SECTION 4

LUBRICATION SYSTEM

Contents

4.0000
LUBRICATION SYSTEM SPECIFICATIONS

OIL PUMP

Driving Impeller Spindle Diameter	14.24-14.26 mm (.5607"-.5612")
Driving Impeller Spindle End Float	.076-.152 mm (.003"-.006")
Driving Impeller Spindle Clearance in Body	.023-.053 mm (.0009"-.0021")
Driven Impeller Spindle Diameter	14.30-14.31 mm (.5629"-.5634")
Driven Impeller Spindle Fit in Body	.003-.033 mm (.0001"-.0013")
Backlash Between Impeller Teeth	.08-.25 mm (.003"-.010")
Driving Impeller Bore Diameter	14.23-14.24 mm (.5602"-.5607")
Driven Impeller Bore Diameter	14.33-14.34 mm (.5642"-.5647")
Driving Impeller Fit on Spindle	Zero-.0254 mm (Zero-.001") Interference
Driven Impeller Fit on Spindle	.02-.046 mm (.0008"-.0018") Interference
Impeller End Float in Body	.05-.13mm (.002"-.005")
Impeller Overall Length	39.6-39.62 mm (1.559"-1.560")
Impeller Radial Clearance in Body	.04-.09 mm (.0015"-.0035")
Oil Pressure Relief Valve Plunger Diameter	15.84-15.86 mm (.6235"-.6243")
Oil Pressure Relief Valve Plunger Clearance in Bore	.02-.06 mm (.0007"-.0025")
Oil Pressure Relief Valve Spring Free Length	112-113 mm (4.42"-4.45")
Oil Pressure Relief Valve Spring Load at 65.5 mm (2.58")	7.7-8.2 kg. (17-18 lb)
Driving Gear Bore Diameter	14.24-14.25 mm (.5607"-.5612")
Driving Gear Fit on Spindle	0.0127 mm (.0005") Clearance 0.0127 mm (.0005") Interference
Driving Gear Thrust Washer Thickness	2.26-2.39 mm (.089"-.094")

OIL FILTER

Make and Type	AC 720 - Full Flow
Element	AC 72
Element Spring Load at 31.77 mm (1.25")	7-9 kg. (15-20 lb)

OIL DISTRIBUTION

Oil Pressure (Hot)	241-345 KPa (35-50 lb/sq in)
Oil Pressure Switch Operating Pressure	21-34 KPa (3-5 lb/sq in)

OIL PAN CAPACITIES

Four-cylinder, 220 cubic inch, standard sump:	
Total	14 Imp. Pints (8 Litres)
Refill	11 Imp. Pints (6 Litres)
Refill With Filter Element Change	13 Imp. Pints (7 Litres)
Four-Cylinder, 220 cubic inch, pressed steel deep sump:	
Total	11 Imp. Pints (6 Litres)
Refill	8 Imp. Pints (5 Litres)
Refill With Filter Element Change	11 Imp. Pints (6 Litres)
Six-cylinder, 330 cubic inch, standard sump:	
Total	17 Imp. Pints (10 Litres)
Refill	14 Imp. Pints (8 Litres)
Refill With Filter Element Change	16 Imp. Pints (9 Litres)
Six-cylinder, 330 cubic inch, pressed steel deep sump:	
Total	19 Imp. Pints (11 Litres)
Refill	16 Imp. Pints (9 Litres)
Refill With Filter Element Change	18 Imp. Pints (10 Litres)
Six-cylinder, 330 cubic inch, cast aluminium deep sump (off-highway):	
Total	16 Imp. Pints (9 Litres)
Refill	13 Imp. Pints (7 Litres)
Refill With Filter Element Change	15 Imp. Pints (8 Litres)

VENTILATION SYSTEM

MAXIMUM DEPRESSION IN INCHES OF WATER

Engine	Speed of Engine (rpm)			
	1000	1500	2000	2600
220 cu in	0.5	0.8	1.1	1.3
330 cu in	0.3	0.9	1.6	3.0

TORQUE WRENCH DATA

Oil pump cover retaining bolts	8-11 Nm (6-8 lb ft)
Oil pump retaining bolts	18-20 Nm (13-15 lb ft)
Oil filter centre bolt	14 Nm (10 lb ft)
Oil filter retaining bolts (Industrial)	49-56 Nm (36-41 lb ft)
Oil filter retaining bolts (Marine)	30-37 Nm (22-27 lb ft)
Oil pan retaining screws	8-11 Nm (6-8 lb ft)
Vent system baffle chamber	8-11 Nm (6-8 lb ft)

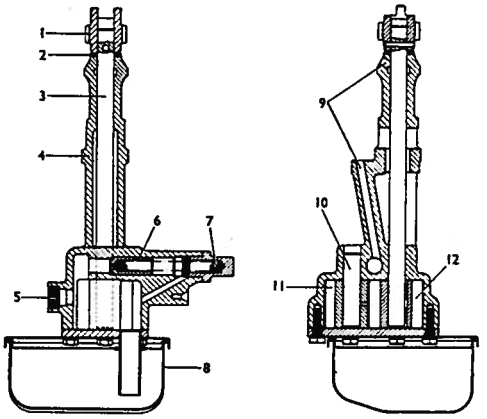
4.1000

OIL PUMP

Oil Pump (Description)

1. Lubrication is by forced feed system embodying full flow filtration. Oil is circulated through the system by a gear type pump mounted in a boss on the right hand side of the crankcase.

2. The pump is driven by a skew gear integral with the camshaft. The pump driving spindle is carried direct in the bore of the pump body and has a helical tooth impellor pressed and keyed to its lower end. The driving impellor meshes with the driven impellor, which rotates freely on a spindle pressed into the pump body. A bottom cover bolted to the pump body incorporates a suction pipe and gauze screen.



4.1000-2

1. Driving gear
2. Thrust washer
3. Driving impeller spindle
4. Pump body
5. Delivery port
6. Relief valve plunger
7. Spring
8. Gauze screen
9. Driving gear and spindle oil feed drillings
10. Driven impeller spindle
11. Driven impeller
12. Driving impeller

3. A spring loaded oil pressure relief valve is incorporated, and a pipe connects the delivery port to a vertical drilling in the crankcase which leads to the oil filter.

Oil Pump (Removal)

4. Remove the oil pan as detailed in 4.7000.

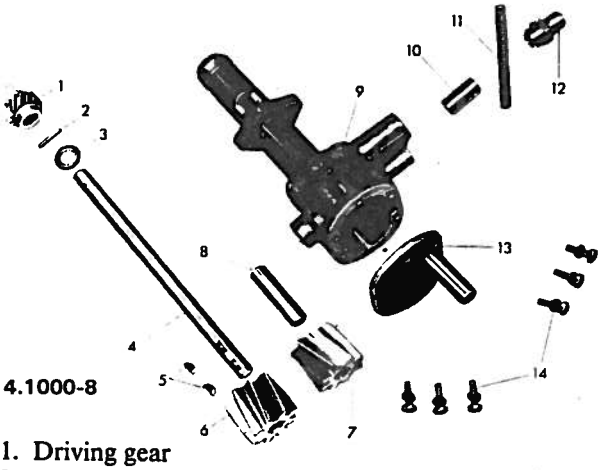
5. Unscrew the delivery pipe from the crankcase.

6. Remove the two fixing bolts and washers and withdraw the complete pump assembly.

Oil Pump (Inspection and Overhaul)

7. Remove the oil delivery pipe from the pump body.

8. Prise up the gauze retaining clips and remove the screen. Unscrew the bolts securing the screen retainer, cover the suction tube to the pump body and remove the screen retainer with the screw and suction tube.



4.1000-8

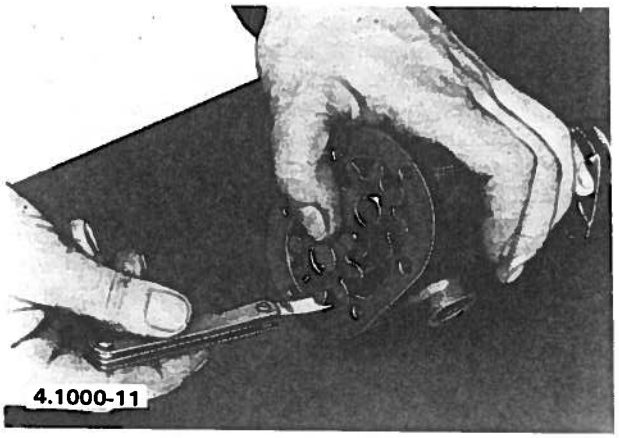
1. Driving gear
2. Gear rivet
3. Thrust washer
4. Driving impeller spindle
5. Driving impeller keys
6. Driving impeller
7. Driven impeller
8. Driven impeller spindle
9. Pump body
10. Relief valve plunger
11. Spring
12. Relief valve plug
13. Cover and suction tube
14. Cover attaching bolts

9. Examine the machined face of the cover for wear or scores. If the wear or depth of scoring is not excessive the cover can be refaced.

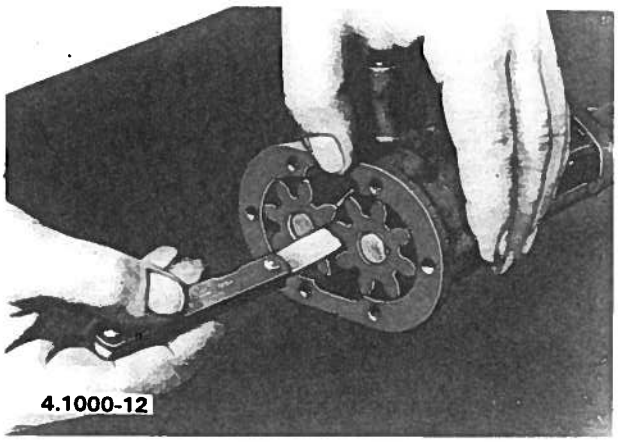
10. Using a flat bar and feeler gauges check the end float of the impellers in the body which should be between .002" and .005".

4.1000-10

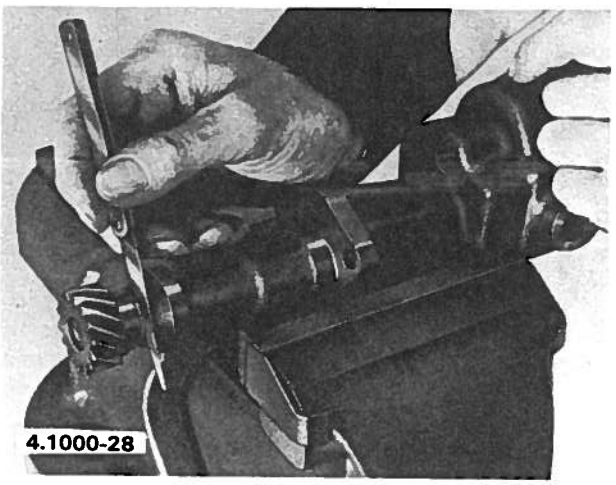
11. With the aid of feeler gauges check the radial clearance of the impellers in the body. This should be between .0015" and .0035".



12. Again with the aid of feeler gauges, check the backlash between the impeller teeth which should be between .003" and .010".



13. If in any of these checks, the limits are exceeded the pump should be dismantled and parts renewed where necessary.
14. Prior to dismantling the pump, mark the end of the impellers to identify them when reassembling.
15. Withdraw the driven impeller and spindle.
16. Drive out the rivet securing the driving gear to the spindle and using a soft metal drift, tap the spindle out of the gear. This will enable the driving impeller and spindle to be withdrawn from the body.
17. Unscrew the relief valve plug and withdraw the spring and plunger.
18. All components should now be inspected for wear.
19. The driving spindle bores in the body should be examined for wear by checking the clearance of an unworn part of the spindle.
20. Examine the oil pressure relief valve plunger, and the plunger bore in the body for wear or scores. The plunger should slide freely without slackness. The clearance in the bore should be .0007" to .0025".
21. The valve spring should be examined for damage and its free length and rate should be checked. The free length should be between 4.42" and 4.45", and with a load of 17 to 18 lbs. it should be 2.58 inches.
22. Examine both impeller spindles, impeller teeth and the end faces for wear and scores. The driven impeller spindle should be a press fit on the body. If there is any sign of slackness, renew the spindle and if necessary the pump body.
23. To renew the driven impeller spindle, drive out the old spindle from outside the impeller chamber, then press in the new spindle until its outer end is 1/64 inch below the cover attaching face.
24. To renew the driving spindle or impeller, press out the spindle and transfer the two keys to the new spindle. Align the keys with the keyway in the impeller and press on the impeller until its end face is flush with the end of the spindle. If the existing impeller is being refitted remove any burrs or roughness from the teeth with a fine carborundum stone. After stoning remove all traces of swarf. Ensure that the face previously marked will be towards the bottom of the pump when refitting.
25. Examine the driving gear for worn or chipped teeth and the thrust face for scores. A new thrust washer must be used when refitting the gear.
26. Lubricate the spindles with mineral oil containing colloidal graphite and install the driving impeller spindle into the body.
27. The driving spindle can now be installed, when this operation is being performed the lower end of the spindle must be held against a dolly of lesser diameter than the impeller bore, otherwise the spindle may be pressed further through the impeller. This could cause the spindle to foul the pump cover or create misalignment of the rivet holes, if the original spindle is to be reinstalled.
28. When a new driving impeller spindle is being installed, use a 3/16 inch diameter drill for drilling the rivet hole. Refit the gear rivet, check that the driving spindle end float is within .003" to .006" and stake the gear rivet.



29. Ensuring that the previously marked face is towards the bottom of the pump, install the driven impeller.

30. Refit the relief valve plunger, spring and plug. Replace the cover and screen retainer and tighten the six securing bolts to a torque of 6-8 lbs. ft. Refit the screen by pressing the screen retaining clips back into position.
31. Refit the oil delivery pipe.

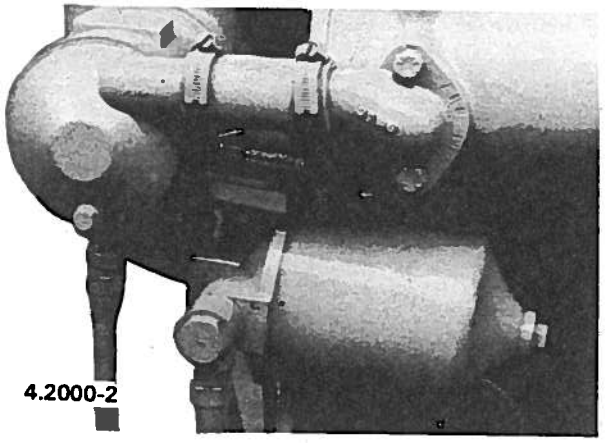
Oil Pump (Refitting)
32. Place the oil pump into position and secure with the two bolts tightening to a torque of 13-15 lbs. ft. Screw the delivery pipe to the crankcase.
33. Replace the oil pan as detailed in 4.7000.

4.2000

LUBRICATING OIL FILTER

Lubricating Oil Filter (Description)

1. The AC full flow oil filter is fitted directly to the cylinder block with four screws, the lubricating oil passing through oilways in the cylinder block. However, on engines fitted with a lubricating oil cooler, a cast adaptor is fitted to the block in a position normally occupied by the filter. The filter is fitted to the adaptor and then the whole assembly is fitted to the cylinder block using four longer screws.
2. On marine engines a cast adaptor is fitted to the block in the position normally occupied by the filter. The filter is then fitted to a bracket attached to the front end of the water cooled exhaust manifold. Oil pipes are led from the adaptor block attached to the cylinder block to the filter.



4.2000-2

3. The filter incorporates a spring loaded ball valve in the outlet port which allows oil to by-pass the filter element should it become choked.
4. A hole is tapped into the filter head to accommodate a pressure switch for use with the low oil pressure warning lamp.

Lubricating Oil Filter (Removal)

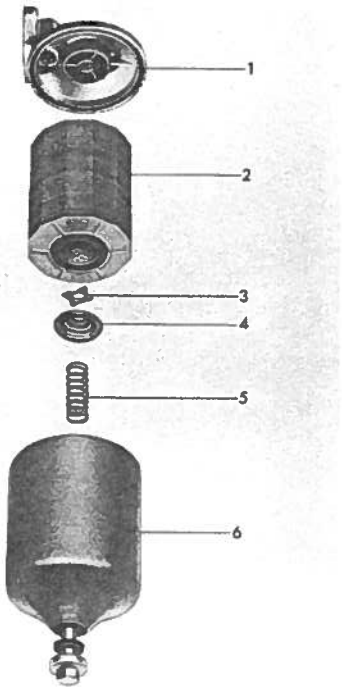
5. Thoroughly clean the area around the oil filter assembly.
6. Disconnect the electrical connections to the pressure switch, if fitted.
7. Remove the four screws which secure the filter to either the cylinder block or the adaptor and lift out the filter from the engine.

Note: On 220 engines prior to serial number P & I 1350 and 330 engines prior to serial number P & I 1900 only two securing screws were used.

8. On marine engines, the filter inlet and outlet pipes should be disconnected after provision has been made to catch any oil in the system. The two filter retaining nuts, bolts and washers should next be removed and the filter lifted from the engine.

Lubricating Oil Filter (Inspection and Overhaul)

9. There are no moving parts in the lubricating oil filter assembly except the relief valve. The inspection, therefore, consists of a visual check for damage caused by knocks, mis-assembly of shell into head or over-torqued centre bolt.
10. The filter element must be changed every 200 hours.
11. Unscrew the filter casing centre bolt and withdraw the casing and element assembly. Hold the casing upright to avoid spilling of oil.



4.2000-11

1. Filter head
2. Filter element
3. Element centralizer
4. Spring retainer
5. Spring
6. Filter casing

12. Drain the oil from the casing and discard the element.
13. Remove the gasket from the filter head.
14. Thoroughly clean the inside of the filter head and casing. Install a new gasket ensuring that it locates correctly and is free from kinks.
15. Install a new element in the casing and bolt the assembly to the filter head. Before tightening the bolt, check that the casing is located correctly on the gasket. Tighten to 1.4 kg/m (10 lbs ft.).
16. Top up the oil pan with the recommended oil and run the engine for two or three minutes to allow oil to circulate. Recheck the oil level and examine for oil leaks.

Lubricating Oil Filter (Refitting)

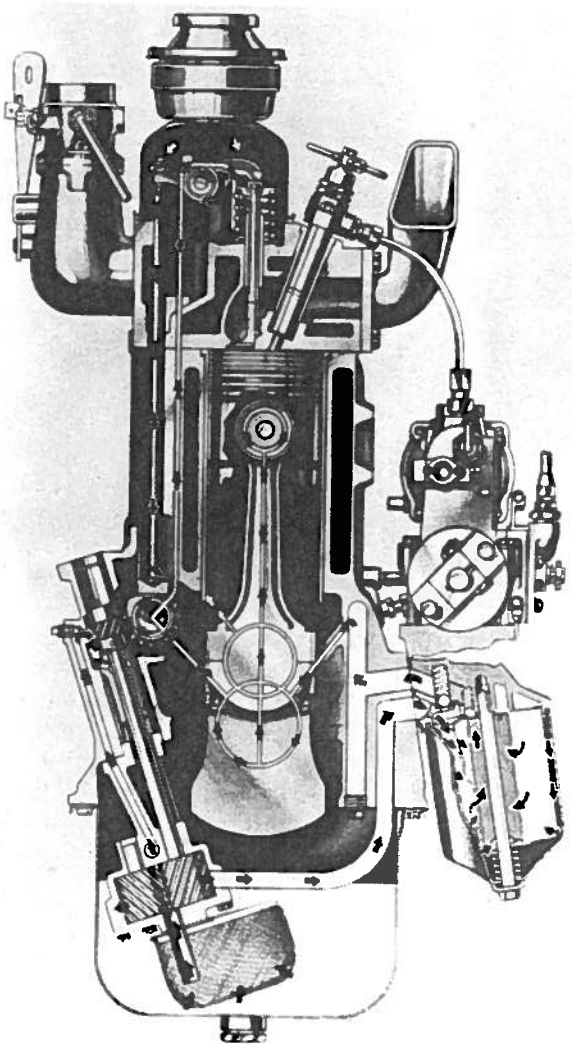
17. Clean all traces of old gaskets from the cylinder block or adaptor and also ensure all parts are clean.
18. Refit the filters using a new gasket, tighten the securing screws to a torque of 36-41 lbs. ft. (48.8-55.6 newton/metres) and 22-27 lbs. ft. (29.8 - 36.6 newton/metres) on marine engines.
19. Reconnect any mechanical or electrical connections to the pressure switch.
20. On marine engines the oil pipes should be reconnected between the oil cooler and adaptor block and the oil cooler and filter.

4.3000

OIL DISTRIBUTION

Oil Distribution (Description)

1. Oil drawn from the screen into the pump impeller chamber is discharged through the oil filter element to the main oil gallery where it then flows down oilways to the crankshaft main bearings, and thence through oilways in the crankshaft to the connecting rod bearings. A bleed hole in each rod directs oil on the thrust side of the cylinder walls.



4.3000-1

2. The camshaft bearings are lubricated through oilways from the main bearings. An oilway in the front intermediate camshaft journal directs oil at every camshaft revolution through a vertical drilling in the cylinder block and head to the oil pipe connected to the rocker shaft. After lubricating the rockers, surplus oil drains down the push rod tubes and lubricates the rods, tappets and camshaft arms before returning to the oil pan. The camshaft skew gear is lubricated by oil discharged from the oil pump impeller chamber through a drilling in the pump body and crankcase. Surplus oil then lubricates the pump spindle through a drilling in the upper end of the spindle housing.

3. The timing gears are lubricated by a jet of oil fed from the front main bearing through oilways drilled in the main bearing cap and bearing, and the timing gear case. The idler gear hub is separately lubricated from the main gallery, the oil passing through the oilways drilled in the hub and crankcase.

4. When the oil pressure reaches a predetermined figure (3-5 lb/sq. in.), the pressure switch diaphragm flexes and separates its contacts thus extinguishing the warning light. Should the pressure drop below the specified limit whilst the engine is running, the diaphragm, regaining its original position, closes the contacts and illuminates the lamp.

5. The oil pressure is maintained within specified limits by the pressure relief valve. Excess pressure displaces the valve plunger and uncovers the port connecting the oilway to the suction side of the pump. As soon as the excess pressure is relieved the spring returns the plunger to its original position.

Oil Distribution (Removal)

6. With the exception of marine engines, the only serviceable parts of the oil distribution system are the rocker feed pipe, oil delivery pipe, oil pump screen and various oil seals.

7. Remove the oil pan as detailed in 4.7000.

8. Unscrew the two sleeve nuts from the ends of the delivery pipe and remove the pipe.

9. Prise up the gauze screen retaining clips and remove the screen.

10. The removal of the rocker feed pipe is described under section 1.7100 and the removal of oil seals are described in the various sections in which they appear.

11. For removal of the oil piping on marine or industrial engines with heat exchangers fitted, the sleeve nuts should be loosened and the pipes withdrawn. It must be remembered that some oil will remain in these pipes and the appropriate action taken to avoid spillage.

Oil Distribution (Inspection and Overhaul)

12. Lubricating oil distribution pipes require only a visual inspection for damage, which if found the pipe must be replaced.

Oil Distribution (Refitting)

13. Attach the gauze screen to the fuel pump and press down the retaining clips.

14. Refit the delivery pipe between the oil pump and crankcase and tighten the two sleeve nuts.

15. The pipes between the oil filter, heat exchanger and/or crankcase can be repositioned and the sleeves tightened.

4.4000

OIL COOLER

Oil Cooler (Description)

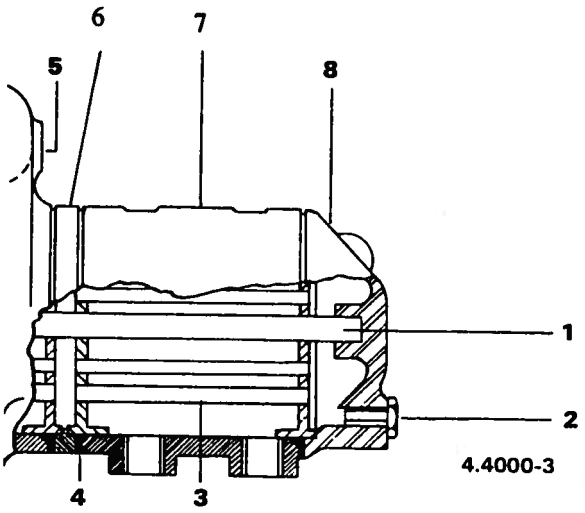
1. Two types of oil cooler are used on 220 and 330 cu. in. engines:
   (a) air blast and
   (b) water cooled
2. The air blast cooler is of light alloy construction and is fitted on the front of the radiator by a bracket assembly. Oil is cooled by air passing between the finned tubes of the oil cooler through which the oil is flowing. The oil is directed to and from the oil cooler by hose assemblies attached to the oil filter adaptor.

4.4000-2

1. Oil cooler
2. Hose assembly
3. Oil filter adaptor
4. Oil filter

3. On engines fitted with a heat exchanger, a small aluminium cylinder attached to the header tank houses the oil cooler. The cooling of the oil is achieved by passing raw water through a series of tubes surrounded by the oil which requires cooling.

4. Hose assemblies allow the flow of oil between the engine and oil cooler.



4.4000-3

1. Tie rod
2. Sea water drain plug
3. Oil cooler tube stack
4. Tube stack seals
5. Heat exchanger drain plug
6. Spacing ring
7. Oil cooler body
8. End cover

Oil Cooler (Removal)

5. Place a pan beneath the oil cooler hose assemblies to catch any oil in the system.
6. Remove the air blast oil cooler by unscrewing the two hose connections beneath the oil cooler, then remove the four nuts which attach the cooler to the radiator.
7. Removal, inspection, overhaul and refitting of the combined heat exchanger and oil cooler is described in section 5.5000

Oil Cooler (Inspection and Overhaul)

8. To cleanse the oil cooler prepare a solution of one part muriatic acid to nine parts of water. Add one pound of oxalic acid and 0.01 of a gallon of pyridine to every 5 gallons of solution required.
Note: The tank used to mix the solution must be of an acid resistant material.
9. Plug the oil inlet and outlet ports, immerse the cooler in the solution. Remove immediately when the bubbling and foaming action has ceased, (approximately 1 to 2 minutes).
10. Flush thoroughly with warm clean water. Repeat the operation if necessary.
11. Remove a plug from either the inlet or outlet port and attach an air hose with a maximum pressure of 170 lb/sq. in. Submerge the cooler in water. Air bubbles indicate any leaks that have occurred which will necessitate replacement of the cooler.

Oil Cooler (Refitting)

12. Refit the oil cooler to the radiator bracket assembly by fitting the four retaining nuts and bolts.
13. Reconnect the hose assemblies.

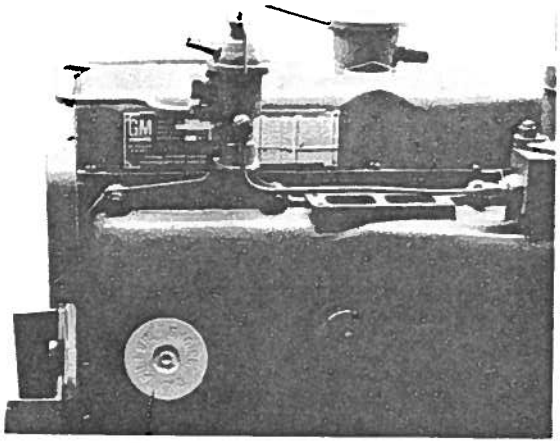
4.5000

OIL FILLER

Oil Filler (Description)

1. The oil filler cap is situated on top of the rocker cover although on some engines a second filler tube and cap are fitted to either the oil sump or side cover to enable easier filling.

Standard filler cap



Special filler cap

4.5000-1

Oil Filler (Removal)

2. A 90° anticlockwise turn is all that is required to remove the oil filler cap.
3. The filler tube is part of a welded assembly and therefore no further disassembly is necessary.

Oil Filler (Inspection and Overhaul)

4. The oil filler tube and cap require only a visual inspection for damage, which if found the cap or tube assembly must be replace.

Oil Filler (Refitting)

5. Fill the engine with the correct quantity and grade of oil. The grade of oil is shown under the recommended lubricants at the end of section 1 and the recommended quantities are listed below.

CAPACITIES

Engine Oil Sump:

Four cylinder, 220 cubic inch, Standard sump:

Total	14 Imp. Pints (8 Litres)
Refill	11 Imp. Pints (6 Litres)
Refill with filter element change	13 Imp. Pints (7 Litres)

Four cylinder, 220 cubic inch, Pressed steel deep sump:

Total	11 Imp. Pints (6 Litres)
Refill	8 Imp. Pints (5 Litres)
Refill with filter element change	11 Imp. Pints (6 Litres)

Six-cylinder, 330 cubic inch, Standard sump:

Total	17 Imp. Pints (10 Litres)
Refill	14 Imp. Pints (8 Litres)
Refill with filter element change	16 Imp. Pints (9 Litres)

Six-cylinder, 330 cubic inch, Pressed steel deep sump:

Total	19 Imp. Pints (11 Litres)
Refill	16 Imp. Pints (9 Litres)
Refill with filter element change	18 Imp. Pints (10 Litres)

Six-cylinder, 330 cubic inch, Cast aluminium deep sump (Off-Highway);

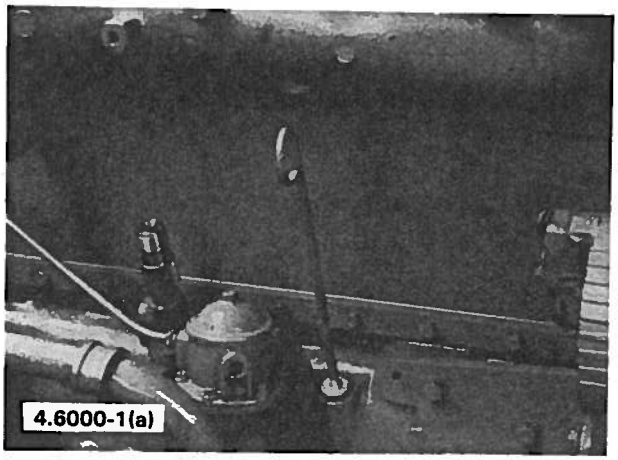
Total	16 Imp. Pints (9 Litres)
Refill	13 Imp. Pints (7 Litres)
Refill with filter element change	15 Imp. Pints (8 Litres)

4.6000

DIPSTICK

Dipstick (Description)

1. The dipstick is used to determine the quantity of oil in the engine oil pan. It is located either (a) on the side cover or (b) a dipstick tube, welded to the oil pan.



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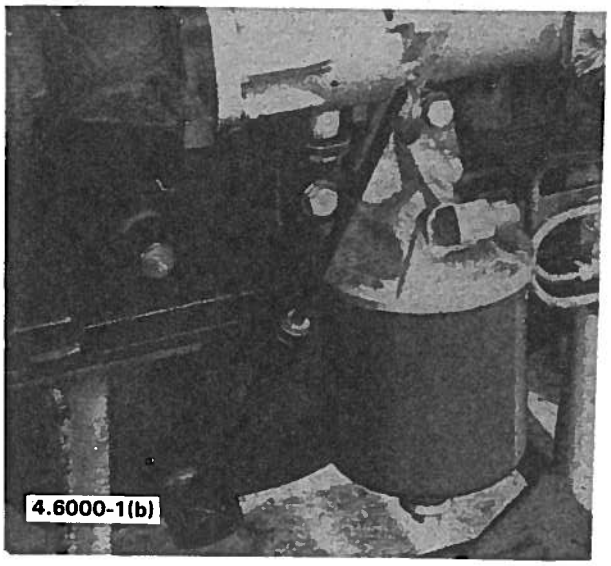
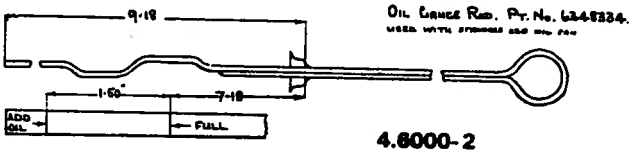


4.6000-1(b)

2. The dipstick has two marks scribed at the end with oil filling instructions.



4.6000-2

3. The oil should never be allowed to drop below the 'ADD OIL' mark, nor should oil be allowed above the 'FULL' mark.

4. The oil level should be checked daily with the engine stopped. If the engine has been running, ten minutes should be allowed for oil to drain into the sump before taking a reading.

Dipstick (Inspection and Overhaul)

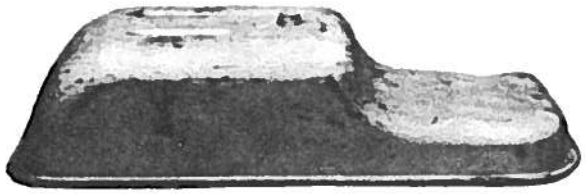
5. The dipstick requires only a visual inspection for damage, which if found, must be replaced.

4.7000

OIL PAN

Oil Pan (Description)

1. The 220 and 330 cu. in. engines may be equipped with either (a) a standard or (b) a deep sump, both of which can be treated for marine use. Dependent on the model application the oil pans may be provided with an inclination angle of 10°, 12°, 15°, 30°, or 45°.



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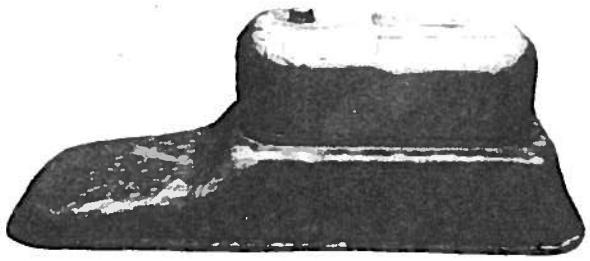


4.7000-1(b)

2. Some oil pans have an oil filler and/or dipstick tube fitted.

Oil Pan (Removal)

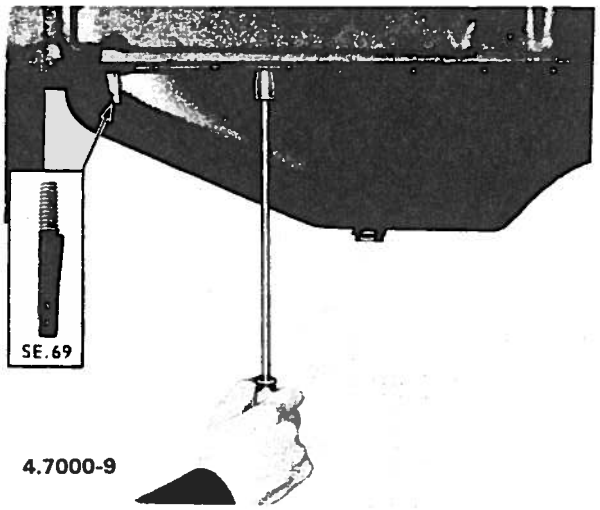
3. Place a tray beneath the sump, remove the drain plug and drain the oil.
4. Replace the drain plug.
5. Remove the securing screws, using screwdriver D1058 and lower the oil pan and gasket.

Oil Pan (Inspection and Overhaul)

6. There are no moving parts within the oil pan, therefore no wear could take place, however, a visual check for signs of damage or corrosion should be carried out.

Oil Pan (Refitting)

7. Clean any pieces of the old gasket from the cylinder block and oil pan.
8. Using a new gasket refit the oil pan. To facilitate the assembly of the oil pan, screw two retainers SE69 into the crankcase, one each side, so that the oil pan will locate accurately and prevent displacement of the gasket.
9. Tighten all screws evenly to a torque of 6-8 lbs. ft. (1 kg/m), using screwdriver D1058.



4.7000-9

10. Refill the oil pan with a recommended oil (see recommended lubricants at the end of section 1) to the full mark on the dipstick.
11. Run the engine and check for oil leaks.

4.8000

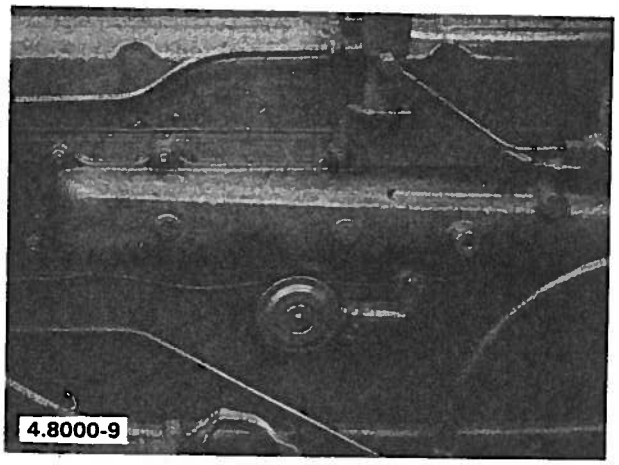
VENTILATION SYSTEM

Ventilation System (Description)

1. The ventilation system is designed to ensure that at all times when the engine is running a depression exists in the crankcase.
2. For maximum depression refer to the following table:

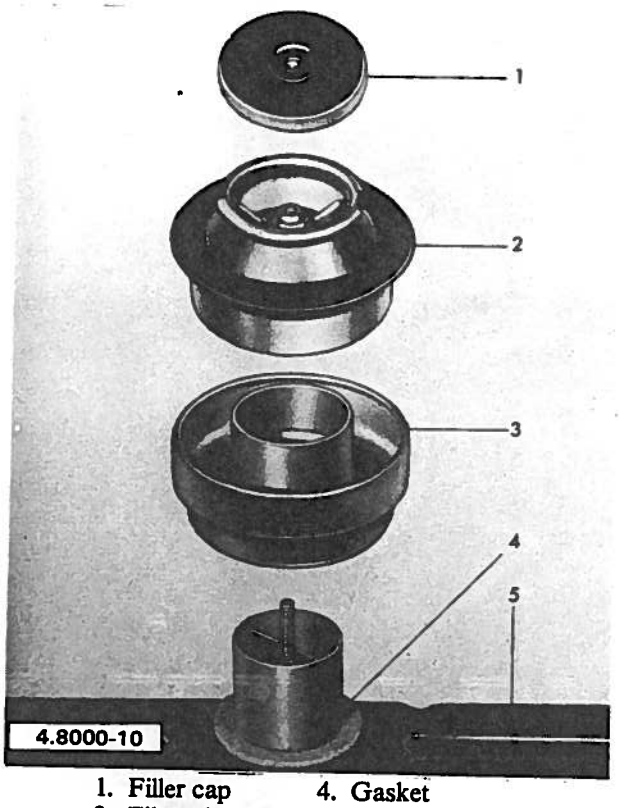
Inches of Water				
Engine	Speed of Engine (rpm)			
	1000	1500	2000	2600
220 cu.in.	0.5	0.8	1.1	1.3
330 cu. in.	0.3	0.9	1.6	3.0

3. Various ventilating systems have been used since the first engines were built. Each system has been described individually in the following paragraphs.
4. Originally on the six cylinder engines the crankcase was ventilated through a pipe connected to an outlet in the push rod cover. On the four cylinder engines the pipe was attached to a baffle chamber which communicated with the crankcase immediately above the oil pump drive gear.
5. The upper end of the pipe on both engines was connected to the air cleaner, and an oil bath type breather was mounted on the rocker cover.
6. The crankcase was ventilated by air drawn through the oil bath breather and after circulating round the crankcase, extracted through the outlet pipe by the air cleaner.
7. At engine serial numbers P & I 0148 on four cylinder engines and P & I 1229 on six cylinder engines, the combined oil filler and oil bath breather was deleted in favour of a plain filler neck with a sealing cap. This was introduced to improve the anti sludging characteristics. The filler neck was interconnected via a pipe between the push rod cover and the engine air cleaner, and had no provision for entry of cold air into the crankcase or rocker cover.
8. The current ventilation system was introduced at serial number P & I 10933 on four cylinder engines, and P & I 7571 on six cylinder engines.
9. This system consists of a vent. valve attached to the push rod cover with a rubber elbow connection to a stub pipe in the underside of the inlet manifold. This system is identical for both four and six cylinder engines.



Ventilation System (Removal)

10. On the original system the crankcase breather can be removed by first lifting away the oil filler cap and then releasing the nut securing the filter element to the rocker cover. The oil bath and element can now be withdrawn.



1. Filler cap
2. Filter element
3. Oil bath
4. Gasket
5. Rocker cover

11. On all systems unscrew the clips securing the hoses, elbows etc., and remove the pipes.
12. If a baffle chamber is fitted this can be removed by unscrewing the two retaining nuts and lifting the baffle chamber from its seating.
13. To remove the current vent valve, after withdrawing the rubber elbow, unscrew the clip and withdraw the vent valve from the push rod cover outlet.

Ventilation System (Inspection and Overhaul)

14. The crankcase breather used on early engines should be inspected for damage and then cleaned prior to reassembly as described in paragraphs 15-17 inclusive.
15. Rinse the element in paraffin/kerosene and blow out with compressed air.
16. Empty the oil bath and clean out any sediment.
17. Install the oil bath and refill to the indicated level with the recommended oil. Install the filter element, retaining nut, and oil filler cap.
18. All other components should be visually inspected for damage, especially rubber hoses.

Ventilation System (Refitting)

19. On engines with a baffle chamber apply a sealant on the inside of the connector and press the baffle chamber into position. Add the two retaining nuts and tighten to 6-8 lbs/ft (8.1-10.8 newton/metres).
20. Replace the vent valve, where fitted, onto the push rod cover outlet and tighten the clip.
21. Replace all the pipes and hoses into their respective positions and tighten all the clamps.
22. The crankcase depression should now be checked as follows:
23. Remove the dipstick.
24. Prepare a bung with a short length of tube installed so that a manometer can be connected, this assembly should be installed in the dipstick hole.
25. With the engine running a depression must always be noted within the crankcase, the maximum which should be obtained is shown in the table on page one.
26. To decrease the crankcase depression, the hole into the trunking from the stub pipe should be decreased. Should it be desired to increase the depression the diameter of the hole should be increased.