

SECTION C

Periodical Attentions

Daily

Check coolant level.
Check sump oil level.
Check oil pressure (where gauge is fitted).
In extreme dust conditions, clean oil bath air cleaner and empty dust bowl on dry type air cleaner.

Every 4,000 miles (6,000 km), 150 hours or 3 months (whichever occurs first)

Drain and renew lubricating oil (see list of approved lubricating oils in Appendix).
Renew lubricating oil filter element.
Clean oil bath air cleaner.
Empty dust bowl on dry type air cleaner.
*Check drive belt tension.
Clean water trap.
Check engine for leakage of oil, water or fuel.
Lubricate dynamo rear bush (where applicable).

Every 10,000 miles (15,000 km) 400 hours or 12 months (whichever occurs first)

Renew final fuel filter element — agricultural and industrial applications.
Check hoses and clips.
Clean element of dry type air cleaner or renew (if not indicated earlier).

Every 20,000 miles (30,000 km) or 800 hours

Renew final fuel filter element — vehicle applications.

Every 60,000 miles (90,000 km) or 2,400 hours

Arrange for examination and service of proprietary equipment, i.e., compressor, exhauster, starter, dynamo etc.
Service atomisers.
Check and adjust valve clearance.
*The drive belt tension should be checked monthly on engines rated above 3,000 rev/min.

Operators of 4.108 engines are reminded that the above periodical attentions are general in application. Therefore the operator should compare the routine maintenance for his engine with the schedules specified by the manufacturer of the application to which the engine is fitted and where necessary adopt the shorter periods, also bearing in mind that on stop start low mileage work, the hours run are more applicable than the mileage covered.

POST DELIVERY CHECKOVER

After a customer has taken delivery of his Perkins Diesel engine, it is advisable, in his own interest, that a general checkover of the engine be carried out after the first 250/500 miles (400/800 km) or 6/12 hours in service.

It is also recommended that the following procedure be adopted where an engine has been laid up for a considerable period before it is again put into service. With the engine thoroughly warmed through, this checkover should comprise the following points.

1. Drain lubricating oil sump. Renew lubricating oil filter element (Refer to Page M.6).
2. Remove the rocker assembly, check that the cylinder head nuts are to the correct torque. (Refer to Page B.2).
3. Refit rocker assembly and set valve clearances. (Refer to Page B.8).
4. Refill lubricating oil sump with clean new oil to the correct level. (Do not overfill).
5. Check fan belt tension. (Refer to Page N.1).
6. Check coolant level in radiator, inspect for any coolant leaks.
7. Check security of all external nuts, setscrews, mountings, etc.
8. Start engine and check for any fuel or lubricating oil leaks.
9. Carry out test to check general performance of engine.

Thereafter routine maintenance should be in accordance with Periodical Attentions which are given on this Page.

NOTE: If the cylinder head is removed for any reason e.g. top overhaul, then it is recommended that the cylinder head nuts are retorqued as shown in Fig. E.23 after 250/500 miles (6/12 hours) with the engine hot, to the setting given on Page B.2.

It is assumed that electrical equipment will have already been checked for such points as dynamo rate of charge, effectiveness of connections and circuits, etc.

PRESERVATION OF LAID-UP ENGINE

Where an application which is powered by a Perkins engine is to be laid-up for several months, it is advisable that some measure of protection be afforded the engine to ensure that it suffers no ill effect during the intervening period before operations are recommenced.

It is recommended, therefore that the following procedure be adopted and applied immediately the unit is withdrawn from service.

1. Thoroughly clean all external parts of the engine.
2. Run the engine until well warmed through. Stop the engine and drain the lubricating oil sump.
3. Discard the paper element in the full flow lubricating oil filter, clean the filter bowl and fit a new element. Fill the filter bowl (where possible) with new oil of an approved grade. A list of approved lubricating oils appears in the appendix.
4. Clean out the engine breather pipe.
5. Fill the lubricating oil sump to the correct level with clean new lubricating oil of an approved grade, as referred to in (3) above.
6. Carry out attention to the fuel pump as described in the appropriate Fuel Pump section on this page.
7. Drain water by opening all the drain taps both on the cylinder block and the radiator. To ensure complete draining, it is preferable to remove the drain taps entirely and check that the holes are not blocked by scale. After a reasonable drainage period, refit the taps in the open position.
8. Remove the atomisers and spray into the cylinder bores $\frac{1}{4}$ pint (70cm³) of lubricating oil, divided between all cylinders.
9. Replace the atomisers (using new joint washers) and slowly rotate the crankshaft one complete revolution.
10. Remove the air cleaner and any air intake pipe which may be fitted between the air cleaner and air intake. Carefully seal the air intake orifice with waterproofed adhesive tape or some other suitable medium.
11. Remove the exhaust pipe, and seal the manifold orifice with adhesive tape as in (10) above.
12. Remove cylinder head cover, lubricate the rocker assembly with engine oil and replace the cover.
13. Remove the fan belt and retain this for refitting when the engine is to be returned to service.

Batteries

- (a) Remove the battery or batteries from the engine and top up the cells with distilled water, making sure that the top edges of the separators or separator guards are just covered.
- (b) Recharge the battery thoroughly from a separate source of supply.
- (c) Screw home the vent plugs and clean the battery thoroughly, removing all dust, dirt and moisture.
- (d) Clean the terminals and lightly smear them with petroleum jelly.
- (e) Store in a cool, dry, dust-free place. On no account should the battery be left where there is a risk of freezing.

- (f) Recharge once a month at the normal rate of charge, to a state of free gassing.

Starters and Dynamos

Clean the terminals and lightly smear them with petroleum jelly. If the machine is to stand in the open, the dynamo, starter and control panel must be protected against water falling directly onto them.

D.P.A. Distributor Pump

1. Drain all fuel oil from the fuel tanks and filters. Put into the fuel tank at least a gallon of one of the oils listed under "Recommended Oils for Inhibiting the Fuel System". If, because of the construction of the fuel tank, this quantity of oil is inadequate, break the fuel feed line before the first filter and connect a small capacity auxiliary tank.
2. Prime the system as detailed on page P.10.
3. Start the engine and run it until the oil has circulated through the injection pump, feed pipes and injectors, which will be after it has run light, at about half maximum speed, for at least fifteen minutes.
4. Stop the engine.
5. Seal the air vent in the tank or filler cap with waterproofed adhesive tape to reduce the risk of water condensation during the lay-up period.

The proprietary brands of oils listed are recommended for the purpose by the respective oil companies. They may not be available in all parts of the world, but suitable oils may be obtained by reference to the appropriate companies. The specification should include the following:—

Viscosity: The viscosity should not be greater than 22 centistokes at the lowest ambient temperature likely to be experienced on restarting.

Pour Point: Must be at least 15°F (9°C) lower than the lowest ambient temperature likely to be experienced on restarting and should preferably be lower than the lowest temperature likely to be met during the lay-up period.

The oils selected are not necessarily suitable for calibrating or testing pumps.

Caution

When oil is being drained from the system it must not be allowed to fall on electrical equipment.

RECOMMENDED OILS FOR INHIBITING THE FUEL SYSTEM

	Lowest Temperature During Lay-up
Esso IL815	25°F (— 4°C)
Esso IL1047	0°F (—18°C)
Shell Calibration Oil "C"	0°F (—18°C)
Shell Calibration Oil "B"	—70°F (—57°C)
Shell 'Fusus A'	25°F (— 4°C)
Shell 'Fusus A' (alternative grade) ...	—15°F (—26°C)

NOTE: In choosing a suitable oil the lowest temperature likely to be met by the engine during the lay-up period should be estimated, and the oil should be such that the temperature given in the table is as low as, or lower than this estimate. No attempt should be made to restart the engine until the temperature has been at least 15°F (9°C) above that shown in the table for not less than 24 hours, otherwise there may be difficulty in obtaining a free flow of fuel.

PREPARING THE ENGINE FOR RETURN TO SERVICE

When the engine is to be returned to service, the following procedure must be observed:—

1. Thoroughly clean all external parts of the engine.
2. Carry out attention to the fuel pump as described later.
3. Ensure that the cylinder block and radiator drain taps are correctly fitted in the closed position and fill the system with clean coolant. Check visually for leaks and remedy where necessary.
4. Rotate the water pump by hand to ensure freedom of the water pump seals.
5. Refit the fan belt and adjust to the correct tension.
6. Remove the cylinder head cover, lubricate the rocker assembly with engine oil and replace the cover.
7. Remove the adhesive tape from the air intake orifice and refit the air cleaner. Ensure that the gauze is clean and if it is the oil bath type, fill with clean engine oil to the correct level.
8. Refit any air intake pipe between the air cleaner and the air intake which may have been removed during laying-up procedure.
9. Remove the adhesive tape from the exhaust manifold orifice and refit the exhaust pipe using new joints.
10. Connect the battery or batteries into circuit, fully charged and topped up as necessary with distilled water.
11. Wipe the grease from the starter and alternator or dynamo terminals and check that all connections are sound. If the starter is fitted with a Bendix type of drive, which proves sluggish in engagement when operated, the starter motor must be removed and the drive cleaned thoroughly in a suitable cleaning fluid. Lubricate with a little light engine oil before replacement.
12. Check the level and condition of the lubricating oil in the sump. Change the oil if necessary.
13. Start the engine in the normal manner checking for oil pressure and generator charge immediately. Whilst the engine is attaining normal running temperature it is advisable to check that it is running normally and that it is free from water, fuel and lubricating oil leaks.

D P A Distributor Pump

1. Remove the adhesive tape from the fuel tank vent or filler cap.
2. Drain the fuel tank to remove any remaining oil and condensed water, and refill the tank with fuel oil.
3. Fit a new filter element and vent the filter until oil flows free from air bubbles (see page P.10).
4. Air vent and prime the pump (see page P.10).

NOTE: If the foregoing instructions are observed, the laying-up and returning to service should be carried out efficiently and without adverse effect on the engine. Perkins Engines Ltd., however, cannot accept liability for direct or consequential damage that might arise following periods of laying up.

FROST PRECAUTIONS

Precautions against damage by frost should be taken if the engine is to be left exposed to inclement weather either by adequately draining the water system or where this is not convenient, an anti-freeze of reputable make and incorporating a suitable corrosion inhibitor may be used.

Should it be your policy to protect engines from frost damage by adding anti-freeze to the cooling system, it is advisable that the manufacturers of the relevant mixture be contacted to ascertain whether their products are suitable for use in Perkins engines and also to ensure that their products will have no harmful effect on the cooling system generally. It is our experience that the best results are obtained from anti-freeze which conforms to British Standard 3151.

When the engine is drained the water pump is also drained, but rotation of the pump may be prevented by:—

- (a) Locking of the impeller by ice due to the pump drain hole being blocked by sediment.
- (b) The locking of the seal through the freezing of globules of moisture between the seal and the insert.

Operators are therefore advised to take these precautions when operating in temperatures below freezing point:

1. Before starting the engine, turn the water pump by hand, this will indicate if freezing has taken place. If freezing has taken place, this should free any ice formation.
2. If it is impossible to turn the pump by hand, the engine should be filled with warm water.
3. To avoid this trouble, the operator should, when all water has been drained, run the engine for a few seconds at idling speed, thus dispersing any moisture remaining in pump.

After an anti-freeze solution has been used, the cooling system should be thoroughly flushed in accordance with the anti-freeze manufacturer's instructions before refilling with normal coolant.

If the foregoing action is taken, no harmful effects should be experienced, but Perkins Engines Ltd., cannot be held responsible for any frost damage or corrosion which may be incurred.