CHAPTER IV. SERVICING INSTRUCTIONS

SECTION 1. ELECTRICAL SYSTEMS

4-1. DC ELECTRICAL SYSTEM.

4-2. FUNCTIONAL CHARACTERISTICS.

4-3. The dc electrical system (Figure 4-1) provides 24-vdc power and control for propulsion engine and diesel generator starting/stopping, lighting, navigation/communication equipment operation, siren operation, twin 50-caliber machine gun operation, and windshield wiper operation. The dc system consists basically of the two engine-driven alternators, two 24-volt batteries (12-volt in series), one 12-volt battery, the distribution panel, and associated wiring. DC power supply and circuits are described in following paragraphs 4-4 through 4-11.

4-4. DC POWER SUPPLY. Normal boat dc power is supplied by the engine-driven alternator. When the engines are secured, dc boat power is supplied by the 24-volt starboard battery. The 24-volt port battery is used for propulsion starting and floodlight operation only. The 24-volt batteries are charged by the engine-driven alternators.

4-5. ENGINE CIRCUITS. Normally the propulsion engines are started by power supplied from the 24-volt port battery. If the port battery is weak, a battery paralleling relay can be energized to connect the starboard battery in parallel with the port battery for engine starting. Normal propulsion engine start/stop is controlled from the pilot house by completing circuits to the start and stop solenoids. Circuits will be completed to the engine alarm light in the pilothouse should any of the following occur: low fuel oil pressure, low lub oil pressure, engine overheating, or loss of coolant.

4-6. The ac generator engine is started from power supplied by the single 12-volt battery. Normal start/stop of the generator engine is controlled from the pilothouse. The engine will be stopped by circuits being completed to the engine stop solenoid should overheating or loss of oil pressure occur. Local control switches are provided on the generator for starting and stopping.

4-7. LIGHTING CIRCUITS. Power distribution and control for lighting is provided by the distribution panel located in the pilot house with exception of the instrument, engine room, and lazerette lights. Power is distributed to the engine room and lazerette lights from the main dc switch in the engine room. When the main dc power switch is closed, 24-vdc power is supplied to the distribution panel and the engine room and lazerette lights. Power to the instrument lights in the pilothouse is available at all times. These lights are controlled by two switches and a rheostat on the control panel. The distribution panel distributes power to all other lights.

4-8. INDICATOR CIRCUITS. Circuits are provided for the following indicators:

a. Forward fuel tank gauge.
b. Tachometers for both engines.
c. Ammeters
d. Rudder angle indicator (operates off standard 1.5-volt battery).
e. Alarm light to indicate engine malfuntion.

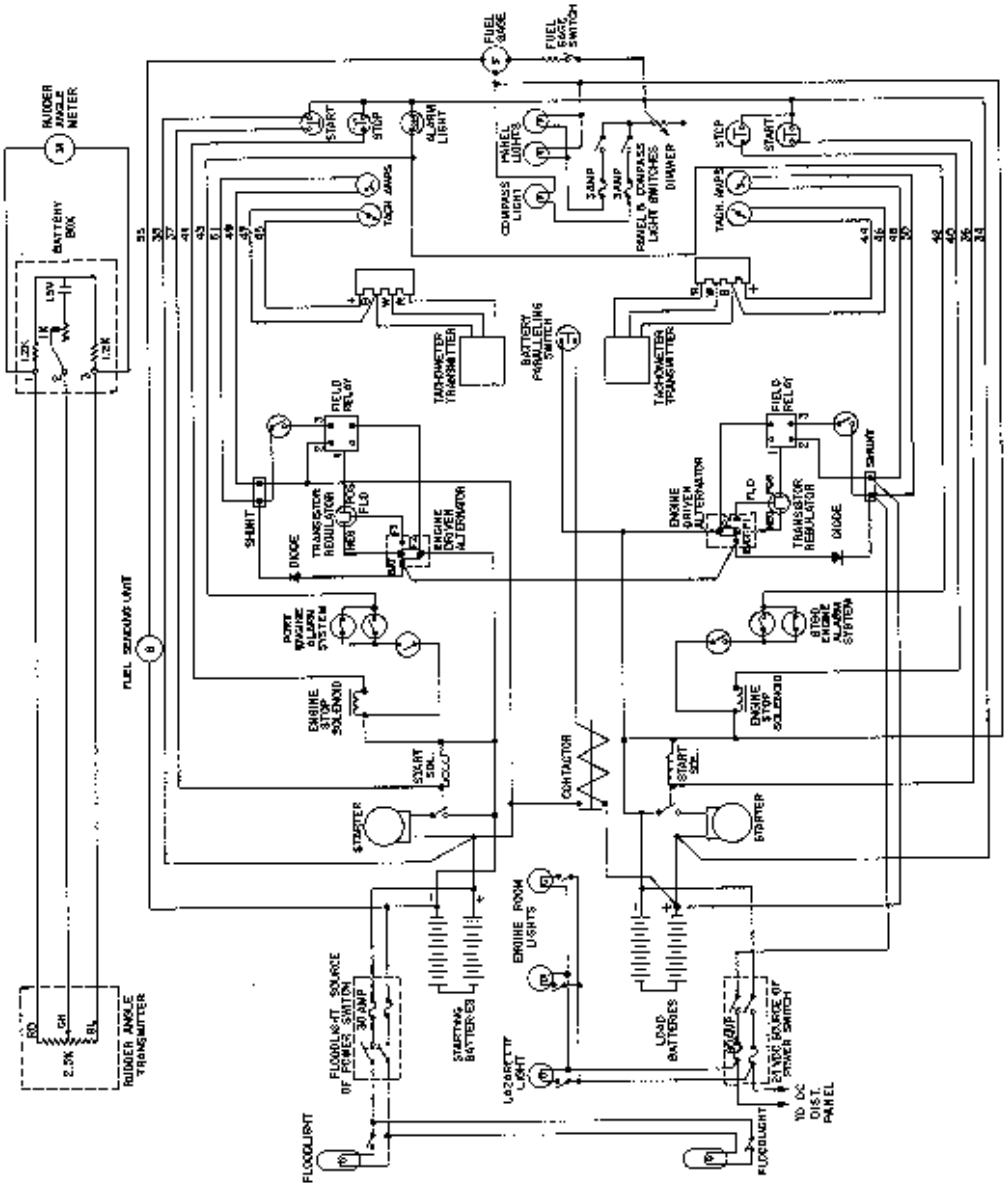

Figure 4-1. DC Electrical Schematic (Sheet 1 of 5)

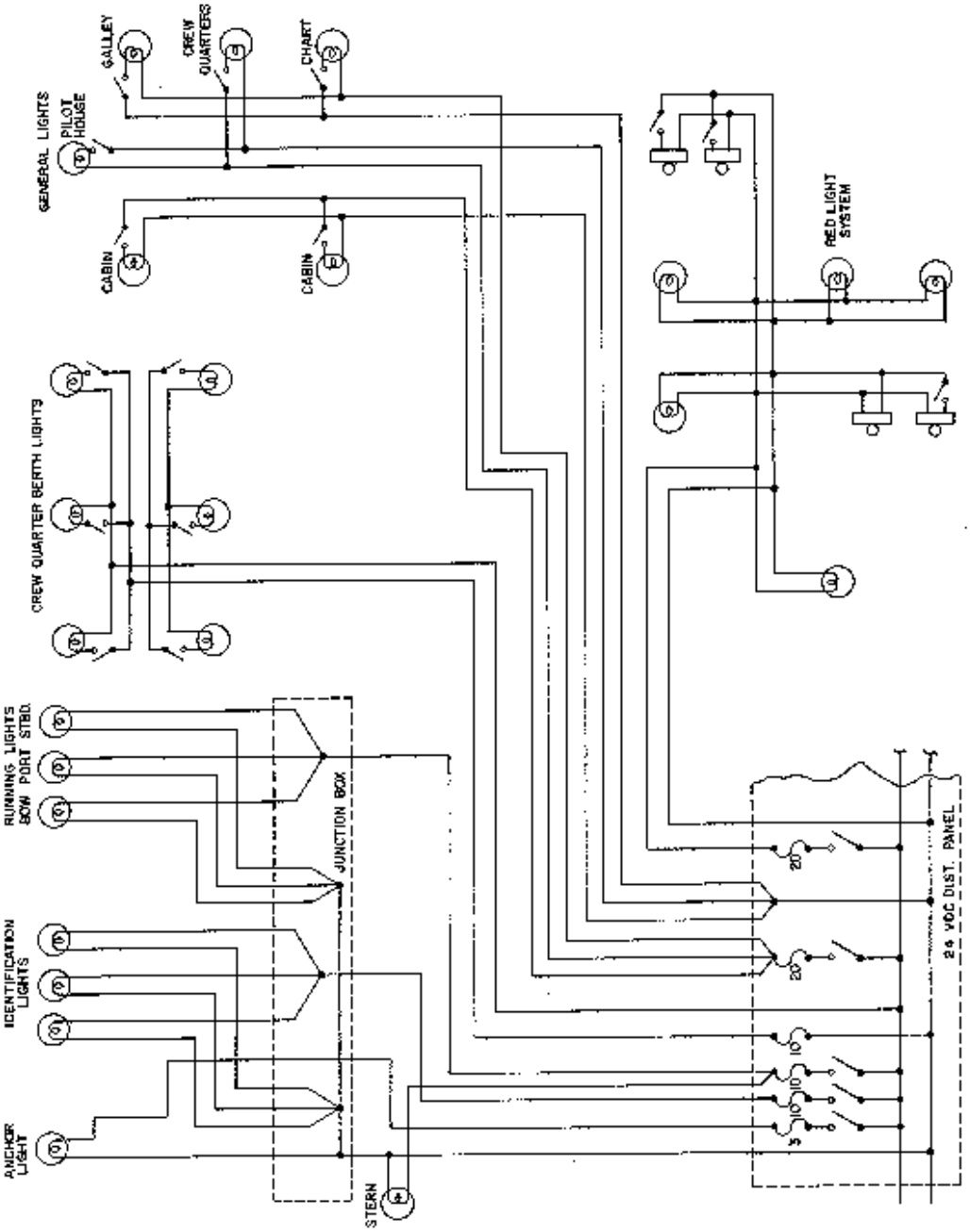

Figure 4-1. DC Electrical Schematic (Sheet 2 of 5)

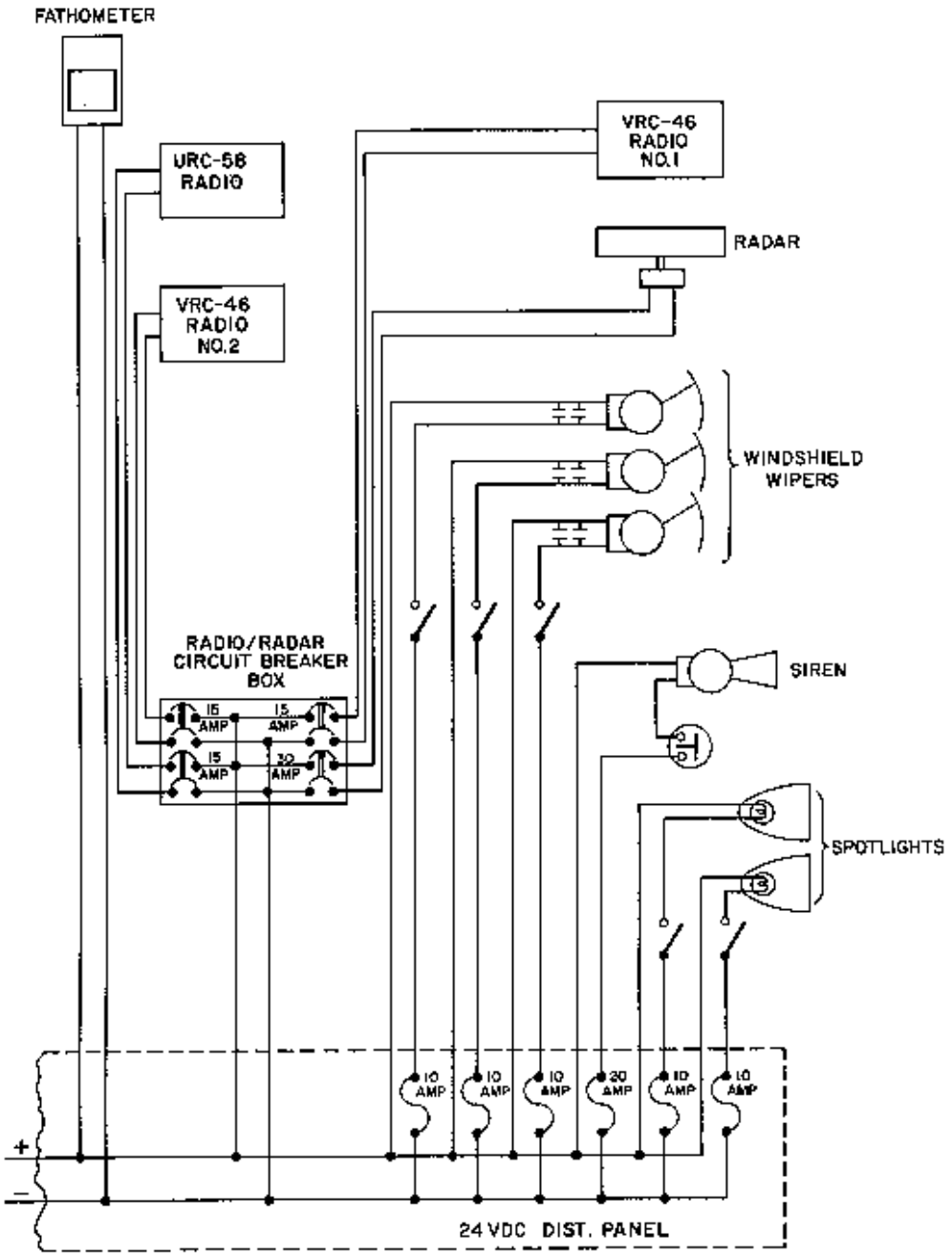

Figure 4-1. DC Electrical System Schematic (Sheet 3 of 5)

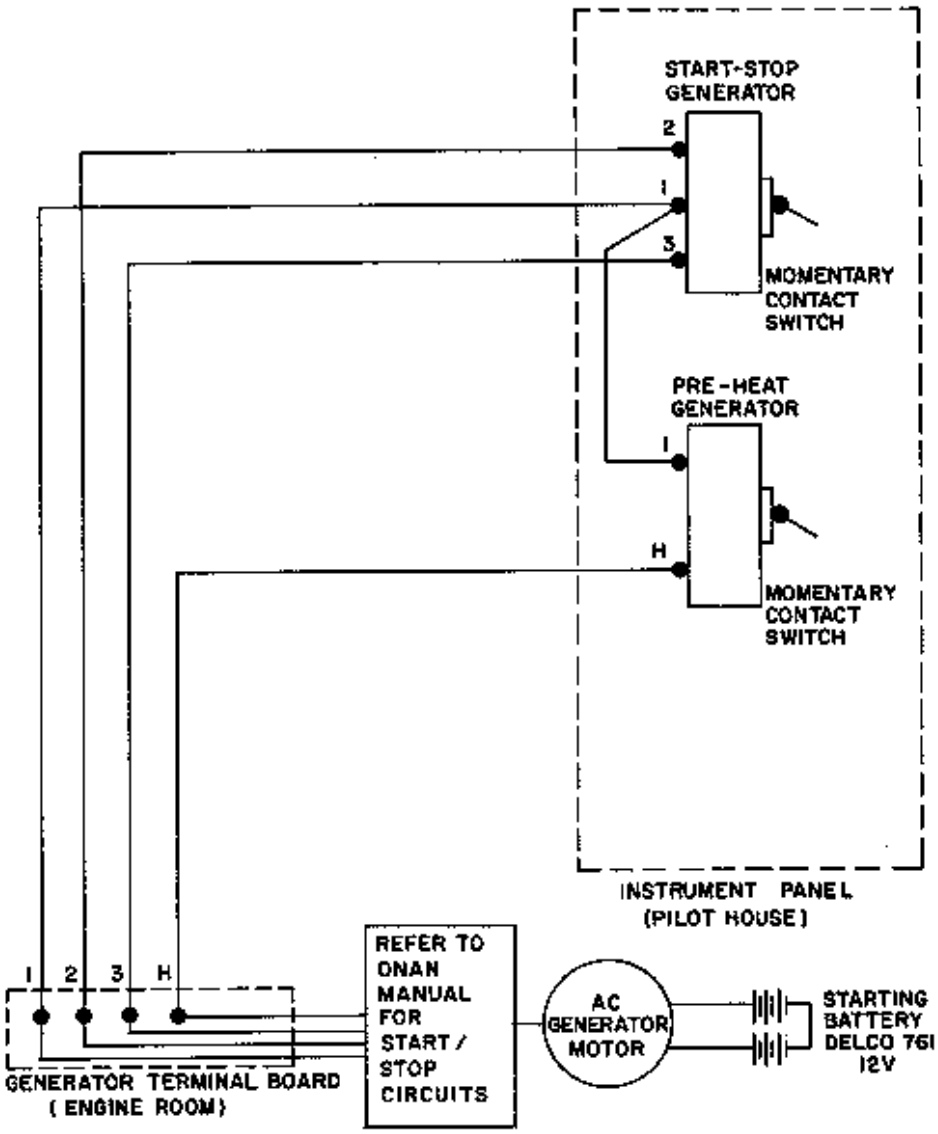

Figure 4-1. DC Electrical Schematic (Sheet 4 of 5)

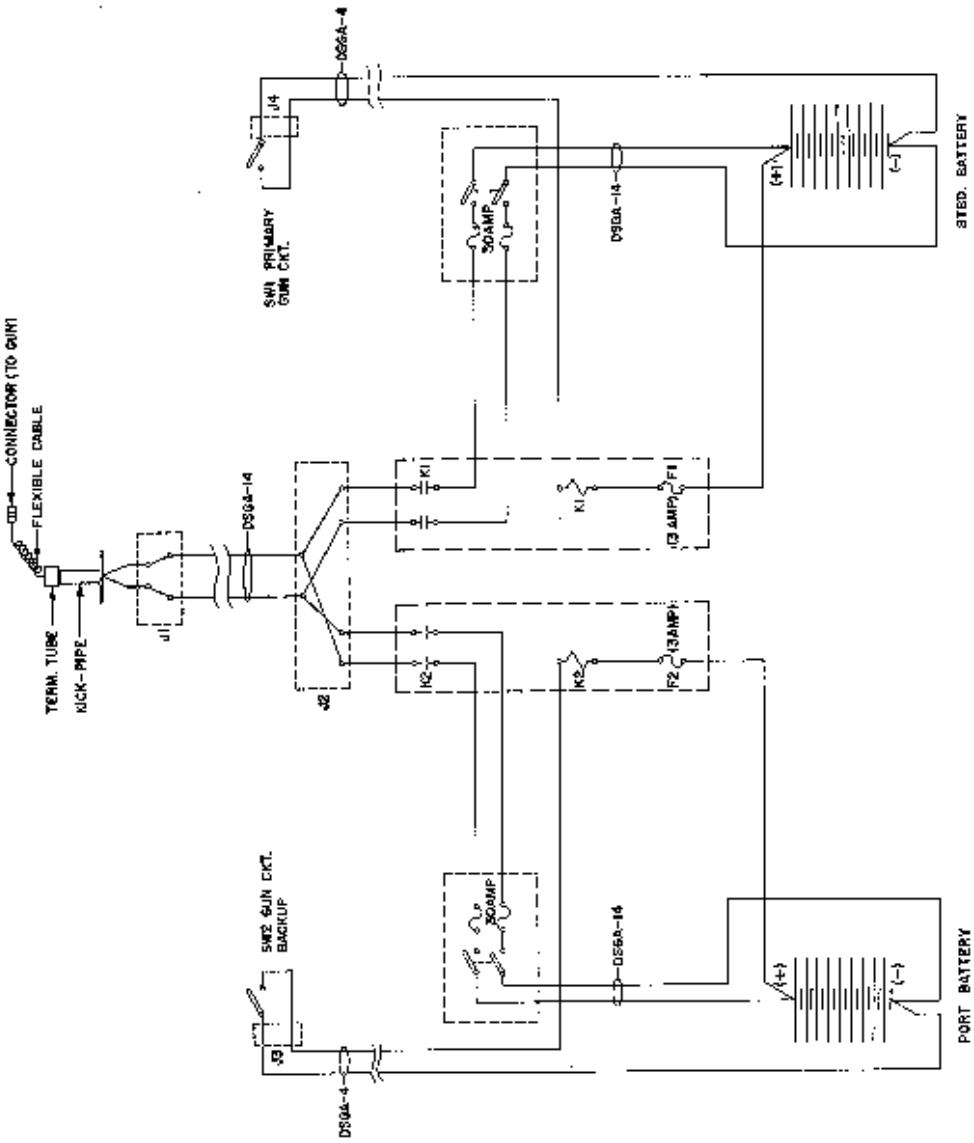

Figure 4-1. DC Electrical Schematic (Sheet 5 of 5

4-9. RADIO, RADAR, AND FATHOMETER CIRCUITS. Power is supplied to the radios and the radar from the circuit breaker panel located in the radio room. Power is available for operation of these components when the main dc switch in the engine room is closed and circuit breakers in the radio room are closed. Power to the fathometeris supplied from the distribution panel and is available when the main dc switch is closed.

4-10. SIREN AND WIPER CIRCUITS. Power to the siren and windshield wipers is supplied through the distribution panel and is available when the main dc switch is closed. Control of wipers and siren is provided by switches located in the pilot house.

4-11. GUN CIRCUITS. Two circuits (Figure 4-1, Sheet 4) are provided to supply 24-volt power for operation of the twin 50-caliber machine gun. One circuit supplies primary power from the starboard battery. If the primary supply fails, power can be supplied by the auxiliary circuit from the port battery. Power is supplied to the gun by closing the two fused switches in the engine room and then closing either the primary or auxiliary switch located in the gun tub.

4-12. TROUBLESHOOTING

4-13. Refer to Table 4-1 and Figure 4-1 for troubleshooting the dc electrical system.

CAUTION

Before replacing a blown fuse, check circuit to determine cause.

4-14. INSPECTION

4-15. Inspect dc electrical circuits and components as described in Table 3-5.

4-16. REMOVAL

WARNING

Before working on any circuit, be sure power to that circuit has been turned off by opening applicable switch or circuit breaker and warning tag placed on switch or breaker.

4-17. Location of dc system components are shown in Figures 1-16 through 1-20. Special instructions required for removal of dc system components are contained in following paragraphs 4-18 through 4-23.

NOTE

Tag electrical lines for identification during reconnect.

4-18. ALTERNATOR AND ENGINE COMPONENTS. Refer to Engine Maintenance Manual, GM 6SE-193, for special instructions for removing the alternator, start and stop solenoids, starter, engine alarm components, and regulator.

4-19. LAMP REPLACEMENT. Refer to Table 3-7 for replacement lamps for all lights.

4-20. FUSES AND CIRCUIT BREAKERS. All circuits are protected by fuses or circuit breakers. Fuses and circuit breakers are located as shown in Figure 4-1. Main dc circuit, gun circuit, and flood light circuits are protected by fused switches located in the engine room. Instrument lighting is protected by fuses located on the control panel.

Table 4-1. DC System Troubleshooting

TROUBLE	SYMPTOM	PROBABLE CAUSE	REMEDY
No power to system or component	All lights and dc components are inoperative, except instrument and flood lights will work.	Main dc switch in engine room open or fuse blown. Check circuits for damage, etc. if fuse is blown.	Close switch or replace fuse.
	Only one circuit of lights or one component inoperative (e.g. anchor lights, wipers, radio, etc.)	1. Control switch off or defective. 2. Fuse for that circuit blown. Check circuit for wire damage, shorts, etc. 3. Loose connections or damaged wire.	1. Close switch or replace. 2. Replace fuse after cause has been determined and repaired. 3. Tighten connections; repair damage.
Insufficient power	Floodlights weak; engines hard to start. Ammeter for port circuit shows continuous high rate of charge during engine running.	Port battery weak; alternator output low or defective regulator	1. Check fluid level in battery and refill if necessary. 2. Check alternator output (70 amps, 28 v at engine idle). 3. Check voltage regulator. Repair or replace.
	Lights weak, wipers operate slow, etc. Ammeter for starboard circuit shows continuous high rate of charge during engine running.	Starboard battery weak; alternator output low or defective regulator.	1. Check fluid level in battery and refill if necessary. 2. Check alternator output (70 amps, 28 v at engine idle). Repair or replace.

Table 4-1. DC System Troubleshooting (Con't)

TROUBLE	SYMPTOM	PROBABLE CAUSE	REMEDY
Insufficient power (cont'd)			3. Check voltage regulator. Repair or replace.
AC generator engine hard to start	Engine turns slowly during start	Starting battery weak	1. Check fluid level in battery and refill 2. Check charging circuit (Refer to Onan Manual).
Engine not starting	Either engine will not start or turns only a few times.	1. Starting battery cables loose or corroded. 2. Start circuit defective (start button, loose connections, etc.)	1. Tighten or clean connections. 2. Check circuit and repair or replace defective component.
No Rudder angle indication	No indication on meter when wheel is turned	1. 1.5v battery discharged 2. Loose connection to tiller.	1. Adjust battery gain or replace battery. 2. Tighten connection
	Rudder angle indication incorrect.	Transmitter adjusted wrong.	Adjust (refer to Columbian Hydrosonics Instructions).

4-21. SEARCHLIGHT.

a. Remove searchlight handle.
b. Remove screws inside and on top of the pilothouse.
c. Pull searchlight out and disconnect electrical wires.

4-22. WINDSHIELD WIPERS.

a. Remove wiper blade.
b. Disconnect electrical wires.
c. Remove screws securing wiper; remove wiper.

4-23. CONTROL CONSOLE COMPONENTS.

a. Remove plexiglass cover to remove gauges and indicators on top of console.
b. Tag electrical wires for identification during reconnect.
c. Install protective caps on disconnected tubing and open ports of gauges.

4-24. SERVICING AND REPAIR

4-25. Information on servicing and repair of the dc electrical equipment can be found by referring to applicable manufacturer's service manual or instructions as follows:

a. Alternator and Regulator - Delco Remy Division.
b. Windshield Wiper - American Bosch.
c. Rudder Indicator - Columbian Hydrosonics, Inc.
d. Contactor (Gun Circuit) - Zenith Controls, Inc.

4-26. INSTALLATION

4-27. Installation of components of the dc system is the reverse of removal. See Figures 1-16 through 1-20 for location of components.

4-28. TESTING

4-29. Test of the dc system is accomplished by operating all components and checking for abnormal operation or malfunction as each component is operated. Check output of each alternator. With engines idling, output should be 28 volts, 70 amps.

4-30. AC ELECTRICAL SYSTEM

4-31. FUNCTIONAL CHARACTERISTICS

4-32. The ac electrical system (Figure 4-2) provides 120-volt, 60-cycle, single phase ac power for operation of the refrigerator, stove, chlorinator, and ventilator fans. Power is normally supplied by the 6-kw, 120-volt, 60-cycle ac diesel generator. AC shore power can be supplied through an ac receptacle mounted on the aft deck. Power source is selected by the fused switch located in the engine room. An ac indicator light located on the control console indicates when either shore or generator ac power is available. The ac distribution panel, mounted in the pilothouse, contains appropriate circuit breakers for control and protection of the ac powered components. Two receptacles are provided on the exterior of the pilothouse, adjacent to each pilothouse door, for connecting the ac signal lights. An ac outlet receptacle is provided in the galley for connecting additional ac-powered items. Refer to the Onan Generating Plant Service Manual for characteristics and description of the ac diesel generator.

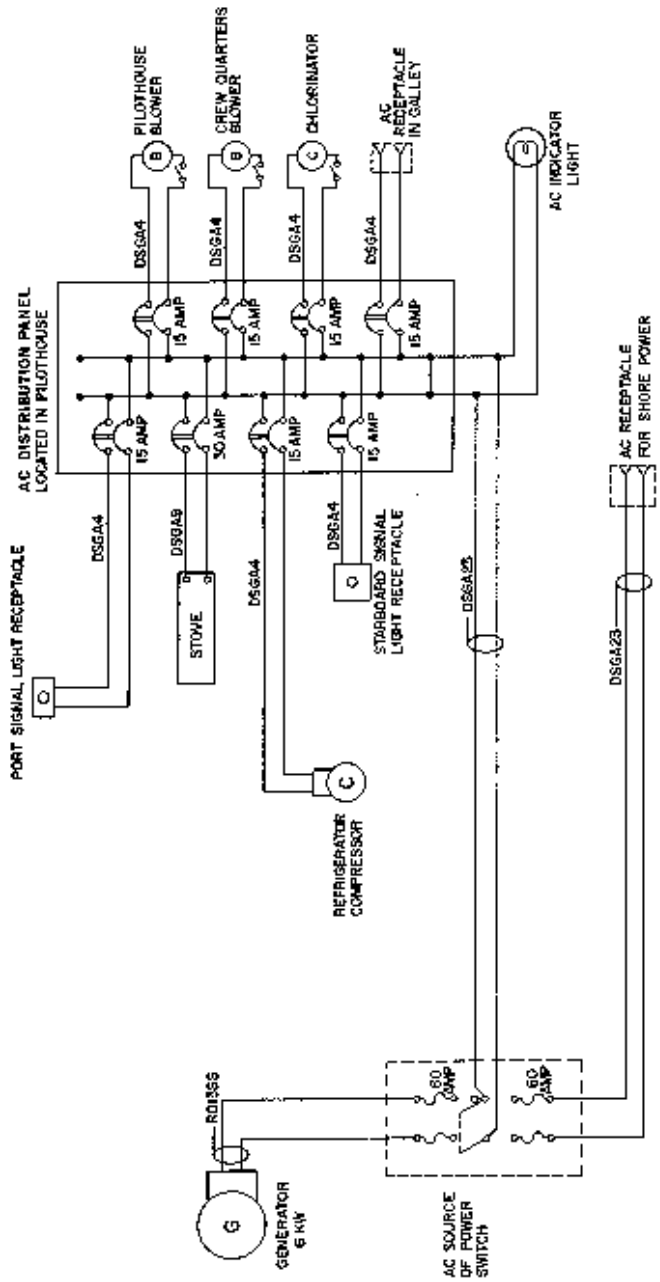

Figure 4-2. AC Electrical Schematic

4-33. TROUBLESHOOTING

4-34. Refer to Table 4-2 and Figure 4-2 for troubleshooting the AC Electrical System.

NOTE

Refer to Onan Generating Plant Service Manual for troubleshooting the generator.

4-35. INSPECTION. Inspect electrical system as described in Table 3-5 and as follows:

a. Refer to Onan Generating Plant Service Manual for periodic service requirements of the ac generator.

b. Inspect ac wiring and components for corrosion, loose connections, damage, etc.

4-36. LUBRICATION

4-37. Refer to Onan Generating Plant Service Manual for periodic lubrication of the ac generator.

4-38. REMOVAL

WARNING

Before working on any circuit, check that power to that circuit has been turned off and warning tag placed on applicable switch or circuit breaker.

4-39. Location of ac system components are shown in Figure 1-21. Special instructions required for removal of ac components are contained in the following paragraphs, 4-40 and 4-41.

4-40. AC GENERATOR. Remove the ac generator as follows:

a. Open engine hatches and remove center hatch support.
b. Disconnect battery leads.
c. Disconnect and tag all electrical wires.
d. Close fuel supply and return valves and disconnect fuel lines.

NOTE

Install protective caps on lines and ports.

e. Disconnect water temperature and oil pressure gage lines.
f. Close seawater cooling supply valve and disconnect inlet line to engine and outlet line to muffler.
g. Disconnect exhaust pipe.
h. Connect sling, capable of lifting 648 lb., to generator lifting eye.
i. Remove mounting hardware and lift generator carefully out of engine compartment.

4-41. COMPRESSOR, STOVE, CHLORINATOR. Refer to Section V.

4-42. REPAIR/OVERHAUL

4-43. AC GENERATOR. Refer to Onan Generating Plant Service Manual for repair information on the ac generator.

4-44. COMPRESSOR, STOVE, CHLORINATOR. Refer to Section V.

4-45. INSTALLATION

4-46. Location of ac system components is shown in Figure 1-21. Special instructions for installation of components are contained in the following paragraphs.

4-47. COMPRESSOR, STOVE, CHLORINATOR. Refer to Section V.

Table 4-2. AC System Troubleshooting

TROUBLE	SYMPTOM	PROBABLE CAUSE	REMEDY
No power, generator running	AC powered units inoperative.	AC switch in engine room in SHORE POWER position or fuse blown.	Place switch in BOAT POWER position; or replace fuse.
	Only single item inoperative (stove, fan, etc.	1. Circuit breaker open.	1. Check circuit for shorting and repair before closing breaker.
		2. Circuit breaker defective.	2. Replace
Insufficient or erratic power supply	AC indicator light in pilot-house goes off.	1. Generator speed to slow	1. Increase speed (Refer to Onan manual).
		2. Loose connections	2. Tighten
		3. Fluctuating load	3. Correct any abnormal loading.
Voltage drops under heavy	AC indicator light in pilot-house goes off.	Refer to Onan Manual	Refer to Onan Manual
Diesel engine hard to start or operates abnormally.	Misfiring, black exhaust, knocking, overheating, etc.	Refer to Onan Manual	Refer to Onan Manual

4-48. AC GENERATOR. Install the ac generator in reverse sequence of removal and in accordance with the following:

a. Open fuel and seawater cooling valves after connections are made.

b. Prepare engine for operation as described in Onan Operators Manual.

4-49. TESTING

4-50. Testing of ac generator should be accomplished as described in Onan Generating Plant Service Manual.

SECTION 2. PROPULSION SYSTEM

4-51. PROPULSION ENGINE CONTROLS.

4-52. FUNCTIONAL CHARACTERISTICS

4-53. The PCF is equipped with engine controls (Figure 1-25) located in the pilothouse and aft on the port side of the deckhouse. Each set of controls allows the operator to control both engines with one hand. Each lever operates both clutch and governor of one engine. Clutch action occurs in the first 30° of travel from neutral, and the remaining 60° of travel controls engine rpm from idle to full ahead or astern. The levers at both control stations operate simultaneously. Throttle controls are provided for controlling engine speed when the control levers are in the neutral position.

4-54. TROUBLESHOOTING

4-55. Refer to Table 4-3 and Figure 1-25 for troubleshooting the engine controls.

4-56. INSPECTION

4-57. Inspect engine controls for damage, loose connections, and wear. Check that controls operate smoothly without binding. Refer to Morse Instructions for repair and adjustment.

4-58. LUBRICATION

4-59. Refer to Table 3-12 for lubrication requirements.

4-60. REMOVAL AND INSTALLATION

4-61. Refer to Morse Installation Instructions and Parts Catalog for removal and installation procedures. Components are located as shown in Figure 1-25.

4-62. TESTING AND ADJUSTMENT

4-63. Refer to Morse Installation Instructions for testing and adjustment.

4-64. PROPULSION ENGINES

4-65. FUNCTIONAL CHARACTERISTICS

4-66. The PCF is equipped with two GM 12V71N engines, models 7122-3000 (port) and 7122-7000 (starboard). For description of engine operation and characteristics, refer to Engine Manual, GM 6SE-193.

4-67. TROUBLESHOOTING

4-68. Refer to Engine Manual GM 6SE-193, for engine troubleshooting instructions.

4-69. SPECIAL TOOLS

4-70. Refer to Engine Manual, GM 6SE-193 for special tools required for engine repair.

Table 4-3. Engine Controls Troubleshooting

TROUBLE	SYMPTOM	PROBABLE CAUSE	REMEDY
Binding in system	Controls hard to operate	1. Lack of lubricant in control unit.	1. Lubricate
		2. Obstruction in linkage or chains	2. Remove obstruction.
		3. Cable adjusted too tight	3. Adjust (Refer to Morse Instructions)
		4. Control unit defective.	4. Replace
No control of engine speed and/or clutch	Controls operate abnormally. Clutch will not engage.	1. Cable or chain connection broken.	1. Repair
		2. Linkage to governor clutch broken.	2. Repair
		3. Control unit defective.	3. Replace

4-71. SERVICING

4-72. Refer to Engine Manual, GM 6SE-193, for periodic engine servicing instructions.

4-73. REMOVAL

4-74. Remove propulsion engine from boat as follows:

a. Open engine hatch.
b. Disconnect battery cables.
c. Disconnect and tag all electrical wires.
d. Close fuel oil supply and return valves; disconnect fuel oil supply and return lines.

NOTE

Install protective covers on lines and ports to prevent contamination.

e. Drain cooling system and disconnect cooling water supply and return lines.
f. Remove section of cooling discharge line that is routed across engine.
g. Disconnect engine lube oil and marine gear oil pressure gage lines.
h. Remove bilge pump drive belt.
i. Connect lifting sling to engine so that engine will be lifted at approximately the same angle of installation.

NOTE

One lifting eye is provided on top of engine and two eyes on the marine gear. Engine and gear weigh approximately 5000 lb.

j. Remove bolts securing shaft coupling to marine gear.

NOTE

Support engine with sling before mounting bolts are removed.

k. Remove engine mounting bolts.
l. Carefully lift engine out of engine compartment.

4-75. INSTALLATION

4-76. Installation of a propulsion engine is reverse of removal and as follows:

NOTE

Support engine with lifting sling until engine is aligned and mounting bolts are torgued.

a. As engine is bolted to mounting pad, alignment with shaft coupling must be maintained. Clearance between coupling and engine flange should be as close to zero as possible and maximum misalignment shall be 0.001 to 0.004 inch measured at 90-degree points around flanges. Use shims as required to correct misalignment.
b. After all connections are made, prepare engine for operation as described in Engine Manual, GM 6SE-193, for an initial engine start.

4-77. REPAIR AND OVERHAUL

4-78. Refer to Engine Maintenance Manual, GM 6SE-193, for repair and overhaul instructions on the engines.

4-79. PROPELLORS AND SHAFTING

4-80. SPECIAL TOOLS

4-81. Special tools required for removing the propellor and shaft bearings are listed in Table 4-4.

4-82. INSPECTION

a. Check that propellor locknut is tight and cotter pin is secure.
b. Inspect propellor for damage.
c. Check shaft-bearing water circulating holes for clogging.

4-83. CLEANING

4-84. Propellor can be cleaned in accordance with instructions contained in Bureau of Ships Technical Manual, NAVSHIPS 0901-000.

4-85. REMOVAL

4-86. PROPELLOR. Remove propellor as follows:

a. Prevent propellor from turning by placing a block of wood between propellor and hull.
b. Remove cotter pin (1, Figure 4-3).

CAUTION

To prevent possible damage to shaft log strut, position wrench so that direction of removal force of nuts is vertical.

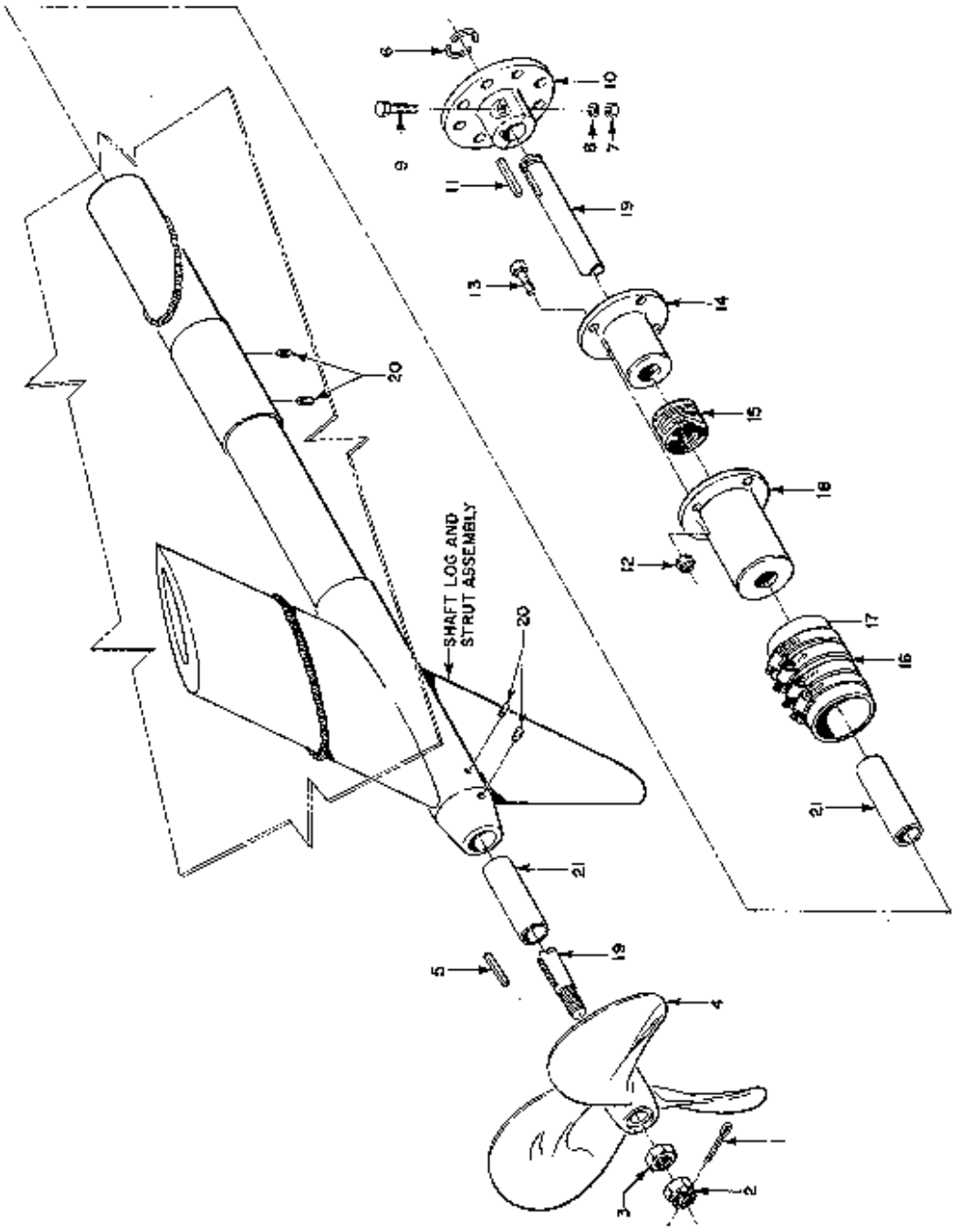

Figure 4-3. Propeller and Shafting Removal

Table 4-4. Special Tools For Bearing Removal

NAME	USE	MFG. PART NO.
1. Prop Puller	Pull prop off shaft.	Sewart Seacraft M1-224 or equivalent.
2. Bearing Puller	Pull bearings out of shaft logs and rudder logs.	Sewart Seacraft M1-223 or equivalent.

c. Remove castellated nut (2).
d. Loosen prop nut (3) several turns, but do not remove.

NOTE

If prop is hard to remove, apply small amount of heat to prop hub.

e. Using prop puller, loosen propellor from shaft.
f. Remove nut (3), propellor (4), and key (5).

4-87. SHAFTING. Remove coupling, stuffing box, shaft and bearings by following the sequence of index numbers shown in Figure 4-3 and as follows:

a. Remove propellor in accordance w with paragraph 4-86.
b. Loosen clamps (16) on hose (17) and slide hose down on shaft log.
c. Loosen bolts (9) and tap coupling (10) on shaft until keeper rings (6) can be removed.
d. Remove packing (15) from stuffing box (18) only if the shaft is hard to remove.
e. Remove bearings (21) from shaft log using bearing puller.

NOTE

If bearing is hard to remove, apply heat to shaft log at bearing location. Do not exceed 450°F.

4-88. REPAIR

4-89. Refer to Bureau of Ships Technical Manual, NAVSHIPS 0901-000 for recommended repairs on propellors and shafts.

4-90. INSTALLATION

4-91. SHAFTING. Installation of the bearings, shaft, stuffing box, and coupling is accomplished by following the reverse sequence of index numbers shown in Figure 4-3 and as follows:

a. Mark forward bearing before installing so that during installation, when mark is obeerved through setscrew hole, bearing will be centered between the setscrew holes.

b. Coat bearings (21) with light film of No-Lok or equivalent and install by tapping firmly. Aft bearing is completely installed when flush with shaft log. Forward bearing is correctly installed when mark (step a) is observed through set-screw hole.
c. Lubricate shaft lightly with Ru-Glyde or equivalent. Slide shaft (19) into shaft log until distance from end of shaft is 11 1/4 inches.
d. Secure stuffing box (18) to shaft log with hose (17) and clamps (16).
e. When installing packing (15), stagger packing cuts to prevent excessive leakage. Install packing so that pull-down distance between the box flange and packing gland is approximately 1 1/2 inch. Do not tighten bolts (13) now.

f. Check alignment of engine flange to coupling. Misalignment shall be 0.001 to 0.004 inch measured at 90-degree points around the flanges. Shim engine as required.
g. Alternately tighten packing box bolts (13) after engine alignment is correct.

4-92. PROPELLOR. Install propellor as follows:

a. Coat shaft (19, Figure 4-3) with very light film of No-Lok or equivelent.
b. Manually shove prop on shaft as far as possible. Mark shaft where prop stops.
c. Remove prop from shaft.
d. Check fit of key (5) in slots of prop and shaft. Key should fit snug but not bind.
e. Insert key (5) in shaft keyway.
f. Install prop on shaft making sure key does not ride out of shaft keyway. Prop should come very close to mark (step b); if not, remove prop and file key down.
g. Install prop nut (3) and manually tighten.
h. Prevent prop from turning by placing a block of wood between prop and hull.

CAUTION

To prevent possible damage to shaft log strut, force applied to the wrench for tightening the nuts should be vertical.

i. Tighten prop nut (3) until snug.
j. Install and tighten castellated nut (2)
k. Install cotter pin (1).

4-93. BALANCING

4-94. Refer to Bureau of Ships Technical Manual, NAVSHIPS 0901-000, for propellor balancing procedures.

4-95 EXHAUST SYSTEM

4-96. FUNCTIONAL CHARACTERISTICS

4-97. The Engine Exhaust System (Figure 1-27) provides muffling of the engine exhausts. Each engine is provided with a single muffler. Exhausts from each manifold of the engine is routed into the muffler and a single exhaust line routes the exhaust overboard. The exhaust pipes are cooled by seawater pumped from the propulsion engine cooling system into each muffler.

Table 4-9. Exhaust System Troubleshooting

TROUBLE	SYMPTOM	PROBABLE CAUSE	REMEDY
Damaged pipes or loose connections	Abnormal engine sound	1. Damaged pipe section (hole, crack, etc.)	1. Replace damaged section.
		2. Loose clamps or bolts at a connection.	2. Tighten.
Overheating of exhaust pipes	Excessive heat; overboard discharge abnormal	Cooling water supply insufficient (valve closed, clogged strainer, etc.)	Refer to water cooling system.
Damaged or corroded muffler	Abnormal engine sound	Muffler damaged or corroded excessively inside.	Replace

4-98. TROUBLESHOOTING

4-99. Refer to Table 4-5 for troubleshooting the exhaust system.

4-100. INSPECTION

4-101. Inspect the exhaust system for corrosion, loose connections or insulation, cooling water leakage, etc.

4-102. REMOVAL

4-103. Location of exhaust system components is shown in Figure 1-27. Before removing muffler, close cooling-water supply valve to muffler.

4-104. INSTALLATION

4-105. Location of exhaust system components is shown in Figure 1-27. Special procedures to be observed during installation of components are as follows:

a. Insulate exhaust pipes between engine manifold and muffler with 1/2 inch insulation in accordance with MIL-I-16411, Type II (Pittsburgh-Corning Corp., Temp Mat or equivalent). Lap insulation and secure with wire spaced about 2 inches.

b. Cover outside of insulation with 95% asbestos, wire-insert cloth, secured with wire through brass rings or over brass hooks.

SECTION 3. FUEL SYSTEM

4-106. FUNCTIONAL CHARACTERISTICS

4-107. The PCF Fuel System (Figure 1-28) stows, supplies, and controls fuel oil for the propulsion engines and the ac generator engine. Fuel is stored in three tanks: two located in the lazerette and one in the compartment below the deckhouse. Description of the system is contained in the following paragraphs.

4-108. FILL AND VENTILATION.

4-109. Each of the three fuel tanks is provided with a separate fuel fill port located on deck. The aft tank fill ports are located on the tank hatches. The forward tank fill port is located on the port side of the craft. Tanks should be re-filled as often as possible to prevent condensation. The tanks are vented to separate flameproof vents on deck. The aft fuel tank vents are connected together to allow venting of both tanks if one tank vent should become obstructed. This connection would also permit possible overflow from one tank to be received by the other.

4-110. SUPPLY AND RETURN.

4-111. The supply and return manifolds, with the control valves, are provided to control selection of the tank(s) from which fuel will be supplied and returned. Engines can be operated from any one tank, two tanks, or all three tanks by appropriate valve selection. Return fuel should be directed back to the same tank(s) from which the engines are operating or overflow could occur. A typical operation would be with the aft/port tank supply valve and the aft/port tank return valve open. During engine operation the ac generator engine is operated from the same tank(s) as are the propulsion engines. During engine shutdown, the ac generator engine can be operated from any tank by valve selection.

4-112. STRIPPING

4-113. A fuel stripping system is provided to remove condensation and sludge from the tanks. In turn, each sump valve is opened and a small amount of fuel is removed from each tank sump by manually operating the stripping pump. When fuel being pumped becomes clear, pumping is stopped and sump valve closed.

4-114. EMERGENCY FUEL SHUTOFF

4-115. Emergency fuel shutoff is provided by cables connected to each lever-operated tank supply valve. The cables are routed to the pilothouse. Pulling the control in the pilothouse will shut off fuel supply at the tank.

4-116. TROUBLESHOOTING

4-117. Refer to Table 4-6 and Figure 4-4 for troubleshooting the fuel system.

4-118. INSPECTION

4-119. Inspect fuel system as described in Table 3-5.

4-120. CLEANING

4-121. Cleaning of fuel tanks should be accomplished in accordance with procedures in Bureau of Ships Technical Manual, NAVSHIPS 0901-000.

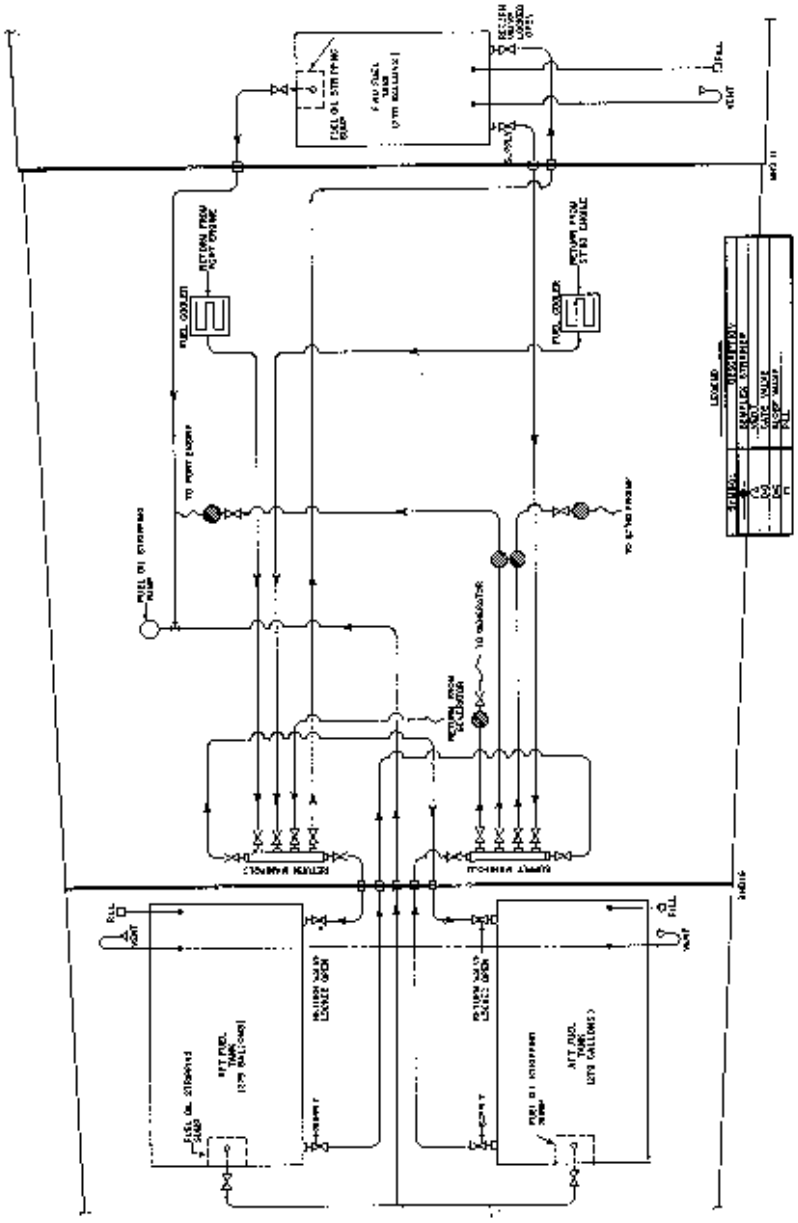

Figure 4-4. Fuel System Schematic

Table 4-6. Fuel System Troubleshooting

TROUBLE	SYMPTOM	PROBABLE CAUSE	REMEDY
Air leak in lines	Engine runs uneven; stalls when idling; or loss of power.	Loose or improper connection in supply lines to engine.	Tighten or repair connection.
Insufficient fuel supply	Engine runs uneven; excessive vibration; stalls when idling; or loss of power.	1. Clogged filter	1. Remove filter element and clean or replace.
		2. Supply valve not fully open	2. Open
		3. Vent stopped up	3. Remove obstruction.
Return fuel to full tank	Fuel overflows through vent	Wrong return valve open.	Open return valve to tank supplying fuel.

4-122. REMOVAL

4-123. Location of fuel system components is shown in Figure 1-28. Special instructions for removal of fuel system components are contained in the following paragraphs.

NOTE

Before breaking any connection, isolate the section by closing applicable valves. Secure valves closed and place warning tags on valves and engine controls. Install protective covers over all ports and lines to prevent contamination.

4-124. AFT TANK.

4-125. Remove either aft tank as follows:

a. Drain fuel from tank using stripping pump.
b. Disconnect fuel fill line from inside lazarette.
c. Remove tank hatch from deck.
d. Close sump, supply, and return valves at tank and disconnect hoses from those valves.
e. Disconnect emergency fuel shutoff cable from supply valve.
f. Disconnect vent line from tank.
g. Remove strap securing tank to frame.
h. Connect lifting sling to lifting eyes on tank; lift tank carefully through hatch and at an angle to clear mortar box.

4-126. FORWARD TANK.

4-127. Remove forward tank as follows:

NOTE

Forward fuel tank can only be removed as far as the deckhouse. Repairs, cleaning, etc. must be accomplished there.

a. Drain fuel from tank using stripping pump.
b. Remove forward fuel tank hatch.
c. Disconnect fuel fill line and vent line.
d. Close sump, supply, and return valves at tank.
e. Disconnect hoses at sump, supply, and return valves.
f. Disconnect fuel gage electrical cable.
g. Disconnect emergency fuel shut-off cable from supply valve.
h. Remove bolts securing tank to craft's frame.
i. Connect lifting sling to lifting eyes on tank; lift tank carefully through hatch.

4-128. REPAIR

4-129. FUEL TANK

4-130. Refer to Bureau of Ships Technical Manual, NAVSHIPS 0901-000, for fuel tank repair procedures.

4-131. STRIPPING PUMP

4-132. Refer to Blackmer Pump Co. instructions for information on repair of the stripping pump.

4-133. VALVES

4-134. Refer to applicable manufacturer's instructions for repair information on fuel system valves. Refer to Figure 1-28 and Chapter V for identification of valve and manufacturer.

4-135. INSTALLATION

4-136. Installation of fuel system components is the reverse of removal. Components are located as shown in Figure 1-28. Special installation procedures are contained in the following paragraphs.

4-137. FUEL TANK

4-138. Installation of the forward and aft fuel tanks is the reverse of removal and as follows:

a. Check operation of emergency shutoff cable.
b. Ensure that supply and return valves are open. Secure return valve in open position.
c. Close sump valve.
d. Fill tank and check connections for leaks.

4-139. Use Rectorseal or equivalent on all threaded pipe connections.

4-140. TESTING

4-141. Fuel flow can be checked for adequate supply and air leaks as described in Engine Maintenance Manual, GM 6SE-193.

SECTION 4. STEERING

4-142. FUNCTIONAL CHARACTERISTICS

4-143. The Steering System (Figure 1-29) provides directional control of the craft. Normal control of the craft is provided from the wheel in the pilothouse. During docking and close maneuvering where visibility is essential, the aft steering wheel can be employed. The aft wheel is normally disengaged and has no control over the rudders. The aft wheel is engaged by a lever-operated clutch at the aft station. Once the clutch is engaged both wheels have control and will turn simultaneously. Steering wheel motion is transmitted to the steering gear through the chain/sprocket-driven shafts. Rotating motion of the shafts is changed to lateral motion by the steering gear and transmitted to the rudder tillers through pipe linkage as shown in Figure 4-12. Emergency rudder control is provided by connecting the emergency tiller to the starboard tiller as shown in Figure 1-29.

4-144. TROUBLESHOOTING

4-145. Refer to Table 4-7 and Figure 1-29 for troubleshooting the steering system.

4-146. INSPECTION

a. Inspect steering system for damage, loose connections, excessive play in chains, etc.
b. Inspect rudders for barnacles and damage.

4-147. LUBRICATION

4-148. Periodically lubricate steering system components in accordance with requirements shown on Lubrication Diagram, Figure 3-7.

4-149. REMOVAL

4-150. Location of steering system components is shown in Figure 1-29. Special removal procedures for system components are contained in the following paragraphs.

4-151. STEERING GEAR.

a. Disconnect steering gear from drive shaft at universal joint.
b. Disconnect steering gear arm from linkage pipe to tillers.
c. Remove four bolts securing gear mounting plate to boat structure; remove plate and steering gear.

4-152. RUDDER

4-153. Remove rudder by following the sequence of index numbers shown in Figure 4-5 and as follows:

a. If removing port rudder, disconnect rudder transmitter arm from tiller.

NOTE

Support rudder (15) before removing bolt (6).

b. Use bearing puller to remove bearing (17) from rudder log.

4-154. AFT WHEEL CLUTCH.

4-155. Remove aft steering wheel clutch as follows:

a. Disconnect clutch activating linkage.
b. Remove chain from sprocket.
c. Remove four bolts securing chain sprocket to boat structure.
d. Remove bolts securing u-clamps and remove clutch.

Table 4-7. Steering System Troubleshooting

TROUBLE	SYMPTOM	PROBABLE CAUSE	REMEDY
Binding in system	Wheel hard to turn	1. Dry or defective bearing	1. Lubricate or replace.
		2. Obstruction in linkage or chains	2. Check linkage in lazarette, and chains. Remove obstruction.
		3. Chain binding	3. Add link.
		4. Bent shaft	4. Replace shaft.
		5. Steering gear defective	5. Replace gear.
No control over craft	Wheel turns freely	1. Loose or broken chain	1. Repair or replace.
		2. Coupling(s) or linkage in lazarette sheared or broken.	2. Repair
		3. Sprocket slipping on shaft (key sheared)	3. Repair
		4. Steering gear defective (shaft turns, but tiller arm does not).	4. Replace gear
Rudder damage	Craft slow in responding to wheel motion	One rudder shaft sheared from tiller arm.	Repair.

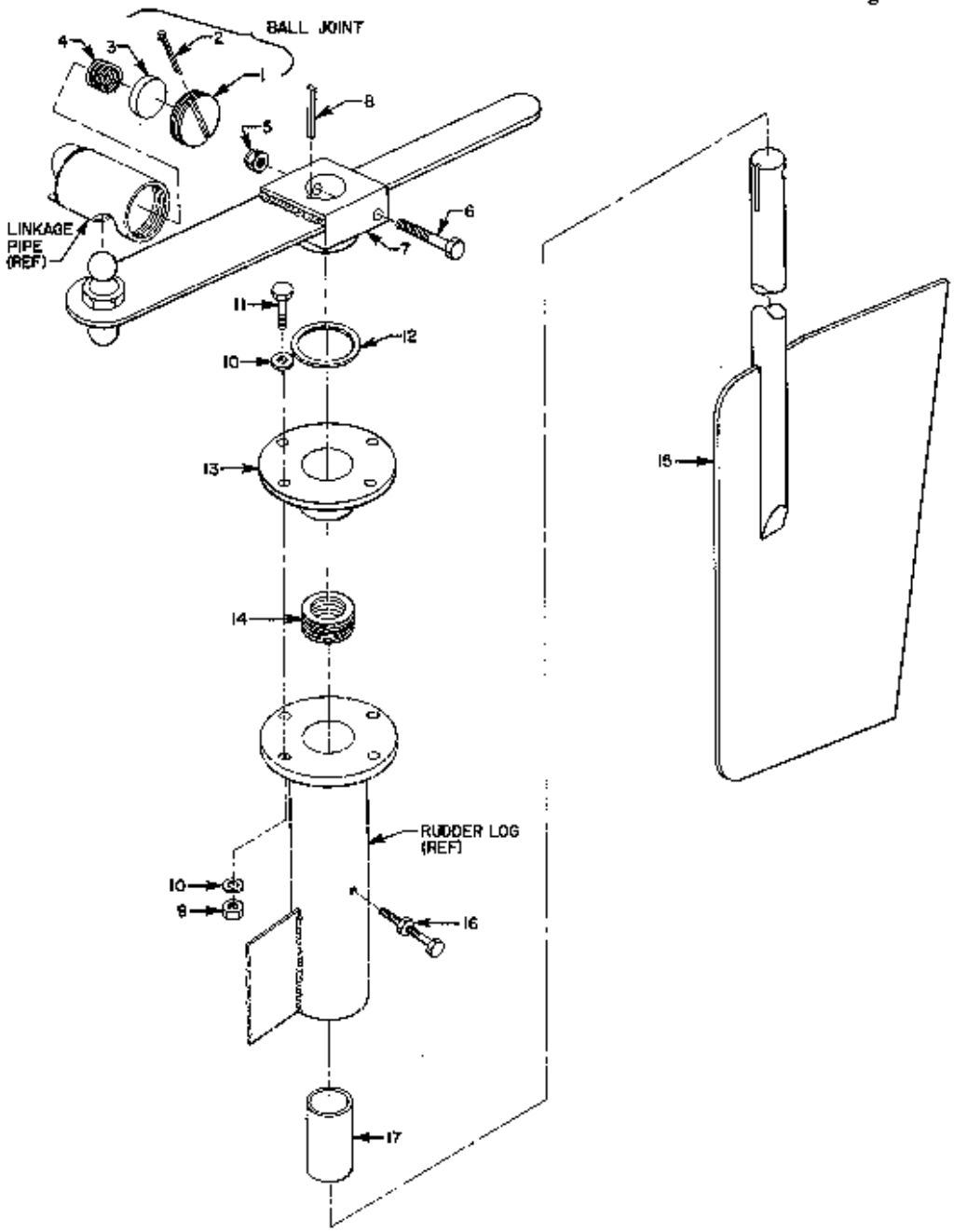

Figure 4-5. Rudder Removal

4-156. REPAIR

4-157. STEERING GEAR

4-158. Refer to Ross Manual for repair information on the steering gear.

4-159. AFT WHEEL CLUTCH

4-160. Refer to Twin Disc Manual for repair information on the aft wheel clutch.

4-161. INSTALLATION

4-162. Installation of steering system components is the reverse of removal. Location of components is shown in Figure 1-29. Special procedures to be observed are contained in the following paragraphs.

4-163. RUDDER

4-164. Install rudder in the reverse sequence of index numbers shown in Figure 4-5 and as follows:

a. If new bearing is being installed, cut length so that bearing will fit flush in rudder log.

b. Coat bearing (17) lightly with No-Lok or equivalent and install in log by tapping firmly.

NOTE

Hold rudder (15) in place until bolt (6) is installed.

c. Stagger cuts of packing (14) to prevent excessive leakage.

4-165. CHAIN ADJUSTMENT

4-166. Idler gears are provided as shown in Figure 1-29 for adjustment of the steering system chains. Chains are adjusted by loosening the idler gear mounting bolts and sliding gear in desired direction.

4-167. TESTING

4-168. With boat at rest, no more than 5 pounds force shall be required to turn the steering wheel. The force shall be measured one inch inside the rim of the wheel. Backlash shall be limited so that rudder will move after wheel is turned 15 degrees.

SECTION 5. WATER SYSTEMS

4-169. FRESH WATER SYSTEM

4-170. FUNCTIONAL CHARACTERISTICS.

4-171. The fresh water system (Figure 1-30) stores and supplies potable water to the galley sink. Water is stored in a 51-gallon tank located in the lazerette. Water is pumped from the tank by the hand-operated pump located in the galley sink.

4-172. TROUBLESHOOTING

4-173. Refer to Table 4-8 and Figure 4-6 for troubleshooting the fresh water system.

4-174. INSPECTION

4-175. Inspect all lines and connections for leakage.

4-176. CLEANING

4-177. After repair or replacement of the water tank or other system components, the system should be disinfected as follows:

a. Remove access plate and clean tank with hot detergent solution; pump solution through system with galley pump.
b. Install tank access plate.
c. Flush out system with clean potable water.
d. Fill tank with chlorinated potable water (100 parts by weight of free chlorine to a million parts of water).
e. Leave chlorinated water in tank for 4 hours, then flush out with clean potable water until chlorine taste disappears.

4-178. REMOVAL

4-179. Location of fresh water system components is shown in Figure 4-15. Special instructions for component removal are as follows:

a. Close supply valve at tank before disconnecting supply line at any point.
b. Drain water from tank before removing tank.
c. Remove tank through 20-inch lazerette access hatch.
d. Install protective covers over ports and lines.

4-180. REPAIR

4-181. SUPPLY VALVE. Refer to Nibco, Inc. instructions for repair information on the water supply valve.

4-182. SINK PUMP. Refer to Wilcox-Crittenden instructions for repair information on the sink pump.

4-183. INSTALLATION

4-184. Installation of fresh water system components is the reverse of removal. Figure 1-30 shows location of components. Special installation instructions are as follows:

a. Use Rectorseal or equivalent on all threaded connections.
b. Check that supply valve is open.
c. If required, clean system in accordance with paragraph 4-176.

4-185. SEAWATER COOLING SYSTEMS

4-186. FUNCTIONAL CHARACTERISTICS.

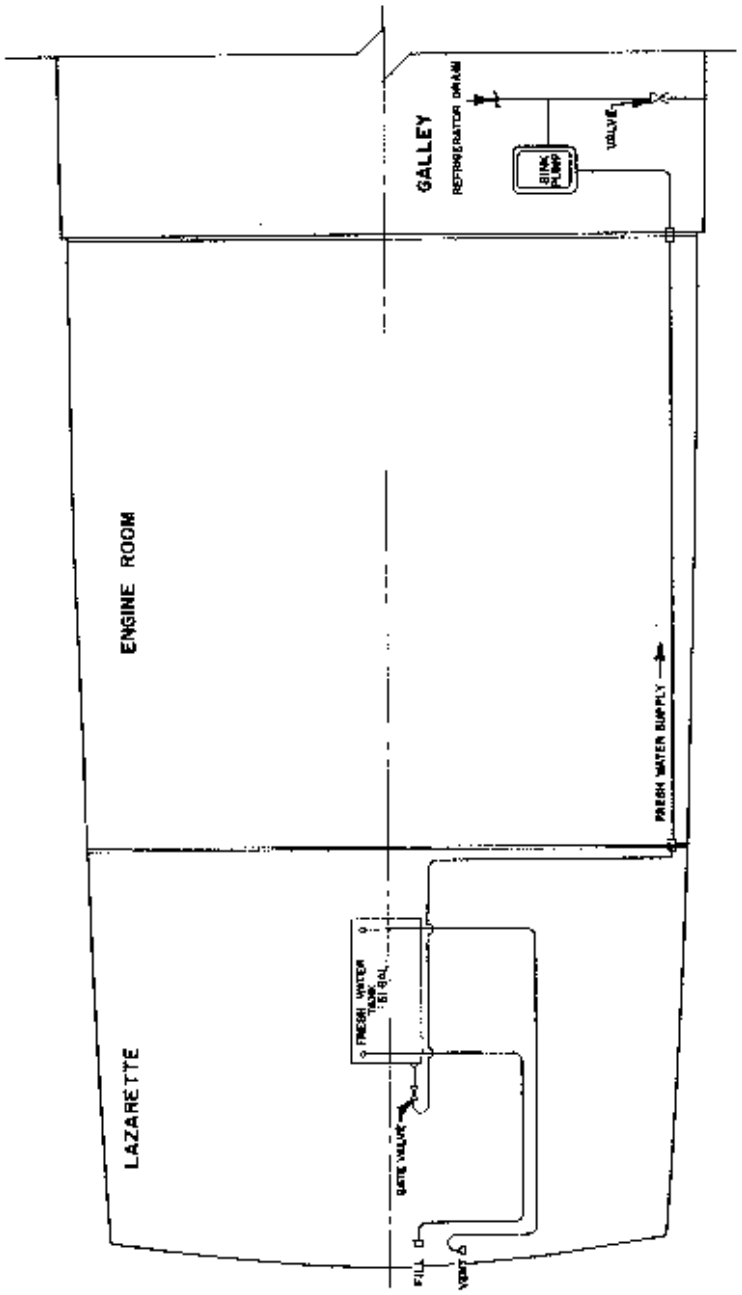

Figure 4-6. Fresh Water System Schematic

Table 4-8. Fresh Water System Troubleshooting

TROUBLE	SYMPTOM	PROBABLE CAUSE	REMEDY
Insufficient water supply	Little or no water from galley pump	1. Tank empty.	1. Fill tank.
		2. Vent stopped up.	2. Remove vent obstruction
		3. Shutoff valve at tank not fully open	3. Open valve
		4. Leak in system	4. Repair
		5. Defective pump	5. Repair or replace.

4-187. ENGINE COOLING. Each propulsion engine is cooled by a seawater cooling system (Figure 1-31). The system also cools the engine exhaust pipes and engine return fuel, and provides for priming the bilge system. The seawater is sucked through a sea scoop and circulated by an engine driven pump. The seawater first flows through a fuel cooler and then the engine mounted heat exchanger absorbing return fuel and engine heat. Most of the water is then routed overboard. A portion of the water is routed into the engine muffler for cooling the exhaust pipes. Some of the water is routed to the bilge manifold and pump for priming the manifold and pump. A connection is provided between the strainer and supply valve for connecting a water supply so that the engines can be operated when the boat is out of the water.

4-188. GENERATOR COOLING. A seawater cooling system (Figure 1-32) is provided for cooling the ac generator engine and exhaust. Seawater is sucked through a sea scoop and circulated by an engine-driven pump. The water is circulated through an engine mounted heat exchanger where it absorbs engine heat and is then routed to the exhaust muffler. The water cools the exhaust muffler and pipe and is discharged overboard with engine exhaust.

4-189. TROUBLESHOOTING

4-190. Refer to Table 4-9 and Figures 4-7 and 4-8 for troubleshooting the seawater cooling systems.

4-191. INSPECTION

4-192. Inspect cooling systems in accordance with Table 3-5 and inspect sea scoop for clogging.

4-193. REMOVAL

4-194. Location of components in the seawater cooling systems is shown in Figures 1-31 and 1-32. Special removal instructions are contained in the following paragraphs.

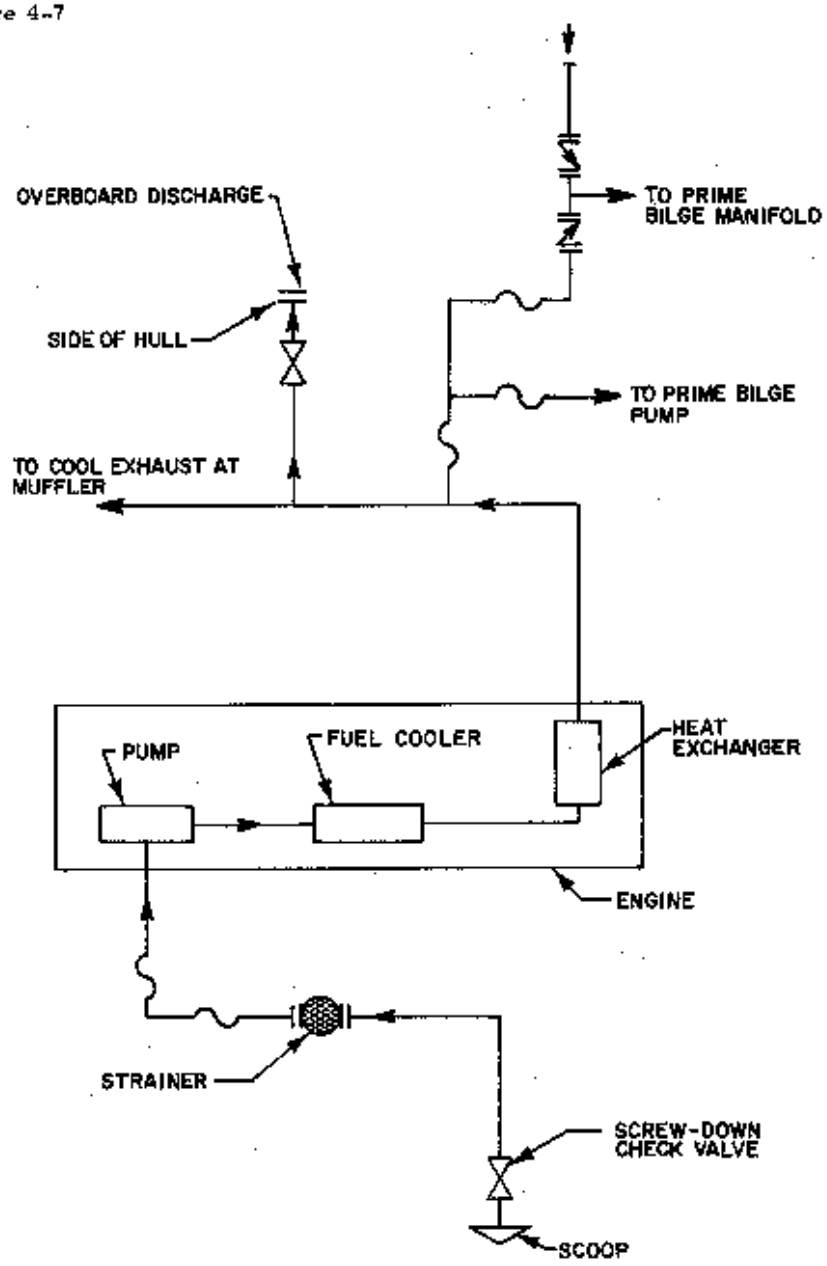

Figure 4-7. Engine Cooling Schematic

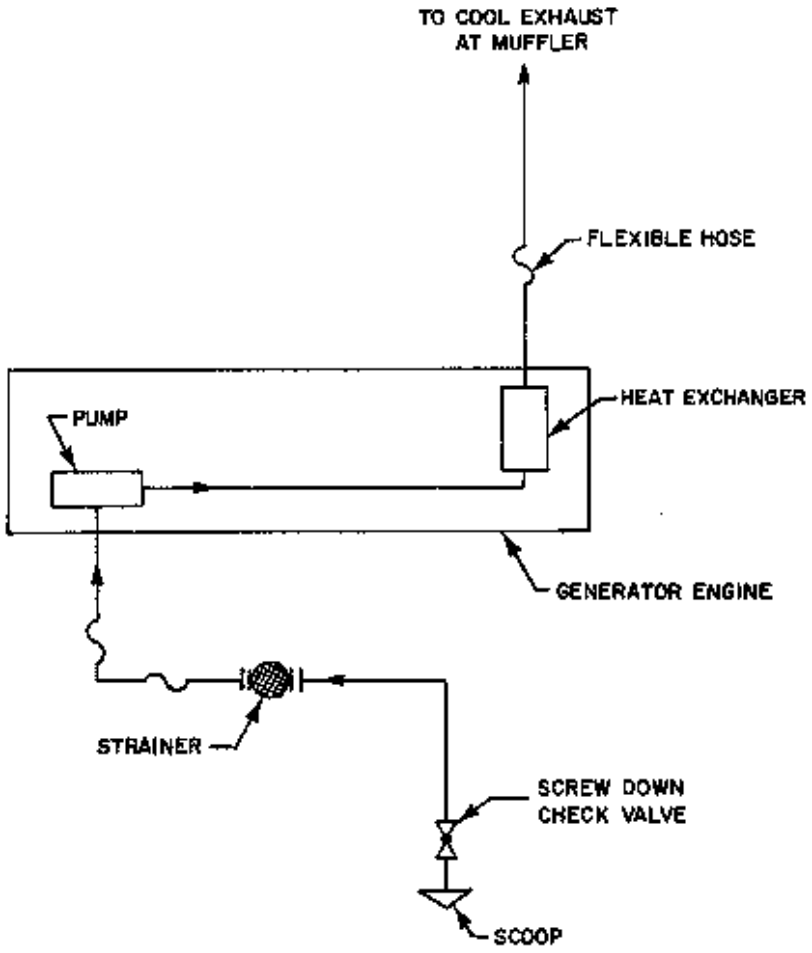

Figure 4-8. Generator Cooling Schematic

Table 4-9. Seawater Cooling System Troubleshooting

TROUBLE	SYMPTOM	PROBABLE CAUSE	REMEDY
Insufficient water circulating through system.	Overheating of engine or exhaust pipes. Overboard discharge not normal	1. Strainer clogged	1. Clean
		2. Supply or discharge valve not fully open.	2. Open valve.
		3. Engine-mounted pump defective.	3. Repair or replace. Refer to manual on engine.
		4. Heat exchanger clogged	4. Clean. Refer to manual on engine.

NOTE

Before breaking any line or connection, close the seawater supply valve and place warning tags on valve and engine controls.

4-195. STRAINER ELEMENT. Remove element from seawater cooling strainer as follows:

a. Remove wing nut from top of strainer.
b. Lift washer, cover, and o-ring from top of strainer.
c. Lift element out of strainer.

4-196. ENGINE-MOUNTED COMPONENTS. Refer to the Onan Manual or GM Manual, 6SE-193, for removal instructions for the seawater pumps, heat exchangers, or oil cooler.

4-197. REPAIR AND OVERHAUL

4-198. ENGINE PUMP AND HEAT EXCHANGER. Refer to Engine Manual, 6M 6SE-193, or Onan Service Manual for repair and overhaul instructions for the seawater pumps or heat exchangers.

4-199. VALVES. Refer to applicable manufacturer's instructions for repair information on the cooling system valves. Refer to Figures 1-31 and 1-32, and Chapter V for identification of valve and manufacturer.

4-200. INSTALLATION

4-201. Location of the seawater cooling system components is shown in Figures 1-31 and 1-32. Special instructions for installation of components are contained in the following paragraphs.

4-202. ENGINE-MOUNTED COMPONENTS. Refer to the Onan Service Manual or Engine Manual, GM 6SE-193, for installing the seawater pumps, heat exchangers, or fuel cooler.

4-203. BILGE SYSTEM

4-204. FUNCTIONAL CHARACTERISTICS.

4-205. The bilge system (Figure 1-33) provides for draining water from the bilge and also supplies seawater to the deck hoses for washdown and fire fighting. The two primary bilge pumps are belt-driven by the engines (one by each engine) and are capable of pumping approximately 180 gpm each. A lever operated hand pump is located on deck to provide bilge draining when the engines are secured. The hand pump is capable of pumping approximately 25 gpm. Bilge drainage is accomplished by opening only the valve(s) to the bilge area(s) which require(s) draining. Opening a valve to a dry bilge area will result in air being drawn into the pump. Priming of the engine-driven bilge pumps and bilge manifold is provided by water supplied from the seawater cooling systems. The hand-operated bilge pump is self priming.

4-206. Water to the hoses on deck can be pumped from either or both of the two sea suctions depending on valve selection. During use of either of the hoses, the applicable overboard discharge valve is closed. Deck washdown and bilge drainage accomplished simultaneously by proper valve selection. During this operation one pump is used for draining and the other for supplying water to the hose.

4-207. TROUBLESHOOTING

4-208. Refer to Table 4-10 and Figure 4-9 for troubleshooting the bilge system.

4-209. INSPECTION

4-210. Inspect bilge system as follows:

a. Inspect system in accordance with instructions in Table 3-5.
b. Inspect sea suctions for clogging.

4-211. LUBRICATION

4-212. Periodically refill lubrication cups on engine-driven pumps in accordance with requirements on Lubrication Diagram, Figure 3-12.

4-213. REMOVAL. Bilge system components are located as shown in Figure 1-33. Special removal instructions are contained in the following paragraphs.

NOTE

Before breaking a line or connection, ensure that valves isolating the section are closed and secured. Warning tags should be attached to the valves and engine controls.

4-214. STRAINER ELEMENT AND GLASS. Remove element and glass of strainer (16 and 27, Figure 1-33) as follows:

a. Remove wing nut from top of strainer.
b. Lift washer, cover, and O-ring from top of strainer.
c. Lift screen element out of strainer.
d. Support bottom plate and remove two nuts and tie rods.
e. Lower bottom plate and strainer glass.
f. Remove gasket from each end of glass.

Table 4-10. Bilge System Troubleshooting

TROUBLE	SYMPTOM	PROBABLE CAUSE	REMEDY
Bilge area not being drained by engine pumps.	Very little or no overboard discharge	1. Valve open to dry bilge area.	1. close valve.
		2. Valve to flooded bilge area is closed.	2. Open.
		3. Overboard valves are closed.	3. Open
		4. System not primed. Priming valve closed.	4. Open.
	Strong overboard discharge.	Sea suction valve open.	Close
	Very little or no discharge from one overboard port.	1. Pump belt slip- or broken	1. Adjust or replace.
		2. Defective pump.	2. Repair or replace.
No water supply to on-deck hose connection.	No discharge.	1. Sea suction valve and/or supply valve closed.	1. Open
		2. Pump belt broken or slipping.	2. Adjust or replace.
		3. Defective pump.	3. Repair or replace.
Bilge cannot be drained with hand pump.	Very little or no overboard discharge.	1. Valve to dry bilge area open	1. Close
		2. Valve to flooded area closed.	2. Open.
		3. Defective pump.	3. Repair or replace.
	Strong discharge	Sea suction valve open.	Close.

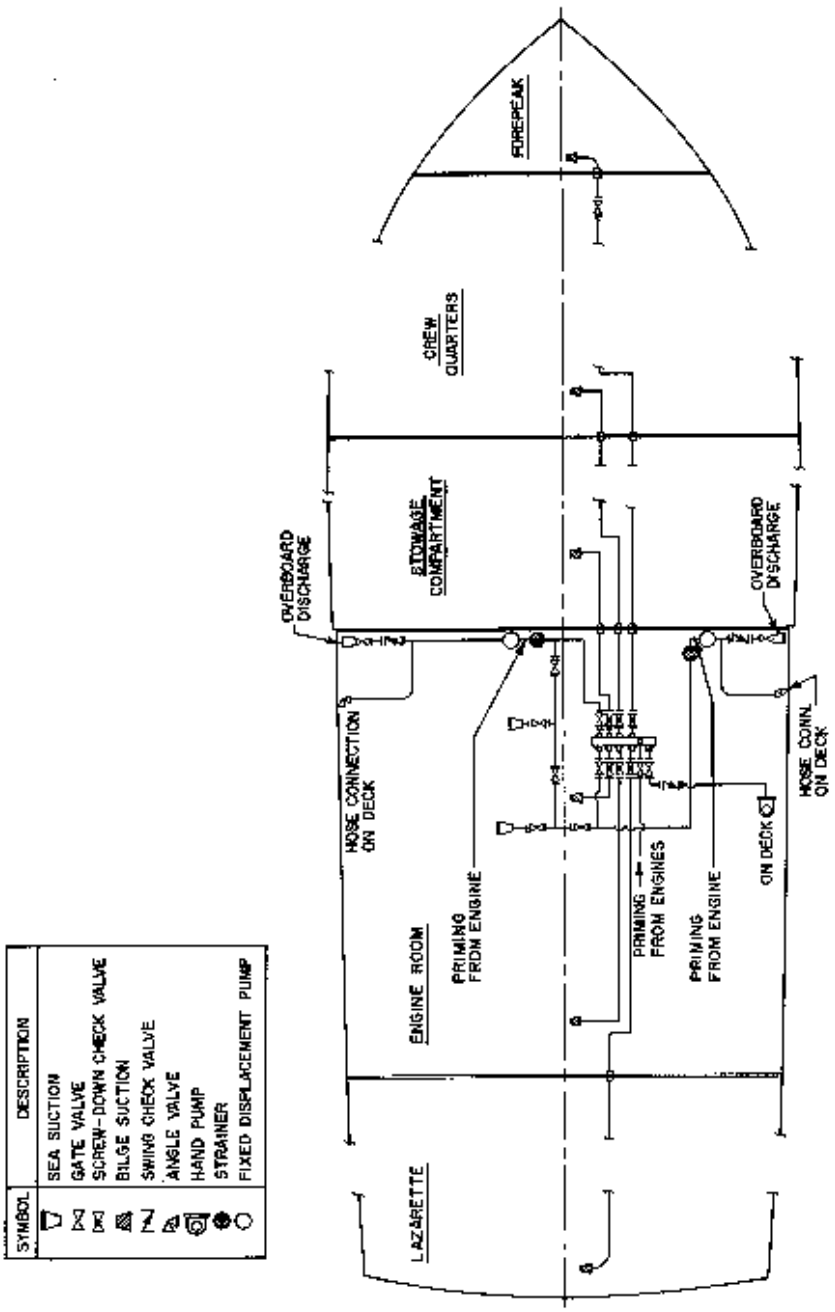

Figure 4-9. Bilge System Schematic

4-215. BILGE PUMP. Remove pump as follows:

a. Close valves to isolate pump.
b. Loosen clamps securing flexible hoses to the inlet and discharge ports of pump.
c. Remove belt.
d. Remove four bolts, washers, and nuts; remove pump.

4-216. REPAIR AND OVERHAUL

4-217. BILGE PUMP. Refer to MP Pump Manual for repair and overhaul instructions for the engine-driven bilge pumps.

4-218. HAND PUMP. Refer to Edson Pump Instructions for repair and overhaul information on the hand-operated bilge pump.

4-219. STRAINERS. Refer to Groco Strainer Parts Sheet for identification of repair parts for the bilge system strainers.

4-220. VALVES. Refer to applicable manufacturer's instruction for repair information on bilge system valves. Refer to Figure 1-33 and Chapter V for valve and manufacturer identification.

4-221. INSTALLATION

4-222. Installation of components of the bilge system is the reverse of removal. Components are located as shown in Figure 1-33. Special installation procedures are as follows:

a. Use gaskets and sealant on all flanged connections.
b. Use pipe cement (Rectorseal or equivalent) on all threaded connections.

4-223. ADJUSTMENT

4-224. The bilge pump belt can be adjusted by (1) loosening the mounting bolts and sliding pump in desired direction or (2) adjusting v-slot on pump pulley.

4-225. TESTING

4-226. With engines running, check that each pump discharges water overboard (this is priming water from engine cooling system and should always be present).

SECTION 6 ELECTRONIC SYSTEMS

4-227. FUNCTIONAL CHARACTERISTICS

4-228. RADAR

4-229. The PCF is equipped with a Decca D202 radar system (Figure 4-10) Refer to the Decca Manual for description and functional characteristics of the radar.

4-230. SSB COMMUNICATIONS

4-231. The PCF is equipped with an AN/URC-58 SSB Communications System (Figure 4-11) consisting of a RF Communications, Inc. RF-301 transceiver (AN/URC-58), RF-302 antenna coupler, RF-304 power supply,

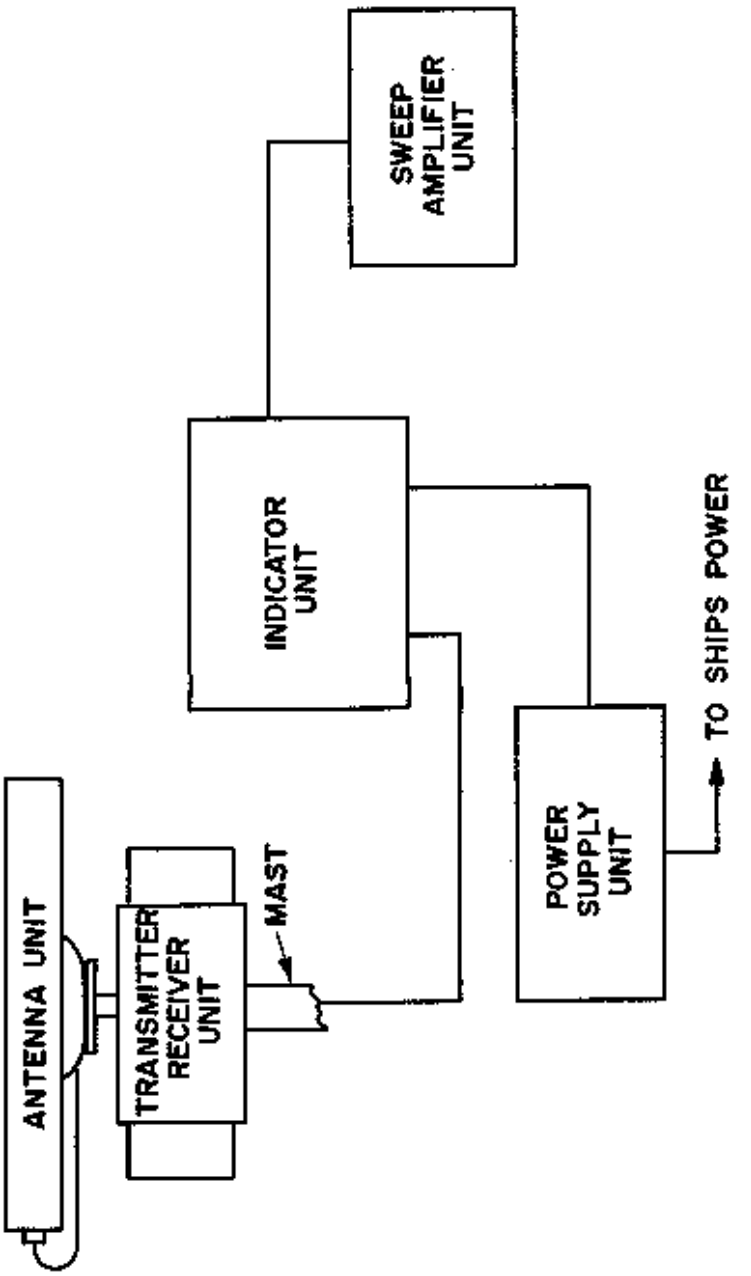

Figure 4-10. Radar System Block Diagram

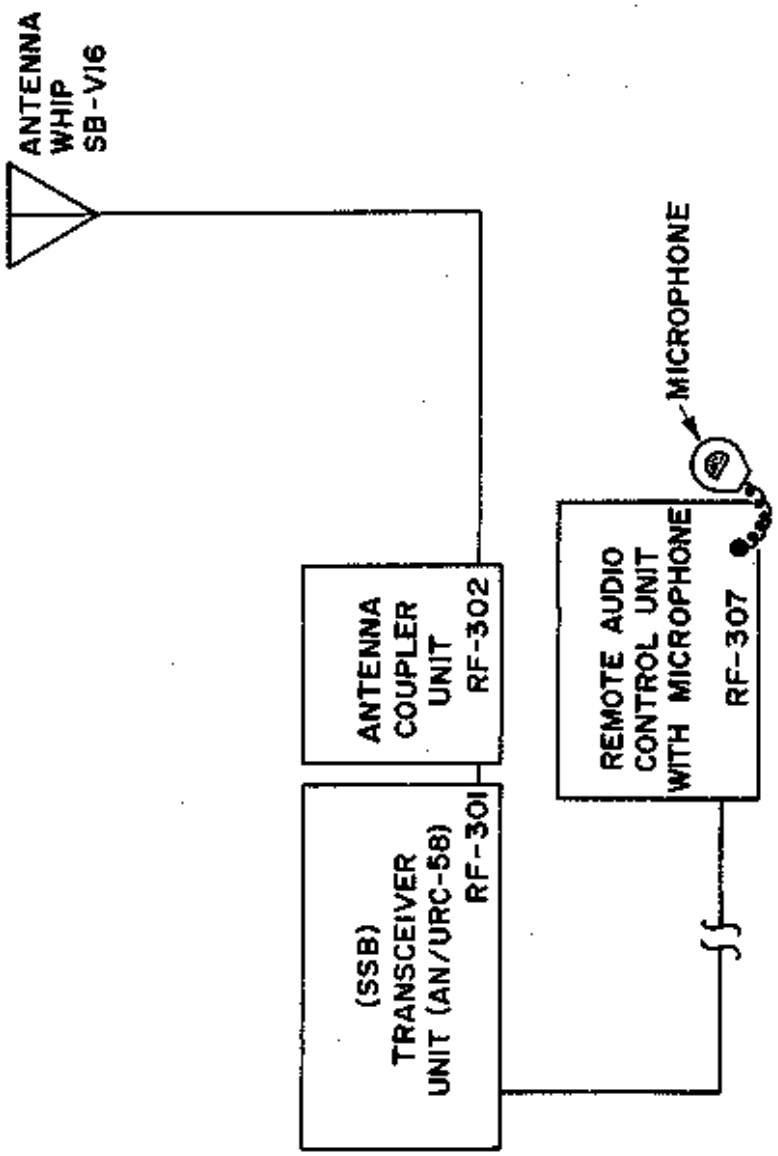

Figure 4-11. AN/URC-58 Radio Block Diagram

RF-305 shockmount, RF-307 remote control, RF-308 running spares, and a SB-V16 antenna. Refer to applicable RF Communications Manual for descriptions and functional characteristics as follows:

a. NAVSHIPS 0967-034-8000, RF-301 SSB Transceiver Instruction Manual (includes RF-302 Antenna Coupler Manual and information on the RF-304 power supply and RF-305 shockmount).
b. RF 307 Remote Control Instruction Manual.

4-232. VHF COMMUNICATIONS

4-233. The PCF is equipped with two AN/VRC-46 VHF Communication Systems (Figure 4-12) consisting of RT-524/VRC and MT-1029/VRC radio sets, M-80/GR microphones, LS-454/U loudspeakers, AN-719/VRC antenna bases, and AT-912/VRC antennas. Refer to TM 11-5820-401-10 Operator's Manual, AN/VRC-46, for descriptions and functional characteristics.

4-234. FATHOMETER

4-235. The PCF is equipped with a Raytheon, DE-736 Fathometer System (Figure 4-13). Refer to Raytheon Manual for description and functional characteristics of the fathometer.

4-236. TROUBLESHOOTING AND SERVICING

4-237. RADAR

4-238. Refer to Decca Marine Radar Technical Manual for troubleshooting and servicing instructions on the radar.

4-239. SSB COMMUNICATIONS

4-240. Refer to applicable manual listed in paragraph 4-231 for troubleshooting and servicing instructions on the AN/VRC-58 radio system.

4-241. VHF COMMUNICATIONS

4-242. Refer to TM 11-5820-401-20, Organizational Maintenance Manual, for troubleshooting and servicing instructions on the AN/VRC-46 radio system.

4-243. REMOVAL AND INSTALLATION

4-244. Location of the electronic equipment is shown in Figures 1-34 thru 1-37). Special instructions for removal and installation of the electronic equipment are contained in applicable manual listed in paragraphs 4-228 through 4-235.

WARNING

Before working on the electronic equipment ensure the power to that equipment has been turned off and warning tag placed on circuit breaker. Power to all the electronic equipment can be turned off by opening the main dc switch in the engine room.

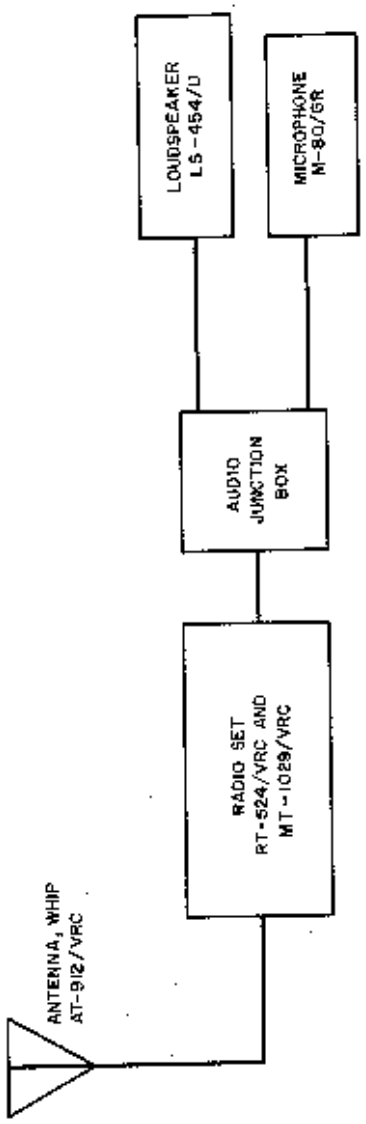

Figure 4-12. AN/VRC-46 Radio Block Diagram

Figure 4-13. Fathometer Block Diagram

SECTION 7. INTERCOMMUNICATION SYSTEM

4-245. FUNCTIONAL CHARACTERISTICS

4-246. The PCF is equipped with a sound-powered phone system (Figure 1-38) with stations located in the pilothouse, the gun tub, the radio room, and the aft gun. Permanent handsets are provided at the pilothouse and radio stations. Removeable headchest sets are provided for each station. A station is called by pressing appropriate button at the calling station which completes a circuit to the buzzer at the called station.

4-247. TROUBLESHOOTING

4-248. Refer to Table 4-11 and Figure 4-14 for troubleshooting the intercommunication system.

4-249. INSPECTION

4-250. Inspect all components and wiring for damage, loose connections, corrosion, etc.

4-251. REMOVAL

4-252. Components of the intercommunication system are shown in Figure 1-38. Place identification tags on disconnected wires.

WARNING

Open main dc switch in engine room before disconnecting wires, etc. Place warning tag on switch.

4-253. REPAIR

4-254. HANDSET AND HEADCHEST SET.

4-255. Refer to Henshel Mfg. Co. Manuals for repair instructions on the handsets and headchest sets.

4-256. RING AND JUNCTION BOX.

4-257. Refer to Pauluhn Co. instructions for repair information on the ring and junction box.

4-258. INSTALLATION

4-259. Location of intercommunication system components is shown in Figure 1-38.

4-260. TESTING

4-261. Check operation of all calling circuits and handsets and headchest sets.

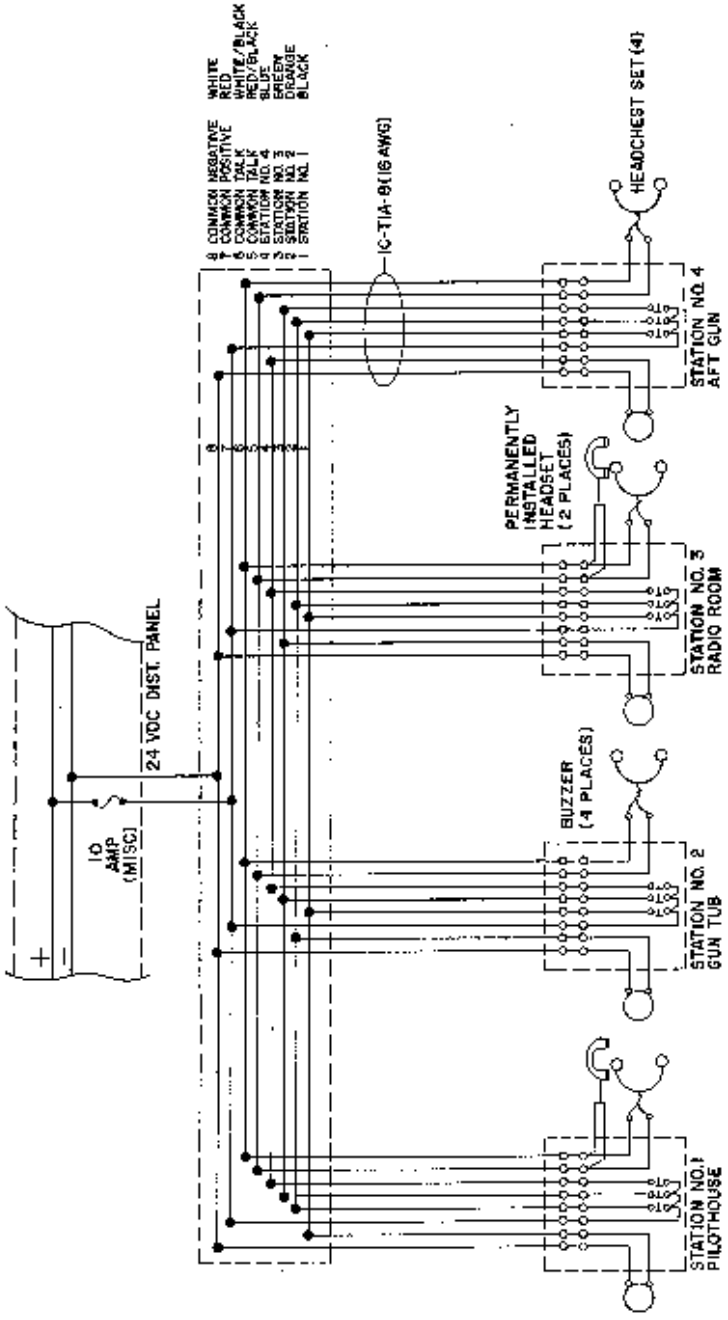

Figure 4-14. Intercommunication System Schematic

Table 4-11. Intercommunication Troubleshooting

TROUBLE	SYMPTOM	PROBABLE CAUSE	REMEDY
No power	All stations inoperative	Main dc power switch opened.	Close.
Call circuit inoperative	Buzzer at called station will not operate.	1. Pushbutton defective	1. Replace.
		2. Buzzer defective.	2. Replace.
		3. Loose connection.	3. Tighten.
		4. Damaged wire.	4. Splice.
Talk circuit inoperative	Two stations cannot communicate.	1. Handset or headchest set defective.	1. Replace
		2. Loose connections.	2. Tighten.
		3. Damaged wire.	3. Splice.

SECTION 8. VENTILATION SYSTEM

4-262. FUNCTIONAL CHARACTERISTICS

4-263. Ventilation of the PCF is provided by vents and fans located as shown in Figure 1-39. The pilot and deck houses are ventilated by a blower fan which pulls air through the two vents located on top of the deckhouse. Additional cabin ventilation is provided by the four portlights and two cabin windows which can be opened. The crew quarters is ventilated by a blower fan which pulls air in through the four vents located on deck. When necessary, the two watertight vents are closed and air is circulated through the crew quarters from the other two vents. Ventilation of the forepeak, stowage compartment, and lazerette is provided by port and starboard vents as shown in Figure 1-39. Engine room ventilation and air supply for the engines is provided by the two port and starboard cowl vents. Vents for the fuel and water tanks are located as shown in Figure 1-39.

4-264. INSPECTION

a. Inspect all vents for obstructions.
b. Inspect fans through access doors on fan drum for loose fan, loose bolts, damage, etc.

4-265. CLEANING

4-266. Clean vents by blowing out with compressed air.

4-267. LUBRICATION. None required

4-268. REMOVAL

4-269. Remove blower fans as follows:

WARNING

Open blower fan circuit breaker and place warning tag on breaker.

a. Remove top of blower by removing six bolts, spacers, washers, and nuts.
b. Disconnect electrical wires.
c. Remove fan by removing four bolts, washers, and nuts.

4-270. INSTALLATION

4-271. Installation of the blower fans is the reverse of removal (paragraph 4-269).

SECTION 9. FURNISHINGS

4-272. FUNCTIONAL CHARACTERISTICS

4-273. GRIDDLE AND COOKER

4-274. Refer to Hotpoint Co. Technical Manual NAVSHIPS 334-1214, for information on the griddle and cooker.

4-275. REFRIGERATOR, COMPRESSOR AND CONDENSER UNIT.

4-276. Refer to Bendix-Westinghouse Installation and Service Manual and Parts List No. 6 for information on the refrigerator compressor and condenser unit.

4-277. TOILET CHOLINATOR

4-278. Refer to the Raritan Instructions and Parts List for information on the chlorinator.

4-279. TOILET.

4-280. Refer to MoH Manual (Model M-10) for information on the toilet.

4-281. HELMSMAN SEAT

4-282. Refer to American Seating Co. Instructions for information on the helmsman's seat.

4-283. GREASE GUN

4-284. Refer to Lincoln St. Louis Instructions (Model 1012) for information on the grease gun.

4-285. UTILITY PUMP

4-286. Refer to PAR Inc. Instructions (No. 3799) for information on the pump used for draining the engine crankcases.

4-287. ARMAMENT

4-288. Refer to applicable manual as listed in Table 1-6 for information on the armament.

4-289. SERVICING

4-290. For servicing instructions on the griddle, refrigerator, compressor, toilet, chlorinator, sink, grease gun, utility pump, and armament, refer to applicable manual or instructions as listed in paragraphs 4-273 through 4-287.

4-291. REMOVAL AND INSTALLATION

4-292. Refer to applicable manual or instructions as listed in paragraphs 4-273 through 4-287 for removal and/or installation instructions on the furnishings.

SECTION 10. HULL

4-293. FUNCTIONAL CHARACTERISTICS

4-294. HULL CONSTRUCTION

4-295. The PCF hull is an all welded aluminum structure. All deck plating, bulkheads, and other structural members are 5086-H321 aluminum alloy for sheet and plate, and 5086-H311 for extrusions. Mooring and towing fittings are installed using doubler plates, welded all around. Pipe rails and handrails are of welded construction. Portable pipe rails are retained by corrosion resisting steel toggle pins. Toggle pins are secured to the portable stanchion by a corrosion resisting steel wire rope. All Window installations are watertight. The opening windows are provided with seals to ensure watertightness. Moveable latches are corrosion resisting steel. The mast is secured to the boat with corrosion resisting steel bolts and elastic stop nuts to permit removal.

4-296. WELDING

4-297. Refer to Linde Welding Instruction Manual on Heliarc Welding for welding information and data.

4-298. INSPECTION

4-299. Inspect hull as follows:

a. Inspect hull painting for chipping, peeling, and wear.
b. Inspect hull for damage (cracks, bends, etc.), loose fasteners, etc.) Use dye penetrant.
c. Inspect anodes (located on transom) for damage and use. Replace anode if used up.
d. Inspect hull for electrolysis (white substance on hull).
e. Check all water intakes for clogging.
f. Inspect trim tab for damage and proper angle. Straighten tab if necessary.
g. Inspect transducer unit for corrosion and face of unit for cleanliness.

4-300. MAST REMOVAL

4-301. Remove mast as follows:

WARNING

Open main dc switch in engine room before disconnecting cables to remove mast. Place warning tag on switch.

a. Remove radar scanner unit from mast.
b. Disconnect the five cables for the identification, anchor, and running lights from the junction box below the gun tub. Remove the five cable clamps securing the cables to the boat structure.

NOTE

Place protective caps over the cable and connectors.

c. Disconnect the two cables from the radar junction box located in the deckhouse. Remove all clamps securing the cables to the deckhouse ceiling.
d. Remove four bolts securing mast to gun tub structure.
e. Remove 50 caliber machine gun guide rail.
f. Connect suitable lifting hoist to the mast.
g. Remove bolts securing mast to boat structure.
h. Lift mast slowly being careful not to damage radar scanner cables.

4-302. HULL REPAIR

4-303. DENT REMOVAL

4-304. Reshaping of aluminum can be accomplished by means of rubber or wood mallets. Steel hammers and hydraulic jacks should be used with wood blocks. Avoid local thinning from heavy steel mauls or hammers. Final operations may consist of planishing with smooth polished steel tools.

4-305. Heating by gas torch up to but not exceeding 400°F will make straightening much easier. Temperatures in excess of 400°F are unnecessary. "Templisticks" provide an accurate means of indicating temperature. These crayons will mark only when the temperature of the aluminum exceeds the 350°, 375°, or 400°F value designated on the crayon.

4-306. CRACKS IN SHEET

4-307. A thorough visual inspection to determine the extent and cause of any cracking should be made. The use of a dye penetrant check is recommended. Drill holes at the ends of cracks to deter further cracking. The holes should be large enough to allow accesibility during repair welding. Chip and thoroughly clean the crack to allow full penetration of repair weld. Do not leave any residue of the original crack since this will be a stress raiser and will progress through the structure after the repair is made. Clean all foreign material and oil from the repair weld area and replacement sections.

4-308. Should a plate become fractured to the extent where the crack cannot be repaired, it may be necessary to remove the damaged area and insert another plate in the area. Recommended repair plate dimensions are shown in Figure 4-15. There should be no square corners and the section to be inserted should be 3/4 to 1/2 inch smaller so that a back-up plate can be installed to accomodate a fillet weld.

4-309. The nature or extent of cracking may require replacement of a complete section. Remove section by drilling rows of holes, by saber saw, or by Heliarc or consumable electrode cutting.

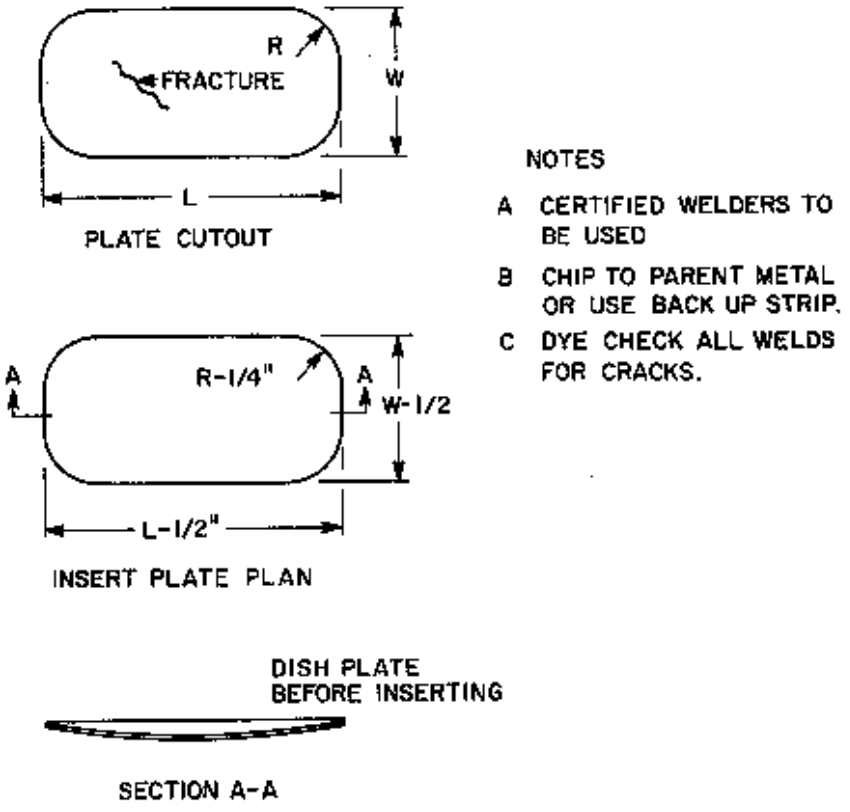

Figure 4-15. Typical Hull Repair

4-310. SHAFT LOG AND STRUT

4-311. If shaft log and strut is damaged beyond repair, the complete structure should be replaced. Remove propellor and shaft in accordance with paragraphs 4-85 through 4-87. Remove damaged log and strut by Heliarc or consumable electrode cutting.

4-312. PAINTING

4-313. Where the paint has been chipped, blistered, or eroded, the first step is to remove all fouling, algae, and barnacles. This should be followed by scraping with a stainless steel wire brush, or scouring pads until all oxidized or powdery areas, or those that show surface cracks, are removed. A firm, sound undercoat should remain as a base for new ground coats. If it appears that the undercoating also is unsatisfactory, all paint should be removed to the bare aluminum. Repainting then should proceed as for a new boat. Refer to Table 3-6 for painting requirements.

4-314. If most of the undercoat can be saved, the scraped and sanded surface should be washed with a liquid detergent cleaner. Blocking and cradles should be arranged so that all parts of the hull can be reached by slight change of position. One coat of wash primer should then be applied to all exposed surfaces, including welded seams, rivet heads, and joints. The hull is now ready for new coats of paint.

4-315. If the only necessary repainting is to apply additional antifouling coats, then the same antifouling paint as shown in Table 3-6 should be used. If only some areas require replacement of the ground coats, removal to the bare metal is necessary. This must be followed by complete renewal starting with the wash primer and followed by ground coats before antifouling paint is added. The application of wash primer alone over such surface is not adequate preparation for re-application of antifouling paint.

4-316. MAST INSTALLATION

4-317. Installation of the mast is the reverse of removal (paragraph 4-300).