

## Chapter Four

# Lay-up and Fitting Out

### LAY-UP

Boats that are stored for more than a month require careful preparation for the lay-up. This is necessary to prevent the engine from freezing. A thorough service will also minimize damage from corrosion or fuel system contamination. Begin the service, if possible, while the boat is still in the water.

If the boat has been removed from the water, a supply of cooling water must be made available to the engine. This can be accomplished using a water hose attached to the water pump inlet. Always start the water flow before starting the engine.

#### CAUTION

*Some of the following steps require water for the cooling system. The boat must be in the water, or a source of water must be connected to the seawater cooling pump.*

#### NOTE

*Except where specified, F and D series engines are included when a basic model num-*

*ber is specified. For example, if model 3GM is called out in a procedure, the procedure also applies to 3GMD and 3GMF.*

1. Run the engine until it reaches normal operating temperature.
2. Change the engine oil and filter as described in Chapter Three.
3. Use a suitable engine fogging oil as instructed by the oil manufacturer.
4. Thoroughly inspect the engine, including the cooling and fuel systems. Perform service work that will protect against damage during extended storage, such as replacing hoses and gaskets. Make a list of problems that should be corrected before the boat is returned to service.
5. If the engine is equipped with freshwater cooling, flush and change the freshwater coolant as described in Chapter Three.
6. Drain the seawater cooling system as described in this chapter. Be sure to drain or blow out all portions of the system.

**NOTE**

*In some instances, such as to prevent rust formation, it may be desirable to fill the seawater cooling system with an antifreeze solution. Refer to the following section in this chapter.*

7. If the seawater cooling system was drained, remove the seawater pump impeller as described in Chapter Eight. Lubricate the impeller with dishwashing soap, then install the impeller in the pump housing. Assemble the pump, but do not tighten the cover retaining screws.

**NOTE**

*Make a highly visible sign as a reminder that the seawater pump is inoperable. Attach the sign to the controls.*

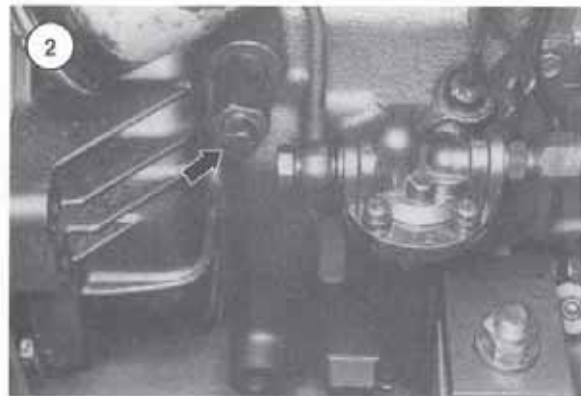
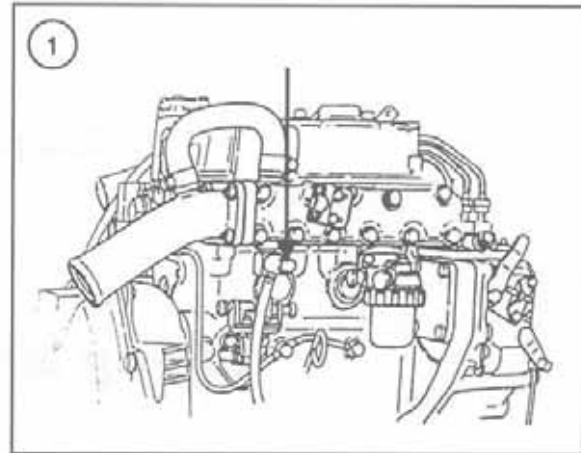
8. Apply lubricant to the control cables and all linkage pivot points.
9. Loosen belt tension for the pump and alternator drive belts.
10. Seal or cover all engine openings to prevent the entrance of water, dirt or debris. Make a list of all the sealed locations to be sure they are all uncovered when returning the engine to service.
11. Wipe any dirt or corrosion off the engine and transmission, then use a rag to apply oil or a rust inhibitor to all engine surfaces.
12. Fill the fuel tank so less condensation will form. Add a good-quality antibacterial additive (biocide) and fuel stabilizer to the fuel tank.
13. Remove the battery from the boat. Tape the vent holes closed and clean the battery case with a baking soda solution to remove any traces of corrosion and acid, then rinse with cold water. Check the electrolyte level in each cell and top off with distilled water as required. Cover the terminals with a light coat of petroleum jelly. Store the battery in a cool, dry place.

**NOTE**

*Remove the battery from storage every 30-45 days. Check electrolyte level and slow-charge for five or six hours at 6 amperes.*

**COOLING SYSTEM DRAINING**

The engine seawater cooling system must be properly drained for storage during the winter months in areas where temperatures fall below 32° F (0° C). If it is not, the engine block or cooling system may be cracked by the expansion of frozen water.



The following procedures are designed to help prevent unnecessary engine damage during winter storage.

To ensure that the cooling system is completely drained, it may be necessary to readjust the position of the engine to drain all water.

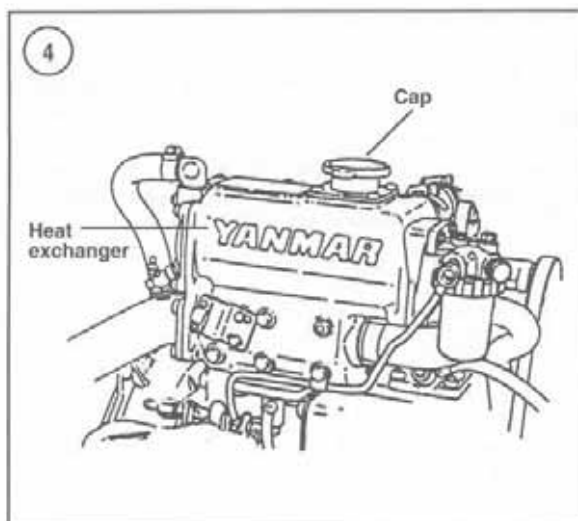
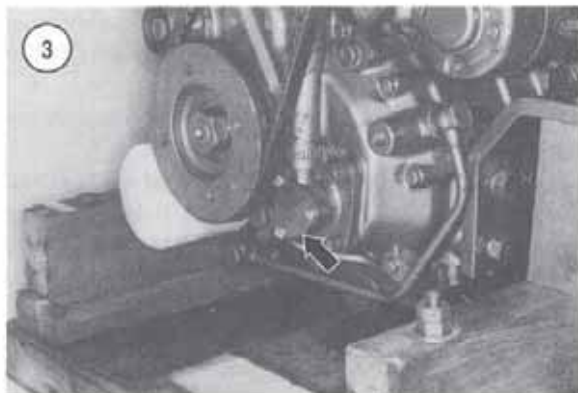
It is possible that some water will remain in the system. Filling it with an antifreeze solution will protect the seawater cooling system.

**Seawater Cooling System**

1. Place a suitable container under each drain, if space permits. This will prevent water from draining into the bilge.

**NOTE**

*If no water flows from a drain, check the drain to make sure it is not obstructed or plugged.*



2. On 3GM, 3GM30, 3HM and 3HM35 engines, open the drain on the underside of the exhaust manifold (Figure 1, typical).
3. Open the drain on the cylinder block (Figure 2, typical).
4. Remove the lower end of all cooling system hoses from the engine, pump and exhaust manifold. Lower the hoses and allow them to completely drain. Reconnect the hoses and clamp securely.

**NOTE**

On 1GM and 1GM10 engines, access is restricted to the upper water pump cover screw. If a suitable tool is not available, it may be necessary to remove the crankshaft pulley for access to all of the water pump cover screws.

5. Loosen the cover screws on the seawater pump (Figure 3, typical) and drain any water in the pump. If the gasket is damaged, remove the cover and install a new gasket and the cover.
6. Allow the cooling system to drain completely, then close all drains.

**Adding antifreeze**

The following procedure pertains to seawater cooling systems and is designed to provide additional protection against damage due to freezing temperatures while the boat is in storage.

**CAUTION**

*Do not run the engine after performing the storage service procedure that follows. Before returning the boat to service, drain the seawater cooling system as described in this chapter.*

1. Refer to Chapter Eight to remove the thermostat and gasket. Discard the gasket.
2. Make sure the seacock or water inlet to the seawater pump is closed.
3. Pour a 50/50 solution of pure soft water and ethylene glycol antifreeze through the thermostat hole into the engine until the cylinder head, block and manifold are full.
4. Reinstall the thermostat with a new gasket.

**Freshwater (Closed) Cooling System**

The freshwater section of a cooling system need not be drained during winter months, provided it is filled with a 50/50 solution of pure soft water and ethylene glycol antifreeze. However, if draining the freshwater cooling system is necessary, use the following procedure.

Note that the following procedures address the freshwater and seawater sections of the cooling system separately. If the freshwater portion is not being drained, follow the draining procedure for the seawater section.

**Freshwater (closed) cooling section**

1. Place containers under the drains, if space permits. This will prevent coolant from draining into the bilge.
2. Remove the pressure fill cap from the heat exchanger (Figure 4).

**WARNING**

*Ethylene glycol is an environmental toxic waste that cannot be legally flushed down a drain or poured on the ground. Put it in suit-*

able containers and dispose of it according to local regulations. Make sure to wipe up any spills and cover any containers of antifreeze. Keep antifreeze out of the reach of children and animals.

3. Open the drain on the underside of the exhaust manifold (Figure 1).
4. Open the drain on the engine block (Figure 2, typical).
5. Allow the freshwater section to drain completely.
6. On models equipped with a remote reservoir, disconnect the hose to the engine and drain the coolant from the reservoir. Reconnect the hose.
7. Close the drain plugs.
8. If refilling the freshwater section, refer to Chapter Three for the filling procedure.

### Seawater cooling section

Refer to the following procedure to drain the seawater section.

1. Place a suitable container under the drain, if space permits. This will prevent water from draining into the bilge.

#### NOTE

*If no water flows from the drain, check the drain to make sure it is not obstructed or plugged.*

2. Open the drain on the underside of the exhaust manifold end cap (Figure 2).
3. Allow the water to drain completely, then close the drain.
4. Loosen the cover screws on the seawater pump (Figure 3) and drain any water in the pump. If the gasket is damaged, remove the cover and install a new gasket and the cover.
5. Remove the lower end of the cooling system hoses from the pump and exhaust manifold. Lower the hoses and allow them to completely drain. Then reconnect the hoses and clamp securely.

#### NOTE

*It is possible that undrained water may remain. Protect the seawater cooling section by filling it with an antifreeze solution.*

### FITTING OUT

Preparing the boat for use after storage is easier if the engine was properly prepared before storage. Refer to the list of needed work that was to be performed before returning the engine to service. If there is other work to be

done, determine if the work is easier, and possibly more economical, if performed before returning the engine to service.

1. Remove all covers placed over engine openings during lay-up.
2. If the seawater cooling system is filled with an antifreeze solution, drain the antifreeze from the system using the draining procedure described for the seawater cooling system or the procedure for the seawater section if equipped with a freshwater (closed) cooling system.
3. If left loose during lay-up, tighten the seawater pump cover screws (Figure 3).
4. Adjust belt tension for the water pump and alternator drive belts as described in Chapter Three.
5. Replace all fuel filters.
6. If equipped with a fuel tank drain valve, open the drain valve and remove any water that may have accumulated in the tank.

#### WARNING

*Be sure to have a Coast Guard-approved fire extinguisher on hand whenever working around fuel.*

#### NOTE

*If the fuel in the fuel tank is dirty, old or contaminated with water, drain or pump out the fuel. Clean the tank and refill with fresh, clean fuel. Although fuel filters will remove most contaminants, excessively dirty fuel may clog the filters or enter the engine, causing damage.*

7. Bleed the fuel system as described in Chapter Seven.
8. Check the battery electrolyte level and fill if necessary. Make certain the battery has a full charge; recharge if necessary. Clean the battery terminals and install the battery, making sure the cables are connected properly. Cover the battery terminals with a light coat of petroleum jelly.
9. Check the crankcase oil level. Add oil, if necessary. If the oil was not changed at time of lay-up or if the engine has been in storage for an extended period of time, change the oil and oil filter.
10. Move the engine control to the STOP position. Position the decompression lever in the ON position. Engage the starter and crank the engine for 30 seconds. This procedure will pump engine oil to the engine bearings and other engine parts.
11. On engines equipped with a freshwater cooling system, check the coolant. If the coolant is contaminated or has reached its scheduled replacement time, drain, flush and refill the freshwater cooling system.

12. Thoroughly inspect the engine. Check for leakage, rust or corrosion that will affect engine operation. Check all hoses for deterioration and clamps for tightness.
13. Check all through-hull fittings.
14. Make sure water is available to the cooling system.
15. Operate all engine controls to be sure they operate properly and smoothly.
16. Start and run engine. Check for oil and water leaks. Check engine operation.
17. Tune-up engine as described in Chapter Three.