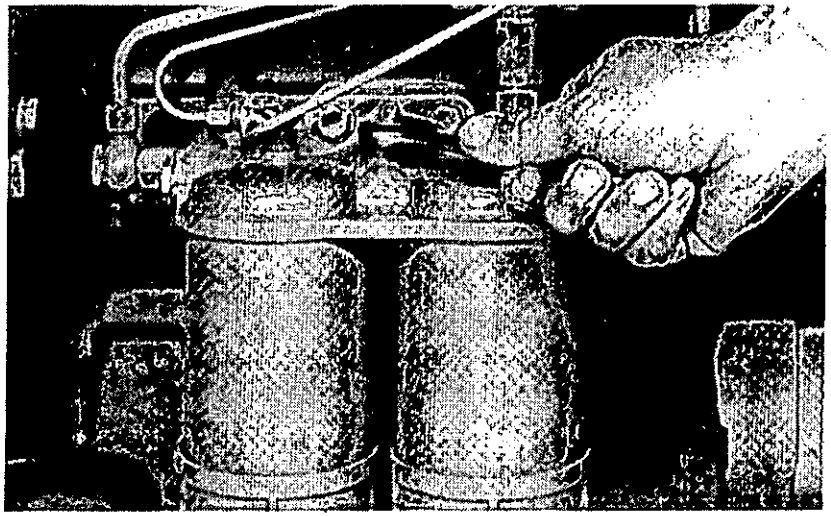


Fig. 16 Fuel filter vent plug

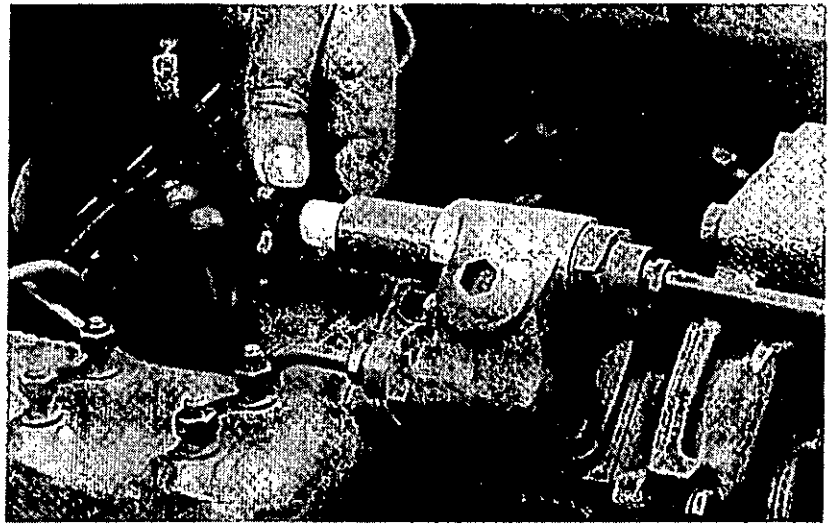


Fig. 17 Fuel lift pump priming plunger

on later pumps it is at the rear of the pump (2, fig. 19). Operate the priming pump plunger until fuel, free from air, comes from the vent point and tighten the vent plug.

4 If the fuel pipe to the Thermostart cold starting aid has been drained, loosen the union nut at the starting aid and operate the priming pump until fuel, free from air, comes from the connection. Tighten the union nut at the starting aid. Fasten the plunger to the fuel lift pump or the priming pump.

5 Remove the high pressure vent plug and washer from the top right side of the fuel injection pump (see fig. 20). Turn the engine by the starter motor until fuel, free from air, comes from the vent point. Fit the vent plug and washer.

6 Loosen the unions at the atomiser end of two of the high pressure pipes. Set the engine speed control to the fully open position and ensure that the stop control (where fitted) is in the 'run' position. Turn the engine by the starter motor until air, free from fuel, comes from both pipes. Tighten the two high pressure pipe connections and the engine is ready to start.

If the engine runs correctly for a short time and then stops or runs roughly, check for air in the fuel system. If there is air in the fuel system, there is probably a leakage in the suction or low pressure system.

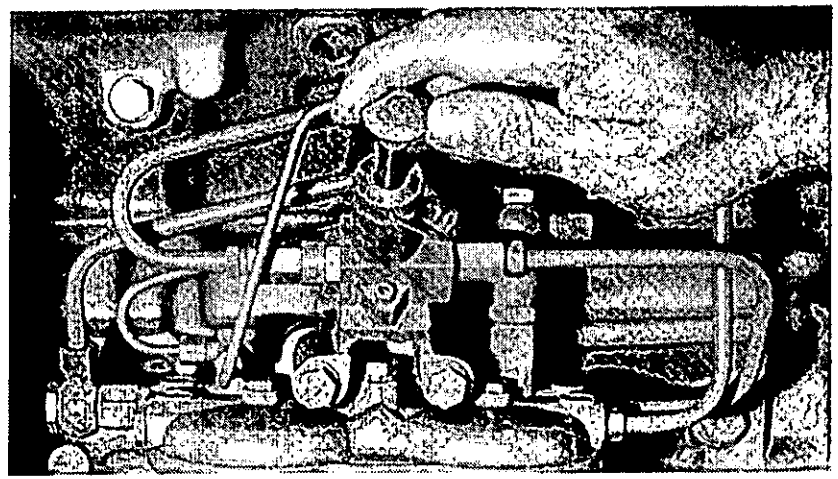
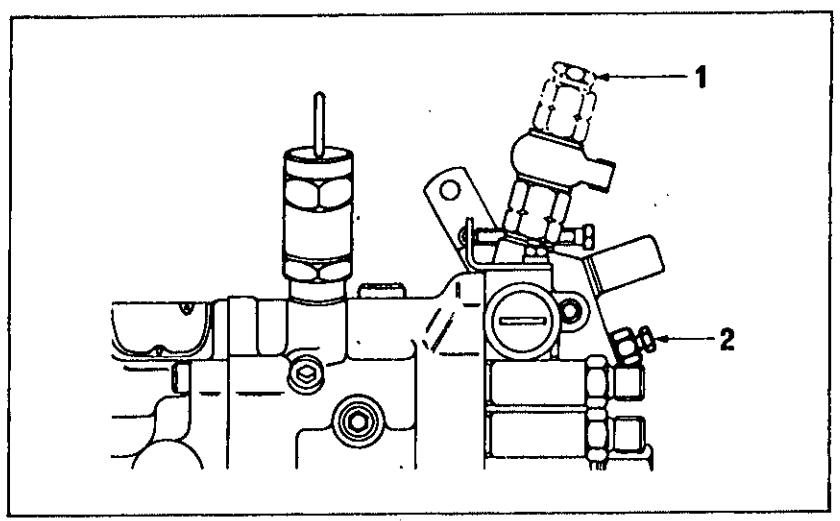


Fig. 18 Fuel priming pump



1 Early engines 2 Later engines

Fig. 19 Fuel injection pump low pressure vent plug

Fuel system with in line fuel injection pump

Remove air from the system as follows:

1 Loosen the vent screws on the top of the fuel filter (see fig. 21) by two or three turns.

2 According to the application, either release the priming pump plunger from the fuel lift pump on the side of the fuel injection pump or release the plunger of the separate priming pump fitted above the fuel filter (see fig. 18). Operate the plunger until fuel, free from air, comes from the filter vent points. Tighten the filter vent screws.

3 Loosen the banjo connection bolt for the fuel return pipe of the injection pump (see fig. 22). Operate the priming pump plunger until fuel, free from air, comes from the connection and tighten the banjo connection bolt. Do not remove the plug that is fitted in the end of the banjo connection bolt as this holds a pressure valve in position. If this plug is removed in error, ensure that the valve is fitted correctly with the flat plate toward the pump and the spring around the valve stem.

4 If the fuel pipe to the Thermostart cold starting aid has been drained, loosen the union nut at the starting aid and operate the priming pump until fuel, free from air, comes from the connection. Tighten the union nut at the starting aid.

5 Fasten the priming plunger to the fuel lift pump or priming pump and the engine is ready to start.

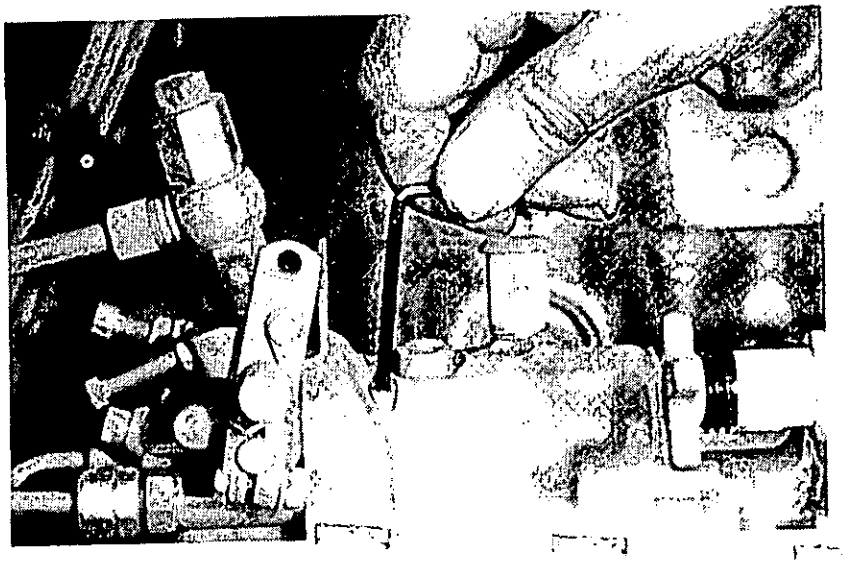


Fig. 20 Fuel injection pump high pressure vent screw

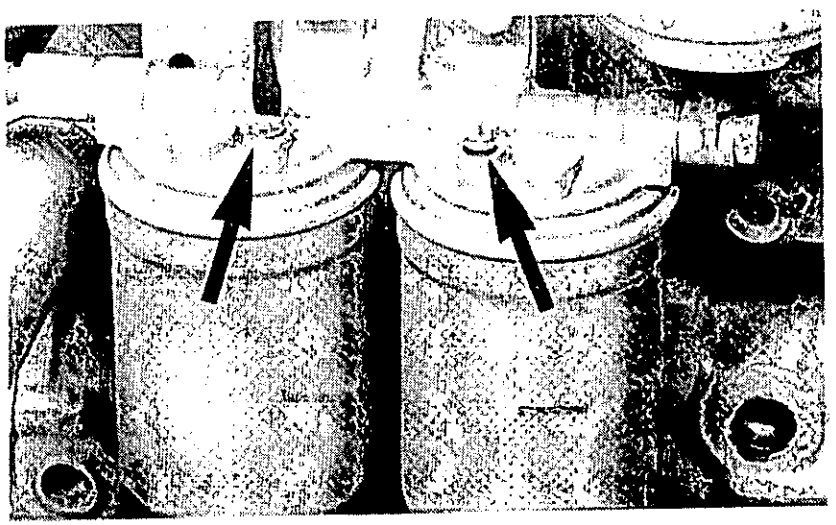


Fig. 21 Fuel filter vent screws

If the engine runs correctly for a short time and then stops or runs roughly, check for air in the fuel system. If there is air in the system, there is probably a leakage in the suction or low pressure system.

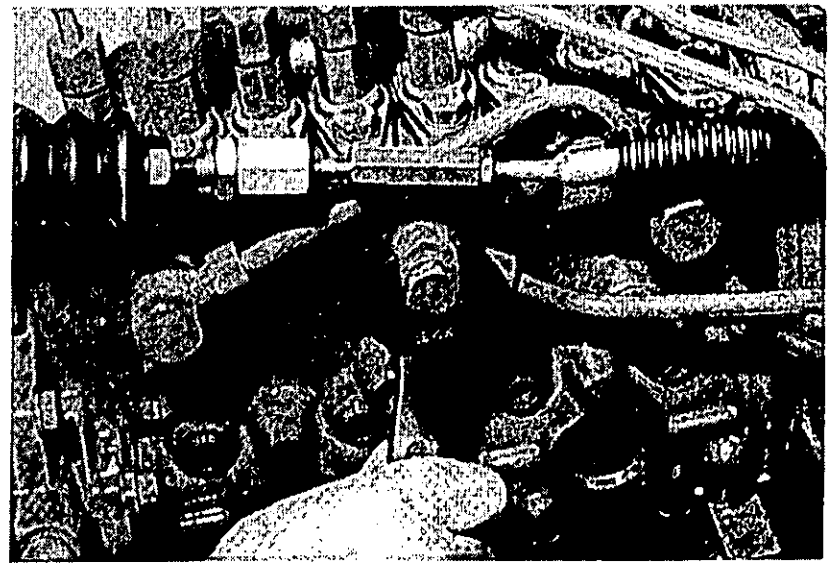


Fig. 22 Fuel injection pump vent point

Atomiser fault

An atomiser fault can be shown by an engine misfire.

To find which atomiser is at fault, run the engine at a fast idle speed and loosen and tighten the high pressure fuel pipe union at each atomiser. When the union nut of the atomiser at fault is loosened, it will have little or no effect on the engine speed. Do not let the fuel spray on to your skin.

To renew an atomiser

1 Remove the fuel leak off pipe.

2 Remove the high pressure pipe union nuts from the atomiser and fuel injection pump and release the pipe. Do not bend the pipe – where necessary release the pipe clamp(s).

3 Remove the atomiser clamp and remove the atomiser and seat washer. Remove the dust seal and, if suitable for use, fit it to the new atomiser.

4 Put the new atomiser in position complete with a dust seal and a new seat washer, fit the atomiser clamp. Tighten the clamp nut to 47 Nm (35 lbf ft) 4,8 kgf m.

5 Fit the high pressure fuel pipe and tighten the nuts to 20 Nm (15 lbf ft) 2,1 kgf m. Where necessary tighten the pipe clamp(s).

6 Fit the leak off pipe.

7 Run the engine and check for fuel and air leakage.

To clean the engine breather

The breather assembly is fitted on the top of the cylinder block between the cylinders. The complete assembly can be removed from the engine or the top cover can be removed to get access to the gauzes.

1 Make suitable marks on the top cover and body for assembly purposes. Release the screw fitted in the side of the top cover and remove the cover (see fig. 23).

2 Remove the top gauze, shield and bottom gauze from the breather body.

3 On earlier engines, remove the funnel, On later engines the funnel is held in the body.

4 Wash the gauzes and component parts and dry them thoroughly.

5 Where necessary, put the funnel in position in the body.

6 Put the lower gauze in position around the inside of the body on the top of the funnel.

7 Press the shield into the body so that the top of the shield is at the same level as the top of the body.

8 Fit the top gauze inside the shield.

9 Check that no damage has occurred to the sealing ring fitted in the top cover. Fit the top cover with the location marks aligned and tighten the small screw in the side of the cover.

10 Where necessary, fit the breather assembly to the cylinder block complete with a new joint. Fit the breather pipe.

When the engine operates or stands in dusty conditions, it is advised that the top gauze only is removed and cleaned at a shorter interval than that given in 'Preventive maintenance'.

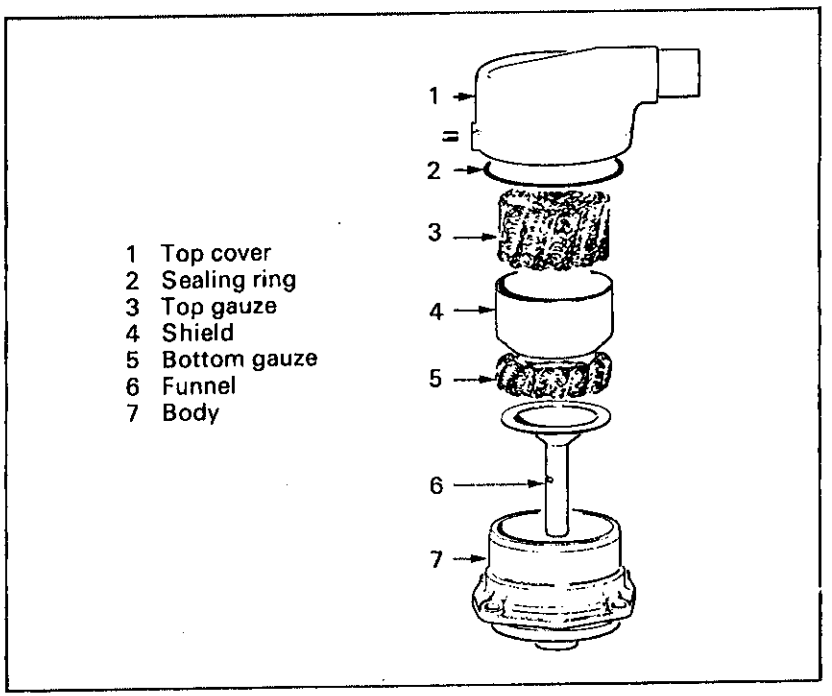


Fig. 23 Engine breather

Protection of an engine not in service

The recommendations given below are to ensure that damage is prevented when an engine is removed from service for an extended period. Use these procedures immediately the engine is removed from service. The instructions for the use of POWERPART products are given on the outside of each container.

1 Thoroughly clean the outside of the engine.

2 Where a preservative fuel is to be used, drain the fuel system and fill with the preservative fuel. POWERPART Lay-Up 1 can be added to the normal fuel to change it to a preservative fuel. If preservative fuel is not used, the system can be kept charged with normal fuel but this will have to be drained and discarded at the end of the storage period together with the fuel filter.

3 Run the engine until it is warm. Correct any fuel, lubricating oil or air leakage. Stop the engine and drain the lubricating oil sump.

4 Renew the lubricating oil filter canisters.

5 Fill the sump to the full mark on the dipstick with clean new lubricating oil or with a correct preservative fluid. POWERPART Lay-Up 2 can be added to the lubricating oil to give protection against corrosion during the period in storage. If a preservative fluid is used, this must be drained and normal lubricating oil used when the engine is returned to service.

6 Drain the cooling system, see page 19. To give protection against corrosion, it is better to fill the cooling system with a coolant that has a corrosion inhibitor, see 'Engine coolant' on page 18. If frost protection is needed, use an antifreeze mixture. If no frost protection is needed, use water with an approved corrosion inhibitor mixture.

7 Run the engine for a short period to send the lubricating oil and coolant around the engine.

8 Clean the engine breather gauzes and seal the end of the breather pipe.

9 Remove the atomisers and spray POWERPART Lay-Up 2 into each cylinder bore. If this is not available, clean engine lubricating oil will give a degree of protection. Spray into the cylinder bores 140 ml (1/4 pint) of lubricating oil divided evenly between the eight cylinders.

10 Slowly turn the crankshaft one revolution and then install the atomisers complete with new seat washers.

11 Remove the air filter and any pipe installed between the air filter and induction manifold. Spray POWERPART Lay-Up 2 into the induction manifolds. Seal the manifolds with waterproof tape.

12 Remove the exhaust pipes. Spray POWERPART Lay-Up 2 into the exhaust manifolds. Seal the manifolds with waterproof tape.

13 Remove the rocker covers. Spray POWERPART Lay-Up 2 around the rocker shaft assemblies. Fit the rocker covers.

14 Disconnect the battery and put it into safe storage in a fully charged condition. Before the battery is put into storage, give the battery terminals a protection against corrosion. POWERPART Lay-Up 3 can be used on the terminals.

15 Seal the vent pipe of the fuel tank or the fuel filler cap with waterproof tape.

16 Remove the drive belts and put them into storage.

17 To prevent corrosion, spray the engine with POWERPART Lay-Up 3. Do not spray inside the alternator cooling fan area.

Note: Before the engine is started after a period in storage, operate the starter motor with the engine stop control in the 'off' position until oil pressure shows on the oil pressure gauge or the oil warning light goes out. If a solenoid stop control is used, this will have to be disconnected for this operation. If an in line fuel injection pump is fitted and the engine has not been run for a month, lubricating oil must be added to the pump (see page 12).

If the engine protection is done correctly according to the above recommendations, no corrosion damage will normally occur. Perkins Engines Ltd. are not responsible for any damage that occurs in relation to a service storage period.

Fault diagnosis

Problem	Possible causes
Starter motor turns engine too slowly	1, 2, 3, 4
Will not start	5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 31, 32, 33
Difficult to start	5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 24, 29, 31, 32, 33
Not enough power	8, 9, 10, 11, 12, 13, 14, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 31, 32, 33, 61, 63
Misfire	8, 9, 10, 12, 13, 14, 16, 18, 19, 20, 25, 26, 28, 29, 30, 32
High fuel consumption	11, 13, 14, 16, 18, 19, 20, 22, 23, 24, 25, 27, 28, 29, 31, 32, 33, 63
Black exhaust	11, 13, 14, 16, 18, 19, 20, 22, 24, 25, 27, 28, 29, 31, 32, 33, 61, 63
Blue/white exhaust	4, 16, 18, 19, 20, 25, 27, 31, 33, 34, 35, 45, 56, 62
Low lubricating oil pressure	4, 36, 37, 38, 39, 40, 42, 43, 44, 58
Engine knocks	9, 14, 16, 18, 19, 22, 26, 28, 29, 31, 33, 35, 36, 45, 46, 59
Runs erratically	7, 8, 9, 10, 11, 12, 13, 14, 16, 20, 21, 23, 26, 28, 29, 30, 33, 35, 45, 59
Vibration	13, 14, 20, 23, 25, 26, 29, 30, 33, 45, 47, 48, 49
High lubricating oil pressure	4, 38, 41
Engine temperature too high	11, 13, 14, 16, 18, 19, 24, 25, 45, 47, 50, 51, 52, 53, 54, 57
Crankcase pressure	25, 31, 33, 34, 45, 55, 60
Bad compression	11, 19, 25, 28, 29, 31, 32, 33, 34, 46, 59
Starts and stops	10, 11, 12

Code list of possible causes

1 Battery capacity low.
2 Bad electrical connections.
3 Fault in starter motor.
4 Wrong grade of lubricating oil.
5 Low engine speed from starter motor.
6 Fuel tank empty
7 Stop control fault.
8 Restriction in fuel pipe.
9 Fault in fuel lift pump.
10 Dirty fuel filter element.
11 Restriction in air filter or induction system.
12 Air in fuel system.
13 Fault in fuel injection pump.
14 Fault in atomisers or not correct type.
15 Cold start equipment not used correctly.
16 Fault in cold start equipment.
17 Broken fuel injection pump drive.
18 Fuel injection pump timing not correct.
19 Valve timing not correct.
20 Bad compression.
21 Restriction in fuel tank vent.
22 Type or grade of fuel not correct.
23 Restriction of engine speed control movement.
24 Restriction in exhaust pipe.
25 Cylinder head gasket leaks.
26 Engine temperature too high.
27 Engine temperature too low.
28 Valve tip clearances not correct.
29 Valves not free.
30 Wrong high pressure pipes.
31 Worn cylinder bores.
32 Valves and seats do not seal correctly.
33 Piston rings not free or are worn or broken.
34 Valve stems and/or guides worn.
35 Wet type air cleaner too full or wrong oil used.
36 Crankshaft bearings wear or damage.
37 Not enough lubricating oil in the sump.
38 Gauge not correct.
39 Lubricating oil pump worn.
40 Relief valve not free to close.
41 Relief valve not free to open.
42 Relief valve spring broken.
43 Fault in suction pipe of lubricating oil pump.
44 Dirty lubricating oil filter element.
45 Piston damage.
46 Piston height not correct.
47 Fan damage.
48 Fault in engine mounting (housing).
49 Flywheel housing or flywheel not aligned correctly.
50 Fault in thermostat or wrong type.
51 Restriction in coolant passages.
52 Water pump drive belt loose.
53 Restriction in radiator.
54 Fault in water pump.
55 Restriction in breather pipe.
56 Damage to valve stem oil seals (where used).
57 Not enough coolant in system.
58 Restriction in sump strainer.
59 Valve spring broken.
60 Fault in exhauster or vacuum pipe leakage.
61 Turbocharger impeller damage, or dirty impeller.
62 Turbocharger lubricating oil seal leaks.
63 Induction system leaks (turbocharged engines).

POWERPART consumable products

To give assistance in the correct operation, service and maintenance of your engine and machine, Perkins Engines Ltd. have made available the products shown below.

The instructions for the use of each product are given on the outside of each container.

These products are available from your Perkins distributor.

POWERPART Antifreeze

Gives corrosion protection and also a more efficient coolant in hot conditions See page 18.

POWERPART Lay-Up 1

A diesel fuel additive for protection against corrosion See page 34.

POWERPART Lay-Up 2

Gives inside protection to the engine and other closed systems. See page 34.

POWERPART Lay-Up 3

Gives outside protection to any metal parts. See page 35.

POWERPART De-Icer

To remove frost.

POWERPART Silent Spray

Silicone lubrication to lubricate and prevent noise from hinges, slide doors, etc.

POWERPART Damp Displacer

To make damp electrical equipment dry and to give future protection.

POWERPART Hylomar

Universal sealing compound to seal joints.

POWERPART Hylosil

Silicone rubber sealant to prevent leakage.

POWERPART Impact Adhesive

To keep joints in position during installation and other general attachment purposes.

POWERPART Solvent

To thoroughly clean metal faces before assembly.

POWERPART Locking Agent

Used to securely install fasteners, sleeves, etc.

Examples of service assistance

Service

If any problems occur with your engine or the components fitted to it, your Perkins distributor can make the necessary repairs and 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 some repairs.

Extended warranty

The engine warranty period can be extended to two years. For details get in contact with your nearest Perkins distributor.

Service literature

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

Training

Local training on correct engine operation, overhaul and service is available at some Perkins distributors. If special training is needed, your Perkins distributor can give details on how to get this at the Product Education Department, Peterborough, or other main centres.

Parts illustrations

The illustrations which follow are a guide for your assistance in the purchase of Perkins service parts. A list of the reference numbers and part descriptions is given on pages 51 and 52.

There can be differences in the shape of similar components in different engine applications.

Many years of experience and development have ensured that Perkins parts are of the highest quality and standard. Use correct Perkins parts which are available from all Perkins distributors.

To ensure you get the correct parts when you order, give the complete engine number, the machine or vehicle description, name and serial number.

Note: Perkins Engines Ltd. can not supply to an operator direct. To purchase the correct Perkins parts, give an order to your Perkins distributor.

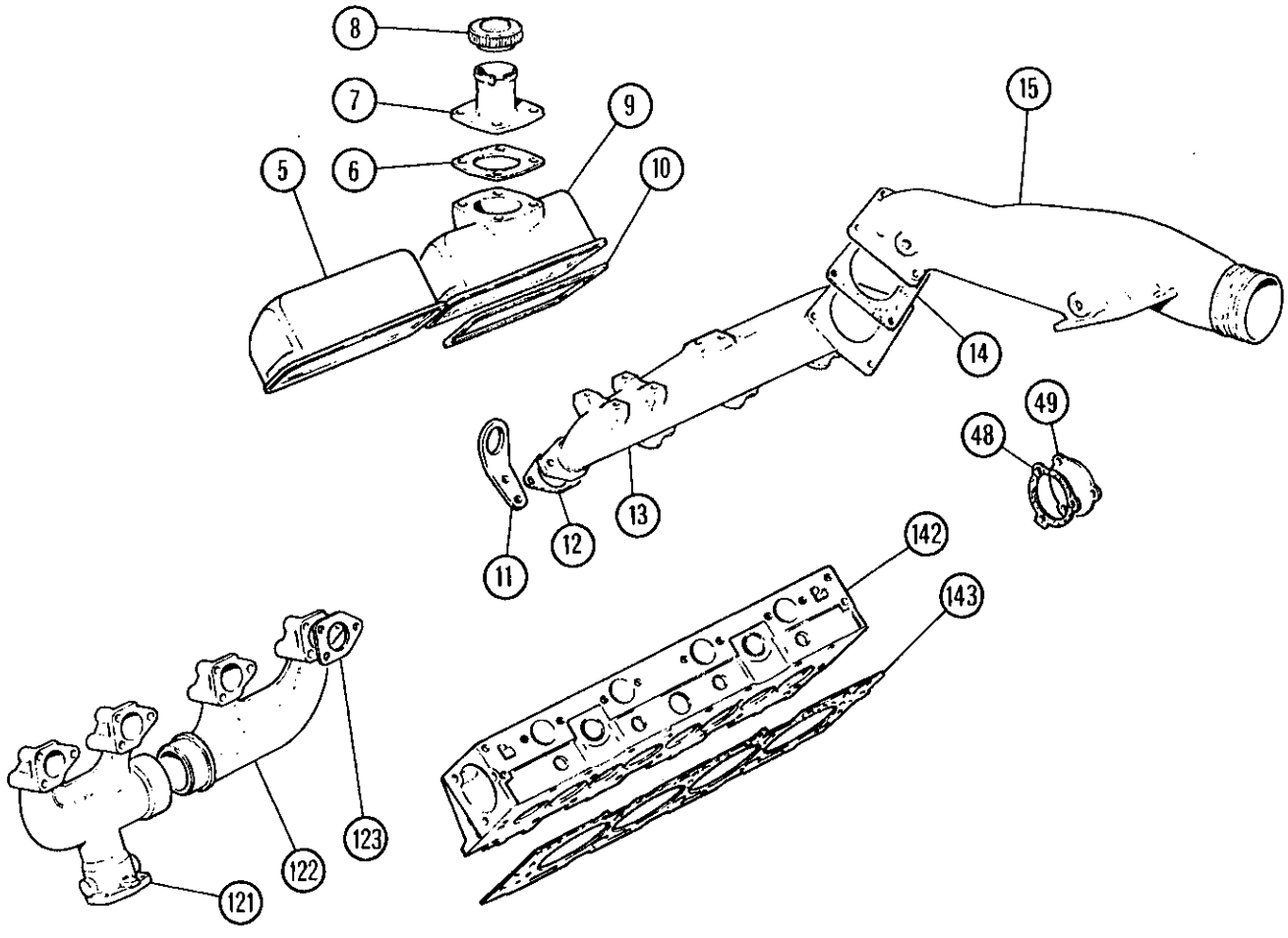


Fig. 24 Cylinder head arrangement

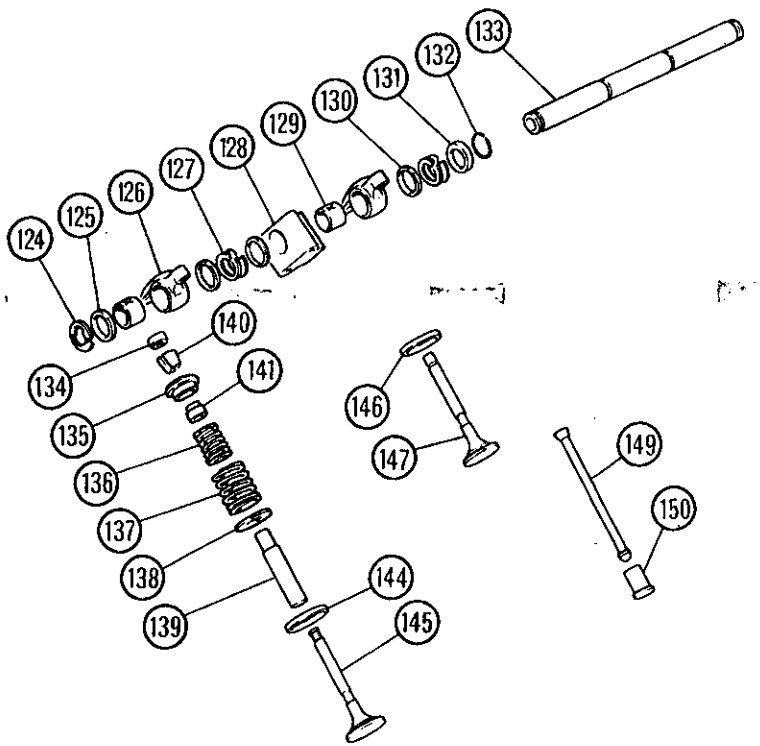


Fig. 25 Valves and rocker assembly

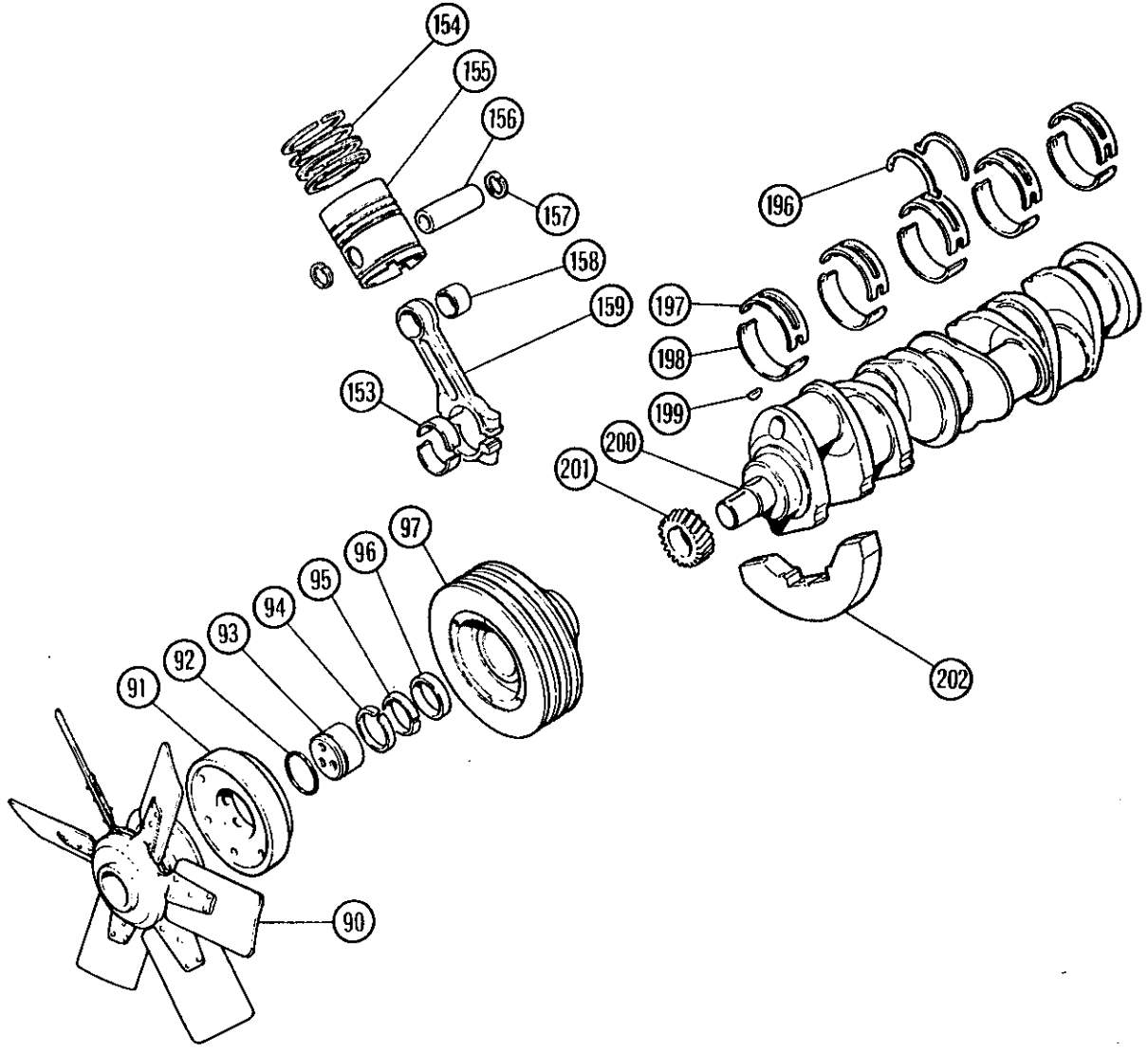


Fig. 26 Crankshaft and piston assemblies

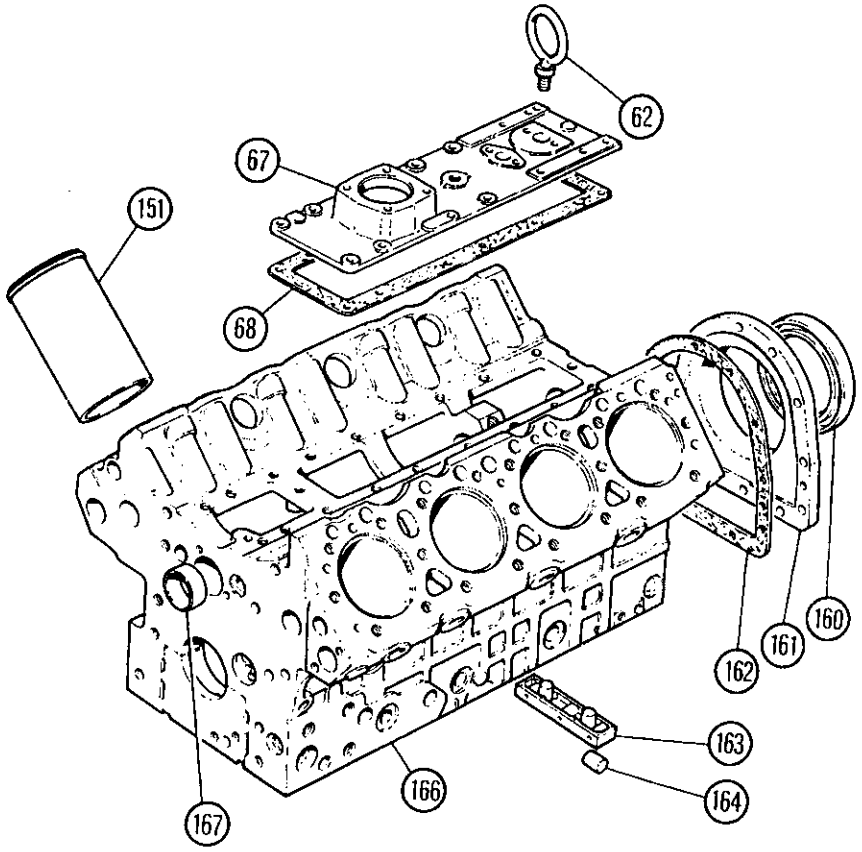


Fig. 27 Cylinder block assembly

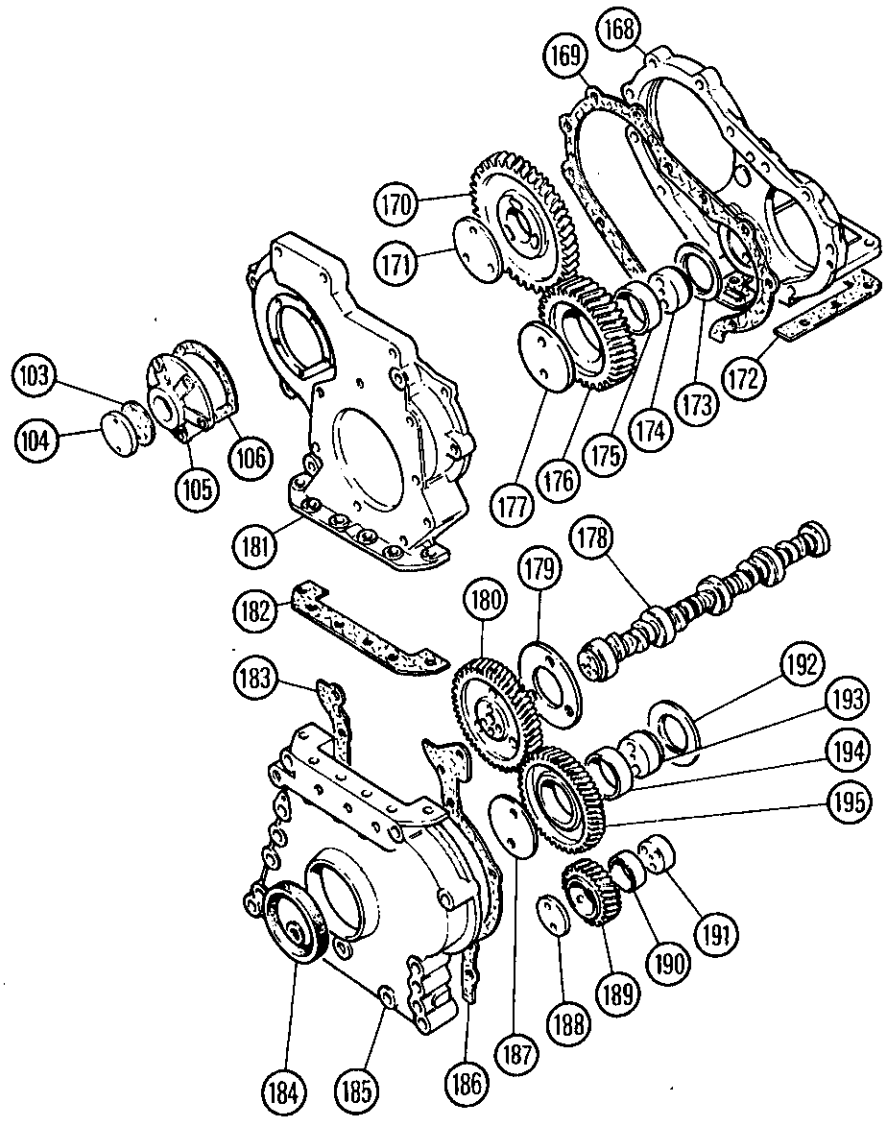


Fig. 28 Timing case and drive arrangement

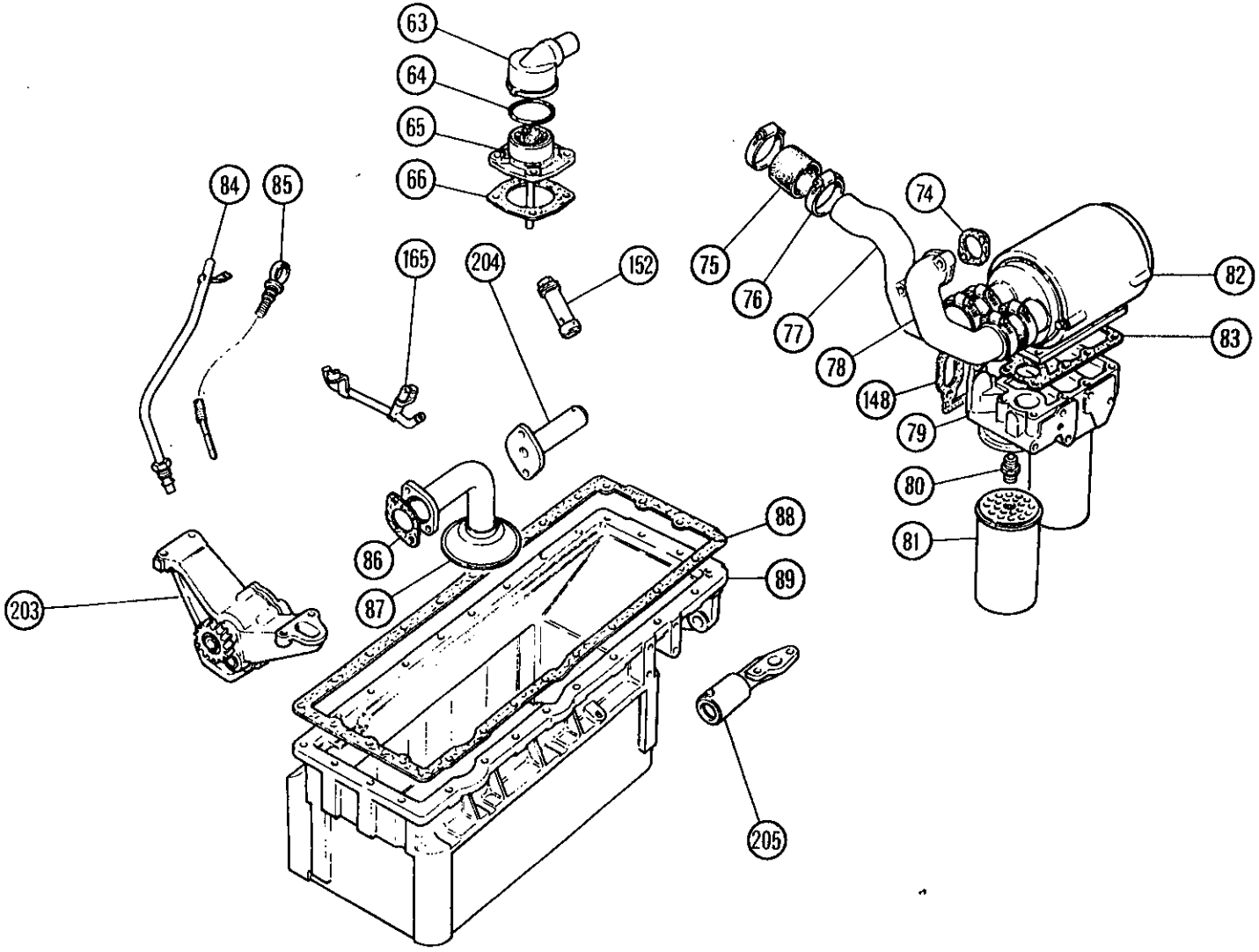


Fig. 29 Lubrication system components

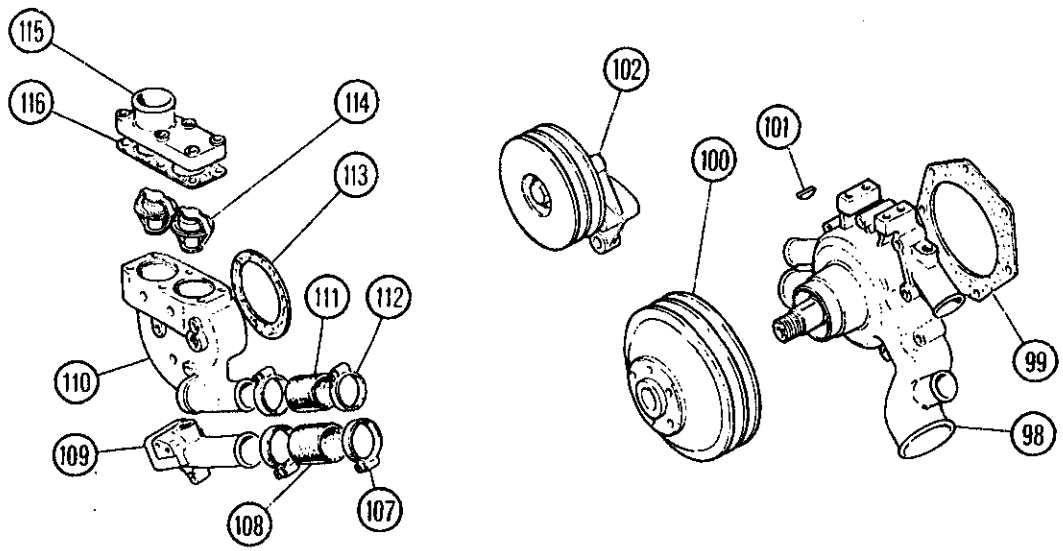


Fig. 30 Cooling system components

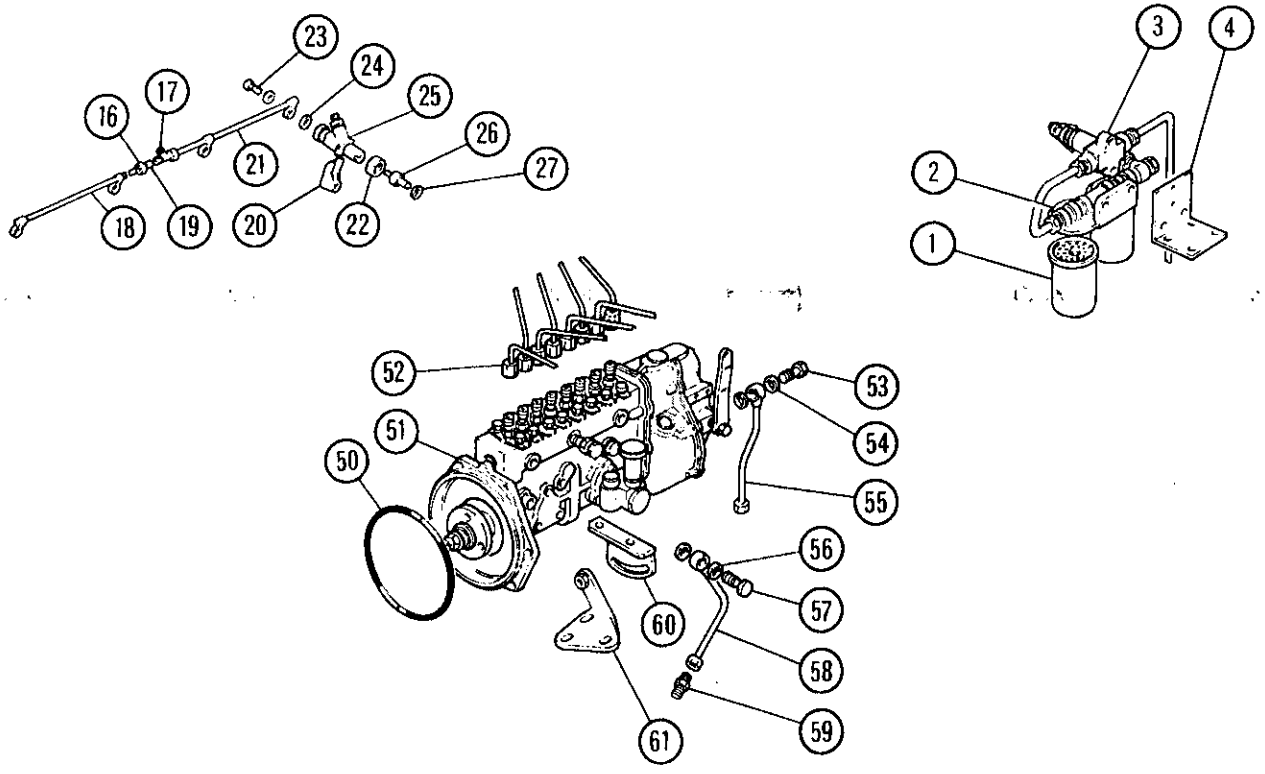


Fig. 31 Fuel system components (in line pump)

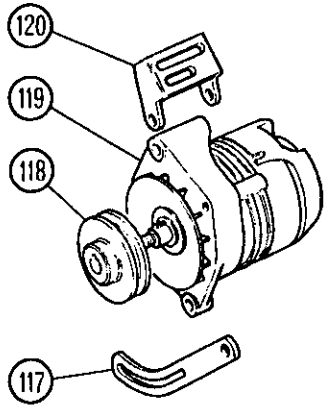


Fig. 32 Alternator and brackets

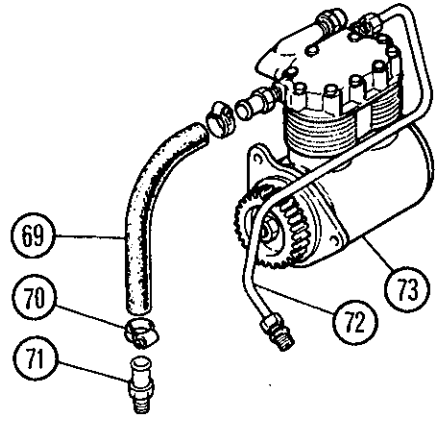


Fig. 33 Compressor

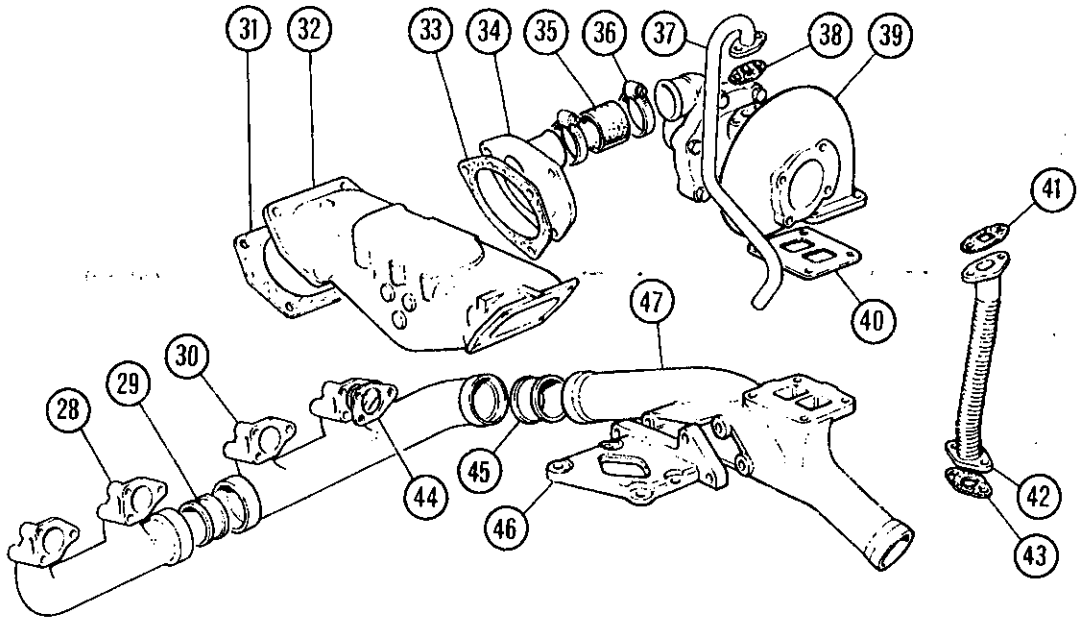


Fig. 34 Turbocharger system

Part descriptions

To be used with the illustrations given on pages 41 to 50.

1 Fuel filter element
2 Fuel filter head
3 Fuel priming pump
4 Bracket
5 Rocker cover
6 Joint
7 Lubricating oil filler
8 Filler cap
9 Rocker cover with filler
10 Joint
11 Engine lift bracket
12 Joint
13 Induction manifold
14 Joint
15 Crossover pipe
16 Nut
17 Connection
18 Leak off pipe
19 Olive
20 Clamp
21 Leak off pipe
22 Dust seal
23 Banjo connection bolt
24 Sealing washer
25 Atomiser body
26 Atomiser nozzle assembly
27 Sealing washer
28 Exhaust manifold
29 Connection
30 Exhaust manifold
31 Joint
32 Crossover pipe
33 Joint
34 Adaptor
35 Hose
36 Clip
37 Pipe
38 Joint
39 Turbocharger
40 Joint
41 Joint
42 Pipe
43 Joint
44 Joint
45 Connection
46 Bracket
47 Crossover pipe
48 Joint
49 Plate
50 'O' Ring
51 Fuel injection pump
52 Fuel injection pipe
53 Banjo connection bolt
54 Sealing washer
55 Pipe
56 Sealing washer
57 Banjo connection bolt
58 Pipe
59 Union
60 Bracket
61 Bracket
62 Engine lift eye
63 Breather cover
64 Sealing ring
65 Breather body
66 Joint
67 Cover
68 Joint
69 Hose
70 Clip
71 Connection
72 Pipe
73 Compressor
74 Joint
75 Hose
76 Clip
77 Pipe
78 Pipe
79 Lubricating oil filter head
80 Adaptor
81 Lubricating oil filter element
82 Lubricating oil cooler
83 Joint
84 Dipstick tube
85 Dipstick
86 Joint
87 Lubricating oil strainer
88 Joint
89 Lubricating oil sump
90 Fan
91 Extension
92 'O' ring
93 Thrust block
94 Outer tapered ring
95 Inner tapered ring
96 Spacer
97 Crankshaft pulley
98 Water pump
99 Joint
100 Water pump pulley
101 Key
102 Tensioner pulley
103 Joint
104 Plate
105 Cover
106 Joint
107 Clip
108 Hose
109 Connection
110 Housing
111 Hose
112 Clip
113 Joint
114 Thermostat
115 Cover
116 Joint
117 Adjustment link
118 Alternator pulley
119 Alternator
120 Bracket
121 Exhaust manifold
122 Exhaust manifold
123 Joint
124 Circlip

125 Washer
126 Rocker lever
127 Double spring washer
128 Bracket
129 Bush
130 Shim washer
131 Collar
132 Circlip
133 Rocker shaft
134 Valve stem cap
135 Valve spring cap
136 Inner valve spring
137 Outer valve spring
138 Valve spring seat
139 Valve guide
140 Cotters
141 Seal
142 Cylinder head
143 Gasket
144 Inlet valve seat insert
145 Inlet valve
146 Exhaust valve seat insert
147 Exhaust valve
148 Joint
149 Push rod
150 Tappet
151 Cylinder liner
152 Cooling jet valve
153 Bearing
154 Piston rings
155 Piston
156 Gudgeon pin
157 Circlip
158 Bush
159 Connecting rod
160 Seal
161 Housing
162 Joint
163 Bridge piece
164 Seal
165 Cooling jet
166 Cylinder block
167 Bush
168 Housing
169 Joint
170 Fuel injection pump gear
171 Plate
172 Joint
173 Thrust washer
174 Hub
175 Bush
176 Idler gear
177 Plate
178 Camshaft
179 Thrust plate
180 Camshaft gear
181 Upper half timing case
182 Joint
183 Joint
184 Seal
185 Lower half timing case
186 Joint
187 Plate
188 Plate
189 Idler gear
190 Bush
191 Hub
192 Thrust washer
193 Hub
194 Bush
195 Idler gear
196 Thrust washer
197 Upper half main bearing
198 Lower half main bearing
199 Key
200 Crankshaft
201 Crankshaft gear
202 Balance weight
203 Lubricating oil pump
204 Dump valve
205 Relief valve

Latest information

Introduction

The purpose of this page is to enable important information to be added to this handbook after publication.

CALIFORNIA
Proposition 65 Warning

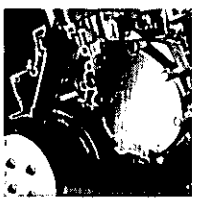
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Asia
Perkins Engines (Asia Pacific) Pte Ltd
7 Tractor Road
Singapore 627968
Telephone +65 6828 7469
Fax +65 6828 7414

Europe, Middle East and Africa
Perkins Engines Company Limited
Peterborough PE1 5NA
United Kingdom
Telephone +44 (0)1733 583000
Fax +44 (0)1733 582240

North America
Perkins Engines Inc
N4 AC 6160
PO Box 610
Mossville, IL 61552-0610, USA
1-888-PERK-ENG
Telephone +1 309 578 7364
Fax +1 309 578 7329

Latin America
Perkins Motores do Brasil Ltda
Rua Alexandre Dumas, 1711 Ed. Birman 11, 9° andar
Chácara Santo Antonio
São Paulo / SP - Brasil
Cep: 04717-004
Telephone +55 11 2109 2038
Fax +55 11 2109 2089



Perkins®

www.perkins.com