

Fig. C.1.
Removing an Atomiser.

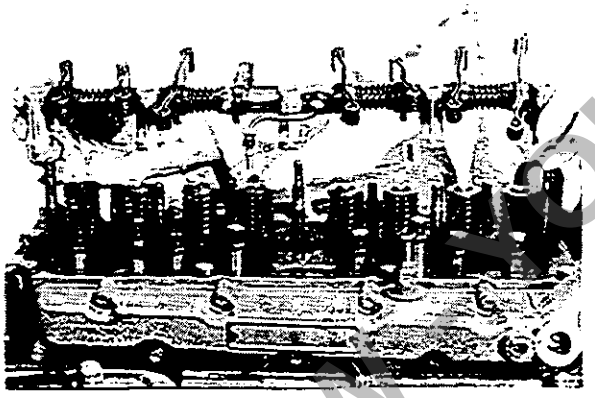


Fig. C.2.
Removing Rocker Shaft Assembly.

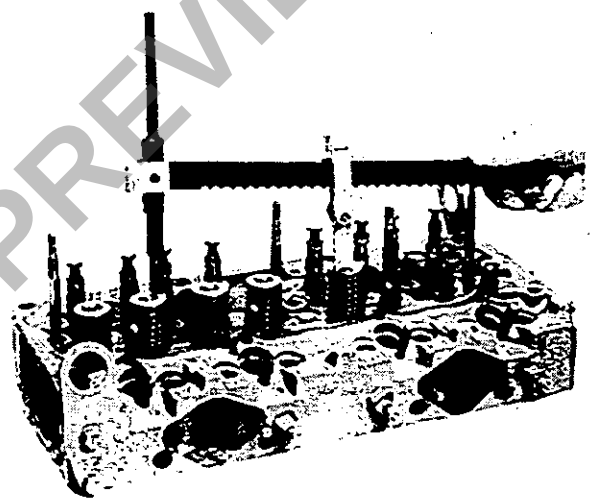


Fig. C.3.
Removing Valve from Cylinder Head.

To Remove the Cylinder Head from the Engine

Ensure that the cooling system is completely drained. A drain plug is provided on the right hand side of the cylinder block near the flywheel housing and a tap is usually provided at the base of the radiator.

Remove the lub. oil pipe between the camshaft chamber and the cylinder head.

Remove the fuel injection pipes taking care to cover the fuel injection pump outlets with suitable caps or clean non-fluffy cloth.

Remove all connections to the cylinder head.

Remove the cylinder head securing nuts and set-screws.

Remove the cylinder head.

To Overhaul the Cylinder Head

Remove the induction and exhaust manifolds.

Valves

Remove the valves from the cylinder head by depressing the valve springs and retaining caps and removing the split collets (Fig. C.3).

The valve springs, spring retainer, collets and locating washer are shown in Fig. C.4.

Remove all traces of carbon from the valves, valve guides, and cylinder head ports.

If the valve face is found to be pitted or distorted it should be refaced on a suitable valve grinding machine to an angle of 35 degrees. This operation should continue only until the face is clean and true, as the removal of an excessive amount of metal may reduce the thickness of the edge of the valve head to such an extent that it will burn or distort under operating conditions, the valve may be unduly lowered in its seating in the cylinder head and "pocketing" will result.

Valves are not numbered. Where valves are to be re-used, they should be suitably marked to ensure they are replaced in their original respective positions.

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FOREWORD

This Workshop Manual has been compiled for use in conjunction with normal workshop practice. Mention of certain accepted practices, therefore, has been purposely omitted in order to avoid repetition.

Reference to renewing joints and cleaning off joint faces, has not always been made as it is understood that this will be carried out where applicable.

Similarly, it is understood that in re-assembly and inspection, all parts are to be thoroughly cleaned, and burrs and scale are to be removed if necessary.

All open ports of high precision components, e.g. fuel injection equipment, exposed by dismantling, should be blanked off until re-assembled, to prevent the ingress of dust and dirt.

When fitting setscrews into "through" holes into the interior of the engine, a suitable sealant should be used.

Note: Some setscrews may already have sealant coated threads. These can be identified by the colour of the threads which will be red or blue etc. Ensure that where these setscrews are fitted, the holes do not have sharp edges as this could remove the sealant.

Throughout this manual, whenever "left" or "right" hand side of the engine is referred to, it is that side of the engine when viewed from the flywheel end.

Running in Procedure

It is not necessary to gradually run-in a new or factory rebuilt engine and any prolonged light load running during the early life of the engine can in fact prove harmful to the bedding in of piston rings and liners.

Full load can be applied on a new or factory rebuilt engine as soon as the engine is used, provided that the engine is first allowed to reach a coolant temperature of at least **140° F (60° C).**

SERVICE LITERATURE

Other service literature is available from your normal source of supply at a nominal charge.

Users Handbooks by engine family.

Fault Finding Guide — all engines.

Engine Brake Testing Data.

Crankshaft Regrinding.

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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 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.

Engine Coolant

The quality of the coolant which is used can have a great effect on the efficiency and life of the cooling system. The recommendations indicated below can help to maintain a good cooling system and to protect it against frost and/or corrosion.

If the correct procedures are not used, Perkins cannot be held responsible for frost or corrosion damage.

1. If it is possible, use clean soft water in the coolant.
2. If an antifreeze mixture, other than Perkins POWERPART, is used to prevent frost damage, it must have an ethanediol base (ethylene glycol) with a corrosion inhibitor. It is recommended that the corrosion inhibitor is of the sodium nitrite or sodium benzoate type. The antifreeze mixture must be an efficient coolant at all ambient temperatures and it must provide protection against corrosion. It must also have a specification at least as good as the requirements of the standards below:

United Kingdom:
BS.6580 MOD AL39: "Specification for corrosion inhibiting, engine coolant concentrate (antifreeze)".

Perkins POWERPART antifreeze exceeds the requirements of the above standards. The quality of the antifreeze coolant must be checked at least once a year, for example at the start of the cold period. The antifreeze mixture must consist of equal quantities of antifreeze and water. Concentrations of more than 50% of antifreeze must not be used because these can affect adversely the performance of the coolant.

3. When frost protection is not necessary, it is still an advantage to use an approved antifreeze mixture because this gives a protection against corrosion and also raises the boiling point of the coolant. If an antifreeze is not used, add a correct mixture of corrosion inhibitor to the water. Renew the mixture of water and corrosion inhibitor every six months or check it according to the inhibitor manufacturer's recommendations.

Attention: Certain corrosion inhibitor mixtures contain soluble oil which can have an adverse effect on certain 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 the side of the cylinder block to drain the engine. Ensure that the drain hole does 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.
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. If the cooling system is left drained, it is advisable to further safeguard the oil cooler (where fitted) by inserting $^1/_2$ pint (0,28 litre) of undiluted antifreeze into the cooler to prevent freezing of any water that may drain into the cooler if the machine is moved.

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Crankshaft End Float

The crankshaft end float is controlled by detachable thrust washers fitted each side of the rear main bearing cap (See Fig. F.2) and the cylinder block half housing. The lower halves of these thrust washers fitted in the rear main bearing cap have suitable locating lugs to prevent them from turning out of position. Fit the crankshaft thrust washers to each side of the bearing housing with the vertical oil grooves facing outwards.

To check the crankshaft end float, push the crankshaft forward as far as it will go and using feeler gauges check the gap between the machined shoulder on the crankshaft web and the crankshaft thrust washer. See Fig. F.3.

Check the gap on the other side of the rear main bearing with the housing of the oil seal removed and the crankshaft pushed back as far as it will go.

The clearances both sides of the bearing should be identical. The manufacturers production limits for the crankshaft end float are given on Page A.5.

To Remove Crankshaft

1. Remove the engine from the machine.
2. Remove the clutch assembly, flywheel, starter motor and transmission housing adaptor plate. See Section M.
3. Remove the water pump, crankshaft pulley, alternator and front timing case cover.
4. Remove the lubricating oil sump and oil pump suction and delivery pipes.
5. Remove the oil seal housing (See Fig. F.4).
6. Remove the connecting rod caps and big end bearings.
7. Remove the main bearing setscrews.
8. Detach the main bearing caps (See Fig. F.5) taking care not to drop either the bearing shells or thrust washers. The lubricating oil pump may remain affixed to No. 1 main bearing cap.
9. Lift the crankshaft from the cylinder block.
10. Ensure all the main bearings are identified with the relevant cap or cylinder block housing.
11. Remove the main oil filter and clean all the oilways in the cylinder block.
12. The crankshaft oilways and bearing surfaces must be cleaned.
13. Examine the main bearing setscrews for stretch and thread damage.

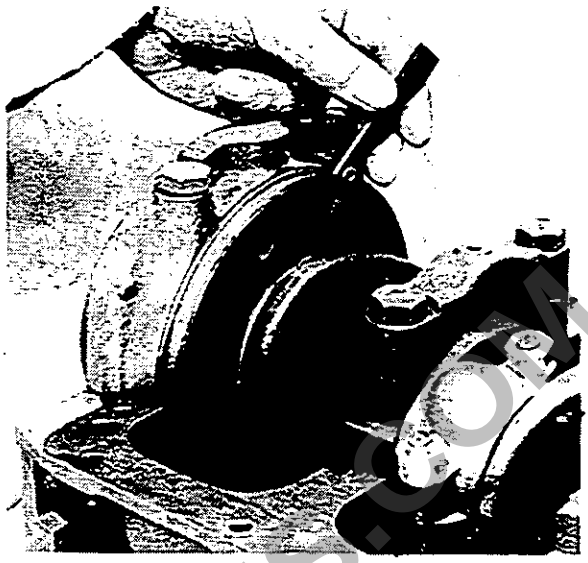


Fig. F.3.
Checking Crankshaft End Float.

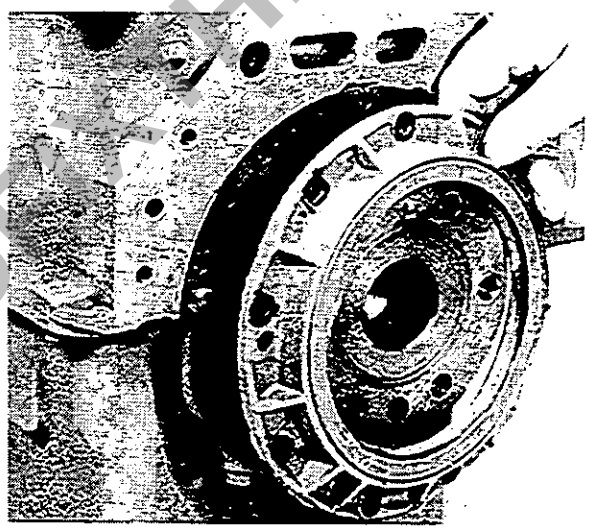


Fig. F.4.
Removing Lip Rear Main Oil Seal Housing.

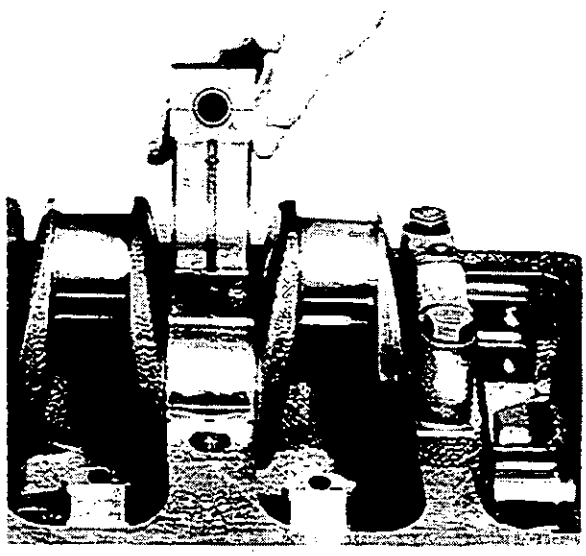


Fig. F.5.
Removing Main Bearing Cap.

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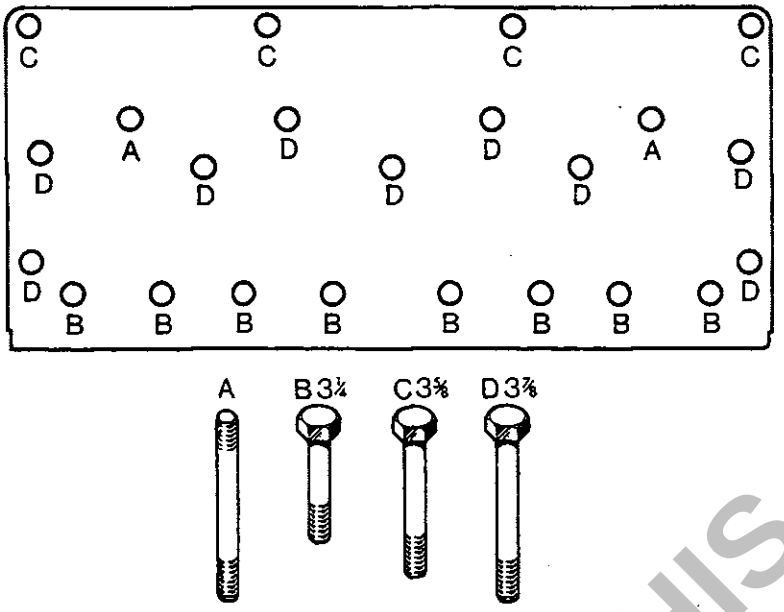


Fig. C.10.
Cylinder Head Fixings.

To Re-assemble the Cylinder Head

Lubricate the valve stems and valve guides with engine oil and place the valves in their respective guides. Replace in the following order. Locating washer, inner valve spring and oil seal (inlet valves only), outer valve spring and spring retaining cap.

Refit induction and exhaust manifolds using new joints.

Cylinder Head Retaining

The cylinder head is secured to the cylinder block by two studs and twenty-one setscrews of three different lengths, i.e. 3¼ in (82,5 mm), 3⅝ in (92 mm) and 3⅞ in (98,5 mm), see Fig. C.10.

It is important that the studs and correct setscrews are fitted to their respective positions.

NOTE: The threaded holes in the cylinder block at the front and rear positions at "C" are through holes into the camshaft journal housings and if the long 3⅞ in (98,5 mm) setscrews are fitted into these positions, they can protrude far enough to score the rear camshaft journal or compress the bush at the front camshaft journal.

There is also a possibility of an oil leak from the cylinder head gasket since the tightening torque will be registered when the setscrews bottom on the thread rather than the clamping of the cylinder head.

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