

# **WORKSHOP MANUAL SUPPLEMENT FOR MARINE ENGINES**

4.154 (200 SERIES)

# **workshop manual supplement for the 4.154 200 Series marine engine**

To be used in conjunction with  
the Workshop Manual  
Publication No. 601SER03821176

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Every endeavor has been made to ensure that the information contained in this book is correct at the date of publication, but due to continuous developments, Perkins Engines Inc., reserve the right to alter the contents without notice.

# General Data

Type .....	Four Cylinder, Four Stroke, In-Line
Bore (Nominal) .....	3.5 in (88,9 mm)
Stroke .....	4.0 in (101,6 mm)
Cubic Capacity .....	153.9 in <sup>3</sup> (2,523 litres)
Compression Ratio .....	21:1
Combustion System .....	Indirect Injection
Firing Order .....	1-3-4-2
Rotation (viewed from rear of engine) .....	Left Hand Rotation
Cooling System .....	Indirect (Heat Exchanger)
Fresh Water Capacity .....	25 Imp. pints (14,2 litres) 15 U.S. qts.
Cylinder Head Water Temperature .....	178°F (81°C)
Maximum Permissible Seawater Inlet Temperature .....	100°F (37,8°C)
Lubricating Oil Pressure (engine) .....	30/60 lbf/in <sup>2</sup> (2, 1/4, 2 kgf/cm <sup>2</sup> )—207/414 kN/m <sup>2</sup> at maximum speed and normal operating temperature.
Lubricating Oil Sump Capacity* .....	11.7 IMP. PINTS (6, 65 LITRES)
Total System .....	7.0 U.S. QTS.
	10.0 U.S. QTS.
Maximum Permissible Engine Compartment Temp. ..	140°F (60°C)
Operating Angles	
Max. installation angle aft. end down (Assumes 3° additional when underway):	17°
Maximum Continuous angle of	
Heel Port: .....	30°
STBD: .....	30°
Battery Cable Resistance .....	Not to exceed 0.0017 OHM.

## Gearboxes

All matters relating to marine gearboxes should be referred to the gearbox manufacturer's Distributor or Dealer.

Perkins' "Marine Engine Installation Know-How" manual is published by Marketing, and are available from:— Perkins Marine Engine dealers.

# Crankshaft

Perkins Marine Diesel engines. 200 Series are fitted with a crankshaft rear rope seal

## Crankshaft Rear Oil Seal and Housing.

If examination reveals the necessity to renew the oil seals the following procedure should be adopted.

With a half housing in a vice, and the seal recess uppermost, settle approximately 1 in (25 mm) of the seal, at each end, into the groove ensuring that each end of the seal projects 0.010/0.020 in (0,25/0,51 mm) beyond the half housing joint face.

Press, the remainder of the seal into position starting from the centre and working outwards.

Using a suitable round bar, roll and press the seal into position.

Fit the seal to the other half housing in a similar manner.

To refit the assembly, proceed as follows: — Thoroughly clean the joint and butt faces, removing all traces of the old joint.

Lightly coat the cylinder block and bearing cap side of the joint with jointing compound, and place the joint in position, ensuring that the securing holes are aligned.

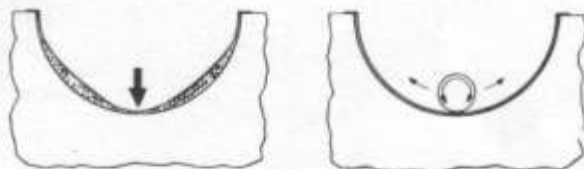
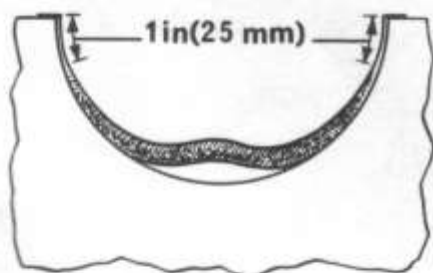
Lightly coat the butt faces of the half housings with jointing compound. Lubricate the exposed diameter of the rope seal with graphite grease.

Oil the crankshaft rear end around the oil return groove. Place the half housings in position on the engine and locate all setscrews in the cylinder block, and bearing cap face, finger tight only.

Tighten the clamping bolts to a torque of only 6 lbf ft (0,83 kgf m)—8 Nm.

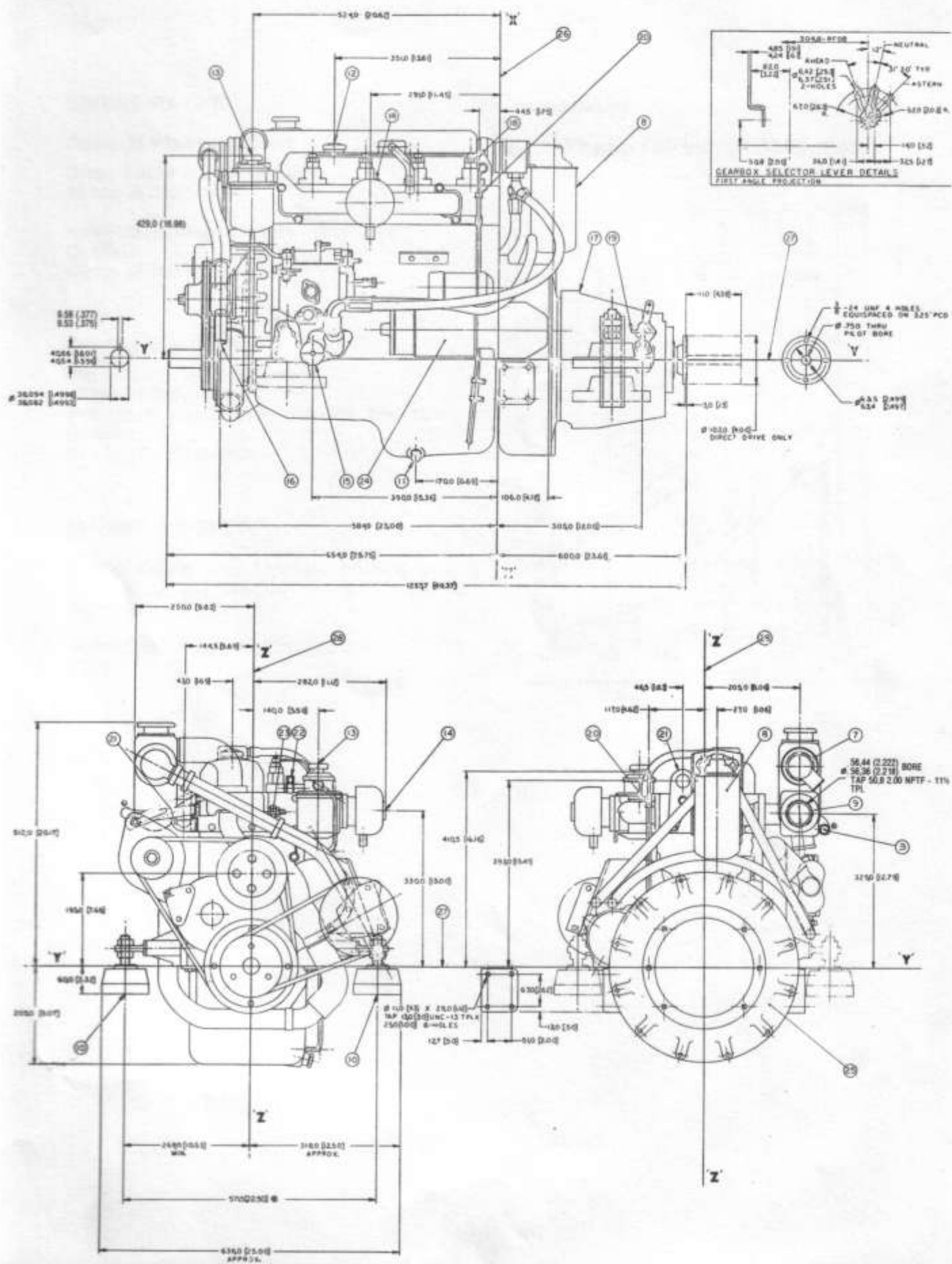
Tighten the setscrews in the cylinder block and bearing cap to a torque of 12 lbf ft (1,66 kgf m)—15 Nm.

Finally tighten the clamping bolts to a torque of 12 lbf ft (1,66 kgf m)—15N Nm.





## Dimensions



## ENGINE RATING

### General Pleasure Craft

Gross Output without Gearbox  
62 bhp at 3000 rev/min

Nett Shaft Horsepower with Direct Drive  
Gearbox  
58 shp at 3000 rev/min

### Commercial Craft

Gross Output without Gearbox  
62 bhp at 3000 rev/min  
Nett Shaft Horsepower with 2:1 Reduction  
Gearbox  
54 shp at 3000 rev/min

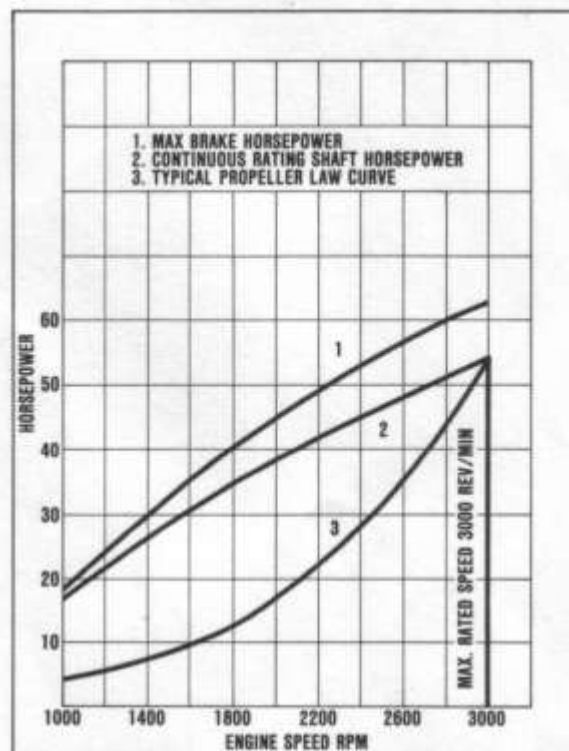
## ENGINE WEIGHTS

Marine Engine with Flywheel Housing and  
Flywheel but less Gearbox  
668 lb (299 kg)

Marine Engine Including 2:1 Gearbox  
803 lb (364 kg)

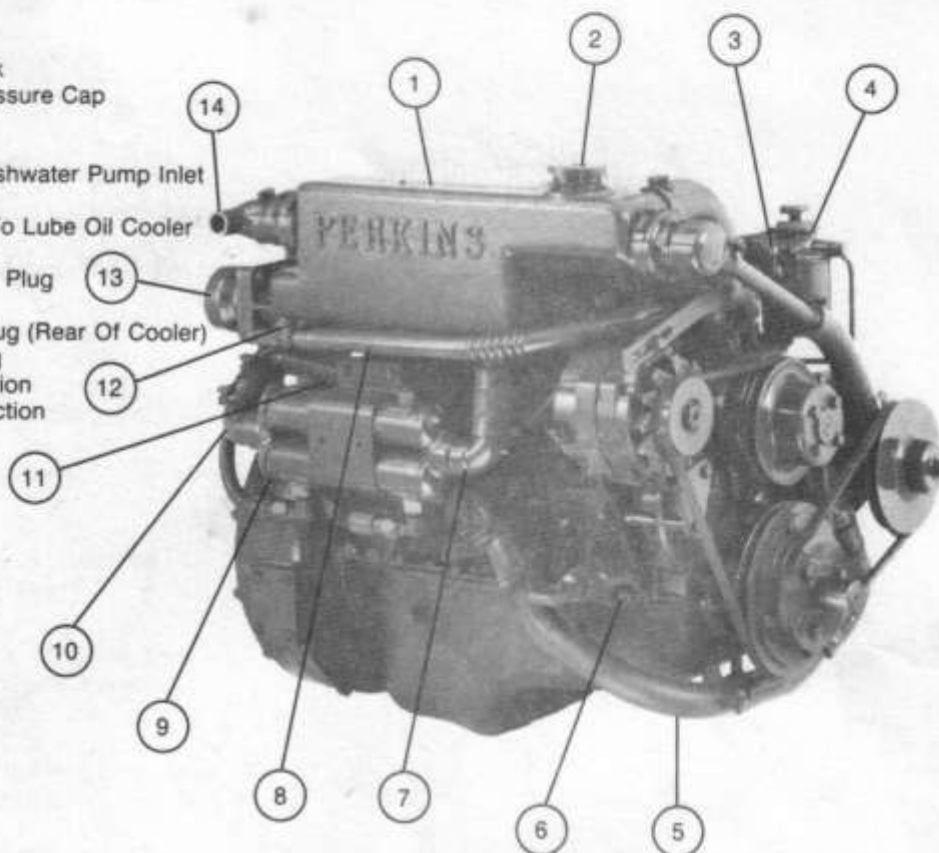
## Rating Details

62 bhp (46 kw) at 3000 rpm

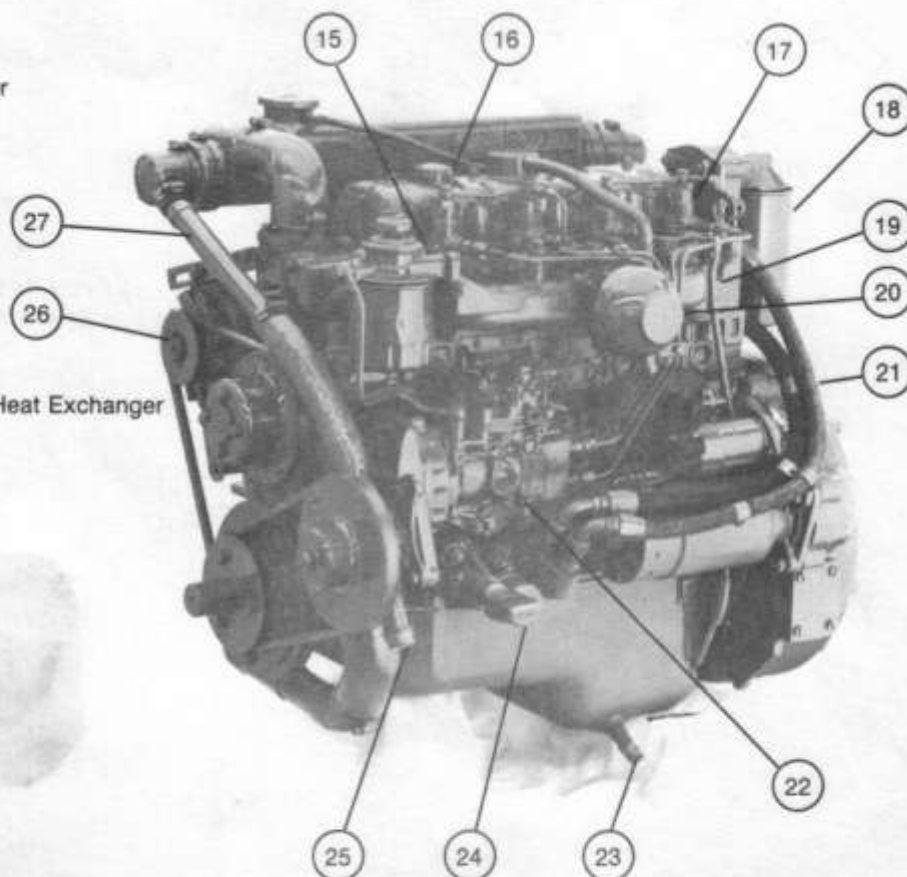


## Engine views

- 1 Header/Expansion Tank
- 2 Freshwater Filler & Pressure Cap
- 3 Fuel Inlet
- 4 Fuel Filter
- 5 Pipe, Oil Cooler To Freshwater Pump Inlet
- 6 Engine Front Mounts
- 7 Pipe, Heat Exchanger To Lube Oil Cooler
- 8 Hose, Air Bleed
- 9 Engine Oil Cooler Drain Plug
- 10 Engine Oil Cooler
- 11 Cylinder Block Drain Plug (Rear Of Cooler)
- 12 Header Tank Drain Plug
- 13 Exhaust Outlet Connection
- 14 Seawater Outlet Connection



15. Water Temperature Sender
16. Lube Oil Filler Cap
17. Fuel Oil Return
18. Lube Oil Filter
19. Dipstick & Tube
20. Air Filter
21. Lube Oil Pipes
22. Fuel Injection Pump
23. Lube Oil Drain Plug
24. Lube Oil Pressure Sender
25. Seawater Pump Inlet
26. Alternator
27. Pipe, Seawater Pump To Heat Exchanger



# Preventive Maintenance

If a Perkins marine diesel engine is to give long and trouble-free service, it is imperative that it be maintained in accordance with the following Periodical Attentions:—

## Daily

Check coolant level in header tank.  
Check sump oil level.  
Check engine and gearbox oil pressures (where gauge fitted).

## Every 150 hours or 3 months (whichever occurs first)

Drain and renew engine lubricating oil.  
Renew lubricating oil filter canister.  
Check both drive belt tensions.  
Check air intake gauze or screen.  
Check engine for leakage of oil or water.  
Clean sediment/water trap.

## Every 400 hours or 12 months (whichever occurs first).

Renew final fuel filter element.  
Check hoses and clips.  
Drain and clean fuel tank.  
Renew gearbox lubricating oil.  
Service atomisers.

## Every 2,400 hours

Arrange for examination and service of proprietary equipment, i.e. starter motor, generator, etc.  
Check and adjust valve tip clearances.



# Lubricating Oils

Lubricating oils should meet the requirements of the U.S. Ordnance Specifications MIL-L-46152 or MIL-L-2104C. Some of these oils are listed below. Any other oils which meet these specifications are also suitable.

## MIL-L-46152 OILS

Company	Brand	SAE Designation		
		0°F(-18°C) to 30°F(-1°C)	30°F(-1°C) to 80°F(27°C)	Over 80°F(27°C)
B.P. Ltd.	Vanellus M	10W	20W	30
Castrol Ltd.	Vanellus M		20W-50	20W-50
	Castrol/Deusol CRB	10W	20	30
	Castrol/Deusol CRB	5W/20		
	Castrol/Deusol CRB	10W/30	10W/30	10W/30
A. Duckham & Co. Ltd.	Castrol Deusol CRB		20W/50	20W/50
	Fleetol HDX	10	20	30
	Q motor Oil		20W/50	20W/50
	Fleetol Multi V		20W/50	20W/50
	Fleetol Multilite	10W/30	10W/30	10W/30
	Farmadcol HDX		20	30
Mobil Oil Co. Ltd.	Delvac 1200 Series	1210	1220	1230
	Delvac Special	10W/30	10W/30	10W/30
Shell	Rotella TX	10W	20W/20	30
	Rotella TX		20W/40	20W/40

## MIL-L-2104C OILS

Company	Brand	SAE Designation		
		0°F(-18°C) to 30°F(-1°C)	30°F(-1°C) to 80°F(27°C)	Over 80°F(27°C)
B.P. Ltd.	Vanellus C3	10W	20W/20	30
Castrol LTD:	Castrol/Deusol CRD	10W	20	30
	Agricastrol HDD	10W	20	30
	Fleetol 3	3/10	3/20	3/30
A. Duckham & Co. Ltd.	Farmadcol 3	3/10	3/20	3/30
	Essolube D-3 HP	10W	20W/	30
Esso Petroleum Co. Ltd.	Delvac 1300 Series	1310	1320	1330
Mobil Oil Co. Ltd.	Rimula CT	10W	20W/20	30
Shell	Rotella TX	10W	20W/20	30
	Rotella TX		20W/40	20W/40

Where oils to the MIL-L-46152 or MIL-L-2104C specification are not available, then oils to the previous specification MIL-L-2104B may continue to be used providing they give satisfactory service.

Lubricating oils for use in Perkins Diesel engines should have a minimum viscosity index of 80.

The above specifications are subject to alteration without notice.

## To Renew Lubricating Oil Filter Element

1. Unscrew filter canister from filter head.
2. Discard old canister.
3. Clean filter head.
4. Using clean engine oil, liberally oil top seal of replacement canister.
5. Screw replacement canister onto filter head until seal just touches head and then tighten by hand as per instructions on canister. Where a tool is available, tighten to 12-15 lbf ft (1,66/2,07 kgf m):
6. Run engine and check for leaks.

# Cooling System

A centrifugal type water pump, mounted on the front of the engine and belt driven from the crankshaft, delivers coolant directly into the cylinder block and head.

When the thermostat valve lifts, water is then passed through the combined heat exchanger/exhaust manifold/header tank unit. Following this, the fresh water is circulated through a dual engine and gearbox tubular lubricating oil cooler before returning to the engine freshwater pump.

An external by-pass arrangement allows the fresh water to circulate within the engine until the temperature allows the thermostat to open. Seawater is circulated through the heat exchanger by means of a self-priming vane type pump before being expelled overboard or into a water injected exhaust system.

## Seawater Pump

The seawater pump is used in conjunction with the heat exchanger and is bracket mounted onto the timing case cover.

The pump is belt driven from the crankshaft pulley.

The pump is self priming but it is advisable to prime it when first commencing service or after the engine has been laid up for any considerable period.

## To Remove the Seawater Pump

Uncouple the inlet and outlet connections.

Unscrew the two nuts and bolts which attach the body of the pump to the bracket. The pump can now be freed of the drive belt and lifted off.

## To Refit the Seawater Pump

Secure the pump to the bracket in the reverse manner to the removal as described above.

In order to tension the drive belt, leave the pump to bracket securing nuts slack, lever the pump to tighten the belt and maintain the tension until the securing nuts have been tightened.

Check that sufficient tension is present to prevent the drive from slipping but not over tight which could damage the pump shaft bearings.

Recheck after a short period of running.

## To Dismantle the Seawater Pump

Remove the end cover fixed to the water pump body by six slotted screws and remove the rubber impeller and wear plate.

Remove the nut securing the pulley and draw off the pulley from the shaft.

A suitable press may be used to press out the impeller shaft together with the water pump bearing.

The cam in the impeller housing may then be detached by removing the single securing set-screw.

Remove the rubber seal in the impeller housing and "O" ring and seal in the bearing housing.

If wear indications are apparent on the impeller wear plate or water pump end plate, both of these may be reversed. In the case of the end plate it may be necessary to remove the stamped instructions by means of emery paper. This will remove the arrows showing the rotation of the impeller, but this rotation can be ascertained by turning the engine and noting the rotation of the pump coupling.

## To Reassemble the Seawater Pump

The reverse order to the procedure above should be adopted for the reassembly of the seawater pump.

Care should be taken when replacing the rubber impeller that the blades all lay in the same direction relative to the rotation of the pump i.e. blades trailing.

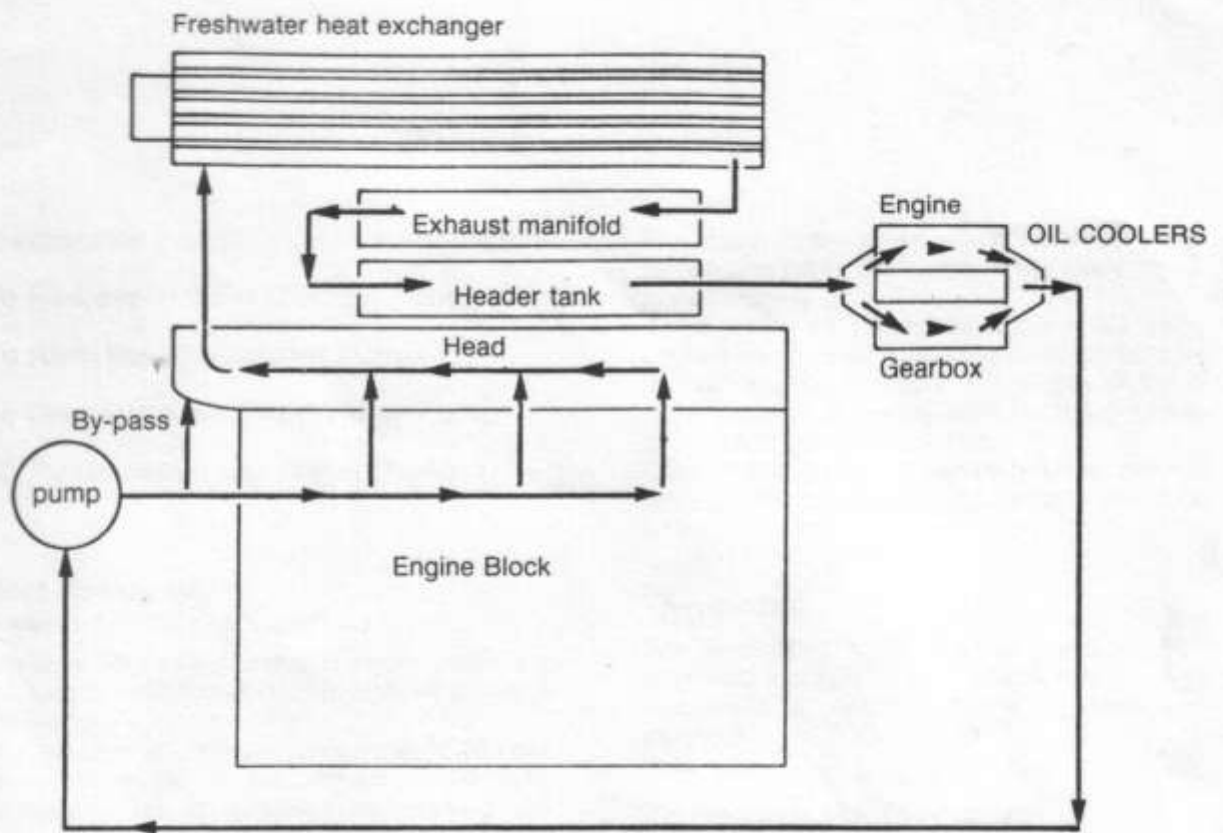
When the rubber impeller is being fitted, it must be coated with MARFAK 2HD grease or glycerine as an alternative.

When refitting the cam in the impeller housing, coat the top surface, rear face and securing setscrew hole with a suitable jointing compound.

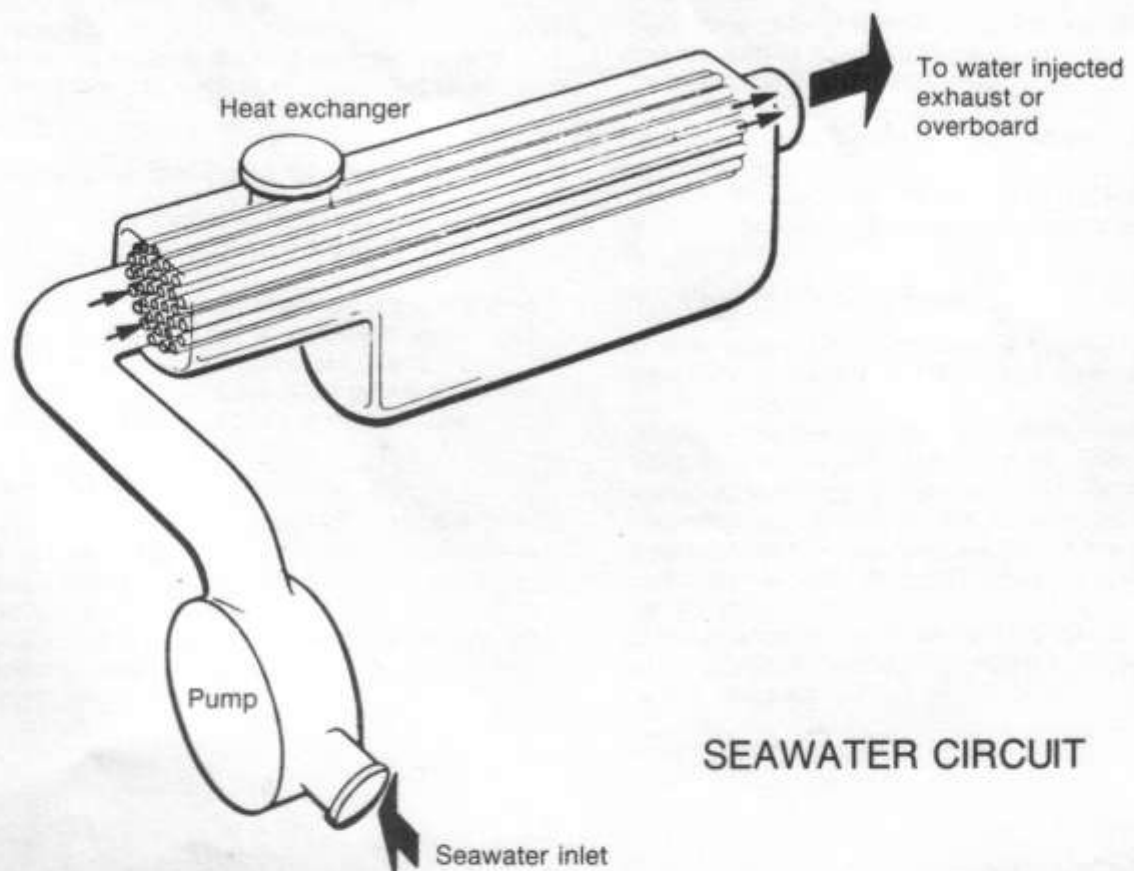
It is possible to fit the cam to the housing one way only.

## Cautionary Note

Because the water pump contains a rubber impeller it must not be run in a dry condition. If the craft is to be laid-up and the engine unused for any length of time the water pump should be packed with MARFAK 2HD grease or coated with glycerine.



FRESHWATER SYSTEM



SEAWATER CIRCUIT

**Freshwater Pump** See (basic manual)

**To Remove the Freshwater Pump**

**To Refit the Freshwater Pump**

**To Dismantle the Freshwater Pump**

**To Reassemble the Water Pump**

### **Heat Exchanger**

(Refer to Engine views, page 5.)

The heat exchanger unit is combined with the exhaust manifold and header tank as a single assembly.

The function of the heat exchanger is to cool the fresh water in the closed circuit with seawater. This is achieved by passing the seawater through a series of small bore tubes and guiding the heated fresh water, piped from the engine, over the tubes with the aid of a number of brass baffles. Because the exhaust manifold is also contained in the heat exchanger/header tank assembly, the water acts as a cooling media for the manifold gas passages.

In order to clean a choked-up tube stack it is not necessary to remove the assembly from the engine.

### **To Remove the Tube Stack**

Remove the freshwater filler cap, unscrew the water drain plug or open the tap, if fitted, and drain the water.

Loosen the two hose clips securing the end covers at both ends of the heat exchanger assembly and remove the end covers.

This will expose the tube stack which may now be drawn out from within the header tank.

### **Cleaning**

If the tube stack is badly choked the best method of cleaning is to place the assembly in a hot, preferably boiling caustic soda solution. This will loosen all foreign matter adhering to the unit. The outside of the tubes should be relatively clean as these are in the closed circuit.

The inside of the tubes, which have salt water passing through them, are more likely to require cleaning.

If the inside of the tubes are not so badly choked as to require using caustic soda, they can be cleaned by pushing a length of 1/8 in (3.18 mm) rod down the tubes in the opposite direction to the flow of water.

Care should be taken, when pushing the rod through the tubes, not to damage the tube walls.

### **Thermostat**

The thermostat is situated in a housing attached to the front of the cylinder head and its function is to control the engine coolant temperature.

### **To Remove the Thermostat**

Drain the freshwater coolant from the system by removing the filler cap from the top of the header tank and removing the drain plug from the bottom rear of the header tank/heat exchanger assembly. The cylinder block can be drained by removing the drain plug from the right hand side of the block, at the rear behind the lubricating oil/gearbox oil cooler.

Remove the two setscrews securing the top water connection situated on the top of the thermostat housing at the forward end of the cylinder head.

The top water connection may now be removed and the thermostat lifted out of its location.

### **To Test the Thermostat**

If it is suspected that the thermostat is not operating correctly it may be tested in the following manner.

Immerse the thermostat in a suitable container filled with water and gradually heat. Check the water temperature at frequent intervals with a thermometer and when the thermostat valve opens check that the temperature of the water corresponds with the figure which is stamped on the thermostat.

If the thermostat does not function properly no attempt should be made to adjust it. Replace it with a new unit.



### **To Replace the Thermostat**

Clean the two joint faces thoroughly. Place the thermostat in its location making sure that it is seated correctly.

Using a new joint and suitable jointing compound fit the top water connection and secure with setscrews and spring washers to a torque of 24 lbf/ft (3,32 kgf/m).

Refill the closed circuit cooling system with fresh water through the filler situated on the top of the header tank.

### **Water Pump Belt Adjustment**

Slacken the nut and bolt securing the alternator to the adjusting lever.

Slacken the adjusting lever to thermostat housing securing setscrew.

Slacken the bottom support bracket nut and bolt to alternator.

Sideways movement of the alternator, limited by the adjustment lever should now be possible.

With the belt in position over the pulleys, pull the alternator away from the cylinder block until the drive belt is tensioned. Tighten the adjusting lever to alternator nut and test the tension in the following manner.

The tension should be adjusted so that, without undue pressure, the belt can be depressed approximately 3/8 in (10 mm) with the thumb applying pressure at a point midway along the longest unsupported length of the belt (between the alternator pulley and crankshaft pulley).

When the correct tension has been achieved, the alternator to bottom support bracket nut and bolt should be tightened followed by the adjusting lever to the thermostat housing set-screw.

Incorrect adjustment of the belt can result in eventual failure. If the adjustment is too slack belt slip will occur. The efficiency of the water pump will be reduced which could lead to overheating. The output of the alternator would also be reduced.

If the adjustment is too tight the water pump and alternator bearings will be overloaded which will result in early failure.

### **New Belts**

When a new driving belt is fitted it should be checked and readjusted after a short period of running to take up the initial stretch common to new belts.

### **To Remove the Engine/Gearbox Oil Cooler**

If a sump drain pump is fitted it will have to be removed as follows: —

Unscrew the union securing the drain pump to the sump. The clamp which secures the pump body to the cooler support bracket with two nuts and bolts may now be removed to enable the pump assembly to be drawn out of the sump.

Care should be exercised when withdrawing the drain pump suction pipe from out of the sump to prevent damage to the pipe.

Drain off the fresh water coolant by removing the drain plug at bottom rear of the cooler body.

Loosen the clips from the hoses connecting the inlet to the cooler from the bottom outlet of the heat exchanger and the outlet from the cooler to the pipe taking the coolant back to the fresh water pump.

The flexible lubricating oil pipes may now be disconnected from the cooler.

Four nuts and bolts, two at the top and two at the bottom secure the clamp holding the cooler body to the support bracket; their removal will enable the clamp and cooler body to be detached.

### **To Clean the Oil Cooler**

Because of its integral construction it is not possible to dismantle the oil cooler.

However, because only fresh water is used as the cooling medium blockage caused by foreign bodies is unlikely.

If it is necessary to clean the unit, firstly remove all traces of oil by dipping the unit in a container of kerosene or paraffin and drying thoroughly. Prepare a solution of caustic soda in hot water in a container and immerse the cooler in it.



