

# CHAPTER 4

## MAINTENANCE

### 4-0 INTRODUCTION.

This chapter contains the maintenance and repair procedures that can be accomplished by the crew while the boat is in their custody, in port or underway, with the limited tools and repair parts/ supplies on board. This is the first level of regular Preventive Maintenance Schedules (PMS) administered and supervised by the U.S. Naval Academy. Included are actions that serve to alert the crew of certain safety related maintenance and repair actions that should be attended to periodically. The tool kit provided on each NAVY 44 has a limited assortment of tools, but has the necessary tools to accomplish the simple, part replacements listed in this chapter.

### 4-1 CARE OF SAILS AND RIGGING.

1. Every time a sail is hoisted or an item of equipment is used it should be inspected for condition. A torn sail should not be hoisted, rather the next best suitable alternate should be used, i.e., use the #2 Genoa if the #1 is in need of repair.
2. Simple repairs can be accomplished onboard with the sail repair kit.
3. Tape sharp objects that may cause chafe.

### 4-2 AUXILIARY DIESEL ENGINE.

The following maintenance and corrective procedures are to be used in conjunction with the equipment manuals and as necessary in accordance with scheduled preventive maintenance on the following systems:

- fuel system
- cooling system
- starter
- lubricating oil
- alternators
- refrigeration compressor.

### 4-2.1 FUEL SYSTEM.

All diesel fuel supplied to the engine is passed through a primary filter/separator and a secondary engine mounted filter.

#### **WARNING**

**WORK ON THE FUEL SYSTEM ONLY WHEN THE ENGINE IS COOL.**

#### **NOTE**

Contaminated fuel removed from the system or used in the cleaning of fuel system components should be delivered to a contaminated fuel disposal station. Do not dump it at sea.

### 4-2.1.1 PRIMARY FUEL FILTER/SEPARATOR CLEANING AND/OR REPLACEMENT.

The primary Racor 500MA filter/separator is mounted behind the engine compartment on the bulkhead to port. Replace the filter cartridge if water or debris is identified in the sight bowl on the bottom of the filter assembly.

Before starting this procedure ensure that the following are on hand:

- RACOR replacement filter element, Part No. RACOR R60T w/gasket.
  - Clean lint-free rags.
  - A spill container, (bucket).
  - A container with clean diesel fuel.
1. Isolate the unit by securing the fuel supply and return shut-off valves.
  2. Place a suitable spill container directly under the filter/separator.
  3. Open the bottom drain petcock and drain sediment and/or moisture.
  4. SPIN OF the filter element from the housing assembly.
  5. SPIN OFF and separate the sediment bowl from the filter element.
  6. Clean the sediment bowl.
  7. Clean the exterior of the assembly.

8. If a new filter element is available, moisten the new top gasket with clean diesel fuel and place into the race on the top of the filter element, with the beveled surface facing the filter element.
9. If a new filter element is not available SPIN ON the old filter element and go to step 11.
10. SPIN ON the filter to the Assemble.
11. SPIN ON the sediment bowl.
12. Open the fuel supply and fuel return valves located in the bilge.
13. Use the fuel priming pump (black button) on the top of the filter assembly to draw fuel into the filter, or fill directly with clean diesel fuel..
14. Start the engine and let run at a fast idle to ensure the positive fuel continues to flow.
15. If engine does not start or if it dies after starting bleed the fuel system. (See 4-2.1.3 Bleeding the Fuel System procedures below).

#### 4-2.1.2 SECONDARY FUEL FILTER.

Before starting this procedure ensure that the following are on hand:

- Replacement fuel filter, Fram C1191A, NSN 2910000571421.
- 7/16-inch open-end wrench.
- Clean lint-free rags.
- A spill container, (bucket).
- A container with clean diesel fuel.

The secondary filter is an engine mounted unit located on the starboard side of the engine, aft of the manual fuel lift pump. This is not a cleaning item. Replace it when the primary fuel filter is replaced.

1. Isolate the filter assembly by securing the fuel supply and return shut off valves.
2. Use a 7/16-inch open-end wrench to unscrew the retaining bolt from the center of the top cover.
3. Remove the filter element and bottom cover. Discard the element.
4. Clean the seating surfaces, visually inspect the gasket sealing rings, and center in position. Replace the gasket if necessary.
5. Clean the exterior of the filter assembly.

6. Fit a new filter element to the bottom cover. Place squarely against top cover and tighten the retaining bolt.
7. Open the fuel supply and return shut-off valves.
8. Start the engine and let run at a fast idle to ensure the positive fuel continues to flow.
9. If engine does not start or if it dies after starting bleed the fuel system. (See 4-2.1.3 Bleeding the Fuel System procedures below).

#### 4-2.1.3 BLEEDING THE FUEL SYSTEM.

When any component of the fuel system is opened to the atmosphere, it must be bled of any trapped air. See Figure 4-1 Engine Bleed Points.

Before starting this procedure ensure that the following are on hand:

- Clean lint-free rags.
- 5/16-inch box wrench.
- 5/8- inch open-end wrench.

1. Ensure that the fuel supply and return valves are OPEN.
2. Ensure the ENGINE-SHUTDOWN T-Handle in the cockpit is PUSHED IN (i.e., normal running position).
3. Disengage the transmission by pulling out the Morse control clutch disengage button.
4. Push the throttle to the fully open position.
5. Use a 5/16-inch box wrench to crack open the fuel injector pump vent screw. (bleed point #1).
6. Manually work the fuel lift pump lever until a solid stream of fuel flows from the bleed screw. Close the fuel injector pump vent screw.
7. Use a 5/16-inch box wrench to crack open the fuel governor vent screw (bleed point #2).
8. Manually work the fuel lift pump lever until a solid stream of fuel flows from the bleed screw. Close the fuel governor vent screw.
9. Use a 5/8-inch open end wrench to crack open the fuel injector supply lines for each injector, (bleed points #3).

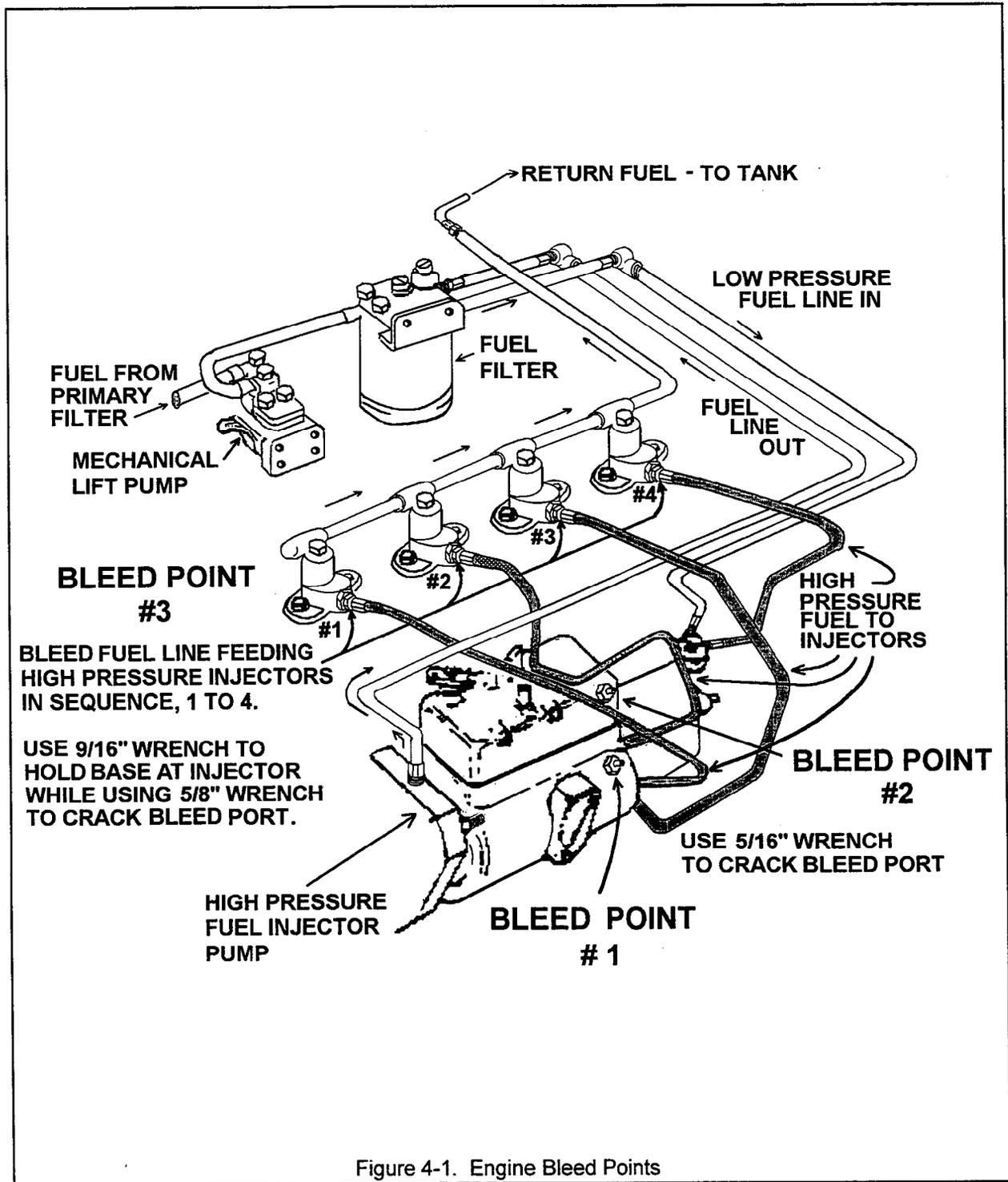


Figure 4-1. Engine Bleed Points

## **WARNING**

### **STAND CLEAR OF MOVING ENGINE PARTS.**

10. Energize the system by placing the ENGINE BATTERY SWITCH in the ON position.
11. Place the throttle nearly fully OPEN.
12. Push the engine PREHEAT and START buttons simultaneously to crank the engine several revolutions (this will pump up the fuel system) and bleed the fuel injectors.
13. Crank the engine until each injector emits a solid spurt of fuel.
14. Tighten each injector supply line sequentially starting at #1.
15. As injector supply line #4 is tightened the engine should kick over. Run at a fast idle to ensure the fuel system is properly bled.

### **4.2.2 CRANKCASE OIL AND FILTER CHANGE.**

Before starting this procedure ensure that the following are on hand:

- Clean lint-free rags.
- Dirty oil container.
- Transfer pump.
- Replacement Oil Filter, either of the following:

Purolator	L10017
AC	PF-13
FRAM	PH16
Motorcraft	FL-300
WIX	51084

- 6-inch crescent wrench.
- Oil Filter wrench.
- 4-quarts, engine oil, either of the following:  
Standard Navy Stock, Type 9250,  
SAE 30 HD  
NSN 9150-00-181-8229  
Mil Spec 9250601L  
Code 54161  
or  
Chevron, Delo 400, SAE 30  
Union 76, Truck motor oil SAE 30  
Any good grade SAE 30  
Multi Vis oils SAE 10W30  
API Service Grade CC or CD

1. Engine must be warm, at least 150 degrees for oil to flow freely.
2. Ensure BATTERY SWITCHES are OFF.
3. Remove oil fill cap on valve cover and pull dipstick.
4. Remove pipe cap from crankcase drain hose fitting (drain hose is located to starboard near front of engine) and attach hand transfer pump suction hose to drain hose. Place pump discharge hose in two gallon bucket and operate pump until suction is broken.
5. Replace drain hose cap and tighten firmly with 6-inch crescent wrench.
6. Place oil absorbent pad or rags under installed filter to catch oil which will spill as soon as filter is loosened.
7. Use oil filter wrench to turn filter counterclockwise for removal.
8. Clean filter gasket mating surface on engine block of any foreign matter or lint from the cleaning rag.
9. Apply a light film of engine oil to new filter.

### **NOTE**

Never use a filter wrench or any mechanical aid in tightening.

10. Carefully start new filter onto mounting stud to avoid cross threading and turn clockwise until filter gasket is snug against block. Tighten as much as possible by hand.
11. Add four (4) quarts of new oil through oil fill opening in the valve cover. Check crankcase oil level with dipstick and continue to add oil until oil level reaches dipstick FULL mark. Do not bring oil level above FULL mark. Excess oil in crankcase can cause oil seal and lubrication failures. Replace oil fill cap and dipstick.
12. Start engine and operate at fast idle (1200 rpm) for five (5) minutes. Check oil filter, crankcase drain hose, and engine block for oil leaks. Check oil pressure gauge for reading between 30

and 60 psi. Shut down engine immediately if oil pressure is above or below this range.

13. Shut down engine and switch off batteries. Wait five (5) minutes for oil to drain from block passages into oil pan and check oil level with dipstick. If necessary, add oil to bring level to "full" mark. If crankcase has been overfilled, use hand transfer pump to remove excess oil via crankcase drain hose.

#### 4-2.3 COOLING SYSTEM.

The engine has a captive anti freeze/water internal cooling system. The coolant plumbing is run through a heat exchanger that uses raw sea water to cool the internal coolant.

The heat exchanger is mounted across the back of the engine.

#### NOTE

The engine must not be running to perform the following procedures.

##### 4-2.3.1 RAW WATER COOLING SYSTEM.

Maintenance items in this system are:

- Raw water strainer.
- Replacement of the zinc anode.
- Replacement of the pump impeller.

##### 4-2.3.1.1 CLEANING THE RAW WATER STRAINER.

No tools or supplies are required for this procedure.

1. Close the ENGINE INTAKE seacock.
2. Loosen the two wing nuts (without removing) on the top access cover.
3. Open the cover by lifting to starboard (the starboard mounting lug will act as a hinge).
4. Remove the internal strainer, clean and put it back .
5. Clean the top access cover mating surfaces.

#### NOTE

Flat washers must be in place below the wing nuts.

6. Return top access cover to original position and hand tighten.
7. OPEN ENGINE INTAKE Seacock.

##### 4-2.3.1.2 CHECKING/REPLACING THE HEAT EXCHANGER ZINC ANODE.

Before starting this procedure ensure that the following are on hand:

- 3/8-inch box wrench.
  - Replacement Zinc, part no. Westerbeke 011885.
  - Suitable spill container.
1. Close the ENGINE INTAKE seacock.
  2. Place spill container under the zinc bolt-head located to starboard of the Fresh Water drain petcock.
  3. Remove the zinc anode using a 3/8-inch box wrench.
  4. Inspect the zinc. Replace if 50 percent wasted away, otherwise, clean zinc surface and return to the heat exchanger using anti-seize compound or teflon tape on the bolt thread and tighten with 3/8-inch box wrench. See Figure 4-2 Cooling System Zinc.
  5. Open the ENGINE INTAKE seacock.

##### 4-2.3.1.3 REPLACE RAW WATER PUMP IMPELLER.

Before starting this procedure ensure that the following are on hand:

- Blade screwdriver.
  - Replacement Impeller, part no. Westerbeke 033104.
1. Close the ENGINE INTAKE seacock.
  2. Use a blade screwdriver to remove the four retaining screws and front access cover plate.
  3. Observe the direction that the impeller blades are bent and pull out the damaged impeller from the splined shaft, making sure all loose, damaged parts are removed. Note the woodruff key/groove for alignment.
  4. Remove the old gasket around the cover plate periphery. If necessary, scrape the inside of the cover plate to remove gasket residue without marring the mating surfaces.
  5. Align the woodruff key/groove and insert the new impeller onto the shaft making



**NEW  
ANODE**



**REPLACE**



**REPLACE**



**CLEAN  
OR  
REPLACE**

**Zinc Anode Condition**

**Figure 4-2. Cooling System Zinc**

sure the impeller blades are bent in the same direction as they were before they were removed. This will allow the impeller to turn clockwise without distorting the blades.

6. Apply a coating of non-hardening gasket sealant to the cover plate and gasket mating surfaces. Install cover plate with gasket, hand thread the four screws and use a blade screwdriver to tighten down evenly for a snug fit.
7. Open Engine Intake seacock.

#### 4-2.3.2 ADDING COOLANT TO THE CAPTIVE SYSTEM.

##### **WARNING**

NEVER OPEN THE EXPANSION TANK WHEN ENGINE IS HOT, AS THERE IS DANGER OF BURNS FROM ESCAPING STEAM. FILL ONLY WHEN SYSTEM IS COOL.

Before starting this procedure ensure that the following are on hand:

- 50/50 mixture of antifreeze/water solution.
1. Open the fill cap on the expansion tank.
  2. Fill the expansion tank with a 50/50 mixture of antifreeze and water.
  3. Close the cap on the expansion tank and make sure the hose between the expansion tank and the recovery tank is properly connected.

#### 4-2.3.3 ADJUSTING AND/OR REPLACING THE FRESH WATER PUMP DRIVE BELTS.

The fresh water pump has a double pulley attached to its drive shaft to accommodate two drive belts. One is the same drive belt that drives the port alternator. The other is the same drive belt that drives the starboard alternator. The procedure for **replacing** the belt is inserted in this procedure where applicable as annotated with **Replacing the drive belt (bold print)**. Drive belts should have no more than 1/2-inch of play.

Before starting this procedure ensure that the following are on hand:

- 3/4-inch wrench.
- 1/2-inch wrench.

- Pry bar.
- Replacement Drive Belts.

##### NOTE

Drive Belt sizes may not be substituted, they must be of the following:

FSN 3030-529-0350  
WESTERBEKE PART #33361  
COMMERCIAL AX46

1. Shutdown the engine.
2. Loosen the top mounting bolt for the Ship's Service Alternator using a 3/4-inch wrench and a 1/2-inch wrench on the lower sliding bracket bolt. If only adjusting drive belt tension skip Belt Replacement Procedures and go to step 3.

##### **PROCEDURE FOR REPLACING A DRIVE BELT.**

- Ship's Service Alternator Drive Belt.
- SS1. Disconnect the 3/4-inch raw water pump inlet hose placing the hose in an upward position to minimize spillage of raw water.
  - SS2. Slide the alternator inboard and remove the defective belt.

##### NOTE

The Engine drive shaft has a double pulley mounted on it. The drive belt for the Ship's Service Alternator drive belt traps the belt for the Engine Start Alternator drive belt.

- SS3. DO NOT replace the Ship's Service drive belt at this time of the Engine Start Alternator belt must also be replaced. It will only be in the way.

Engine Start Alternator Drive Belt.

- ES1. Remove the SS Belt from the pulley to allow access to the ES belt.
- ES2. Loosen the ES Alternator to remove the defective belt.
- ES3. Replace the ES drive belt.
- ES4. Now replace the SS drive belt.

3. Reconnect water pump inlet hose.

#### NOTE

Use a large screwdriver or a bilge pump handle as a pry bar.

3. Pull/pry the SS Alternator outward to exert tension on the belt.
4. Maintain pressure on the alternator and tighten the lower sliding bracket bolt and the top mounting bracket.
5. Check the belt tension and readjust as necessary.
6. Repeat the procedure for the Engine Start Alternator.

#### 4-2.3.3 REPLACEMENT OF THE FRESH WATER PUMP.

The fresh water pump requires loosening the dual purpose alternator/fresh water pump drive belts for both the Engine Start and the Ship's Service Alternator.

Before starting this procedure ensure that the following are on hand.

- 3/4-inch open-end wrench.
- 1/2-inch open-end wrench.
- Pry bar.
- Replacement placement Water Pump, Part No. Westerbeke 016423.

#### NOTE

Inspect the replacement pump. If the double pulley is not mounted on the spare, contact a qualified mechanic.

1. Shutdown the Engine.
2. Loosen the top mounting bolt for the Ship's Service Alternator using a 3/4-inch wrench on the top mounting bolt and a 1/2-inch wrench on the lower sliding bracket bolt. Remove the belt from the water pump pulley.
3. Repeat the procedure on the Engine Start Alternator.
4. Using a 1/2-inch socket wrench, remove the four retaining bolts on the pump housing and remove the pump and the end plate spacer (accounting for all missing parts and/or pieces).

#### NOTE

Carefully clean surfaces to ensure gouging or scarring does not occur to the engine block end plate, or the pump housing.

5. Clean both sides of the spacer end plate and the gasket mating surface on the engine block removing all traces of the old gasket and gasket sealant.
6. Apply non-hardening gasket sealant to both sides of the gasket serving the end plate spacer and the mating surface on the engine block. Position the replacement pump assembly against the engine block.
7. Thread in the four retaining bolts until hand tight while holding the pump assembly in place.
8. Using a 1/2-inch socket with extension, evenly tighten down the four retaining bolts by tightening in a diagonal pattern. Check and re-tighten all bolts in a clockwise order. DO NOT OVERTIGHTEN.

#### PROCEDURE FOR THE SS ALTERNATOR.

9. Return the belts to the pulley and use the pry bar on the SS Alternator to put tension on the drive belt.
10. Maintain pressure on the alternator and tighten the lower adjustment arm, and the top mounting bracket.
11. Check drive belt tension and readjust as necessary.
12. Repeat STEPS 9 THRU 11 for the Engine Start Alternator.
13. Check engine coolant, (50/50 coolant/water mixture), and add as required.

#### 4-2.3.5 REPLACING THE COOLING SYSTEM HEAT EXCHANGER.

Before starting this procedure ensure that you have a:

- Replacement Cooling System Heat Exchanger, part no. Westerbeke 036896.

1. Drain the fresh water (captive anti-freeze side) of all coolant.
2. Close the Engine Intake valve and drain the raw water side of the head exchanger.
3. Remove the two (2) lower retaining bolts and spacers.
4. Lift the electrical mounting plate (with switches attached) up and out of the way.
5. Remove the defective head exchanger and replace.
6. Place electrical mounting plate against head exchanger, insert retaining bolts and spacers and tighten.
7. Fill the fresh water cooling system with 50/50 coolant/water mixture.
8. OPEN Engine Intake valve.
9. Vent the heat exchanger as necessary.

#### 4-2.4 ALTERNATORS

The Engine Start Alternator is mounted on the highest mounting pad on the STBD forward side of the engine. The SS Alternator has been relocated from the PORT side of the engine, (access through the head inspection panel), and mounted on the STBD side on the pad vacated by the removal of the engine driven refrigerator compressor. (See Figure 1-19. Engine (Front View).

##### 4-2.4.1 ADJUSTING AND/OR REPLACING THE ALTERNATOR DRIVE BELTS.

The drive belts for the Alternators are the same ones that drive the fresh water pump. Procedures are repeated here for continuity.

Before starting this procedure ensure that the following are on hand:

- 3/4-inch wrench.
- 1/2-inch wrench.
- Pry bar.
- Replacement Drive Belts.

#### NOTE

Drive belt sizes may not be substituted, they must be one of the following:

FSN 3030-529-0350  
WESTERBEKE PART NO. 33361  
COMMERCIAL AX46

1. Shut down the engine.
2. Loosen the top mounting bolt for the Ship's Service Alternator using a 3/4-inch wrench and a 1/2-inch wrench on the lower sliding bracket bolt. If only adjusting drive belt tension, skip Belt Replacement Procedures and go to step 3.

#### PROCEDURES FOR REPLACING A DRIVE BELT.

#### NOTE

The Engine drive shaft has a double pulley mounted on it. The drive belt for the Engine Start Alternator is trapped by the drive belt for the Ship's Service Alternator drive belt.

##### Ship'S Service Alternator Drive Belt.

- SS1. Disconnect the 3/4-inch raw water pump inlet hose placing the hose in an upright position to minimize spillage of raw water.
- SS2. Slide the alternator inboard and remove the defective belt.
- SS3. DO NOT replace the Ship's Service drive belt at this time if the Engine Start Alternator belt must also be replaced. It will only be in the way.

#### Engine Start Alternator Drive Belt.

- ES 1. Remove the SS Belt from the pulley to allow access to the ES belt.
- ES 2. Loosen the ES Alternator to remove the defective belt.
- ES 3. Replace the ES drive belt.
- ES 4. Now replace the SS drive belt.

Reconnect the 3/4-inch water pump inlet hose.

#### NOTE

Using a large screwdriver or bilge pump handle as a pry bar.

3. Pull/pry the SS Alternator outward to exert tension on the belt.
4. Maintain pressure on the alternator and tighten the lower sliding bracket.
5. Check the belt tension and readjust as necessary.

#### 4-2.4.2 REPLACEMENT OF ALTERNATORS

This part of the procedure is identical to the replacement of drive belts and is included here for continuity.

Before starting this procedure ensure that the following part is on hand:

- WESTERBEKE PART NO. 24684.

1. Shut down the engine.
2. Loosen the top mounting belt for the desired Alternator using a 3/4-inch wrench on the top bracket, and a 1/2-inch wrench on the lower sliding bracket bolt. When the drive belt is loose, remove it from the alternator.

#### NOTE

Use a large screwdriver or a bilge pump handle as a pry bar.

3. Pull/pry the SS Alternator outward to exert tension on the belt.
4. Maintain pressure on the alternator and tighten the lower sliding ratchet bolt and then the top mounting bolt.

5. Check the belt tension and readjust as necessary.

In the unlikely event that BOTH alternators need replacement, repeat the procedure to the other alternator.

#### 4-2.5 STARTER

The starter is mounted on the PORT side of the engine. Access is through the removable panel in the head compartment.

Before commencing on this procedure, ensure that the following part is on hand:

- WESTERBEKE PART NO. 30593.

1. De-ENERGIZE the electrical system by switching the Engine Start Selector Switch to OFF.
2. Remove any cooling hoses, fresh water/raw water, that would restrict access to the starter.
3. Tag the electric wires and the respective starter terminals and disconnect them.
4. Remove the two retaining bolts using a socket and extension. Remove the defective starter.

Install the replacement starter reversing the order of removal.

5. Replace the two retaining bolts using a socket and extension.
6. Install the electric wires according to their tagged positions.
7. Replace any cooling hoses removed to gain access room.
8. Turn the Engine Start Selector Switch to ON.
9. Turn ON the engine alarm at the Switchboard.
10. Ensure that the T-handle is down.
11. Ensure that the transmission button is OUT.
12. Crack the throttle.
13. Test the starter.
14. Shut down the engine when successful test has been completed.

## 4-10 ELECTRICAL SYSTEM

### CAUTION

Electrical power from the batteries is a perishable commodity. A rule of thumb is, "If you don't need it, TURN IT OFF".

Once the vessel is underway, the only available electrical power is provided by the Ship's Service Battery Banks, and the Engine Start Battery Bank. Periodic inspection and maintenance is essential, not only for maximum battery life, but for crew safety while underway.

### WARNING

ALL SAFETY PROCEDURES MUST BE STRICTLY ADHERED TO WHILE WORKING ON THE BATTERIES.

### NOTE

A incremental change to the NA44's includes equipping them with an AGM, Glass MAT, cell structure type batteries. While checking the electrolyte it is not required on these batteries all other aspects of routine maintenance apply.

Periodic inspection and maintenance includes, but is not limited to the following:

1. Check battery cell electrolyte levels.
2. Inspect condition of the battery boxes. Under the Nav Station seat for the Ship's Service batteries, and in the storage cutout behind the engine port side for the Engine Start Battery.
3. Inspect and clean battery casings.
4. Check and clean battery terminal connections.
5. Check wire condition at the terminal lugs.
6. Check that storage batteries maintain a charged condition.

### NOTE

The 120 vdc battery charger has been moved from under the sink in the head compartment to the void under the Nav Station. Access is from the knee hole area.

## 4-11 REFRIGERATOR

All NA44's have been equipped with the NAVTRONIC COASTAL 12 refrigeration system. This is a completely 12 vdc system. The engine run compressor has been eliminated.

### 4-11.1 CLEANING THE REFRIGERATOR

Maintenance of the box includes washing of the inside surfaces and pumping out the ice box bilge to remove spills and melted ice water.

1. Use the telephone showerhead spigot in the galley to rinse the box periodically.
2. Use a solution of commercial biodegradable soap and fresh water to thoroughly clean, and wipe down all interior and exterior surfaces of the box.
3. Open the GALLEY SINK DRAIN seacock.
4. Use the foot pump, (the outboard one at the base of the sink cabinet), to remove liquid residue. (See Figure 1-42. Refrigeration System for component locations).
5. The box should be left clean and dry after use, with the doors pinned open with the barrel bolts in the galley area.
6. If the refrigerator drain foot pump should malfunction, see the Whale Gusher MK III foot pump maintenance procedures.

## 4-12 LUBRICATION

1. Lube Oil, Standard Navy Stock
  - Type 9250, SAE 30 HD  
NSN 9150-00-181-8229  
MilSpec 9250601L  
Codes 54161
  - Comparable commercial lube oil
  - Chevron, Delo 400, SAE 30
  - Union 76, Truck motor oil SAE 30
  - Any good grade SAE
  - Multi Vis oils SAE 10W30 may be Substituted.
  - API Service Grade CC or CD

dirt from the compass and housing using a damp soft cloth.

### CAUTION

Before leaving the boat, ensure that no Ferrous (magnetic) metal is near the compass as this will tend to deviate the compass and provide erroneous readings.

#### 4-6 WINCHES.

The NAVY 44 has twelve (12) Barient two-speed winches which are thru-bolted to the deck. The winches on deck are exposed to salt spray and airborne pollutants and must be periodically cleaned and re-lubricated.

### CAUTION

Never use grease on the pawls or pawl springs. The pawls should be lubricated with light machine oil.

Clean all parts with a petroleum solvent. Any parts showing damage or excessive wear must be replaced. During the assembly process, all gears and bearings should be lightly greased.

#### 4-7 MARINE HEAD

General maintenance and overhaul on the head should be done periodically to insure proper operation. During normal use, the following preventive maintenance measures will ensure proper functioning of the head:

1. Make sure seacocks are open, turn freely and are free of leaks.

### NOTE

Wilcox Crittenden has a commercial produce SEALUBE that is specifically meant for lubrication of their marine heads.

2. Apply light machine oil to the piston rod and bearings for easier pumping.
3. Ensure packing nut is just tight enough to prevent leakage.

### CAUTION

Do Not use oil solvents, solutions or alcohol in the marine head - it will ruin valves.

4. If pumping action becomes stiff, pour a pint of water soluble lubricant or vegetable oil into the bowl and stroke twice to allow lubricant to enter the pump cylinder only, and not overboard. If possible, allow the lubricant to stand for 24 hours before pumping out.
5. If the head fails to function properly, the valves may be restricted or damaged. Disassembly of the water closet may be necessary to inspect the cause of the malfunction. Figure 3-7. Marine Head, Parts Breakdown, and Table 3-6. Parts List will assist in assembly and disassembly of the marine head.

#### 4-8 WATER SYSTEM

Water tanks should be regularly flushed and inspected by competent medical authority.

1. During winter layup, the water tanks are filled with potable anti-freeze. Spring fitting out required that the system be flushed to eliminate the "safe", but awful tasting, water.
2. Lift the cabin sole panels in the galley area to gain access to the 23 gallon day tank. Disconnect the water feed lines from each of the 70 gal saddle tanks. Gravity will empty the tanks.
3. Run the pressure water system, and the manual system to drain the water out of the day tank.
4. Spray the inside of the 70 gal tanks with a garden hose to rinse out the winter water.
5. Run the pressure water spigot in the galley, and in the head to flush the lines out.
6. Re-connect the feed lines to the day tank.
7. Fill the 70 gal tanks.

#### 4-9 BILGE SYSTEM

### CAUTION

Visually inspect bilges for trash, oil, etc. Clean if necessary and pump slowly. .

## NOTE

This procedure can be performed with the boat in the water since the rudder post stuffing box is normally above the water line.

1. Using a ½-inch open-end wrench to loosen and remove the bolts holding the retaining ring in place.
2. Pry out the old packing gland.
3. Use the old packing gland for an approximate measure for the length of the replacement.
4. Insert the new gland using the same rotation pattern as that observed in the removal of the old gland material.
5. Replace the retainer ring and tighten the retainer bolts evenly.

## 4-5 COMMUNICATIONS AND ELECTRONIC EQUIPMENT.

Continuous satisfactory operation of the communications and electronic equipment is dependent on the care and maintenance performed on each equipment. The following simple maintenance steps will help to avoid equipment failure.

1. Always keep the equipment as clean as possible. Wipe off dirt and dust during post-operation procedures.
2. Check all hardware and cable connections for tightness.
3. Check for evidence of any corrosion on the equipment, cable connections and connectors. Clean as required. If the equipment does not come on when the power is turned on, proceed as follows:
  - Ensure the breaker is not switched off at the switchboard panel.
  - Check for a blown fuse. Refer to Table 4-3 for the location and size of fuses for the communications and electronic equipment.
4. Ensure the power supply connection on the unit is tight. If the equipment is not working properly or the display gives inaccurate or faulty information, check all the connections at the unit and the antenna terminals.

## NOTE

Only qualified technicians should perform repairs on communications and electronic equipment.

### 4-5.1 REPLACEMENT OF FACSIMILE RECORDING PAPER.

See Technical Manual for procedure.

### 4-5.2 SAILING PERFORMANCE INSTRUMENT, (SPEEDO).

#### **WARNING**

**SEAWATER WILL FLOOD INTO THE BOAT WHEN THE UNDERWATER UNIT IS REMOVED. THE PLUG SHOULD BE PUT IN PLACE IMMEDIATELY. ADROIT HAND COORDINATION IS REQUIRED.**

The sailing performance instrument requires no routine maintenance other than care of the underwater impeller unit. The impeller must be kept free from marine growth. A stiff nylon brush should be used to clean the impeller.

1. Unscrew the locking ring-nut and loosen the impeller unit for an easy withdrawal.
2. With the dummy plug in hand, draw out the impeller unit, and quickly replacing it with the dummy plug.
3. Screw in the locking ring-nut.
4. Clean the impeller paddlewheel.
5. Use the reverse procedure to replace the paddlewheel.

The sealing ring under the ring-nut should be kept liberally greased.

### 4-5.3 MAGNETIC COMPASS.

The magnetic compass is a delicate instrument which with some care requires little or no maintenance. The compass must be properly compensated at all times to ensure correct readings while underway. After having been underway on the craft, wipe off any sea spray or dirt from the compass and housing using a damp soft cloth.

#### 4-3 REFRIGERATION COMPRESSOR.

The refrigeration system that required an engine mounted compressor has been removed. This section is retained for numerical continuity of the paragraphing for the chapter.

#### 4-4 STEERING SYSTEM

The steering system should be checked and maintained periodically to ensure proper operation. Steering failure can be extremely hazardous, particularly under heavy wind and sea conditions. In conjunction with pre-underway procedures, the following should be performed on the steering system.

1. Check the tension of the wire rope from the pulleys to the radial drive. Adjustment of the wire rope tension is done on the eyebolts located below the radial drive using two ½-inch open-end wrenches.

#### **WARNING**

An active test on the steering system can be hazardous to the inspection party below. Keep hands clear of the wire rope and pulleys. If slack tension is not readily apparent, use a long metal object, such as a wrench handle or hammer, to pull on the wire rope observing the amount of play. **DO NOT OVERTIGHTEN!**

2. Wire rope tension inspection is preferably done while another crewmember slowly turns the steering wheel, "Hardover", in each direction. The wire rope should never be slack to the eye under a static condition.
3. Inspect the stuffing box and around the rudderpost for visible leads or signs of wear.

#### CAUTION

Do Not over-tighten the packing gland on the Stuffing Box. If moderate tightening does not stop a static leak, the packing gland needs to be replaced.

4. Inspect the rudder post for leaks at the stuffing box. If any leakage is noted, gradually tighten the packing gland bolts, ½ turn at a time. The stuffing box is located directly below the circular quadrant. If the leak cannot be stopped when moderate tightness has been achieved, replace the packing gland.
5. Check the turning sheaves that change the direction of travel of the wire rope from the quadrant up through the deck to the wheel pedestal. Use a strong flashlight to inspect the housing for cracks.
6. Check and lubricate the crosswire pulley bearings with a light coat of machine oil. Excessive wear on the bearings should be reported immediately.

#### NOTE

The internal mechanism of the steering pedestal (sprocket, chain and bearings), should be inspected and lubricated once a year. The wire rope should be replaced every five (5) years.

7. Check bolt tightness throughout the system, to include the pedestal base, steering wheel hub, pulley base, and rudder stops. Tighten as necessary.

#### 4-4.1 REPLACING THE RUDDER POST PACKING GLAND

Before starting this procedure ensure that the following are on hand:

- 2-1/2-feet of 3/8-inch packing gland material.
- ½-inch open-end wrench.

3. Hydraulic Oil (petroleum base).
  - Hydraulic oil type 2135  
NSN 9150-00-985-7236  
Mil Spec 11-17672.
  - Comparable commercial hydraulic oil
  - Chevron 2135<sup>th</sup>
  - Richfield Eagle oil, light
  - Gulf 2135H
  - Texaco MS2135H
  - Standard 2135<sup>th</sup>
  - Sinclair MS2135TH
4. Winch grease, teflon, super lube PTFE  
(Supplied by Sail Craft Support).

#### 4-13 TROUBLESHOOTING

1. Refer to equipment manufacturer's manuals for guidance in troubleshooting equipment. Each boat is provided with the manual for the particular make and model of equipment installed onboard.

End of Chapter 4.