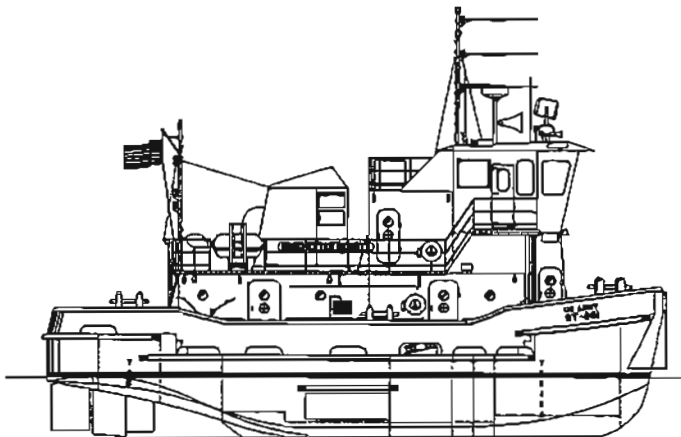


TECHNICAL MANUAL

OPERATOR AND UNIT
MAINTENANCE MANUAL
FOR

SMALL TUG

NSN: 1925-01-435-1713



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HEADQUARTERS, DEPARTMENT OF THE ARMY

20 JULY 2002

WARNING**MODIFICATION HAZARD**

Unauthorized modifications, alterations or installations of or to this equipment are prohibited and are in violation of AR 750-10. Any such unauthorized modifications, alterations or installations could result in death, injury or damage to the equipment

WARNING**HIGH PRESSURE HYDRAULIC SYSTEM HAZARDS**

If hydraulic system's high pressure lines or equipment fail, serious injuries could result.

Never work on hydraulic systems or equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment, and who can give first aid. A second person should stand by controls to turn off hydraulic pumps in an emergency.

WARNING**MOVING MACHINERY HAZARDS**

Be very careful when operating or working near moving machinery. Running engine, rotating shafts, and other moving parts could cause personal injury or death.

WARNING**ELECTRICAL HAZARDS**

Do not be misled by the term "low voltage". Potentials as low as 50 volts may cause death under adverse conditions. Be careful not to contact 115-VAC, 230-VAC or 460-VAC input connections when installing and operating equipment. Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through the body.

WARNING**FLAMMABLE LIQUID AND COMBUSTIBLE VAPOR HAZARDS**

Gasoline, fuel oil, lubricating oil, grease, paint-thinner, cleaning solvents and other combustible liquids present a serious fire hazard. Always store combustible liquids in designated storage lockers. Insure exhaust and ventilation fans are operating while using cleaning solvents or paint products. Never store or charge batteries in a confined space without ventilation or near operating electrical equipment.

When refueling and de-fueling the vessel, ensure appropriate signs are posted in visible locations and warnings are announced over the vessel's public address system. Smoking, welding and any operation involving open flame must be prohibited throughout the vessel.

WARNING

CAUSTIC AND CORROSIVE CHEMICAL HAZARDS

Battery acid and water purification chemicals such as bromine and chlorine can cause serious burns to eyes or exposed areas of skin. Always wear eye protection and protective clothing when working with caustic and corrosive chemicals. If chemical accidentally contacts skin or eyes, immediately flush with large quantities of water and seek medical attention.

WARNING

COMPRESSED AIR HAZARDS

High pressure air tanks, piping systems and air operated devices possess potential for serious injury to eyes and exposed areas of skin due to escaping air pressure.

WARNING

ELECTROMAGNETIC RADIATION HAZARDS

Electromagnetic radiation from the searchlight, radar, and radio antennas has the potential for serious radiation burns. Do not stand in the path of radiation emission.

WARNING

HIGH TEMPERATURE FLUID HAZARD

Hot fluid such as engine coolants, hot water, engine lubrication oil, and hot hydraulic fluid possess the potential for serious burns to personnel.

WARNING

HIGH INTENSITY LIGHT HAZARDS

High intensity light from the searchlight and other flood-lights possess the potential to shatter lens covers creating a danger from flying glass.

Never stand directly in front of the searchlight or other powerful lights. Allow elements and bulbs to cool prior to performing maintenance. If elements and bulbs must be replaced while hot, wear protective gloves.

WARNING

CO₂ FIRE SUPPRESSANT HAZARDS

All personnel must immediately evacuate spaces when CO₂ fire suppressant systems are activated. CO₂ displaces oxygen to smother combustion. It can cause death by suffocation if personnel do not evacuate within 45 seconds after activating handle is pulled.

WARNING

FIRE SUPPRESSANT HAZARDS

Fire suppressant chemicals displace oxygen and can cause suffocation. Immediately evacuate areas where they will be used.

WARNING

WORKING IN CONFINED AREAS

Before entering or working in confined areas such as tanks, voids or machinery spaces, always insure space has adequate ventilation. Upon entering a confined area care should be taken to avoid protruding objects such as hatch dogs, piping, frame braces, machinery etc. Failure to wear necessary protective clothing/equipment could result in death or serious injury.

WARNING

HIGH NOISE LEVEL HAZARDS

Ear protection must be worn when engines and machinery are in operation. Failure to wear hearing protection in areas with high noise concentrations will result in eventual permanent hearing loss.

For Artificial Respiration, refer to FM 21-11

TECHNICAL MANUAL
OPERATOR AND UNIT
MAINTENANCE MANUAL
For
SMALL TUG (ST)
NSN: 1925-01-435-1713

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Publications and Blank Forms), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is <http://aeprs.ria.army.mil>. If you need a password, scroll down and click on "ACCESS REQUEST FORM". The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or E-mail your letter or DA Form 2028 direct to: AMSTA-LC-CI Tech Pubs, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The email address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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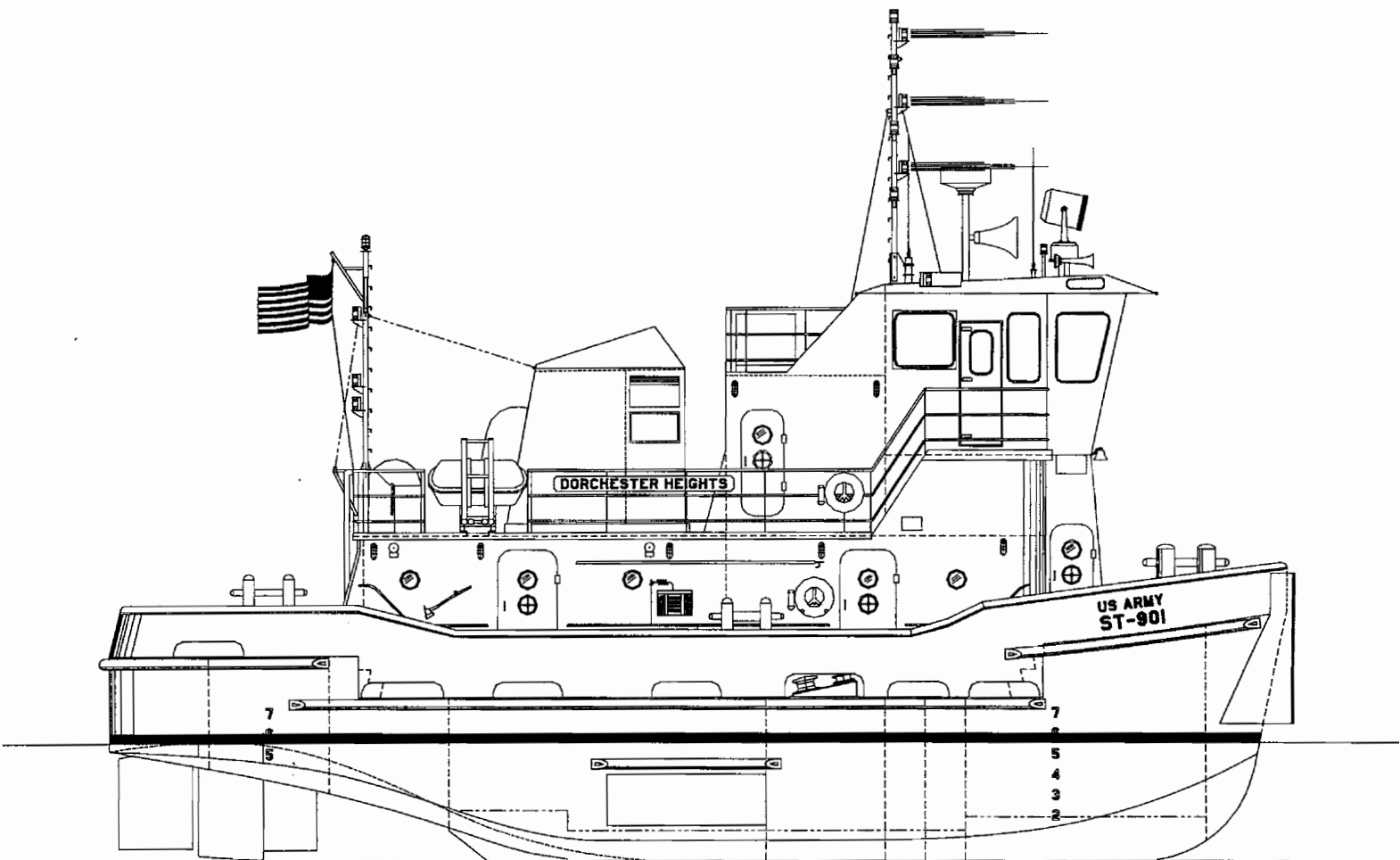


Figure 1-0. Small Tug.

CHAPTER 1 INTRODUCTION

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**SECTION I
GENERAL INFORMATION**

1.1. Scope. This manual describes the Direct and General Support maintenance for the Class A1, Maltese Cross, Small Tug (ST) Towing Vessel (see Figure 1-0). The ST is designed to provide towing of barges and general cargo barges in harbors, inland waterways, and along coastlines. It is also capable of assisting larger tugs in all types of harbor utility work, such as in the docking and undocking of ships of all sizes, the movement of floating cranes, floating machine shops, and in line handling duties. The ST will support deployment of forces and sustainment of forces in an overseas theater, including port operations in either fixed port facilities or during logistics over the shore (LOTS) type operations. The ST will accommodate all types of barges and non-powered types of lighterage expected to be encountered in deployment and sustainment operations worldwide.

1.2. Maintenance Forms, Records, and Reports. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 (The Army Maintenance Management System-TAMMS).

1.3. Destruction of Army Material to Prevent Enemy Use. Department of the Army instructions/procedures for the destruction of army material to prevent enemy use will be those prescribed by TM750-244-3.

1.4. Preparation for Storage and Shipment. Instructions/procedures for preparation for storage or shipment, including packaging and administrative storage, can be found in Chapter 4, Section V: Unit Maintenance Procedures.

1.5. Nomenclature Cross-reference List. The following table contains a listing/cross-reference of major components used within this manual.

Table 1 - 1. Cross Reference List for Nomenclature Usage.

NO.	COMMON NAME	GOVERNMENT NOMENCLATURE
1.	Main Propulsion Engine	Engine, Main Diesel
2.	Reduction Gear	Gear, Reduction
3.	Propulsion Shafting	Shafting, Propulsion
4.	Genset	Generator Set, Diesel
5.	Motor Starter	Controller, Motor
6.	Power Panels	Panel, Power Distribution
7.	Communication System	Communication System, Integrated
8.	Bilge Pump	Pump, Bilge
9.	Potable Water Pump	Pump, Potable Water

Table 1 - 1. Cross Reference List for Nomenclature Usage – CONT.

NO.	COMMON NAME	GOVERNMENT NOMENCLATURE
10.	Water Heater	Heater, Water
11.	Hydraulic Power Unit	Power Unit, Hydraulic
12.	Grey Water Pump	Pump, Grey Water
13.	Incinolet Toilet	Toilet, Incinerator
14.	Incinolet Urinal	Urinal, Incinerator

1.6. Reporting Equipment Improvement Recommendation (EIR).

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander U.S. Army Tank-Automotive and Armaments Command (ATTN: AMSTA-AC-NML), Rock Island, IL 61299-7630. A reply will be furnished to you.

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1.7. Warranty Information. The ST is warranted for 24 months from formal acceptance. The warranty starts on the date found in block 23, DA Form 2408-9 in the logbook. Report all defects in material and workmanship to your supervisor, who will take appropriate action.

1.8. Critical Safety Items List. The following table contains the Critical Safety Items and their location.

Item	Smoke Detector	Carbon Monoxide Indicator	Fire Extinguisher	Carbon Dioxide Bottles	Personal Floatation Device (PFD)	Fire Station	Throwable Life Rings With Floating Light
Location	Pilot House, Double Berth, HVAC Room, Mess Area	Pilot House, Double Berth, Generator Room, Upper EngineRoom, Mess Area, Triple Berth	Pilot House, Generator Room, Mess Area, Lower EngineRoom, Engine Stores, Tankage Space	01 Deck	01 Deck	Main Deck	01 Deck, Main Deck

Critical Safety Items List - Continued

Item	Life Raft	Heat Detector	Emergency Escape Breathing Devices (EEBD's)	Fire Detection Alarm Panel
Location	01 Deck	Generator Room, Head, Forward Storage, Tankage Space, Lower Engine Room, Upper Engine Room	Double Berth, Triple Berth	Pilot House

1.9. Corrosion Prevention and Control.

Corrosion Prevention and Control (CPC). It is important to report any corrosion problems with the ST vessel and/or its equipment so that the problem can be corrected and improvements made to prevent it in future items. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem. If you find a corrosion problem, report it on a SF 368 (Product Quality Deficiency Report). Using key words like corrosion, rust, deterioration, or cracking will help ensure identification as a CPC problem. Submit the form to the address specified in DA PAM 738-750.

1.10. List of Abbreviations. See Section I in the Glossary.

SECTION II. EQUIPMENT DESCRIPTION AND DATA

1.11. Characteristics. The ST's hull and superstructure are of steel construction. Propulsion consists of two diesel engines fitted with reduction gearing, shafting and props. It is configured for pushing and stern and hip tows.

1.12. Capabilities. The ST is designed to provide towing of general cargo barges in harbors, inland waterways, and along coastlines. It has the ability to assist larger tugs in all types of harbor utility work, such as in the docking and undocking of ships of all sizes, the movement of floating cranes, floating machine shops, and in line handling duties. It can produce 30,000 pounds (13,605 kilograms) of ahead Bollard pull (15,000 pounds [6,802.50 kilograms] astern; 4,000 pounds [1,814 kilograms] side thrust) and can push six loaded barges in Sea State 0-1, and tow three loaded barges in Sea State 2-3. The ST can sustain a minimum speed of 8 knots in Sea State 2, and a minimum of 7 knots in Sea State 3 when under Full Load Condition. The ST is capable of 120 hours of operation at 6 knots with a 15% fuel reserve based on an initial Full Load Condition with no tow. It has a maximum range of 720.93 nautical miles.

The ST design capabilities allow satisfactory operations under the following weather and environmental conditions:

- a. Weather air condition "Hot-Dry" (air temperature of 120° F (48.4°C) with relative humidity of 8%)
- b. Weather air condition "Hot Humid" (air temperature of 105°F (40.15°C) with relative humidity of 88%)
- c. Weather air condition "Basic Cold" (air temperature of -25° F (-31.35°C) with relative humidity of 100%)
- d. Seawater temperature ranging from 28° F (-2.20°C) to 95° F (34.65°C).
- e. Sea state 2 (SS2) Significant wave height 2.2 feet (0.67 Meters), modal period 4.1 seconds.
- f. Sea state 3 (SS3) Significant wave height 4.6 feet (1.40 Meters), modal period 5.9 seconds.

The ST will support deployment and sustainment of forces in an overseas theater, including port operations in either fixed port facilities or during logistics over the shore (LOTS) type operations. The ST will accommodate all types of barges and non-powered types of lighterage expected to be encountered in deployment and sustainment operations worldwide.

The ST is capable of being operated by personnel wearing field duty uniforms, MOPP IV equipment or cold weather gear, and is capable of meeting applicable industry HFE requirements.

1.13. Features. The ST is transportable by deck loading aboard a commercial or military vessel (including a LMSR and/or Float-on/Float-off ship). The tug is equipped with installed lifting pads/eyes, cradle, sling, and lifting frame to facilitate loading. Design features are such that the towing arrangement and operating equipment allow for minimum manning requirements. The various operations required of the ST can be performed without reconfiguration between operations; thus, the tug can switch rapidly from one type of operation to another. The ST has been designed with the expectation that it will operate in waters throughout an overseas theater, and may be subject to small arms fire as well as major weapons systems. It is anticipated that, at some time, the ST may be required to operate in a nuclear, chemical and/or biological (NBC) environment, and may be attacked as a prime target of opportunity. For further guidance on NBC contamination see U.S. Army regulation AR 70-71 Nuclear, Biological and Chemical Contamination of Army Material.

1.14. Location and Description of Major Components. Major components and compartments of the ST are in the paragraphs that follow.

a. Decks (Overview). The ST decks are described below and are delineated in Figure 1-1 .

- (1) Pilot House Overhead (Item 1)
- (2) Pilot House Deck (Item 2)
- (3) 01 Deck (Item 3)
- (4) Main Deck (Item 4)
- (5) Hold Deck (Item 5)

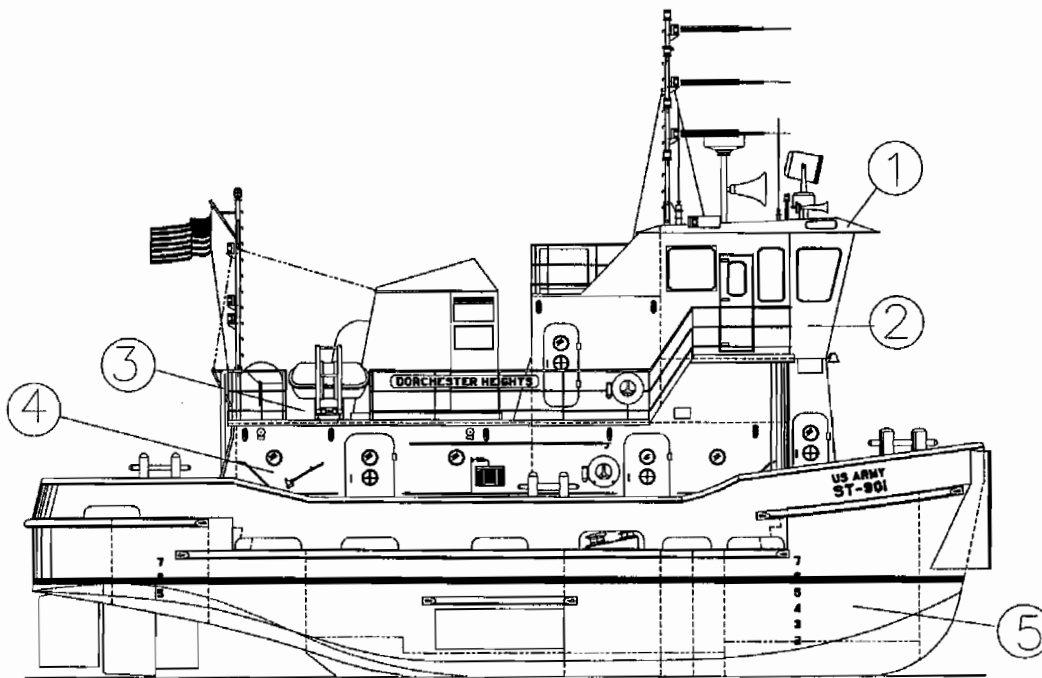


Figure 1-1. Deck Levels

- (1) Pilot House Overhead. Features of the Pilot House overhead are depicted in Figure 1-2. Note that in this figure and others in this section, call-outs are keyed to the text with callout numbers in parenthesis.
- (a) Searchlight. The searchlight (4) is located between Frames 5 and 6, port of centerline.
 - (b) Horn. A horn (7) is located between Frames 5 and 6, starboard of centerline with a white indicating light (10).
 - (c) Running Lights. Running lights (1) are located at Frame 9, one each port and starboard outboard.
 - (d) Forward Mast. A collapsible mast (6) is located centerline at Frame 10. The mast can be leaned forward for restricted clearance areas and for maintenance purposes. Figure 1-3 illustrates the forward mast. The mast contains the following:
 - 1 Restricted in Ability to Maneuver (RIAM) Light (360° red light) (Item 1)
 - 2 Towing Light #2 (225° white light for tow greater than 200 meters) (Item 2)
 - 3 Towing Light #1 (225° white light for tow less than 200 meters) (Item 3)
 - 4 RAM Light (360° white) (Item 4)
 - 5 Restricted in Ability to Maneuver/Not Under Command (RIAM/NUC 360° red light) (Item 5)
 - 6 Masthead Light (220° white) (Item 6)
 - 7 Anchor Light (360° white) (Item 7)
 - (e) Radar Scanner. The radar scanner (2) (Raytheon Radome Scanner) is located at Frame 8, port outboard.
 - (f) Loudhailer Horn. A United Marine Model UM-HSWR loudhailer horn (3) is located at Frame 7 on the port side.
 - (g) Antennas. Antennas (5) for the VHF radios are located one each port and starboard. An antenna for the singgars radio (8) is located aft on the starboard side. An antenna (9) for the GPS is located on the starboard side just aft of the horn indicating light.

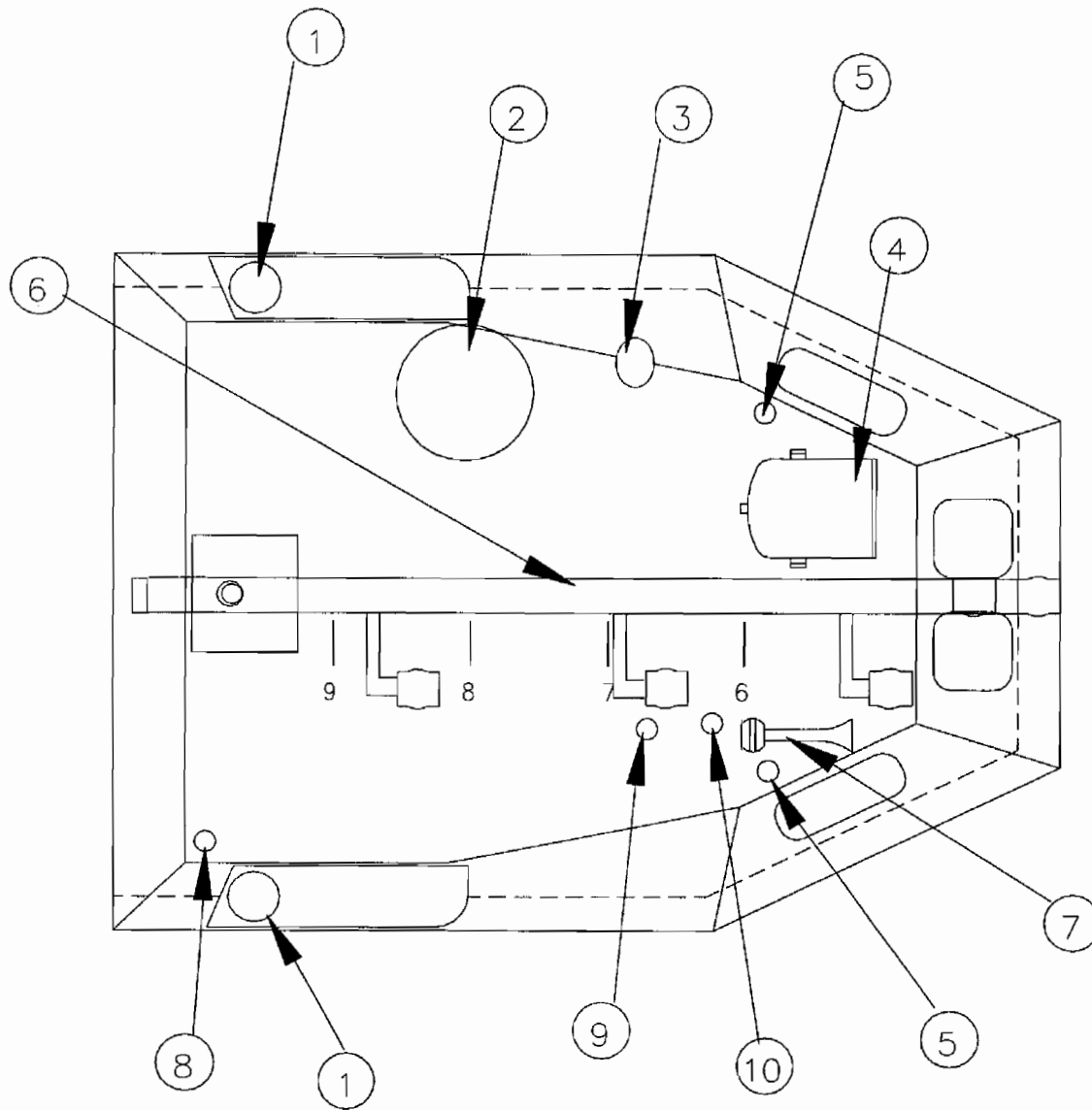


Figure 1-2. Pilot House Overhead

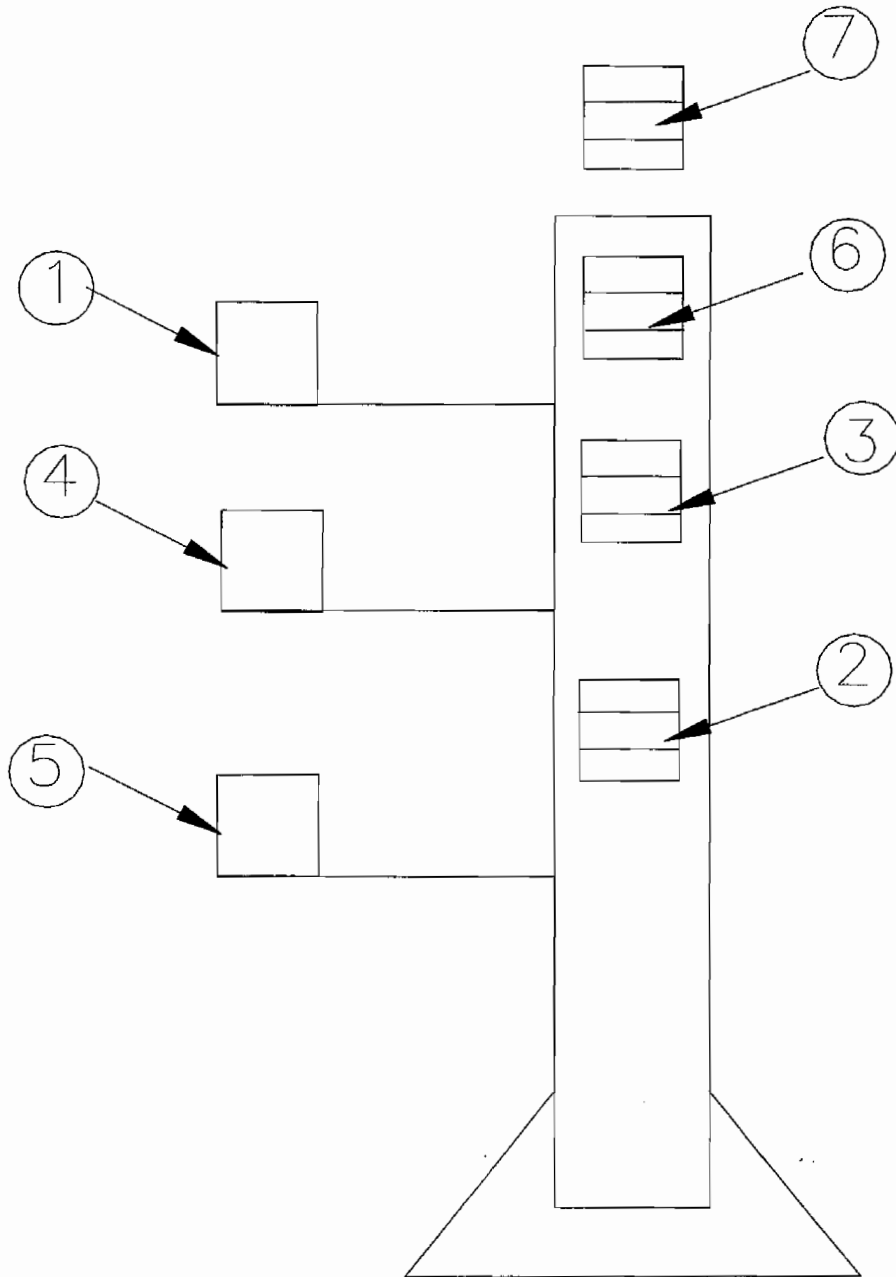


Figure 1-3. Forward Mast

- (2) Pilot House Deck. The Pilot House is the control center of the vessel. Primary components located on the Pilot House Deck are depicted in Figure 1-4. These components include the sound powered phone (1), control console (2), navigation light panel (3), air conditioning condenser (4), air condition service disconnect controller (5), fire detection alarm panel (6), fire extinguisher (7), ventilation shutdown (8), captains chair (9), fluorescent lights (10), emergency DC light (11), smoke detector (12), A/C thermostat (13), carbon monoxide detector (14), fire alarm pull station (15), clock (16), level indicator (17), chart table (18), fire alarm beacon/horn (19), AC receptacles (20), and a light switch (21).

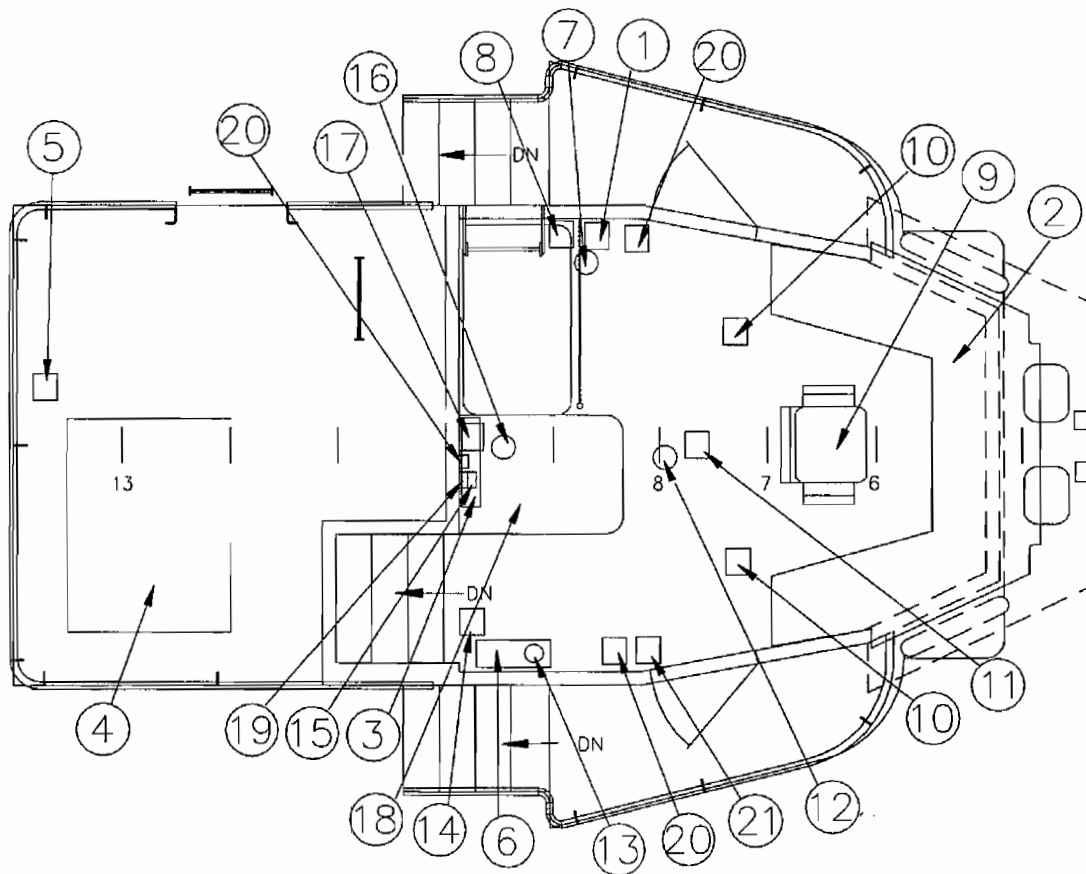
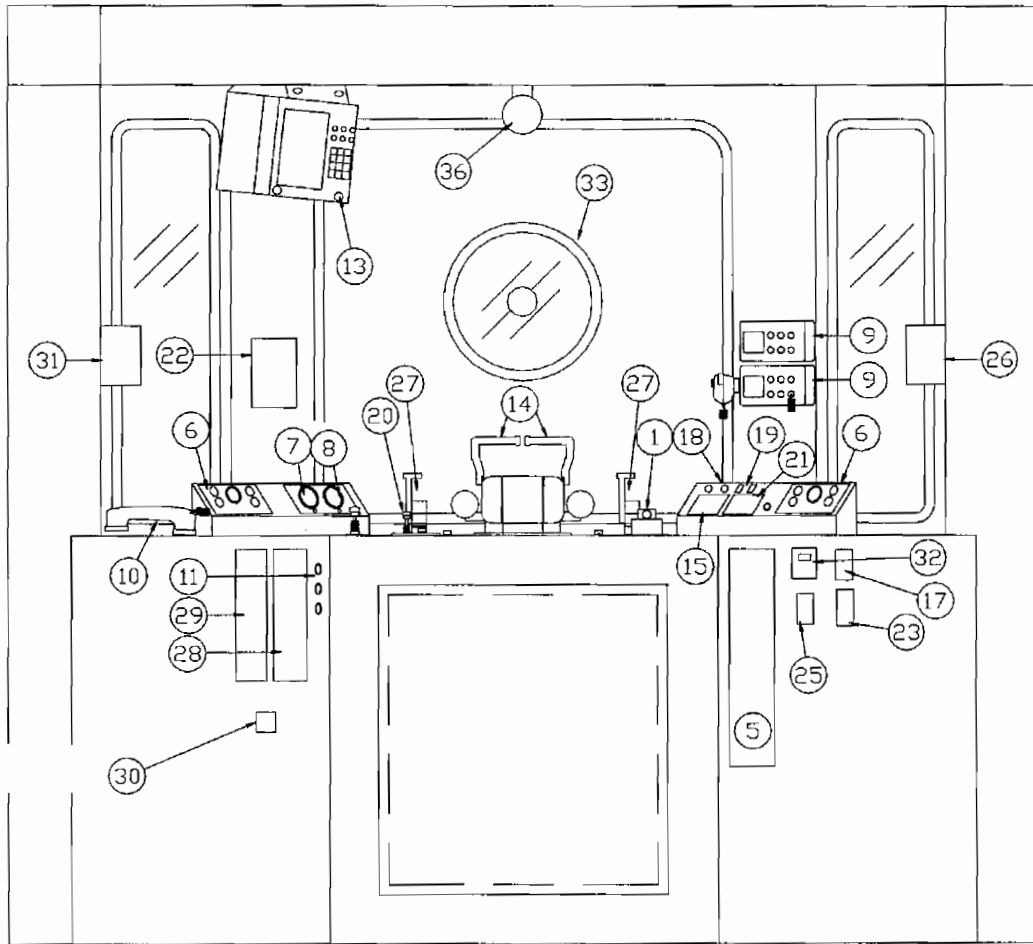


Figure 1-4. Pilot House Deck

(a) Control Console. The control console is located between Frames 5 and 7. The equipment located on the control console is depicted in Figures 1-5 and 1-6 and includes the following:

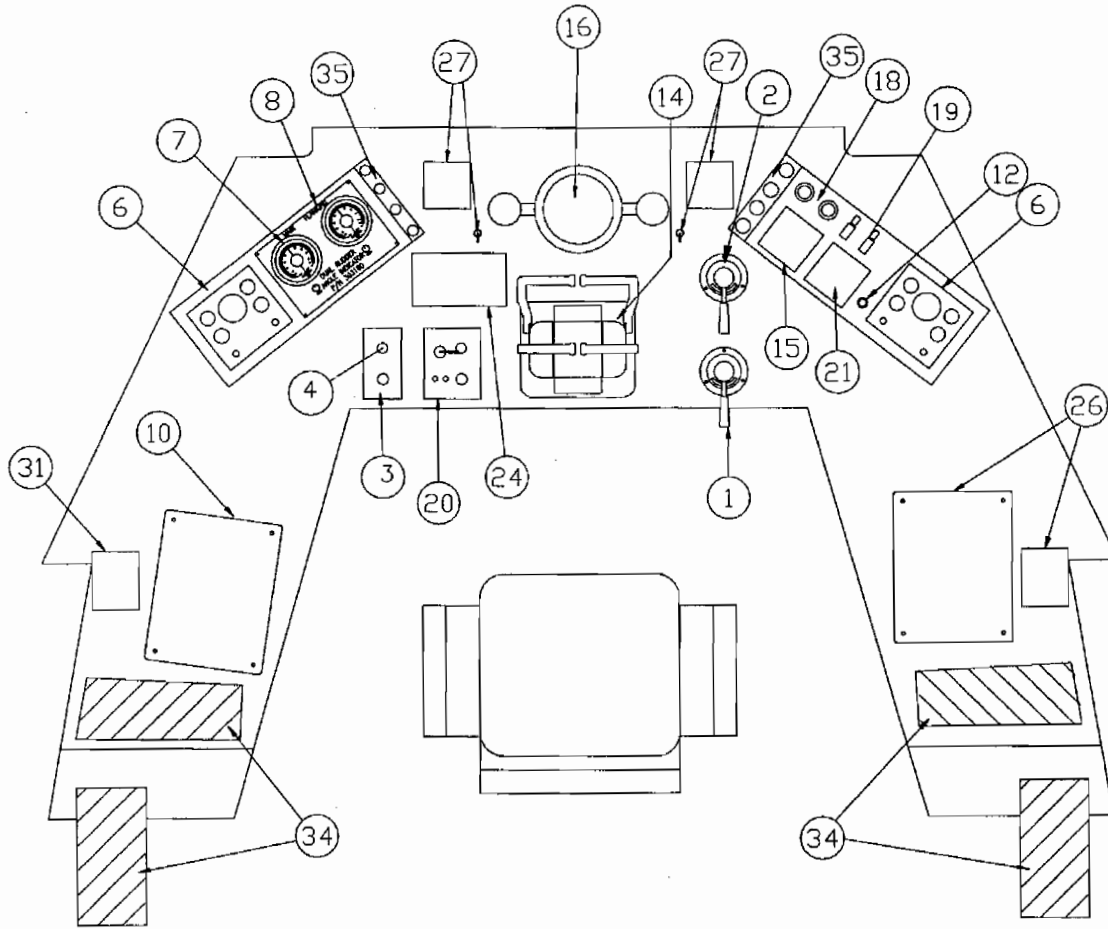
- 1 Main Rudders Full Follow Up Controls (Item 1)
- 2 Flanking Rudders Full Follow Up Controls (Item 2)
- 3 Main Rudders Non Follow Up Controls (Item 3)
- 4 Flanking Rudders Non Follow Up Controls (Item 4)
- 5 Pilot House 208 Volts Alternating Current (VAC) Power Panel (DP5) (Item 5)
- 6 Two Main Engine Gauge Panels (includes lube oil temperature, gear oil pressure, engine oil pressure, tachometer, low coolant level lamp, water temperature, dimmer, and panel power ON/OFF switch) (Item 6)
- 7 Main Rudder Angle Indicator (Control General) (Item 7)
- 8 Flanking Rudder Angle Indicator (Control General) (Item 8)
- 9 Two Marine Band VHF Radio Sets (Ross Engineering Model DSC500) (Item 9)
- 10 Loudhailer/Public Address Digital Control Head (United Marine Model Um-IDCH-7200) (Item 10)
- 11 Emergency Start/Stop Fire Pump (Item 11)
- 12 Horn Control (Item 12)
- 13 Radar Monitor, overhead (Raytheon Model R40XX) (Item 13)
- 14 Main Engine Throttle Control (Mathers Controls) (Item 14)
- 15 Fluxgate Compass (Ritchie Model MD200E) (Item 15)
- 16 Magnetic Compass (Ritchie Powerdamp) (Item 16)
- 17 Emergency Fuel Valve Shutoff Switch (Item 17)
- 18 Two Main Engine Emergency Stop Buttons (Item 18)
- 19 Two Generator Start/Stop Buttons (Item 19)
- 20 Search Light Controls (Carlisle and Finch) (Item 20)
- 21 Depth Sounder (Autohelm Seataalk) (Item 21)
- 22 Global Positioning System (GPS) (Item 22)
- 23 CO₂ Pull Station (Item 23)
- 24 Watertight Door and Carbon Monoxide Alarm (Seawatch) (Item 24)
- 25 Clearview Screen Controls (Item 25)

- 26 Singuars Radio (GFE) (Item 26)
- 27 Backup Engine Controls and Selector Switch (Mathers Controls) (Item 27)
- 28 Steering Control Panel (Control General) (Item 28)
- 29 DC Distribution Panel (Newmar) (Item 29)
- 30 Generator Selector Switch for DC Panel (Item 30)
- 31 Remote Intercom Station (United Marine Model UM-RIMI) above the console (Item 31)
- 32 AC receptacle (located above Clearview screen control) (Item 32)
- 33 Clearview Screen (Item 33)
- 34 A/C Vents (Item 34)
- 35 Winch Controls (Item 35)
- 36 Fluxgate Heading Sensor (Item 36)



Front View

Figure 1-5. Control Console



Console Layout

Figure 1-6. Control Console

Refer to Figure 1-4 for the following components.

- (b) Navigation Light Panel. The navigation light panel is located aft of the chart table on the bulkhead starboard of centerline at Frame 10 (Item 3).
- (c) Air Conditioning Compressor. The air conditioning compressor (Item 4) is located outside of the Pilot House between Frames 11 and 14 at centerline. The disconnect (Item 5) for the compressor is located adjacent to the compressor, mounted on the deck handrail.
- (d) Circuit JV-General Purpose Sound Powered Telephone. The sound powered telephone (Hose McCann model) is located on the port side adjacent to the doorway (Item 1).
- (e) Chart Table. A chart table is located centerline at Frame 9 (Item 18).
- (f) Clock. A clock is located on the aft bulkhead above the navigation light panel (Item 16).
- (g) Captain's Chair. A captain's chair is located between Frames 6 and 7 at centerline (Item 9).
- (h) Fire Detection Alarm Panel. The Fire Alarm Panel is located at Frame 9 on the starboard side bulkhead, aft of the doorway (Item 6).
- (i) Air Conditioning Thermostat. The air conditioning thermostat is located on the starboard side of the Pilot House just above the fire detection alarm panel (Item 13).
- (k) Fire Alarm Pull Station. A fire alarm pull station is located above the navigation light panel (Item 15).
- (l) Fire Alarm Beacon/Horn. A fire alarm beacon/horn is located adjacent to the fire alarm pull station (Item 19).
- (m) Break Glass Ventilation Shutdown. A break glass ventilation shutdown station is located aft of the sound powered telephone (Item 8).
- (n) Level Indicator. The level indicator displays the level of the ST during operations (Item 17).
- (o) Fluorescent Light Fixtures. Two fluorescent light fixtures (with two white lamps and one low-level red lamp) are located overhead in the Pilot House (Item 10).
- (p) Emergency DC Light. A 24VDC emergency DC light is located overhead in the Pilot House (Item 11).
- (q) Smoke Detector. A smoke detector is located overhead in the Pilot House (Item 12).
- (r) AC Receptacles. Three AC receptacles are located on the bulkheads in the Pilot House (Item 20).
- (s) AC Light Switch. An AC light switch is located on the starboard side (Item 21).
- (t) Carbon Monoxide Detector. A carbon monoxide (CO) detector is located over the aft doorway to the two-person berthing area (Item 14).
- (u) Fire Extinguisher. A fire extinguisher is located on the starboard side, just aft of the control console (Item 7).

(3) 01 Deck. The layout of the 01 Deck is discussed below. See Figure 1-7.

(a) Berthing Area (Figure 1-7, Item 1). The accommodation area includes a two-person berthing area between Frames 10 and 14 from centerline. Figure 1-8 illustrates the two-person berth. The berthing area includes the following:

- 1 Double Berth (Item 1)
- 2 Lockers to include a linen locker (Item 4) under the weapons stowage , two personal lockers (Item 3), and a key locker (Item 2) under the safe
- 3 Two Berth Lights (Item 5)
- 4 Desk and Chair (Item 6)
- 5 Smoke Detector (Item 7)
- 6 Fire Protection/Detection to include a fire alarm pull station (Item 8), fire alarm beacon/horn (Item 9), and a carbon monoxide detector (Item 10)
- 7 Fire Proof Safe (Item 11)
- 8 Two AC Receptacles (Item 12)
- 9 Fluorescent Light Fixture (Item 13)
- 10 Remote Intercom Station (UM-RIMI) (Item 14)
- 11 Weapons Stowage (Item 15)
- 12 Clock (Item 16)
- 13 Emergency Escape Breathing Device (EEBD) (Item 17)
- 14 A/C Vent (Item 18)
- 15 Light Switch (Item 19)
- 16 Hand Rail (Item 20)
- 17 Steps to Pilot House (Item 21), access to HVAC Room under steps

- (b) HVAC Room (Figure 1-7, Item 2). The HVAC Room and storage area is located between Frames 6 and 10 at centerline. The stairwell from the two-person berth to the Pilot House must be removed to access the HVAC room. Figure 1-9 illustrates the HVAC Room. The HVAC Room contains the following:
- 1 Air Handling Unit (Item 1)
 - 2 Smoke Detector (Item 2)
 - 3 Searchlight Rectifier Panel (Item 3)
 - 4 Wheelhouse Distribution Panel (Item 4)
 - 5 Steering Amplifier #1 (Item 5)
 - 6 Steering Amplifier #2 (Item 6)
 - 7 Marine Integrated Control Cabinet (United Marine 1338-ICSC) (Item 7)
 - 8 Communication Control Center (United Marine) (Item 8)
 - 9 Air Conditioning Control Panel with Start/Stop Buttons (Item 9)
 - 10 Fluorescent Light Fixture (Item 10)
 - 11 Communication Speaker (Item 11)
 - 12 AC Receptacles (Item 12)
 - 13 Sound Powered Phone Junction Box (Item 13)
 - 14 Light Switch (Item 14)
- (c) CO₂ Bottles (Figure 1-7, Item 3). Three CO₂ bottles with manual pull stations are located aft of the two-person berthing area on the Frame 14 bulkhead, port of centerline.
- (d) Intake and Exhaust Stacks/Ports (Figure 1-7, Item 4). Two Engine Room air supply blowers are located outside of the accommodation area at Frame 16, one each port and starboard of centerline. The exhaust stack is located aft of the Engine Room intake ports between Frames 16 and 20, at centerline. The Engine Room exhaust fan is located aft of the exhaust stack between Frames 20 and 21, at centerline.
- (e) Lockers (Figure 1-7, Item 5). A general stores locker is located between Frames 21 and 23 port outboard. A damage control locker is located forward of the general stores locker between Frames 19 and 21. A flammable liquids locker is located forward of the damage control locker between Frames 17 and 19. A Personal Floatation Device (PFD) locker is located starboard outboard between Frames 17 and 19. An ammunition locker is located just port of centerline aft. An exposure and survival suit locker is located on the port side, forward of the flammable liquids locker, between Frames 16 and 17.
- (f) Life Raft (Figure 1-7, Item 6). A life raft with cradle/launching device is located between Frames 19 and 22, starboard outboard. The launching device facilitates launching the life raft by releasing it from its cradle and pushing it overboard. An automatic release mechanism actuates the CO₂ cartridge, which inflates the life raft.

- (g) Aft Control Station (Figure 1-7, Item 7). An Aft Control Station is provided starboard of centerline on the aft of the 01 Deck. The control station facilitates vessel control during operations under which it is beneficial to see that aft portion the ST. Figure 1-10 illustrates the Aft Control Station. The Aft Control Station contains the following:
- 1 Main Engine Throttle Control (Mathers Controls) (Item 1)
 - 2 Steering Alarm Panel (Control General) (Item 2)
 - 3 Loudhailer Microphone (United Marine Model HMUM-MICH) (Item 3)
 - 4 Two Main Engine Tachometers (Cummins) (Item 4)
 - 5 Main Rudder Angle Indicator (Control General) (Item 5)
 - 6 Flanking Rudder Angle Indicator (Control General) (Item 6)
 - 7 Main Non Follow Up Steering Controls (Item 7)
 - 8 Flanking Non Follow Up Steering Controls (Item 8)
- (h) Ventilation Trunk for Generator Room (Figure 1-7, Item 8). The ventilation trunk is located starboard outboard between Frames 21 and 23.
- (i) Floodlights (Figure 1-7, Item 9). Floodlights (Pauluhn Model Lamp Type 3) are located one each, port and starboard on the aft railing. A floodlight is also located on the forward main deck, mounted on the deckhouse.
- (j) Throwable Life Rings (Figure 1-7, Item 10). Throwable life rings with floating light are accessible from the 01 deck. These are mounted as such: one on the starboard side above the galley door and one on the port side above the main deck fire station. A third life ring (without a floating light) is located just starboard of centerline aft.
- (k) Ensign Mast (Figure 1-7, Item 11) An ensign mast is located at centerline aft. Figure 1-11 illustrates the ensign mast. The ensign mast contains the following lights: one bilge light (Item 1), two yellow towing lights (Item 2), and one white stern light (Item 3).

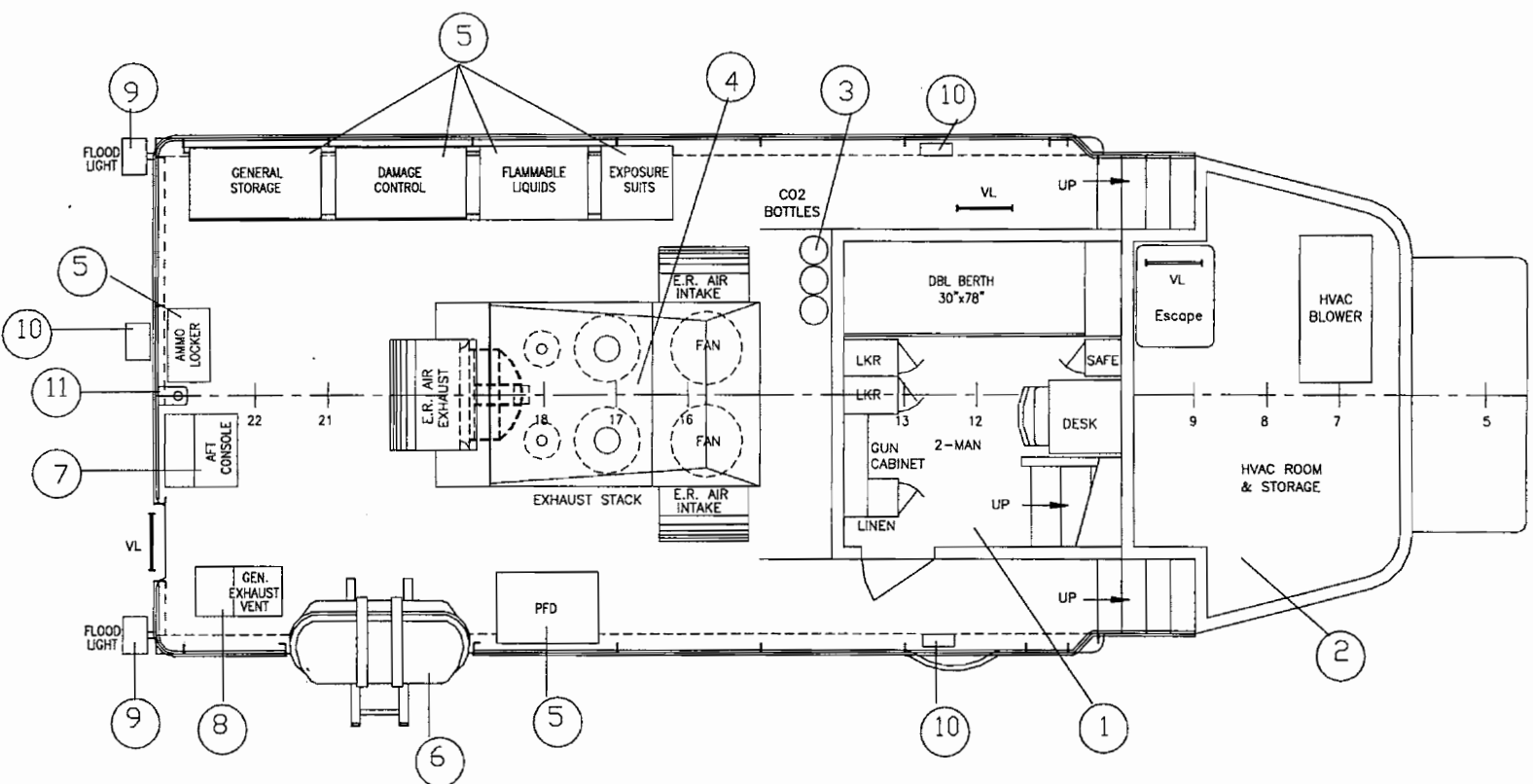


Figure 1-7. 01 Deck

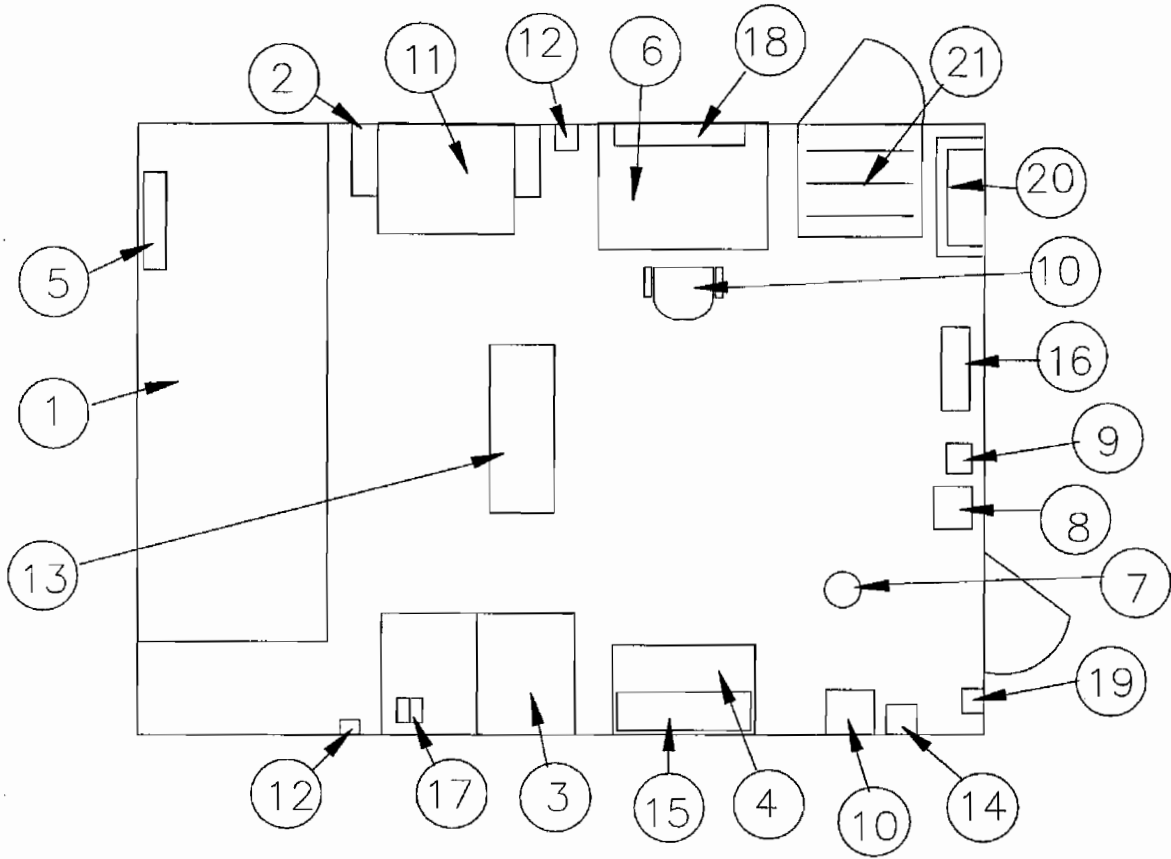


Figure 1-8. Double Berth Area

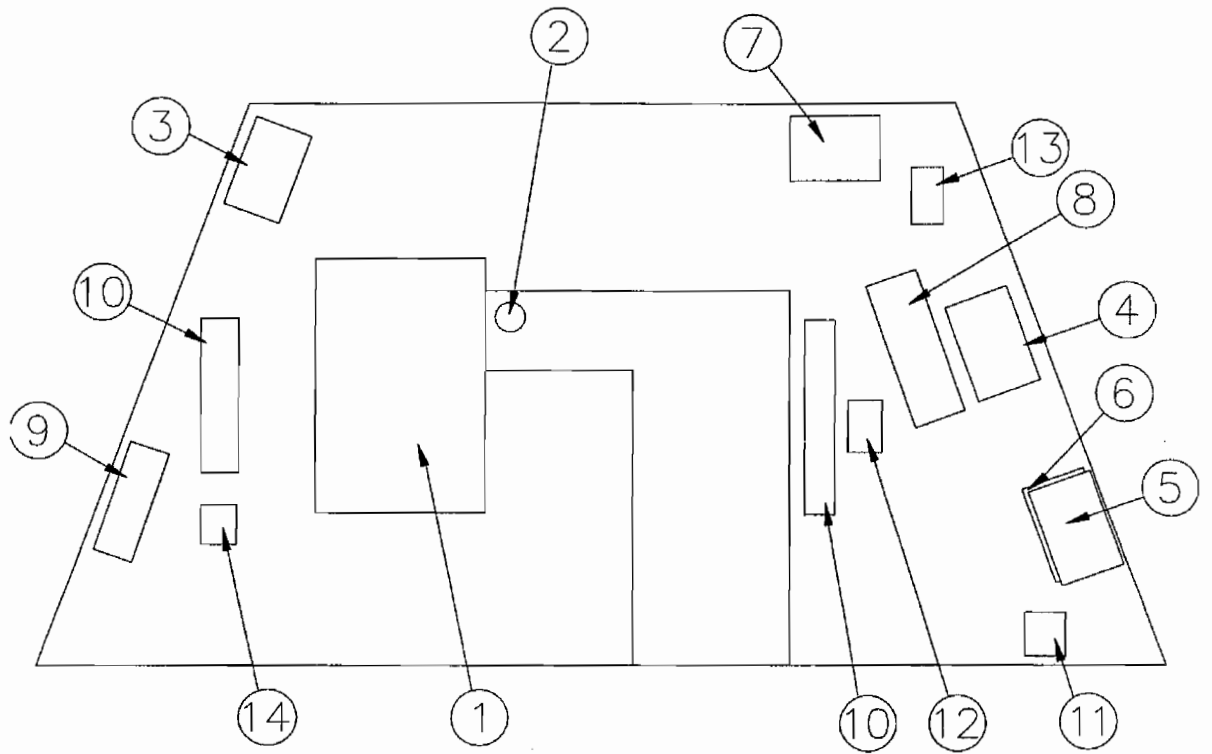


Figure 1-9. HVAC Room

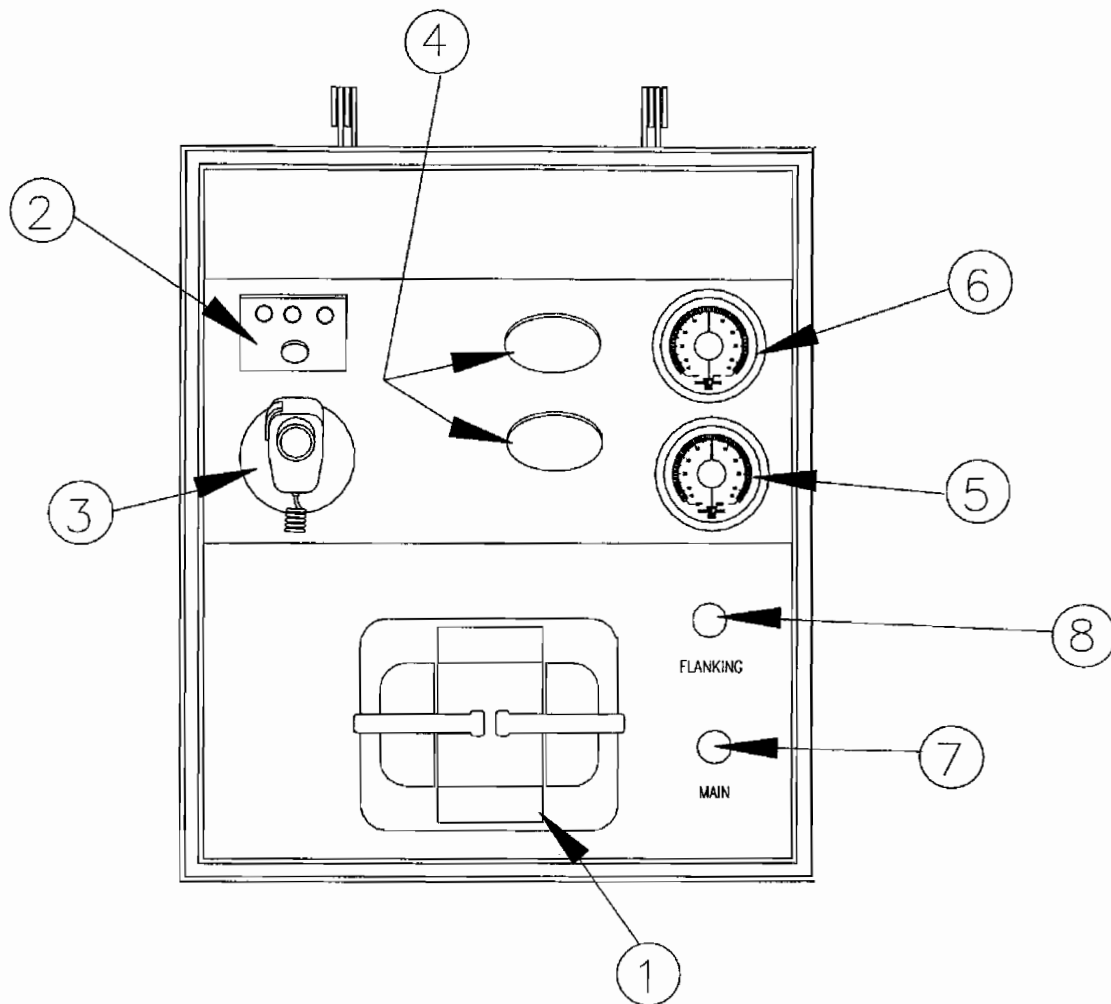


Figure 1-10. Aft Control Station

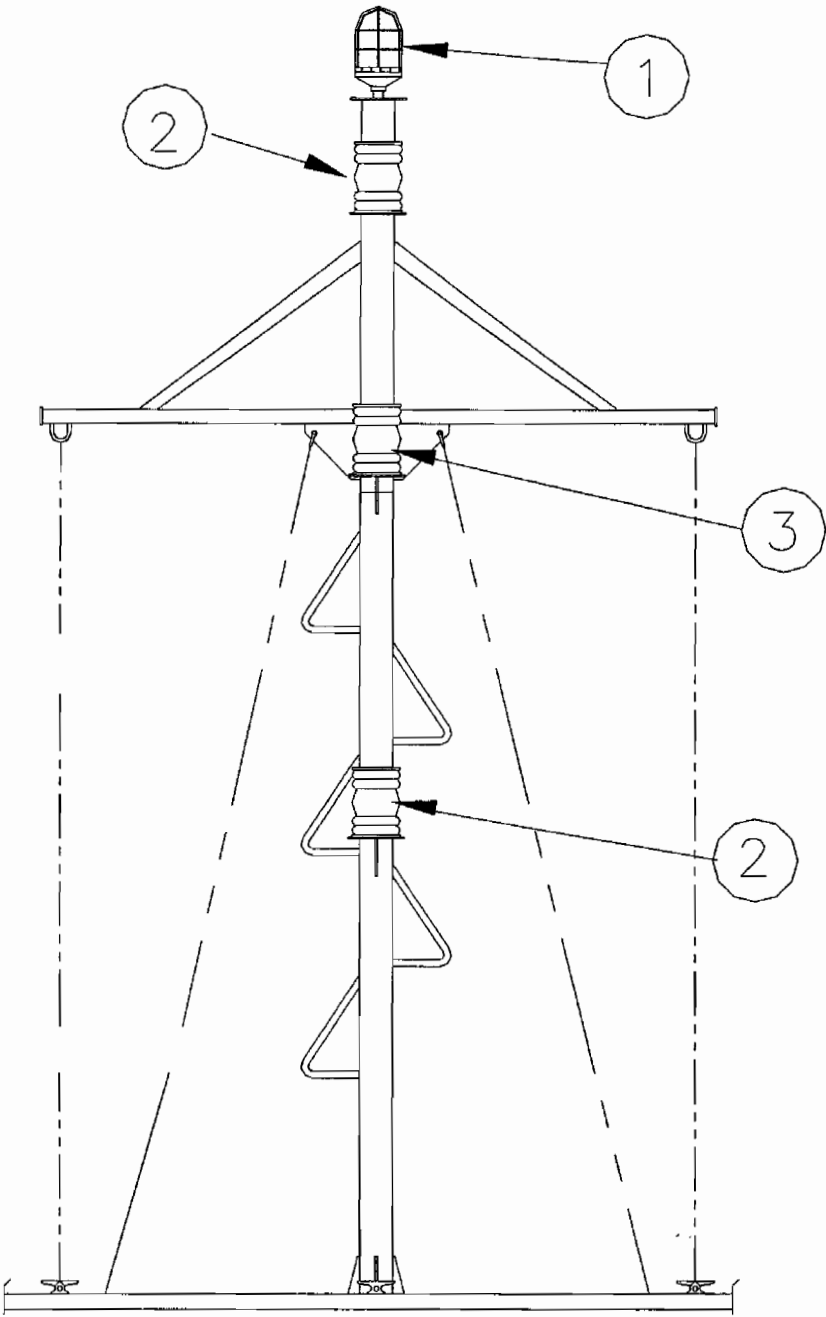


Figure 1-11. Ensign Mast

(4) Main Deck. The rooms on the Main Deck are depicted in Figure 1-12. These include the generator room (1), mess area (2), three-person berthing area (3), and head (4). The layout of the Main Deck is discussed below.

(a) Generator Room (Figure 1-12, Item 1). The generator room is located between Frames 19 and 24, at centerline. See Figure 1-13 for a plan view of the generator room. Key components in the generator room are outlined below.

- 1 Service Generator Set (Item 1). Two Onan/Admiral MCGA 55 kW, 450V AC, 60Hz generator sets are located in opposing corners of the generator room. One generator is positioned on the starboard side between Frames 20 and 22. The second generator is positioned on the port side between Frames 21 and 23.
- 2 Main Switchboard (Item 2). The main switchboard (450V, 208/120V-100A shore power) is located on the port bulkhead between Frames 20 and 22.
- 3 Generator Set Batteries (Item 3). Each generator set is provided with a 24 VDC battery bank to provide power for starting. 24VDC power in each battery bank is derived from two 12V batteries (with boxes) located one each, port and starboard, on the aft bulkhead between Frames 21 and 23.
- 4 Battery Chargers (Item 4). Two 24V-battery chargers (Charles Marine Products 5000 Series) for charging the generator battery banks are located above the generator set batteries on the Frame 23 bulkhead, starboard of centerline.
- 5 Fire Alarm Beacon/Horn (Item 5). A fire alarm beacon/horn is located forward on the starboard bulkhead at Frame 20.
- 6 Heat Detector (Item 6). A heat detector is located starboard of centerline between Frames 21 and 22.
- 7 Transformers (Item 7). Three single-phase 10-kilo volt ampere (kVA) transformers are located at the forward starboard bulkhead at Frame 23.
- 8 Battery Disconnects (Item 8). Two battery disconnects (Perko Model 8603) are provided, one for each battery bank. The disconnects are located on the aft bulkhead at Frame 23 above the battery banks. The disconnects facilitate starting generator sets or main engines, by selecting the designated circuit on the switch.
- 9 Generator Room Supply Fan (Item 9). A supply fan (Hartzell model) is provided on the aft port bulkhead at Frame 23.
- 10 Generator Room Supply Fan Motor Starter (Item 10). A motor starter (Siemens model) is provided for controlling the generator room supply fan. The fan is located on the port bulkhead at Frame 22.
- 11 Distribution Panels (Item 11). Panel DP3 (208 VAC) is located on the aft starboard bulkhead at Frame 23. Panel DP2 (480VAC) is located on the starboard bulkhead between Frames 22 and 23.
- 12 Generator Exhaust (Item 12). Exhaust from each generator is piped upward from the generator room to the exhaust stack.

- 13 Receptacles (Item 13). Two general service receptacles are provided. One is located on the Frame 20 bulkhead starboard side and one is located on the Frame 23 bulkhead starboard side. Two engine heater receptacles are provided adjacent to the engines.
- 14 Escape Hatch (Item 14). An escape hatch (from the Hold Deck) is located on the aft starboard side between Frames 22 and 23.
- 15 Lighting (Item 15). Three fluorescent light fixtures are located in the room. An emergency DC light is located in the generator room as well.
- 16 Fixed Port Lights (Item 16). Fixed port lights are located one each, on the port and starboard bulkhead.
- 17 Communication Horn (Item 17). A communication horn (United Marine Model UM-HSIS) is located on the starboard bulkhead above the fixed port light.
- 18 Fire Extinguisher (Item 18). A fire extinguisher is located under the fixed port light on the port side.
- 19 Sound Powered Phone Jackbox (Item 19). A sound powered phone jackbox is located port and forward of the #1 generator set.
- 20 Remote Intercom Station (Item 20). A remote intercom station (United Marine Model UM-RIMI) is located port and forward of the #1 generator set.
- 21 AC Light Switch (Item 21). An AC light switch is located on the forward bulkhead just port of the doorway.
- 22 DC Light Switch (Item 22). A DC light switch is located on the forward bulkhead just starboard of the doorway.
- 23 Carbon Monoxide Detector (Item 23). A carbon monoxide detector is located on the starboard bulkhead forward of the communication horn.
- 24 Space Heater (Item 24). A space heater is located on the starboard bulkhead below the fixed port light.

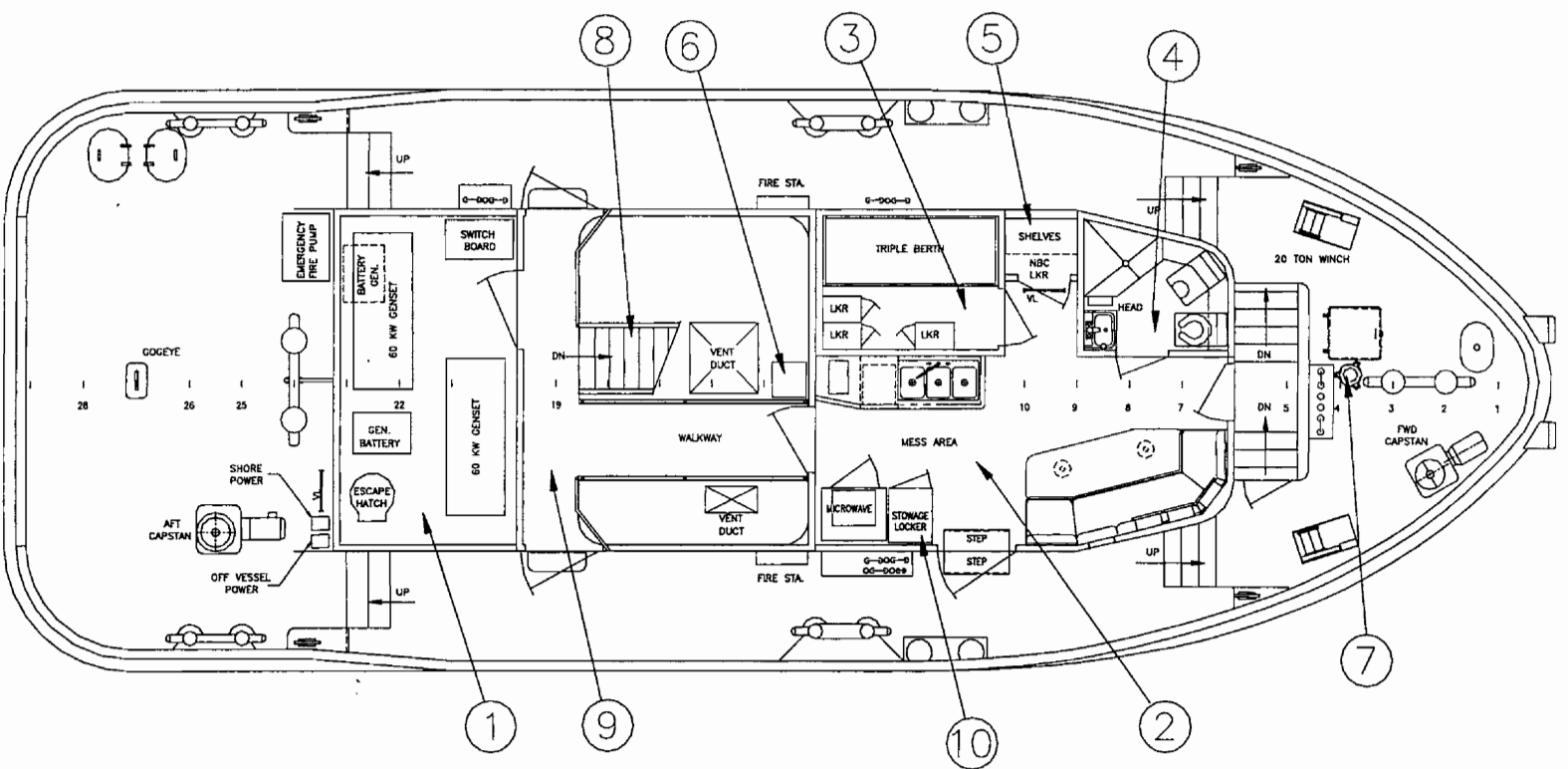


Figure 1-12. Main Deck

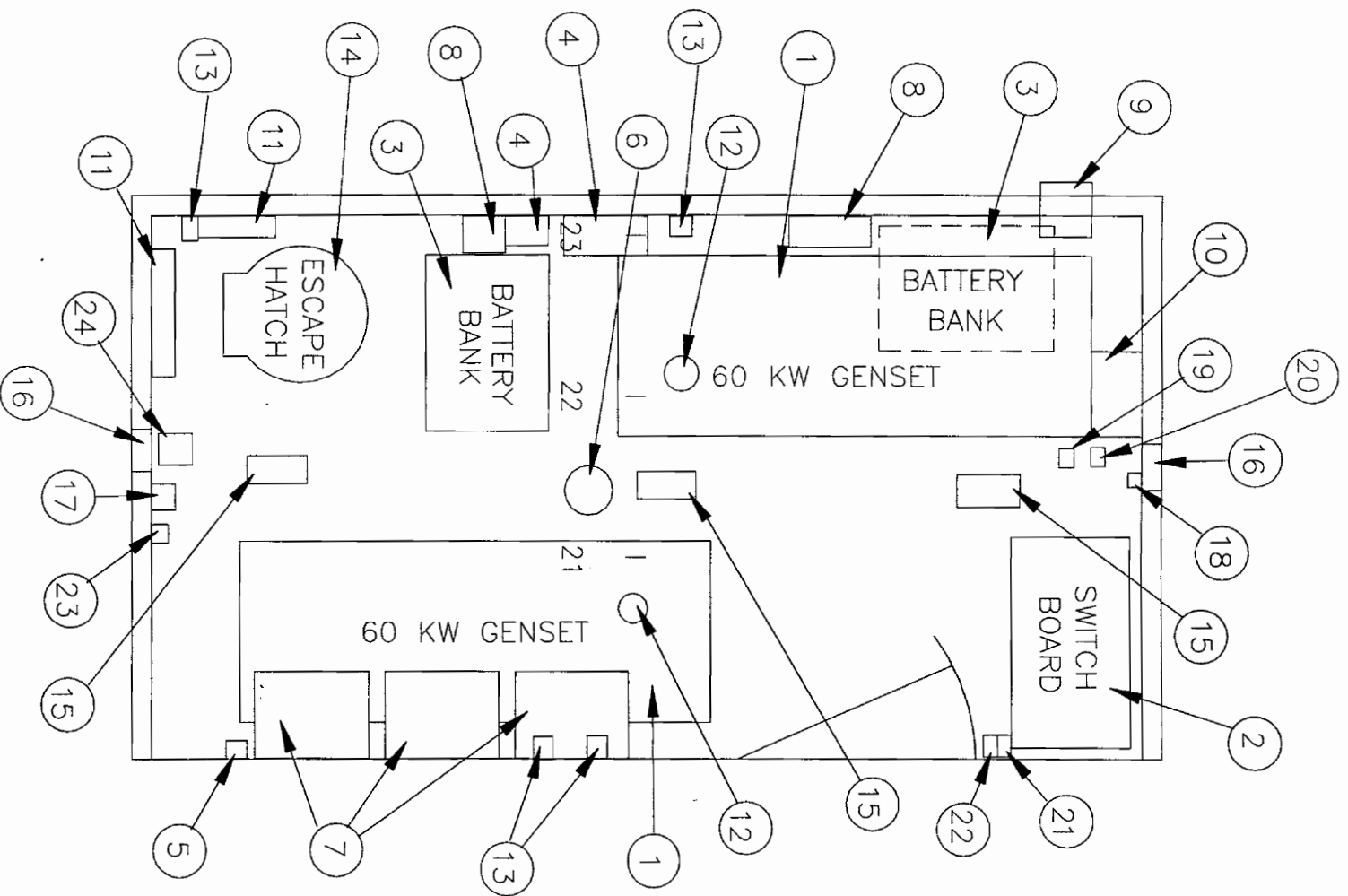


Figure 1-13. Generator Room

- (b) **Mess Area (Figure 1-12, Item 2).** The mess area is located on the starboard side between Frames 6 and 14. The mess area (Refer to Figure 1-14) contains a refrigerator/freezer (Item 1), a stowage locker (Item 3), a microwave oven (Item 2), a mess table with seating (storage provided below seating) (Item 6), a sink with storage above (Item 4), a fire alarm beacon/horn (Item 5), a fire alarm pull station (Item 7), a smoke detector (Item 8), sounding tubes (Item 9), a deck drain (Item 10), a fixed port light (Item 11), a remote intercom station (Item 12), a fire extinguisher (Item 13), a clock (Item 14), a first aid kit (Item 15), six receptacles (Item 16), a sound powered phone (Item 17), an engine alarm (item 18), a ventilation shutdown (Item 19), an intercom speaker (Item 20), a carbon monoxide detector (Item 21), a light switch (Item 22), three fluorescent light fixtures (Item 23), an emergency DC light (Item 24), and an air condition vent (Item 25).

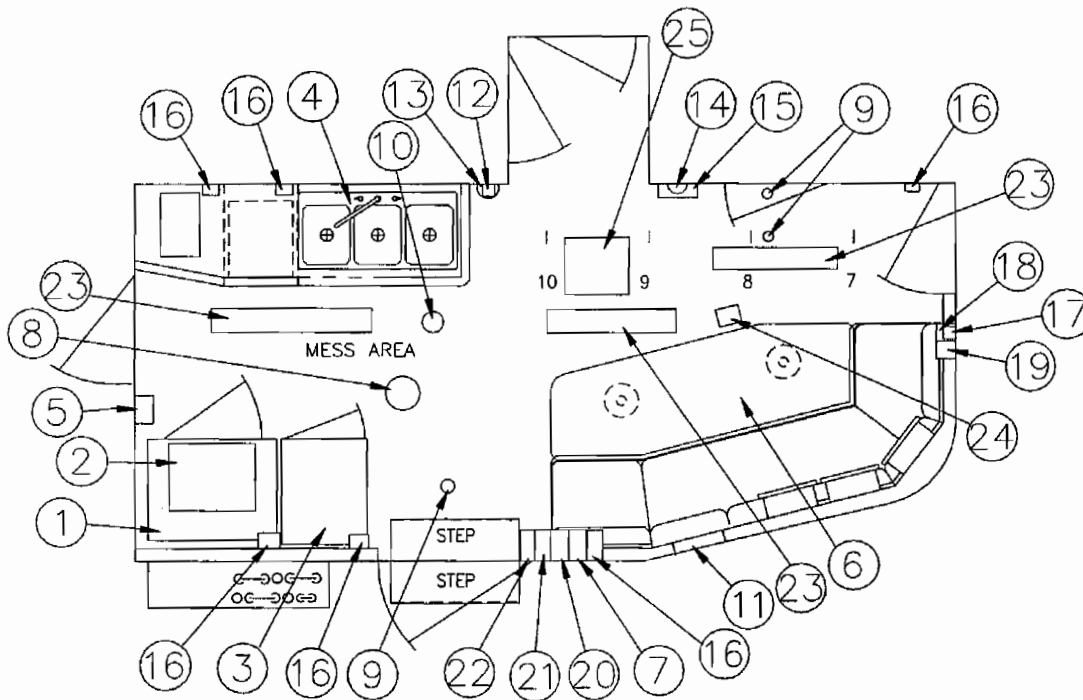


Figure 1-14. Mess Area

- (c) **Three-Person Berthing Area (Figure 1-12, Item 3).** A three-person berthing area (Refer to Figure 1-15) is located port of centerline between Frames 10 and 14. The berthing area contains a triple berth (Item 1), three lockers (Item 2), berthing lights (Item 3), a receptacle (Item 4), a light switch (Item 5), a remote intercom station (Item 6), a carbon monoxide detector (Item 7), an air condition vent (Item 8), a clock (Item 9), a mirror (Item 10), three emergency escape breathing devices (EEBD's) (Item 11) and a fluorescent light fixture (Item 12).

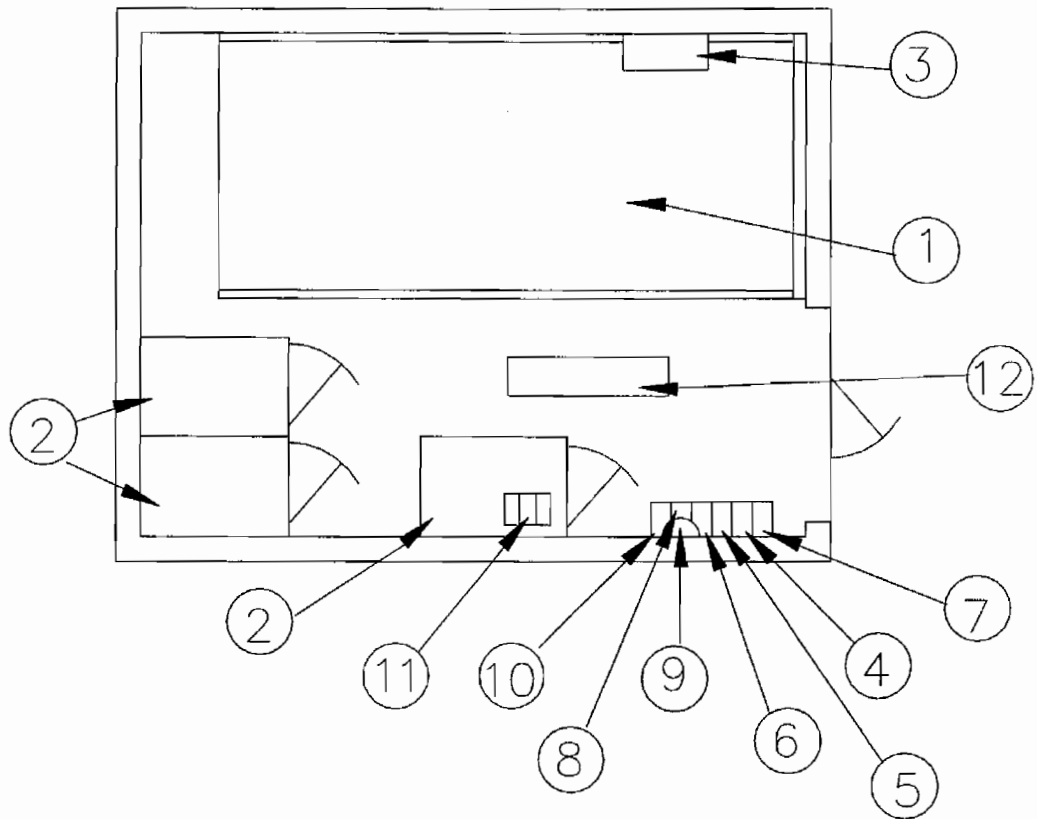


Figure 1-15. Three-Person Berthing Area

- (d) Lockers and First Aid Station (Figure 1-12, Items 5, 6, 7, and 10). The NBC locker (Item 5) is located forward of the three-person berthing area and is situated between Frames 9 and 11. The foul weather gear locker (Item 6) is located on the starboard side of centerline aft of the mess area on the Frame 14 bulkhead in the upper engine room. A first aid station is located on the starboard outside wall of the head between Frames 8 and 9. The chain locker (Item 7) is located centerline at Frame 3 and the stowage locker (Item 10) is located on the starboard side of the mess area.
- (e) Head (Figure 1-12, Item 4). A head is located between Frames 6 and 9 on the port side of the mess area. The head includes the following:
- 1 Shower
 - 2 Incinerating Urinal (Incinolet Model UR)
 - 3 Incinerating Toilet (Incinolet Model WB)
 - 4 Sink
 - 5 Heat detector
 - 6 Exhaust Vent
 - 7 Light Switch
 - 8 Mirror
 - 9 Fluorescent Light Fixture
- (f) Walkway (Figure 1-12, Item 9). There is a walkway between the galley and generator room providing access to the generator room, main deck, and to a stairwell leading to the lower engine room.
- (g) Stairwell (Figure 1-12, Item 8). A stairwell is located aft of the galley and three-person berthing area. The stairwell is accessed from the walkway and provides access to the Hold Deck below.
- (h) Main Deck Equipment and Components. The deck equipment and components are discussed in the paragraphs that follow. See Figure 1-16 for a plan view of the main deck.
- 1 Capstans (Item 1). Two capstans are located on the Main Deck with one located forward between Frames 1 and 3 and another located aft on the starboard side between Frames 24 and 26. The aft Capstan is a McElroy Machine & Mfg. Co. model MCR-18-10EN with 10,000 pound (4,536 Kilograms) line pull at 30 feet (9.14 Meters) per minute (FPM)/10HP. The aft capstan has 18 inch (0.4572 Meters) warping heads and is coupled with a marine 460 VAC severe duty TEFC electric motor. The forward capstan is a McElroy Machine & Mfg. Co. model MCR-12-3EN with 2000 pound (907.20 Kilograms) line pull at 43 FPM (13.10 Meters)/3 HP. The forward capstan is equipped with a 12 inch (0.3048 Meters) warping head. They have marine 460 VAC severe duty TEFC electric motors.
 - 2 Hatches and Manholes (Item 2). A manhole is located port outboard between Frames 27 and 28 providing access to Void #2. A manhole is located port outboard between Frames 26 and 27 providing access to Void #1. A manhole is located on port of

centerline on the forward Main Deck providing access to the ballast tank between Frames 1 and 2. A hatch is located on the forward Main Deck port side of centerline between Frames 3 and 4. The hatch provides access to the forward stores.

- 3 Towing Pad (Item 3). The towing pad is located centerline at Frame 24 on the aft main deck.
- 4 Deck Winches (Item 4). Two 20-ton deck winches (Nabrico Model #20-7HE) are located on the Main Deck, with one each port and starboard, between Frames 3 and 5.
- 5 Anchor (Item 5). Ground tackle includes a Fortress Model FX125 style anchor stowed in brackets on the starboard bulkhead; the attached anchor rode, to be stowed in chain locker, includes 500 feet (152.40 Meters) of nylon line. The forward capstan is used for hoisting the anchor.
- 6 Grease Zerks (Item 6). Grease zerks for each of the rudders are provided on the Main Deck. Two sets for the flanking rudders are located at Frame 24, one each port and starboard at the outboard edge of the deckhouse. Two sets for the main rudders are located aft at Frame 29, one each port and starboard of centerline.
- 7 Bitts (Item 7). The side bitts are constructed of 6-1/2 inch (0.1651 Meters) extra-heavy pipe with a 3-1/2 inch (0.0889 Meters) cross pipe. The forward and aft double bitts are constructed of 12-1/2 inch (0.3175 Meters) EH pipe with 4-1/2 inch (0.1143 Meters) cross pipe. They are securely tied off with shelf plate and vertical brackets to the bulwark. A towing bitt and associated capstan are located 8 feet (2.43 Meters) forward of the steering rudder stocks for line retrieval for towing barges astern when seas are in excess of 2 to 3 feet.
- 8 Buttons (Item 8). A pair of roller button chocks is connected by means of a shelf plate to the Main Deck on the port and starboard sides between Frames 10 and 13. The buttons are used for towing by pushing ahead utilizing fairlead makeup winch wires.
- 9 Fire Stations (Item 9). Fire Stations #1 and #2 are located outside of the deckhouse on the Main Deck. Fire Station #1 is located on the starboard side between Frames 16 and 17. Fire Station #2 is located on the port side between Frames 16 and 17.
- 10 Boat Hook (Item 10). A boat hook is located on the starboard side of the deckhouse on the Main Deck just above Fire Station #1.
- 11 CO₂ Pull Stations (Item 11). CO₂ pull stations are located one each, port and starboard on the Main Deck just aft of the fire stations.
- 12 Axes (Item 12). Axes are located one each port and starboard at Frame 21 (just aft of the engine room doors).
- 13 Lifting Eyes (Item 13). Four lifting eyes are positioned on the Main Deck. Two are located just forward of Frame 24, one each port and starboard outboard. Two are located just forward of Frame 6, one each port and starboard outboard. These lifting eyes facilitate lifting the ST onto/from another vessel with the required lifting cradle arrangement.
- 14 Throwable Life Rings (Item 14). Throwable life rings with floating light are located one each, port and starboard, forward of the fire stations between Frames 12 and 14.
- 15 Gogeye (Item 15). A gogeye is located on the aft main deck at Frame 27 centerline.

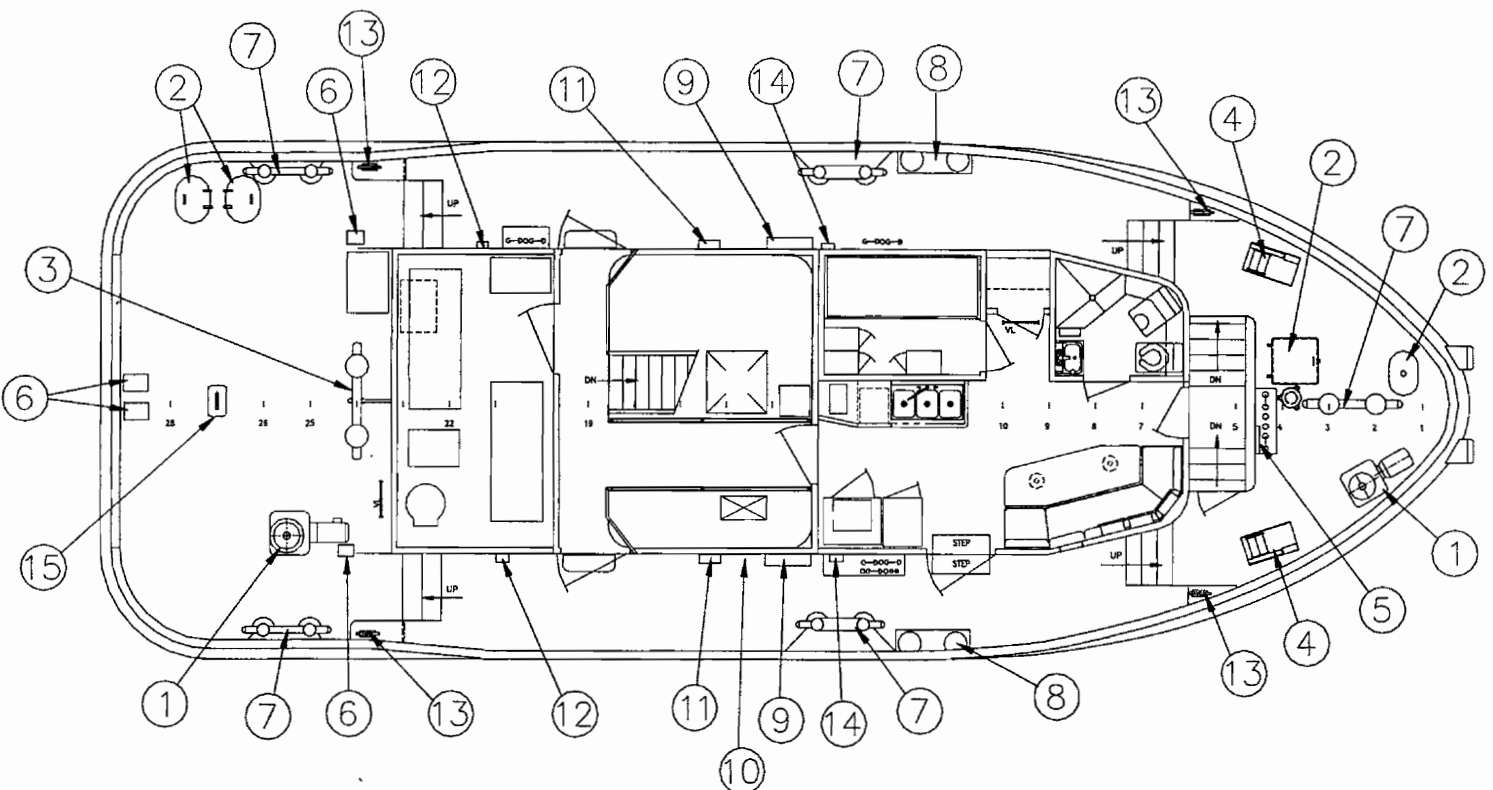


Figure 1-16. Main Deck Equipment and Components

- (5) Hold Deck. The compartments on the Hold Deck consist of the following: ballast tank (3); voids (6); engine stores compartment (5); upper and lower engine room (1); tankage space (2); forward storage area (4). Each of these is discussed below. See Figure 1-17 for a plan view of the hold deck.
- (a) Ballast Tank (Figure 1-17, Item 3). A ballast tank is located between Frames 0 and 2 from centerline, port and starboard.
- (b) Forward Storage Area (Figure 1-17, Item 4). A storage area is located aft of the ballast tank between Frames 2 and 8. Components within the forward storage area are depicted in Figure 1-18. These components include:
- 1 Stairwell (Item 1). Located from centerline and between Frames 5 and 6 is a stairwell.
 - 2 Locker (Item 2). A locker is located between Frames 4 and 5, port inboard.
 - 3 Tool Locker (Item 3). A tool locker is provided port outboard between Frames 6 and 7.
 - 4 Fire Detection and Alarms (Item 4). A heat detector is located starboard of centerline between Frames 4 and 5. A fire alarm beacon/horn is located centerline at Frame 5.
 - 5 Forward Capstan Motor Starter (Item 5). The forward capstan motor starter (Siemens Model) is located aft starboard in the storage area at the Frame 6 bulkhead.
 - 6 Towing Winch Disconnects (Item 6). A disconnect switch (Square D Model) is provided for each of the towing winches. These disconnects are located starboard outboard between Frames 5 and 6.
 - 7 Transducer Well (Item 7). A well for the depth sounder transducer is provided at aft centerline under the stairway.
 - 8 Rope Locker (Item 8). A rope locker is located beneath the stairwell.
 - 9 Storage Bins (Item 9). Storage bins are provided around the forward bulkhead and the port and starboard bulkheads. Basic issue items are stored in this area.
 - 10 Fuel Oil Cleanout (Item 10). A fuel oil cleanout is located aft on the port side.
 - 11 Equipment Removal Hatch (Item 11). An equipment removal hatch (quick acting dog type) is located overhead on the port side between Frames 3 and 4.
 - 12 Bilge Suction (Item 12). A bilge suction is located beneath the floor plates at centerline.
 - 13 Fire Alarm Pull Station (Item 13). A fire alarm pull station is located on the starboard side bulkhead.
 - 14 Fuel Oil Tanks (Item 14). There are two fuel tanks (1,248 gallons; 5,677.95 Liters each), located one each, port and starboard between Frames 6 and 8.
 - 15 Space Heater (Item 15). A space heater is located above the capstan controller.
 - 16 Fluorescent Light Fixtures (Item 16). There are five fluorescent light fixtures located overhead.

(c) Tankage Space (Figure 1-17, Item 2). The tankage space is depicted in Figure 1-19 and includes the following:

- 1 Gray Water Tank (Item 1). A gray water tank (759 gallons; 2,873.04 Liters) is located forward and to the port side of the fuel tanks, between Frames 8 and 11.
- 2 Sea Chest (Item 2). A sea chest is located starboard outboard between Frames 12 and 13.
- 3 Oily Water Tank (Item 3). The oily water tank (365 gallons; 1,381.63 Liters) is located to the port of the sea chest, between Frames 11 and 13.
- 4 Fuel Oil Day Tank (Item 4). The fuel oil day tank (546 gallons; 2,066.77 Liters) is located to the port of the oily water tank, between Frames 11 and 13.
- 5 Lube Oil Tank (Item 5). The lube oil tank (266 gallons; 1,006.88 Liters) is located above the oily water tank and the fuel oil day tank between Frames 12 and 13.
- 6 Potable Water Tanks (Item 6). Two potable water tanks (392 gallons; 1,483.83 Liters each) are located on the port side between Frames 11 and 13.
- 7 Water Heater (Item 7). A water heater (Vanguard Model 6E733) is located port outboard between Frames 11 and 13.
- 8 Pressure Set (Item 8). A potable water pressure set (consisting of a Myers Model MPD 20 pressure tank and an Aermotor Model 5K38PN48 potable water pressure pump) is located forward of the water heater between Frames 11 and 12.
- 9 Gray Water Pump (Item 9). A gray water pump (Teel Model 2P375) is located to the starboard of the gray water tank between Frames 8 and 9.
- 10 Ballast Pump (Item 10). A ballast pump (Burks Model 350G6-2-A-B) is located starboard of the gray water pump and port of centerline between Frames 8 and 9.
- 11 Bilge Pump (Item 11). A bilge pump (Burks Model 350G6-2-A-B) is located at centerline between Frames 8 and 9.
- 12 Fire Pump (Item 12). A fire pump (Worthington Model D-824) is located beneath the workbench on the starboard side between Frames 8 and 9.
- 13 Fuel Oil Transfer Pump (Item 13). The fuel oil transfer pump (Roper Type 1, Fig. 2AM12) is located on the starboard side between Frames 8 and 9.
- 14 Fire Detection and Alarms (Item 14). A heat detector is located port of centerline between Frames 10 and 11. A fire alarm beacon/horn is located starboard centerline at Frame 10.
- 15 Work Bench (Item 15). A workbench is located forward starboard between Frames 8 and 10.
- 16 Distribution Panel (Item 16). Panel DP1 (480VAC) is located on the starboard bulkhead.
- 17 Seawater Suction Line (Item 17). A seawater suction line is piped to the sea chest. The line includes two valves and a strainer.

Motor controllers are provided for the following equipment in the tankage space:

- 18 Fuel Oil Transfer Pump Motor Controller (Item 18).
- 19 Fire Pump Motor Controller (Item 19).
- 20 Bilge/Ballast Pump #1 Motor Controller (Item 20).
- 21 Bilge/Ballast Pump #2 Motor Controller (Item 21).
- 22 Grey Water Pump Motor Controller (Item 22).
- 23 Potable Water Pressure Set Motor Controller (Item 23).
- 24 Bilge Suction (Item 24). A bilge suction is located below the floor plates centerline between Frame 10 and 11.
- 25 Fuel Filters (Item 25). Fuel filters inline from the fuel oil tanks are provided one each, port and starboard at Frame 9 and 10.
- 26 Firemain Piping Valves (Item 26). Firemain piping valves are located overhead port inboard.
- 27 Remote Intercom Station (Item 27). A remote intercom station (United Marine Model UM-RIMI) is located above the workbench.
- 28 Sight Glasses (Item 28). Sight glasses are provided for monitoring the level of the fuel oil day tank, fuel oil tank, grey water tank, and potable water tanks
- 29 Fire Extinguisher (Item 29). A fire extinguisher is located forward on the starboard side bulkhead.
- 30 AC Receptacles (Item 30). Two (2) AC receptacles are located on the forward bulkhead above the work bench.
- 31 Space Heater (Item 31). A space heater is located on the forward bulkhead port of the Bilge/Ballast pump #2 motor controller.
- 32 Emergency DC Light (Item 32). An emergency DC light is located overhead just port of centerline at Frame 9.
- 33 Intercommunications Horn (Item 33). An intercommunications horn is located overhead on the forward bulkhead starboard of centerline.
- 34 Remote Intercom Station (Item 34). A remote intercom station (United Marine Model UM-RIMI) is located on the forward bulkhead starboard of centerline above the work bench.
- 35 Light Switch (Item 35). A light switch is located on the forward bulkhead just port of the door leading to the forward stores room.
- 36 Bench Grinder (Item 36). A bench grinder is located on top of the work bench.
- 37 Vice (Item 37). A vice is located on top of the work bench.

- 38 Fluorescent Light Fixtures (Item 38). Four fluorescent light fixtures are located overhead in the Tankage Space.
- 39 Hand Operated Fuel Oil Transfer Pump (Item 39). A hand operated fuel oil transfer pump is located on the starboard side of the workbench.
- (d) Lower Engine Room (Figure 1-17, Item 1). The Engine Room is located between Frames 13 and 21. Key components and fixtures in the lower Engine Room are depicted in Figure 1-20.
- 1 Main Diesel Engines (Item 1). The two main propulsion diesels (Cummins KTA19-M3, 640 BHP @ 1800 RPM) are located one each port and starboard between Frames 15 and 20.
 - 2 Reduction Gearing (Item 2). A Twin Disc MG 5202, deep case reduction gear is coupled to each main diesel engine.
 - 3 Dirty Oil Tank (Item 3). The waste oil tank (350 gallons; 1,324.85 Liters) is located at centerline between Frames 19 and 21 and below the deck plates in the Engine Room.
 - 4 Oil Content Bilge Alarm (Item 4). The oil content bilge alarm (oily water tank monitor HF Scientific BA-1/MA-1/BA-100) is located on the port side between Frames 18 and 19.
 - 5 Oily Water Separator (Item 5). The oily water separator (Nelson Model #10025, Bilge Boy 96504A) is located port inboard between Frames 20 and 21.
 - 6 FLOCS Pump (Item 6). The fast lube oil change system (FLOCS) pump is located port of centerline between Frames 17 and 18. This unit is a Model 15 gear Aeroquip #FF9315-01.
 - 7 Multi-jet Nozzles (Item 7). Two multi-jet nozzles (CO₂ release) are located one each at the main diesel engines, port and starboard between Frames 17 and 18.
 - 8 Heat Detectors (Item 8). There are two heat detectors, one each port and starboard, at Frame 17 near the main diesel engines.
 - 9 Emergency Transfer Switch and Dual Emergency Steering Station (Item 9). The emergency transfer switch and dual emergency steering station is located on the port of the doorway on the forward bulkhead.
 - 10 Bilge Alarm/Tank Alarm Panel (Item 10). The Bilge Alarm/Tank Alarm panel is located on the port forward bulkhead.
 - 11 Lower Engine Room Panel DP4 (Lower Engine Room) (Item 11). Panel DP4 is located on the port forward bulkhead.
 - 12 Batteries (Item 12). Each main engine is provided with a 24 VDC battery bank to provide power for starting. 24VDC power in each battery bank is derived from two 12V batteries (with boxes) located one each port and starboard at Frame 20.
 - 13 Oily Water Hand Pump (Item 13). An oily water hand pump is mounted on the starboard side of the staircase in the Engine Room.
 - 14 Staircase (Item 14). A staircase is located centerline in the Engine Room providing access upward to the Main Deck.

- 15 Engine Control Panels (Item 15). Engine control panels are located one each, adjacent to each of the main engines, port and starboard.
- 16 Fuel Filters (Item 16). Two duplex fuel filters (Racor Model 75/900 MAX) are provided port and starboard inboard forward of the main engines. These provide filtered fuel to the main engines and to the generators.
- 17 Bilge Suction (Item 17). A bilge suction is located below the floor plates between Frames 15 and 16. An emergency suction is provided below the deck plates at Frame 14 starboard of centerline.
- 18 Main Engine Cooling Cofferdams (Item 18). Main engine cooling cofferdams are located between Frames 13 and 14 port and starboard outboard.
- 19 Generator Engine Cooling Cofferdams (Item 19). Generator engine cooling cofferdams are located above the main engine cooling cofferdams.
- 20 Receptacles (Item 20). Four 120VAC receptacles are located in opposing corners.
- 21 Bilge Sump Pumps (Item 21). Bilge sump pumps (Rule Model 3700) are located port and starboard at Frame 19.
- 22 Fast Lube Oil Change System (FLOCS) Quick Disconnects (Item 22). FLOCS quick disconnects for the generator set lube oil/waste oil are provided one each, port and starboard.
- 23 Oily Water Separator Overboard Discharge (Item 23). An oily water separator overboard discharge is provided in the aft port corner.
- 24 Watertight Door Detector Switch (Item 24). Both of the doors in the lower engine room are provided with a watertight door detector switch. The status of doors in the engine room are indicated at the Pilot House watertight door alarm panel. The indicator for the door to the engine stores compartment is located within the engine room. The indicator for the door to the tankage space is located within the tankage space.
- 25 Fire Extinguisher (Item 25). Two (2) fire extinguishers are located in the lower engine room. They are located one each port and starboard mounted just below the main engine control panels.
- 26 Communication Strobe Lights (Item 26). A communication strobe light is located forward overhead on the port side bulkhead.
- 27 Intercommunication Speaker (Item 27). Two (2) intercommunication speakers are located in the lower engine room. One is located forward overhead on the port bulkhead and one is located forward overhead on the starboard bulkhead.
- 28 Steering Control Panels (Item 28). Two (2) steering control panels (Mathers Intercommand) are located port on the forward bulkhead. One is a Model MS547-11760 and the second is a Model MS12521.
- 29 Remote Intercom Station (Item 29). A remote intercom station (United Marine Model UM-RIMI) is located port of centerline on the forward bulkhead.
- 30 Space Heater (Item 30). A space heater is located port of centerline on the forward bulkhead just below the Bilge Alarm/Tank Alarm Panel.

- 31 Main Engine Throttle Controls (Item 31). Main engine throttle controls are located on the forward bulkhead just port of the doorway.
 - 32 Intercommunication Strobe Light (Item 32). An intercommunication speaker is located forward overhead just port of the doorway.
 - 33 Sound Powered Phone (Item 33). A sound powered phone is located on the forward bulkhead just starboard of the doorway.
 - 34 Emergency Eyewash Station (Item 34). An emergency eyewash station is located on the forward bulkhead just starboard of the sound powered phone.
 - 35 Sound powered Phone Bell (Item 35). A bell for the sound powered phone is located starboard overhead on the forward bulkhead.
 - 36 Fluorescent Lights (Item 36). Seven (7) fluorescent light fixtures are located in the lower engine room. Four (4) fixtures are located overhead on the port side and three (3) fixtures are located overhead on the starboard side.
 - 37 Battery Chargers (Item 37). Two (2) battery chargers are located in the lower engine room centerline under the stairs.
 - 38 Lower Engine Room Heaters Panel (DP6). Panel DP6 is located on the forward bulkhead below the space heater.
- (e) Upper Engine Room (Figure 1-17, Item 1). The components of the upper Engine Room are outlined below and depicted in Figure 1-21.
- 1 Ventilation Fan (Item 1). One ventilation fan which provides supply air to the Engine Room is located centerline. Two air ducts are located overhead, one at centerline and one starboard.
 - 2 Engine Cooling Day Tanks (Item 2). Engine Cooling Day tanks are located one each, port and starboard.
 - 3 Air Filters (Item 3). Air intake filters for the Engine Room are located port and starboard in the upper Engine Room.
 - 4 CO₂ Nozzle (Item 4). A CO₂ nozzle for extinguishing fires in the Engine Room is located centerline in the upper Engine Room.
 - 5 Exhaust Fan Motor Starter (Item 5). The motor starter for the exhaust fan is located on the forward starboard bulkhead.
 - 6 Supply Fans Motor Starters (Item 6). The motor starter for supply fan #1 and #2 are located on the forward starboard bulkhead.
 - 7 Fixed Port Lights (Item 7). Fixed port lights are provided one each, port and starboard.
 - 8 Fire Alarm Pull Stations (Item 8). A fire alarm pull station is located at each main deck entrance to the upper Engine Room.
 - 9 Fire Alarm Beacon/Horn (Item 9). A fire alarm beacon/horn for the fire alarm is located on the aft bulkhead, starboard side in the upper Engine Room.

- 10 Heat Detector (Item 10). A heat sensor is located aft, starboard of centerline in the upper Engine Room.
- 11 Generator Exhaust Trunk (Item 11). The generator exhaust trunk is routed upward from centerline from the generator room below.
- 12 Main Engine Exhaust Trunk (Item 12). The main engine exhaust trunk is routed upward from centerline.
- 13 Communication Head Sets (Item 13). Two communication head sets (United Marine Model UM-CPHI-A) are provided in the upper Engine Room, one each port and starboard.
- 14 Pressure Switch for CO₂ (3PDT) System (Item 14). A pressure switch is located at centerline.
- 15 Generator Ventilation Manual Pull Station Junction Boxes (Item 15). Two generator ventilation manual pull station junction boxes are located in the upper Engine Room, centerline on the aft bulkhead.
- 16 Engine Room Exhaust Fan (Item 16). The Engine Room exhaust fan is located centerline aft.
- 17 Main Engine and Generator Mufflers (Item 17). The main engine generator mufflers (1 for each engine) are mounted in the stack in the upper Engine Room.
- 18 Alarm Sirens (Item 18). Two alarm sirens are located on the aft starboard bulkhead.
- 19 Carbon Monoxide Detector (Item 19). A carbon monoxide detector is located on the aft starboard bulkhead.
- 20 Remote Lamp Indicating Panel (Item 20). A remote lamp-indicating panel (fire alarm) is located on the starboard side forward of the doorway.
- 21 Communication Speaker (Item 21). A surface mount communication speaker (United Marine Model UM-SFIS-C) is located on the starboard side forward of the doorway.
- 22 Foul Weather Gear Locker (Item 22). A foul weather gear locker is located alongside the walkway.
- 23 Receptacle (Item 23). A receptacle is located alongside the walkway across from the foul weather gear locker.
- 24 Fluorescent Light Fixtures (Item 24). Three fluorescent light fixtures are located overhead.
- 25 Light Switches (Item 25). Two light switches are located on the port side aft bulkhead and three light switches are located on the starboard side aft bulkhead.
- 26 Emergency DC Light (Item 26). An Emergency DC Light is located starboard overhead to the aft.
- 27 CO₂ Bell Alarm (Item 27). A CO₂ bell alarm is located overhead on the forward port bulkhead.

- 28 Intercommunication Strobe Light (Item 28). An intercommunication strobe light is located forward port overhead.
- (f) Engine Stores Compartment (Figure 1-17, Item 5). The engine stores compartment is located aft of the Engine Room. The main components of this room are depicted in Figure 1-22 and are identified below.
- 1 Hydraulic Steering Power Unit (Item 1). The hydraulic steering power unit (Control General supplied Model A0009U Parker) is situated within this compartment.
 - 2 Steering Flanking System Motor Starters (Item 2). A motor starter is provided for each of the steering flanking systems.
 - 3 Aft Capstan Motor Starter (Item 3). A motor starter is provided for the aft capstan.
 - 4 Disconnect for Aft Capstan Motor Starter (Item 4). A disconnect for the aft capstan is located in the engine stores compartment.
 - 5 Vent Line for Stern Tubes (Item 5). A vent line for the stern tube is provided in the engine stores compartment, one each port and starboard (with valves).
 - 6 Bilge Suction (Item 6). A bilge suction is located on the port side.
 - 7 Vertical Ladder (Item 7). A vertical ladder is provided for access to an escape hatch to the Main Deck.
 - 8 AC Receptacle (Item 8). A 120VAC receptacle is located overhead.
 - 9 Generator Coolant Lines (Item 9). Coolant lines for the generators run through the engine stores compartment overhead.
 - 10 Bilge Piping (Item 10). Bilge piping runs on the port side of the engine stores compartment.
 - 11 Communication Speaker (Item 11). A communication speaker horn (United Marine) is located at centerline overhead.
 - 12 Light Switch (Item 12). A light switch is located at centerline overhead.
 - 13 Drain Valve at Escape Hatch (Item 13). A drain valve is located on top of the escape hatch.
 - 14 Flooding Alarm (Item 14). A flooding alarm is located on the port side inboard.
 - 15 Fluorescent Light Fixtures (Item 15). Three (3) fluorescent light fixtures are located overhead.
 - 16 Fire Extinguisher (Item 16). A fire extinguisher is located centerline on the support beam.
- (g) VOIDS (Figure 1-17, Item 6). Two voids are located aft of the engine stores compartment. Void #1 is located between Frames 24 and 27. Void #2 is located between Frames 27 and 29.

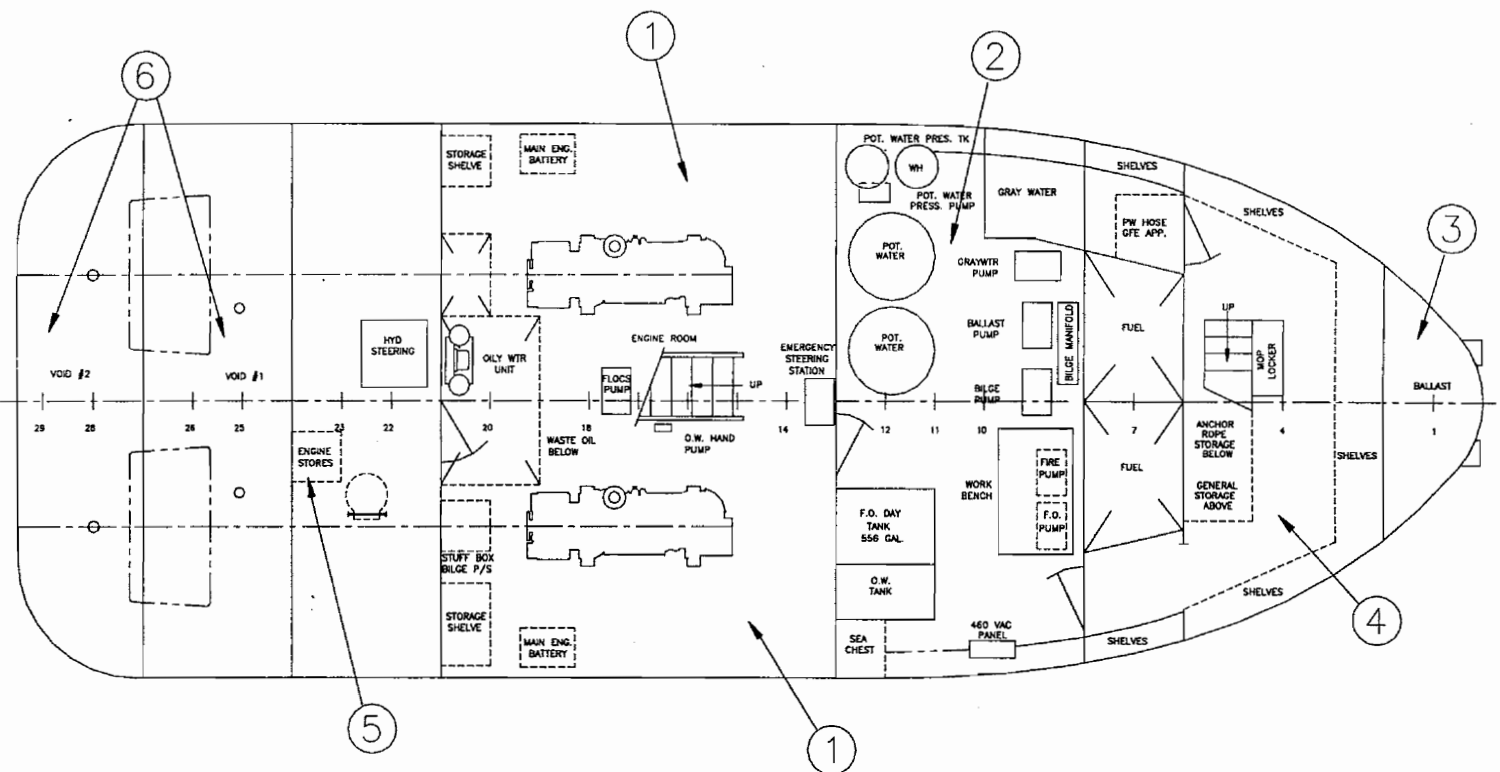


Figure 1-17. Hold Deck

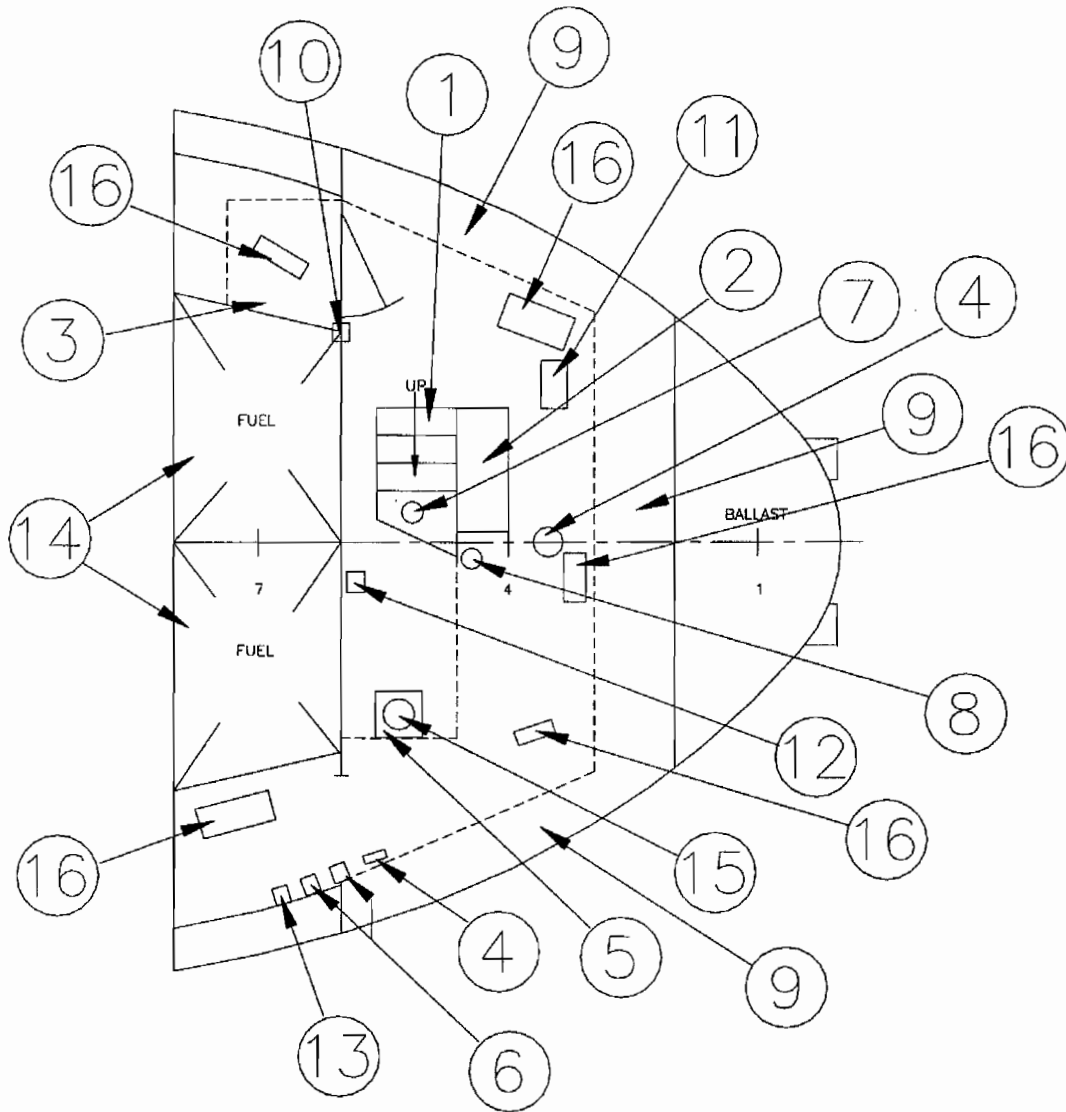


Figure 1- 18. Forward Storage

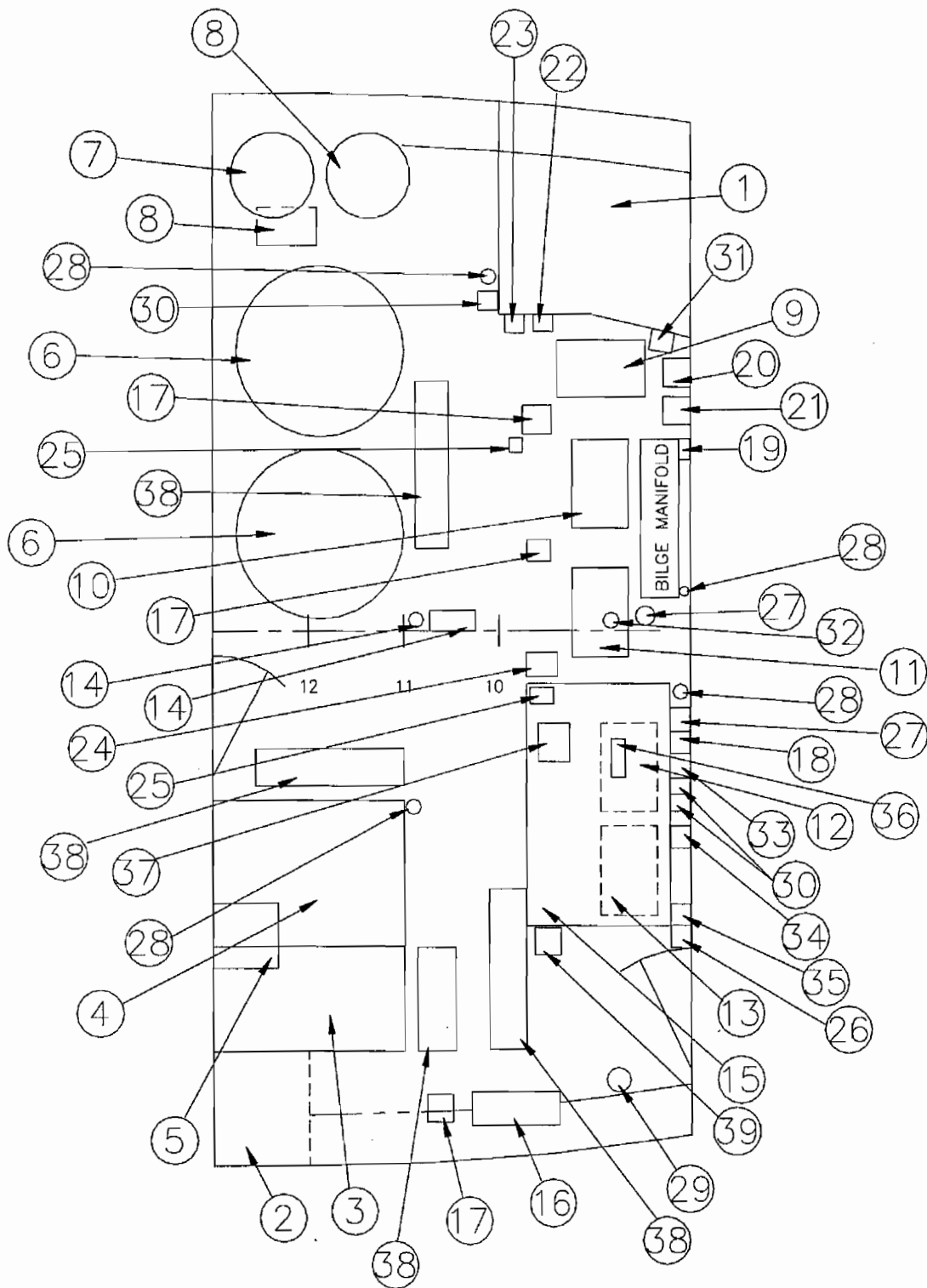


Figure 1-19. Tankage Space

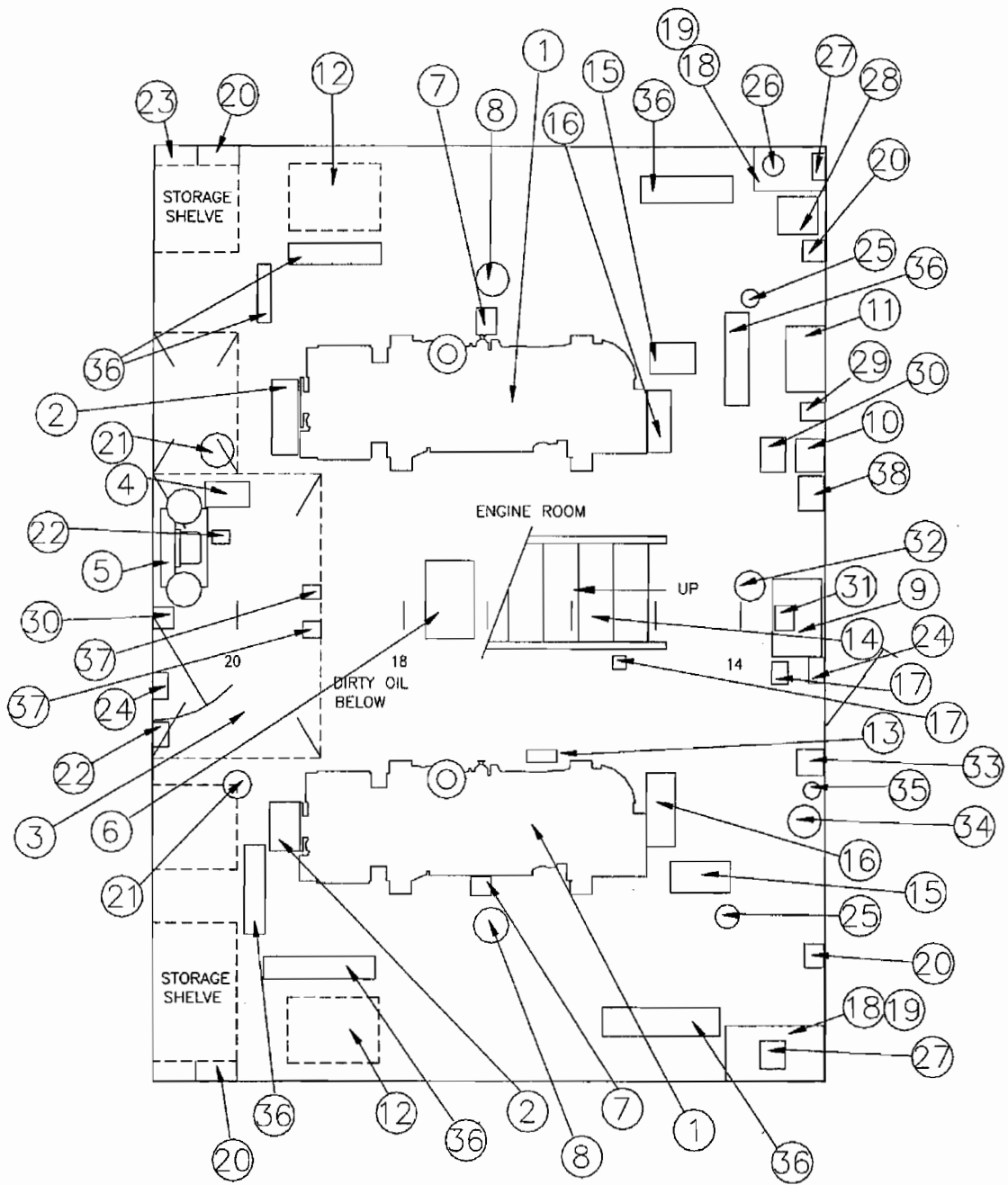


Figure 1-20. Lower Engine Room

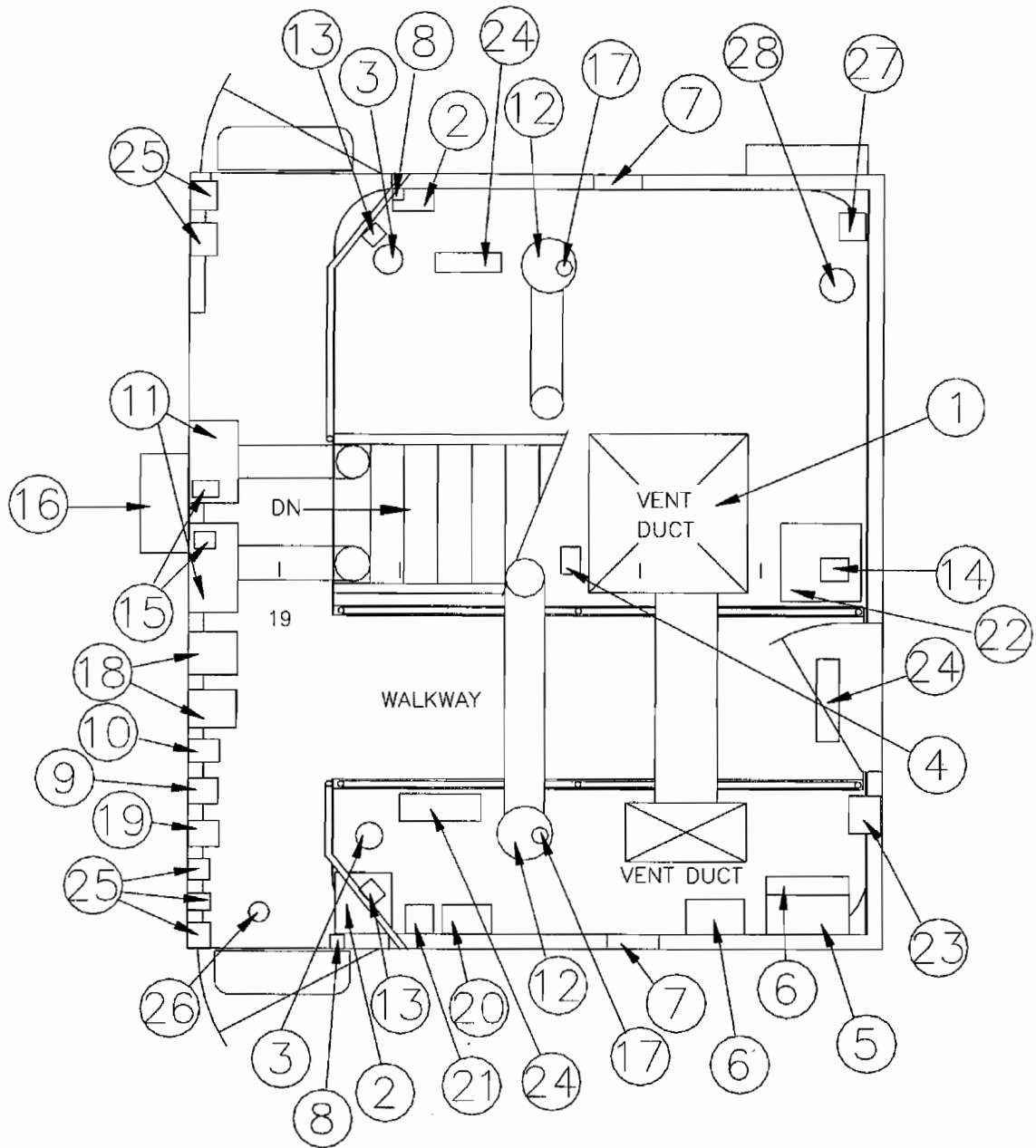


Figure 1-21. Upper Engine Room

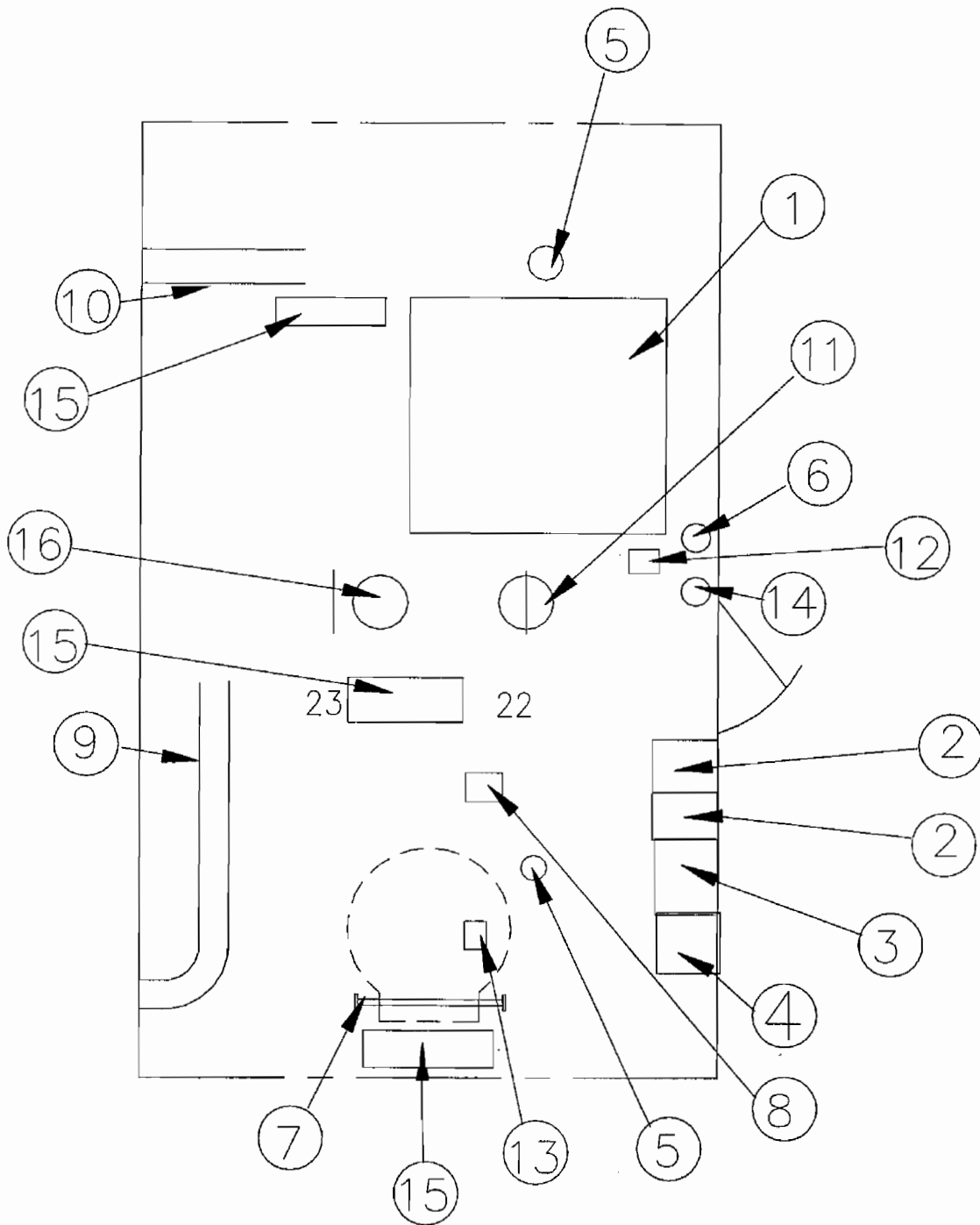


Figure 1-22. Engine Stores

b. ST External Profile Features. External features of the ST are discussed below.

- (1) Hull. Both hull and superstructure are of steel construction.
- (2) Cathodic Protection System. Sacrificial zinc anodes (Corrthern Type M-24 and M-12) are installed for cathodic protection of the underwater hull and other susceptible surfaces. The system is designed to last a minimum of 3 years to conform with normally scheduled overhaul periods. Anodes are attached by bolt-on method with a 3/8 inch (0.009398 Meters) plate installed between the anode and the protected surface.

The anodes are equally divided into two rows, port and starboard; half are installed forward of midship, the other half aft of midship. The remaining one-third anodes are located along the centerline keel, just beneath the turn of the bilge and divided equally between port and starboard.

- (3) Fendering. Refer to Figure 1-23 for a depiction of the ST's fendering system. The fendering system includes rectangular rubber fenders (Hule "D" series) (Item 1) surrounding the ship's perimeter and a Johnson DB-1510 standard push knee (Item 2). The caprail (Item 3), located on top of the gunwale, is constructed of 4-inch (0.1016 Meters) pipe.

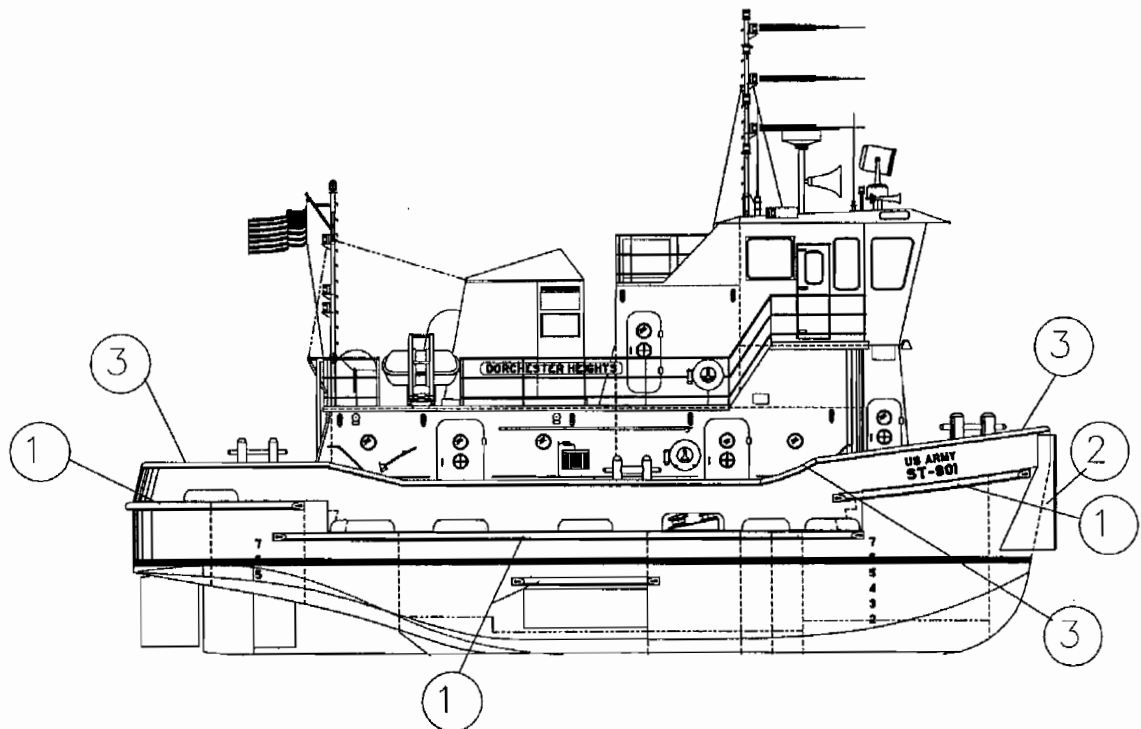


Figure 1-23. Fendering

(4) Handrails. Handrails are provided on the 01 Deck and Pilot House Deck. The handrails are of steel construction (Tubal Caine Industries Model A-120/A53B). See Figure 1-24 for a plan view of the handrails.

- (a) 01 Deck (Item 1). A handrail is provided on the port side extending diagonally downward from the Pilot House Deck where it joins a parallel railing at Frame 10. From there, the railing extends until the stern of the 01 deck. A handrail extends from port to starboard on the stern of the deck. A handrail is also provided on the starboard side extending diagonally downward from the Pilot House Deck where it joins a parallel handrail at Frame 10. From there, it extends to Frame 19, where a break is provided for launching the life raft. The handrail then extends from the aft of the life raft to the stern railing.
- (b) Pilot House Deck. A handrail (Item 2) extends from Frames 6 to 9, port and starboard, where it meets with the diagonal handrail extending upward from the 01 Deck. A handrail (Item 3) extends from Frame 10 to Frame 14, port and starboard, aft of the Pilot House. This encloses the area which contains the AC compressor and deck area.

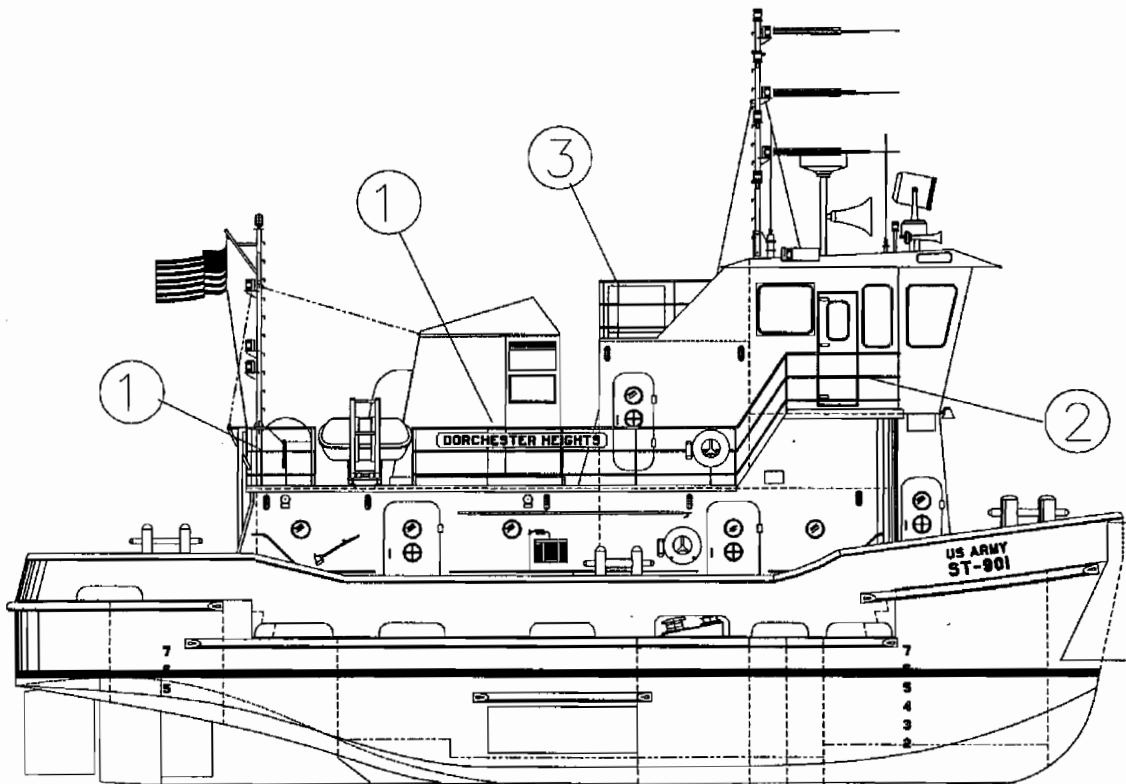


Figure 1-24. Handrails

1.15. Equipment Data.

Length Overall (LOA).....	59' 8" (18.18 Meters)
Length Water Line (LWL)	57' 6" (17.52 Meters)
Beam	22' 0" (6.70 Meters)
Depth	8' 0" (2.43 Meters)
Des. Draft.....	6' 0" (1.82 Meters)
Brake Horsepower (BHP).....	2 @ 640
Fuel Capacity.....	3,044 gallons (11,514.87 Liters)
Maximum Speed.....	8.0 knots
Bollard Ahead (AHD).....	30,000 Pounds (13,605.00 Kilograms)
Bollard Astern	15,000 Pounds (6,802.50 Kilograms)
Side Thrust	4,000 Pounds (1,814.00 Kilograms)
Displacement Full	126LT (128.01 Metric Tons)
Lightship	110LT (11.76 Metric Tons)
Lube Oil Tank Capacity	266 gallons (1,006.88 Liters)
Dirty Oil Tank Capacity.....	350 gallons (1,324.85 Liters)
Oily Water Tank.....	365 gallons (1,381.63 Liters)
Potable Water Tank Capacity.....	2 @ 392 gallons (2 @ 1,483.83 Liters)
Grey Water Tank Capacity	759 gallons (2,873.04 Liters)
Fuel Oil Day Tank Capacity.....	546 gallons (2,066.77 Liters)
Fuel Oil Storage Tank Capacity	2 @ 1,248 gallons (2 @ 4,724.05 Liters)
Range	120 hours/720.93 nautical miles (1,335.88 Meters) (at 6 knots)
40.4 hours/384 nautical miles (711.55 Meters) (at 9.5 knots)	
Personnel Capacity	5
Endurance	25 years, minimum
Propulsion System Components:	
Engine [Type and Size].....	Cummins KTA19-M3
Reduction Gear.....	MG 5202 Deep Case
Shaft.....	Aquamat 17
Propeller.....	58.5/59 four blade Caplan Style
Port.....	Clockwise Rotation
Starboard	Counterclockwise Rotation
Kort Nozzles.....	Type 37, 59 inch Diameter
Stuffing Box and Bearings	Johnson 5 inch, M88IR; Johnson Code Earths

SECTION III

PRINCIPLES OF OPERATION

1.16. Overview of Systems. The following paragraphs provide technical principles of operation of the ST systems. Actual operational procedures (step-by-step) are provided in Chapter 2, Section III of this manual.

1.16.1. Propulsion Plant. The ST's propulsion system consists of two main propulsion plants. Figure 1-25 provides a plan view of the propulsion plant. Each plant consists of a main engine (1) coupled to a two-speed reversing reduction gear (2). The output shaft of the reduction gear is coupled to the propulsion shafts. The machinery plant monitoring system accomplishes monitoring of the propulsion plant. Operational control is provided by an electronic control system.

- a. Main Propulsion Engines. The ST is equipped with two Cummins KTA19-M3 Model four-stroke, turbo-charged, after-cooled, inline six cylinder diesel engines providing 640 horsepower at 1800 RPM.
 - (1) Governor. The operator sets the desired engine speed using throttle control at the station in command. The governor converts the impulse from the throttle controls to the proper setting of the engine injector rack linkage that controls fuel to the cylinders. The governor also contains a manual shutdown button mounted on top for shutdown locally or in an emergency.
 - (2) Fuel System. The fuel oil service system consists of day tank, fuel suction strainer, connecting lines, fuel injectors, fuel pump, engine mounted fuel filter, and fuel supply and return manifolds. Fuel from the day tank is drawn in by the fuel pump, through a suction strainer, to the engine mounted filters. Fuel passes through the filter elements to the supply manifold and through the injector inlet filter to the injector. A small amount of fuel is pumped into the cylinder, at very high pressure, through the needle valve and spray tip of the injector. Excess fuel flows through the fuel return manifold and back to the day tank.
 - (3) Air Intake System. The air is thoroughly cleaned by passing through the air intake filters; this protects the engine from abrasive material and the lubricating oil from contaminants. This filtered air is then provided to the engine air intake manifold, by the turbocharger.
 - (4) Engine Exhaust System. Figure 1-26 provides a plan view of the engine exhaust system. Exhaust gases from the engine cylinders are discharged from the cylinder heads into the exhaust manifold and turbocharger turbine. Going through the turbine, the gases pass through the turbocharger ducting, and upwards to silencers (1) located in the exhaust stack (2) on the rear of the 01 Deck and are finally released into the atmosphere. Engine exhaust silencers also have condensate drain lines (3) located in the stack.
 - (5) Lubricating Oil System. The lubricating oil system for the main propulsion engines is a wet-sump, forced-feed system. A lube oil pump within the engine draws oil from the oil pan. The oil flows to the engine oil filters and then to the individual lubrication points within the engine.
 - (6) Cooling System. Figure 1-27 provides a plan view of the engine cooling system. The engines (2) are coupled to fresh water grid coolers (1). The grid coolers are recessed into the vessel's hull. Fresh water (closed system) from the engines is pumped through the grid exchanger by the engine fresh water pump, is cooled by the surrounding seawater, and is re-circulated through the engine.

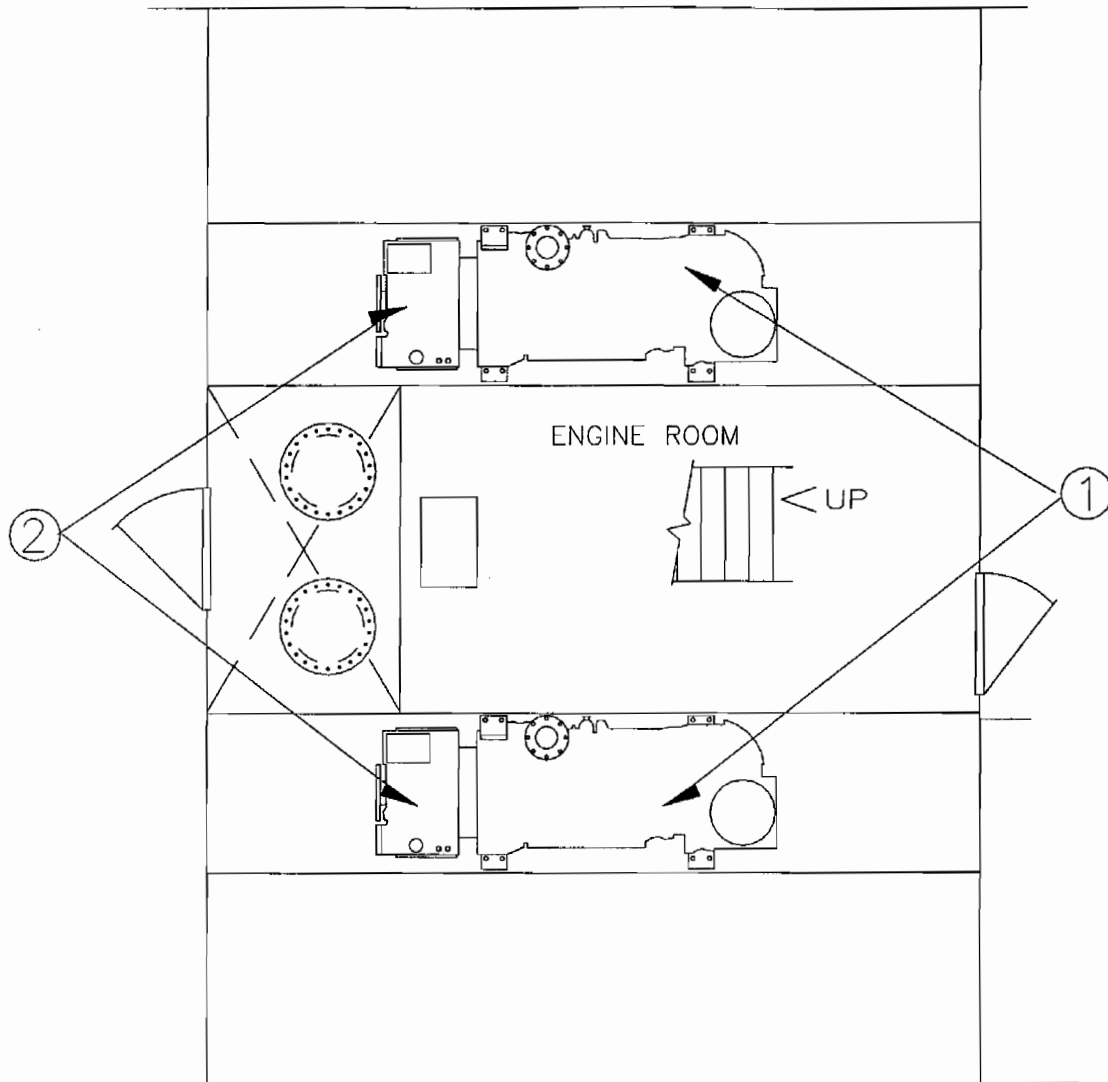


Figure 1-25. Propulsion Plant

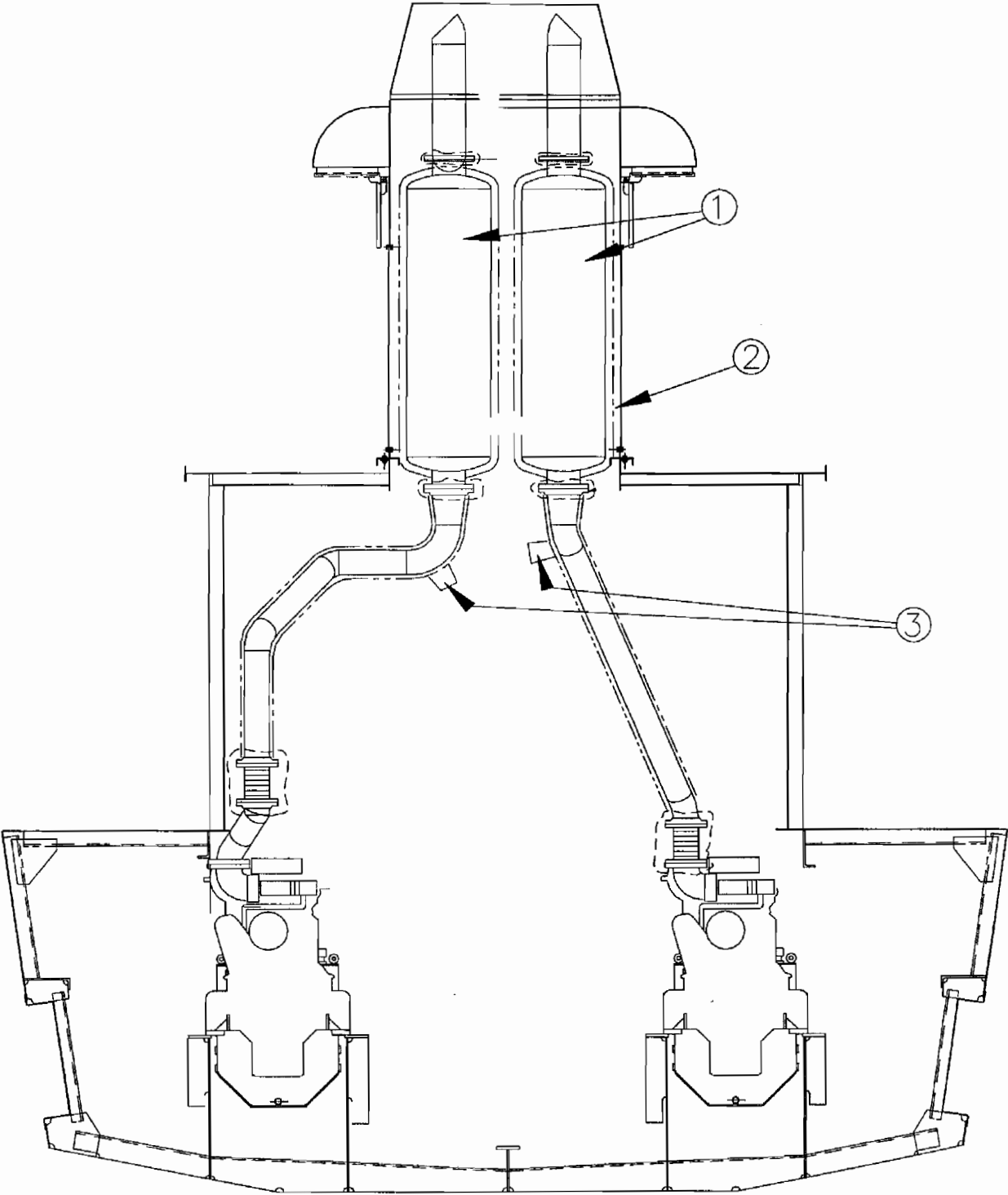
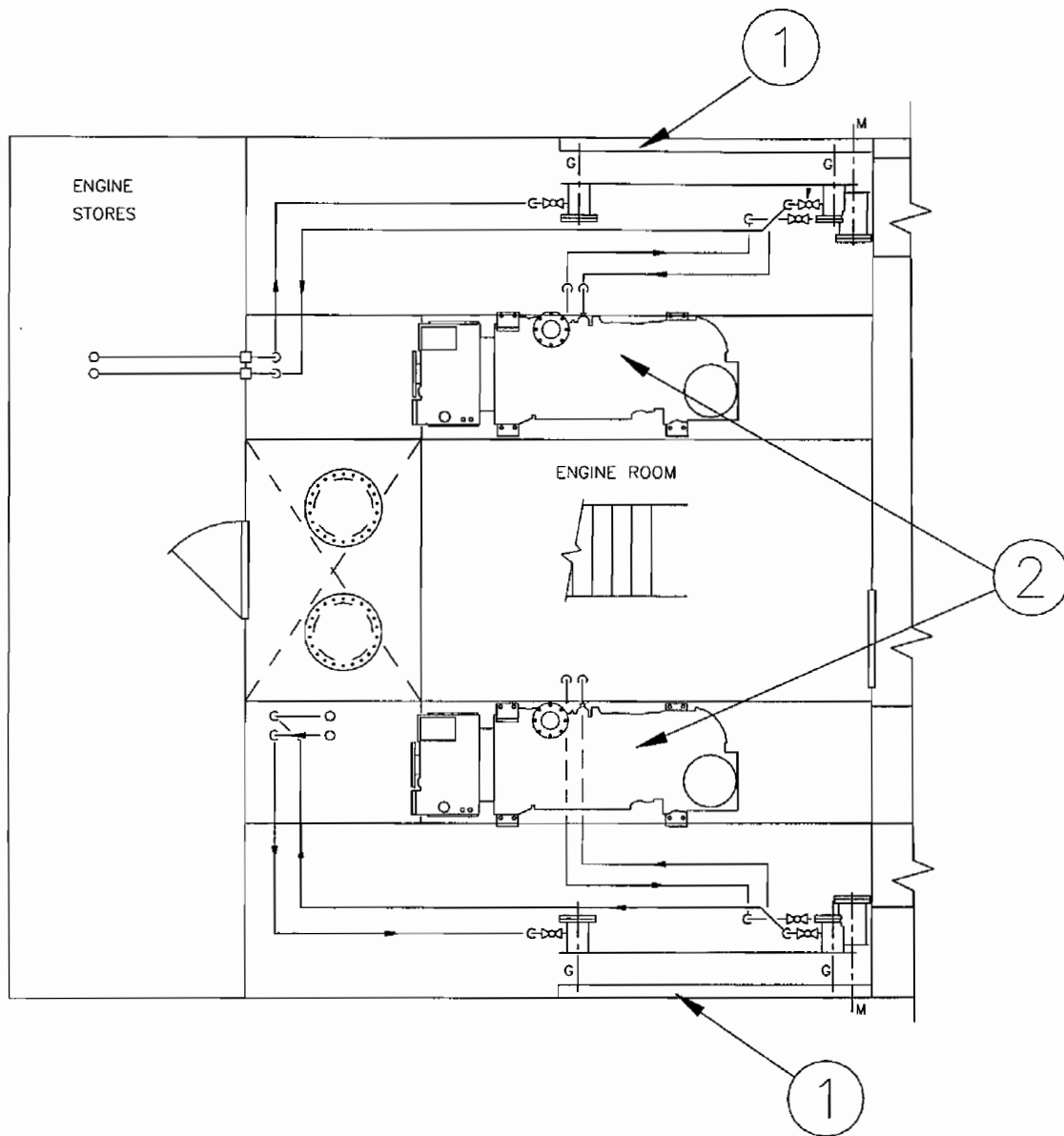
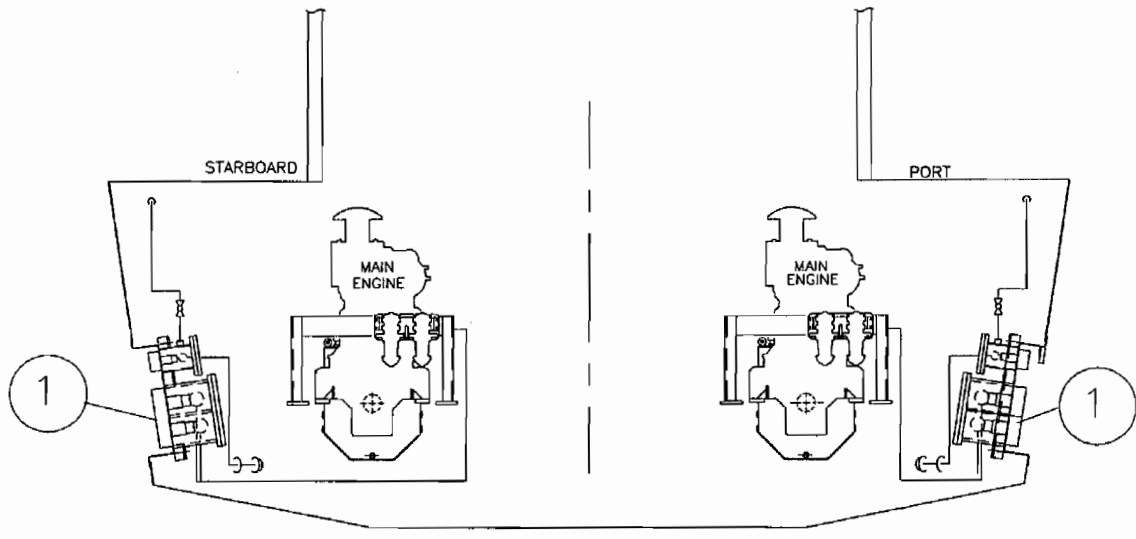


Figure 1- 26. Main Engine Exhaust System



HOLD DECK LEVEL

Figure 1- 27. Main Engine Cooling System, Sheet 1 of 2.



PROFILE

Figure 1-27. Main Engine Cooling System, Sheet 2 of 2.

- (7) Engine Control System. Figure 1-28 provides detailed views of the engine control system. These views include system overview, control head views, and views of control stations. The control system provides for clutch and throttle control of the ST's main propulsion engines and reduction gears. The system includes main control and back-up control. This system does not include provisions for starting and stopping the engines. This is accomplished locally at the engine, as described in paragraph (8) below.
- (a) Main Control System. A Mathers Controls ClearCommand Model MS547-11760 Control Processor System (7) is utilized for controlling various engine operations. The control system consists of a control head installed in the Pilot House Control Console (1), a control head installed in the engine room control station (2), and a control head installed at the aft control station (3) on the 01 Deck. A single lever at the Station-in-Command control head (i.e., the station in command at present time) facilitates selecting clutch direction and engine RPM. The system allows for transferring command from any of the three control stations. Only one station can be in command at a time. However, the aft control station is live at all times allowing for immediate intervention in the event of an emergency. Key features of the main control system include: sequencing of clutch selection and engine speed; proportional pause on through neutral shifts; neutral fast idle; station-in-command indication; system fault indication; failure alarm contact; clutch oil pressure interlock; neutral start interlock; and high/low idle.
- (b) Back-up Control. There is also a backup control system (4), Model MS12521 consisting of two single lever control heads (5) with separate clutch selector switches (6) at the secondary Pilot House station for emergency backup control. This system operates in conjunction with the main control processor to provide independent back-up control in case of a failure condition. The operator may take command of this station by engaging the activation switch on the back up control head.
- (8) Propulsion Engine Panels. Propulsion engine panels consist of two engine control panels (one for each engine) and two engine gauge panels (one for each engine). Each of these is discussed in the paragraphs that follow.
- (a) Engine Control Panels. Each engine, port and starboard is provided with an engine control panel mounted forward of the engine. Figure 1-29 depicts the engine control panel. The engine control panels include the following:
- 1 Lube Oil Temperature (Item 1)
 - 2 Tachometer (Item 2)
 - 3 Jacket Water Temperature (Item 3)
 - 4 Lube Oil Pressure (Item 4)
 - 5 Crankcase Pressure Alarm (Item 5)
 - 6 Crankcase Pressure Shutdown (Item 6)
 - 7 Reduction Gear Drive Oil Pressure (Item 7)
 - 8 Maintained Stop Button (Item 8)
 - 9 Start Button (Item 9)
 - 10 Alarm Reset Button (Item 10)
 - 11 Shutdown/Shutdown Override Switch (Item 11)
 - 12 Power "OFF" – "ON" Toggle Switch (Item 12)

- 13 Timer Gauge (Includes "Start Run Timer", "Not Locked Out By Timer", and "Locked Out By Timer") (Item 13)
 - 14 Low Lube Oil Pressure Alarm (Item 14)
 - 15 High Engine Crankcase Pressure Alarm (Item 15)
 - 16 Spare Alarm (Item 16)
 - 17 Engine Overspeed Alarm (Item 17)
 - 18 Jacket Water Temperature Alarm (Item 18)
 - 19 Low Coolant Level Alarm (Item 19)
 - 20 Low Lube Oil Pressure Shutdown (Item 20)
 - 21 High Engine Crankcase Pressure Shutdown (Item 21)
 - 22 Spare Shutdown (Item 22)
 - 23 Engine Overspeed Shutdown (Item 23)
 - 24 Jacket Water Temperature Shutdown (Item 24)
 - 25 Lube Oil Temperature Shutdown (Item 25)
- (b) Engine Gauge Panels. An engine gauge panel is provided for each propulsion engine. The panels are located on the PilotHouse console and are located one on the port side and one on the starboard side, corresponding to the appropriate engine. Figure 1-30 depicts the engine gauge panels. The engine gauge panels include the following:
- 1 Gear Oil Pressure Gauge (Item 1)
 - 2 Tachometer (Item 2)
 - 3 Oil Pressure Gauge (Item 3)
 - 4 Water Temperature Gauge (Item 4)
 - 5 Panel Power ON/OFF Toggle Switch (Item 5)
 - 6 Low Coolant Level Indicator Light (Item 6)
 - 7 Panel Dimmer Switch (Item 7)
 - 8 Lube Oil Temperature Gauge (Item 8)

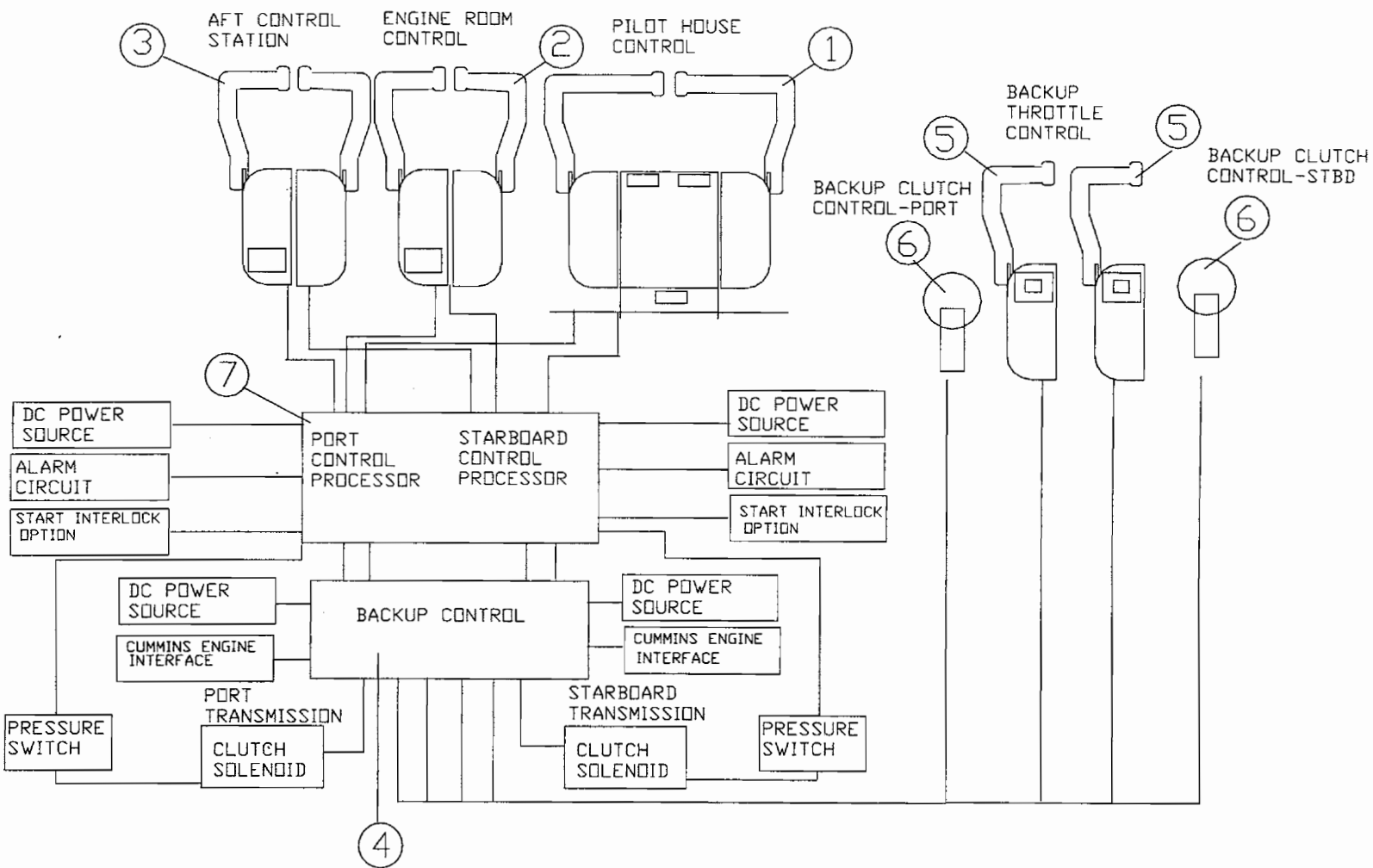


Figure 1-28. Engine Control System Overview, Sheet 1 of 4.

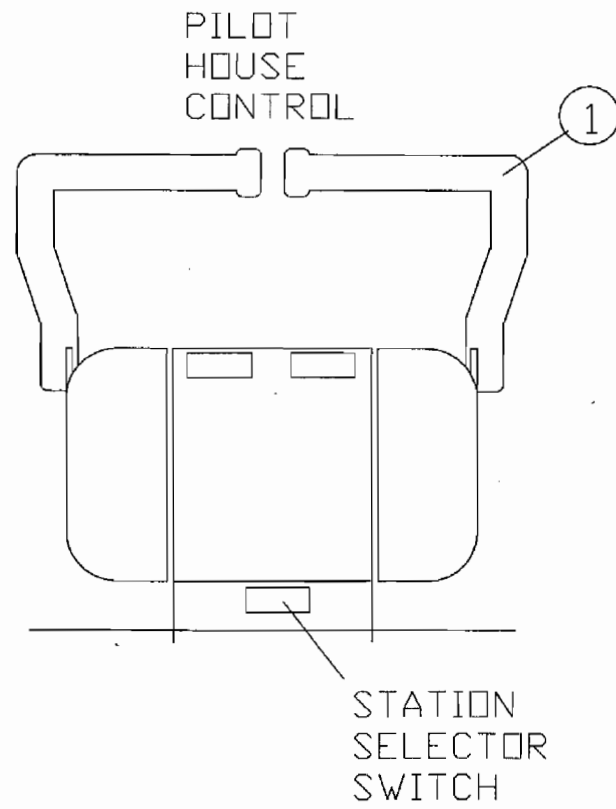
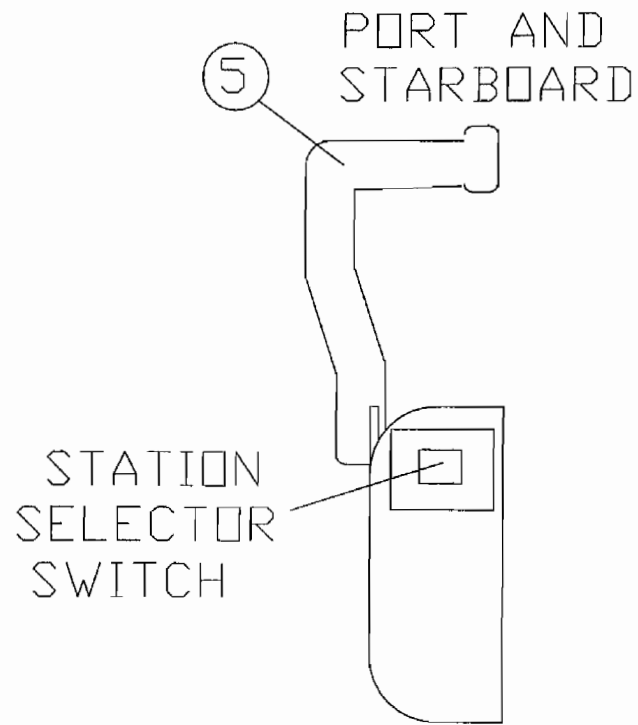
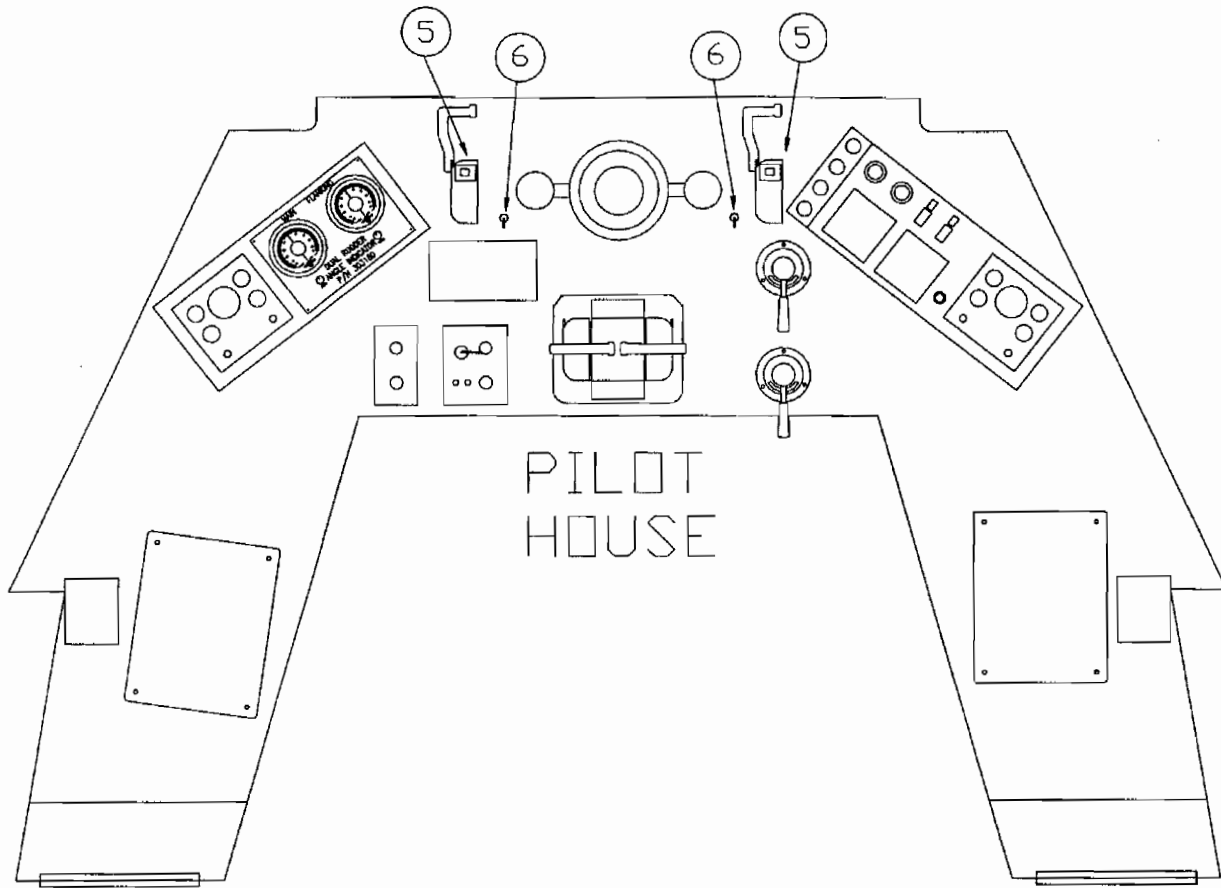
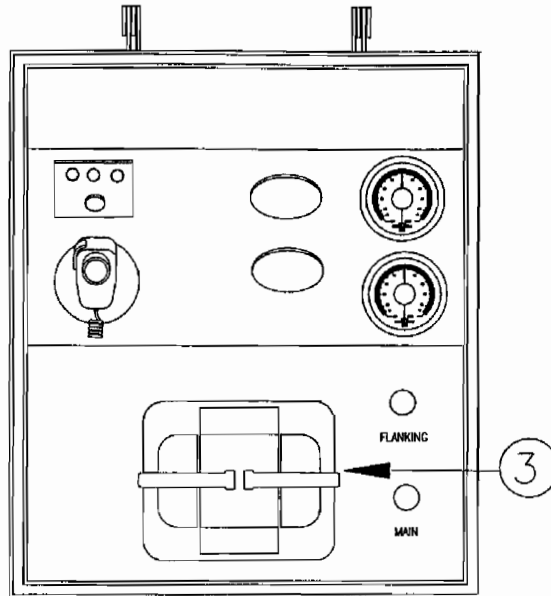


Figure 1-28. Engine Control System (Control Heads), Sheet 2 of 4.



**Figure 1-28. Engine Control System (Pilot House Console Control Station),
Sheet 3 of 4.**



AFT CONTROL STATION

ENGINE ROOM CONTROL

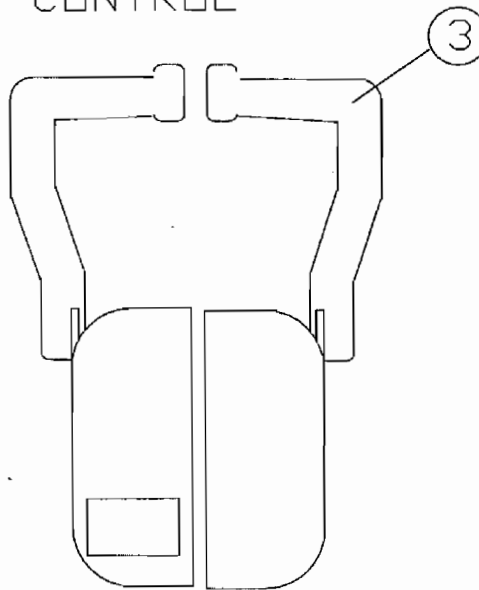


Figure 1-28. Engine Control System, Sheet 4 of 4.

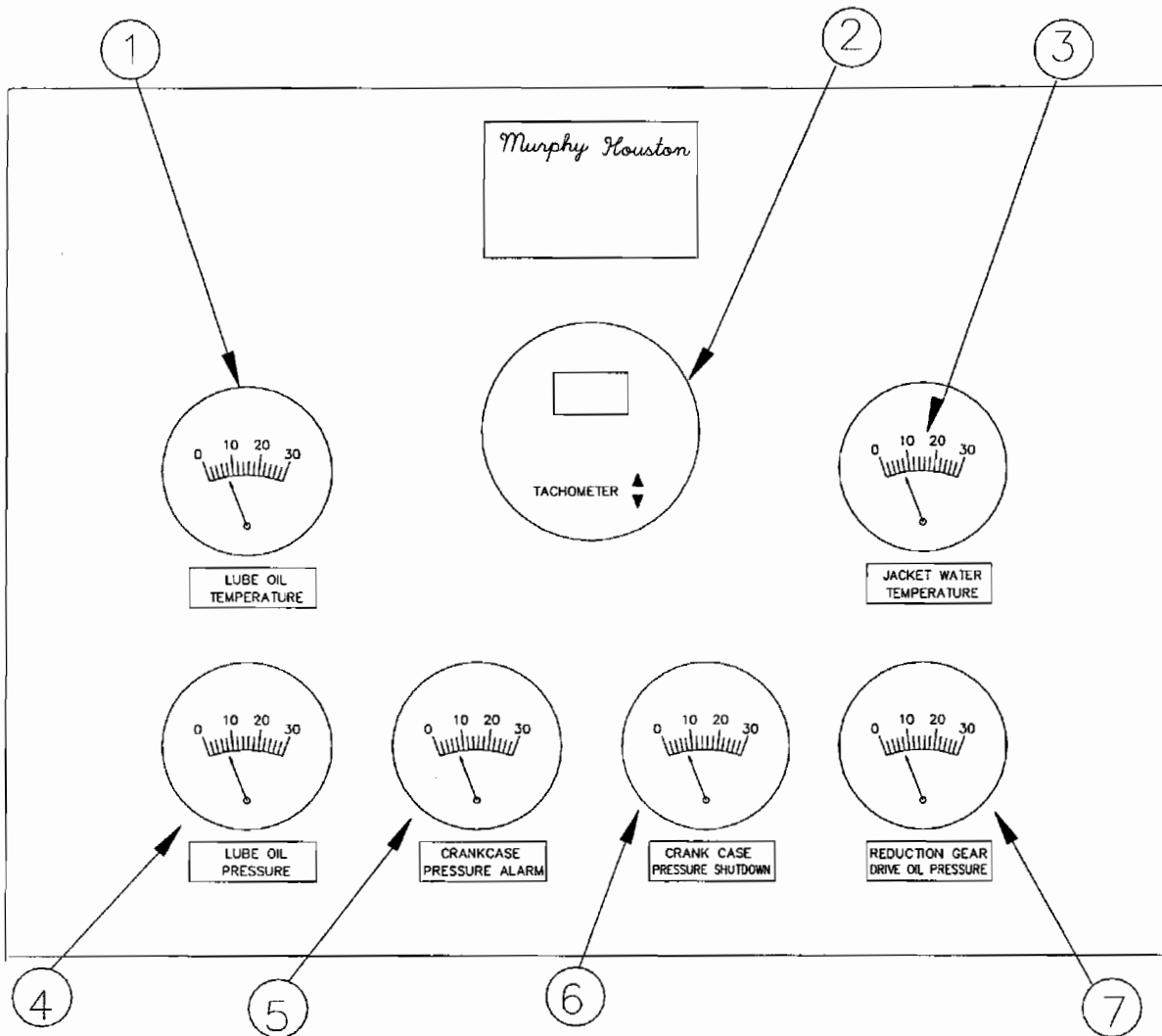


Figure 1-29. Main Engine Control Panel, Sheet 1 of 2.

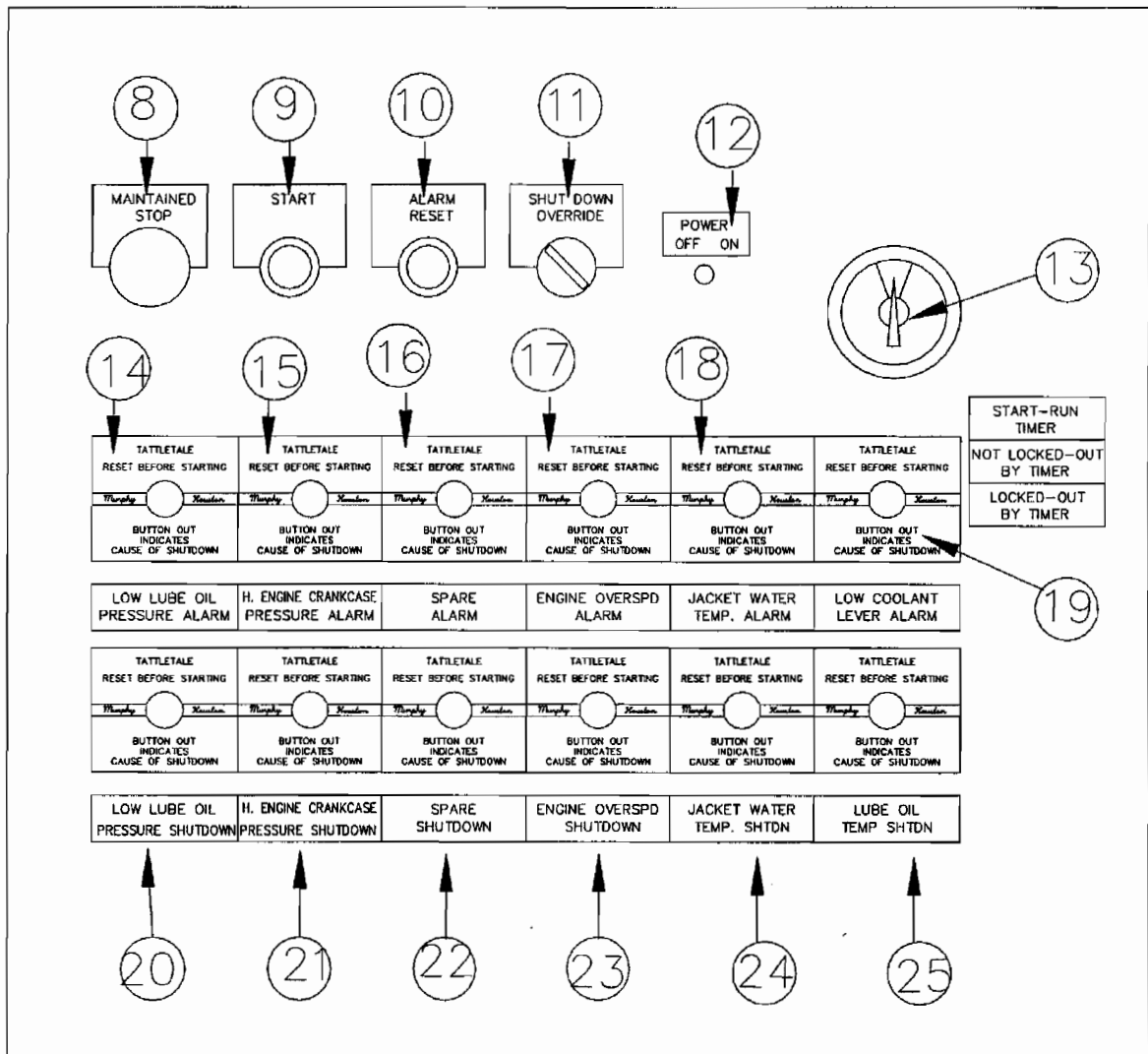


Figure 1-29. Main Engine Control Panel, Sheet 2 of 2.

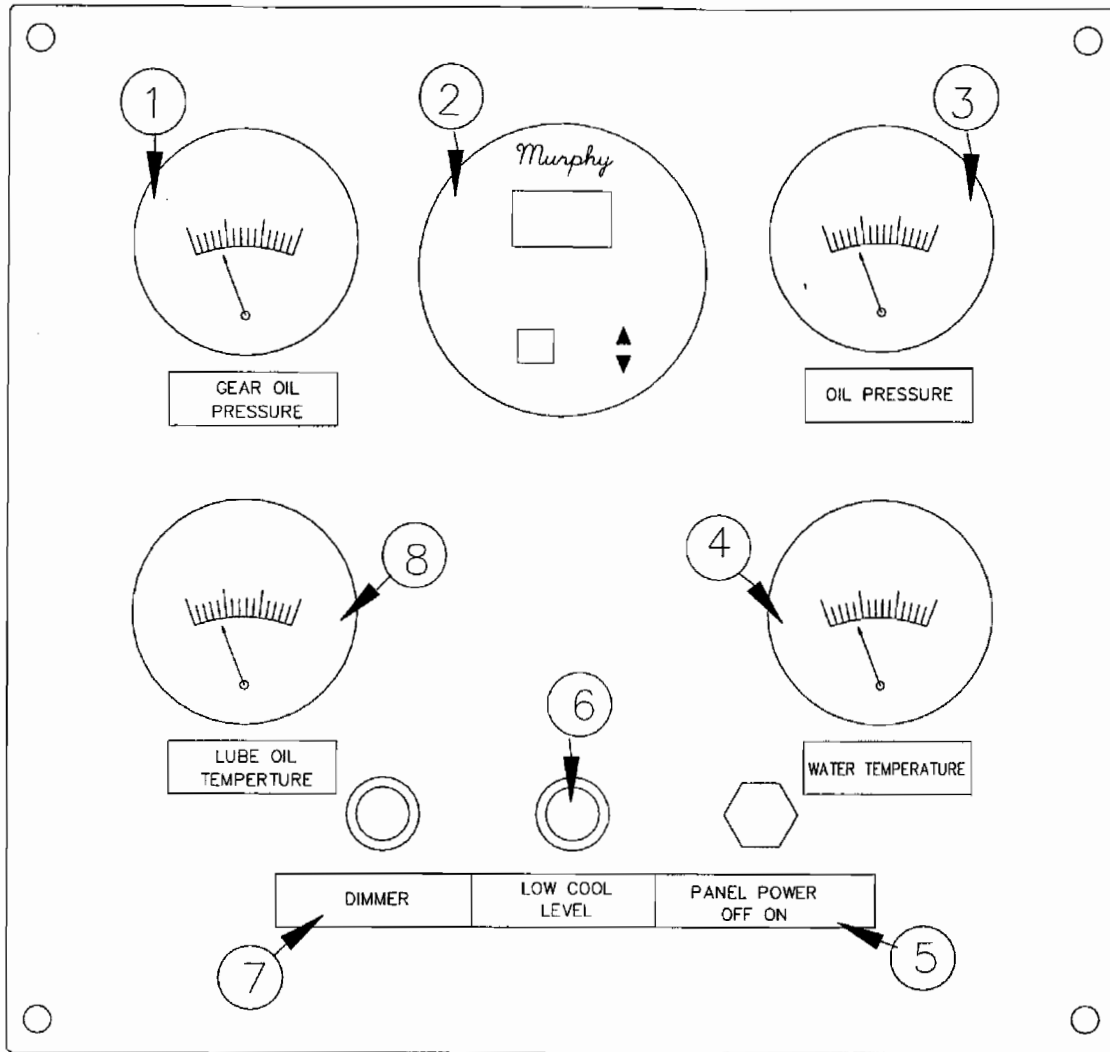


Figure 1-30. Main Engine Gauge Panel

- b. Reverse Reduction Gears. Each propulsion system is equipped with a Twin Disc Model MG 5202DC reverse reduction gear (5.04:1 ratio). The reduction gear for the port engine is left-hand rotating and the reduction gear for the starboard engine is right-hand rotating. Reduction gears are lubricated by low-pressure oil within a closed lubricating system. Key features of the unit are provided in the paragraphs below:
- (1) Input power to the transmission is through a torsional coupling mounted on the engine flywheel. The coupling is splined to the forward end of the primary (forward clutch) shaft causing the primary shaft to rotate in engine direction. Power is transmitted to the secondary (reverse clutch) shaft through transfer gear teeth on the outside diameter of the primary clutch housing causing the secondary shaft to rotate in the reverse direction as the engine (anti-engine direction). The primary and secondary pinions on their respective shafts are in constant mesh with the output gear, which is connected to the output shaft through a keyless tapered joint.
 - (2) Application of the primary clutch locks the primary pinion to the primary shaft causing the pinion to turn in shaft direction and causing the output to rotate in anti-engine direction.
 - (3) Application of the secondary clutch locks the secondary pinion to the secondary shaft, causing the pinion to turn in shaft direction and causing the output shaft to rotate in engine direction.
 - (4) Primary and secondary clutch shafts and pinions are supported and located by a combination of straight and tapered roller bearings.
 - (5) An oil pump provides lubrication to the internal components of the reduction gear and is driven by the secondary clutch shaft. Lubrication is provided via a lubrication tube located inside the main housing. The tube extends from the front to the rear of the inside of the housing. The lubrication tube has drilled holes in the tube that spray oil on the transfer gears and the primary and secondary shafts are lubricated through drillings in the shafts. Output shaft bearings are gravity and splash lubricated. A suction strainer is located below the oil pump and an oil filter is located atop the reduction gear.
- c. Propeller, Shafting and Nozzle. The ST's propellers are driven by the main diesel engines via shafting and reverse reduction gearing. The portside propeller turns in a counterclockwise (CCW) direction (forward direction). The starboard side propeller turns in a clockwise (CW) direction (forward direction). Propellers are housed in kort nozzles (3) (Type 37, 59-inch [1.4986 Meters] diameter) to increase bollard pull by controlling thrust direction. Other components of this system include stainless steel keys (1), propulsion shafts (2) (5 inch Aquamet), propellers (4) (4 blade 58-1/2" X 59 pitch), heavy hex nuts (5) (3-3/4", 4 threads per inch) and shaft couplings (6). See Figure 1-31.

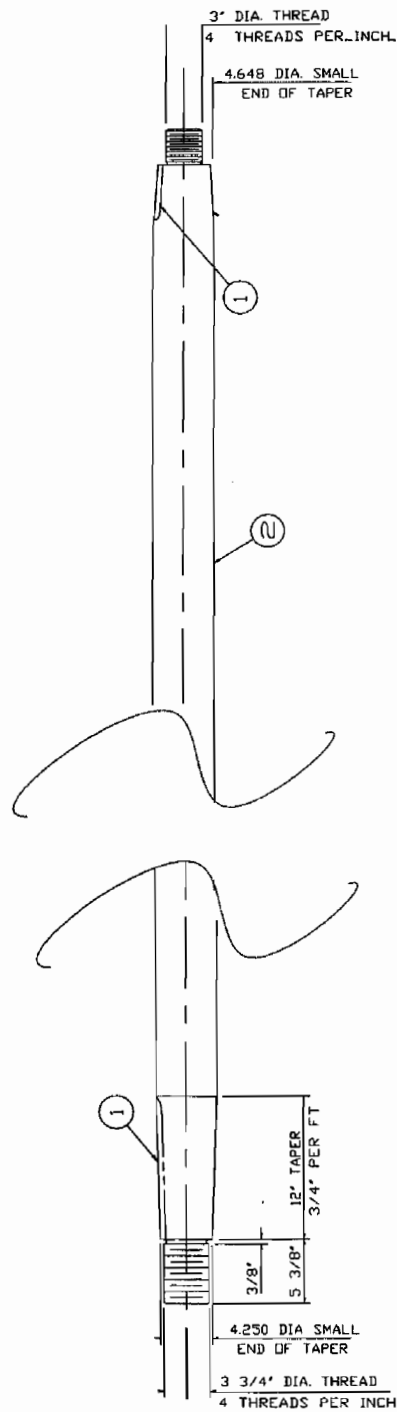
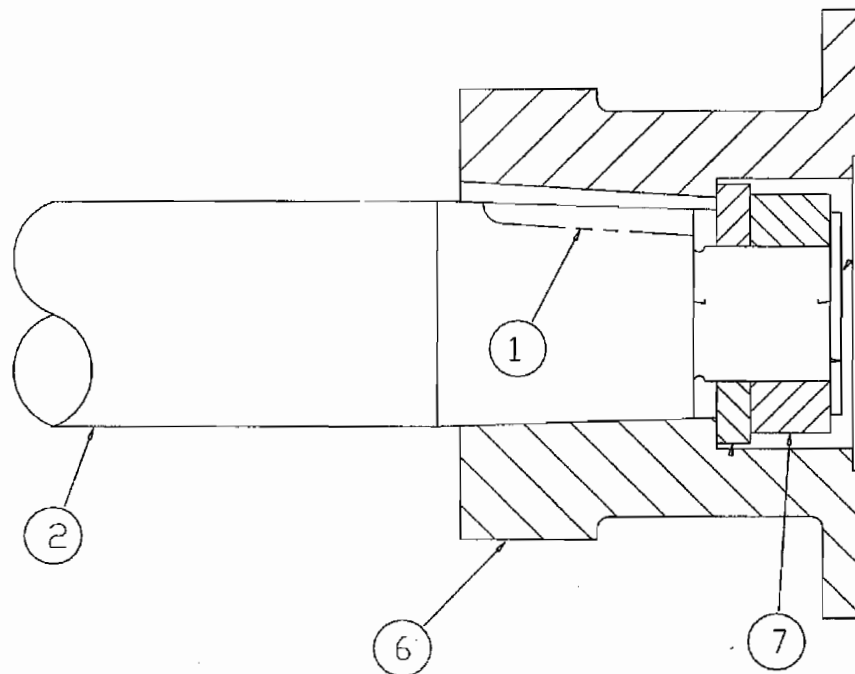
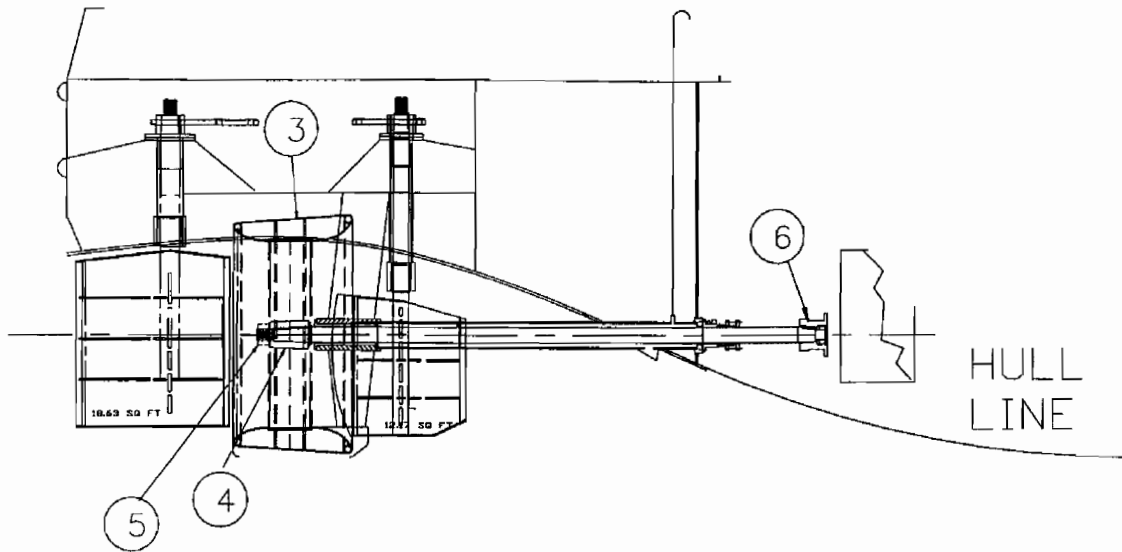
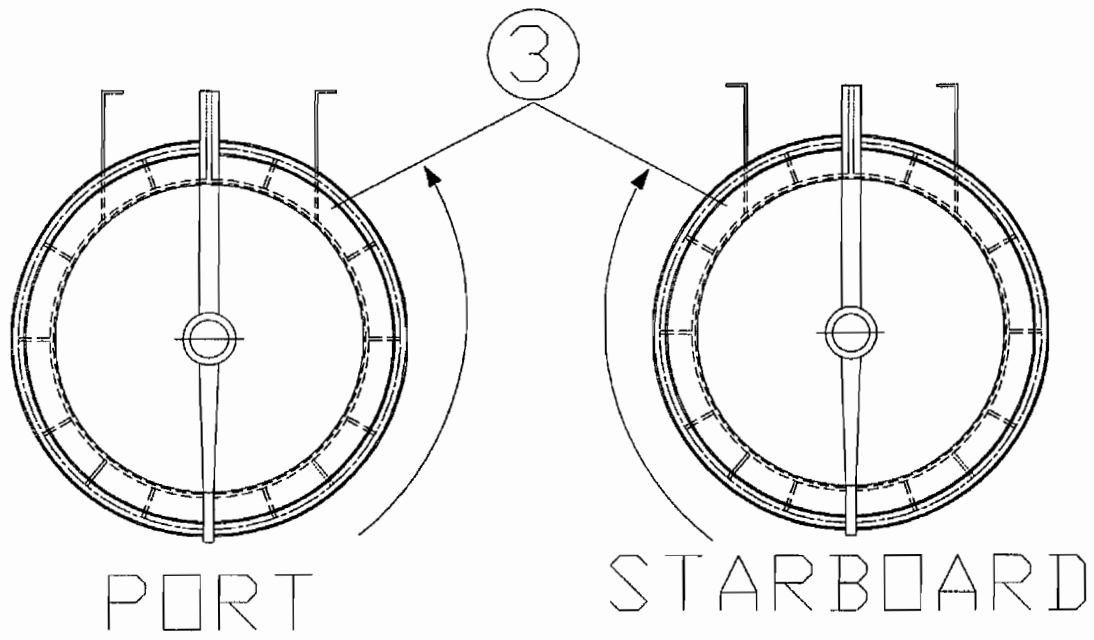


Figure 1-31. Propulsion Shafting Arrangement, Sheet 1 of 3.



Shaft Coupling

Figure 1-31. Propulsion Shafting Arrangement, Sheet 2 of 3.



Kort Nozzle Looking Forward

Figure 1-31. Propulsion Shafting Arrangement, Sheet 3 of 3.

1.16.2. Electrical Plant. The ST's electric plant consists of the Power Generation System, the Shore Power System, and the Power Distribution System. Figure 1-32 provides a diagram of the electrical plant.

- a. Power Generation System. The following sub-paragraphs describe the various components and capabilities of the ST's power generation system:
- (1) Generator Set. Two 55 kW brushless exciter generators provide 450 Volt AC, three-phase, 60 Hz primary vessel service power. Each generator is capable of providing 110 percent of the necessary at sea load. The generators may be operated in parallel. However, normal operation has one generator on line and the other in reserve.

Figure 1-33 provides a plan view of the Generator Room.

(a) Diesel Engine for Generator Set. Engine control and monitoring are provided at the individual engine control panel.

- 1 Engine Instrument and Control Panel (Refer to Figure 1-34). The engine mounted control panel contains the controls and indicators necessary for operation of the engine. An Engine Control Module (ECM) displays service hours (1), system battery voltage (3), engine oil pressure (5), and engine coolant temperature (4) in US units and their metric equivalents. The following fault indicators are also on the control panel: overspeed (6), sea water fault (7), high exhaust temperature (8), low oil level (9), low coolant level (10), high engine temperature (11), and low oil pressure (12). The control panel also contains a three-way toggle switch (2) used to start, run, and stop the generator engine.
- 2 Fuel System. The fuel oil service system consists of the day tank, connecting lines, fuel injectors, fuel pump, engine mounted fuel filter and fuel supply and return manifolds. Fuel from the day tank is drawn in by the fuel pump to the engine mounted filters. Fuel passes through the filter elements to the fuel manifold in the injector pump housing. The injector pump pushes fuel at very high pressure to the injector. A small amount of fuel is pumped in the cylinder, at very high pressure, through the needle valve and spray tip on the injector. The quantity of the fuel injected depends upon the position of the plunger that is controlled by the injector rack and governor. Excess fuel flows through the fuel return manifold and back to the day tank.
- 3 Air Intake System. Air entering the engine is thoroughly cleaned by passing through the air intake filter to protect the engine from abrasive materials and to protect the lubricating oil from contaminants. When the engine is running, each time a piston moves through the intake stroke, it pulls air into the cylinder. The airflow passes through the air filter, inlet manifold, passages in the cylinder head and past the open intake valve into the cylinder.
- 4 Electric Starting System. The 24VDC starter motor is used to turn the engine flywheel fast enough to start the engine. The starter motor has a solenoid and when the start switch is activated, the solenoid moves the starter pinion to engage it with the ring gear on the flywheel of the engine. The starter pinion engages with the ring gear before the electric contacts in the solenoid close the circuit between the battery and the starter motor. The pinion turns the engine flywheel and a clutch gives protection for the starter motor so that the engine cannot turn the starter motor too fast. When the start switch is released, the start pinion moves away from the ring gear.
- 5 Lubricating Oil System. The lubricating oil system for the generator diesels is a wet-sump, forced-feed system. A lube oil pump within the engine draws oil from the oil pan. The oil flows to the engine oil filters and then to the individual lubrication points within the engine.
- 6 Cooling System. Figure 1-35 provides a plan view of the generator engine cooling system. The generator engines (1) are coupled to the fresh water grid coolers (2). The grid coolers are recessed into the vessel's hull. Fresh water from the engines is pumped

through the grid exchanger by the engine fresh water pump. It is cooled by the surrounding seawater, and re-circulated through the engine.

- 7 Engine Exhaust System. Figure 1-36 provides a plan view of the generator engine exhaust system. Exhaust gases from the diesel generator engines are piped upwards to silencers (1) located in the exhaust stack on the rear of the 01 Deck and finally released into the atmosphere. The engine exhaust silencers also have condensate drain lines (2) located in the stack.
- b. Shore Power System. Figure 1-37 provides a plan view of the shore power system. In port, the ST is capable of receiving shore power (450 VAC) through a shore power cable terminating at connection shore power box located on the Main Deck on the aft bulkhead. If available shore power is 450 Volts AC, the power is selected at the main switchboard through a circuit breaker and stepped down to 240 VAC by three shore power transformers, prior to main switch board entry. Shore power of 240 VAC is selected at the main switchboard by circuit breaker, and bypasses the 450 VAC transformers. A mechanical interlock is available on the main switchboard to prevent paralleling between the shore power and the generator. The two connection shore power box provides a cable connection (1) for shore power and another cable connection (2) for providing shore power to another vessel in tandem.
 - c. DC System. Figure 1-38 provides plan views of the DC System. A 12/24-volt DC system is provided for powering the electronic control system and miscellaneous DC services as well as for starting the generators and diesel engines. This system consists of two separate subsystems, one operating from the generator set battery banks and the other operating from the diesel engine battery banks.

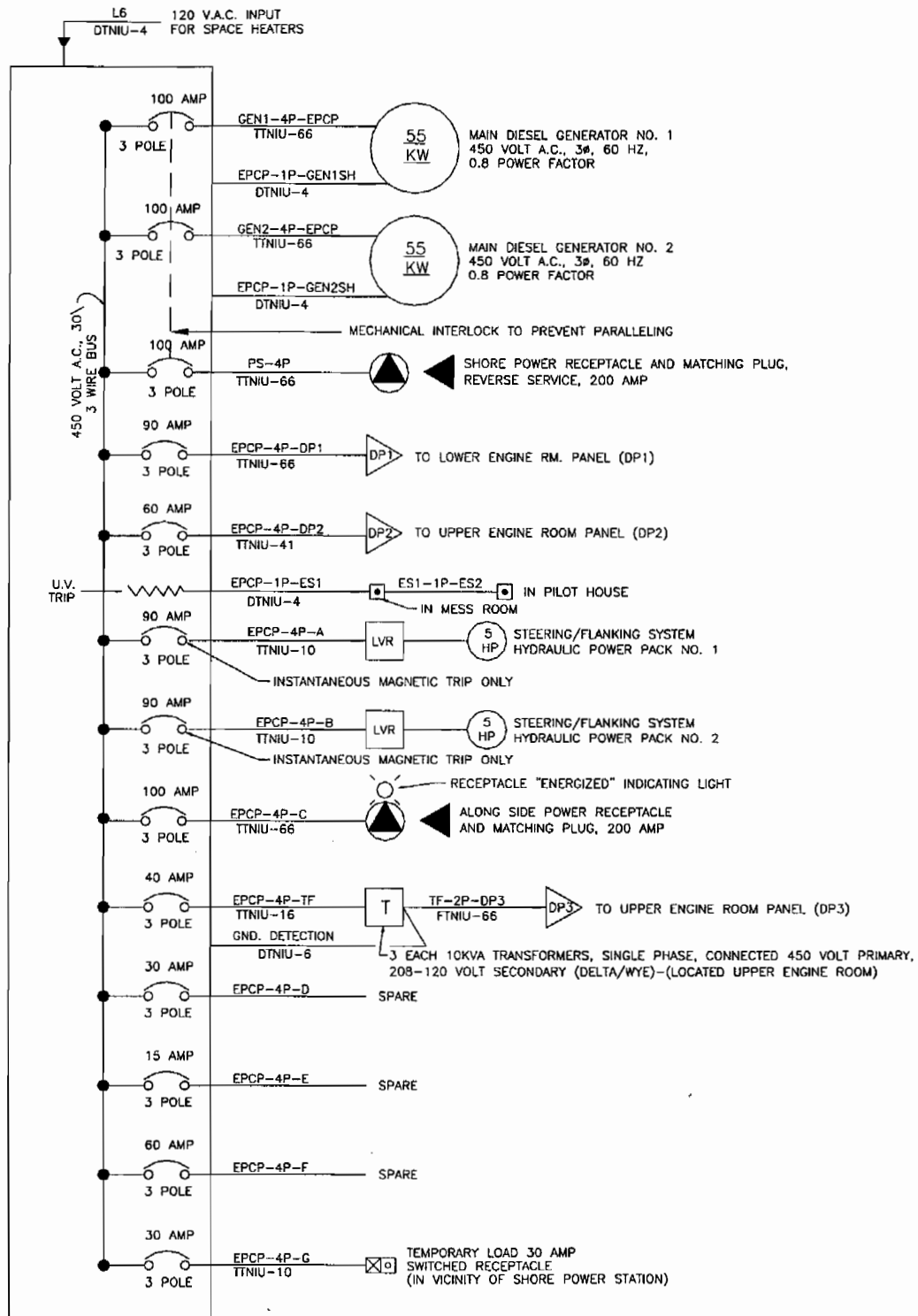


Figure 1-32. Electric Plant, Sheet 1 of 2

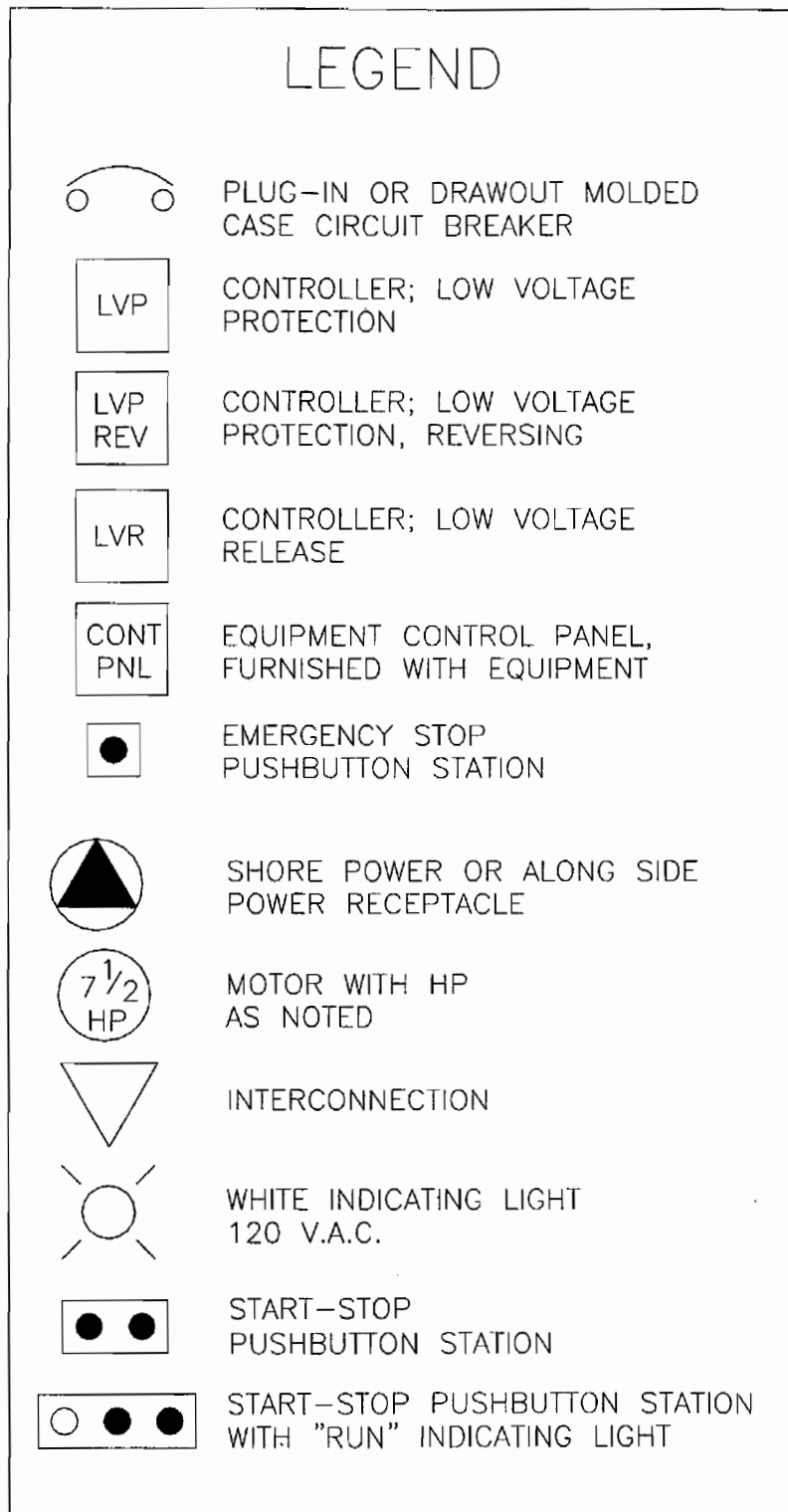


Figure 1-32. Electric Plant, Sheet 2 of 2

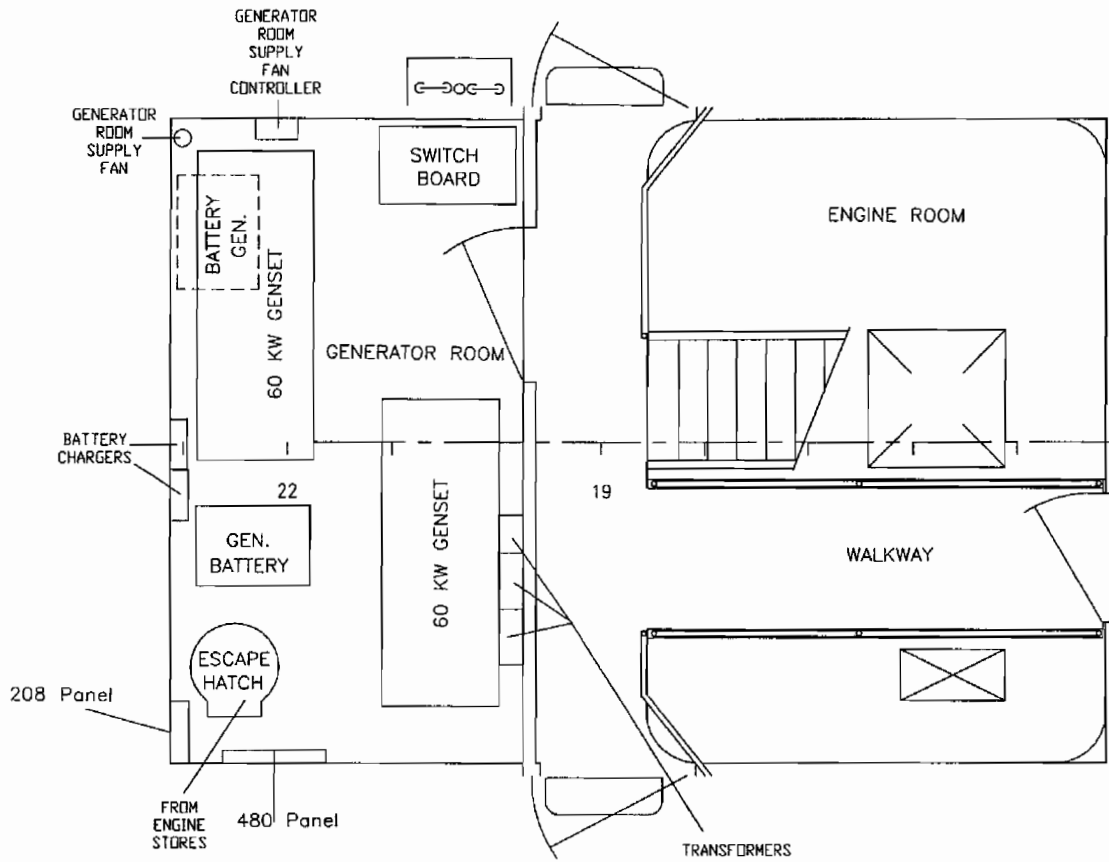


Figure 1-33. Generator Room

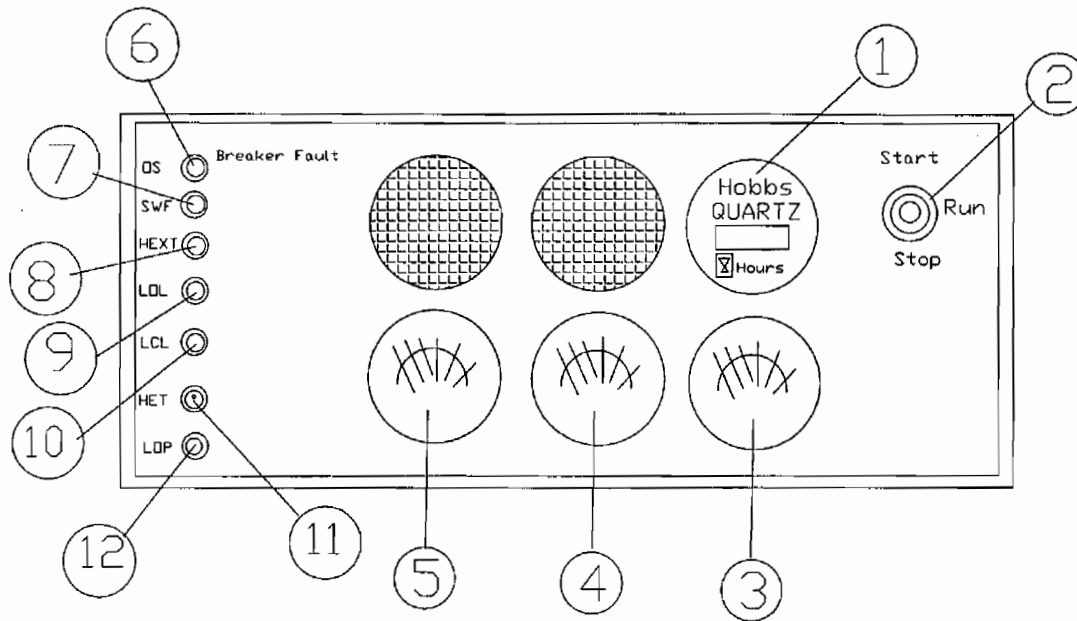


Figure 1-34. Generator Engine Instrument and Control Panel

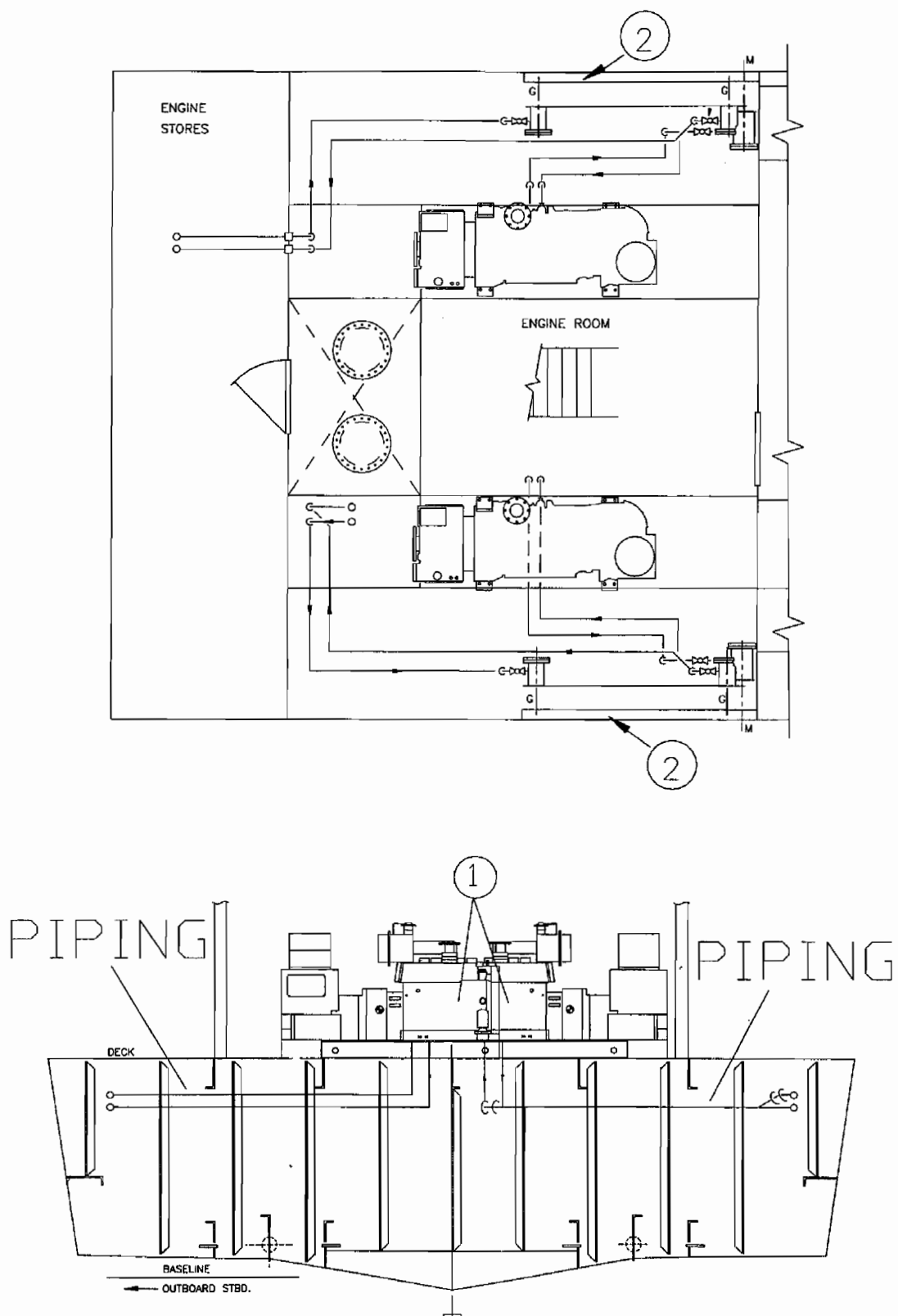


Figure 1-35. Generator Engine Cooling System

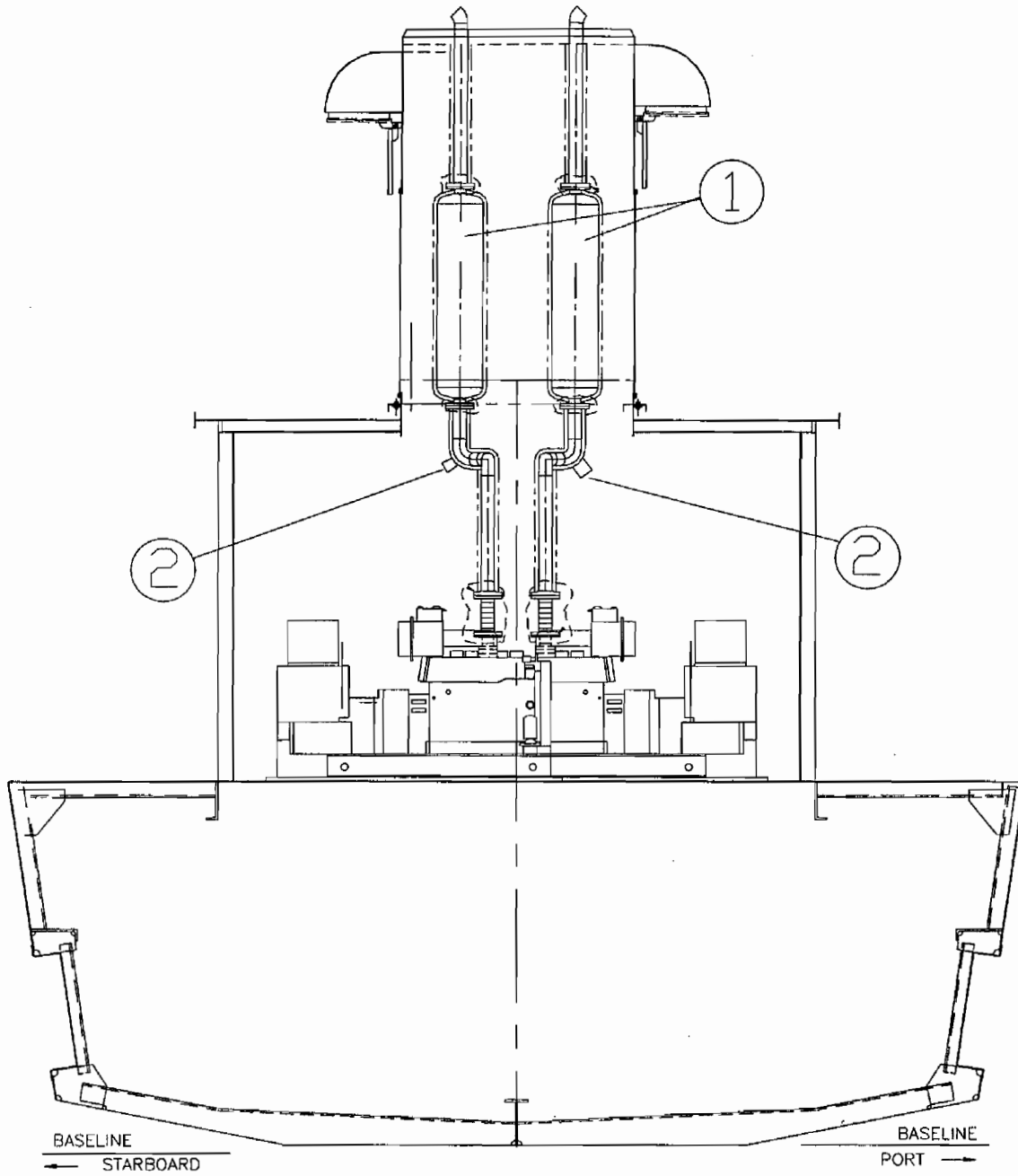


Figure 1-36. Generator Engine Exhaust System

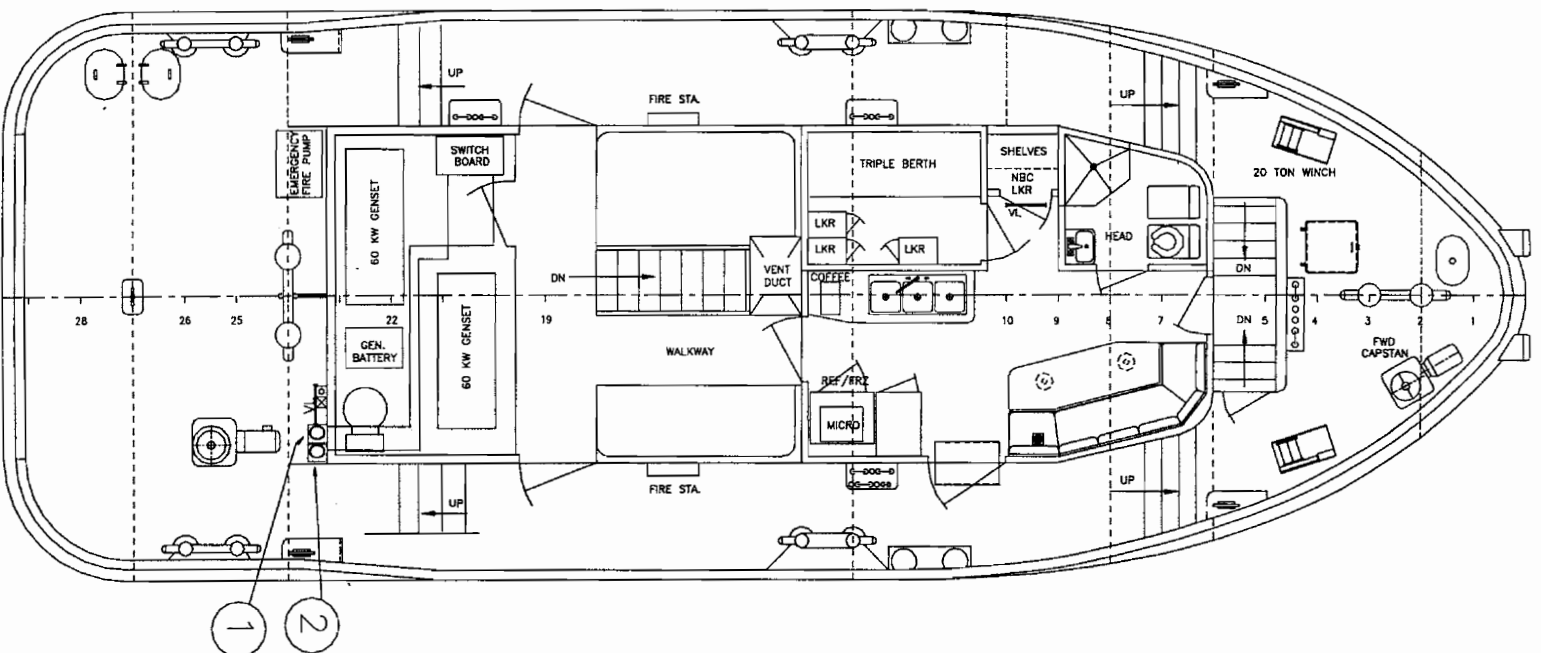
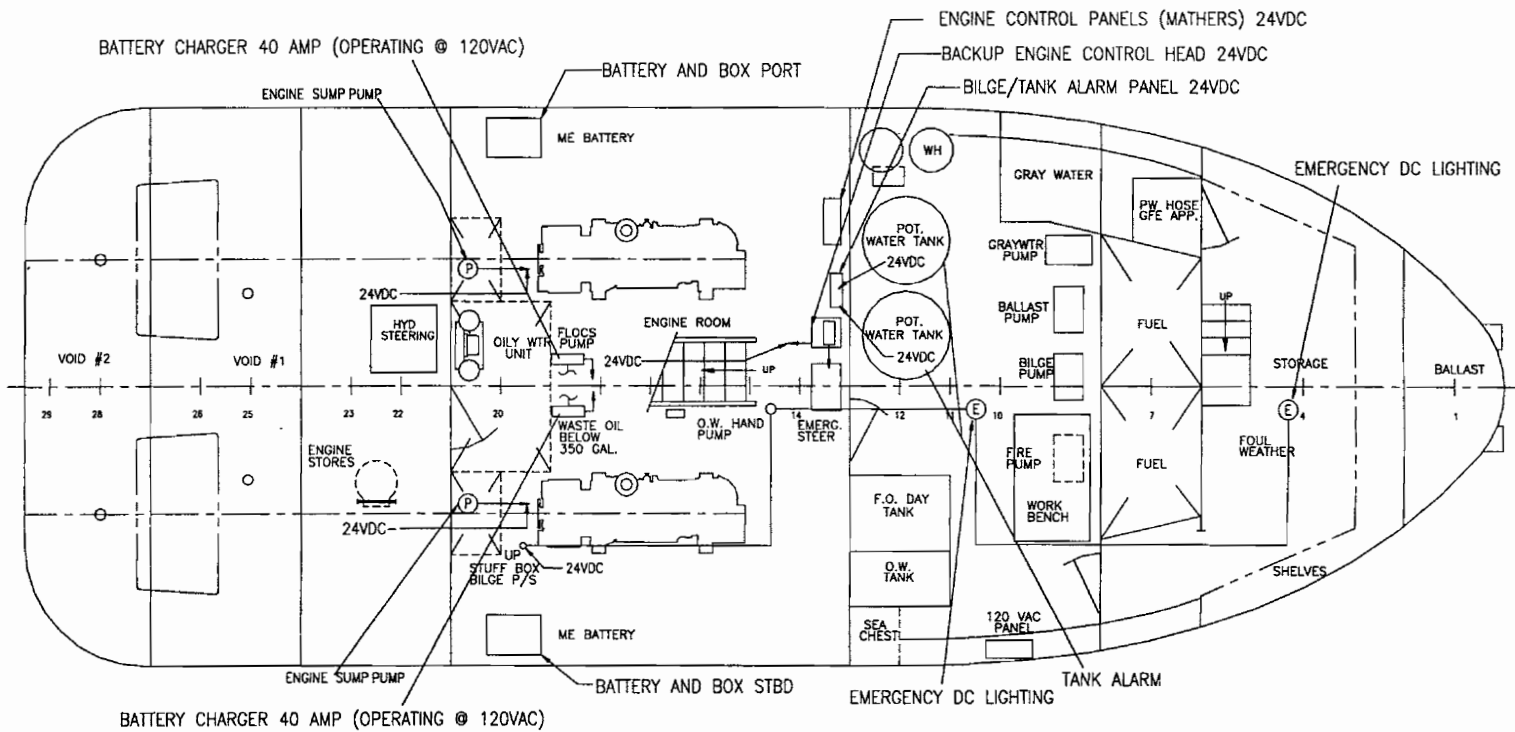
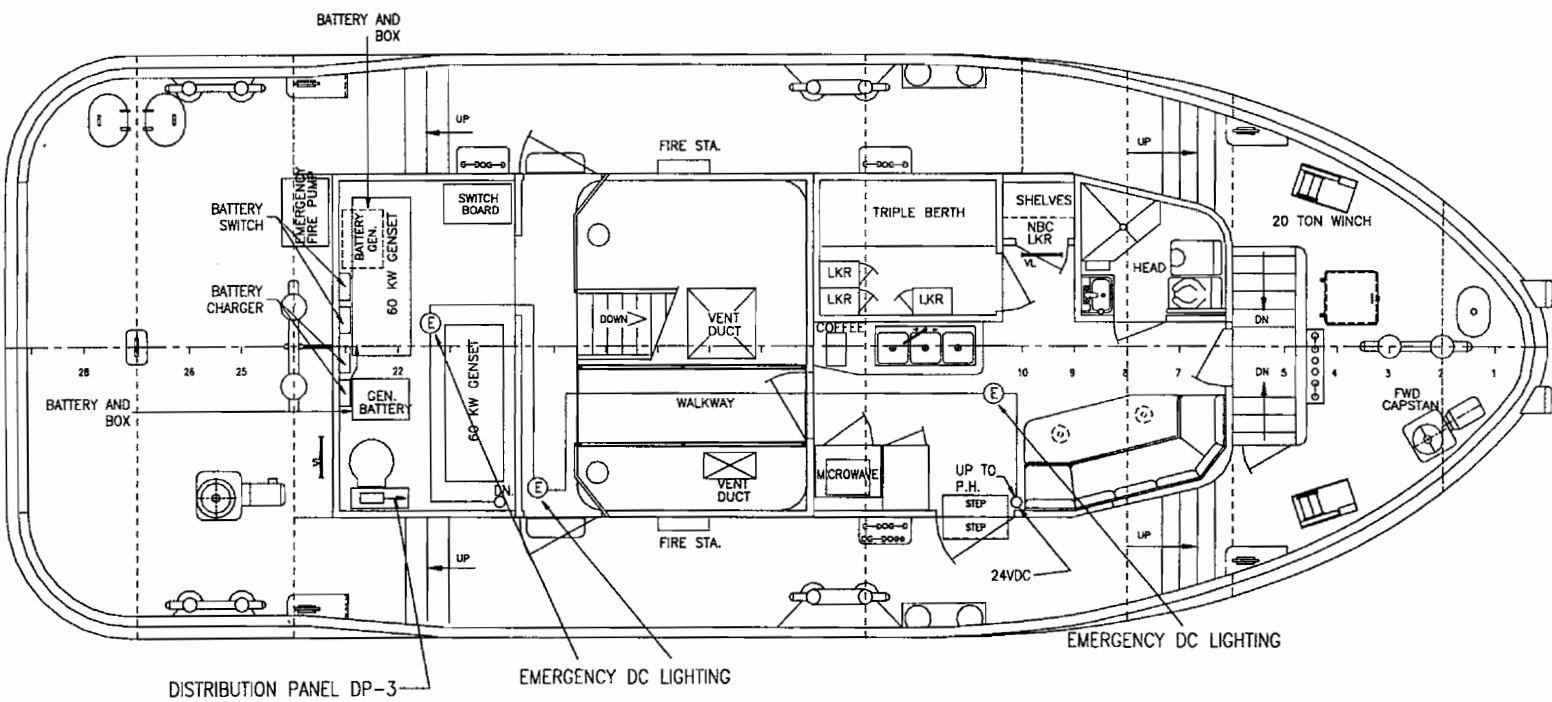


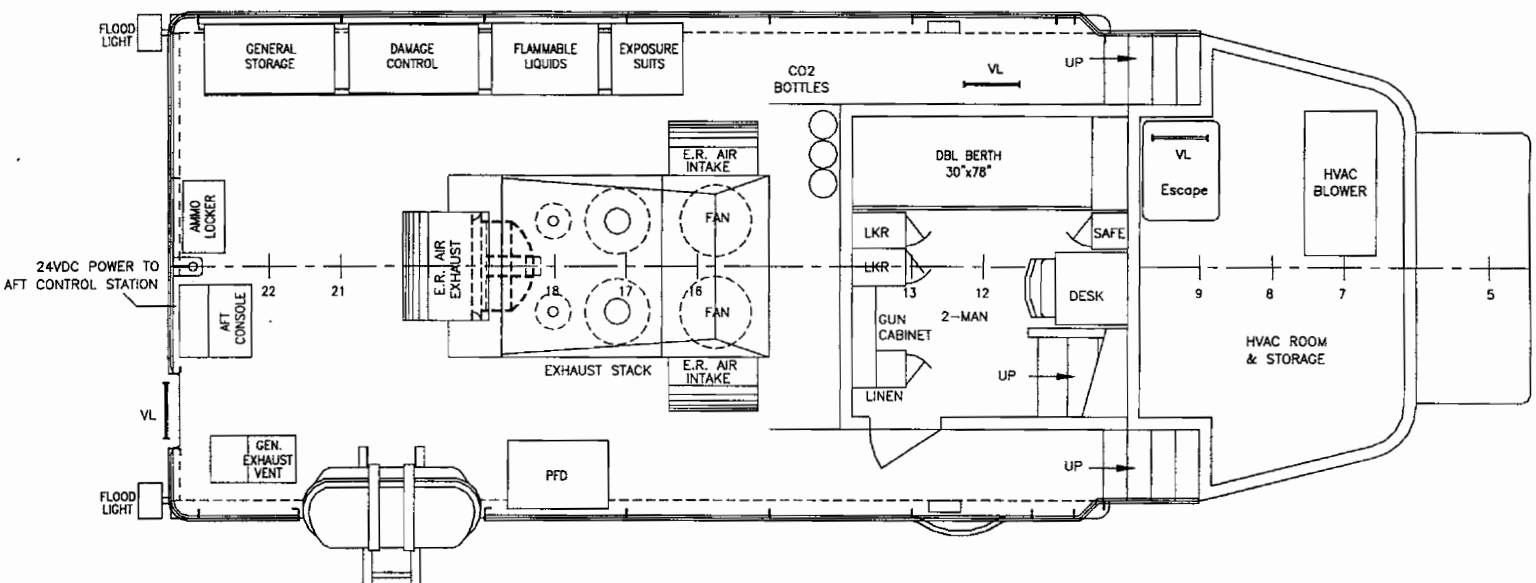
Figure 1-37. Shore Power System



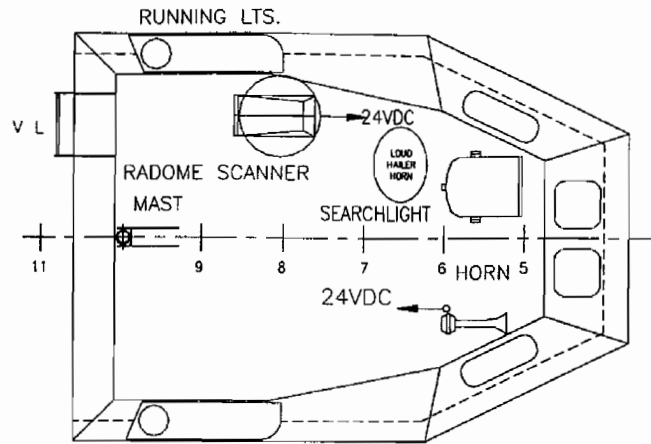
Hold Deck
Figure 1-38. DC System, Sheet 1 of 4.



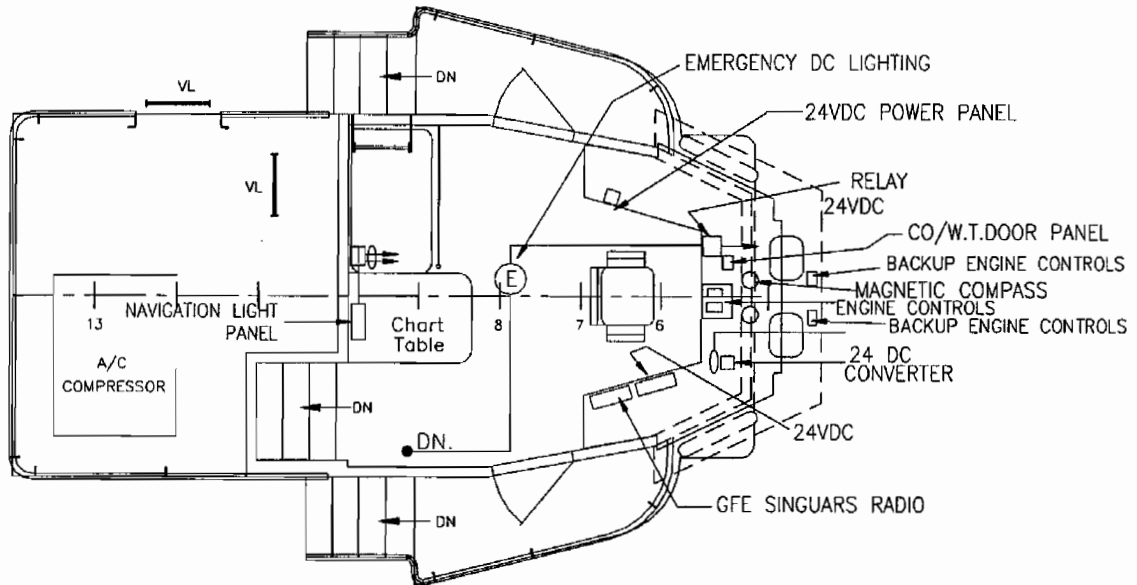
Main Deck
 Figure 1-38. DC System, Sheet 2 of 4.



01 Deck
Figure 1-38. DC System, Sheet 3 of 4.



PILOT HOUSE OVERHEAD



PILOT HOUSE DECK

Pilot House Overhead and Pilot House Deck

Figure 1-38. DC System, Sheet 4 of 4.

- (1) Generator Battery Banks. The generator alternator and self-regulating battery chargers provide for charging each of the generator battery banks. Two selector switches allow for selecting power from either the port generator or starboard generator battery. This system consists of two separate battery banks, each of which consists of two 12-volt batteries (Series 4000, Size 8D, lead acid type) connected in series.

The DC system is powered by the generator battery banks and provides power to the following components through the DC distribution panel located port side in the Pilot House:

- (a) Starboard Sump Pump
- (b) Port Sump Pump
- (c) Emergency DC Lights
- (d) Navigational Light Panel
- (e) Magtronic Compass
- (f) Singuars Radio (GFE)
- (g) Radar
- (h) VHF #1
- (i) VHF #2
- (j) Carbon Monoxide Panel
- (k) Compass
- (l) Horn
- (m) Bilge and Tank Alarm Panel
- (n) Mathers Starboard
- (o) Mathers Port

- (2) Diesel Engine Battery Banks. Diesel engine starting is accomplished via a 24VDC system. This system consists of two separate battery banks, each of which consists of two 12-volt batteries (Series 4000, Size 8D, lead acid type) connected in series. Two self-regulating battery chargers are provided for charging the diesel engine battery banks.

- d. Power Distribution System. The power distribution system consists of the generator control and distribution switchboard, transformers, power distribution panels (six), motor controllers (for hydraulic steering/flanking system), and related wiring. Primary power (450 VAC, 3-phase, 3-wire, 60 Hz) is received from the power generation system (or the shore power receptacle) and routed via the generator control and distribution switchboard to distribution panels and selected equipment. Secondary power (208V/120V, 3-phase, 4-wire, 60 Hz) is supplied by the main system or shore power through a step-down service transformer.

- (1) Generator Control and Distribution Switchboard. The generator control and distribution switchboard, located port outboard in the generator room, provides generator selection, shore power selection, and power distribution for vessel service 450 Volt AC primary and 208-120 VAC (Secondary) power. Distribution of 120 VAC is accomplished through three-vessel service 120 Volt AC transformers located in the generator room. Power selection is provided by closing circuit breakers on the switchboard. Power monitoring is provided by ammeters, voltmeters, frequency meters, and a synchronization meter. Controls are provided for manual and automatic generator

voltage regulation and generator engine speed regulation. An interlock system is incorporated into the switchboard to prevent shore power from being applied to the switchboard while generator power is applied (prevents paralleling of shore power with either generator). Figure 1-39 provides a plan view of the Power Distribution System. See also Controls and Indicators section, Figure 2-32.

The generator control and distribution switchboard provides for the following:

- (a) Input from Main Diesel Generator #1
- (b) Input from Main Diesel Generator #2
- (c) Input from along side power receptacle (200 amp)
- (d) Input from shore power receptacle (200 amp)
- (e) Output to DP1 Distribution Panel – Lower Engine Room
- (f) Output to DP2 Distribution Panel – Upper Engine Room
- (g) Inputs from emergency STOP pushbutton stations (Mess room; Pilothouse)
- (h) Output to Steering Flanking System Hydraulic Power Pack #1 motor controller
- (i) Output to Steering Flanking System Hydraulic Power Pack #2 motor controller
- (j) Output to DP3 Distribution Panel – Upper Engine Room (via three 10KVA transformers – single phase, 450V primary/208-120V secondary)
- (k) Three spare circuits are provided
- (l) Output to Temporary Load Switched Receptacle (30 amp)

(2) Distribution Panels. Power from the vessel service switchboard is distributed to systems/equipment via the following six panels:

- (a) DP1 – Lower Engine Room Panel. The DP1 panel specifications include: 480 VAC, 3 phase, 3 wire, 36 poles, 100 amp main lugs only, drip-proof, surface mounted, and 50° centigrade breakers. Figure 1-40 provides details for Panel DP-1.

The DP1 panel provides power to:

- 1 Fire Pump. Power is provided to the 20-hp fire pump through a low voltage protection controller. A START/STOP pushbutton station with RUN indicator light is provided in the PilotHouse. [(4P-A) 30 amp, 3 pole]
- 2 Bilge/Ballast Pump #2. Power is provided to the 1.5-hp pump through a low voltage protection controller. [(4P-C) 15 amp, 3 pole]
- 3 Forward Capstan. Power is provided to the 3-hp capstan through a low voltage protection controller located in the forward storage. A START/STOP pushbutton station is provided locally at the capstan. [(4P-E) 15 amp, 3 pole]
- 4 Aft Capstan. Power is provided to the 10-hp capstan through a low voltage protection controller located in the engine stores compartment. A START/STOP pushbutton station is provided locally at the capstan. [(4P-G) 30 amp, 3 pole]
- 5 Gray Water Pump. Power is provided to the 1-hp pump through a low voltage protection controller. [(4P-J) 15 amp, 3 pole]

- 6 Bilge/Ballast Pump #1. Power is provided to the 1.5-hp pump through a low voltage protection controller. [(4P-B) 15 amp, 3 pole]
 - 7 Port Towing Winch. Power is provided to the 7.5-hp winch through a low voltage protection controller located in the forward storage. A START/STOP pushbutton station is provided locally at the winch. [(4P-D) 20 amp, 3 pole]
 - 8 Starboard Towing Winch. Power is provided to the 7.5-hp winch through a low voltage protection controller located in the forward storage. A START/STOP pushbutton station is provided locally at the winch. [(4P-F) 20 amp, 3 pole]
 - 9 Potable Water Pressure Pump. Power is provided to the 1.5-hp pump through a low voltage release controller. A pressure switch is provided for automatically actuating the pump to control the pressures within the system. [(4P-H) 15 amp, 3 pole]
 - 10 Lower Engine Room Space Heater Panel (DP6). Power is provided to the DP6 panel through 30 amp, 3 pole circuit. [(4P-K)]
 - 11 Spares. Two spare circuits are provided. [(4P-L) 15 amp, 3 pole], [(4P-M) 15 amp, 3 pole]
- (b) DP2 – Upper Engine Room Panel. The DP2 panel specifications include: 480 VAC, 3 phase, 3 wire, 36 poles, 100 amp main lugs only, drip-proof, surface mounted, and 50° centigrade breakers. Figure 1-41 provides details for panel DP2.

The DP2 panel provides power to:

- 1 Engine Room Supply Fan #1. Power is provided to the 3-hp supply fan through a low voltage protection controller. [(4P-A) 15 amp, 3 pole]
 - 2 Engine Room Exhaust Fan. Power is provided to the 2-hp exhaust fan through a low voltage protection controller. [(4P-C) 15 amp, 3 pole]
 - 3 Engine Room Supply Fan #2. Power is provided to the 3-hp supply fan through a low voltage protection controller. [(4P-B) 14 amp, 3 pole]
 - 4 Fuel Oil Transfer Pump. Power is provided to the 3-hp pump through a low voltage protection controller. [(4P-D) 15 amp, 3 pole]
 - 5 Generator Room Vent Fan. Power is provided to the 3-hp vent fan through a low voltage protection controller. [(4P-F) 15 amp, 3 pole]
 - 6 Air Conditioning Condenser Unit. Power is provided to the condenser unit through a disconnect switch and through the air handler control panel. The unit is controlled by thermostat. [(4P-H) 30 amp, 3 pole]
 - 7 Air Handler Control Panel. Power is provided to the air handler control panel through a 15 amp, 3 pole circuit. [(4P-K) 15 amp, 3 pole]
 - 8 Duct Heater. Power is provided to the duct heater through a 20 amp, 3 pole circuit and through the air handler control panel. The unit is controlled by thermostat. [(4P-M)]
 - 9 Spares. Four spare circuits are provided. [(4P-G) 15 amp, 3 pole], [(4P-J) 15 amp, 3 pole], [(4P-L) 15 amp, 3 pole], [(4P-E) 15 amp, 3 pole]
- (c) DP3 – Upper Engine Room Panel. The DP3 panel specifications include: 208/120 VAC, 3 phase, 4 wire, with separate ground bus, 42 poles, 100 amp main lugs only, 50° centigrade breakers, drip-proof, and surface mounted. Figure 1-42 provides details for panel DP3.

The DP3 panel receives power from the transformers and provides power to:

- 1 DP4 – Lower Engine Room Panel. Power is provided through a 60 amp, 3 pole circuit. [(1P-A)]
- 2 Pilot House Panel. Power is provided through a 60 amp, 3 pole circuit. [(1P-B)]
- 3 Generator Room and Upper Engine Room Receptacles. Power is provided through a 20 amp, 1 pole circuit. [(1P-C)]
- 4 Generator Room and Upper Engine Room Light Circuit #1. Power is provided through a 15 amp, 1 pole circuit. [(1P-D)]
- 5 Coffee Maker. Power is provided through a 20 amp, 1 pole circuit. [(1P-E)]
- 6 Generator Room and Upper Engine Room Light Circuit #2. Power is provided through a 15 amp, 1 pole circuit. [(1P-F)]
- 7 Microwave Oven. Power is provided through a 15 amp, 1 pole circuit. [(1P-G)]
- 8 Generator and Switchboard Space Heaters. Power is provided through a 15 amp, 1 pole circuit. [(1P-H)]
- 9 Refrigerator/Freezer. Power is provided through a 15 amp, 1 pole circuit. [(1P-J)]
- 10 Galley, Messroom, Stateroom, and Head Lights. Power is provided through a 15 amp, 1 pole circuit. [(1P-K)]
- 11 Port Generator Battery Charger. Power is provided through a 20 amp, 1 pole circuit. [(1P-L)]
- 12 Galley and Messroom Receptacles. Power is provided through a 20 amp, 1 pole circuit. [(1P-M)]
- 13 Starboard Battery Charger. Power is provided through a 20 amp, 1 pole circuit. [(1P-N)]
- 14 Stateroom and Head Berth Lights and Receptacles. Power is provided to the space heaters through a 20 amp, 1 pole circuit. [(1P-P)]
- 15 Main Deck Exterior Lights. Power is provided through a 15 amp, 1 pole circuit. [(1P-Q)]
- 16 Forward Compartment Fan. Power is provided through a 15 amp, 1 pole circuit. [(1P-R)]
- 17 Main Deck Exterior Receptacles. Power is provided through a 20 amp, 1 pole circuit. [(1P-S)]
- 18 Electric Toilet Main Deck. Power is supplied to the electric toilet through a 20 amp, 2 pole circuit. [(1P-T)]
- 19 Jacket Water Heater Generator #2. Power is supplied through a 15 amp, 1 pole circuit. [(1P-U)]
- 20 Electric Urinal Main Deck. Power is supplied to the electric urinal through a 20 amp, 2 pole circuit. [(1P-V)]
- 21 Spare. [(1P-W) 15 amp, 1 pole]
- 22 Jacket Water Heater Generator #1. Power is supplied through a 15 amp, 1 pole circuit. [(1P-X)]
- 23 Spare. [(1P-Y) 15 amp]

24 Spare. [(1P-Z) 15 amp]

25 Spare. [(1P-AA) 20 amp]

26 Spare. [(1P-BB) 15 amp]

27 Spare. [(1P-CC) 20 amp]

28 Spare. [(1P-DD) 20 amp]

- (4) DP4 – Lower Engine Room Panel. The DP4 panel specifications include: 208/120 VAC, 3 phase, 4 wire, with separate ground bus, 30 poles, 100 amp main lugs only, 50° centigrade breakers, drip-proof, and surface mounted. Figure 1-43 provides details for panel DP4.

The DP4 panel receives power from DP3 panel and provides power to:

- (a) Lower Engine Room Lights Circuit #1. Power is provided through a 15 amp, 1 pole circuit. [(1P-A)]
- (b) Lower Engine Room Lights Circuit #2. Power is supplied through a 15 amp, 1 pole circuit. [(1P-C)]
- (c) Lower Engine Room Receptacles. Power is supplied through a 20 amp, 1 pole circuit. [(1P-G)]
- (d) Steering Compartment Receptacles. Power is supplied through a 20 amp, 1 pole circuit. [(1P-J)]
- (e) Forward Machinery Space and Forward Storeroom Lights. Power is supplied through a 15 amp, 1 pole circuit. [(1P-L)]
- (f) Forward Machinery Space Receptacles. Power is supplied through a 20 amp, 1 pole circuit. [(1P-N)]
- (g) Forward Storeroom Receptacles. Power is supplied through a 20 amp, 1 pole circuit. [(1P-Q)]
- (h) Port Main Engine Battery Charger. Power is supplied through a 15 amp, 1 pole circuit. [(1P-W)]
- (i) Sound Powered Telephone. Power is supplied through a 15 amp, 1 pole circuit. [(1P-W)]
- (j) Oily Water Separator. Power is supplied to the oily water separator through a 15 amp, 1 pole circuit. The control panel then supplies power to the 0.5-hp oily water separator. [(1P-B)]
- (k) Water Heater. Power is supplied to the 1.5 kW water heater through a 20 amp, 1 pole circuit. [(1P-D)]
- (l) Bench Grinder. Power is supplied to the 0.33-hp bench grinder through a 15 amp, 1 pole circuit. [(1P-H)]
- (m) Engine Stores Lights. Power is supplied through a 15 amp, 1 pole circuit. [(1P-K)]
- (n) FLOCS Pump. Power is supplied to the 0.75-hp pump through a 20 amp, 1 pole circuit. [(1P-M)]
- (o) Emergency Rudder Angle Indicator. Power is supplied through a 15 amp, 1 pole circuit. [(1P-P)]
- (p) Steering System Rudder Angle Indicator. Power is supplied through a 15 amp, 1 pole circuit.

[(1P-R)].

- (q) Loudhailer/Blue Strobe Lights. Power is supplied through a 15 amp, 1 pole circuit. [(1P-X)]
 - (r) Starboard Main Engine Battery Charger. Power is supplied through a 20 amp, 1 pole circuit. [(1P-V)]
 - (s) Spares. Ten spare circuits are provided. [(2P-E 15 amp, 2 pole)], [(1P-S) 15 amp, 1 pole], [(1P-Y) 15 amp, 1 pole], [(1P-AA) 20 amp, 1 pole], [(1P-CC), 20 amp, 1 pole], [(2P-F) 20 amp, 1 pole], [(1P-T) 15 amp, 1 pole], [(1P-Z) 15 amp, 1 pole], [(1P-BB) 15 amp, 1 pole], [(1P-DD) 20 amp, 1 pole]
- (5) DP5-Pilot House Panel. The DP5 panel specifications include: 208/120 VAC, 3 phase, 4 wire, with separate ground bus, 24 poles, 100 amp main lugs only, 40° centigrade breakers, drip-proof, and recessed. Figure 1-44 provides details for panel DP5.

The DP5 panel receives power from the DP3 Panel (Generator Room) and provides power to:

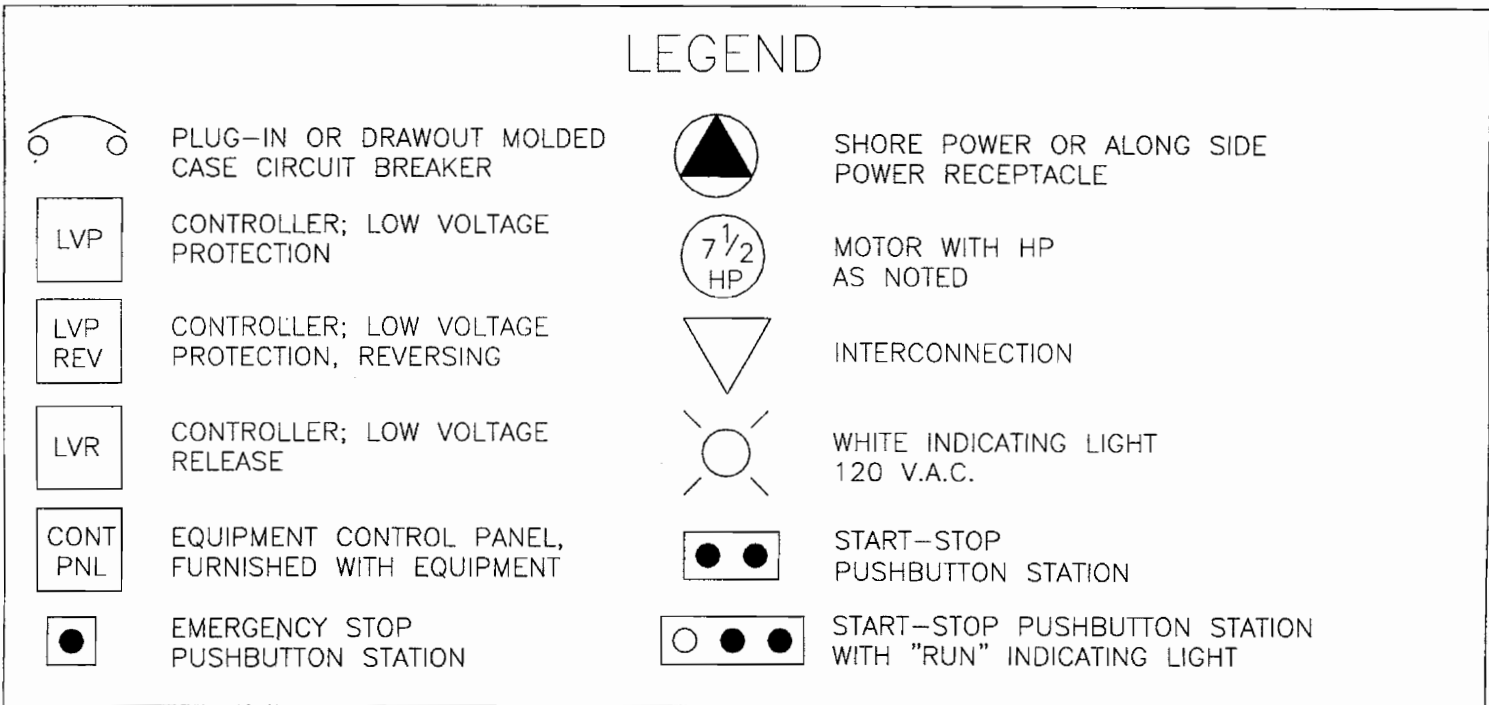
- (a) Deck Stateroom and Storage Lights. Power is provided through a 15 amp, 1 pole circuit. [(1P-A)]
- (b) Deck Stateroom and Storage Receptacles and Stateroom Berth Lights. Power is provided through a 20 amp, 1 pole circuit. [(1P-C)]
- (c) Clearview Heater (Clearview Screen). Power is provided through a 15 amp, 1 pole circuit. [(1P-E)]
- (d) Pilot House Lights. Power is provided through a 15 amp, 1 pole circuit. [(1P-G)]
- (e) Pilot House Receptacles. Power is provided through a 20 amp, 1 pole circuit. [(1P-J)]
- (f) Steering Amplifiers. Power is provided through a 15 amp, 1 pole circuit. [(1P-L)]
- (g) Wheelhouse Distribution Junction Box (Alarms and Emergency Steering). Power is provided through a 15 amp, 1 pole circuit. [(1P-N)]
- (h) Emergency Lighting Relay. Power is provided through a 15 amp, 1 pole circuit. [(1P-Q)]
- (i) Spare. [(1P-S) 15 amp, 1 pole]
- (j) Spare. [(1P-U) 15 amp, 1 pole]
- (k) Searchlight. [(1P-W) 20 amp, 1 pole]
- (l) Spare. [(1P-Y) 20 amp, 1 pole]
- (m) Deck Exterior Lights. Power is provided through a 15 amp, 1 pole circuit. [(1P-B)]
- (n) Loudhailer/Public Address/General Alarm System. Power is provided through a 15 amp, 1 pole circuit. [(1P-D)]
- (o) Clearview Wipers (Screen). Power is provided through a 15 amp, 1 pole circuit. [(1P-F)]
- (p) Spare. [(1P-H) 15 amp, 1 pole]
- (q) Aft 01 Deck Floodlights. Power is provided through a 15 amp, 1 pole circuit. [(1P-K)]
- (r) Forward Main Deck Floodlights. Power is provided through a 15 amp, 1 pole circuit. [(1P-M)]

- (s) Depth Sounder/Fluxgate Compass Power Supply. Power is provided through a 15 amp, 1 pole circuit. A transformer converts from 120 VAC to 12VDC. [(1P-P)]
 - (t) Fire Detection Panel. Power is provided through a 15 amp, 1 pole circuit. [(1P-R)]
 - (u) Intercom System. Power is provided through a 15 amp, 1 pole circuit. [(1P-T)]
 - (v) Spare. [(1P-V) 15 amp, 1pole]
 - (w) Spare. [(1P-X) 20 amp, 1 pole]
 - (x) Spare. [(1P-Z) 20 amp, 1 pole]
- (4) DP6 – Lower Engine Room Panel (Heaters). The DP6 panel specifications include: 450 VAC, 3 phase, 3 wire, 24 poles, 100 amp main lugs only, 50^o centigrade breakers, drip-proof, and surface mounted. Figure 1-45 provides details for panel DP6.

The DP6 panel receives power from DP1 panel and provides power to:

- (a) Engine Room Forward Heater. Power is provided through a 15 amp, 3 pole circuit. [(4P-A)]
- (b) Engine Room Aft Heater. Power is provided through a 15 amp, 3 pole circuit. [(4P-C)]
- (c) Generator Room Heater. Power is provided through a 15 amp, 3 pole circuit. [(4P-E)]
- (d) Forward Storage Heater. Power is provided through a 15 amp, 3 pole circuit. [(4P-B)]
- (e) Tank Space Heater. Power is provided through a 15 amp, 3 pole circuit. [(4P-D)]
- (f) Spare. One spare circuit is provided. [(4P-F) 15 amp, 3 pole]

Figure 1-39. AC One Line Diagram, Sheet 1 of 2



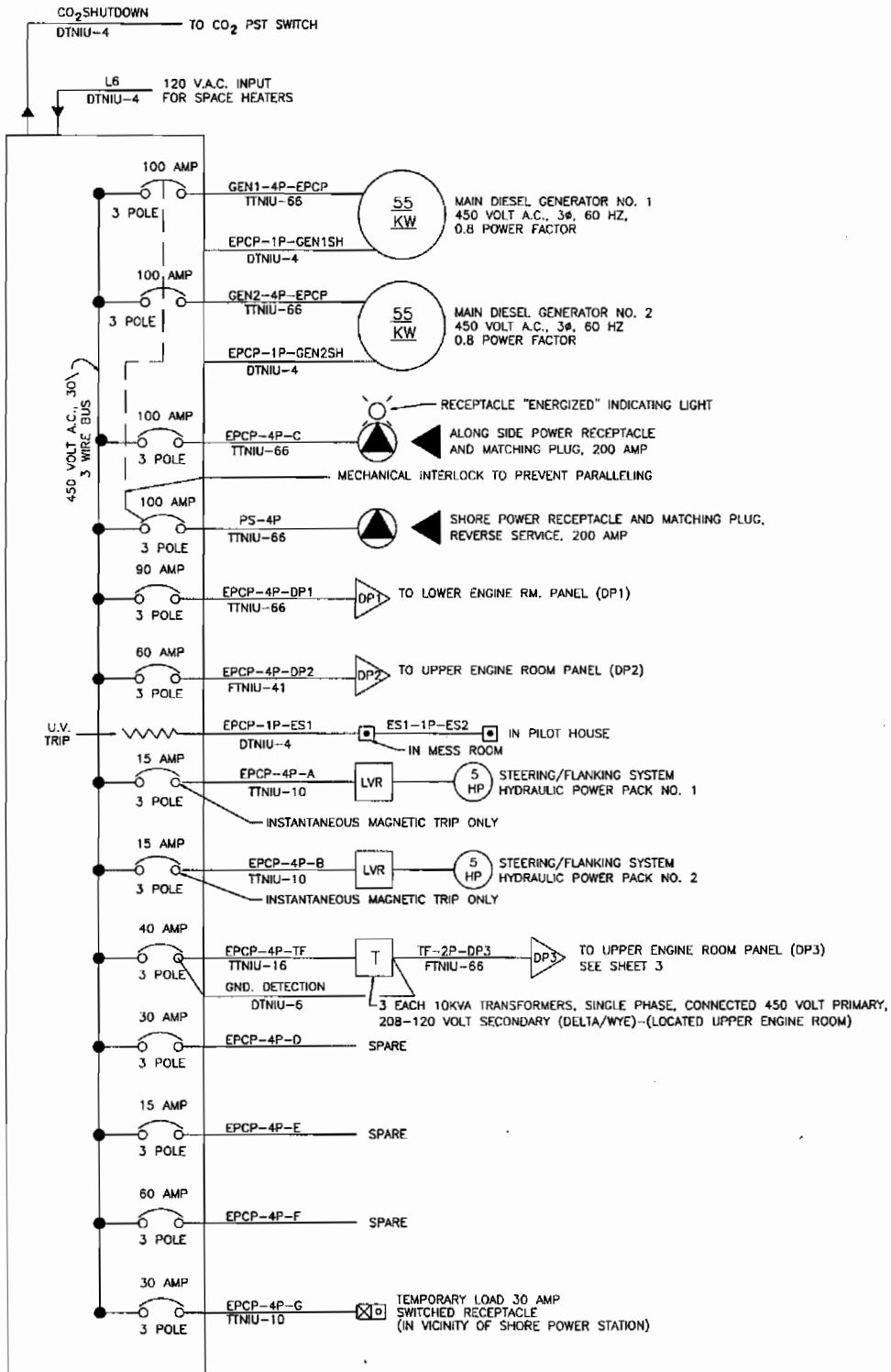
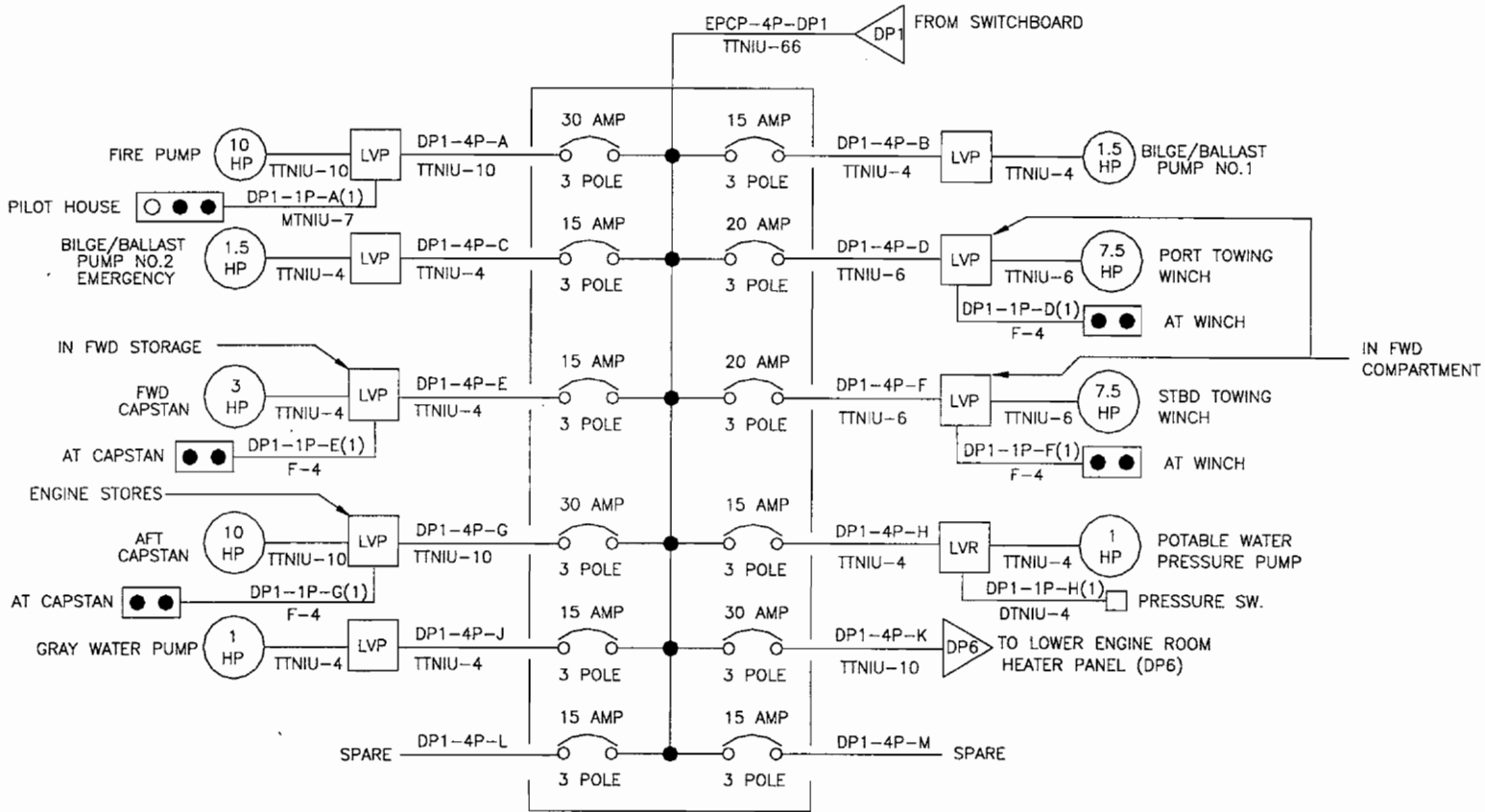


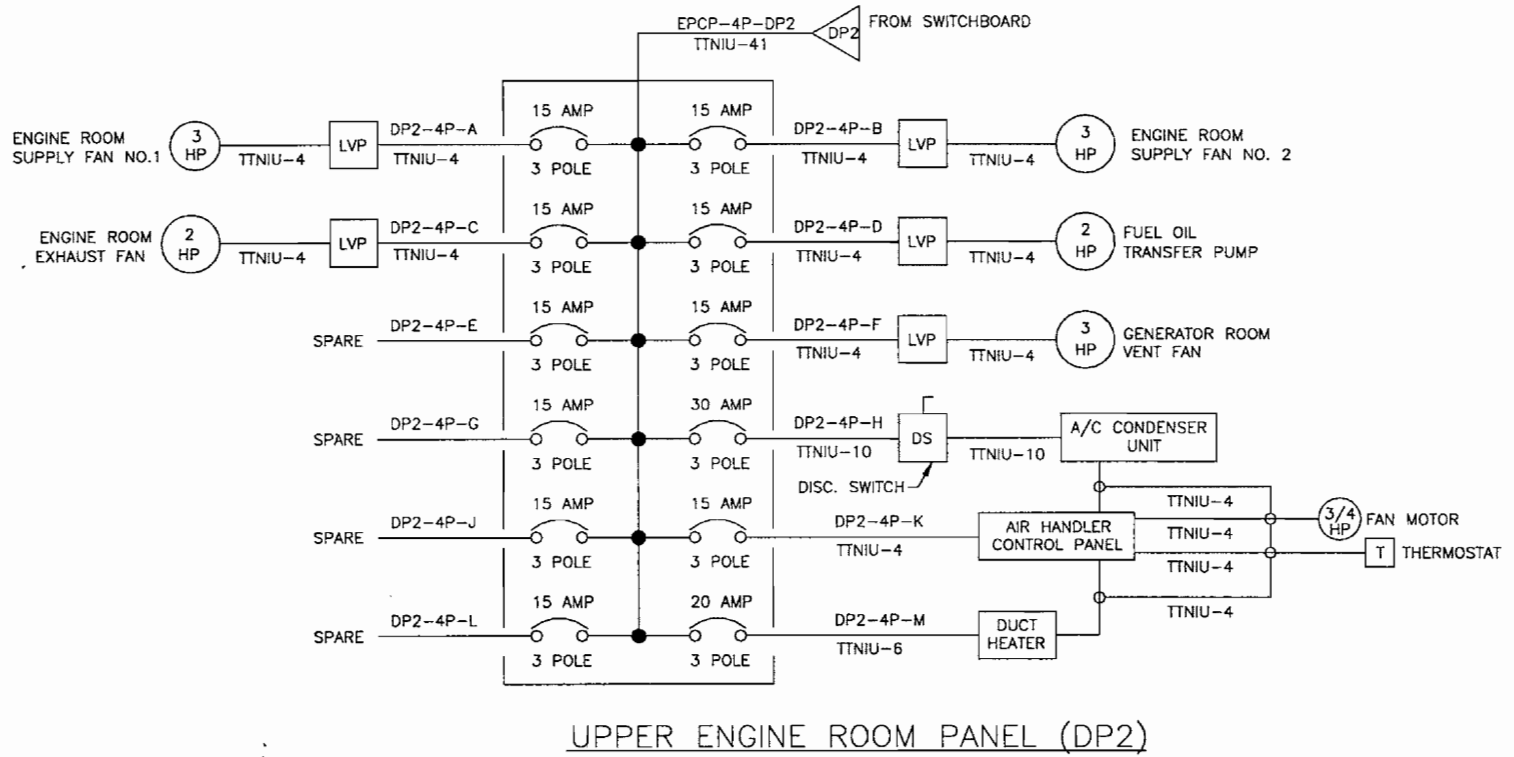
Figure 1-39. AC One Line Diagram, Sheet 2 of 2

Figure 1-40. Distribution Panel DP-1



LOWER ENGINE ROOM PANEL (DP1)

Figure 1-41. Distribution Panel DP-2



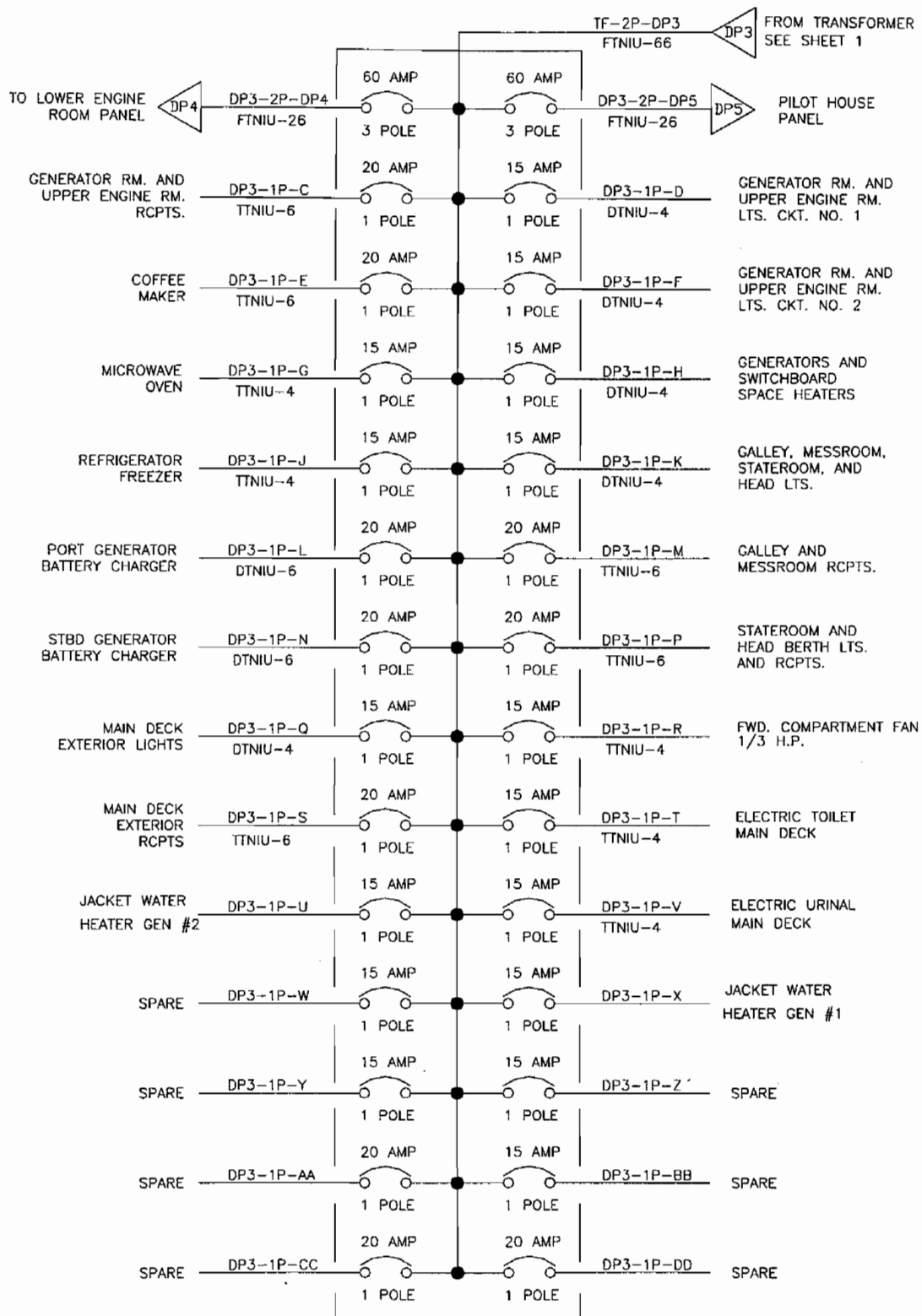
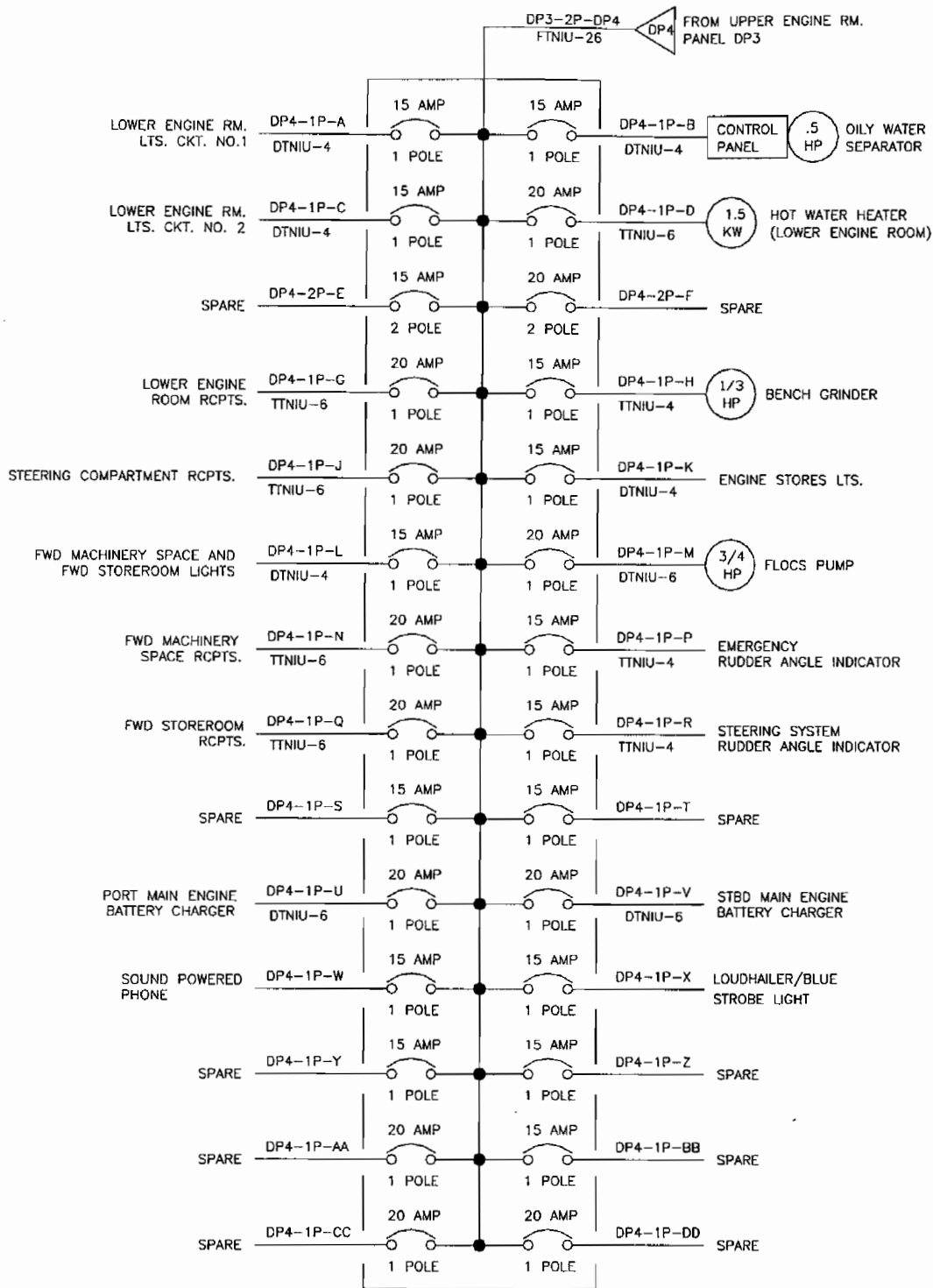
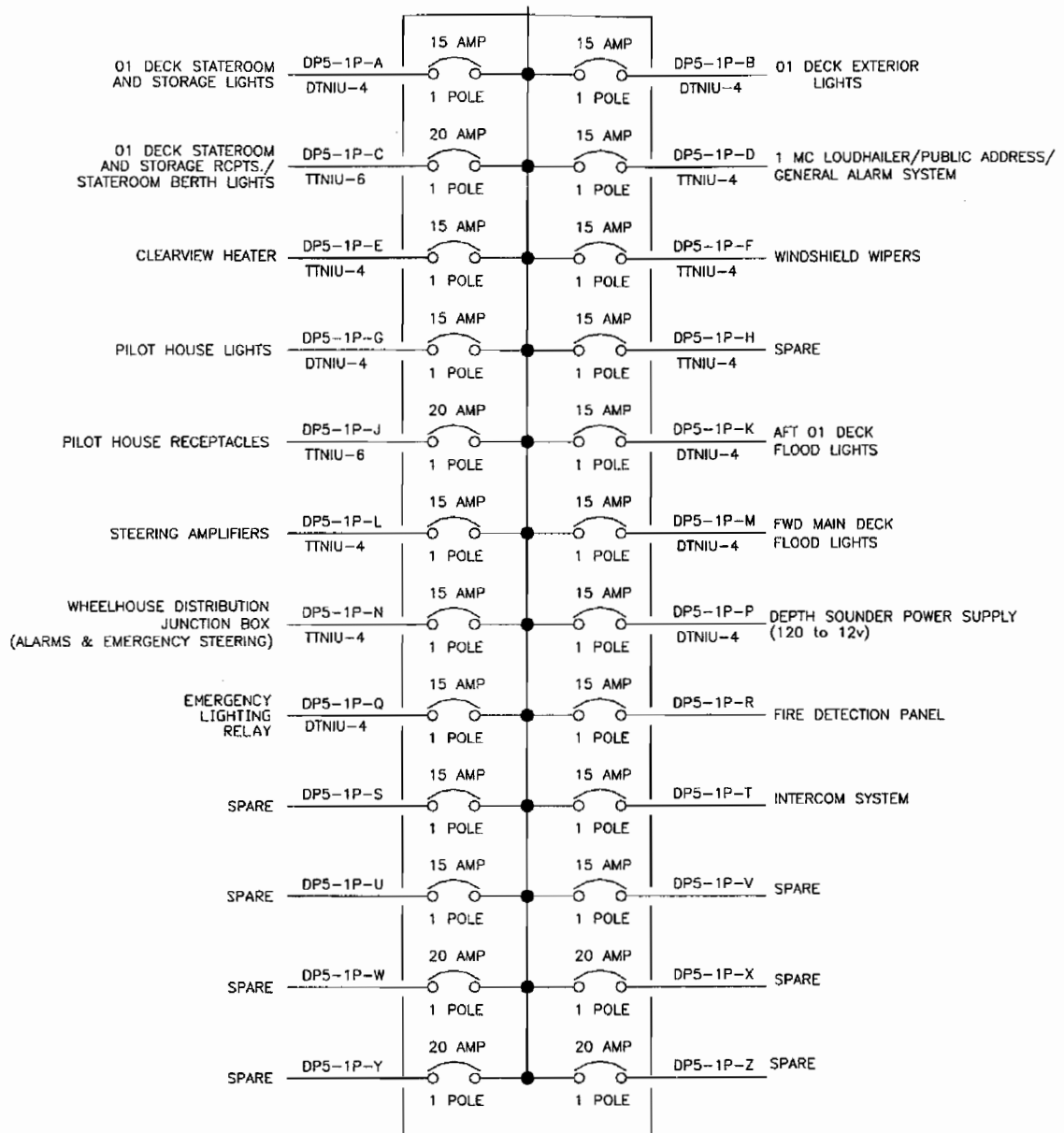


Figure 1-42. Distribution Panel DP-3



LOWER ENGINE ROOM PANEL (DP4)

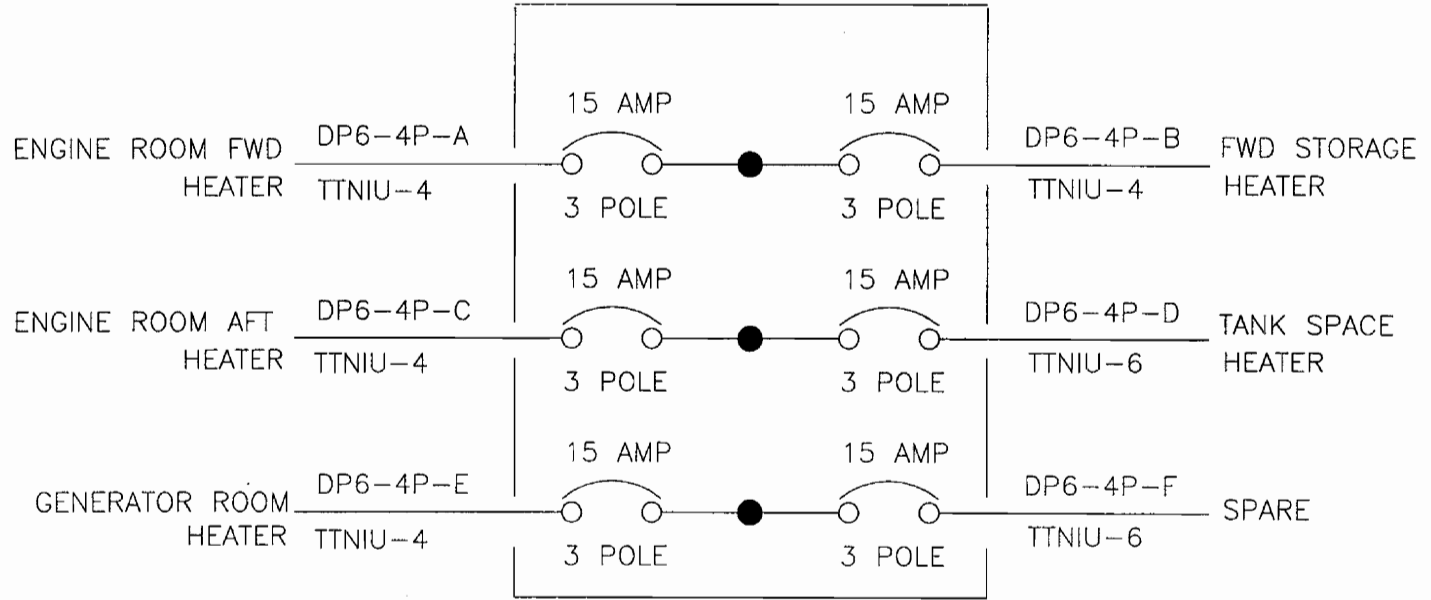
Figure 1-43. Distribution Panel DP-4



PILOT HOUSE PANEL (DP5)

Figure 1-44. Distribution Panel DP-5

Figure 1-45. Distribution Panel DP-6



LOWER ENGINE ROOM HEATERS (DP6)

- e. Lighting Systems. The following sub-paragraphs describe the ST's navigational and general lighting systems. Lighting fixtures are installed in compartments and spaces throughout the craft to provide the levels of general illumination necessary for the tasks to be carried out in each location. All interior fixtures are fluorescent, except for emergency DC lighting, which is incandescent.

For detailed illustrations of the lighting system by deck level, see Figure 1-46, Sheets 1 through 5.

- (1) Detail Illumination. Detail illumination is provided for the following:

- (a) Mirror Light. A 16-watt fluorescent mirror light is installed on the mirror in the head. The switch controlling the general lighting controls the light.
- (b) Berths. Each of the five berths is provided with a separately controlled 16-watt fluorescent light.
- (c) Chart Table. The chart table is provided with a special 25-watt fluorescent light fixture with a red diffuser.

CAUTION

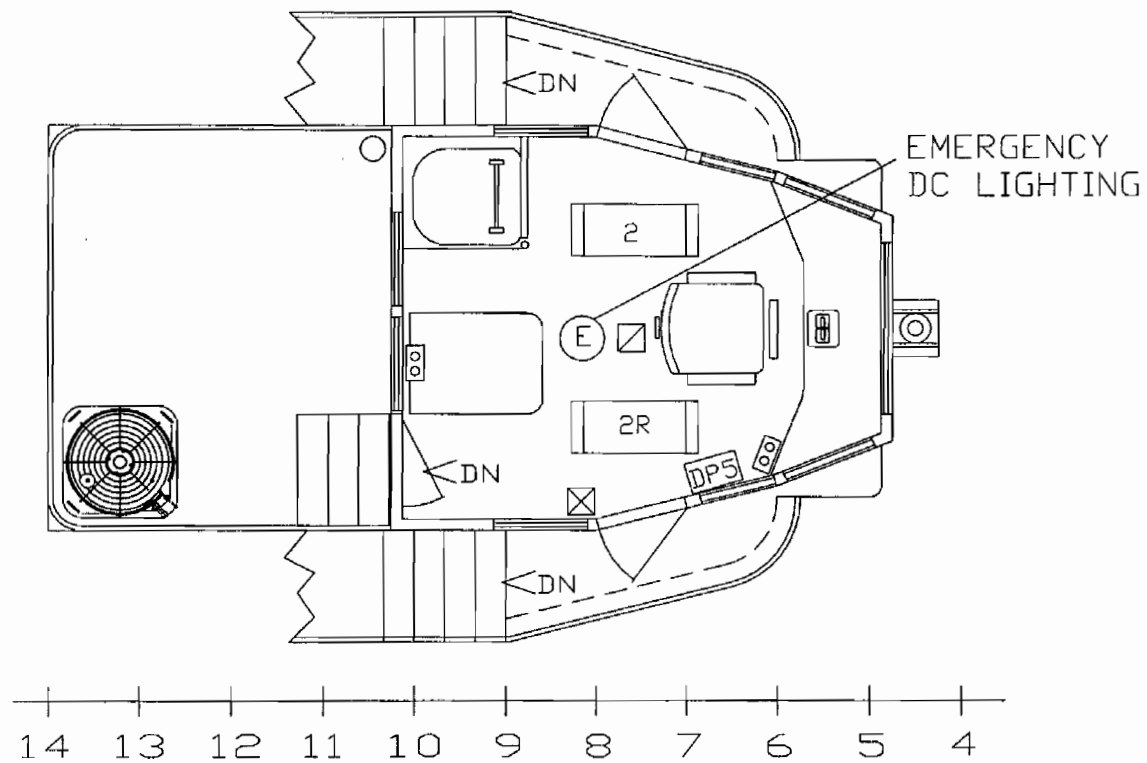
Do not use a bulb exceeding 60 watts.

- (2) Low Level Red Illumination. Red low-level lighting fixtures provide overhead illumination necessary for safe movement throughout the ST affording the least practicable interference with dark-adapted vision. These fixtures are installed as follows:
- (a) Pilot House. A low level red light fixture is installed on the starboard side of the Pilot House. This fixture includes two 20-watt fluorescent tubes on each side and a 20-watt red center fluorescent tube.
 - (b) Engine Room. Two low level red light fixtures are installed in the engine room, one forward port and one starboard aft. These fixtures include two 40-watt fluorescent tubes on each side and a 40-watt red center fluorescent tube.
 - (c) Generator Room. A low level red light fixture is installed at centerline between Frames 21 and 22. This fixture includes two 40-watt fluorescent tubes on each side and a 40-watt red center fluorescent tube.
 - (d) Galley and Mess Area. A low level red light fixture is installed on the starboard side. This fixture includes two 40-watt fluorescent tubes on each side and a 40-watt red center fluorescent tube.
 - (e) Forward Storage. A low level red fixture is installed on the starboard side of the forward storage in the Hold Deck. This fixture includes two 20-watt fluorescent tubes on each side and a 20-watt red center fluorescent tube.
- (3) General Illumination. General illumination is provided as follows:
- (a) Engine Room. Four overhead fluorescent fixtures are provided in opposing corners of the engine room. Each of these drip-proof fixtures includes two 40-watt fluorescent bulbs.
 - (b) 01 Deck. An overhead fluorescent fixture is provided at centerline between Frames 12 and 13 in the 2-person berth. The drip-proof fixture includes two 40-watt fluorescent bulbs. Two overhead fixtures are provided in the HVAC room, one each port and starboard. These drip-proof fixtures include two 20-watt fluorescent bulbs.
 - (c) Tankage Space. Three overhead fluorescent fixtures are provided between Frames 10 and 11, with one each port and starboard and one at centerline. Each of the drip-proof fixtures

includes two 40-watt fluorescent bulbs. An additional overhead fluorescent fixture is located above the workbench. This fixture includes two 20-watt fluorescent bulbs.

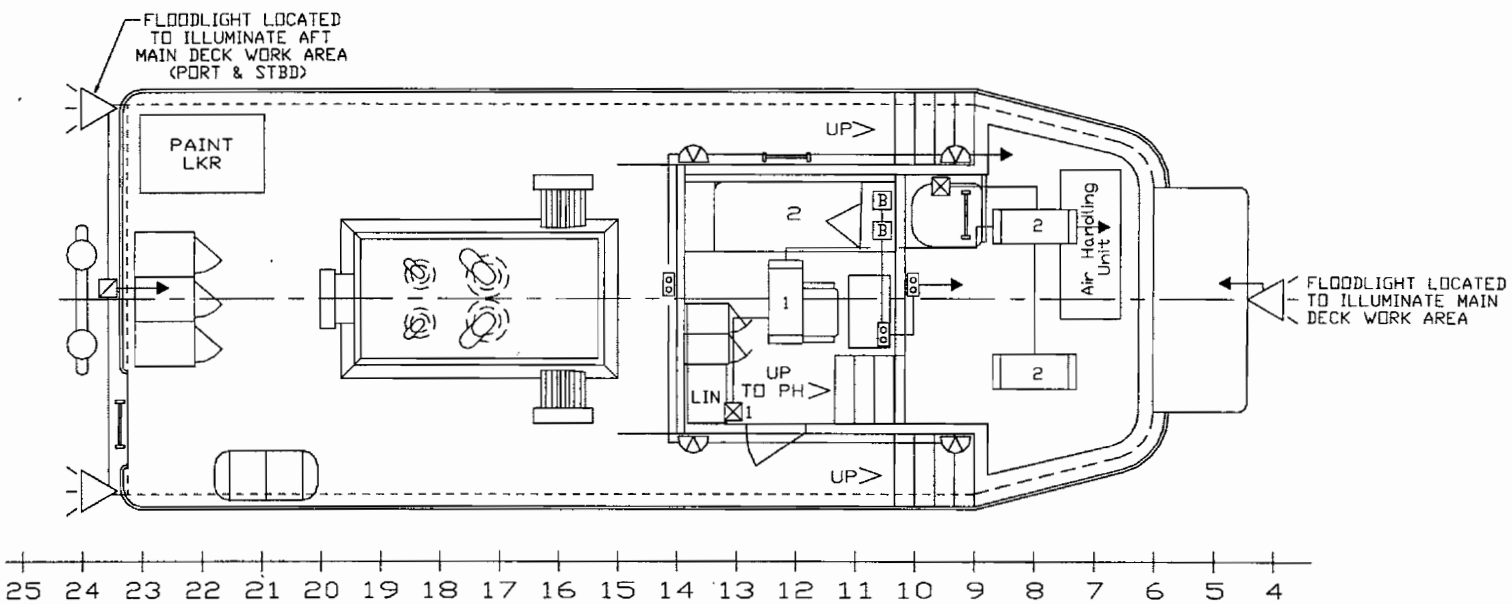
- (d) Galley and Mess Area. Two overhead fluorescent fixtures are provided, one at centerline and one on the starboard side. Each of the drip-proof fixtures includes two 40-watt fluorescent bulbs.
 - (e) Berthing Areas. An overhead fluorescent fixture is provided in each of the berthing areas. The drip-proof fixtures include two 40-watt fluorescent bulbs.
 - (f) Generator Room. Two overhead fluorescent fixtures are provided, one each port and starboard. The drip-proof fixtures include two 40-watt fluorescent bulbs.
 - (g) Upper Engine Room Walkway. Two overhead fluorescent fixtures are provided between Frames 18 and 20, one each port and starboard. The drip-proof fixtures include two 40-watt fluorescent bulbs.
 - (h) Forward Storage. Four overhead fluorescent fixtures are provided. Two fixtures are located between Frames 6 and 8, one each port and starboard. Two fixtures are located between Frames 3 and 6, one at centerline and one on the port side. The drip-proof fixtures include two 20-watt fluorescent bulbs.
 - (i) Engine Stores. Three overhead fluorescent fixtures are provided between Frames 22 and 23, with one each port and starboard and one at centerline. The drip-proof fixtures include two 20-watt fluorescent bulbs.
 - (j) Head. An overhead fluorescent fixture is provided in the head. The drip-proof fixture includes two 20-watt fluorescent bulbs.
 - (k) Pilot House. An overhead fluorescent fixture is provided port side in the Pilot House. The drip-proof fixture includes two 20-watt fluorescent bulbs.
- (4) Emergency DC Lights. A 24VDC Emergency DC Lighting system, consisting of 25-watt light fixtures, automatically provides general illumination in manned spaces when AC power becomes unavailable. One fixture is installed in each of the following areas:
- (a) Pilot House Deck.
 - (b) Mess Area.
 - (c) Upper Engine Room.
 - (d) Generator Room.
 - (e) Lower Engine Room.
 - (f) Tankage Space.
 - (g) Forward Storage.
- (5) Weather Deck Lighting. Incandescent white lighting fixtures are installed to provide the necessary illumination for safe passage of personnel on main walkways, ladders, hatches, as well as for mooring fittings and capstans. These fixtures are located as follows:
- (a) Main Deck. Ten bulkhead mounted 100-watt incandescent fixtures (white) are located around the perimeter of the deckhouse. Four bulkhead mounted 60-watt red incandescent fixtures are located around the perimeter of the deckhouse as well.
 - (b) 01 Deck. Four bulkhead mounted 100-watt incandescent fixtures (white) are located around the perimeter of the deckhouse.

- (6) Floodlights. Three halogen floodlights are located on the 01 Deck to provide illumination of the forward and aft main deck work areas. Two are located on the aft section of the deckhouse railing, one each port and starboard outboard. One is located forward centerline.
- (6) Searchlight. The Searchlight, which is remotely controlled from a panel on the Pilot House console, provides lighting for towing and navigation.
- (7) Portable Lanterns. Portable lanterns provide a limited amount of illumination when other lighting sources fail. They are located one each in the Upper Engine Room, Lower Engine Room, Forward Stores, Pilot House, Void 1 and Void 2.
- (8) Navigation Lights. The navigation lights are discussed in Paragraph 1.16.3, Command and Controls.

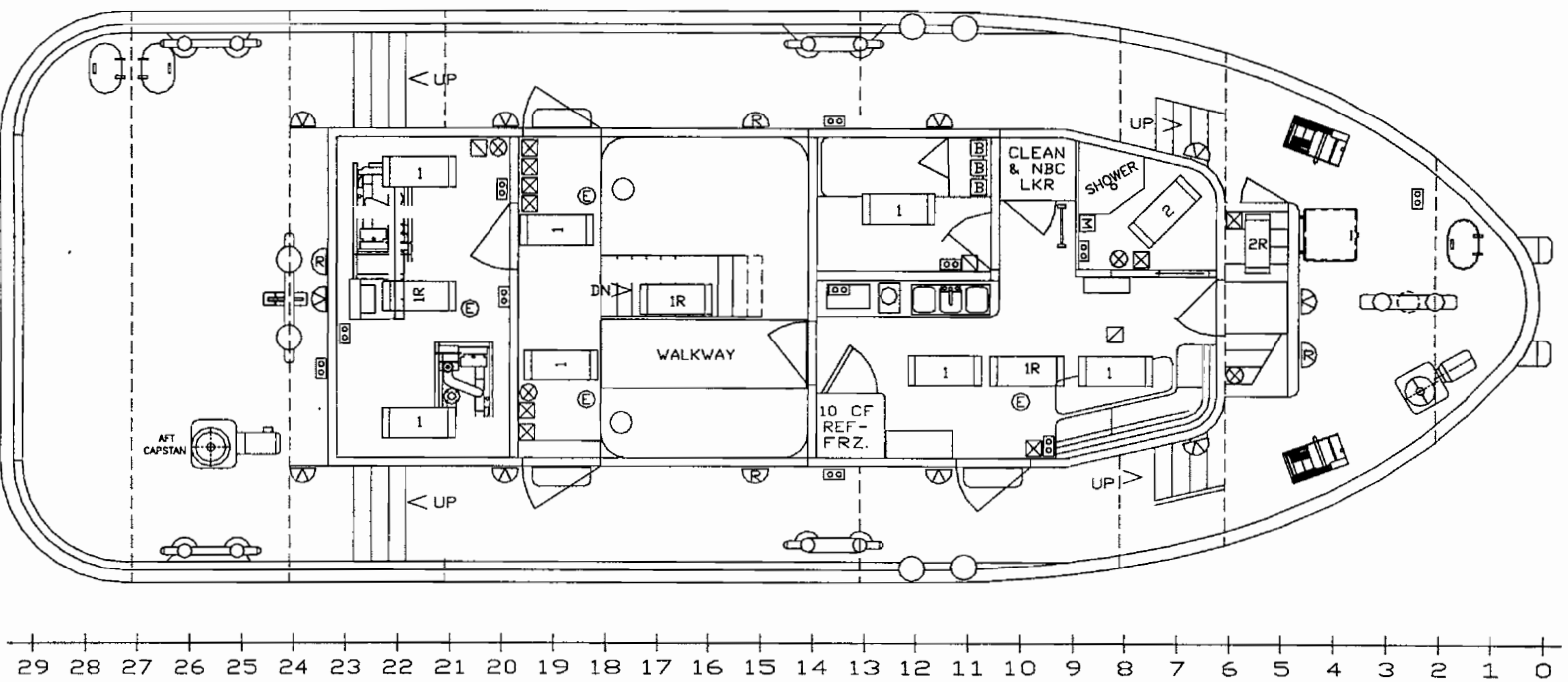


Pilot House Deck Lighting Arrangement

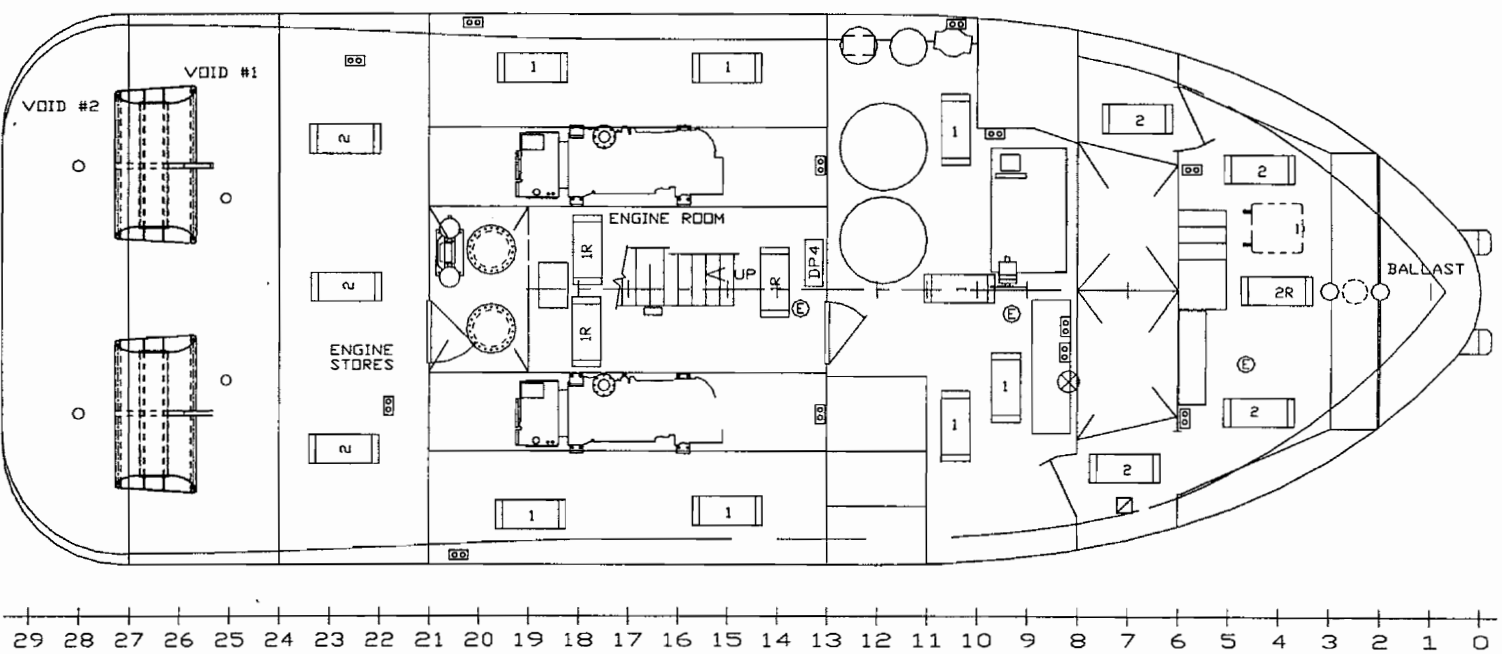
Figure 1-46. Lighting Arrangement, Sheet 1 of 5














01 Deck Lighting Arrangement
Figure 1-46. Lighting Arrangement, Sheet 2 of 5



Main Deck Lighting Arrangement.
Figure 1-46. Lighting Arrangement, Sheet 3 of 5



Hold Deck Lighting Arrangement.
Figure 1-46. Lighting Arrangement, Sheet 4 of 5

	DUPLEX RECPT
	FLOODLIGHT, HALOGEN, 500 WATT, 120V AC, W/ LAMP, SS
	BERTH LIGHT FLUOR., 16 WATT, W/ SWITCH & RECPT
	MIRROR LIGHT FLUOR., 16 WATT, W/ SWITCH & RECPT
	BULKHEAD INCADESCENT FIXTURE, WATERTIGHT, GLOBE AND GUARD, 60 WATT RED BULB
	BULKHEAD INCADESCENT FIXTURE, WATERTIGHT, GLOBE AND GUARD, 100 WATT
	OVERHEAD FLUOR. FIXTURE TUBE "RED" AND WIRED TO SEPARATE BALLAST, PAULUHN
	EMERGENCY LIGHTING
	ROTARY LIGHT SWITCH
	LIGHT SWITCH (3 POSITION)
	LIGHT SWITCH (2 POSITION)

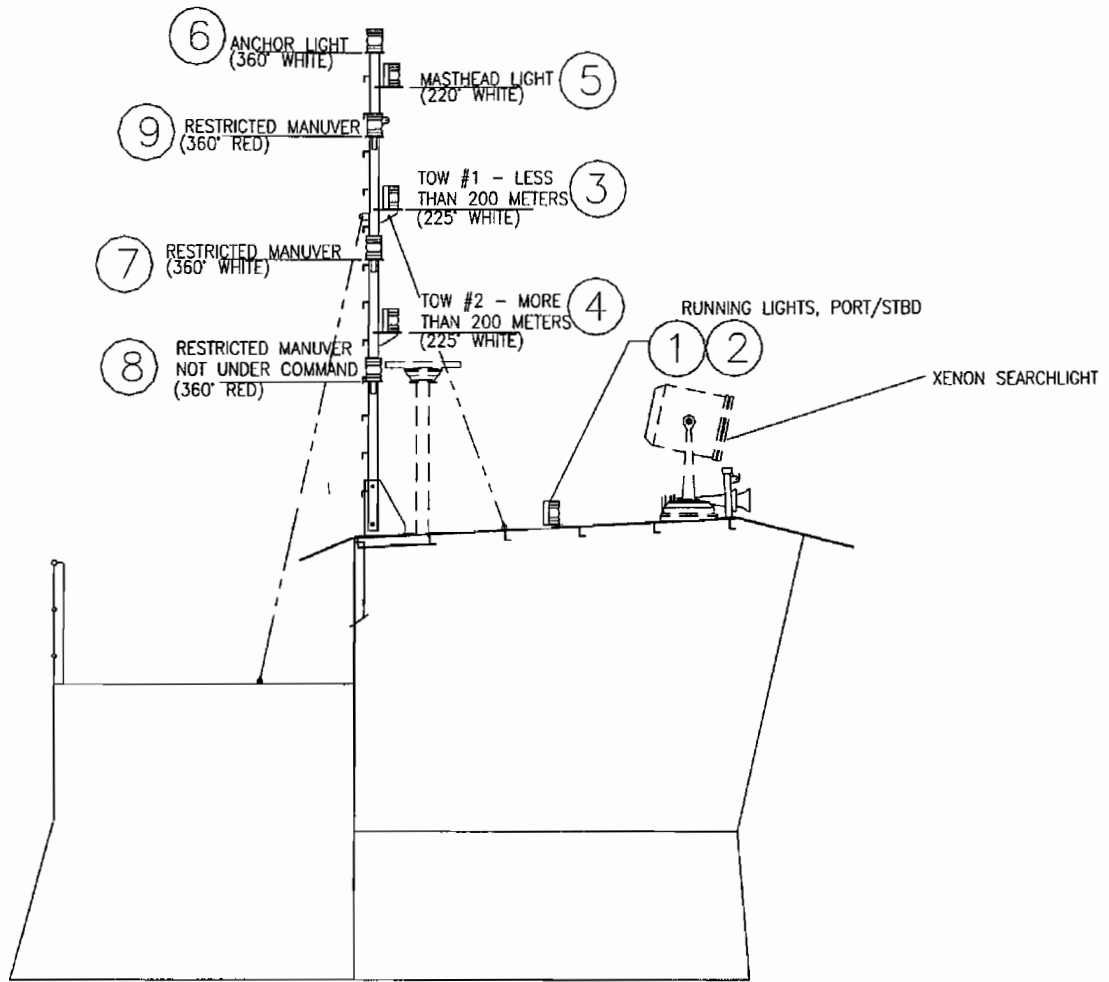
Lighting Arrangement Drawing Key
Figure 1-46. Lighting Arrangement, Sheet 5 of 5.

1.16.3. Command and Controls. The following sub-paragraphs describe the navigational, communication, and alarm systems installed on the ST.

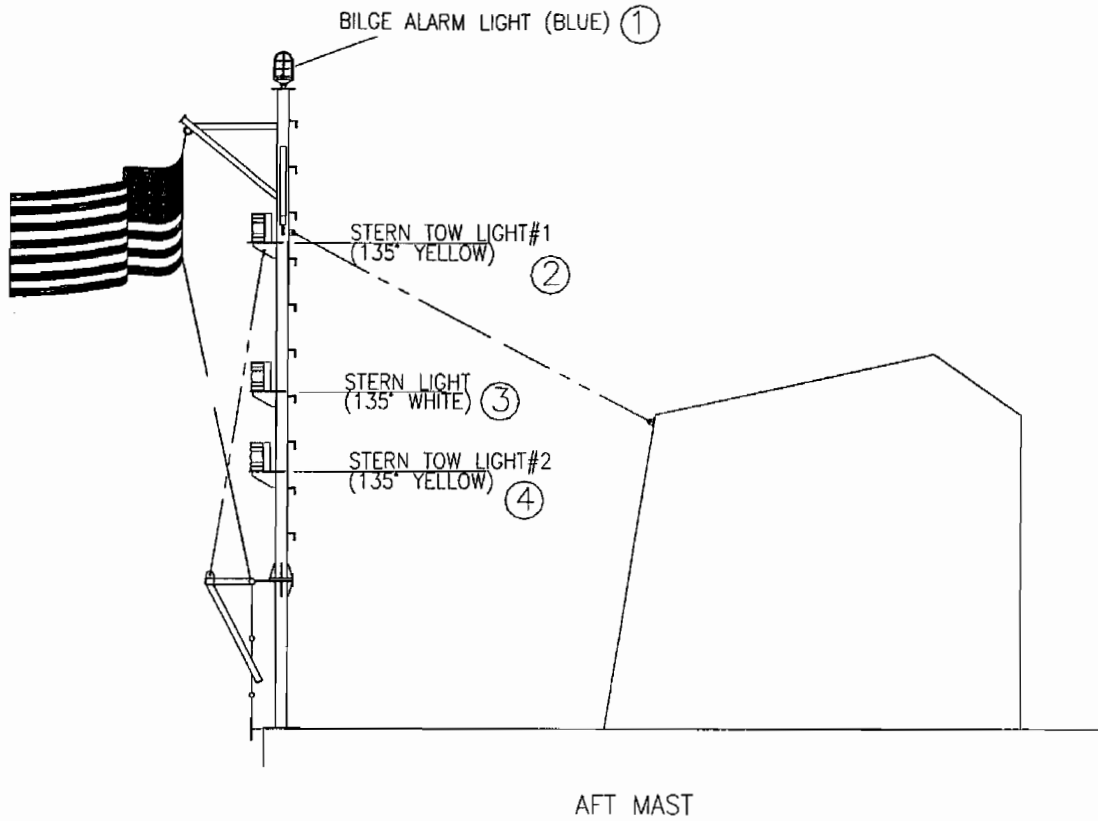
a. Navigational System/Equipment. The ST is outfitted with the following navigational equipment:

- (1) Radar. The ST's radar consists of a Raytheon Model R40XX with 24 nautical mile (44.472 Meters) range and a 24-inch (0.6096 Meters) domed scanner with rotational motor. The display unit is located in PilotHouse. Key operational features are outlined below:
 - (a) Multi-screen capability, which allows for viewing of various windows.
 - (b) Target wakes can be displayed on screen.
 - (c) Pressure sensitive track pad facilitating access to various areas on the screen.
 - (d) Ability to track up to five waypoints in a route sequence.
 - (e) Automatic tuning.
 - (f) Compass stabilized presentation, allowing for true magnetic North display heading changes.
 - (g) Man-overboard features which allow for quick activation and instantaneous readouts for a fast return to the point of origin of the event.
- (2) Global Positioning System. The ST's GPS system consists of an AN/PSN-11 (Lightweight GPS receiver with external antenna). The display unit is located in PilotHouse. The basic function of the GPS is to provide the position of the vessel with a high degree of accuracy utilizing satellite transmissions. This equipment is provided as Government Furnished Equipment.
- (3) Depth Sounder. The ST's depth sounder is an Autohelm Model ST50 Plus with a display unit mounted on the Pilot House console. The depth sounder is a multi-function instrument that employs an echo sounder enabling various alarms. These include deep, shallow, or anchor watch alarms which may be set to provide visual and audible warnings whenever the depth of the water reaches the selected parameters. Essential system components include ST50 Plus Depth Control Head, power cable, and depth transducer (located in transducer tube in Forward Stores compartment).
- (4) Magnetic Compass. The magnetic compass is a Ritchie Model YB 500. The unit is installed on the console in the PilotHouse.
- (5) Fluxgate Compass. The fluxgate compass is a Ritchie Model MS100 providing heading information to the PilotHouse. The magnetic compass senses the earth's magnetic field, with a microprocessor compensating for deviations within the ST and feeds this information to the display and other navigation instruments.

- (6) Navigation Light System. The navigation light system consists of the navigation light panel and the navigation lights. Each of these is discussed in the paragraphs that follow.
- (a) Navigation Light Panel. The navigation light panel located in the Pilot House facilitates operation and/or monitoring of the ST's navigation lights. Key features of the panel are outlined below:
- (1) Receives navigation light power from the 24VDC panel located in the PilotHouse.
 - (2) The panel will not be disabled by a failure of any alarm circuit.
 - (3) Alarm circuitry provides an audible and visual identification of specific navigation light failure.
- (b) Navigation Lights. The navigation light panel distributes power to the navigation lights. Figure 1-47 provides a plan view of the Navigation Lights. The navigation lights are housed on the forward or aft mast.
- (1) Forward Mast. The forward mast contains the following lights:
- (a) Anchor Light (Item 6) (white)
 - (b) Masthead Light (Item 5) (white)
 - (c) Restricted in Ability to Maneuver (RIAM) Light (Item 9) (red)
 - (d) Towing Light #1 (Item 3) (white)
 - (e) Restricted in Ability to Maneuver (RIAM) Light (Item 7) (white)
 - (f) Towing Light #2 (Item 4) (white)
 - (g) Restricted in Ability to Maneuver (RIAM)/Not Under Command (NUC) Light (Item 8) (red)
 - (h) Running Lights (Item 1 and 2); Starboard (green), Port (red)
- (2) Aft Mast. The aft mast contains the following lights:
- (a) Bilge Alarm Light (Item 1) (blue)
 - (b) Stern Towing Light #1 (Item 2) (yellow)
 - (c) Stern Light (Item 3) (white)
 - (d) Stern Towing Light #2 (Item 4) (yellow)



Navigation Light Arrangement, Forward Mast
Figure 1-47. Navigation Lights Arrangement, Sheet 1 of 2



Navigation Light Arrangement, Aft Mast

Figure 1-47. Navigation Lights Arrangement, Sheet 2 of 2

b. Internal Communication System. The ST is outfitted with the following internal communication equipment:

- (1) Integrated Communication System. The system installed on the ST is a United Marine System that includes a 1MC System, a 21MC System, and a General Alarm System. A marine integrated control cabinet and an intelligent digital controlhead facilitate essential system interfaces and operations. Figure 1-48 provides a schematic view of the integrated communication system. See TM# 55-1925-255-14&P for additional reference. System components are described below:
 - (a) Public Address Talkback Rack Monitor Panel. The public address talkback rack monitor panel (United Marine Model HMUM-RACK-1338) is a central control station for the public address system. The unit is located in the HVAC room.
 - (b) Marine Integrated Control Cabinet. The marine integrated control cabinet (United Marine Model 1388-ICSC) serves as a distribution panel for the integrated communication system. The unit is located in the HVAC room.
 - (c) Digital Control Head/Loudhailer/General Alarm. The digital control head (United Marine Model UM-IDCH-7200) provides a base of operation for the 1MC System, 21MC System, and General Alarm. The control head is a microprocessor controlled station unit providing Pilot House users with access to public address, loudhailer, and talkback.
 - (d) Loudhailer Speaker Horn. The loudhailer speaker horn (United Marine Model HMUM-HSWR-20) is a 20-inch (0.508 Meters) weatherproof speaker mounted on the Pilot House Overhead. The unit provides public address, general alarm, and loudhailer capabilities.
 - (e) Public Address Horn Loudspeakers. The public address horn loudspeakers (United Marine Model HMUM-HSIS-15/8 and JMUM-CJSW) are 8-inch (0.2032 Meters) weatherproof speakers mounted at various points on the ST to include the generator room, engine stores compartment, forward stores, engine room, and tankage space. The units provide public address and general alarm capabilities.
 - (f) Public Address Talkback Speakers. Public address talkback speakers (United Marine Model HMUM-USSR-TB-J) provide public address reception and talkback capabilities. These speakers are mounted at various points on the ST to include the forward main deck, aft main deck (starboard), and main deck (port).
 - (g) Surface Mount Interior Loudspeakers. The compact single coil surface mount interior loudspeakers (United Marine Model HMUM-SFIS-S-6) are high efficiency loudspeakers which overcome ambient noise. These speakers are mounted at various points on the ST to include the upper engine room, HVAC room, and mess area.
 - (f) Remote Intercom Stations. The remote intercom stations (United Marine Model UM-RIMI) provide multi-purpose intercom calling. Remote intercom stations are provided in the Pilot House, engine room, generator room, tankage space, mess area, double berthing area, and triple berthing area. Rotating beacons (United Marine Model 200-E) are provided for the engine room station and for the tankage space station.
- (2) Sound Powered Telephone. The sound powered telephone system (Figure 1-49) provides voice communication throughout the ST by means of fixed phone stations and portable units (head/chest sets). Since the system is voice powered only, it is operational even with the loss of vessel power. Three main stations are provided: one each in the Pilot House, Engine Room, and Mess Area. The engine room station has a call light on the phone to indicate an incoming call as well as a bell and a rotating blue beacon. Jack boxes for operation with head/chest sets are provided as well. The jack boxes are functional when coupled to the head/chest sets located one each port and starboard in the upper engine room. Jack boxes are also located on the forward main deck, aft main deck, and in the lower engine room. For additional information, see TM# 55-1925-255-14&P.

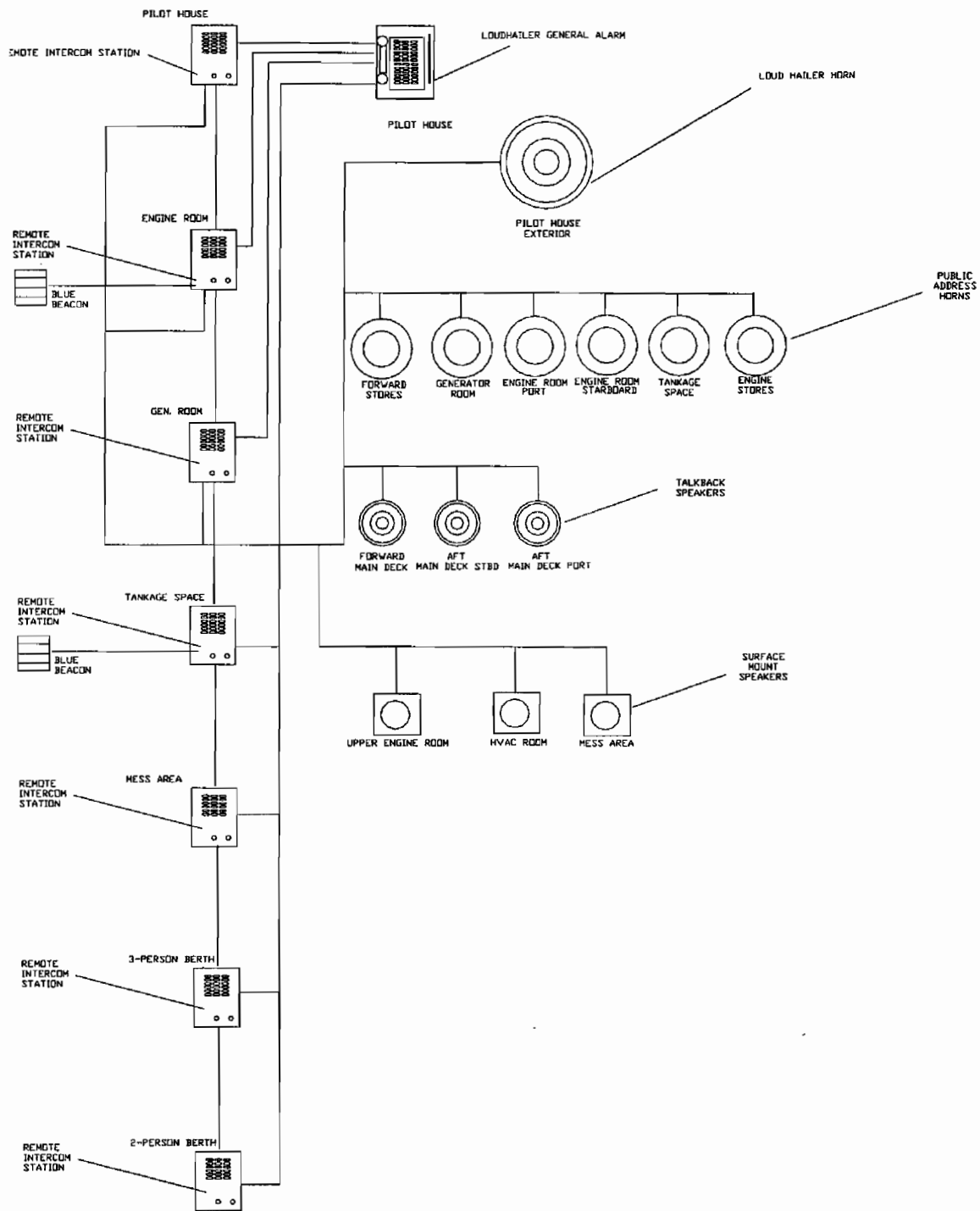
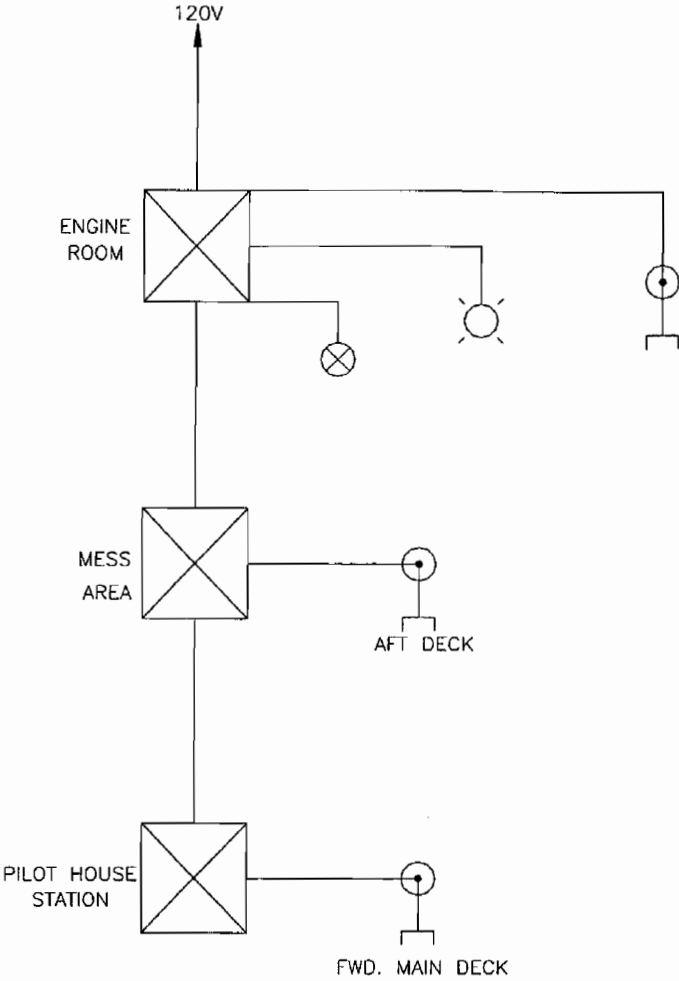


Figure 1-48. Integrated Communication System



PHONE DIAGRAM

LEGEND






	PHONE
	PHONE JACK
	BELL
	ROTATING BLUE LIGHT
	HEAD SET

Figure 1-49. Sound Powered Telephone Arrangement

c. External Communication System. The ST is outfitted with the following external communication equipment:

- (1) Hand Held VHF Radio. A Bendix/King E-Series handheld two-way VHF transceiver is used for bridge-to-bridge, bridge-to-deck or dock and general ship-to-shore communication. The unit has 15 channels with 14 programmable groups for each channel. Features of the transceiver include scanning, priority scanning, low battery indicator and a transmit time out timer.
- (2) Digital Selective Calling VHF Radios. Two Ross Engineering Digital Selective Call (DSC) Radio Sets, Model DSC500, marine VHF transceivers are provided. The unit is an all-channel DSC FM Transceiver operating in the VHF marine frequency range. The antenna for the unit is a reinforced Fiberglass vertical whip antenna, Shakespeare Model 396-1. The antenna is used with the DSC500 for both transmitting and receiving over VHF frequencies.

Essential system characteristics include the following:

- (a) Compact transceiver with microphone.
 - (b) Power output is 25 watts high power and 1 watt low power.
 - (c) 57 standard transmitter communication channels and 42 expansion channels.
 - (d) 57 standard receiver communication channels and 10 weather channels.
 - (e) Weather proof.
 - (f) Ability to monitor any two channels, ten weather channels, or user selected channels.
 - (g) Dedicated power converter (from 115 VAC to 12 VDC) with automatic switchover to battery operation.
- (3) VHF-FM (AN/VRC-90A) (with Imbedded COMSEC) Radio. The ST's VRC radio consists of an AN/VRC-90A Singars system providing short-range, two-way, radio telephone communication in the 30.00 to 75-95 MHz range using frequency modulated (FM) transmission and reception. The transmitter power output is 0.5 – 8.0 watts in the low power mode, 35 watts in the high power mode. Power input requirements are 10 amps at 25.5 VDC. The system includes a RT-1523/VRC Receiver/Transmitter, an AM-7239/VRC Amplifier Adapter, an AM-3238/VRC Power Amplifier, an AM-6352/VRC Mounting Base, an AS-3900/VRC Antenna base and a MK-2332 Installation Kit. A Model 4242-MK1 antenna is provided for use with VRC-90A Mobile Radio Set.
 - (4) Emergency Position Indicating Radio Beacon (EPIRB). The Emergency Positioning Indicating Radio Beacon (EPIRB) located in a special bracket mounted forward of the air conditioning Compressor on the 01 Deck. The EPIRB is capable of automatically floating out of its bracket and activating if the vessel sinks or is capsized.

When turned on, the Class 406 EPIRB transmits tone modulated signals on VHF 406.025 and 121.5 MHz simultaneously. Rescue aircraft or vessels equipped with suitable direction finding equipment can "home" to the transmitting unit. Another means of detection is by Search and Rescue Satellite-Aided Tracking (SARSAT) or COSPAS emergency surveillance systems.

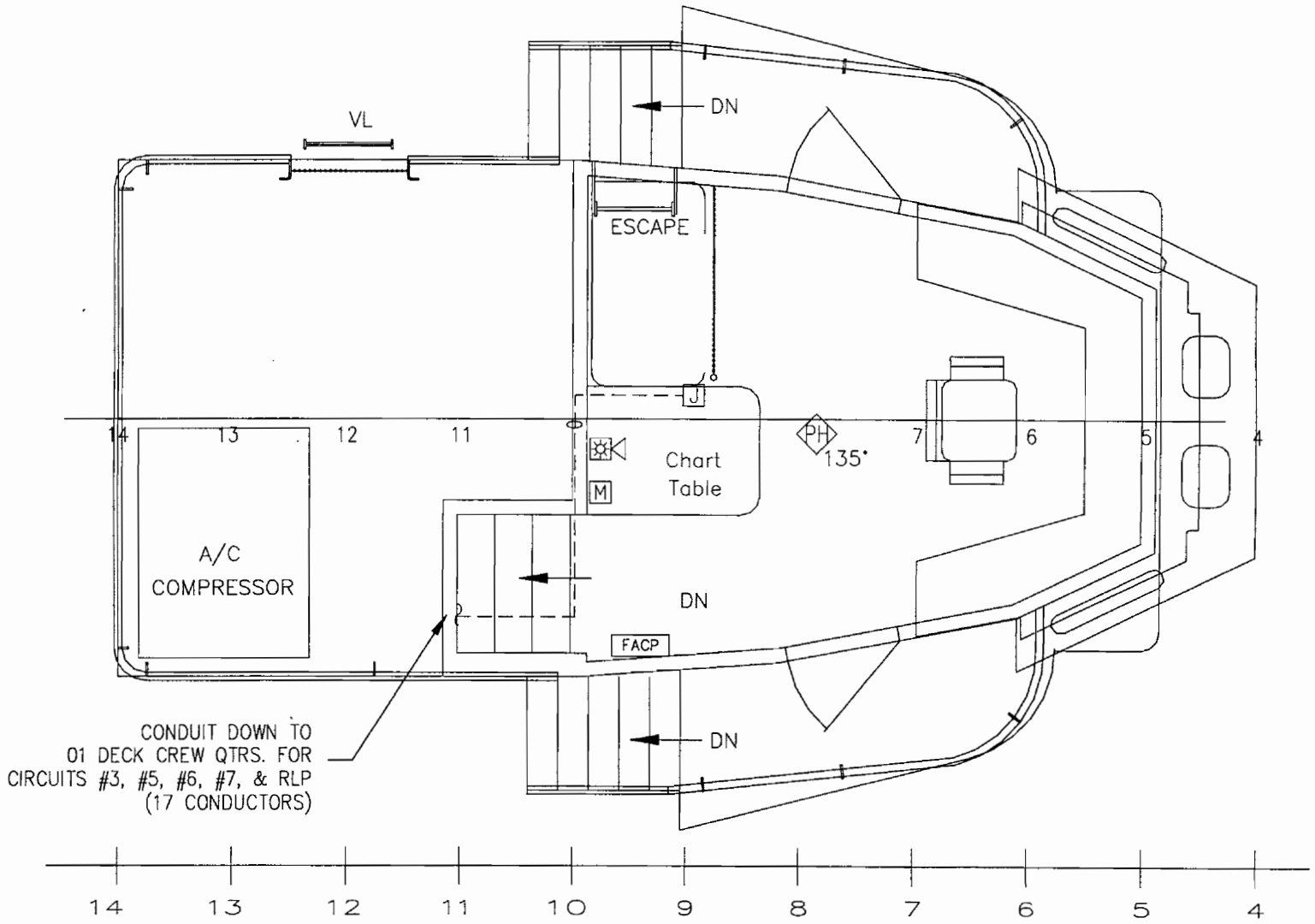
d. Alarm Systems. The ST is outfitted with the following alarm and monitoring equipment:

- (1) Fire and Smoke Alarm System. The fire and smoke alarm system provides visual and audible indication of high temperatures and smoke in all crew rest areas, storage and machinery compartments. The ST is divided into five fire zones: Zone 1 is in the Pilot House and HVAC room; Zone 2 is in the 2-person berth on the Hold deck; Zone 3 is the mess area, the head, 3-person

berth and generator room; Zone 4 is the Hold deck; and Zone 5 is the CO₂ pressure switch which is actuated when the CO₂ system is manually actuated. This system may be actuated in any of the following methods: automatically by five detectors; automatically by heat probes; and automatically by actuation of the CO₂ system. Figure 1-50 provides a plan view of the fire and smoke alarm system. Key components of the system are identified below:

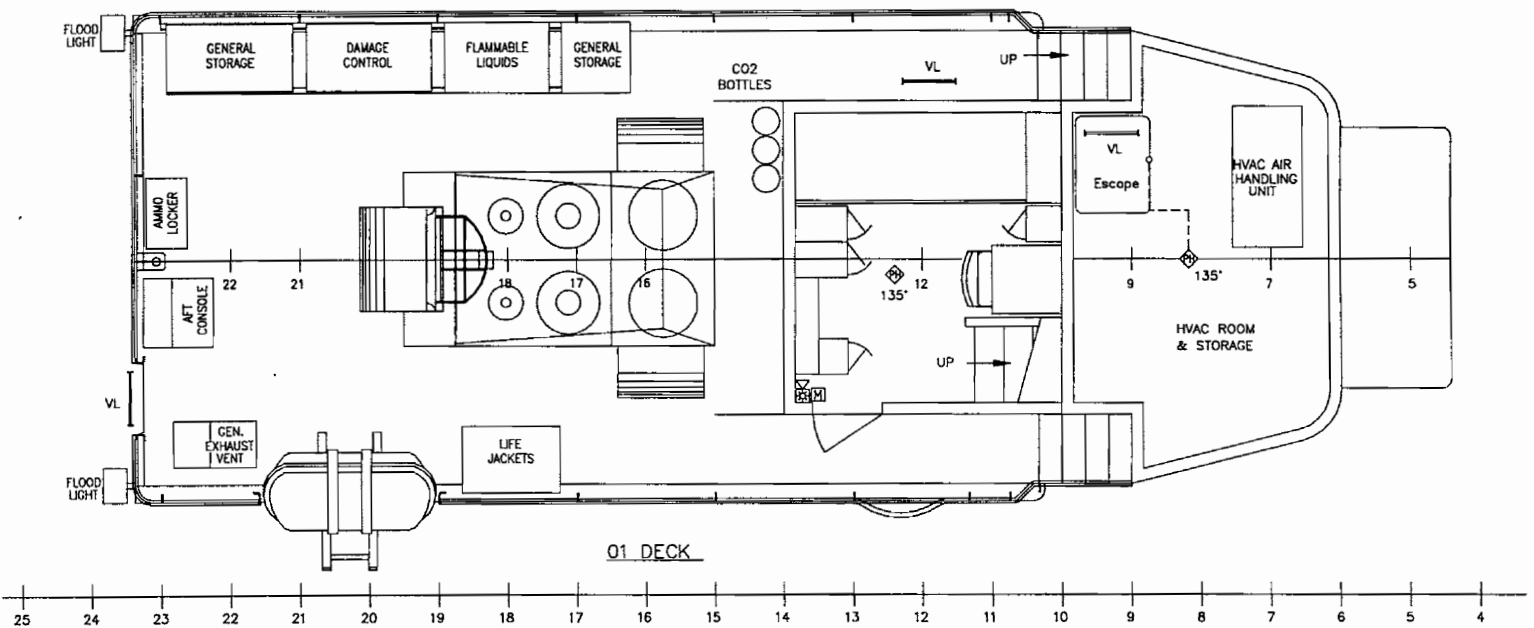
- (a) Fire Alarm Control Panel. A Pyrotronics System 3 Fire Control Panel, Model CP-35, is located in the PilotHouse on the starboard side. This unit serves as the central control for the fire and smoke alarm system.
- (b) Photoelectric Smoke Detectors. Four Model PE-3T photoelectric smoke detectors are located on the ST as follows:
- 1 HVAC Room. A detector is located at centerline in the HVAC room between Frames 8 and 9.
 - 2 2-Person Berth. A detector is located on the starboard side at Frame 13.
 - 3 Pilot House Deck. A detector is located centerline in the Pilot House at Frame 8.
 - 4 Mess Area. A detector is located starboard inboard in the mess area.
- (c) Thermal Detectors. Seven thermal detectors are located on the ST as follows:
- 1 Main Deck.
 - (a) A 200°F (92.4°C) thermal detector is located in the upper engine room (starboard) between Frames 17 and 18.
 - (b) A 200°F (92.4°C) thermal detector is located centerline in the generator room between Frames 21 and 22.
 - (c) A 135°F (56.65°C) thermal detector is located in the head.
 - 2 Hold Deck.
 - (a) Two 200°F (92.4°C) thermal detectors are located in the lower engine room, one each port and starboard outboard at Frame 17.
 - (b) A 135°F (56.65°C) thermal detector is located centerline in the forward storage at Frame 4.
 - (c) A 135°F (56.65°C) thermal detector is located centerline in the tankage space at Frame 11.
- (d) Manual Pull Stations. Manual pull stations actuate the fire alarm system. Six manual pull stations are located on the ST as follows:
- 1 Hold Deck. A station is located starboard outboard in the forward storage at Frame 6.
 - 2 Main Deck.
 - (a) A station is located in the mess area between Frames 9 and 10.
 - (b) Two stations are located forward of the generator room, one each port and starboard between Frames 19 and 20. The stations are mounted on the bulkhead, just forward of the exit to the main deck.
 - 3 01 Deck. A station is located starboard outboard at Frame 13 in the 2-person berth.

- 4 Pilot House Deck. A station is located on the starboard side of the console.
- (e) Remote Alarm Indicating Panel. The remote alarm indicating panel is an 8-lamp panel located in the upper engine room just forward of the main deck door on the starboard side.
- (f) Horn Strobe Alarm Indicators. Seven horn strobe alarm indicators are located on the ST as follows:
- 1 Hold Deck. A horn strobe is located on the starboard side of the front storage between Frames 5 and 6. A horn strobe is also located forward centerline at Frame 8 in the tankage space.
 - 2 Main Deck. A horn strobe is located in the mess area between Frames 9 and 10; one is located centerline aft in the walkway at Frame 19 and one is located on the forward port side of the generator room.
 - 3 01 Deck. A horn strobe is located on the forward of the linen locker on the starboard side at Frame 13.
 - 4 Pilot House Deck. A horn strobe is located forward of the fire alarm control panel on the port side at Frame 8.
- (2) Flooding Alarm. This system provides visual/audio indication of water levels in monitored compartments reaching a level above prescribed limits. Sensors are installed in the bilges of all spaces below the waterline and subject to flooding resulting from damage, improper operation, malfunction, or failure of equipment. Flooding in any compartment is indicated on alarm panel located on the forward bulkhead of the engine room. The system supports both manned and unmanned monitoring of the ST. High and low alarm lights are independently wired in each watertight space. An alarm light (blue) is mounted on the aft mast located topside.
- (3) Carbon Monoxide Indicators. Carbon monoxide indicators are installed in the generator room, the engine room, and berthing areas. The carbon monoxide alarm panel is located on the starboard side of the Pilot House console. Audible and visual alarms indicate warning and danger levels of Carbon Monoxide concentration in the air. Remote alarms are provided outside of the monitored spaces.
- (4) Rotating Beacons (Blue). A rotating beacon (United Marine Model 200-E) is located port of centerline in the engine room to indicate a general alarm.

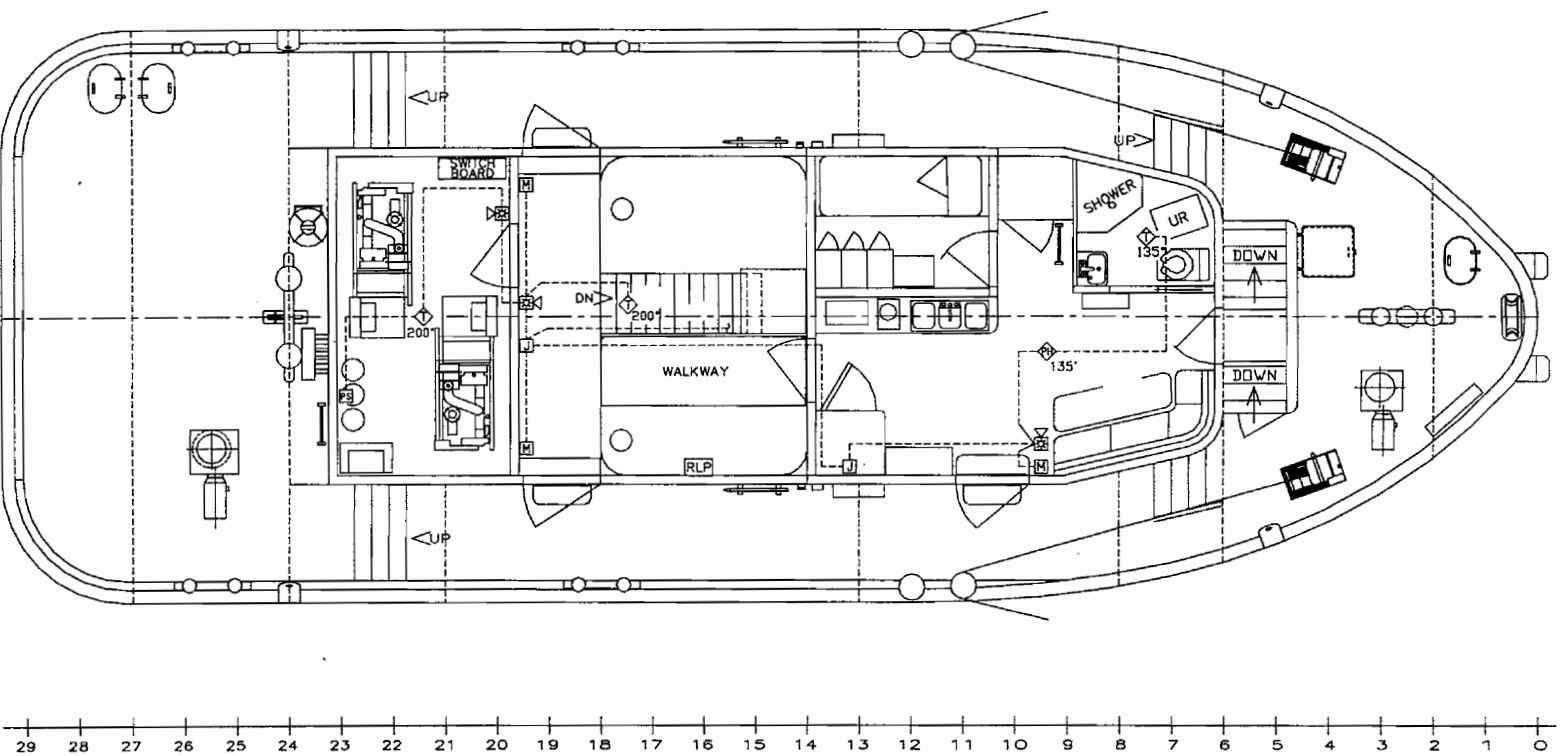


Pilot House Deck

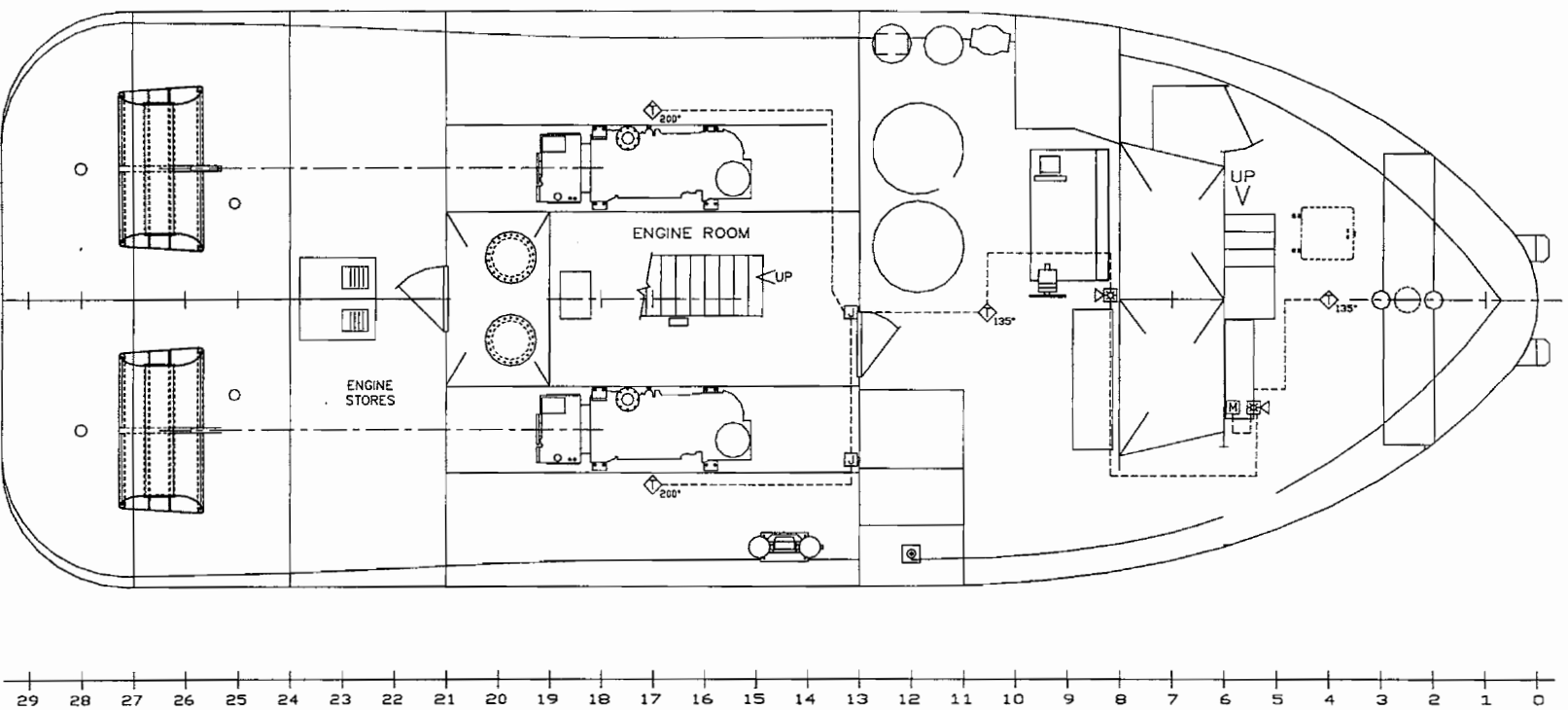
Figure 1-50. Fire Detection System, Sheet 1 of 5.









01 Deck
Figure 1-50. Fire Detection System, Sheet 2 of 5.



Main Deck
Figure 1-50. Fire Detection System, Sheet 3 of 5.



Hold Deck
Figure 1-50. Fire Detection System, Sheet 4 of 5.

<u>LEGEND:</u>	
FACP	FIRE ALARM CONTROL PANEL
RLP	REMOTE LAMP INDICATING PANEL
	PHOTOELECTRIC SMOKE DETECTOR W/135° F SENSOR
	THERMAL DETECTOR, RATE COMP/FIXED TEMP @ 135° F
	THERMAL DETECTOR, RATE COMP/FIXED TEMP @ 200° F
	HORN STROBE
	MANUAL PULL STATION
	ELECTRICAL BOX

Drawing Key

Figure 1-50. Fire Detection System, Sheet 5 of 5.

1.16.4. Steering System. A plan view of the steering system is provided in Figure 1-51. The system installed on the ST is a Control General Corporation electro-hydraulic, ram type steering system. The system operation is such that a selected electric motor driven pump or pumps on a hydraulic power unit supplies hydraulic oil to a solenoid-operated directional control valve (four-way valve). Electrical signals from one of the rudder command input devices (e.g. follow up lever/amp, non-follow up lever) are used to energize the left or right solenoid of a directional control valve(s) and the solenoid of a divert/unloading valves. Hydraulic oil is then ported to hydraulic steering cylinders to position the rudder in the desired angle.

Key components of the system include hydraulic components and electronic components. Each of these is described in the paragraphs that follow.

a. Electronic Components. The electronics components of the steering system include the following:

- (1) Pilot House Control/Alarm Panel. The pilothouse control/alarm panel (Model A0051N) consists of the following components:
 - (a) Steering Motor Selector Switch. The steering motor selector switch is used to select the desired pump, directional control valve, divert/unloading valve, and amplifier to be used for steering.
 - (b) Steering Mode Selector Switch. The steering mode selector switch is used to select the desired steering mode (e.g. follow up, non-follow up, or aft deck).
 - (c) Lamp Dimmer Control. The lamp dimmer control provides adjustment of the intensity of all indicator lamps on the Pilot House control/alarm panel.
- (2) Follow Up Levers. Two full follow up levers (Model 301147) are provided. The follow up lever unit is used to select a desired rudder position as indicated by the rudder angle indicator. The full follow up lever unit consists of a helm, lever, a rudder angle indicator, gearing, and a potentiometer.
- (3) Dual Non Follow Up Lever. A dual non-follow up lever (Model A0054C) is provided. The non-follow up lever is used to move the rudder to a desired position. The operator handle is spring centered to the center "OFF" position. Movement left or right will cause the rudder to move in the appropriate direction.
- (4) Rudder Angle Indicator. A rudder angle indicator (Model 303180) is provided. The rudder angle indicator works in concert with the feedback units to indicate rudder position. The face is illuminated via back lighting.
- (5) Triple Pot Feedback Units. Two triple pot feedback units (Model 300393-1) are provided. The feedback units perform various functions. They contain potentiometers that send electronic signals to the rudder angle indicators and the follow up amplifier in relation to the position of the rudder. In addition, the feedback units contain limit switches that are used to stop the rudder from moving beyond a pre-determined angle.
- (6) Pilot House Distribution Panels. A Pilot House distribution panel (Model A0071J) is provided. The panel is mounted in the HVAC room and provides a mechanism for consolidating wires.
- (7) Steering Amplifiers. Two steering amplifiers (Model 30112) are provided. The full follow up steering system incorporates two independent, single speed amplifier and power supply systems. This serves to provide rudder positioning in response to the operator's command in follow up mode. When the operator moves the full follow up steering lever to a position corresponding to a desired rudder angle as indicated by the rudder angle indicator, the steering amplifier, located in the HVAC room, causes the rudder to move exactly that angle and stop.
- (8) Emergency Steering and Transfer Switch Panel. An engine room panel with emergency steering control (Model A0072H) is provided. The junction box is used to consolidate wiring in the steering flat. The box also serves as a means for transferring steering to the emergency steering station

mounted on the unit. A two position switch is used to select the proper mode (Normal or Emergency) of control of the steering system.

- b. Hydraulic Components. The hydraulic components of the steering system include the following:
- (1) Hydraulic Power Unit. The hydraulic power unit, located in the Engine Stores, is one of the essential components of the steering system. The dual pump unit and its associated components convert electrical rudder orders into hydraulic fluid flow that moves and holds the rudders at an ordered angle. The hydraulic vane pumps a fixed flow rate. Each vane pump is driven by a 5hp, 1800 rpm, electric motor operating at 440VAC, 3 phase, 60hZ. The pilot operated directional control valve ports hydraulic fluid from the pumps to the proper ram or cylinder ports upon receipt of electrical commands. In a normal steering condition with no electrical commands, the entire fluid flow from the pump is returned to the reservoir via the four-way valve. When the directional control valve receives a rudder command it will port the fluid from the pump out to the cylinder rams.

The hydraulic power unit consists of the following equipment mounted on a dual 28-gallon (105.9884 Liters) hydraulic reservoir:

 - (a) Two 5hp totally enclosed fan closed (TEFC) electric motors.
 - (b) Two vane type hydraulic pumps.
 - (c) Two check valves.
 - (d) Two directional control valves.
 - (e) Return line filter.
 - (f) Two suction strainers.
 - (g) Relief valve.
 - (h) Two filler breathers.
 - (i) Two temperature/level gauges.
 - (j) Pressure gauge.
 - (2) 18-inch (0.4572 Meters) and 24-inch (0.6096 Meters) Stroke Hydraulic Steering Cylinders. The hydraulic cylinders are used to directly position the rudders. The body of each hydraulic cylinder is attached to the structure of the vessel on one end. The piston rod, which extends from the other end of the hydraulic cylinder, is attached to the rudder tiller arm. Hydraulic fluid, under pressure, flows into one end of the hydraulic cylinder and out of the other end forcing the piston within the cylinder to move either into or out of the cylinder. The piston is attached to the piston rod, and when the piston is forced to move, the piston rod moves and causes the rudder to move as well. When fluid is not flowing into or out of the hydraulic cylinder, the piston, piston rod, and therefore the rudder, cannot move. The flow of hydraulic fluid into and out of the hydraulic cylinders is provided by the dual hydraulic power unit under the control of the solenoid valves.
 - (3) Dual Cylinder Crossover Relief Valve. The cylinder relief valves are used to relieve high cylinder pressure in case the cylinders are acted upon by an outside force.
- c. Modes of Operation. The steering modes available include single speed non-follow up mode, single speed full follow up mode, and emergency steering mode. Each of these is discussed in the paragraphs that follow.

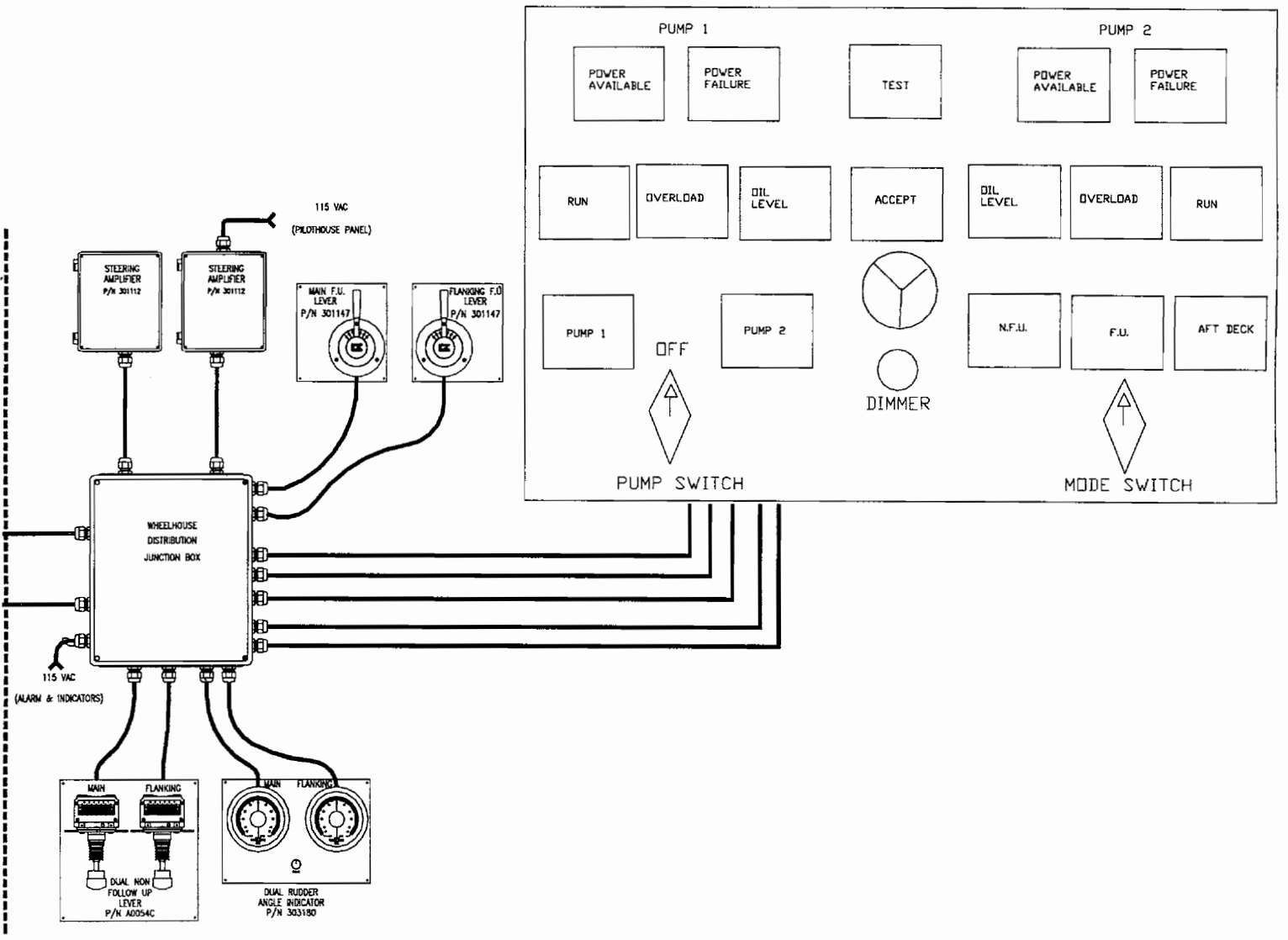
- (1) Single Speed Non-Follow Up Mode. The single speed non-follow up mode of steering facilitates directional movement of the rudder by directly controlling the solenoid operated 4-way valve via contacts on the non-follow up lever. Movement of the non-follow up lever handle to the left of its

spring centered position closes the left circuit. The rudder will then move to the left until the circuit is opened. Movement of the non-follow up lever handle to the right of its spring centered position closes the right circuit. The rudder will then move to the right until the circuit is opened. If the hydraulic or electrical power should fail during this mode, the rudder will hold its last position.

The circuits for the left/right non-follow up levers may be opened by any of the following means:

- (a) The lever is released (it is spring centered to the "OFF" position).
 - (b) The rudder limit switch is activated.
 - (c) The pump switch is turned to the "OFF" position.
- (2) Single Speed Full Follow Up Mode. The follow up mode of steering facilitates rudder position control from the follow up lever unit. When the follow up lever is moved to a desired rudder position, the rudder will follow this command by moving to that position. In this mode, the follow up amplifier receives signals from the follow up lever unit (the ordered rudder position) and the feedback unit (the actual rudder position). The amplifier then compares the ordered rudder position to determine which direction the rudder must be moved. The amplifier moves the rudder by controlling the solenoid operated four-way valve via solid state relays in the amplifier. If hydraulic or electrical power should fail during this mode, the rudders will hold the last position.
- (3) Emergency Steering Mode. The emergency steering mode is engaged when a switch on the emergency steering and transfer switch panel and junction box in the engine room is switched from the "NORMAL" position to the "EMERGENCY" position. All power to the PilotHouse is disconnected and transferred to the emergency steering station non-follow up push buttons. The emergency rudder angle indicator is powered by a separate source, isolating it from the PilotHouse.

Figure 1-51. Steering System, Sheet 1 of 2



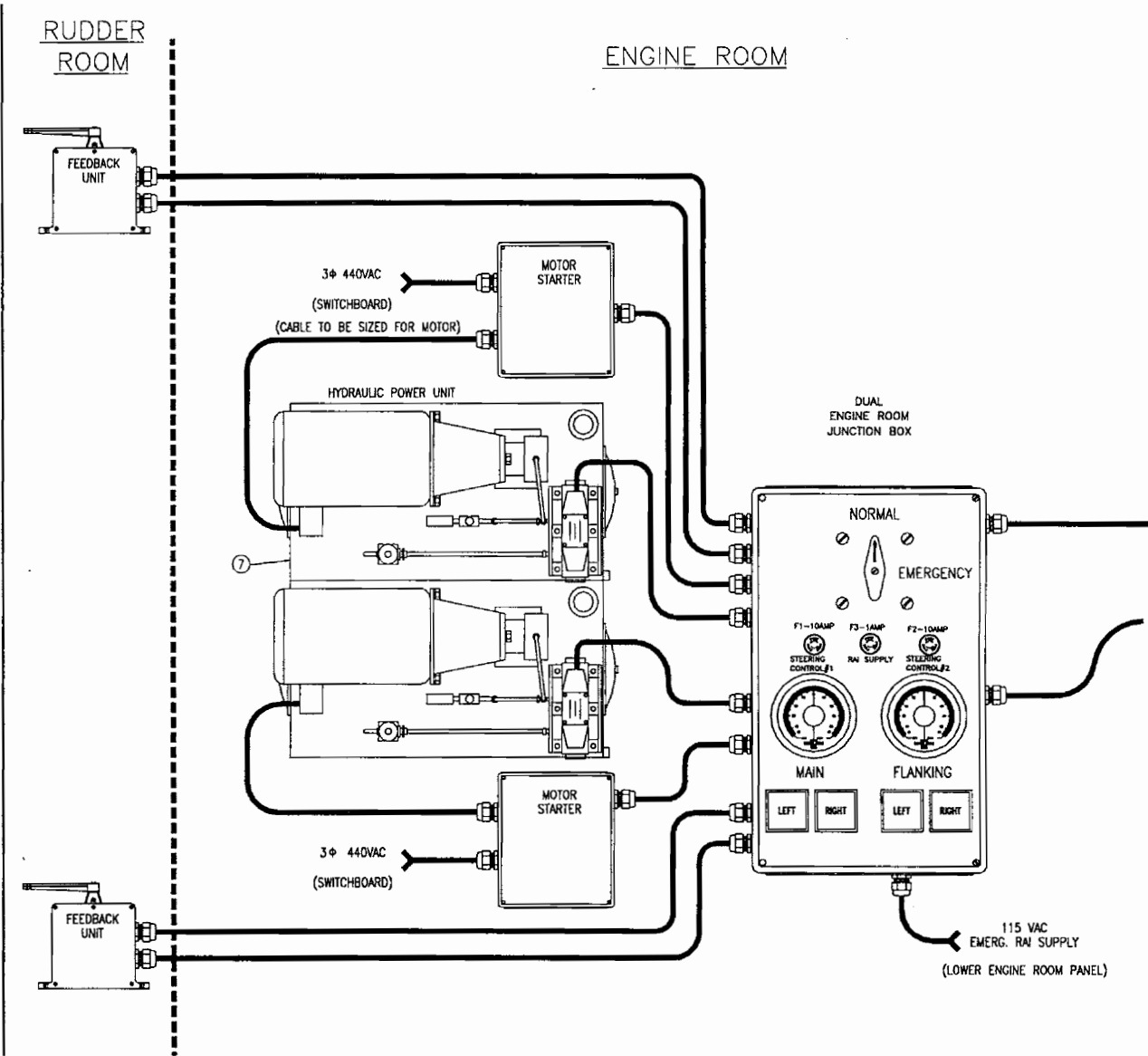


Figure 1-51. Steering System, Sheet 2 of 2

1.16.5 HVAC System. The ST is equipped with an Air Comfort type HVAC system. A plan view of the HVAC system is provided in Figure 1-52. The following sub-paragraphs describe the ST's heating, ventilation, and air conditioning systems.

- a. Heating. The heating system consists of a 460VAC/3 phase/60 Hz duct heater (11.8 kW). The duct heater is thermostatically controlled from the PilotHouse. In addition, two electric zone heaters are provided in the generator room, one for each generator. The air handling unit disseminates the heated air throughout the ST as set on the Pilot House thermostat.
- b. Ventilation. Mechanical ventilation, using vaneaxial fans for supply and/or exhaust, designed for marine application is used to supply/exhaust air to/from the engine room, generator room, and forward storeroom. The ventilation system is designed to carry away the radiated heat of the machinery space equipment. The head is fitted with an exhaust fan having a capacity of two air changes per minute. The storeroom is provided with a ventilation supply fan having a capacity of one air change per six minutes.
- c. Air Conditioning. The air conditioning system installed on the ST has two functioning units. The compressor is located aft of the Pilot House, while the air handling unit is positioned within the HVAC Room. The two units are interconnected by means of refrigerant piping and electrical wiring. Each of these units is described in the paragraphs that follow.
 - (1) Air Cooled Condensing Unit. The air-cooled condensing unit (Air Comfort Model MACU-060) has a five-ton nominal capacity and is equipped with copper tubing and an aluminum fin epoxy coated condenser coil. Cooled refrigerant from the condenser is routed to the coils in the air-handling unit for dispersal of chilled air.
 - (2) Air Handling Unit. The air-handling unit (Air Comfort Model MAHU-060) contains a free flow fan which circulates the conditioned air from the coils. The air-handling unit provides conditioned air through ductwork to the following areas:
 - (a) 01 Deck. An air conditioning supply grille is provided in the two-person berth and a supply grille is located in the HVAC room.
 - (b) Main Deck. An air conditioning supply grille is provided in the three-person berth as well as in the mess area.
 - (c) Pilot House Deck. Four air conditioning supply grilles are provided in the Pilot House, 2 each port and starboard.

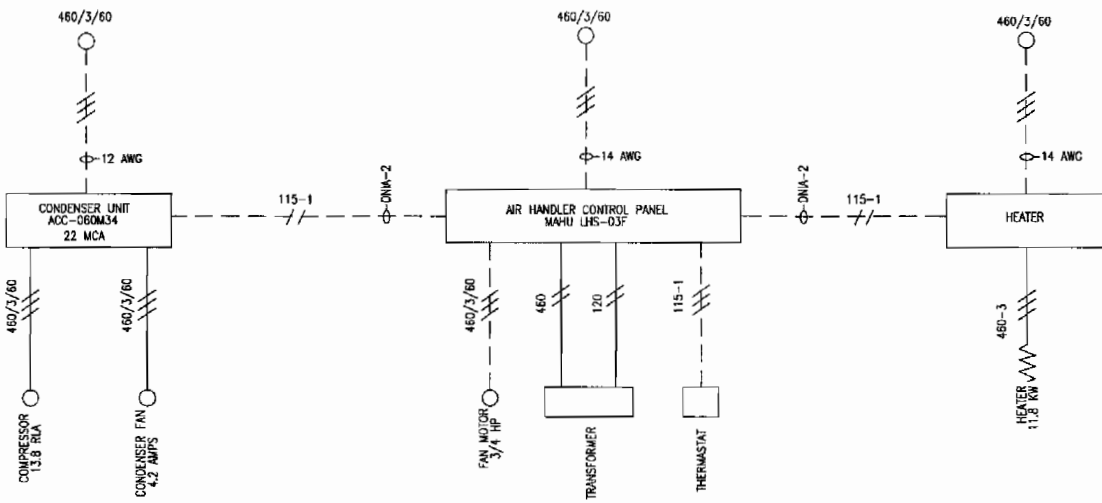
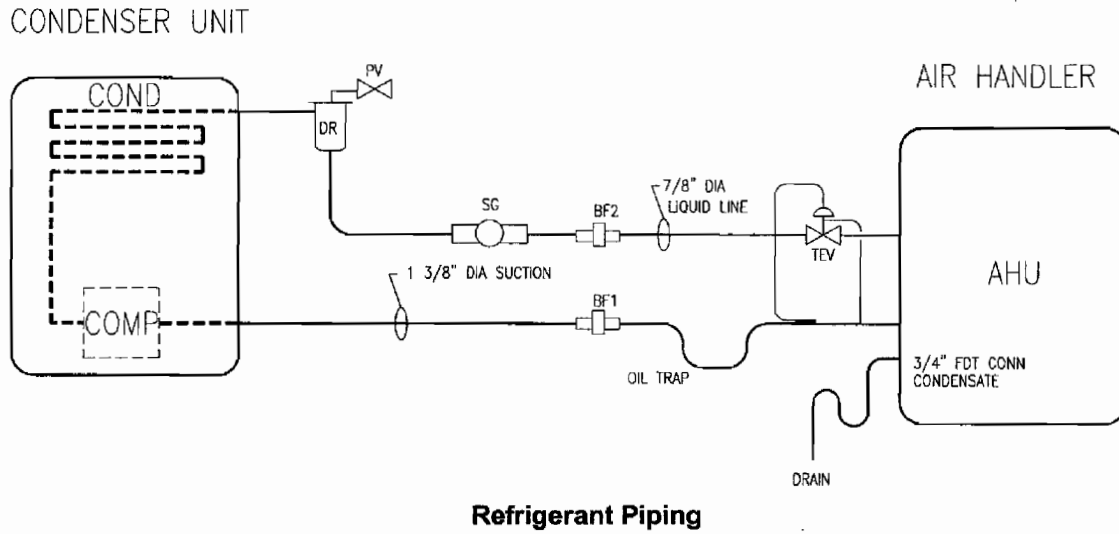
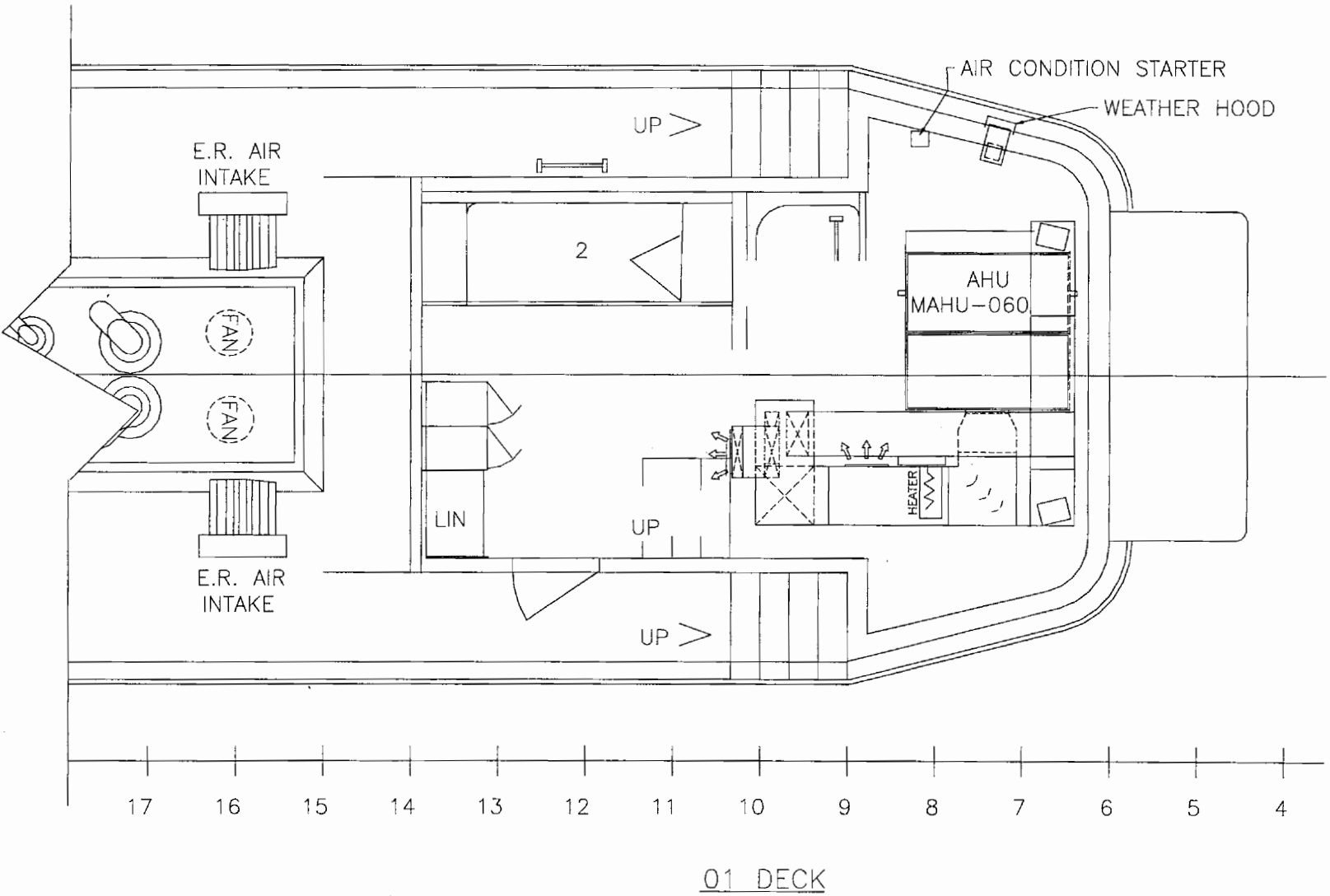
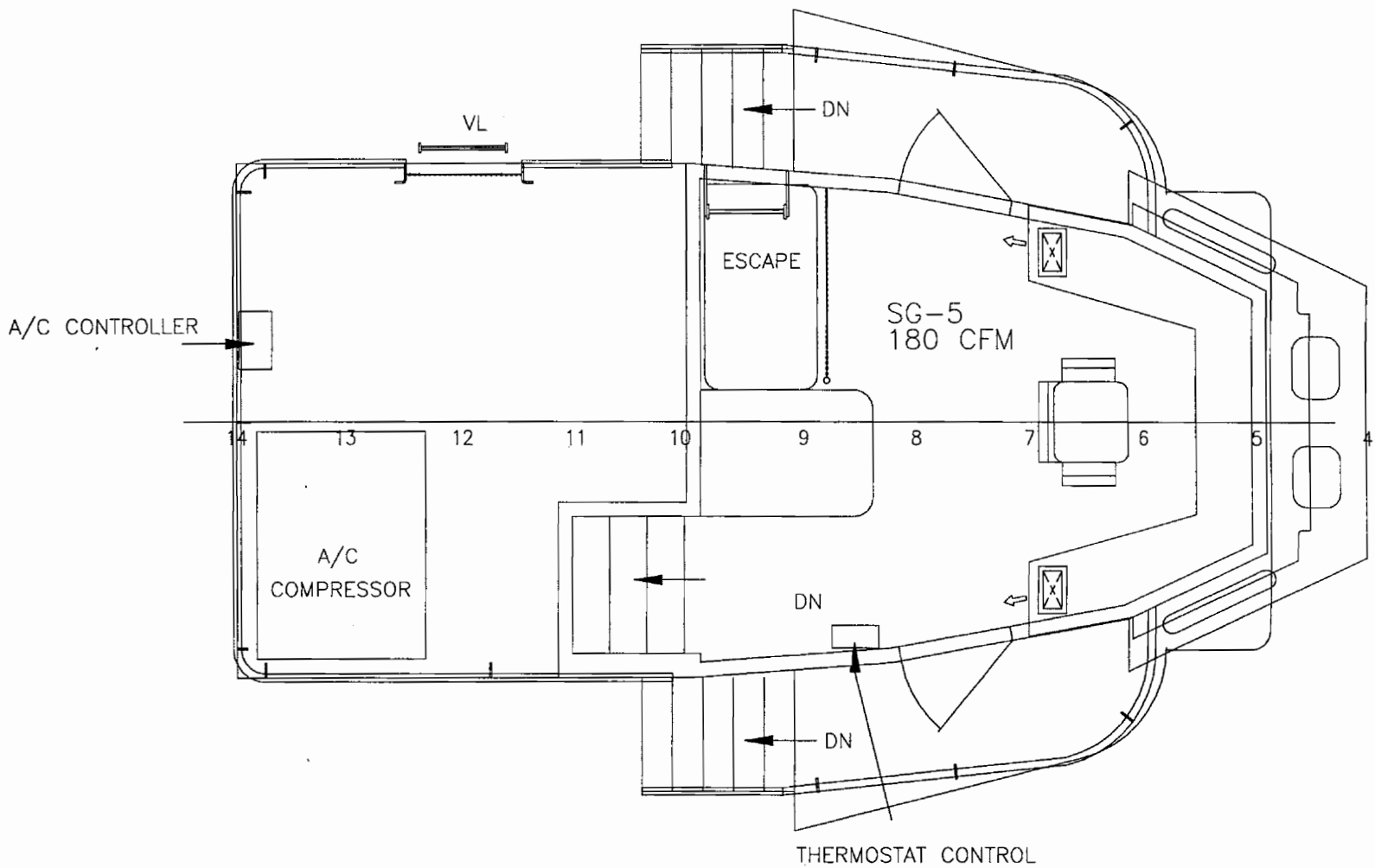


Figure 1-52. HVAC System, Sheet 1 of 4



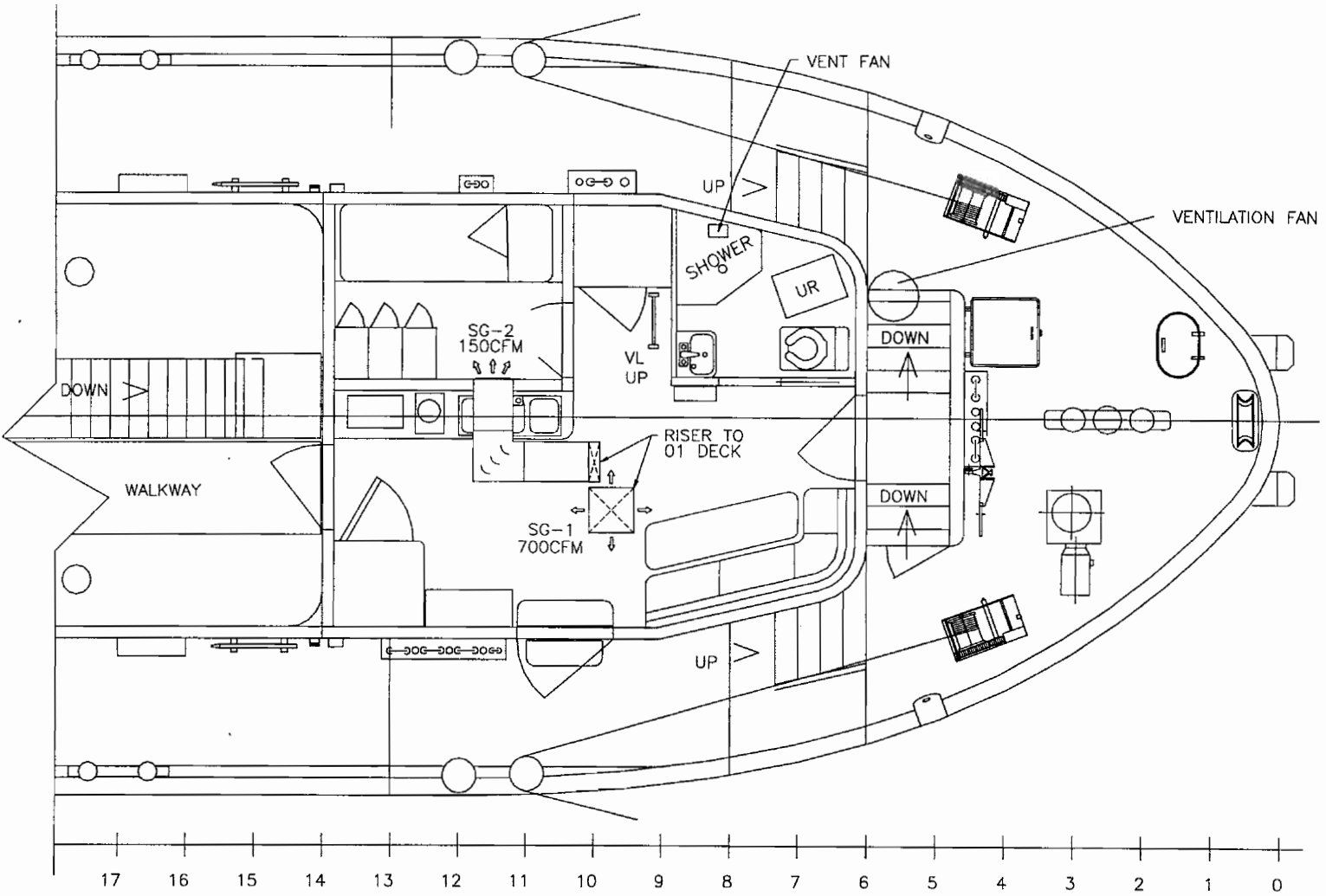
01 Deck Plan View

Figure 1-52. HVAC System, Sheet 2 of 4



Pilot House Deck Plan View

Figure 1-52. HVAC System, Sheet 3 of 4



Main Deck Plan View

Figure 1-52. HVAC System, Sheet 4 of 4.

MAIN DECK

1.16.6 Potable Water System. A plan view of the potable water system is provided in Figure 1-53. The potable water system consists of two 392 gallon (1,4883.8376 Liters) vented holding tanks, water pump (25 gpm @ 74 Feet (22.5552 Meters) of head, 40 psi cut-in and 60 psi cut-out), 80 gallon (302.824 Liters) pressure tank, water heater, and associated valves, vents, and piping. Holding tanks, located in the tankage space, as supplied from shore via above-deck filling station, provide potable water to various points on the vessel. Both tanks are equipped with level gauges as well as high and low level alarms. The water pump draws from the potable water tanks and supplies water to the pressure tank and water heater, and above deck to shower, lavatory and galley sink.

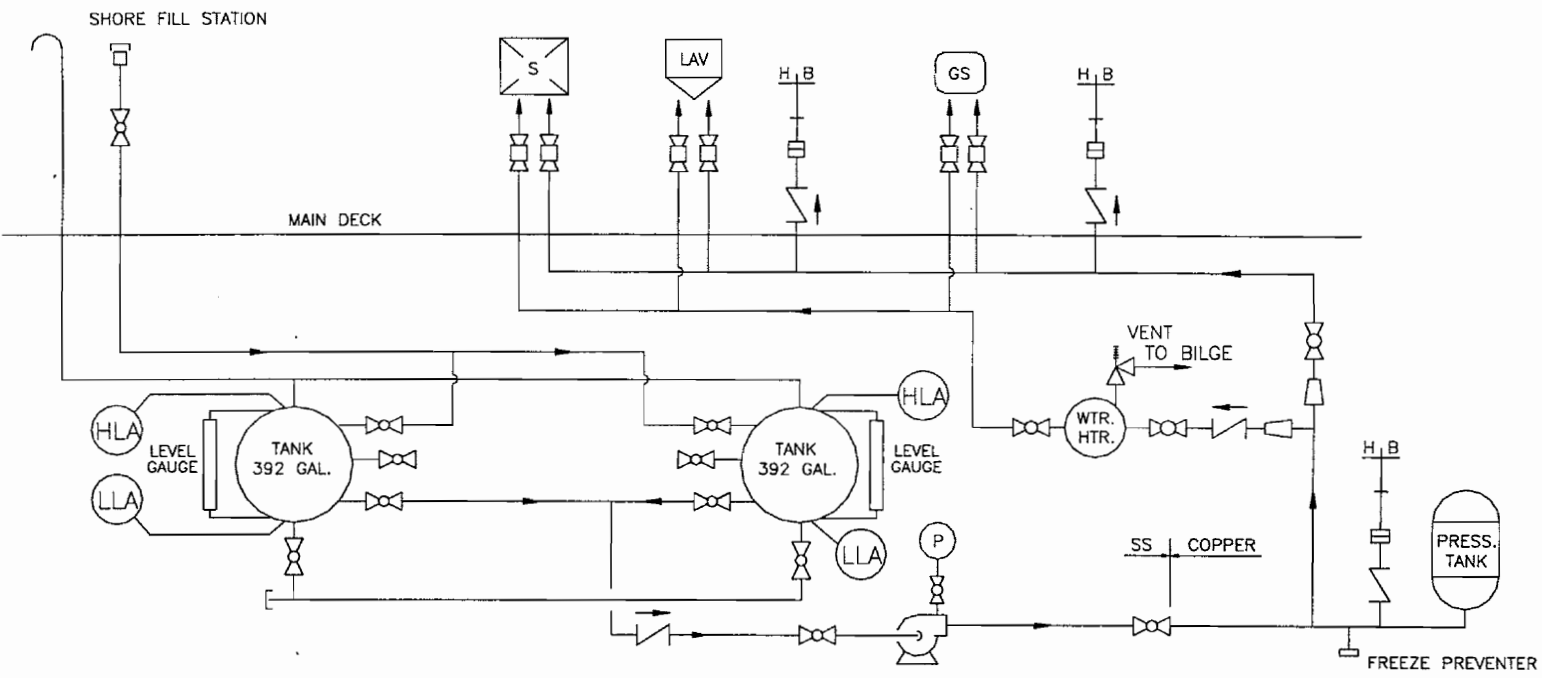
1.16.7. Bilge/Ballast/Firemain Systems. A plan view of the bilge/ballast/firemain system is provided in Figure 1-54. The following sub-paragraphs describe the ST's integrated bilge, ballast, and firemain systems. The system is designed such that two bilge/ballast pumps are provided and a fire pump is provided. Either of the bilge/ballast pumps may serve as backup to the fire pump.

1.16.8. Bilge System. The bilge system is comprised of pumps, controllers, bilge manifold and associated valves, vents, and piping. Two sump pumps are provided as well. Each of these is discussed below:

- a. Bilge/Ballast Pumps. Pumps are designated as Bilge/Ballast Pump #1 and Bilge/Ballast Pump #2. The pumps are 5 HP Burks Model 350G6-2-AB operating at 3500 RPM with a 460VAC, 3 phase, 60 hertz power supply.
- b. Bilge Manifold and Associated Valves, Vents, and Piping. The designated bilge pump draws from engine room bilge (and/or bilge manifold) and pumps to Oily Water Tank via 2-inch (0.0508 Meters) piping.
- c. Bilge/Ballast Pump Controllers. Motor controllers are designated as Bilge/Ballast Pump #1 Controller and Bilge/Ballast Pump #2 Controller. The controllers facilitate starting of the electric pumps. Pumps are energized and de-energized at the controller.
- d. Sump Pumps. Two sump pumps (Rule Model 3700) are provided for pumping out the engine shaft sumps. The pumps are capable of pumping 3700 gallons (14,005.61 Liters) per hour and are submersible with a permanently lubricated ball bearing motor.

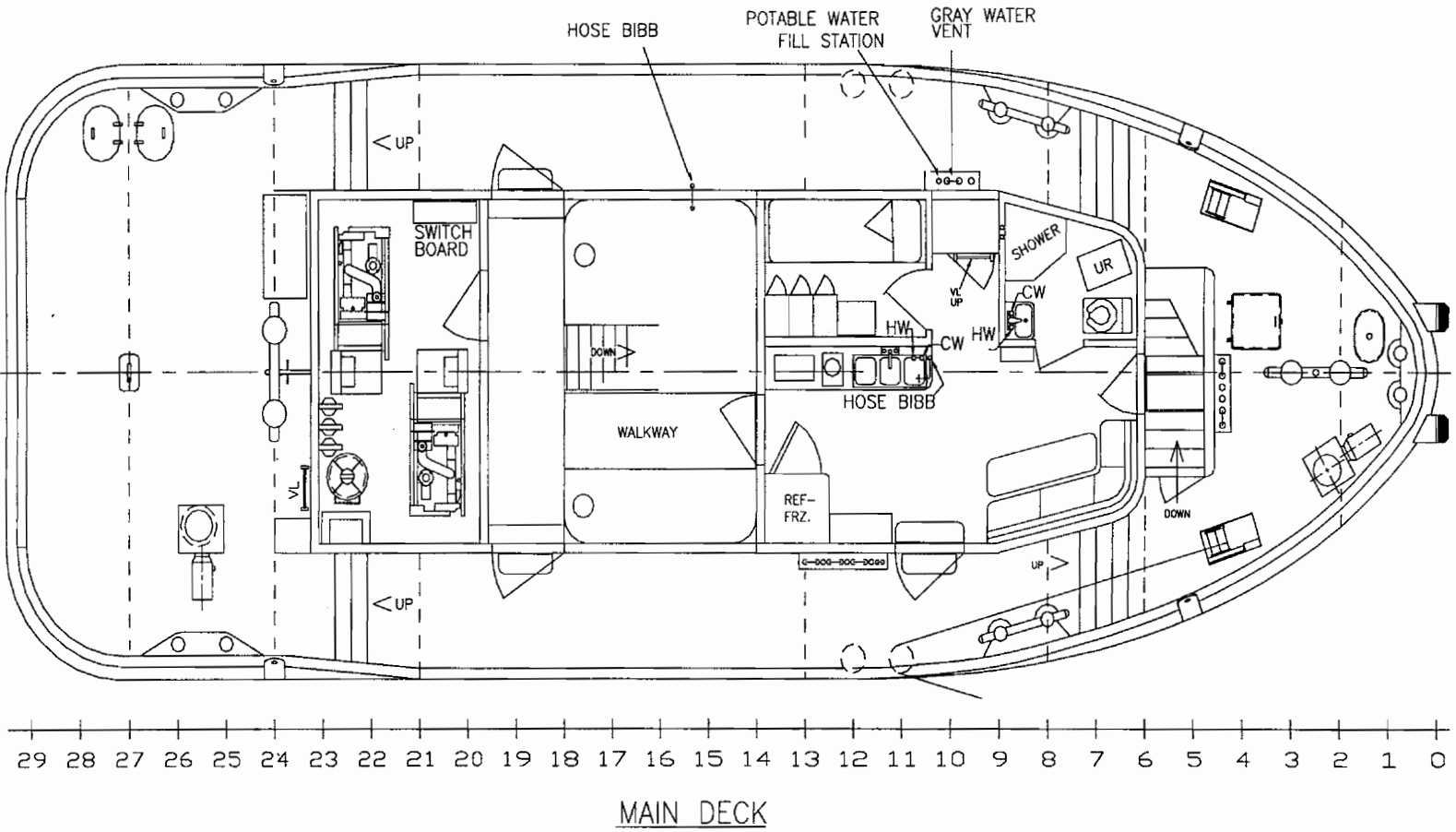
1.16.9. Ballast System. The ballast system is comprised of pumps, ballast compartment, and associated valves, vents, and piping. Each of these is discussed below:

- a. Bilge/Ballast Pumps. Pumps are designated as Bilge/Ballast Pump #1 and Bilge/Ballast Pump #2. The pumps are designed to be capable of several functions. The pumps can draw from the bilge manifold and pump to the Oily Water Tank; or, they can draw from the sea chest and pump to fire stations, ballast compartment, or to the gray-water tank flushing connection. They can also draw from ballast compartment and pump to overboard discharge.
- b. Ballast Compartment. The ballast compartment is located in the Hold Deck between Frames 0 and 2 from centerline, port and starboard.
- c. Ballast Compartment Vent and System Valves. A vent for the ballast compartment is located on the starboard side of the forward main deck. This vent provides a mechanism for air to escape from the ballast compartment during filling and for air to return when evacuating the compartment. When the compartment reaches capacity, ballast water will flow from the vent, indicating full capacity. The ballast system valves facilitate the selection of pumping operations to and from the ballast compartment.
- e. Bilge/Ballast Pump Controllers. Motor controllers are designated as Bilge/Ballast Pump #1 Controller and Bilge/Ballast Pump #2 Controller. The controllers facilitate starting of the electric pumps. Pumps are energized and de-energized at the controller.

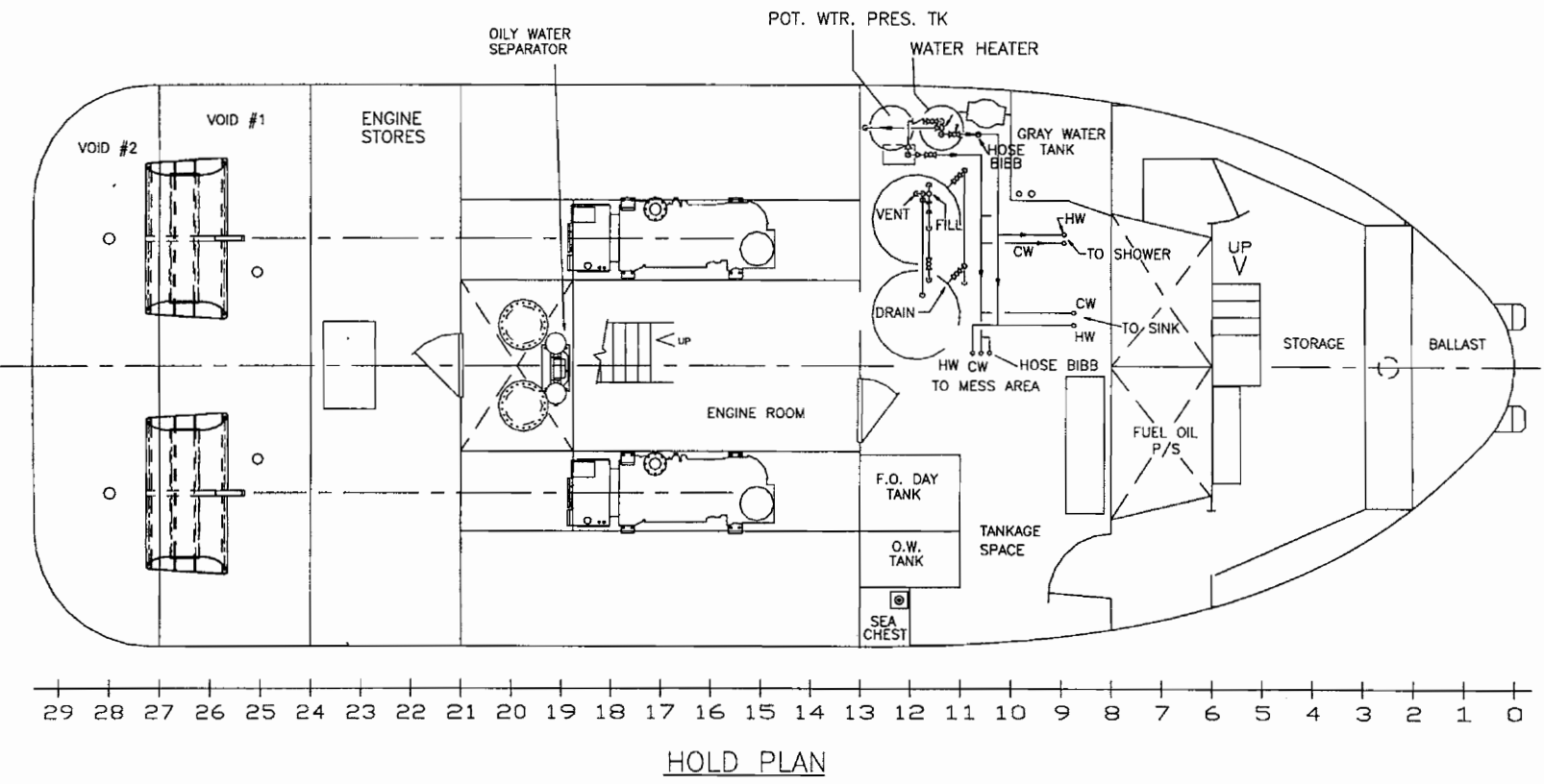


POTABLE WATER SCHEMATIC

Figure 1-53. Potable Water System, Sheet 1 of 4.



Main Deck Arrangement
Figure 1-53. Potable Water System, Sheet 2 of 4



Hold Deck Arrangement
Figure 1-53. Potable Water System, Sheet 3 of 4

SYMBOL LIST

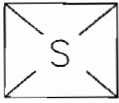










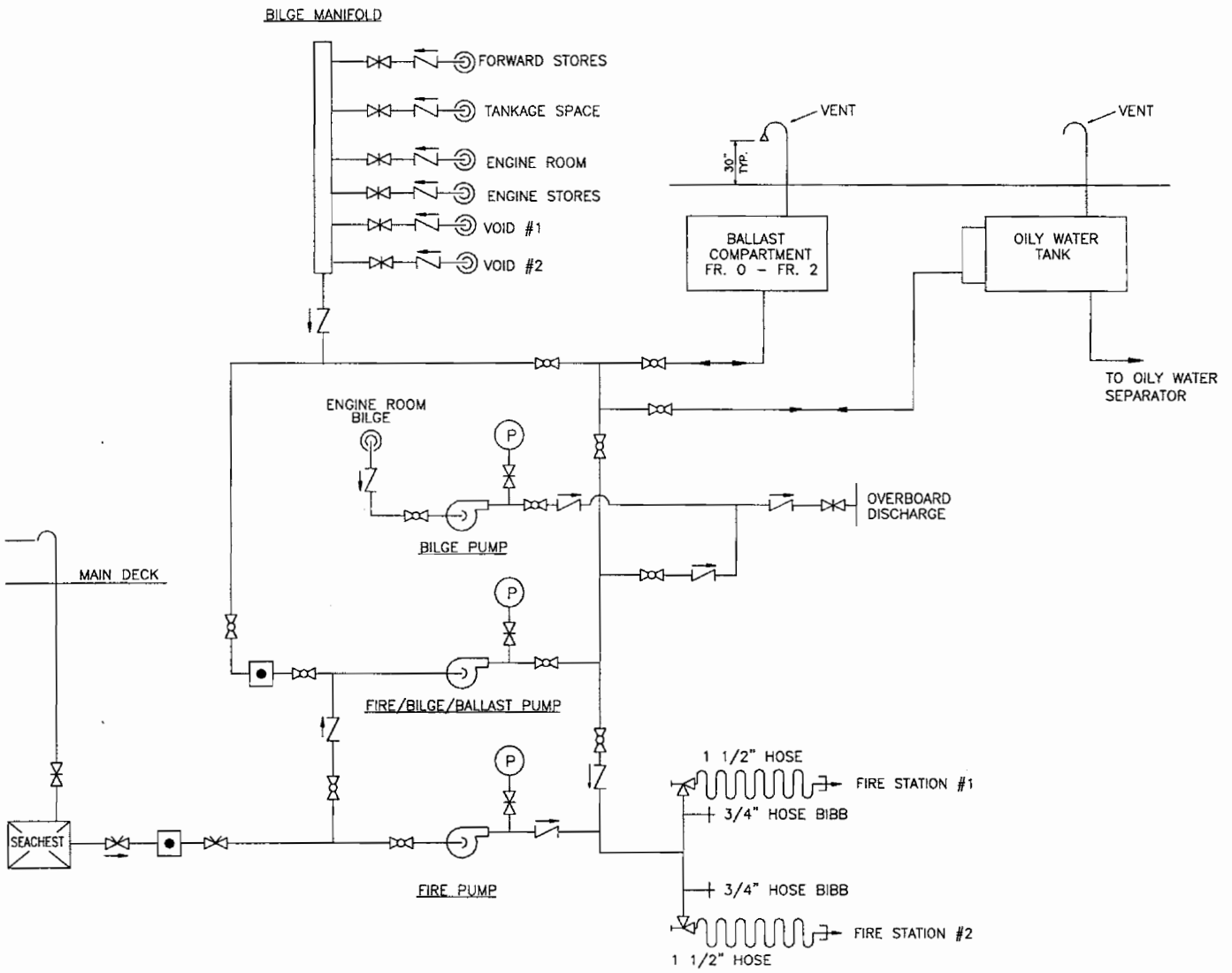
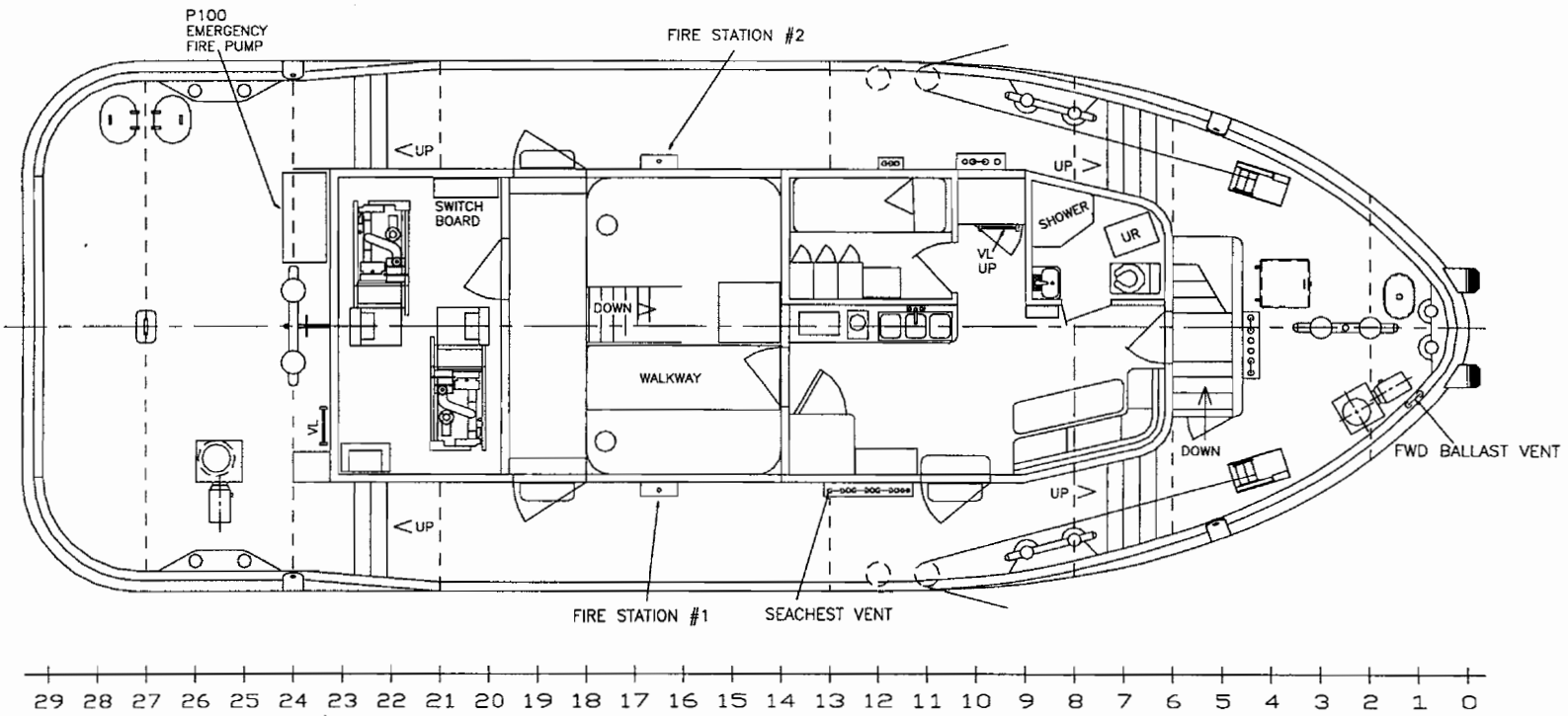
	SHOWER		HOT WATER HEATER
	LAVATORY		PRESSURE GAUGE
	GALLEY SINK		CHECK VALVE
	PRESSURE TANK		GATE VALVE
	PIPE CAP		BALL VALVE
	REDUCER		SUPPLY VALVE
	VACUUM BREAKER		PRESSURE RELIEF VALVE
			HIGH LEVEL ALARM
			LOW LEVEL ALARM

Figure 1-53. Potable Water System, Sheet 4 of 4



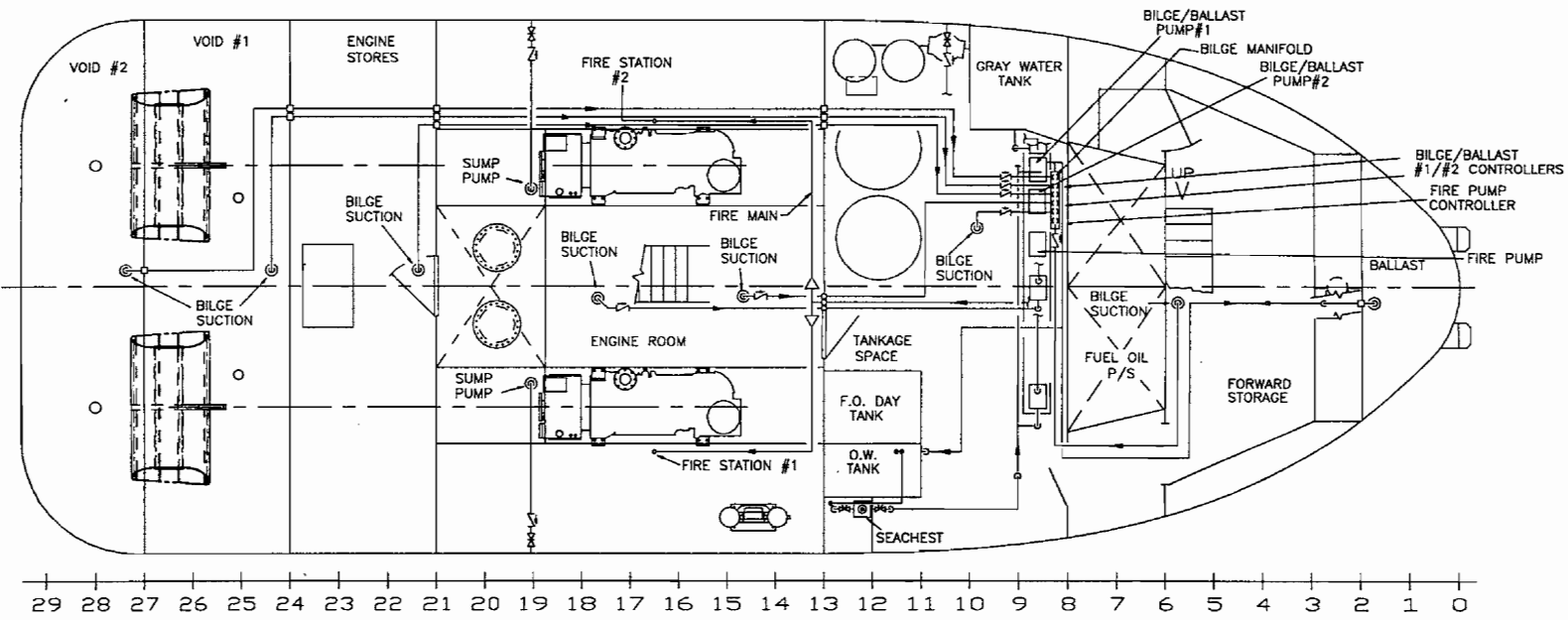
Bilge/Ballast/Firemain Schematic

Figure 1-54. Bilge/Ballast/Firemain System, Sheet 1 of 4.



Main Deck Arrangement

Figure 1-54. Bilge/Ballast/Firemain System, Sheet 2 of 4.



Hold Deck Arrangement

Figure 1-54. Bilge/Ballast/Firemain System, Sheet 3 of 4.














<u>SYMBOL LIST</u>			
	BUTTERFLY VALVE		CHECK VALVE
	GATE VALVE		PRESSURE GAUGE
	GLOBE VALVE		WASHDOWN NOZZLE
	SIMPLEX STRAINER		FIRE NOZZLE
	ANGLE VALVE		SUCTION STRAINER
	BALL VALVE		CENTRIFUGAL PUMP
	INVERTED VENT VALVE		

Figure 1-54. Bilge/Ballast/Firemain System, Sheet 4 of 4.

1.16.10. Firemain System. The firemain system is comprised a fire pump, two fire stations and associated valves, vents, and piping. The bilge/ballast pumps may serve as backup to the fire pump. Each of these is discussed below:

- a. Fire Pump. The 10 HP Fire Pump is an Ingersoll-Dresser Model D824 operating with a 460VAC, 3 phase, 60-hertz power supply. The pump takes suction from the sea chest and discharges to two 1- $\frac{1}{2}$ inch (0.0381 Meters) fire stations on the main deck, port and starboard.
- b. Fire Stations. Each fire station is outfitted with a USCG approved fire hose with a dual nozzle, spanner wrench, and all necessary couplings. Hoses are hung from a rack with provisions for easy pay out of fire hose. The fire pump is electric driven. In addition to the 1- $\frac{1}{2}$ inch (0.0381 Meters) hose fittings, a $\frac{3}{4}$ -inch (0.01905 Meters) hose bib is installed on each fire station.
- c. Emergency Fire Pump. An emergency fire pump is provided. The P-100 portable fire pump, when stowed, is located on the Main Deck between Frames 23 and 25, port side of centerline. The pump is capable of discharging 100 GPM (378.53 LPM) at 93PSI and comes complete with a wrap-around roll cage.

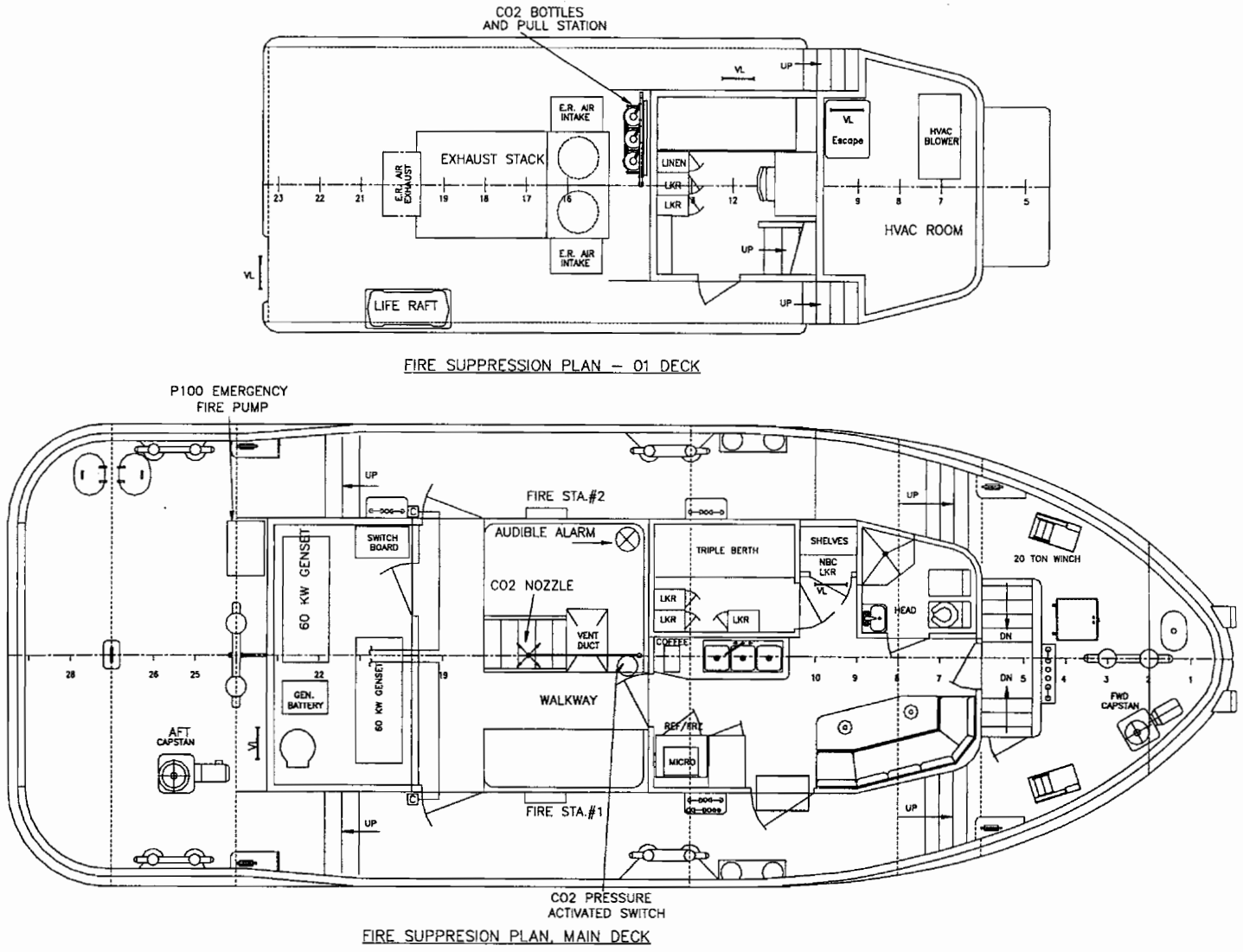
1.16.11. Carbon Dioxide Fire Suppression System. A plan view of the CO₂ system is provided in Figure 1-55. A fixed carbon dioxide (CO₂) fire suppression system has been installed in the engine room. The system utilizes optical sensors for detection. The system is designed to allow remote manual-electric and manual-mechanical carbon dioxide gas release. "FIRE" and "AGENT RELEASE" visual indicators on the control panel and audible alarms are installed in the Pilot House console. A signal from the optical sensors will activate after 45 seconds and release carbon dioxide gas into the diesel engine space. In the manual-electric mode of operation, the carbon dioxide gas is released by actuation of a switch on the fire control and monitoring panel. The manual-mechanical release is accomplished by the activation of a pull handle. The pressurized containers and all associated system components are designed for an ambient temperature of 130° F (53.9°C).

Automatically actuated audible alarms, located in the engine room, provide a warning of the release of fire extinguishing carbon dioxide (CO₂) gas. The system is fitted with an approved delayed discharge arranged so that the alarm will be sounded for at least 45 seconds before the carbon dioxide gas is released in the protected space. When activated, the alarm will automatically shut down the diesel engine and heat exchanger fan motors and close the electrically controlled louvers. The alarm depends on no other source of power, other than pressure from the fire extinguishing carbon dioxide gas.

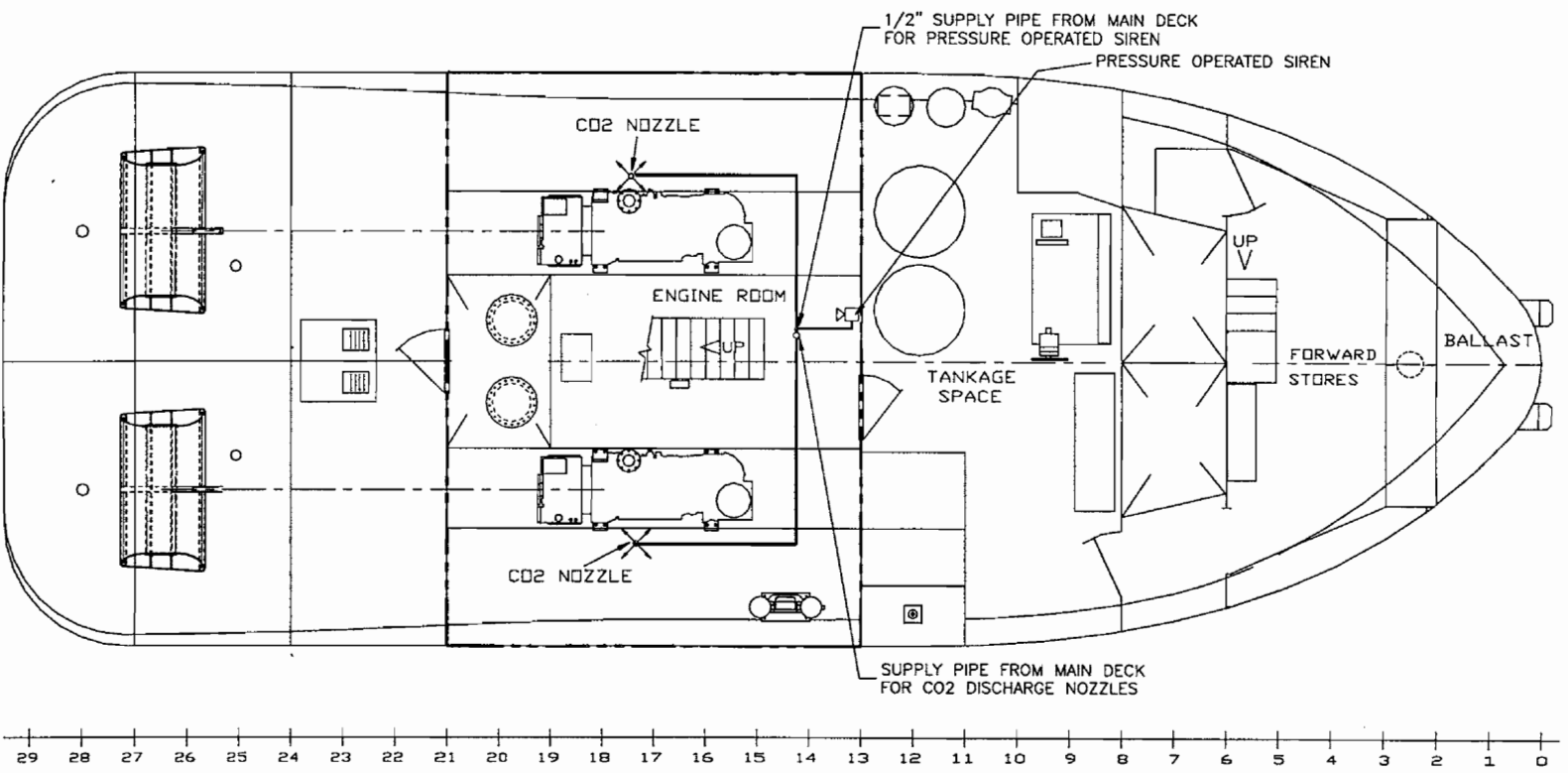
WARNING

CO₂ FIRE SUPPRESSANT HAZARDS

All personnel must immediately evacuate spaces when CO₂ fire suppressant systems are activated. CO₂ displaces oxygen to smother combustion. It can cause death by suffocation if personnel do not evacuate within 45 seconds after activation handle is pulled.



01 Deck and Main Deck Arrangements
Figure 1-55. Fire Suppression System, Sheet 1 of 2.



Hold Deck Arrangements

Figure 1-55. Fire Suppression System, Sheet 2 of 2.

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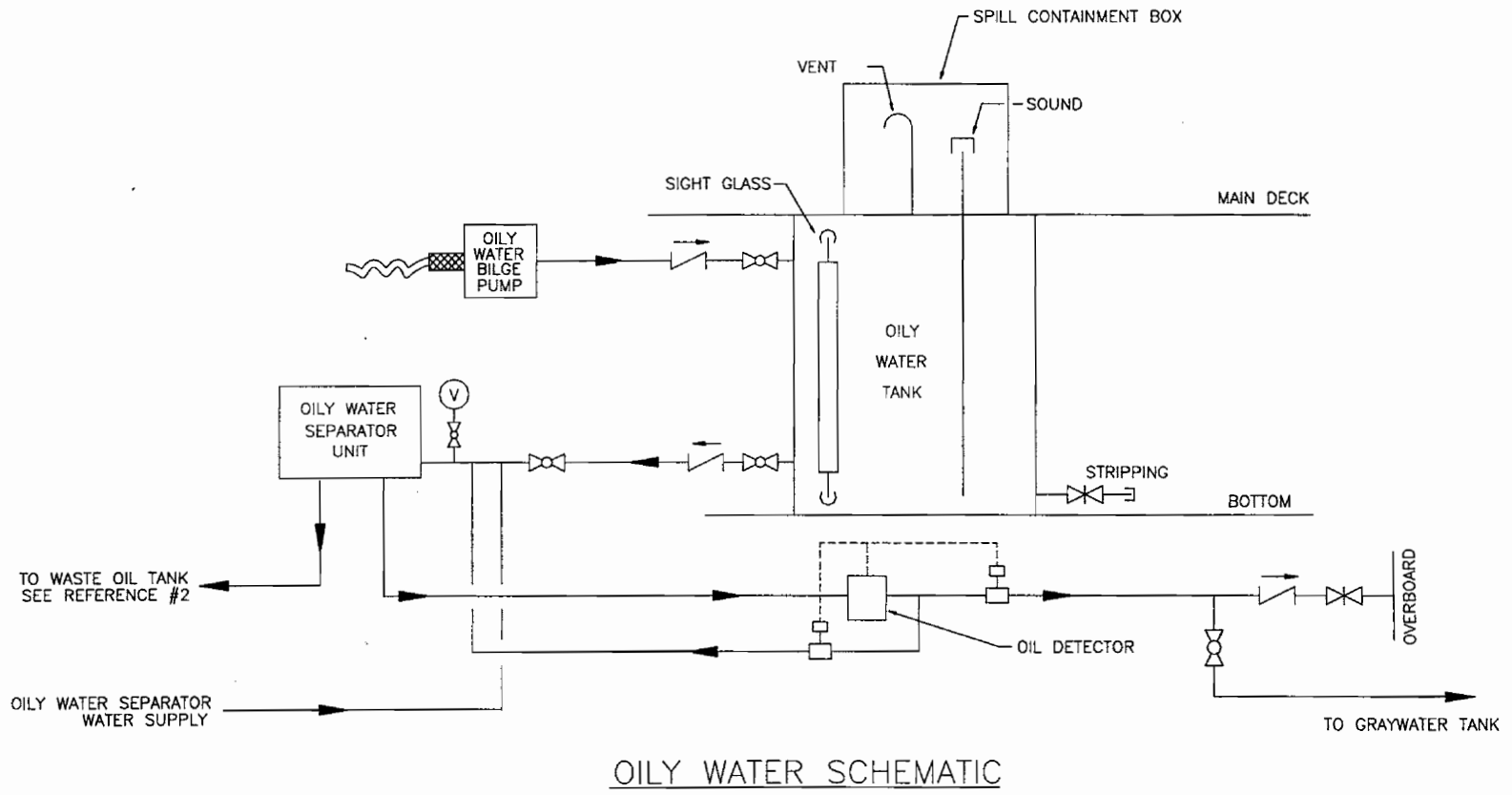
1.16.12. Oily Water System. A plan view of the oily water system is provided in Figure 1-56. Oily water from the bilge manifold is pumped by the bilge pump to the oily water tank. Oily water is drawn by the oily water separator and, after separation, pumps waste oil into the waste oil tank, located beneath the oily water separator, and waste water is pumped to the overboard discharge.

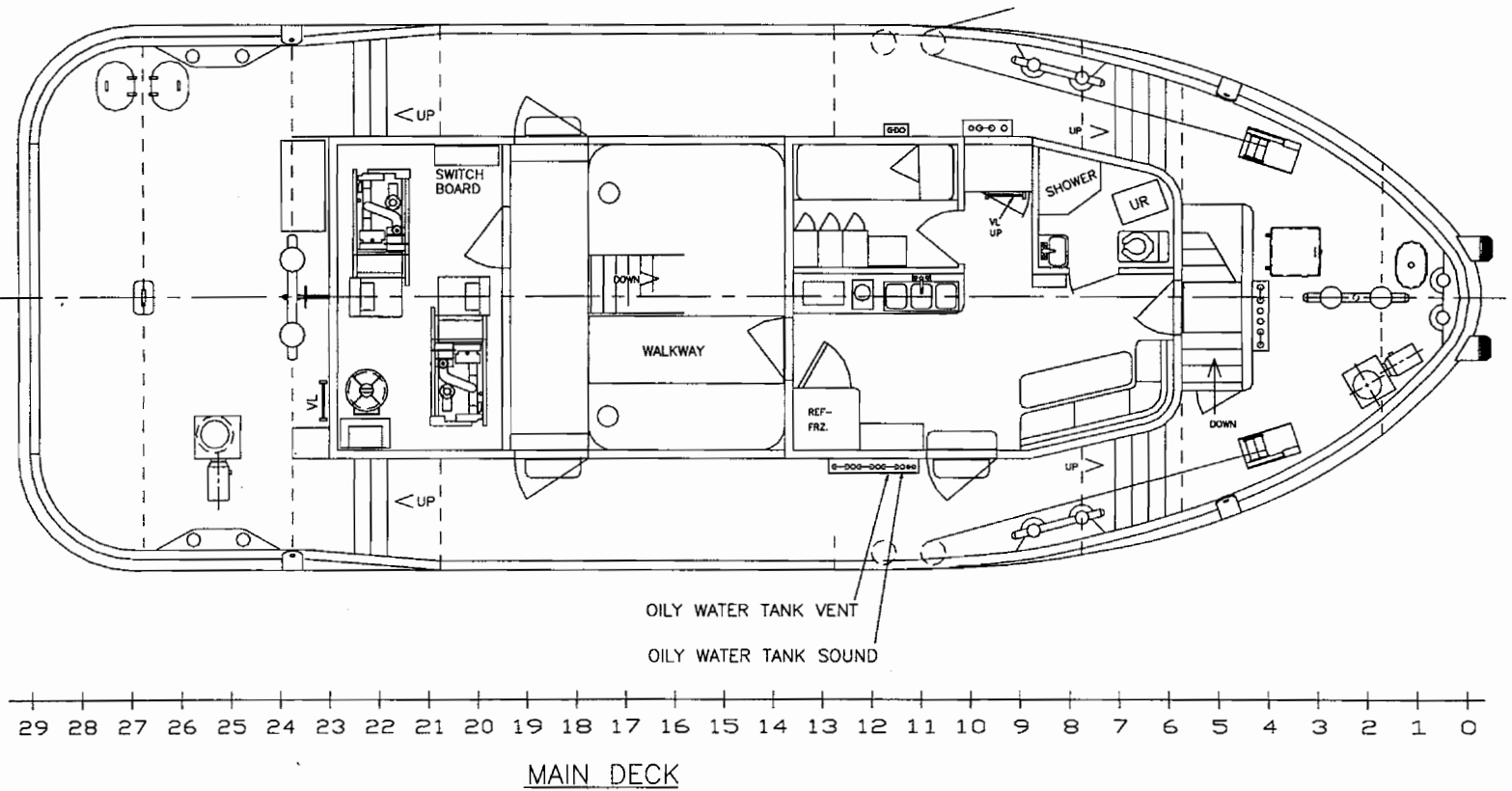
A Nelson #96504A Model 10025, 15 PPM, 2.5 GPM (9.46325 LPM), oily water separator collects oily water from the bilge and discharges separated oil to waste oil tank and water to overboard discharge. The separator is equipped with an oil content monitor alarm that automatically dumps back to the bilge when an unacceptable concentration of oil is detected.

1.16.13. Grey Water System. A plan view of the grey water system is provided in Figure 1-57. The grey water system consists of a grey-water holding tank (759 gallons; 2,872.34 Liters), a sight level glass, and a grey water transfer pump and controller. Grey water from the galley sink, the lavatory, and the shower drains to the grey-water holding tank and oily water separator.

- a. Grey Water Pump. The $\frac{3}{4}$ - HP pump motor is a Teel Model 2P375 operating on a 450VAC, 3 phase, 60 hertz power supply.
- b. Grey Water Pump Controller. The controller facilitates starting of the electric pump. The pump is energized and de-energized at the controller.
- c. Grey Water Tank. The tank is equipped with a sight glass and high level alarm. Gray water is pumped by the gray water transfer pump to an overboard discharge.

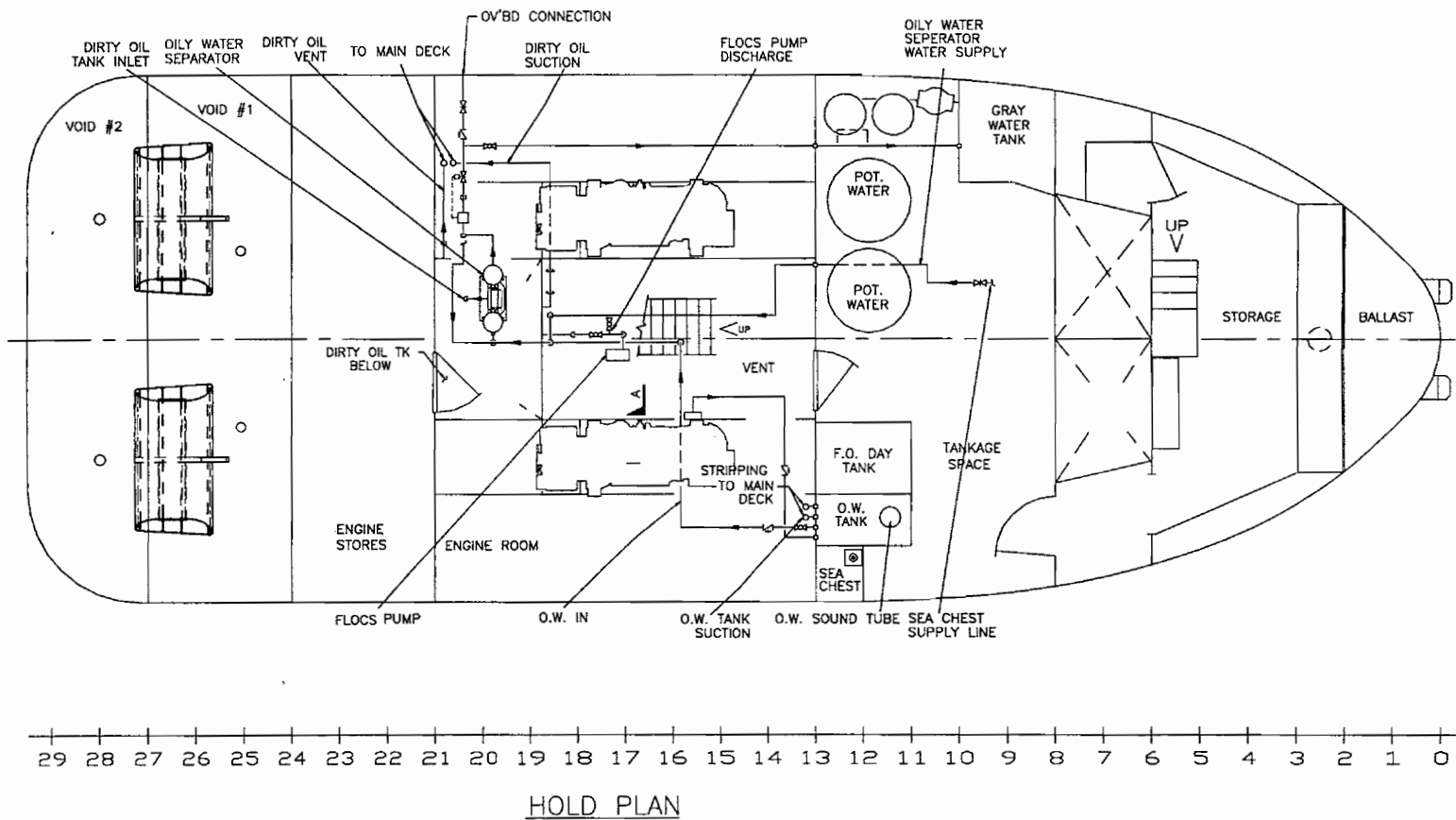
Figure 1-56. Oily Water System, Sheet 1 of 4.





Main Deck Arrangement
Figure 1-56. Oily Water System, Sheet 2 of 4.

Hold Deck Arrangement
 Oily Water System, Sheet 3 of 4.



TM55-1925-236-12








<u>SYMBOL LIST</u>			
	GATE VALVE		CHECK VALVE
	BALL VALVE		FLEXIBLE HOSE
	PIPE CAP		VACUUM GAUGE
	ELEC. CONTROL VALVE		

Figure 1-56. Oily Water System, Sheet 4 of 4.

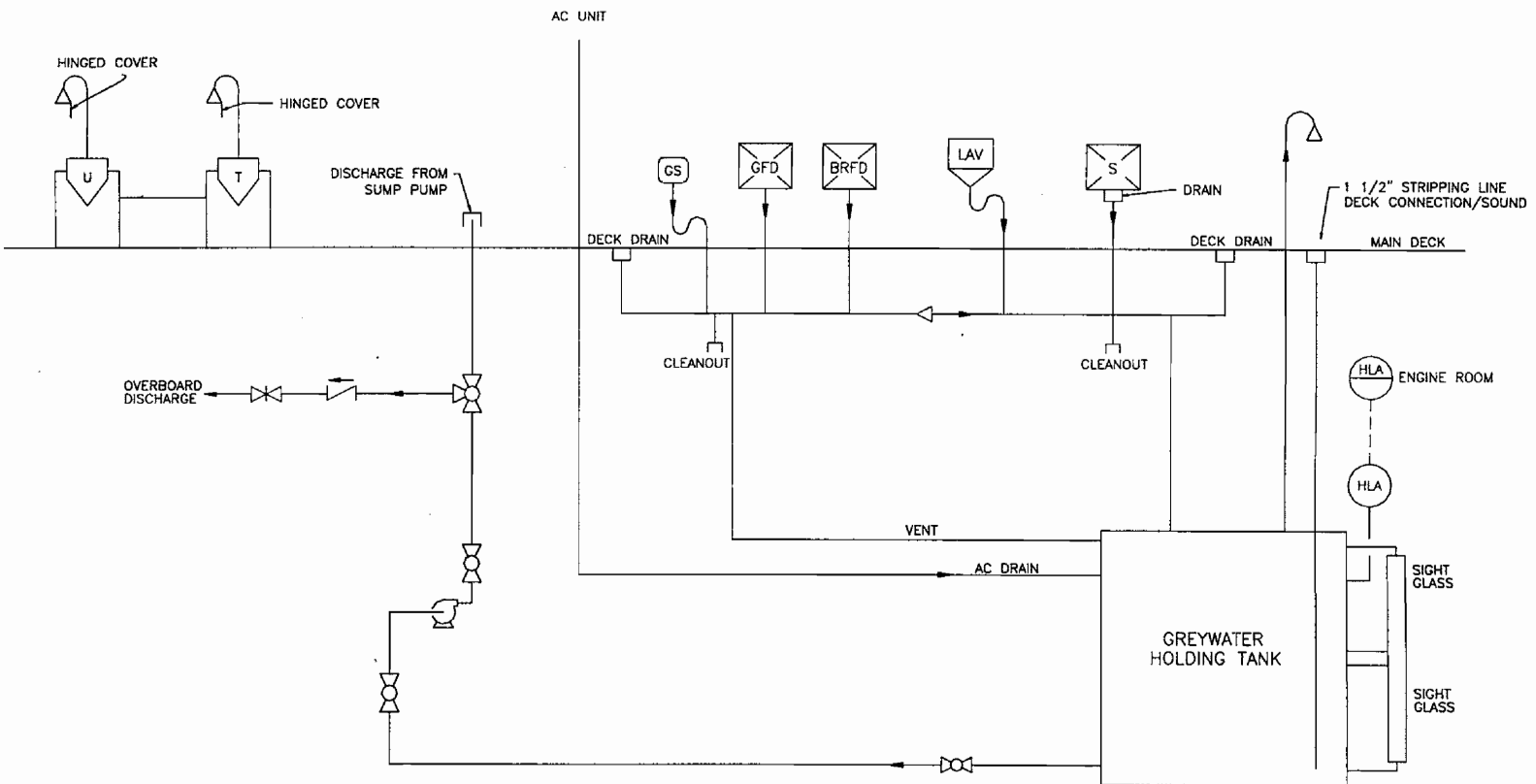


Figure 1-57. Grey Water System, Sheet 1 of 2.











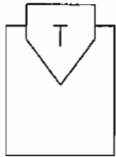
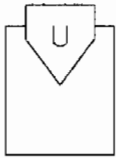




<u>SYMBOL LIST</u>	
	BATH FLOOR DRAIN
	GALLEY FLOOR DRAIN
	SHOWER
	LAVATORY
	TRAP
	PIPE CAP
	PIPE PLUG
	CHECK VALVE
	3-WAY BALL VALVE
	REDUCER
	INCINOLET TOILET
	INCINOLET URINAL
	PUMP
	HIGH LEVEL ALARM
	GALLEY SINK
	BALL VALVE

Figure 1-57. Grey Water System, Sheet 2 of 2.

1.16.14. **Mooring/Anchor Handling System.** Mooring equipment includes a towing pad, double bits, roller chocks, ground tackle, and three point mooring system. The mooring arrangement is depicted in Figure 1-58. Each of these is discussed below:

- a. **Towing Pad.** The towing pad is located aft centerline at Frame 24 and consists of a reinforced double bitt.
- b. **Double Bits.** Double bits are of steel construction and enable the placement of anchor, mooring, and towing lines. Five 8-inch (0.2032 Meters) double bits are located as follows:
 - (1) **Starboard.** One double bitt (aft quarter bitt) is located outboard between Frames 24 and 27. A second (forward quarter bitt) is located outboard between Frames 12 and 15.
 - (2) **Port.** One double bitt (aft quarter bitt) is located outboard between Frames 24 and 27. A second (forward quarter bitt) is located outboard between Frames 12 and 15.
 - (3) **Forward.** A double bitt is located forward centerline between Frames 1 and 4.
- c. **Roller Chocks (Buttons).** Roller chocks are mounted in the tow rail and facilitate controlling rigging or mooring line. The roller chocks are located one each, port and starboard, between Frames 10 and 12.
- d. **Ground Tackle.** Ground tackle includes NAV-X Fortress Model FX-125 anchor and 500 feet (152.4 Meters) of nylon line (with connecting links and swivel).
- e. **Three Point Mooring System.** The ST utilizes a three point mooring system for anchoring the vessel. The anchor rope travels through the bull nose to the capstan and is stowed in the chain locker. The capstan may be used to hoist and/or lower the anchor.

1.16.15. **Towing.** The ST is configured with all deck equipment, fittings, chafing gear, guards and hardware required for barge work, barge towing, and assisting larger tugs in ship work. The barge displacement will range from light condition or empty to full load. Barge towing features include hip tow on one and both sides, stern tow, and pushing. Illustrations of typical towing configurations are provided in Chapter 2 Section III of this manual.

- a. **Towing Equipment.** Specific towing equipment on the ST includes the following:
 - (1) **Pushing.** Port and starboard wire rope ratcheting 20-ton winch connection systems, including all associated deck fittings, face wires, and hardware; stern, backing, jockey, and other lines and associated deck fittings and hardware.
 - (2) **Stern Tow.** Facilities for stern towing include double bitt, towing padeye, gogging D-ring and caprail.
 - (3) **Hip Tow.** Facilities include port and starboard, aft, midship, and forward bits.
 - (4) **Line Handling.** Line handling is accomplish using deck mounted capstans. One is located forward and one is located aft. Each of these is discussed below:
 - a. **Aft Capstan.** The aft capstan is located on the aft main deck and is capable of handling lines up to 6-inch (0.1524 meters) circumference. Features include an 18-inch (0.4572 Meters) gypsy head and a minimum 10,000 pound (4,535 Kilograms) pull at 30 feet (9.144 Meters) per minute. The unit is driven by a 10 HP electric motor operating on 450VAC, 3 phase, 60-hertz power. Motor brake and forward/stop pushbutton control station is provided locally at the capstan.
 - b. **Forward Capstan.** The forward capstan is located on the forward main deck and is capable of handling lines up to 4-inch (0.1016 Meters) circumference. Features include a 12-inch (0.3048 Meters) gypsy head and minimum 2,000 pound (907 Kilograms) pull at 43 feet (13.1064 Meters) per minute. The unit is driven by a 3 HP electric motor operating on

TM55-1925-236-12

450VAC, 3 phase, 60-hertz power. A motor brake and foot pedal control is provided locally at the capstan.

(5) Lines. Lines provided are discussed below.

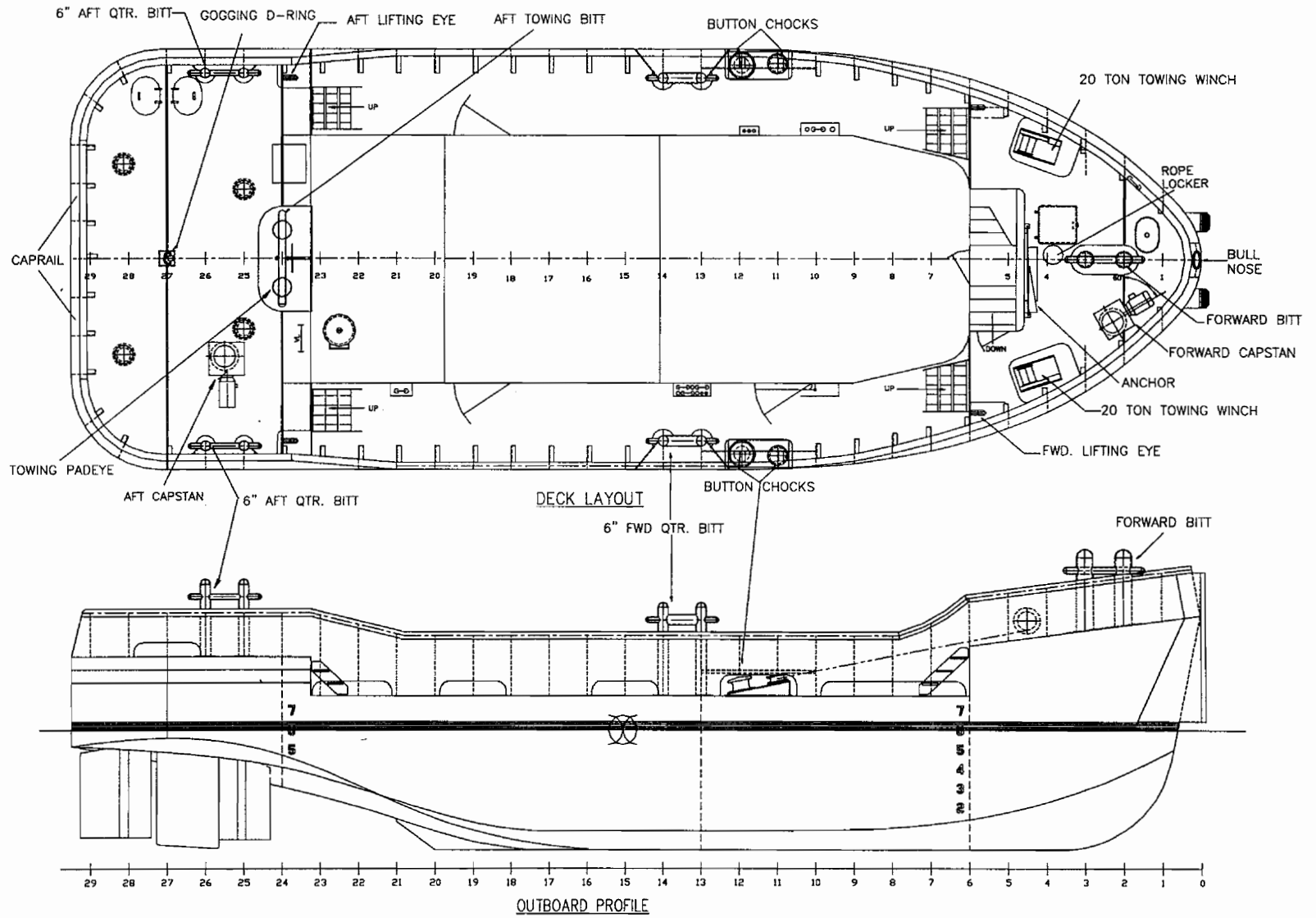
- a. Towing Hawser. The towing hawser consist of 500 feet (152.4 Meters) of Spectron 12 single braid. The hawser is capable of being faked on deck and a thimble is provided at the tow end.
- b. Miscellaneous Lines. Seven 100 foot (30.48 Meters) lengths of Spectron 12 single braid are provided. The lines have an eye at each end and all are capable of being faked on deck.

(6) Line Cutting. Axes are provided for line cutting. An ax is located, one each, on the port and starboard side of the deckhouse on the main deck at Frame 21.

1.16.16. Life Saving Equipment. This section provides an overview of the life saving equipment on the ST. Figure 1-59 provides a plan view of the life saving equipment.

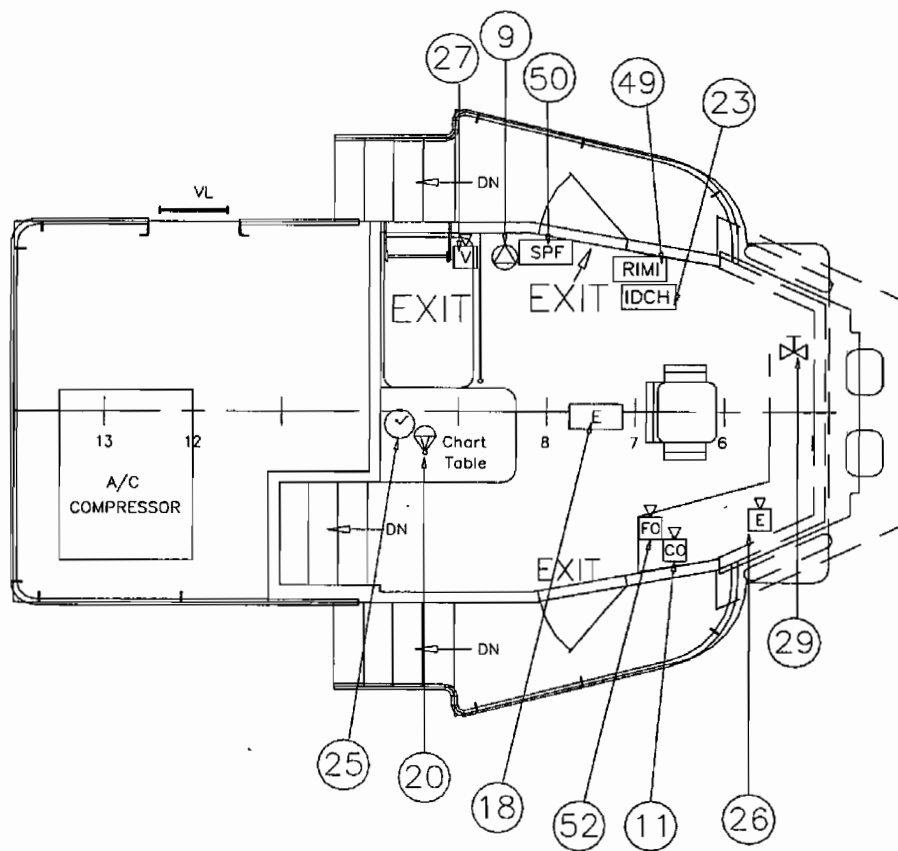
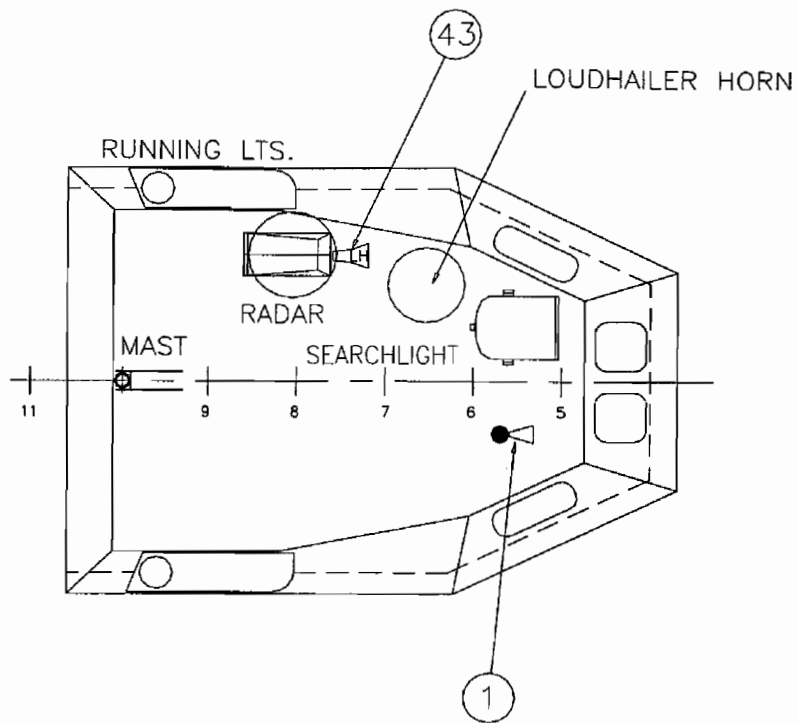
- a. Emergency Life Raft. The emergency life raft consists of an Elliot Viking Model Inflatable life raft. The raft is equipped with a manual quick release as well as an automatic hydrostatic release, each utilizing a self-inflating CO₂ system which is capable of fully inflating the raft in a matter of seconds. The raft is capable of throw-over release. The strength factor of the raft is such that survivors may jump onto the canopy from as high as 15 feet (4.572 Meters). The raft and cradle is located between Frames 19 and 22 on the starboard side of the 01 Deck.
- b. Throwable Life Ring(s). Two throwable life rings are located on the main deck on the deckhouse, one each port and starboard. Two are also located port and starboard on the 01 Deck. Another life ring is located on the aft rail of the 01 Deck.
- c. Personal Flootation Devices (PFDs). PFDs are stored in the PFD Locker located on the starboard side of the 01 Deck, just forward of the life raft cradle.

Figure 1-58. Mooring Arrangement

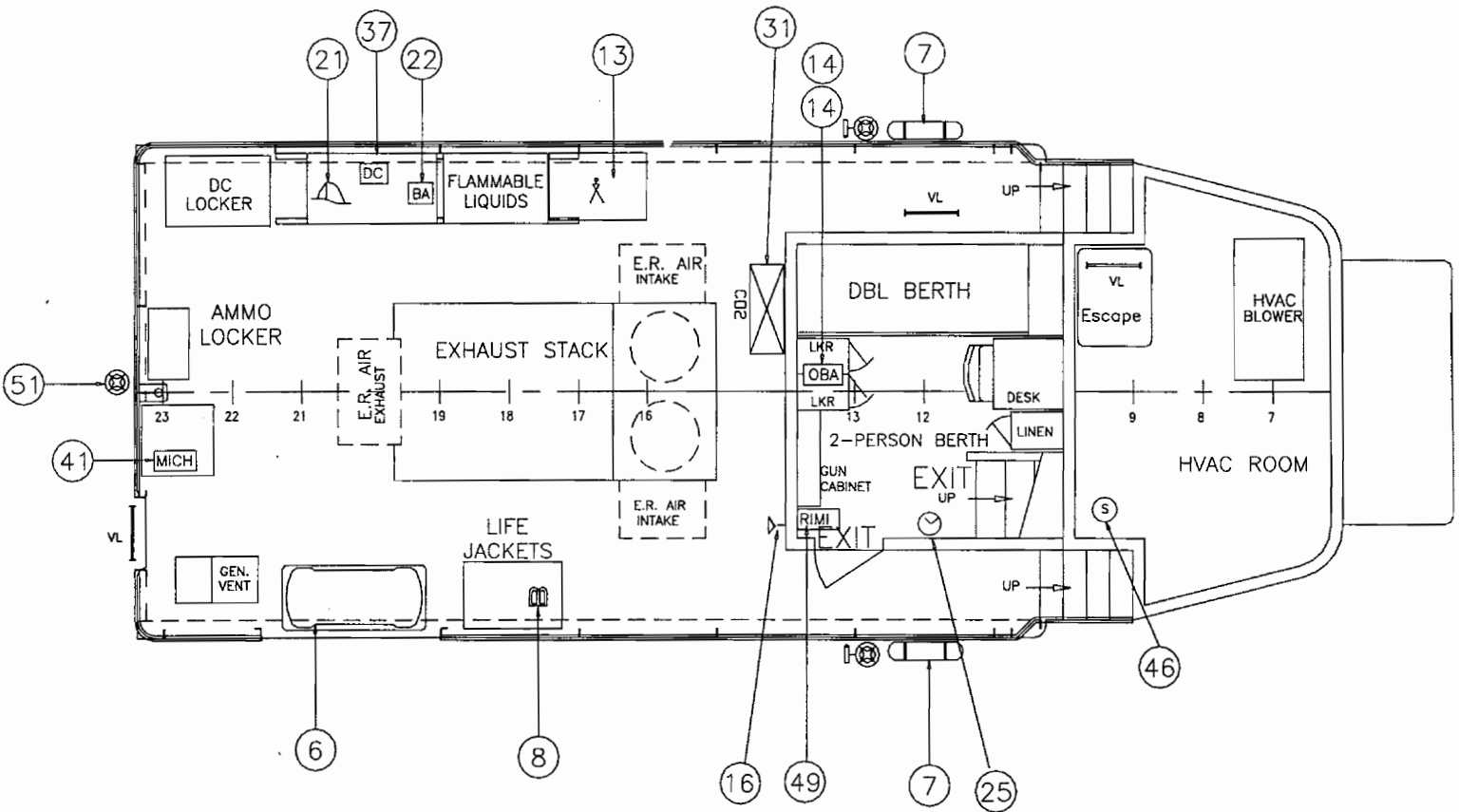


SYMBOL	FIND NO.	PART OR IDENTIFYING NO.	QTY REQ.	NOMENCLATURE OR DESCRIPTION
	52		1	REMOTE FUEL SHUTOFF (LOCATED ON PILOTHOUSE CONSOLE)
	51		1	LIFE RING
	50	HMUM-IDCH	3	SOUND POWERED PHONE
	49	HMUM-RIMI	7	REMOTE INTERCOM STATION
	48	HMUM-ALVR	4	PA STROBE LIGHT
	47	HMUM-CISW	3	PA TALKBACK OUTLET -- WATER PROOF
	46	HMUM-SFIS	3	PA SPEAKER -- INTERIOR TYPE
	45	HMUM-HSSR	2	PA SPEAKER -- EXTERIOR TYPE
	44	HMUM-HSSR	2	PA SPEAKER -- WITH TALKBACK
	43	HMUM-HSWR	1	LOADHAILER SPEAKER
	42	HMUM-HSSR	6	PA/ SPEAKER -- INTERIOR TYPE
	41	HMUM-MICH	1	LOAD HAILER MIKE
	40		1	FIRE STATION NO.2
	39		1	FIRE STATION NO.1
	38		1	FOG APPLICATORS, 4 FT
	37		1	DAMAGE CONTROL LOCKER
	36		1	P 100-- PORTABLE DIESEL FIRE PUMP
	35		1	F.O. REACHROD @ M.D.
	34		4	EMERGENCY ME BATTERY SWITCH
	33		1	STOKES LITTER
	32		1	NEIL ROBERTSON STRETCHER
	31		1	CO ₂ STORAGE BOTTLES
	30		1	CO ₂ ALARM SIREN
	29		2	FIRE PUMP START/STOP
	28		1	BOAT HOOK
	27		1	EMERGENCY VENTALATION SHUTDOWN (FANS)
	26		1	EMERGENCY ENGINE STOP
	25		4	CLOCK
	24		1	EMERGENCY STEERING SYSTEM
	23		1	INTERCOM CONTROL HEAD
	22		2	BREATHING APPARATUS -- 30 MIN. CAPACITY
	21		2	FIREMAN'S OUTFIT
	20		1	EMERGENCY FLARES
	19		1	LOCAL FUEL SHUTOFF (ENGINE ROOM)
	18		6	EMERGENCY LIGHTS
	17		1	FIRE PUMP
	16		1	EMERGENCY POSITION INDICATOR RADIO BEACON
	15		2	EMERGENCY AIR SHUT OFF STATIONS (GENERATOR ENGINES)
	14		6	EMERGENCY ESCAPE BREATHING DEVICES
	13		5	EXPOSURE SUITS
	12		2	FIRE STATION; W/ 50' OF 1 1/2" FIRE HOSE, & NOZ.
	11		3	EMERGENCY PULL STATION FOR CO ₂ SYSTEM
	10		2	FIRE AXES
	9		6	PORTABLE FIRE EXTINGUISHERS: 10# DRY CHEMICAL
	8		7	LIFE PRESERVERS: U.S.C.G. APPROVED VEST STYLE (SEE NOTE #1)
	7		4	RING BUOYS: 24" U.S.C.G. APP'VD LINE & LIGHT
	6		1	INFLATABLE LIFE RAFT: W/ HYDROSTATIC RELEASE -- 16 PERSON
	5		1	24 UNIT FIRST AID KIT / MEDICINE CABINET
	4		1	ANCHOR: 65# W/12' OF 5/8" CHAIN & 500' OF NYLON LINE
	3		1	ANCHOR ROPE HATCH -- W/ 1 1/4" x 500' NYLON ROPE
	2		1	SHIP'S BELL
	1		1	ELECTRIC HORN: 24V DC, U.S.C.G. APPROVED

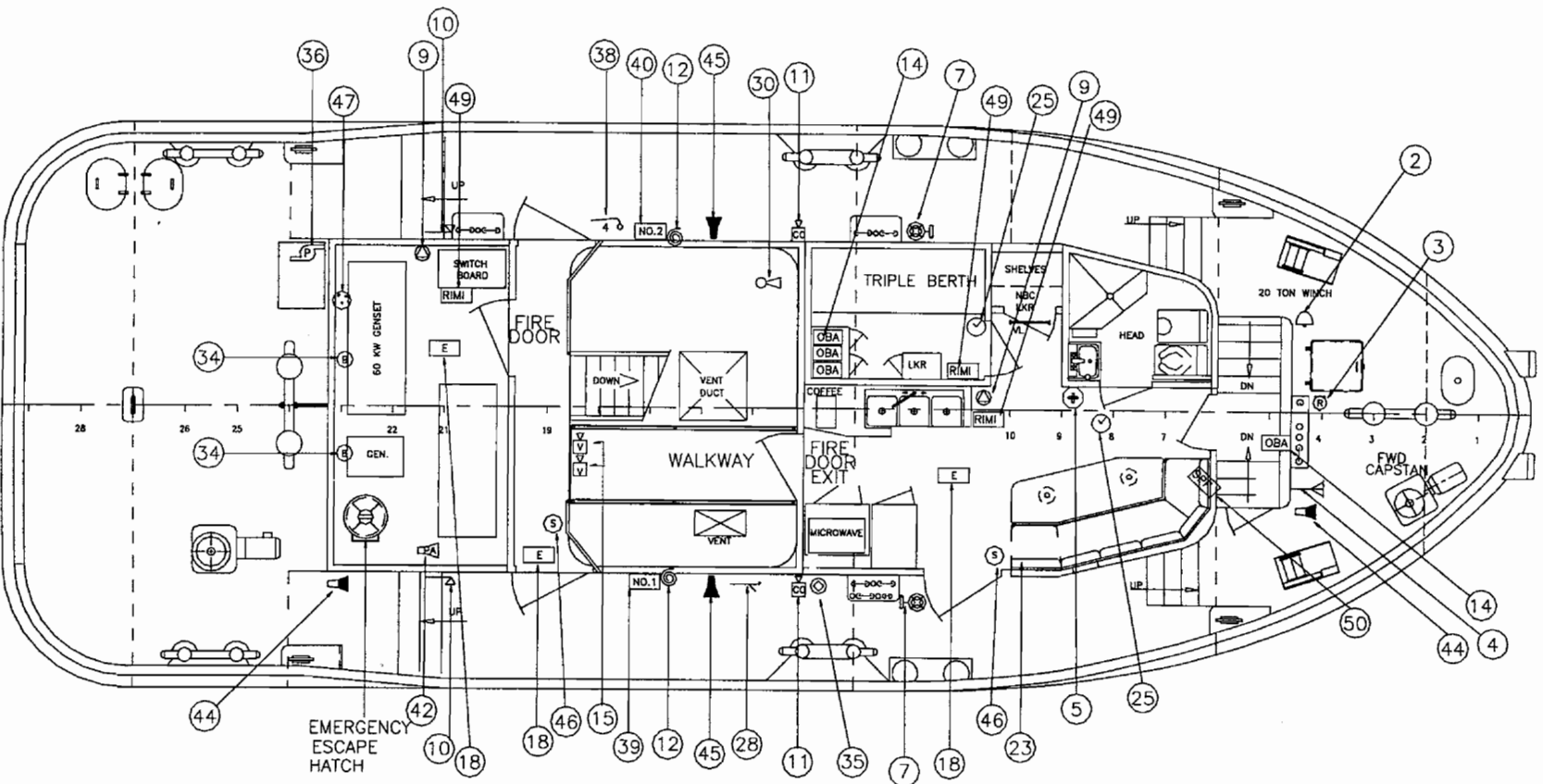
Drawing Key
Figure 1-59. Life Saving Equipment, Sheet 1 of 5.



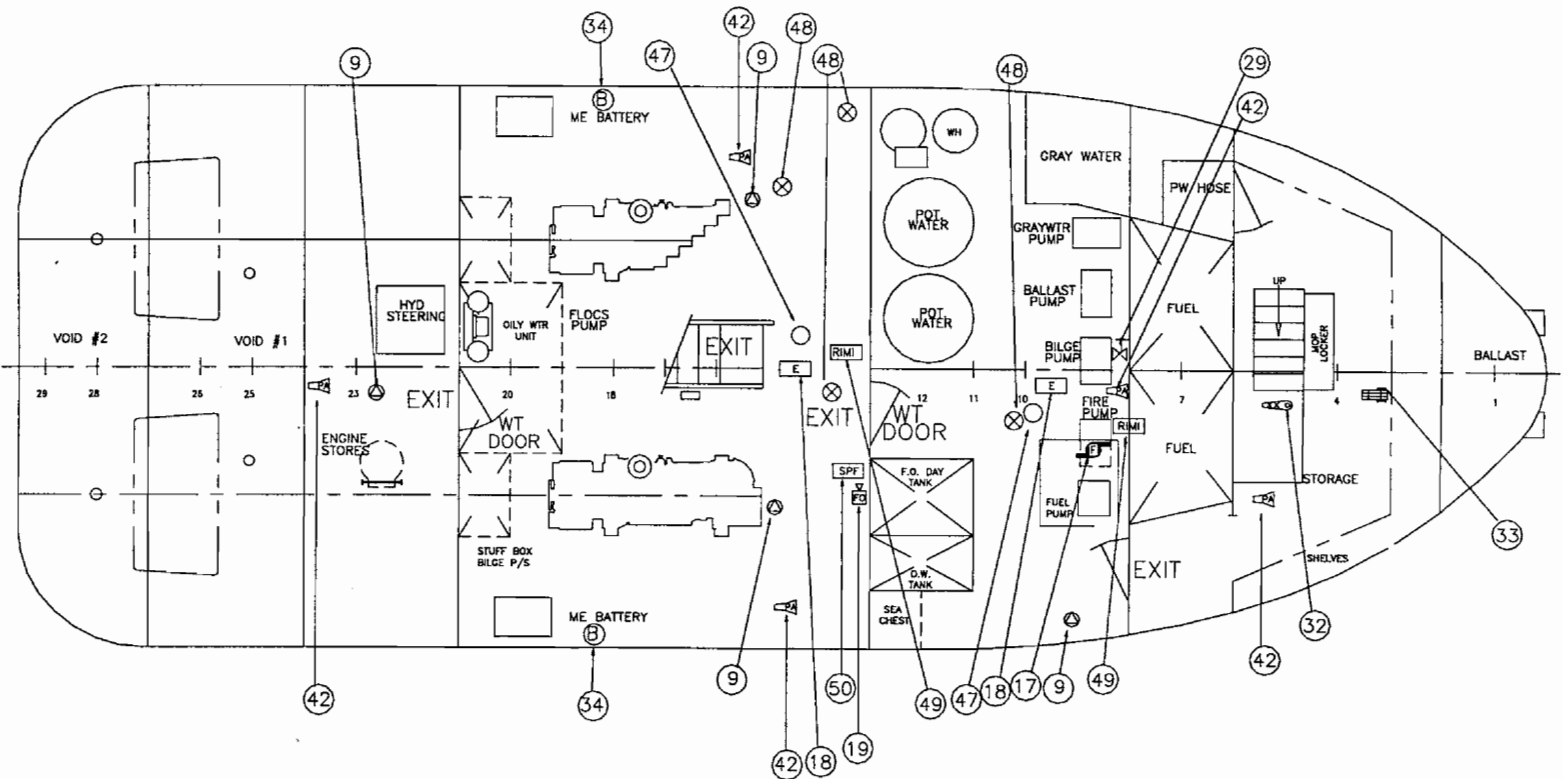
**Pilot House Deck and Pilot House Overhead Arrangements
Figure 1-59. Life Saving Equipment, Sheet 2 of 5.**



01 Deck Arrangement
Figure 1-59. Life Saving Equipment, Sheet 3 of 5.



Main Deck Arrangement
Figure 1-59. Life Saving Equipment, Sheet 4 of 5.



Hold Deck Arrangement
Figure 1-59. Life Saving Equipment, Sheet 5 of 5.

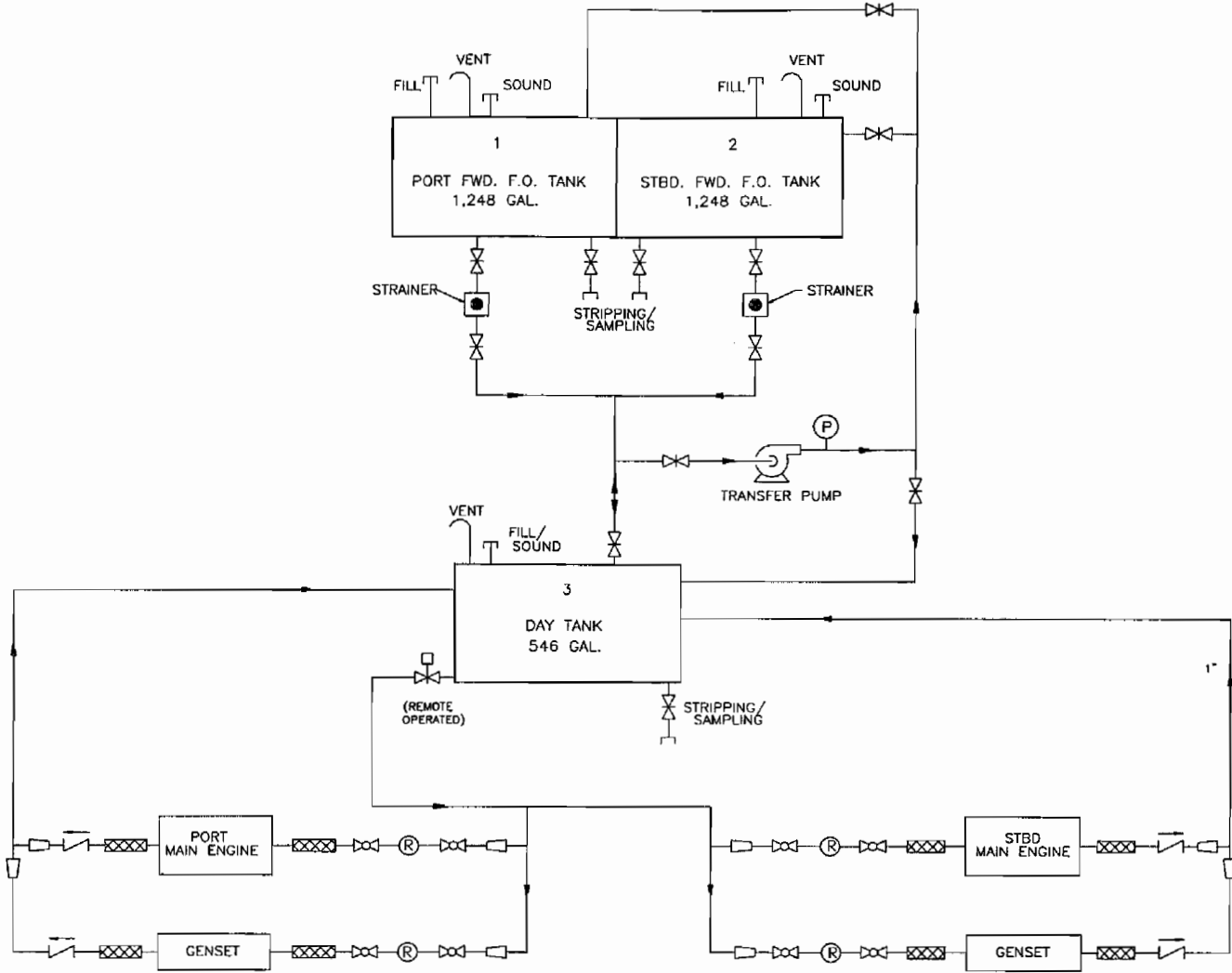
1.16.17. Fuel Oil Fill and Transfer Piping System. A plan view of the fuel oil fill and transfer piping system is provided in Figure 1-60. The fuel oil fill and transfer piping system replenishes the ST fuel oil tanks from deck discharge/fill connections. The system also replenishes fuel oil day tank (546 Gallon; 2,066.77 Liters) for the main engines and the generator diesel engine, by transferring fuel oil from the two 1248 gallon (4,724.05 Liters) storage tanks. System control is maintained through manifold transfer pump and a combination of valves. Fuel oil can be transferred from either storage tank to the day tank. Power to the fuel oil pump is supplied from the upper engine room power panel and controlled by a START/STOP push button and an emergency STOP switch located in the upper engine room. An emergency fuel shutoff valve pull cable is provided in the PilotHouse. Fuel oil purification is provided by the fuel oil filters/coalescer.

1.16.18. Lube/Gear Oil Fill and Transfer Piping System. A plan view of the lube/gear oil fill and transfer system is provided in Figure 1-61. The lubricating oil fill and transfer piping system supplies clean lubricating oil for proper operation of the main propulsion engines and the diesel generators. The system also transfers lubricating oil from the lube oil storage tank to the main engine and the diesel generators by means of the Fast Lube Oil Change System (FLOCS) pump. System alignment is maintained by a manifold and a combination of valves. The FLOCS allows dirty oil and sludge to be discharged from the engine sumps to the dirty oil tanks using a hand pump. Power for the lube oil pump is supplied from the upper engine room power panel. Each unit has a motor controller with push button adjacent to the unit. The lubricating oil system consists of lube oil tank (266 gallon; 1,066.88 Liters), FLOCS pump, dirty oil tank (350 gallon; 1,324.855 Liters), and associated vents, valves, and piping (fixed and portable). Waste oil is removed from engine(s) or generator set(s) by manually attaching flexible hose from appropriate connection to FLOCS pump suction end. The FLOCS pump pumps waste oil through fixed piping to the dirty oil tank. Replacing lube oil is done in the same manner, attaching flexible hose from the lube oil tank to suction end of FLOCS pump, and from the discharge end of FLOCS pump to appropriate machinery connection.

1.16.19. Single Point Hoisting Arrangement. A plan view of the single point hoisting arrangement is provided in Figure 1-62. The single point hoisting arrangement consists of four hoisting eyes located on opposing corners of the vessel. When connected to the single point hoisting arrangement sling, the eyes facilitate lifting of the ST to and from another vessel.

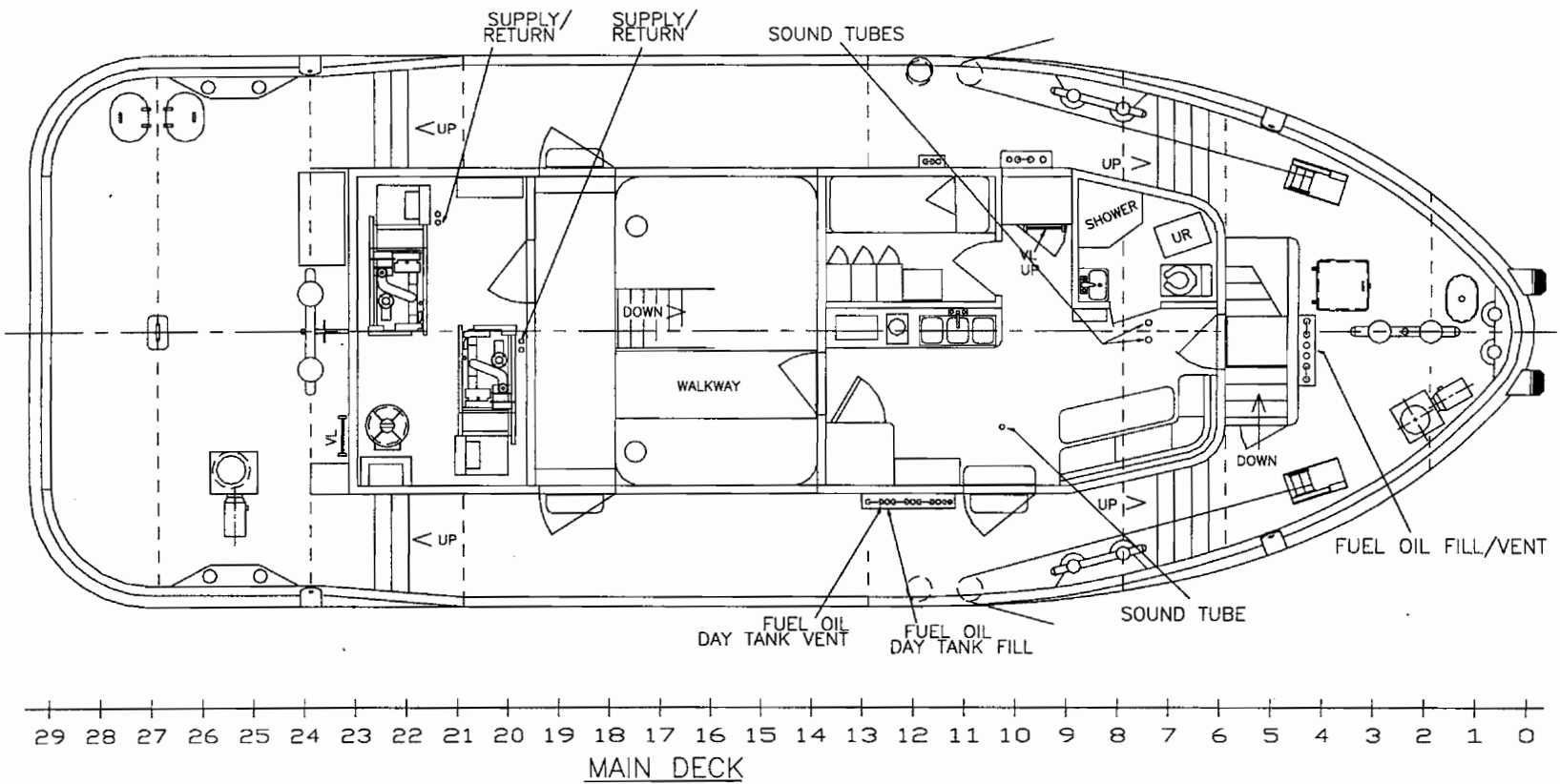
1.16.20. Cathodic Protection System. A plan view of the anodes is provided in Figure 1-63. Sacrificial zinc anodes (Corrthern Type M-24 and M-12) are installed for cathodic protection of the underwater hull and other susceptible surfaces. The system is designed to last a minimum of 3 years to conform with normally scheduled overhaul periods. Anodes are attached by bolt-on method with a 3/8-inch (0.009398 Meters) plate installed between the anode and the protected surface.

The anodes are equally divided into two rows, port and starboard; half are installed forward of midship, the other half aft of midship. The remaining one-third anodes are located along the centerline keel, just beneath the turn of the bilge and divided equally between port and starboard.

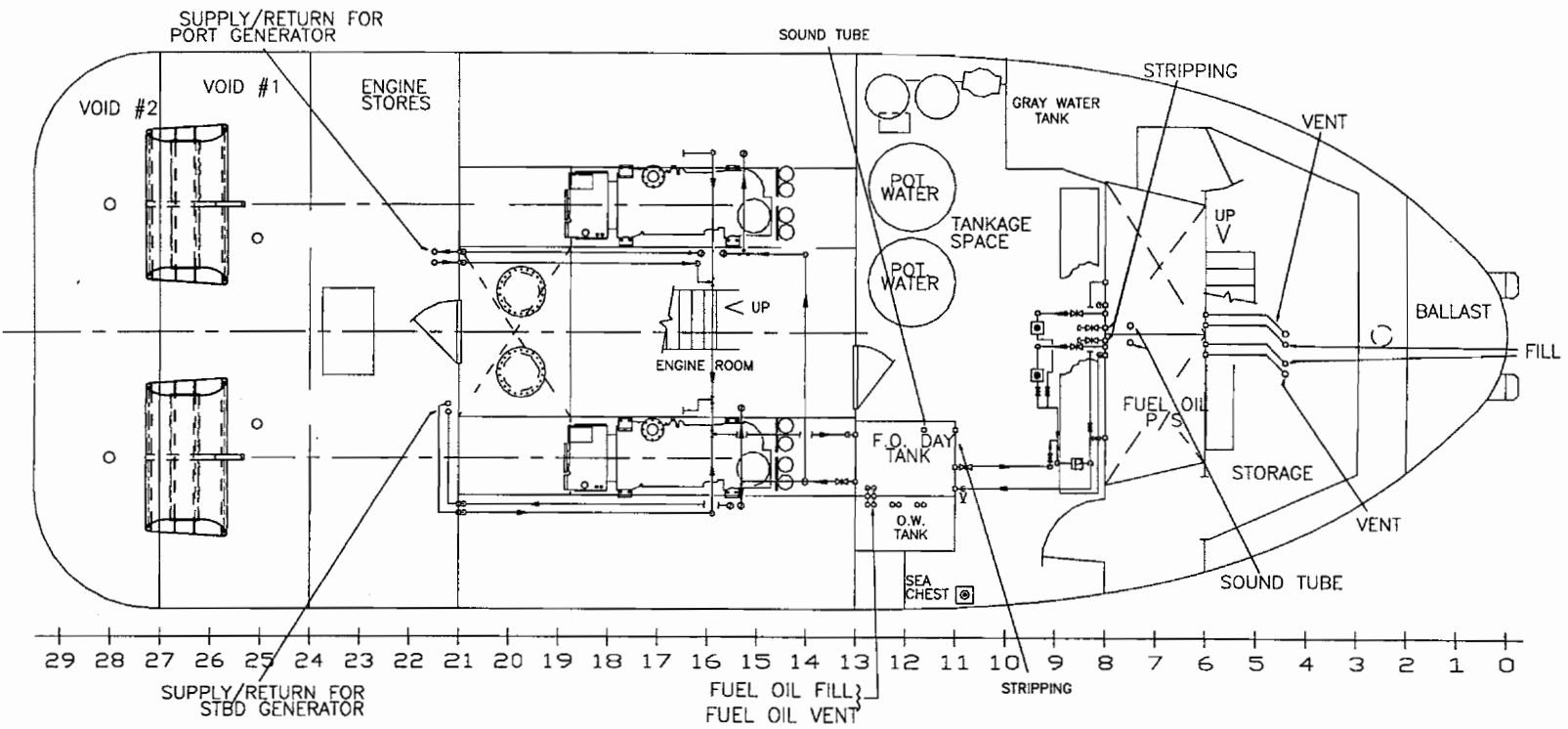


System Schematic

Figure 1-60. Fuel Oil Fill and Transfer Piping System, Sheet 1 of 4



Main Deck Arrangement
Figure 1-60. Fuel Oil Fill and Transfer Piping System, Sheet 2 of 4



Hold Deck Arrangement
 Figure 1-60. Fuel Oil Fill and Transfer Piping System, Sheet 3 of 4













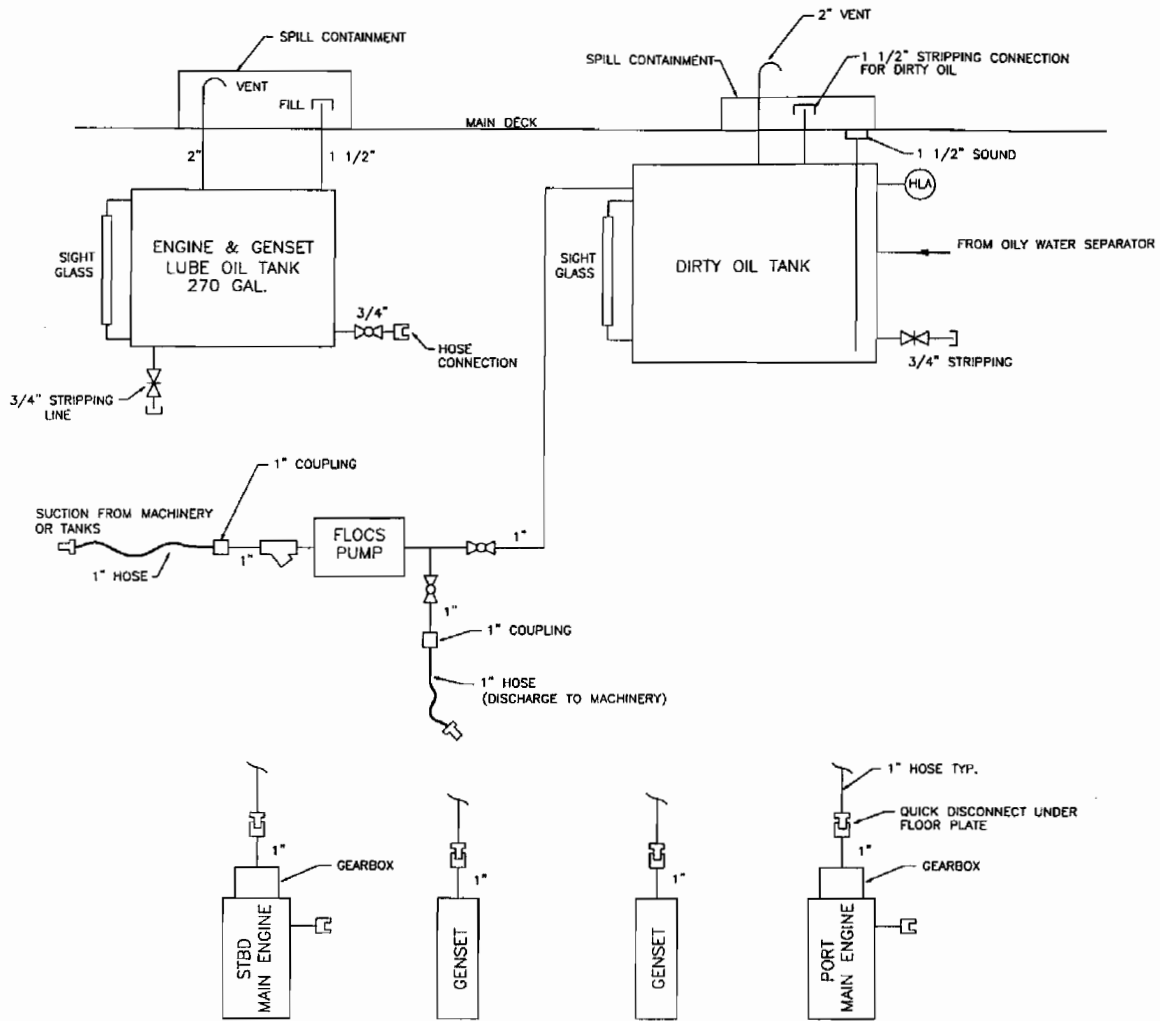
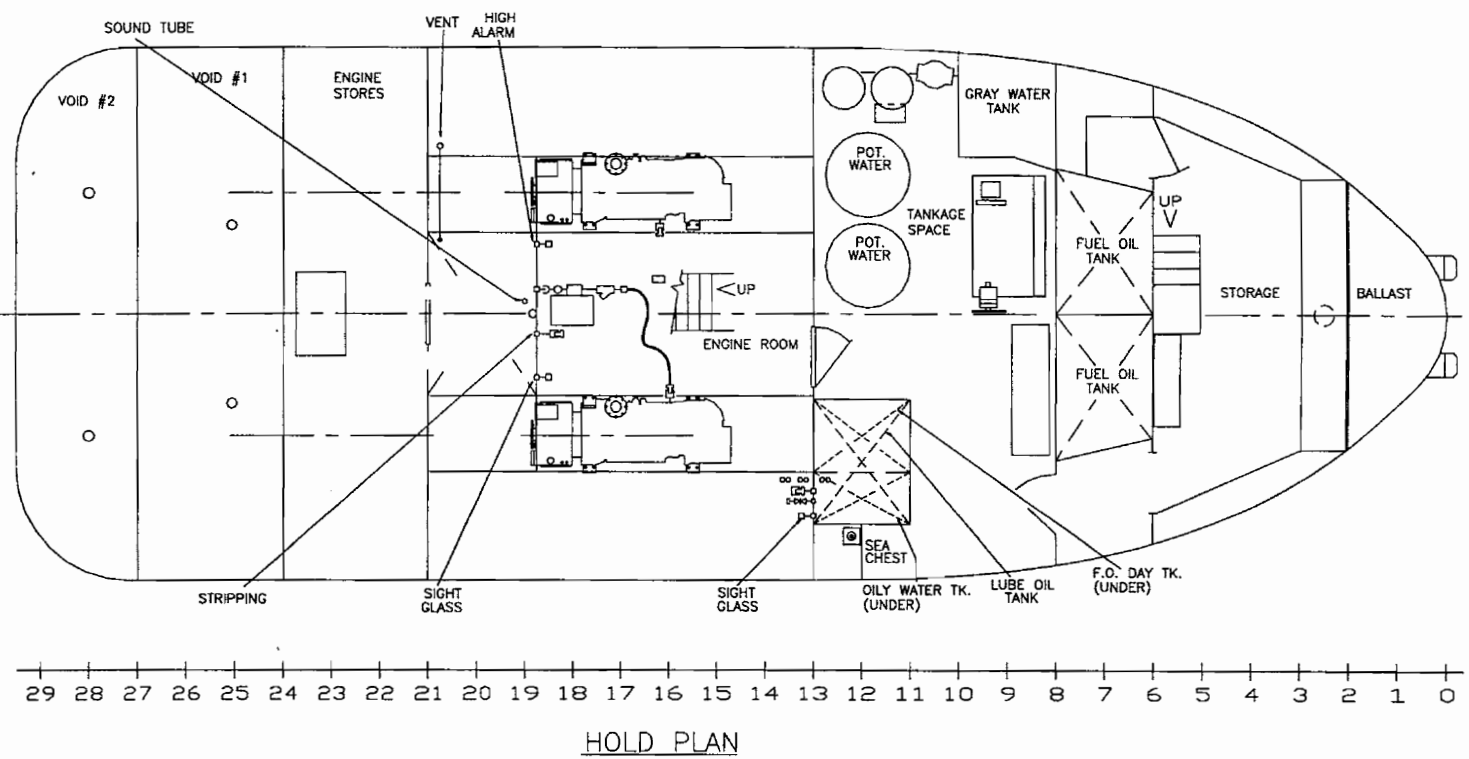
<u>SYMBOL LIST</u>			
	REMOTE OPERATED GATE VALVE		RACOR FUEL FILTER
	BALL VALVE		CHECK VALVE
	GATE VALVE		FLEXIBLE HOSE
	STRAINER		PIPE CAP
	TRANSFER PUMP		PIPE PLUG
			PIPE REDUCER
			PRESSURE GAUGE

Figure 1-60. Fuel Oil Fill and Transfer Piping System, Sheet 4 of 4

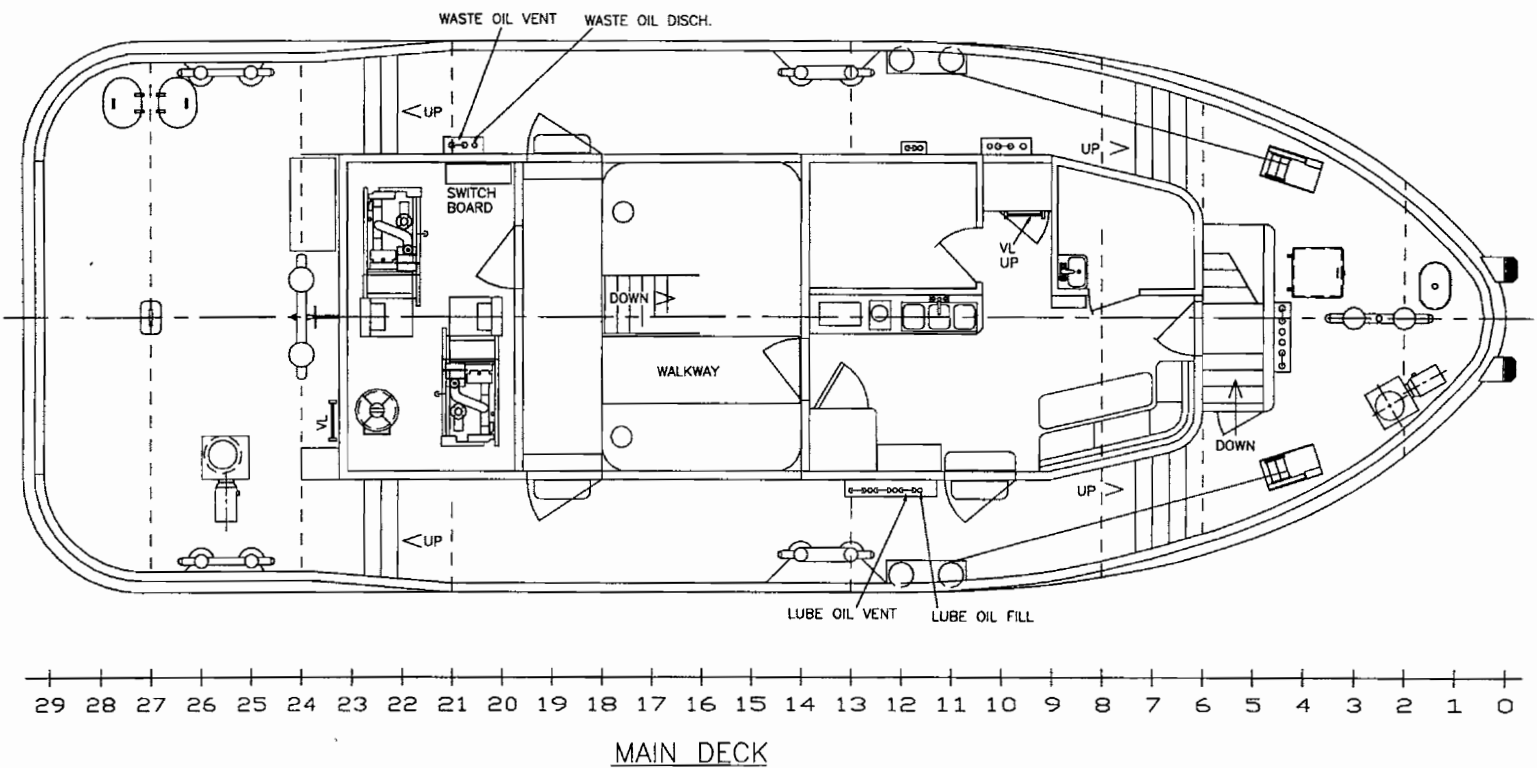


System Schematic

Figure 1-61. Lube/Gear Oil Fill and Transfer Piping System, Sheet 1 of 4



Hold Deck Arrangement
Figure 1-61. Lube/Gear Oil Fill and Transfer Piping System, Sheet 2 of 4



Main Deck Arrangement
Figure 1-61. Lube/Gear Oil Fill and Transfer Piping System, Sheet 3 of 4








<u>SYMBOL LIST</u>			
	BALL VALVE		PIPE CAP
	GATE VALVE		QUICK DISCONNECT
	HIGH LEVEL ALARM		HOSE
	Y STRAINER		

Figure 1-61. Lube/Gear Oil Fill and Transfer Piping System, Sheet 4 of 4

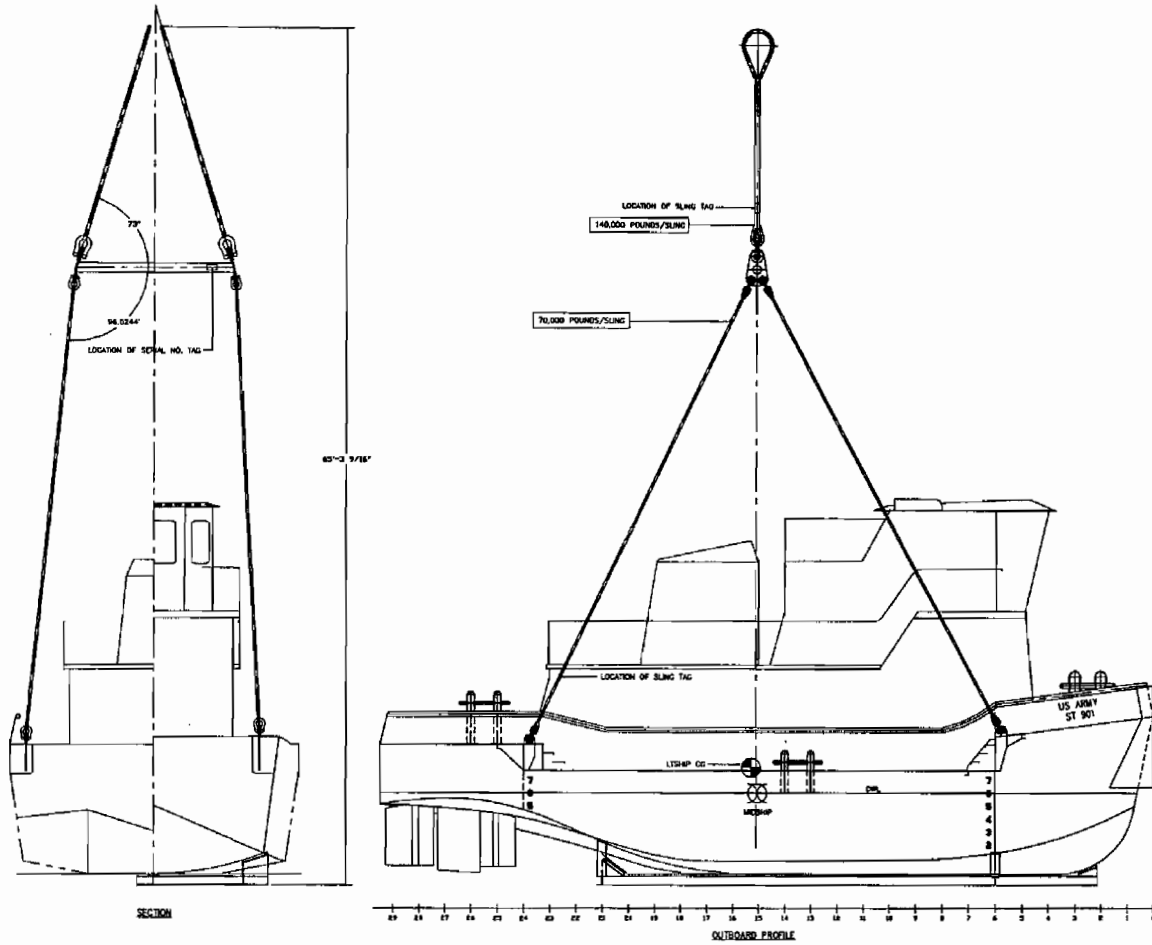


Figure 1-62. Single Point Hoisting Arrangement

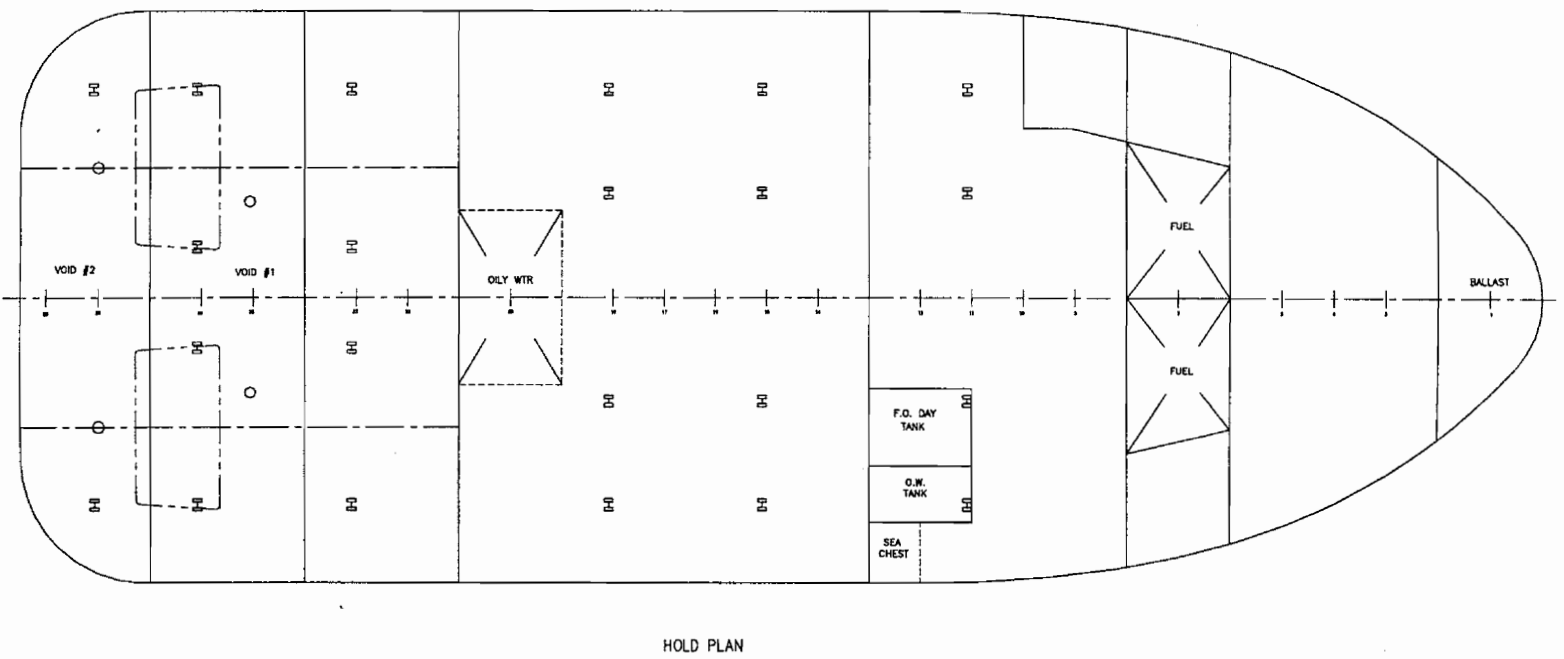


Figure 1-63. Anode Arrangement

CHAPTER 2

OPERATING INSTRUCTIONS

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Section I.

DESCRIPTION AND USE OF CONTROLS AND INDICATORS

2.1. General. This section shows the location and function for all operator controls and indicators on the Small Tug. An associated illustration is given with call-outs corresponding to the item number. Where practical, the exact words or numbers located on the gauge, dial, button or switch are illustrated to assist the operator in locating and properly operating the equipment or system.

NOTE

A vessel's life cycle can be quite extensive; controls or indicators that are replaced through time may vary slightly from those originally installed or described herein.

2.2. Table Arrangement. Table 2-1 is laid out in a space-by-space arrangement. Go to the Section Index and find the compartment where the control or indicator is located. The specific piece of equipment and the associated figure number will be listed. Figures and associated tabular information are located together.

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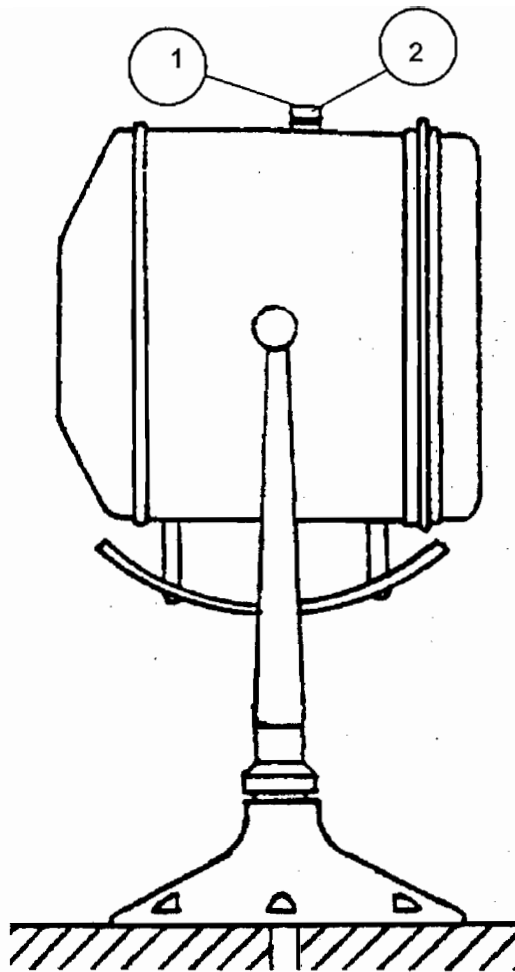


Figure 2-1. Searchlight.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Searchlight.		
1	Manual Focus Knob	Focus FORE and AFT along the axis of the reflector by means of the manual focus knob on top of the drum without the use tools.
2	Lock Knob	Locks manual focus knob in place.

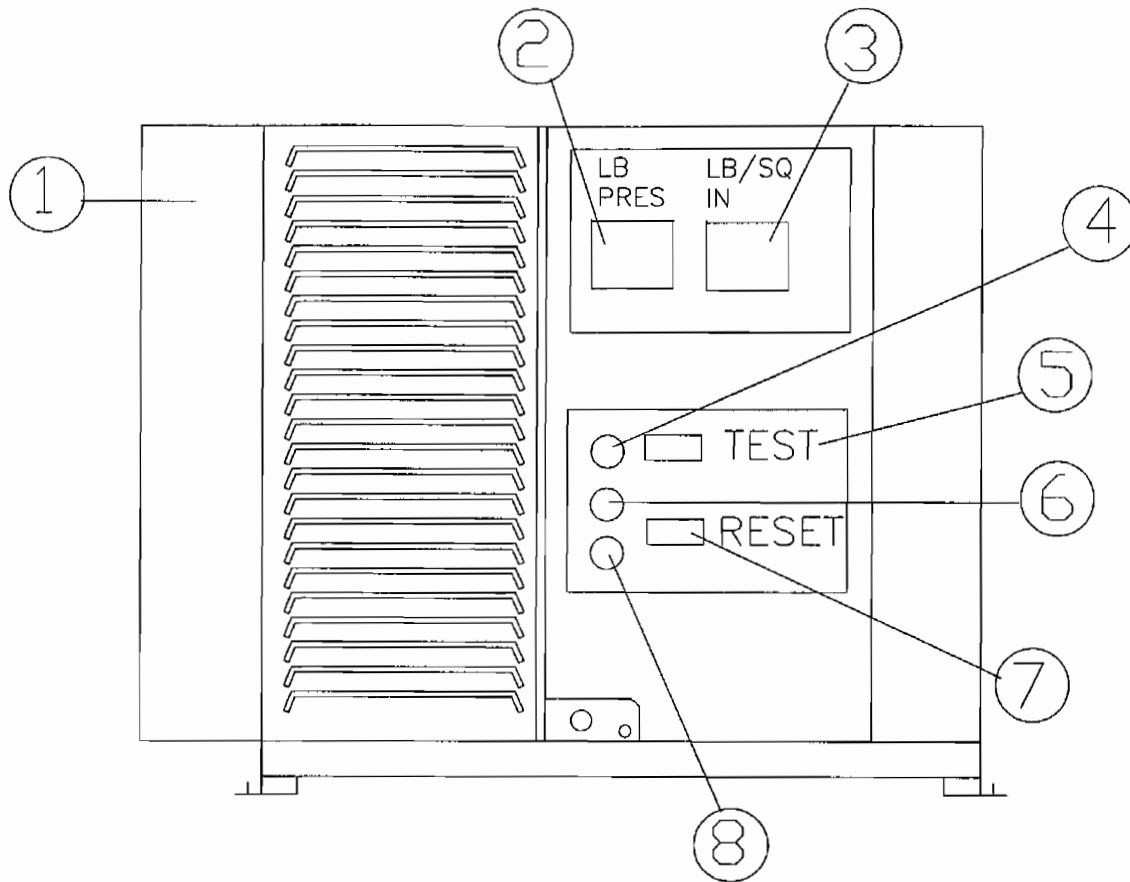


Figure 2-2. Air Conditioning Compressor.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Air Conditioning Compressor		
1	Control Panel	Provides access to various controls for operations and adjustments of the air conditioning compressor.
2	Pound Pressure Indicator	Indicates the pressure in pounds currently in the compressor.
3	Pound Square Inch Indicator	Indicates the pressure in pounds per square inch currently in the compressor.
4	Run Indicator (Green LED)	Indicates the compressor is running.
5	Test Button (Black)	Checks the status of the indicator lights.
6	Timing Indicator (Amber LED)	Indicates the system is timed in and ready to run.
7	Reset Button (Red)	Resets the system after lose of power.
8	Lockout Indicator (Red LED)	Indicates a fault in the system and locks-out the system against start-up.

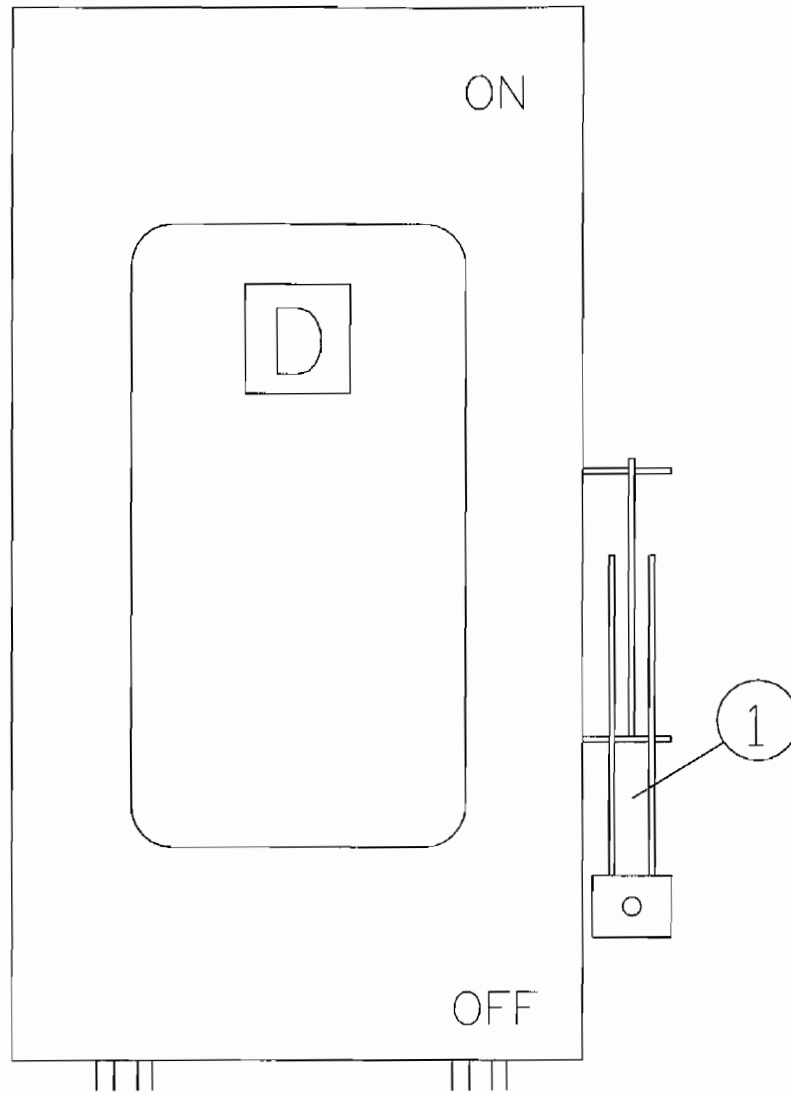


Figure 2-3. Air Conditioning Compressor Disconnect Switch.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Air Conditioning Compressor Disconnect Switch		
1	Main Disconnect Switch	Enables opening and closing the circuit to the air conditioning compressor.

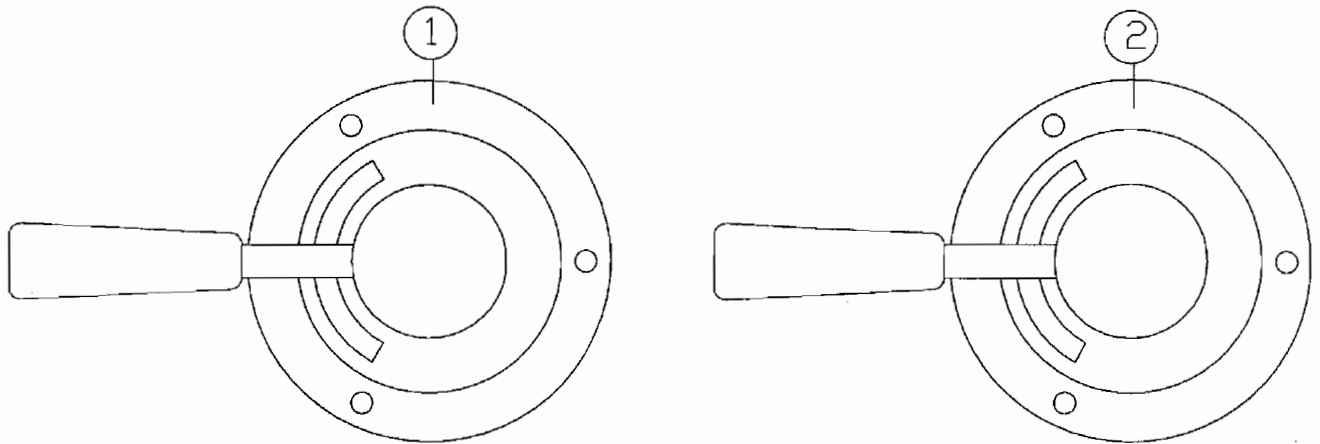


Figure 2-4. Main/Flanking Rudders Full Follow Up Controls.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Main/Flanking Rudders Full Follow Up Controls		
1	Main Rudder Full Follow Up Controller	Facilitates control of the main rudders.
2	Flanking Rudder Full Follow Up Controller	Facilitates control of the flanking rudders.

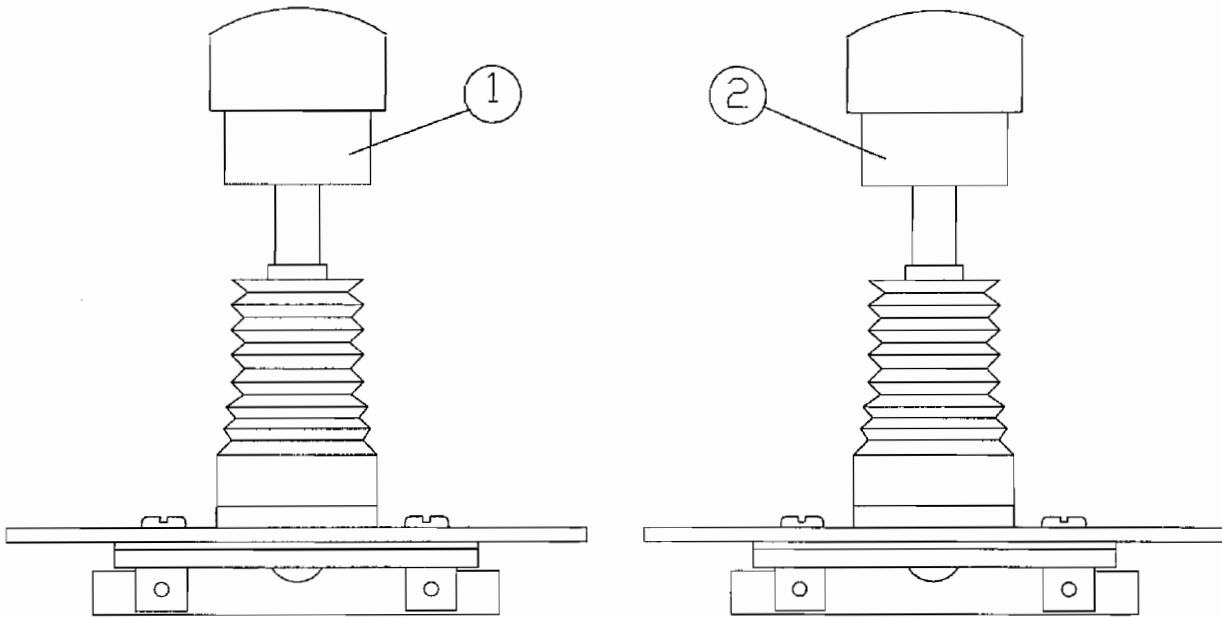


Figure 2-5. Main/Flanking Rudders Non Follow Up Controls.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Main/Flanking Rudders Full Follow Up Controls		
1	Main Rudder Non Follow Up Controller	Facilitates control of the main rudders.
2	Flanking Rudder Non Follow Up Controller	Facilitates control of the flanking rudders.

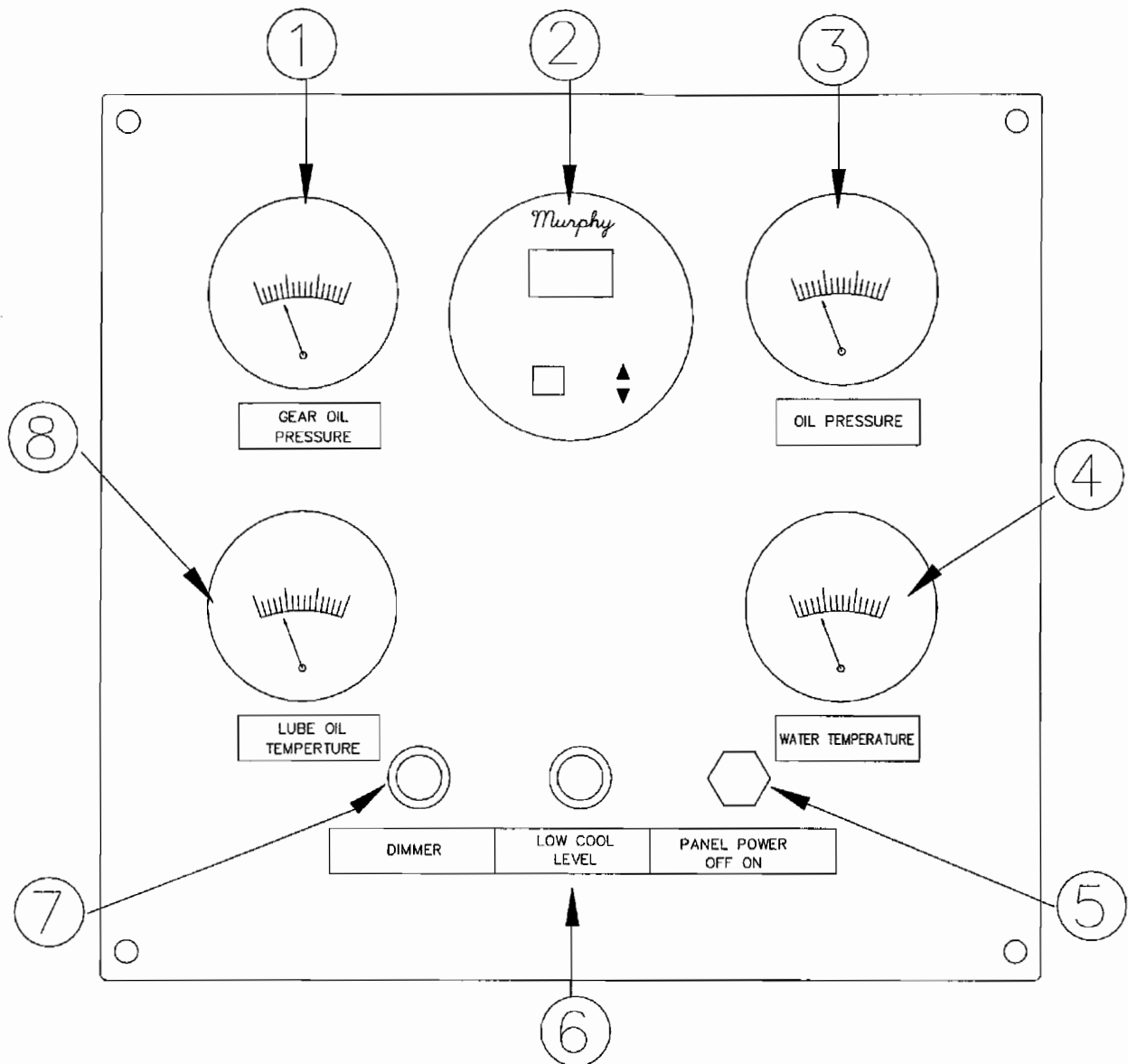


Figure 2-6. Main Engine Gauge Panel.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Main Engine Gauge Panel		
1	Gear Oil Pressure Gauge	Indicates the gear oil pressure for the reduction gear.
2	Tachometer	Indicates the RPM for the main engine.
3	Oil Pressure Gauge	Indicates the oil pressure of the main engine.
4	Water Temperature Gauge	Indicates the water temperature of the main engine.
5	Panel Power Switch	Provides/Removes Power to/from Panel.
6	Low Coolant Level Indicator Light (Red)	Indicates low coolant level.
7	Dimmer Control	Controls intensity of panel illumination.
8	Lube Oil Temperature Gauge	Indicates engine oil temperature.

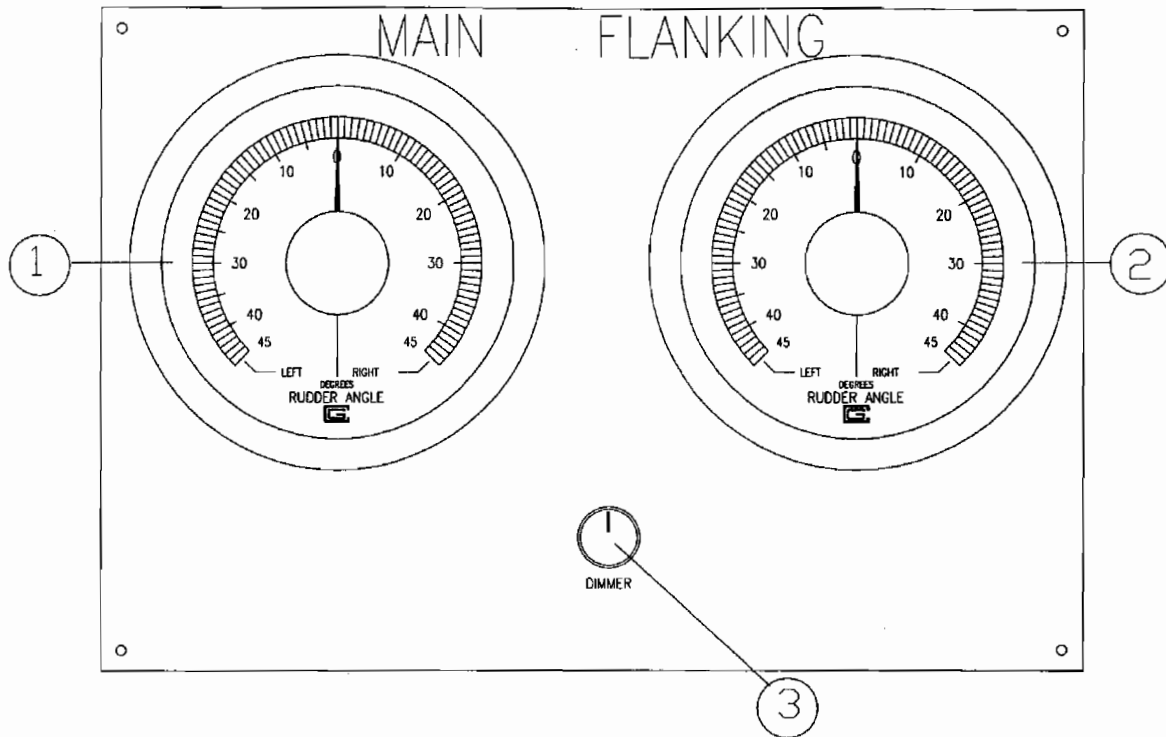


Figure 2-7. Main/Flanking Rudder Angle Indicators.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Main/Flanking Rudder Angle Indicators		
1	Main Rudder Indicator	Indicates the angular position of the main rudders.
2	Flanking Rudder Indicator	Indicates the angular position of the flanking rudders.
3	Dimmer	Allows for adjustment of the brightness of the indicators.

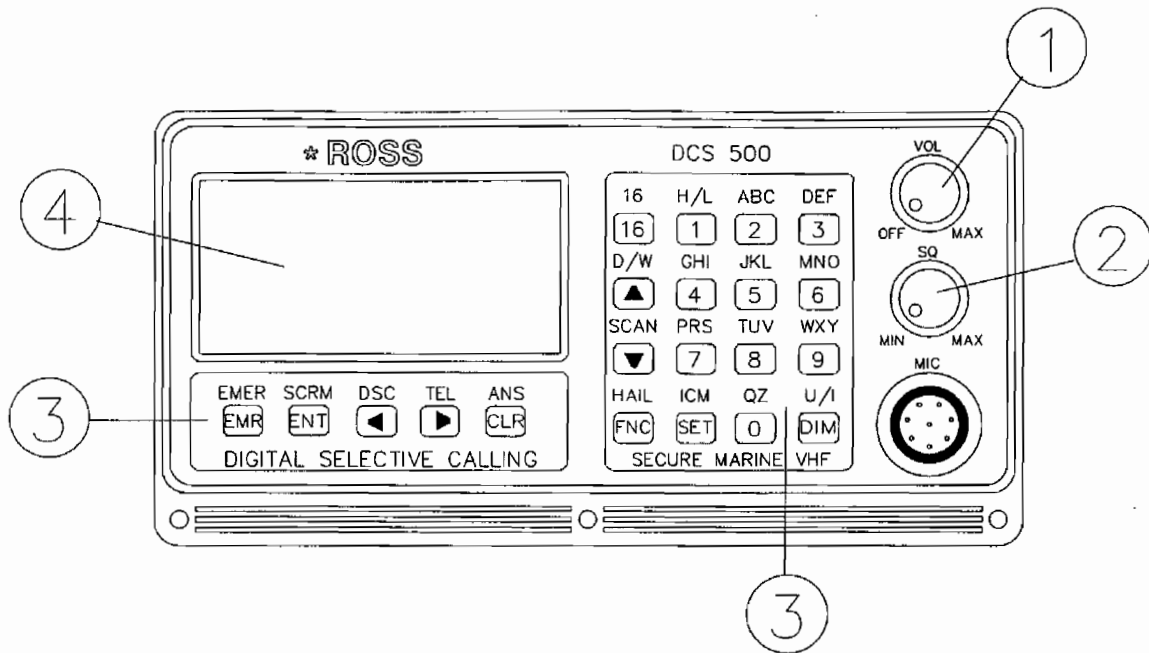


Figure 2-8. DCS 500 Marine VHF Transceiver.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
DCS 500 Marine VHF Radio.		
1	ON/OFF/VOLUME Button	Turns unit on/off and adjusts the speaker volume level; also adjusts the Hail and Intercom output level
2	Squelch Control Button	Sets threshold level of received signals that will produce audio output from the speaker
3	Keypad (with dual function keys)	Accepts input for all control and operations
4	Display Screen	Displays all applicable control/operations information/status

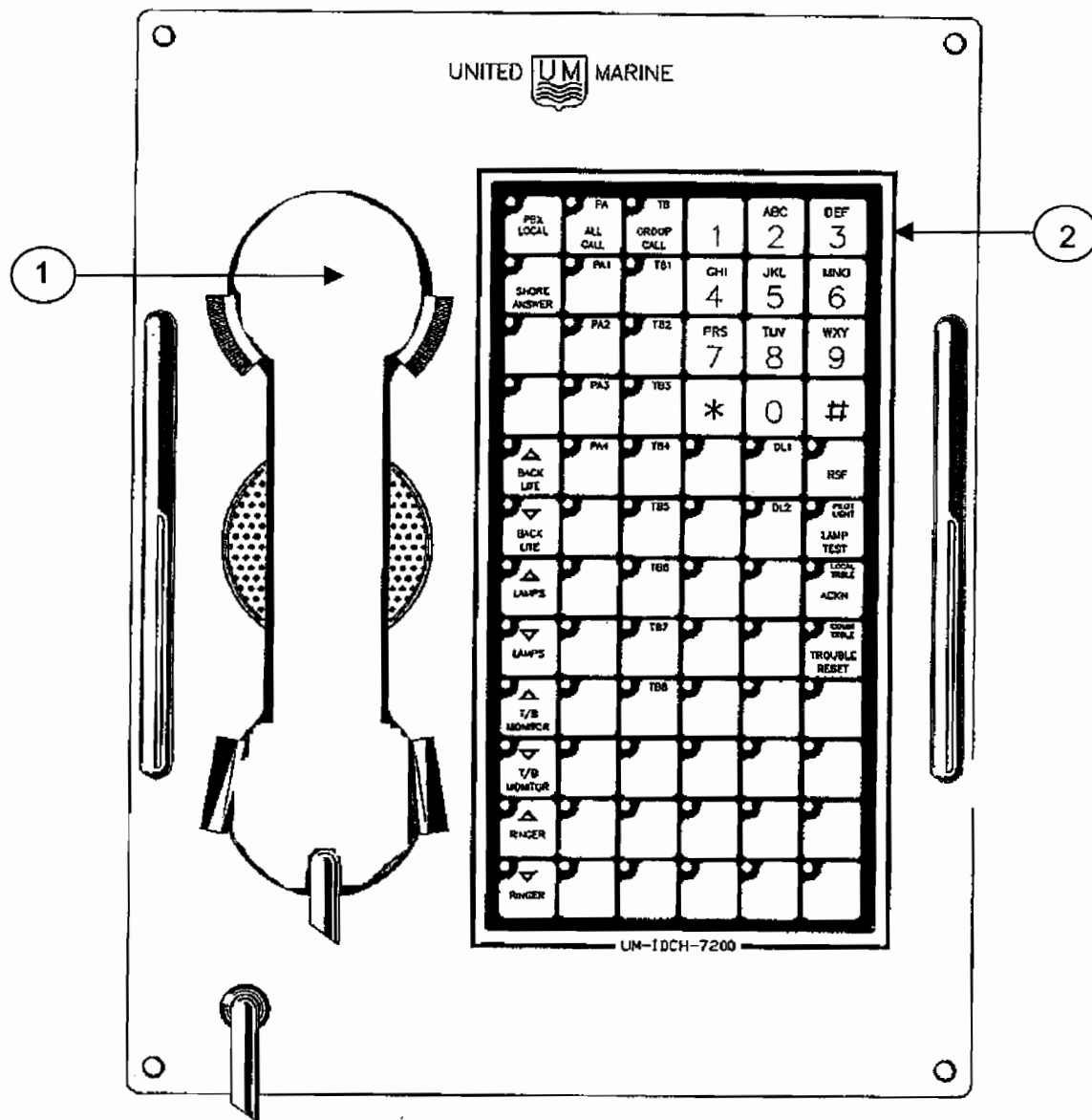


Figure 2-9. Loudhailer/General Alarm.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Loudhailer/General Alarm		
1	Handset	Used to transmit and receive communication signals or messages.
2	Keypad	Used to activate signals and alarms or station(s) being called. (Refer to Figure 2-10 for a detailed view of keypad).

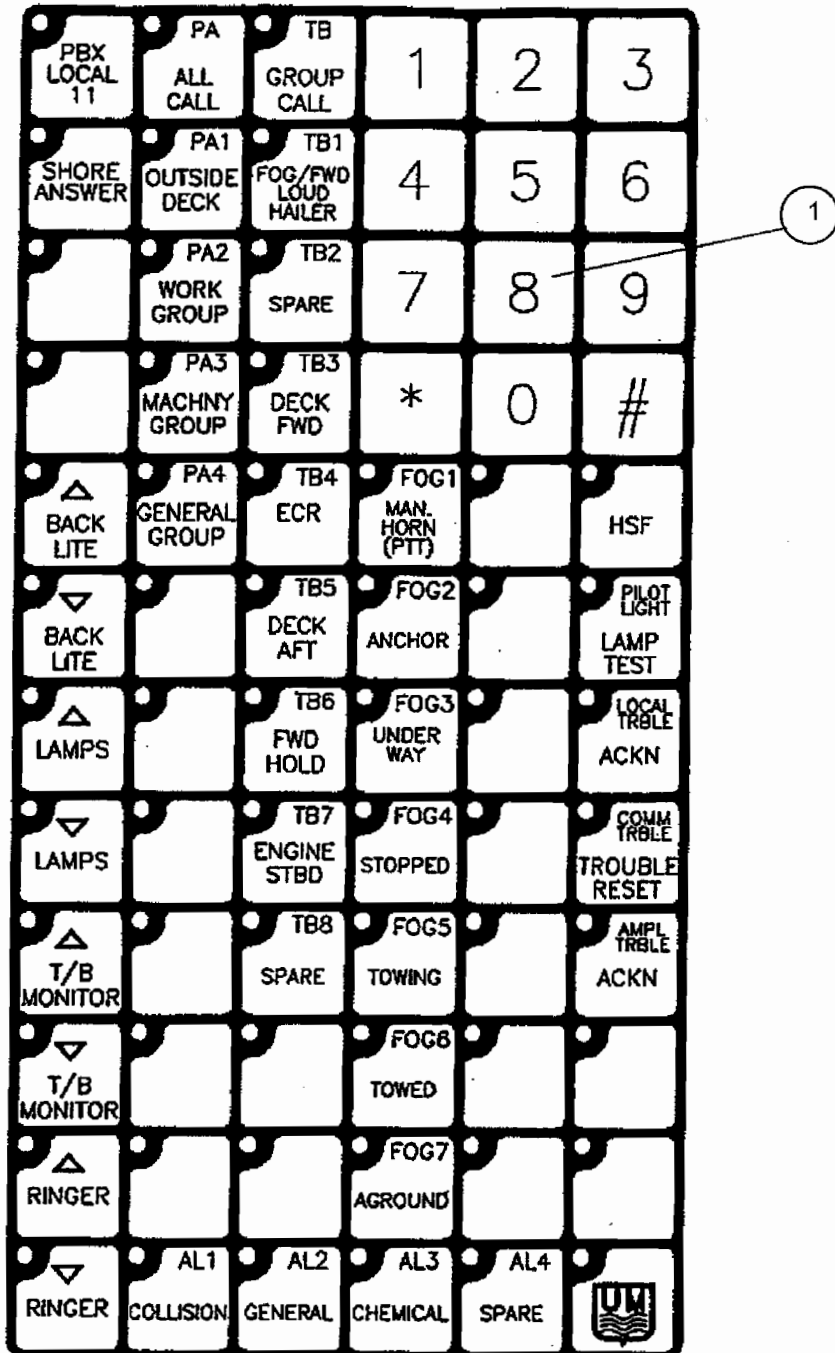


Figure 2-10. Loudhailer/General Alarm Keypad.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Loudhailer/General Alarm Keypad		
1	Keypad	Used to activate signals and alarms or station(s) being called.

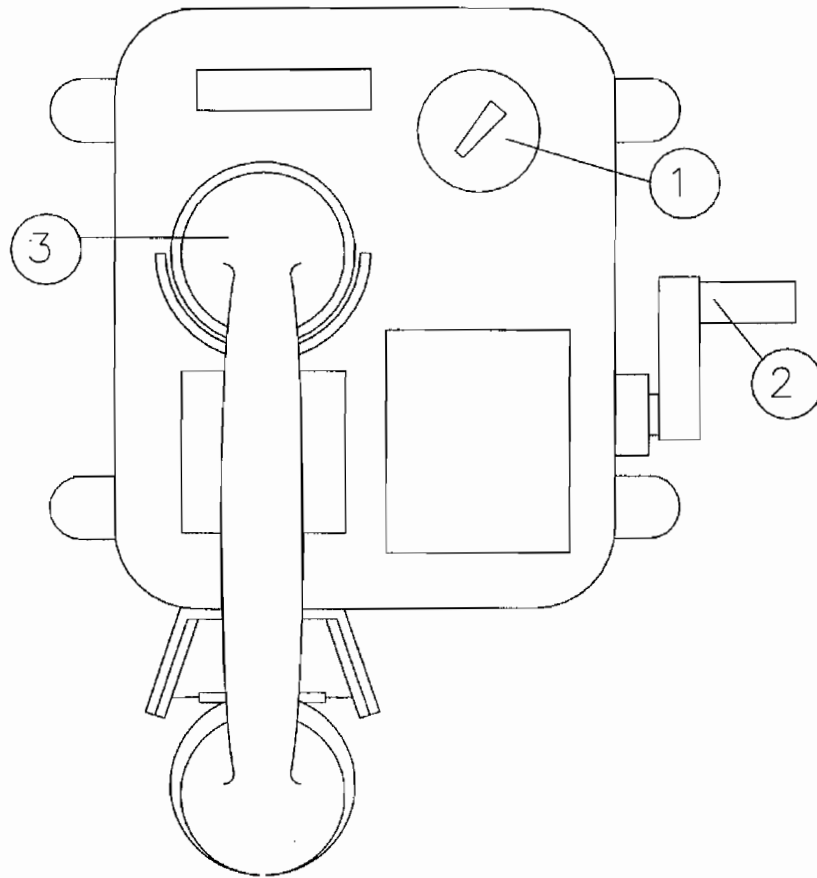


Figure 2-11. General Purpose Sound Powered Telephone System.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Sound Powered Telephone.		
1	Station Selector Switch	Selects receiving station
2	Magneto Handle	Rings selected receiving station
3	Hand Set	Used for sending and receiving messages
Not shown	Push to Talk Button	Push button under hand set to talk

Sound Powered Phone Stations	
JV-1	Pilot House
JV-2	Mess Room
JV-3	Engine Room

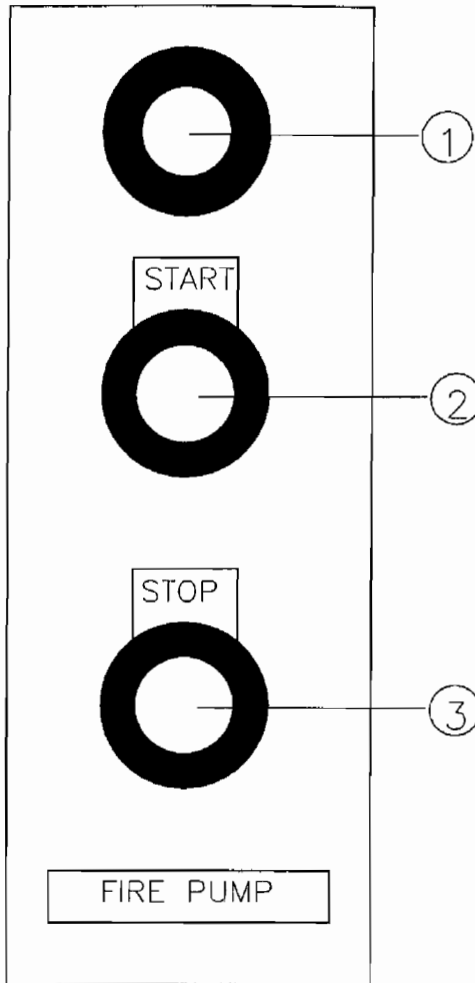


Figure 2-12. Emergency Start/Stop Switch Fire Pump.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Emergency Start/Stop Switch Fire Pump.		
1	Reset Button Indicator Light (Red)	Illuminates when the pump is in operation.
2	Start Button (Black)	Starts the fire pump.
3	Stop Button (Red)	Stops the fire pump.

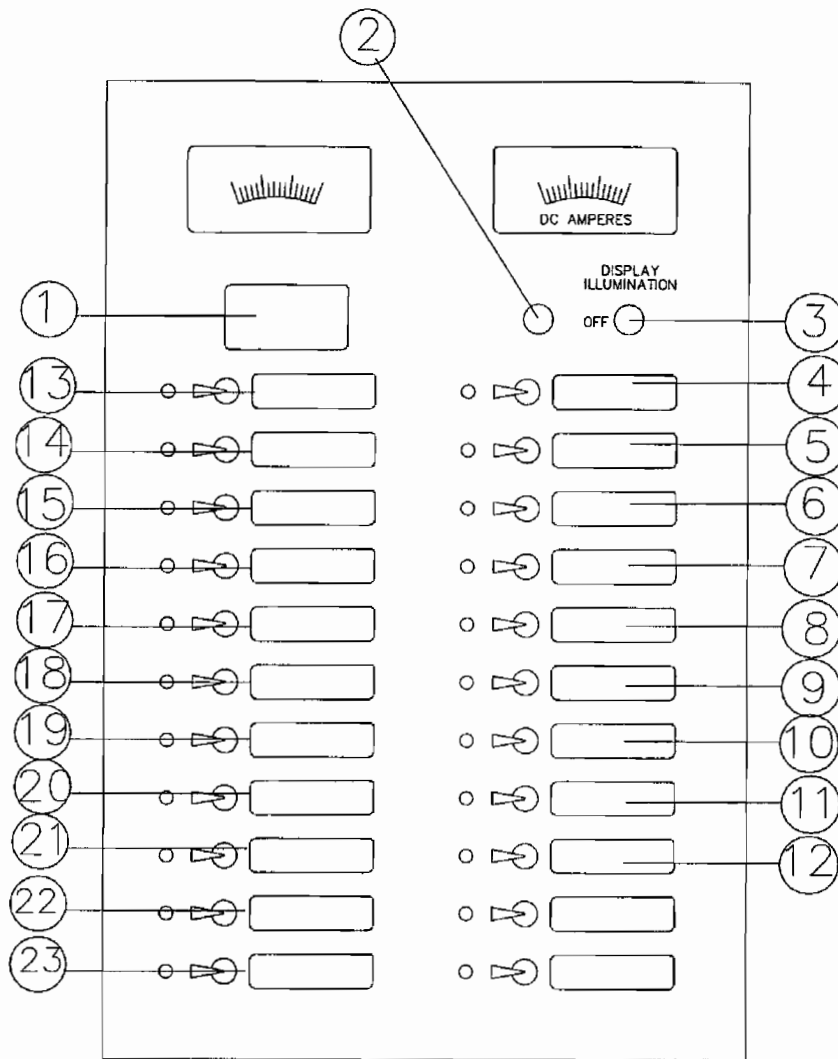


Figure 2-13. 24 Volt DC Panel.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
24 Volt DC Panel.		
1	Main Disconnect Breaker	Provides/Removes power from the 24 Volt DC Panel
2	Battery Test Switch	Test the charge in the battery
3	Dimmer Switch	Controls illumination of the panel
4	Radar	Provides/removes power to the radar
5	VHF #1	Provides/removes power to VHF #1
6	VHF #2	Provides/removes power to VHF #2
7	CO Panel	Provides/removes power to the CO panel
8	Compass	Provides/removes power to the compass backlight
9	Horn	Provides/removes power to the horn and white indicating light

Table 2-1. Description of Operator's Control and Indicators – CONT

Key	Control or Indicator	Function
24 Volt DC Panel-Continued.		
10	Bilge and Tank	Provides/removes power to the bilge and tank alarm panel
11	Mathers Stbd	Provides/removes power to Mathers stbd control
12	Mathers Port	Provides/removes power to Mathers port control
13	Spare	
14	Spare	
15	Spare	
16	Spare	
17	Stbd Sump	Provides/removes power to starboard sump pump
18	Port Sump	Provides/removes power to port sump pump
19	E-Lights	Provides/removes power to emergency DC lights
20	Nav Light Panel	Provides/removes power to navigation light panel
21	Spare	
22	Magtronic	Provides/removes power to Magtronic compass
23	GFE Radio	Provides/removes power to GFE radio

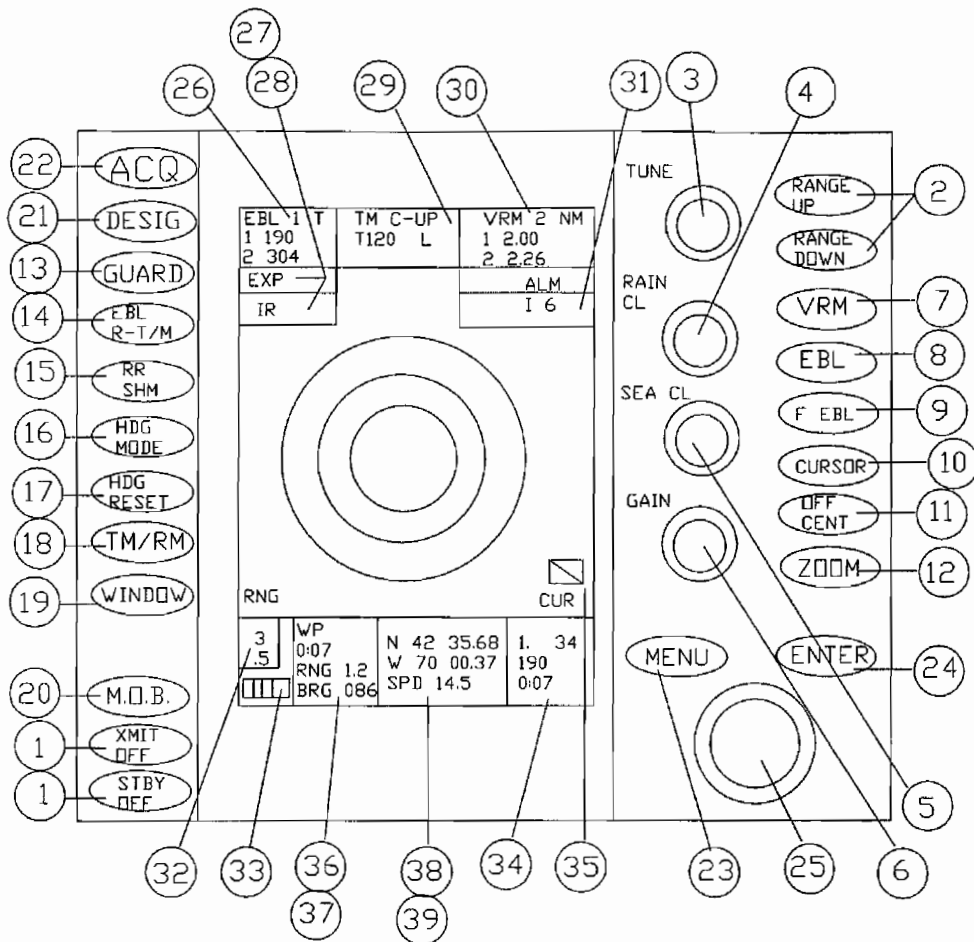


Figure 2-14. Radar Monitor

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Radar Monitor.		
1	Standby/Off Switch	Turns on the power and pedestal/radome and activates 90 second countdown
	Brilliance Reset	When Standby/Off Switch (1) and Menu Key (23) is pressed at the same time, the display automatically resets the brilliance level to 6.
	Transmit Off Switch	Turns on the transmitter which activates the pedestal/radome
2	Range scale up	Increases the range scale in use.
	Range scale down	Decreases the range scale in use.
3	Tune Control	Manually fine tunes receiver by peaking tuning bar in lower left corner (no turning bar in auto tune)
4	Rain Clutter Control	Reduces rain or snow returns
5	Sea Clutter Control	Reduces sea returns
6	Gain Control	Controls strength of target returns

Key	Control or Indicator	Function
Radar Monitor, Continued		
7	VRM Enable/Select	Enables a VRM for display/A short press selects a VRM for operation. Press and hold to turn off selected VRM.
8	EBL Enable/Select	Enables an EBL for display. A short press selects EBL for operation. Press and hold to turn off selected EBL.
9	Free Float EBL Enable/Select	Enables EBL#2 as a free-floating EBL to be placed anywhere on the display.
10	Display Cursor Enable	Enables cursor for range and relative bearing measurements from own ship.
11	Display OFF center	Places origin at any point on screen up to 66% of radius. Inop on 32/48 Nmi Range
12	Display ZOOM Enable	Magnifies a selected point of interest on the display by a factor of X2 Inop on 1/8 NM and in OFF CENTER mode.
13	Guard Zone Select	Enables or displays Guard Zone alarms as set with the Trackpad and I or O Operation I = Inbound Mode O = Outbound Mode Blank = OFF
14	EBL Bearing Mode Select	Selects EBL Relative or True/Mag Bearing Mode Alternately
15	Range Rings ON/OFF and Ship's Heading Marker OFF	Enables or disables the fixed range rings alternately. Momentarily disable the heading flash while pressed and held.
16	Heading Mode Selection	Selects type of Heading Mode C-UP = Course UP N-UP = North UP H-UP = Head UP
17	Heading Reset	Heading reset in Course UP mode returns heading flash to 000.
18	True Motion/Relative Motion	Selects true or relative motion display
19	Window	Enables and selects the displays within the dual screens: Raychart Fishfinder Seataalk OFF
20	Man Over Board	Marks the point where the incident occurred.
21	MARPA Designation	Provides designated target information. Quick presses change designations. Press and hold to turn off.
22	MARPA Acquisition	Acquires targets to be tracked. Press and hold to delete all acquired targets simultaneously
23	Menu Recall	Enables menu for setups and selections
24	Enter Data	Enter selected data.
25	Trackpad	Positions cursor, selects menu items, or makes on screen measurements and selections.

NOTE

The following table illustrates on screen display readouts on the monitor. They are not functions.

Key	Control or Indicator	Function
Radar Monitor, Continued		
26	EBL Selected EBL Bearing Mode R = Relative Bearing T = True Bearing M = Magnetic Bearing Bearing of EBL1 & EBL2	Display Readout, Upper Left. Indicates the EBL is on and in which bearing mode it is functioning in.
27	Target Expander ON	Display Readout, Upper Left. Indicates the target expander is on.
28	Interface Rejection ON	Display Readout, Upper Left. Indicates the interface rejection in on.
29	Heading Mode H-UP = Head UP C-UP = Course UP N-UP = North UP Bearing Selected T = True Bearing M = Magnetic Bearing Own Ship's Heading Heading Data Source M= Magnetic Sensor S= Seataik L= Loran or GPS	Display Readout, Upper Center. Indicates the heading mode, bearing selected, own ship's heading, and heading data source in on.
30	VRM Selected VRM Range Units NM = Nautical Miles KY = Kiloyard KM = Kilometer Range of VRM1 and VRM2	Display Readout, Upper Right. Indicates the VRM is selected and which range unit it is functioning in.
31	Guard Zone Alarm ON Guard Zone Mode 1 = In Mode 0 = Out Mode Sensitivity Level 1-7	Display Readout, Upper Right. Indicates the Guard Zone Alarm in on and indicates the mode and sensitivity of operation.
32	Range Scale Range Ring Interval	Display Readout, Lower Left. Indicates the range scale and range ring interval.
33	Manual Tuning Mode	Display Readout, Lower Left. Used for manual tuning.
34	Cursor Position Range NM, KY, or KM Bearing Deg Time To Go (Min.)	Display Readout, Lower Right. Indicates the cursor position, range, bearing degrees, and time to go (in minutes).
35	Trackpad Mode Indicator	Display Readout, Lower Right. Indicates the trackpad mode of operation.
36	Waypoint Data ON	Display Readout, Lower Mid Left. Indicates the waypoint data is on.
37	MOB Data ON Time To Go (Min.) Range (NM) Bearing (Deg)	Display Readout, Lower Mid Left. Indicates the MOB data is on.
38	Own Ship's LL Waypoint LL MOB Point LL Waypoint TD	Display Readout, Lower Mid Right. Indicates the Own Ship's LL, Watpoint LL, MOB Point LL, and Waypoint TD.
39	Own Ship's Speed	Display Readout, Lower Mid Right. Indicates Ship's speed.

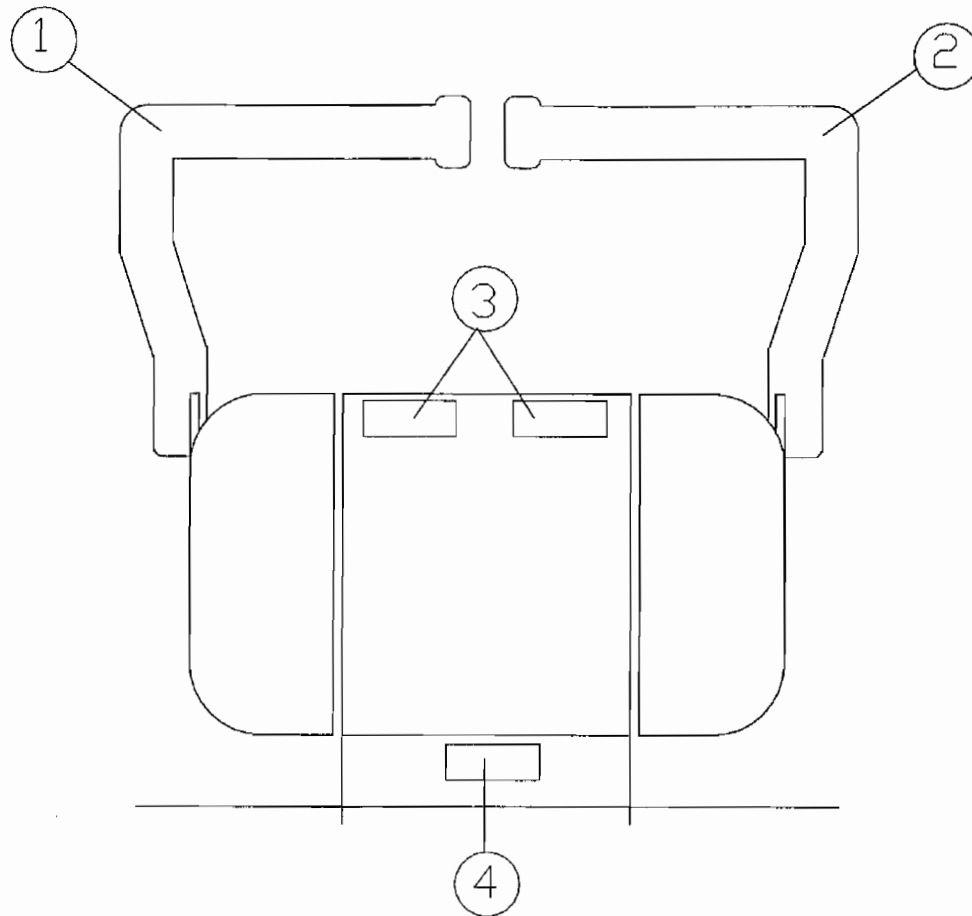


Figure 2-15. Main Engine Throttle Control.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Main Engine Throttle Control.		
1	Port Main Engine Throttle/Clutch Control	Facilitates clutching and throttling of the port main engine and reduction gear.
2	Starboard Main Engine Throttle/Clutch Control	Facilitates clutching and throttling of the starboard main engine and reduction gear.
3	LED Indicators	Indicates various modes of the control head
4	Transfer Switch	Facilitates transfer of control from one station to another.

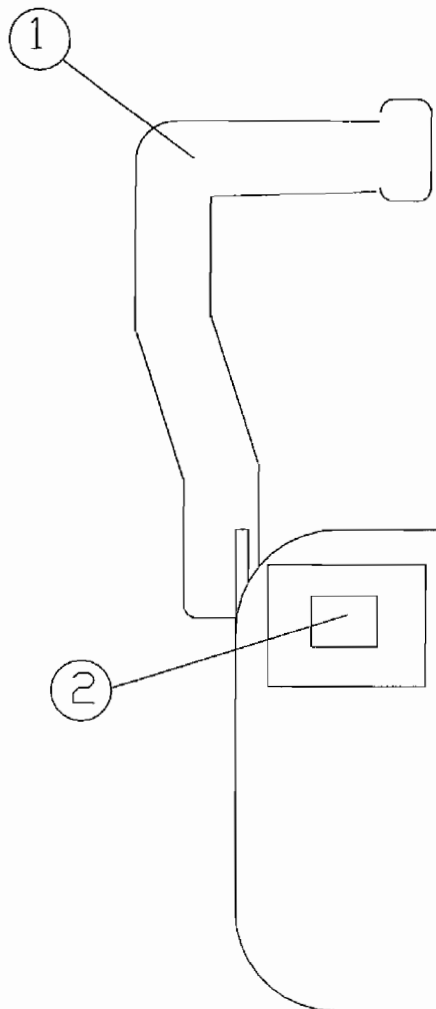


Figure 2-16. Backup Main Engine Throttle Control, Port and Starboard.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Backup Main Engine Throttle Control.		
1	Main Engine Throttle Control	Facilitates throttling of the main engine.
2	Backup Selector Switch	Selects the backup main engine throttle control.

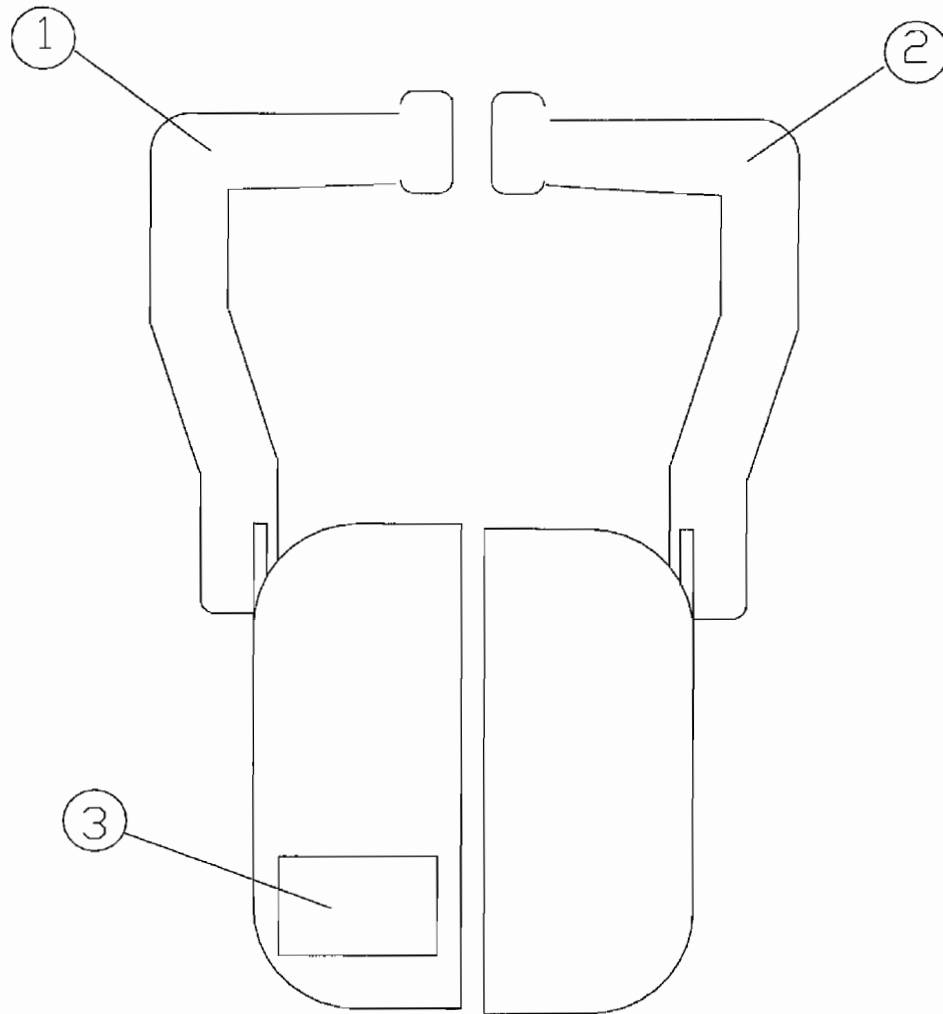


Figure 2-17. Auxiliary Main Engine Throttle Control (Aft Control Station, Engine Room Control Station).

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Auxiliary Main Engine Throttle Control.		
1	Port Main Engine Throttle/Clutch Control	Facilitates clutching and throttling of the port main engine and reduction gear.
2	Starboard Main Engine Throttle/Clutch Control	Facilitates clutching and throttling of the starboard main engine and reduction gear.
3	Station Selector Switch	Used to select station in command.

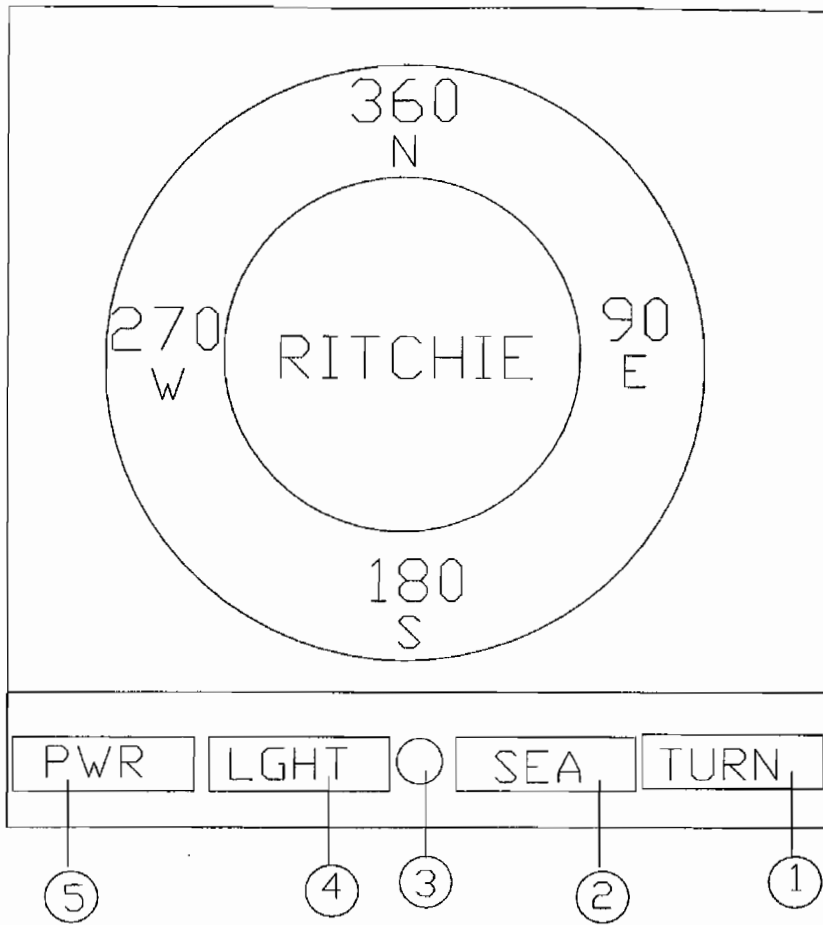


Figure 2-18. Fluxgate Compass.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Fluxgate Compass.		
1	Turn Button	Temporarily bypasses sea state damping to reduce lag in digital readout and compass card.
2	Sea Button	Enables selection of sea state setting.
3	Auto Compensation Button	Button used to set (automatically) the compensation of the fluxgate compass..
4	Light Button	Enables selection of light intensity
5	Power Button	Enables/Disables the unit.

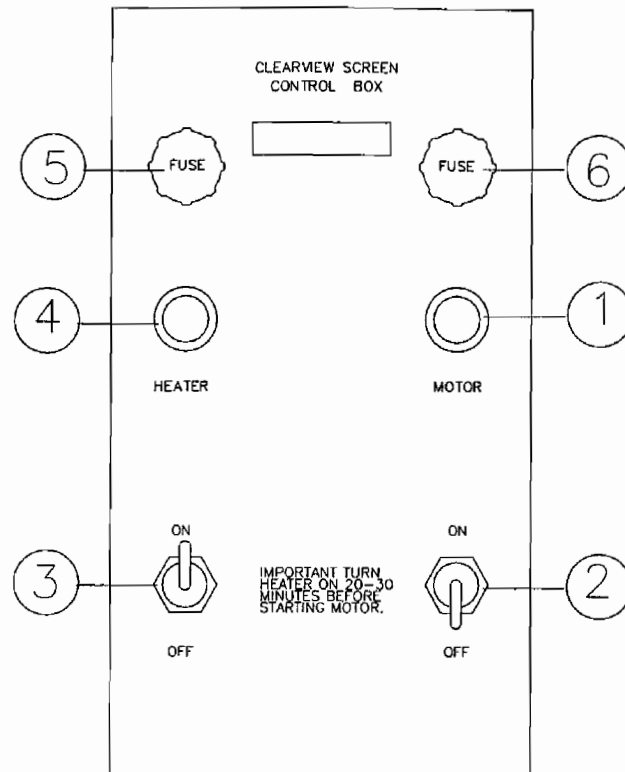


Figure 2-19. Clearview Screen Control Box.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Clearview Screen Control Box.		
1	Motor Running Indicator Light (Red)	Indicates that the motor is running.
2	Motor ON/OFF Switch	Facilitates turning the motor ON/OFF
3	Heater ON/OFF Switch	Facilitates turning the heater ON/OFF
4	Heater ON Indicator Light (Red)	Indicates that the heater is ON.
5	Fuse	Prevents damage to electrical heater components during an overload.
6	Fuse	Prevents damage to electrical heater components during an overload.

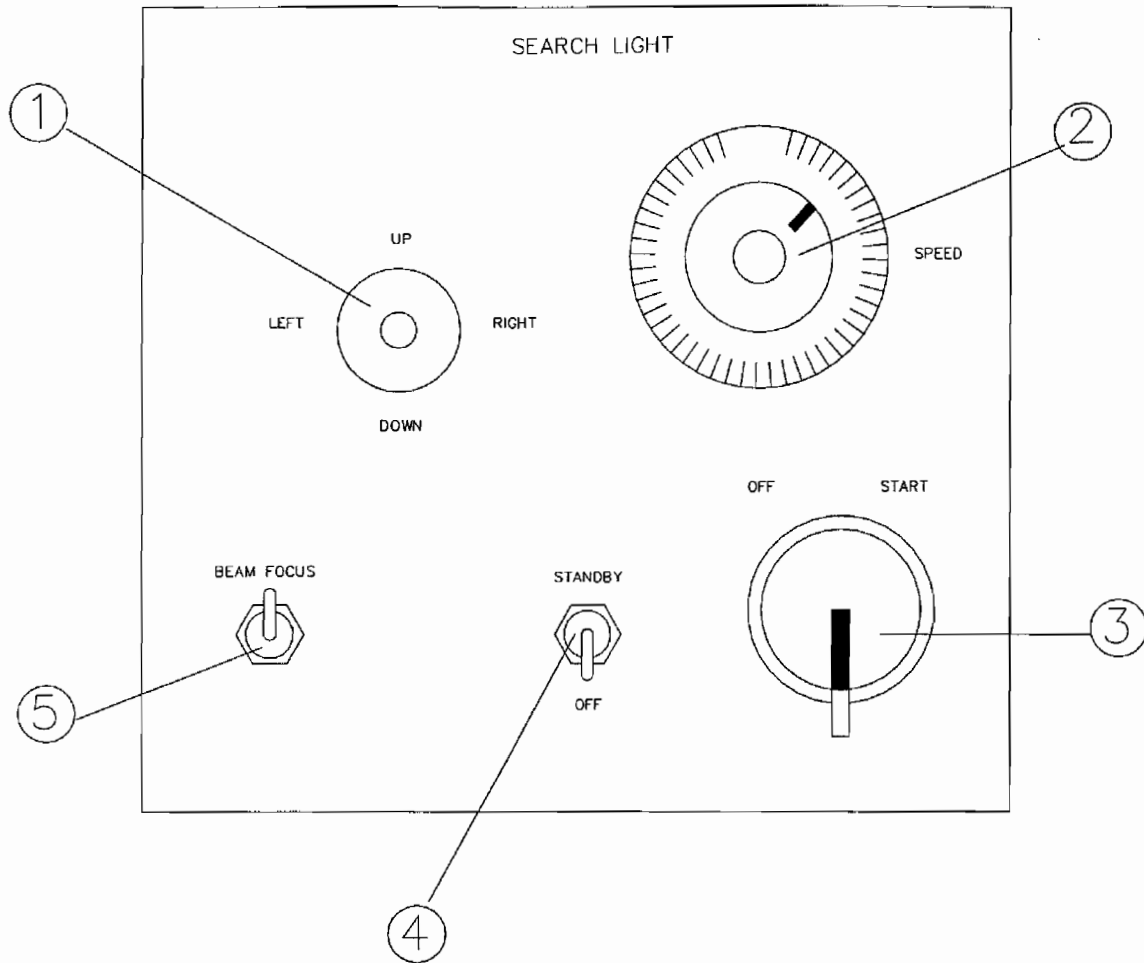


Figure 2-20. Search Light Controls.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Searchlight Controls.		
1	Joystick	Controls the position of the search light beam
2	Speed Adjustment	Controls the speed of the search light
3	START/OFF Switch	Enables/Disables the search light
4	STANDBY/OFF Switch	Toggles between Standby and OFF
5	BEAM FOCUS Switch	Enables focusing of the searchlight beam

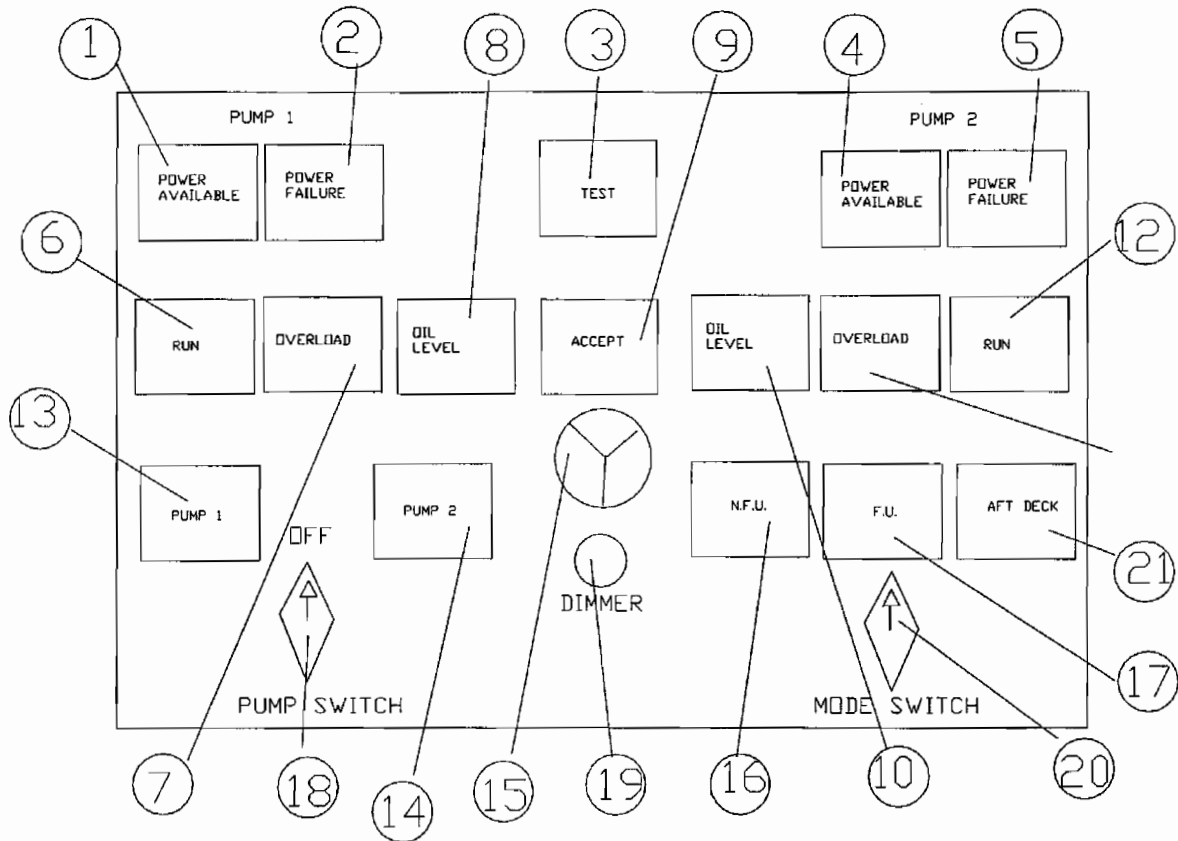


Figure 2-21. Pilothouse Steering Alarm and Control Panel.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Pilothouse Steering Alarm and Control Panel.		
1	Power Available Indicator light (Pump 1) – grn	Illuminates to indicate power is available to Pump 1.
2	Power Failure Indicator light (Pump 1) – red	Illuminates to indicate there is a power failure at Pump 1.
3	Test Pushbutton	Illuminates all indicator lamps when pushed
4	Power Failure Indicator Light (Pump 2) – red	Illuminates to indicate there is a power failure at Pump 2.
5	Power Available Indicator Light (Pump 2) – grn	Illuminates to indicate power is available to Pump 2.
6	Run Indicator Light (Pump 1) – grn	Illuminates to indicate Pump 1 is running.

Pilothouse Steering Alarm and Control Panel-Continued.		
7	Overload Indicator light (Pump 1) – red	Illuminates to indicate overload of Pump 1.
8	Low Oil Level Filter (Pump 1) – red	Illuminates to indicate Low Oil Level Filter condition on Pump 1.
9	Accept Pushbutton	
10	Low Oil Level Filter (Pump 2) – red	Illuminates to indicate Low Oil Level Filter condition on Pump 2.
11	Overload Indicator light (Pump 2) – red	Illuminates to indicate overload of Pump 2.
12	Run Indicator light (Pump 2) – grn	Illuminates to indicate Pump 2 is running.
13	Pump 1 Indicator light – white	Illuminates to indicate Pump 1 is in service
14	Pump 2 Indicator light – white	Illuminates to indicate Pump 2 is in service
15	Audible Device	Sounds alarm
16	N.F.U. Indicator light – white	Illuminates to indicate steering is in non-follow-up
17	F.U. Indicator light – white	Illuminates to indicate steering is in follow-up mode
18	Pump Switch	Selects desired pump, directional control valve, divert/unloading valve, and amplifier to be used for steering
19	Lamp Dimmer Control	Adjusts luminous intensity of all indicator lamps at the wheelhouse control/alarm panel
20	Steering Mode Selector Switch	Selects the desired steering mode (follow-up, non-follow-up, or auto-pilot)
21	Aft Deck Light (White)	Illuminates to indicate the aft control station has command.

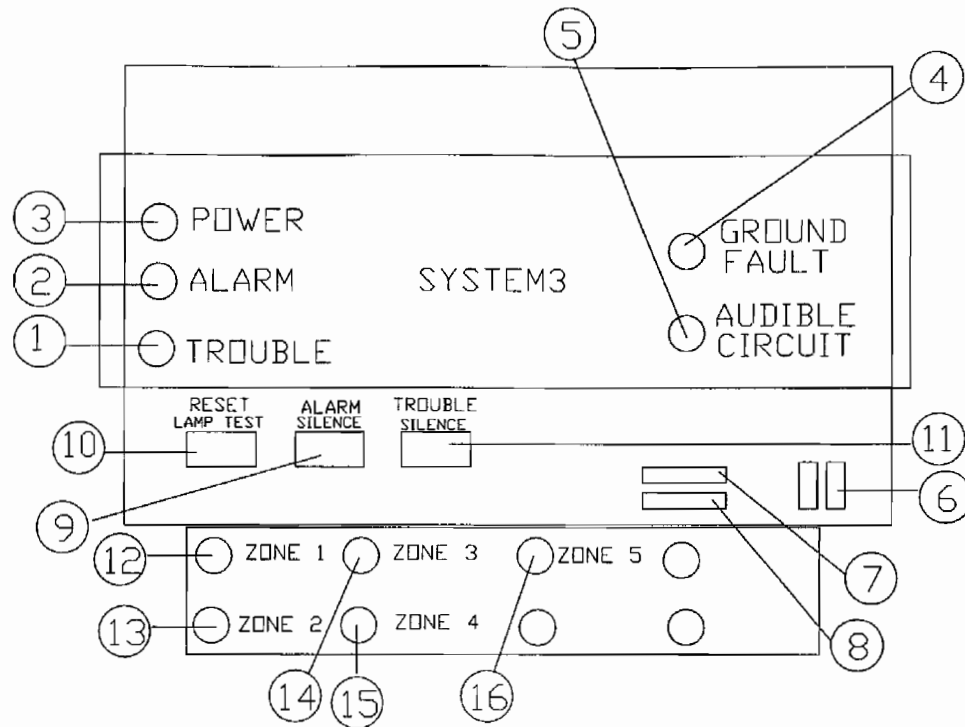


Figure 2-22. Fire Suppression/Detection System Control Panel (CP-35).

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Main Control Panel (CP-35).		
1	Trouble Indicator (amber LED)	Indicates system trouble condition/status
2	Alarm Indicator (red LED)	Illuminates to indicate alarm condition/status; flashes when silenced
3	Power On Indicator (green LED)	Illuminates to indicate unit is turned on; flashes when on battery power
4	Ground Fault Indicator (amber LED)	Illuminates to indicate detection of ground fault
5	Audible Signal Circuit Trouble Indicator (amber LED)	Indicates audible signal circuit trouble condition/status
6	Battery Trouble	Indicates a trouble condition at the battery
7	AC Volt Meter (Top)	Displays the current AC Volts
8	DC Amp Meter (Bottom)	Displays the current DC Amps
9	Alarm Silence Button	Silences audible alarm
10	Reset/Lamp Test Button	Clears "locked in" alarm condition/status; lights all operable indicators
11	Trouble Silence Button	Silences trouble alarm
12	Zone 1 Indicator	Monitors Pilot House and HVAC Room for fire, smoke and heat
13	Zone 2 Indicator	Monitors 2-person berth and 01 Deck
14	Zone 3 Indicator	Monitors Mess Area, Head, 3-person berth NA Generator Room for fire, smoke and heat
15	Zone 4 Indicator	Monitors Hold Deck for fire, smoke and heat
16	Zone 5 Indicator	Monitors actuation of the CO ₂ system in the Engine Room

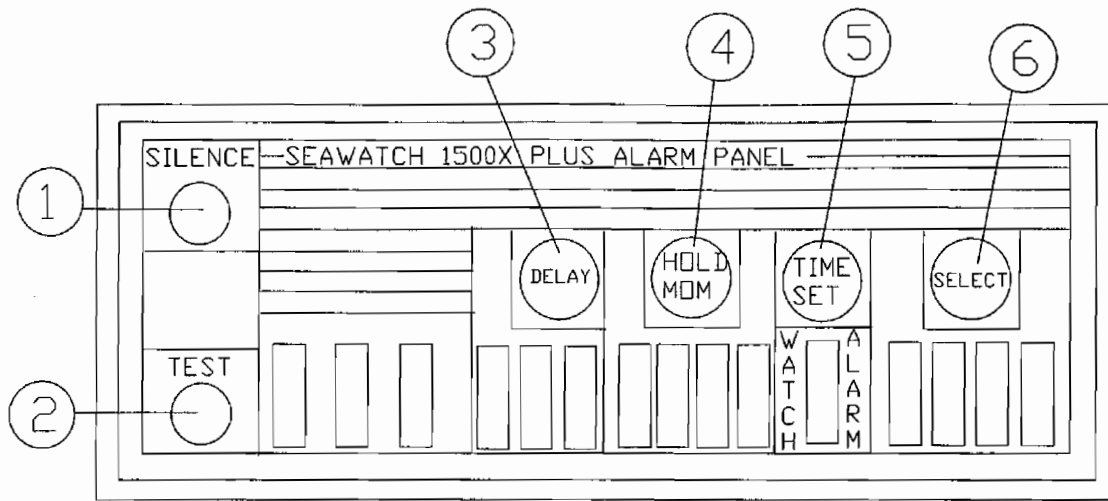


Figure 2-23. Carbon Monoxide/Watertight Door Alarm Panel.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Carbon Monoxide/Watertight Door Alarm Panel.		
1	Silence Button	Acknowledges and silences an alarm.
2	Test Button	Enables testing of alarm settings.
3	Delay Button	Enables/Disables the Delay Audio Feature.
4	Hold Mom Button	Enables/Disables the hold momentary feature.
5	Time Set Button	Enables setting the length of the time for the time delay.
6	Select Button	Entry point for activating or deactivating the watch alarm, changing watch alarm time settings, inserting audible alarm delays on each alarm point, and enabling any alarm point to hold and display momentary alarm signals.

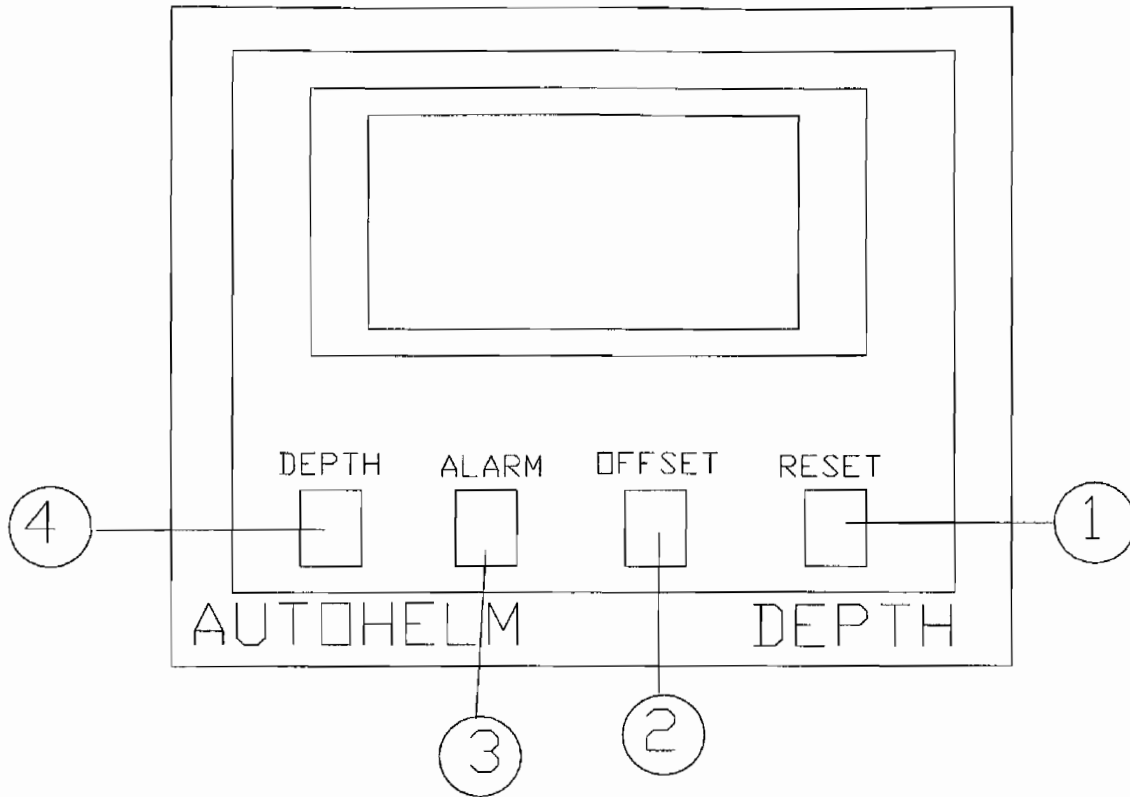


Figure 2-24. Depth Sounder.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Depth Sounder.		
1	Reset Key	Returns unit settings back to default settings.
2	Offset Key	The offset value can be positive or negative: depth measured from the keel is negative and depth to the waterline positive.
3	Alarm Key	Enables selection of deep alarm, anchor alarms, silencing audible alarms, and enabling and disabling alarms.
4	Depth Key	Enables selection of depth modes.

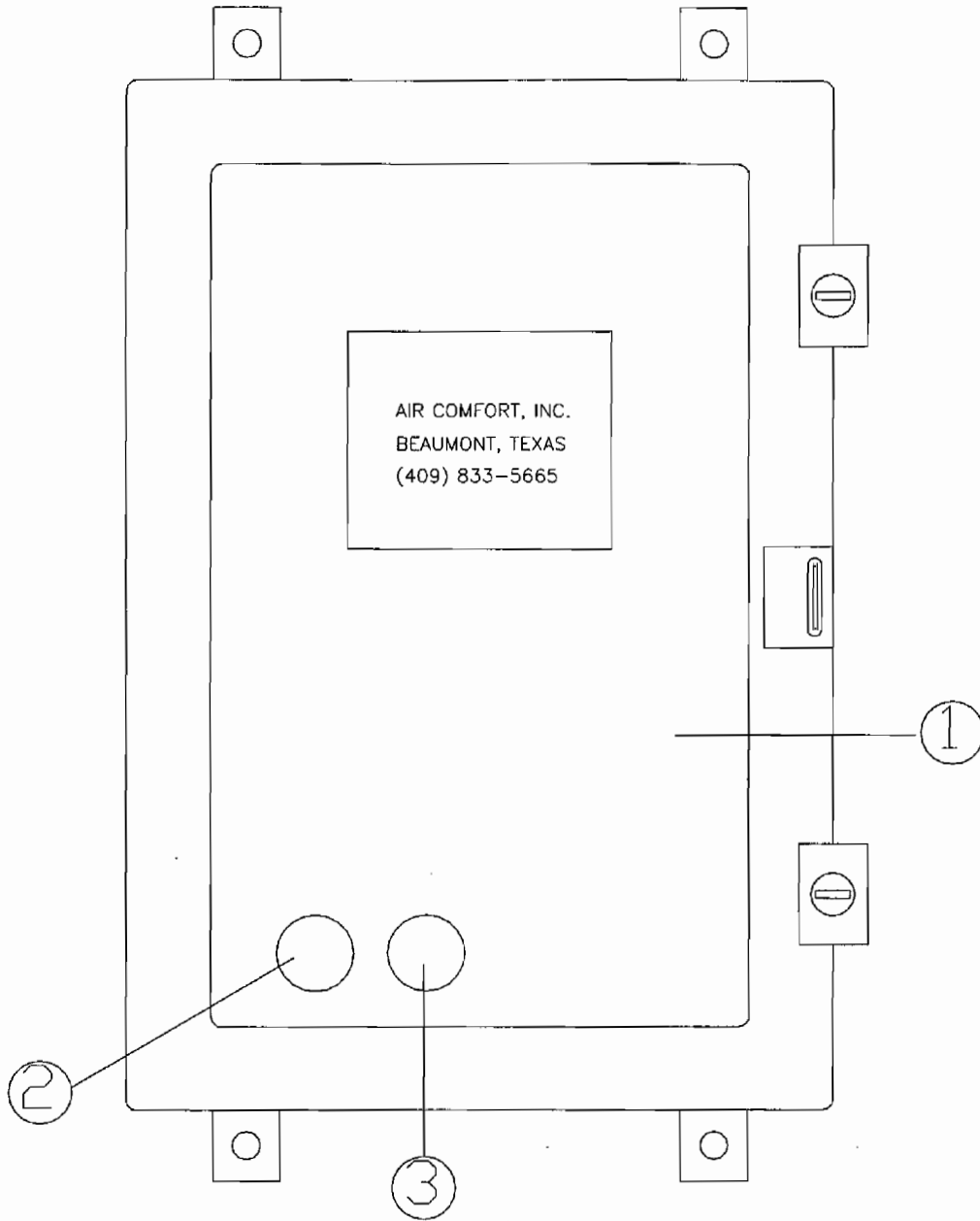


Figure 2-25. Air Conditioning Control Panel

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Air Conditioning Control Panel.		
1	Air Conditioning Control Panel	Air conditioning power distribution
2	Start Button (Green)	Starts the air condition when depressed
3	Stop Button (Red)	Stops the air condition when depressed

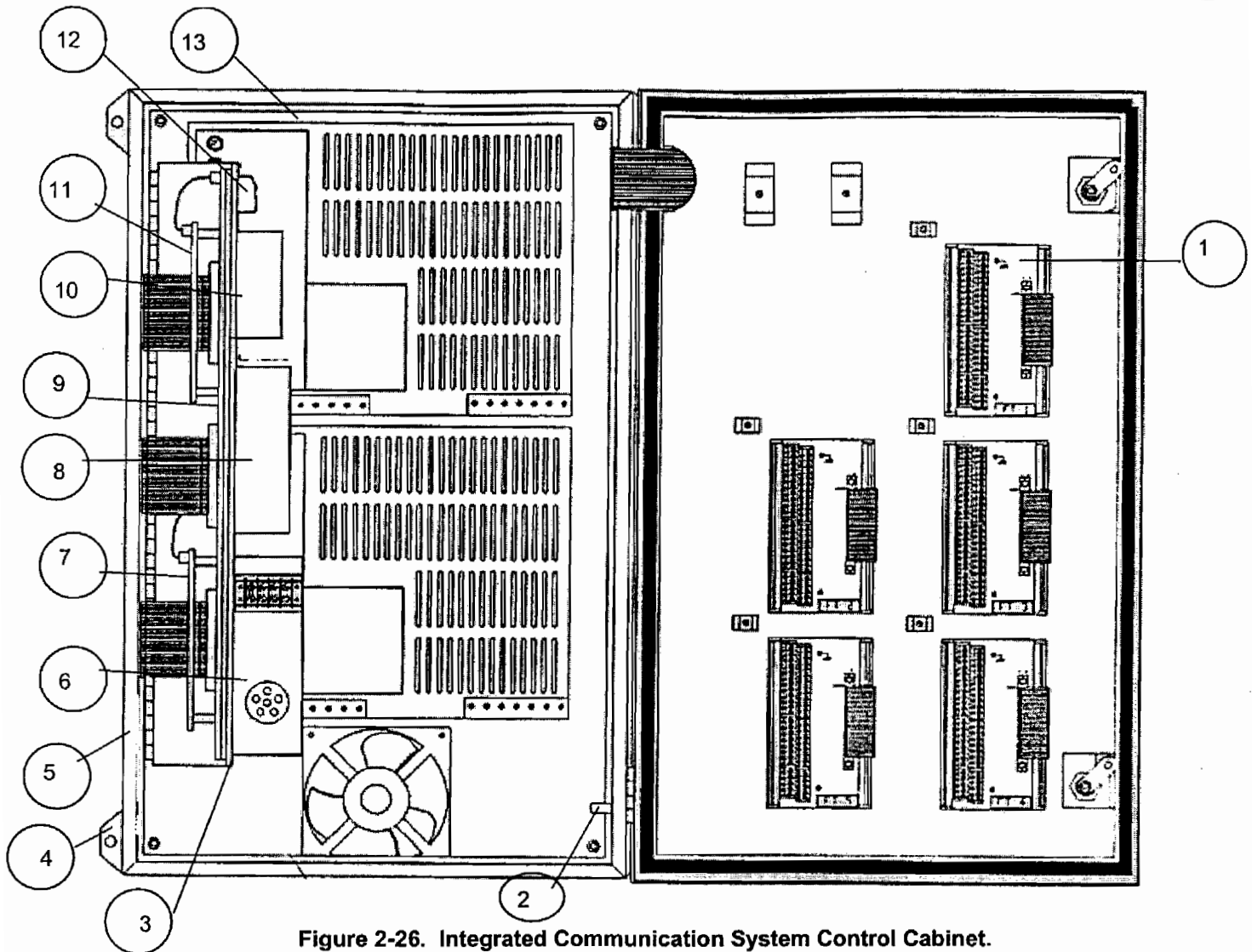


Figure 2-26. Integrated Communication System Control Cabinet.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Integrated Communication System Control Cabinet.		
1	Field Terminal	Facilitates connection of external wiring to control cabinet.
2	Ground Stud	Provides an earth (ground) connection.
3	Swing Panel	Provides access to PC board
4	Shockmount	Provides dampening for unit
5	Enclosure	Unit case
6	Power Supply	Provides power to the unit
7	Expansion PCB	Enables added capabilities to unit
8	AC Distribution	Distributes AC power
9	Main PCB (Mother)	Central Processing Unit for Integrated Communication System
10	Gare	Provides interface for alarm contacts
11	Fog PCB	Fog PC board
12	Thermostat	Provides adjustment for fan cycling
13	Amplifier	Increases the volume and projection of the signal delivered.

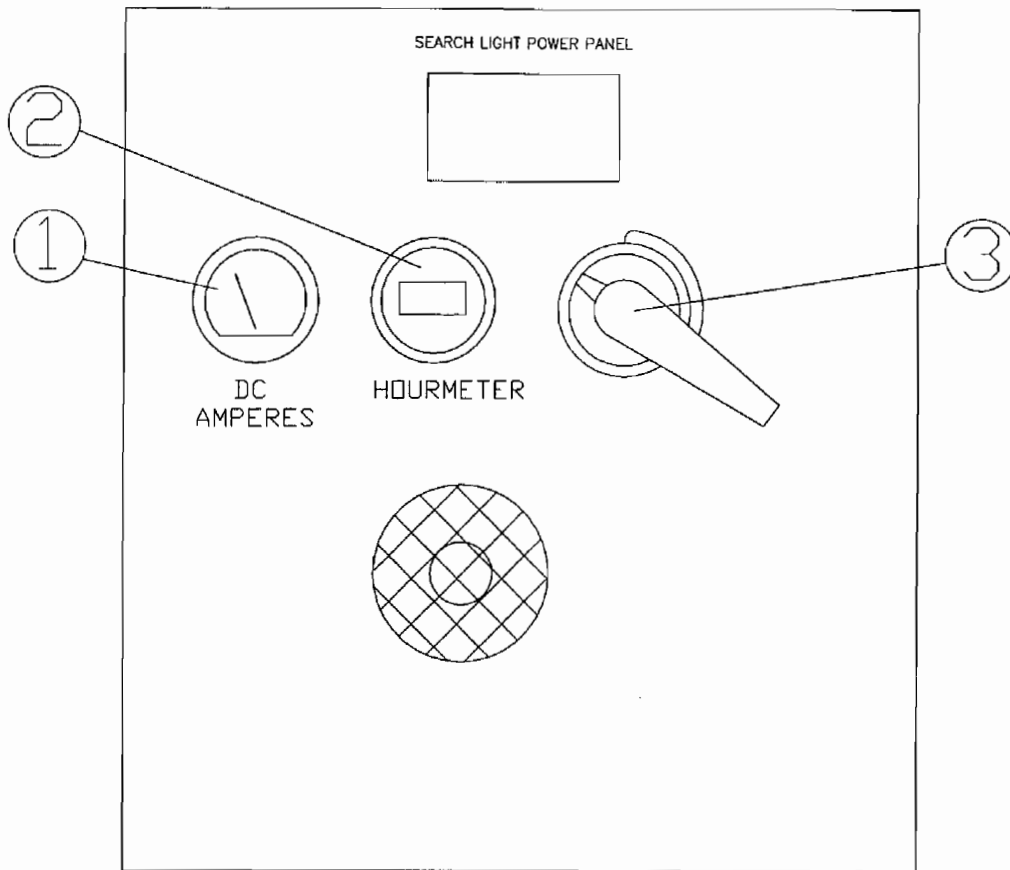


Figure 2-27. Searchlight Power Panel.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Searchlight Power Panel.		
1	Ammeter	Provides a reading of the amperage being drawn by the searchlight.
2	Elapsed Time Meter	Provides an indication of the elapsed time the searchlight has been operated.
3	Main Power Lever	Provides/Removes power from the searchlight.

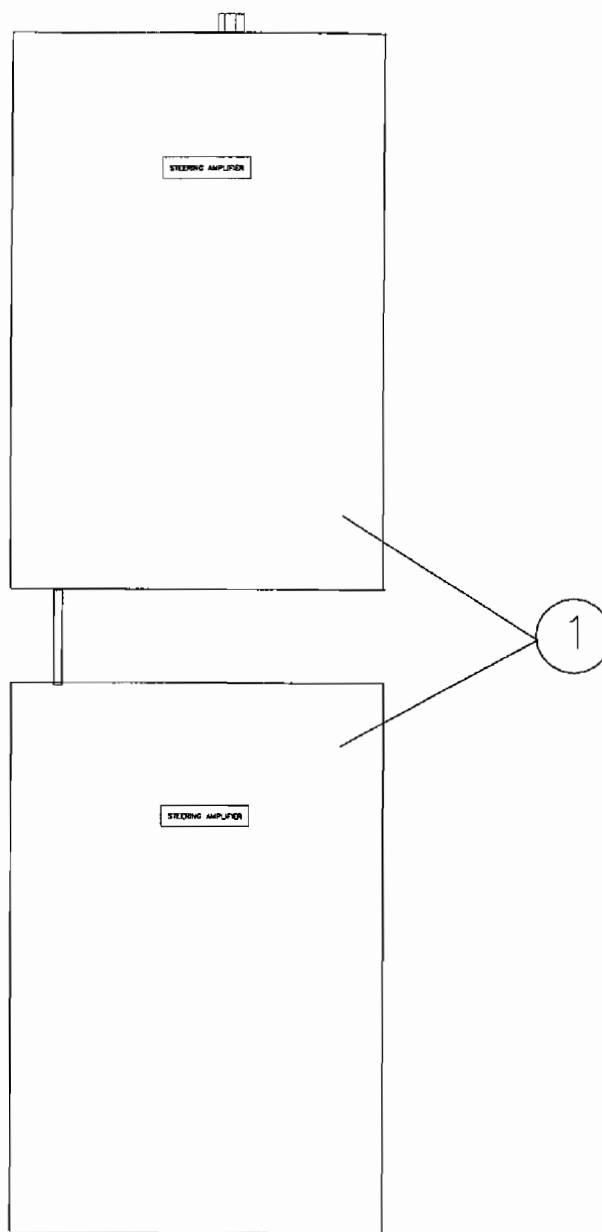


Figure 2-28. Steering Amplifier.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Steering Amplifiers.		
1	Steering Amplifier	Provides rudder positioning in response to the operator's command in the follow up mode.

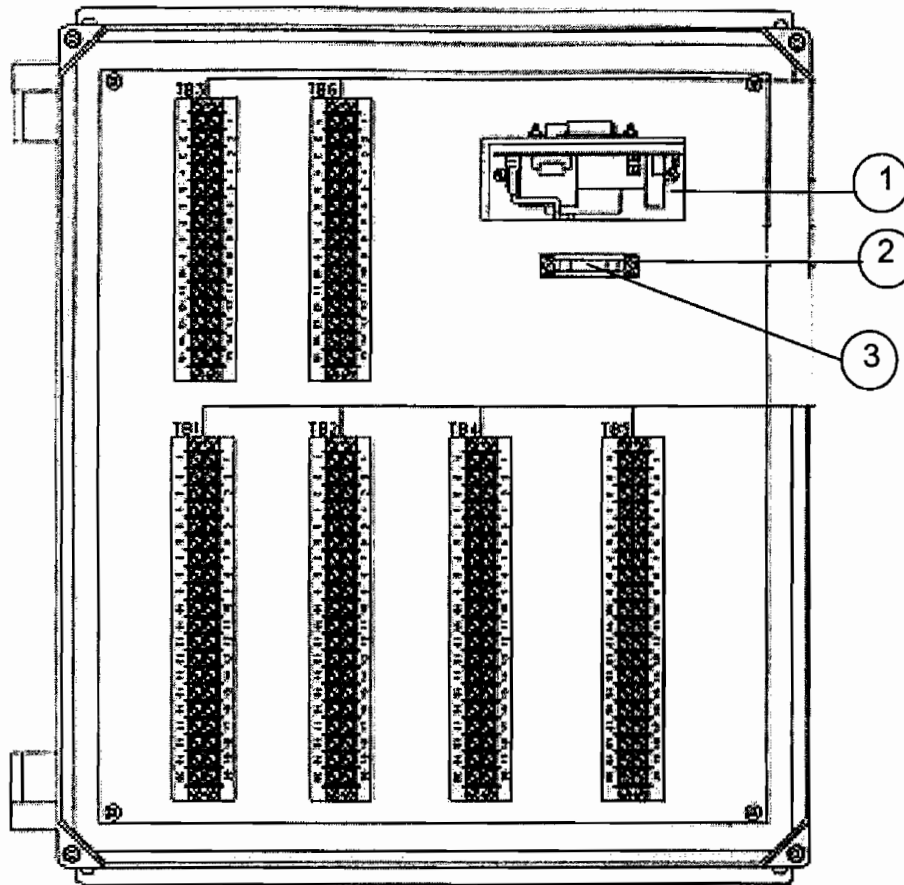


Figure 2-29. Pilothouse (Wheelhouse) Distribution Panel.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Pilothouse (Wheelhouse) Distribution Panel.		
1	12V 1.7A Power Supply	Provides power to distribution panel.
2	Fuse Holder	Holds fuse in place.
3	½ Amp Fast Acting Fuse	Prevents damage to electrical components during an overload.

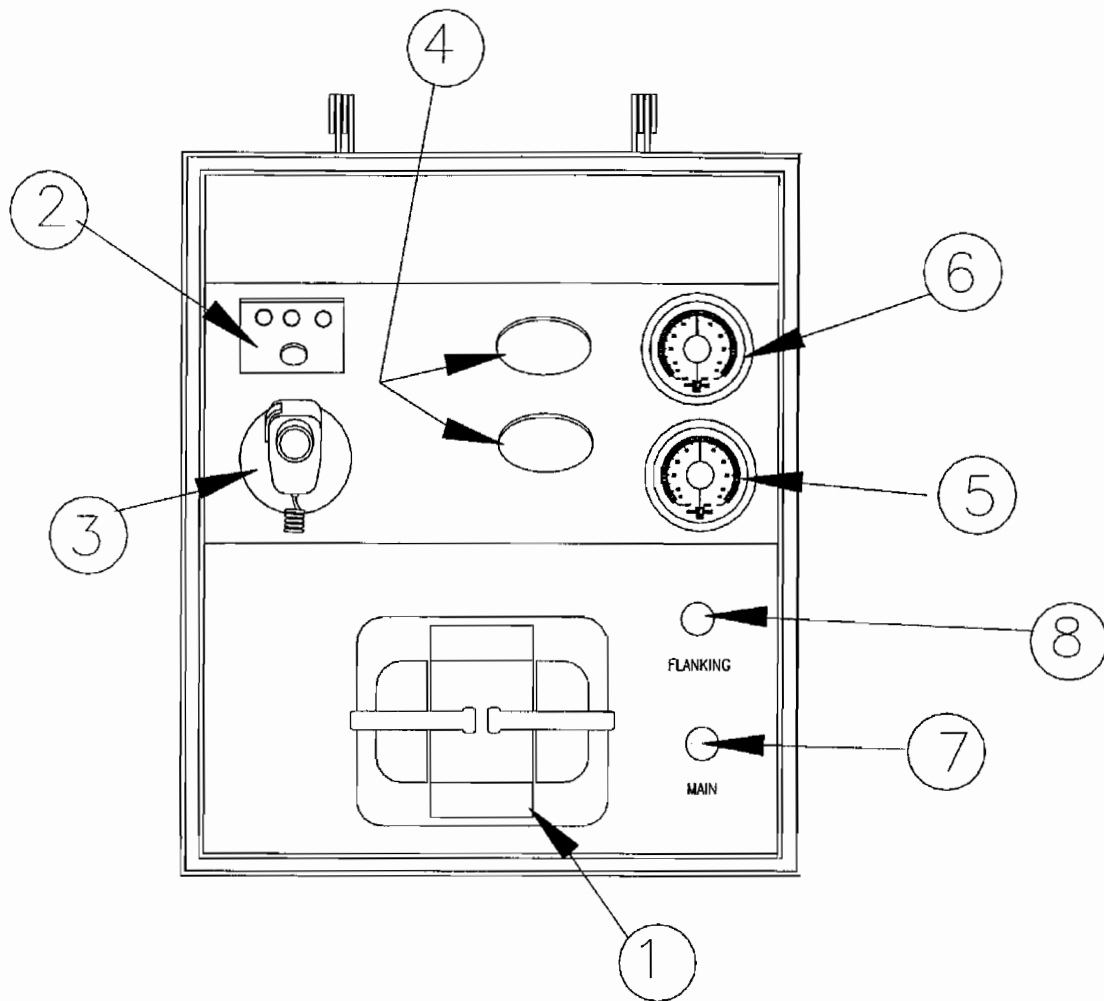


Figure 2-30. Aft Control Station.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Aft Control Station.		
1	Main Engine Throttle Controls	Provides clutch/throttle control of the main engines from the aft station.
2	Steering Alarm Panel	Provides steering indication and alarms from the aft station.
3	Loudhailer Microphone	Provides announcing capabilities from the aft station.
4	Main Engine Tachometers	Provides monitoring of the main engines from the aft station.
5	Main Rudder Angle Indicator	Provides the rudder angle of the main rudder.
6	Flanking Rudder Angle Indicator	Provides the rudder angle of the flanking rudder.
7	Main Rudder Non Follow Up Control	Provides non-follow up steering control of the main rudders from the aft station.
8	Flanking Rudder Non Follow Up Control	Provides non-follow up steering control of the flanking rudders from the aft station.

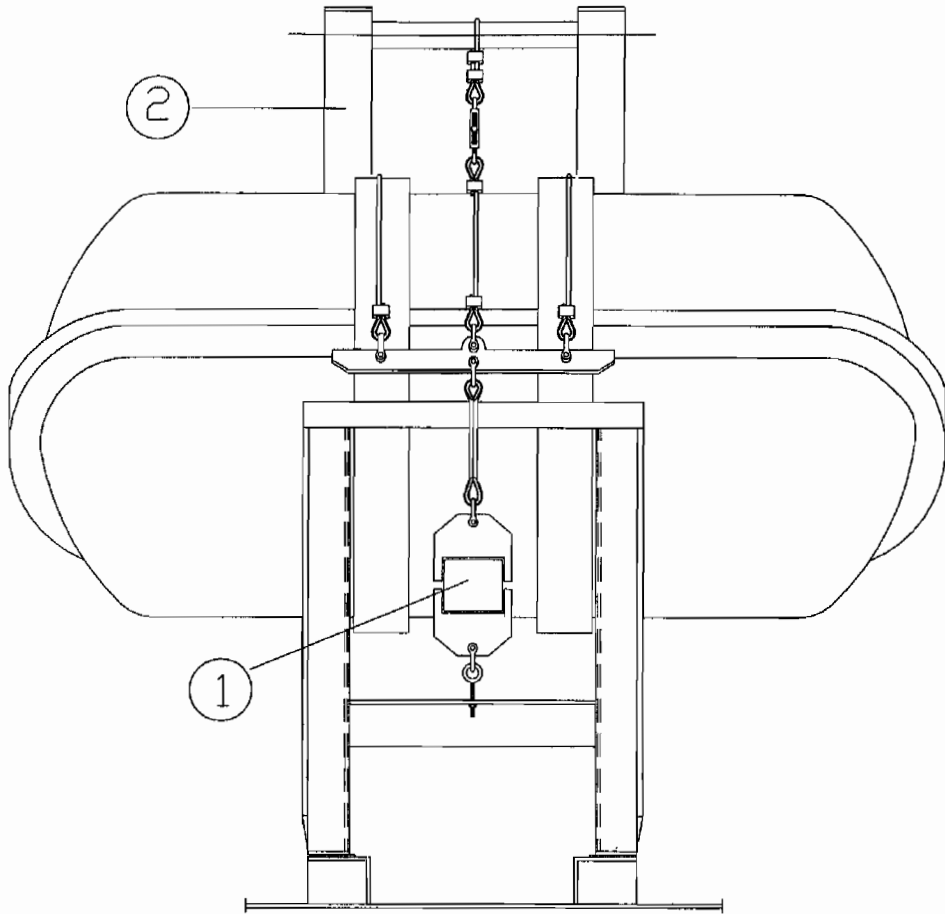


Figure 2-31. Life Raft Launch Cradle.

Table 2-1. Description of Operator's Control and Indicators – CONT

Key	Control or Indicator	Function
Life Raft Launch Cradle.		
1	Auto Release	Mechanism used to activate opening of life raft.
2	Life Raft Launch Cradle	Mechanism designed for stowing and launching life raft.

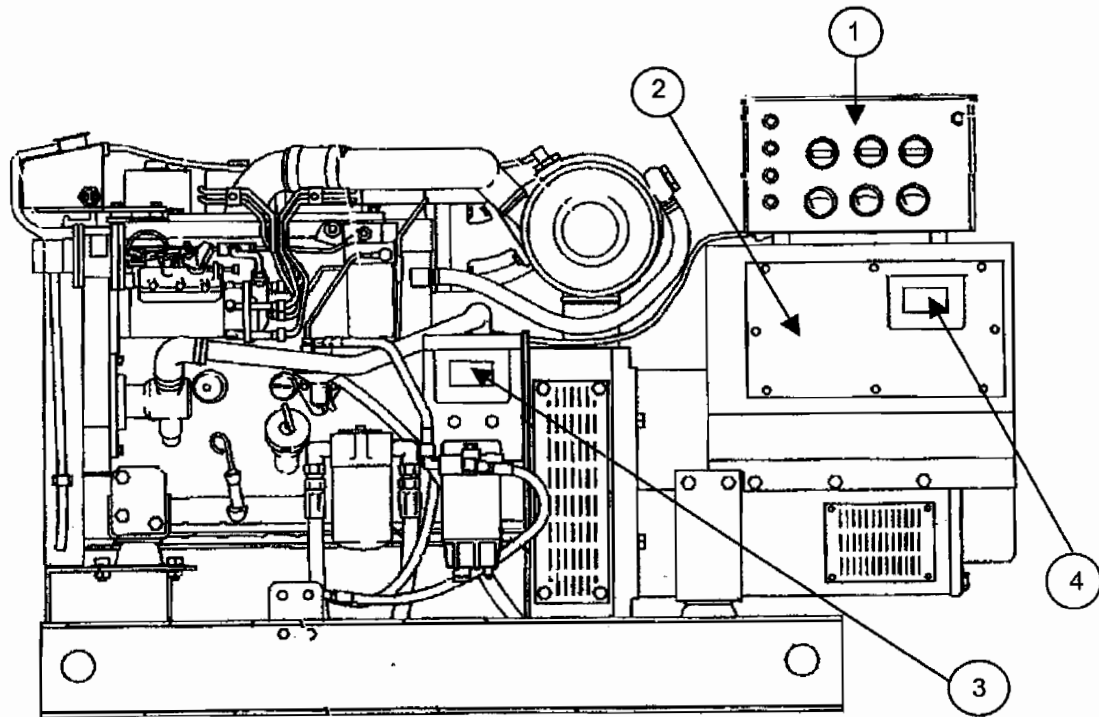


Figure 2-32. Generator Set.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Generator Set.		
1	Six Gauge Engine Control Panel	Provides monitoring and control of the engine. Panel depicted in Figure 2-33.
2	AC Power Output Box	AC outlet for distribution to the switchboard.
3	Electronic Engine Control Governor	Automatically adjusts engine speed as load increases/decreases.
4	100 Amp Breaker Switch	Supplies power to or disconnects power from generator.

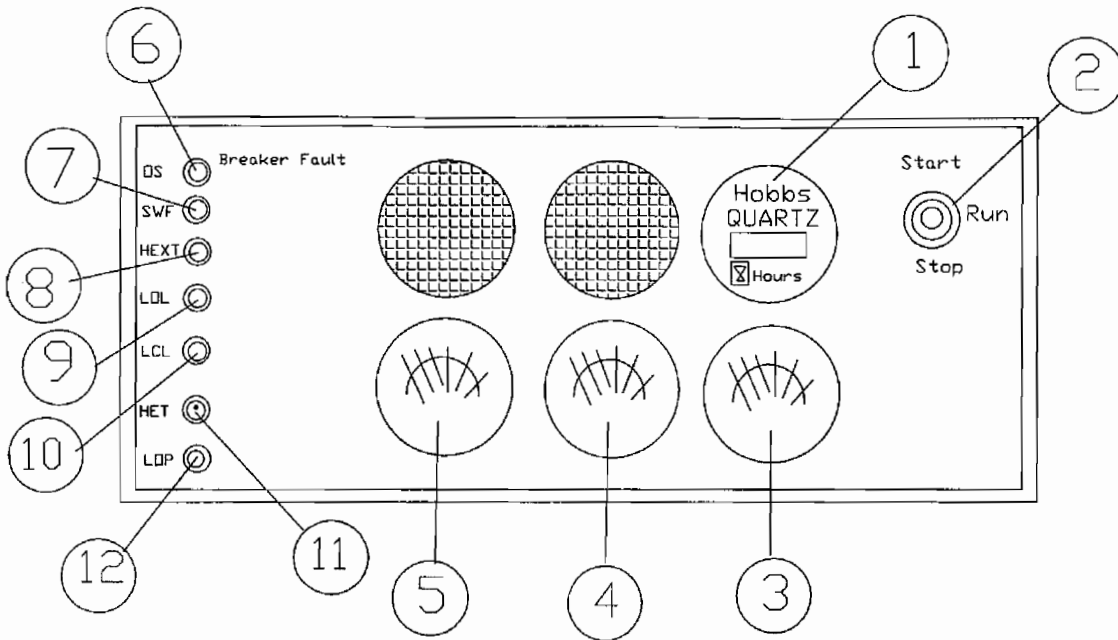


Figure 2-33. Generator Set Control Panel.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Generator Set Control Panel.		
1	Hourmeter	Indicates the total hours the generator has been run.
2	Start/Run/Stop Toggle Switch	Used to start and stop engine.
3	Volt Meter	Indicates voltage being provided to charging system.
4	Water Temperature Gauge	Indicates cooling water temperature.
5	Oil Pressure Gauge	Indicates engine oil pressure
6	Overspeed (OS)	Indicates the engine is running at too high a speed.
7	Sea Water Fault Indicator (SWF)	Indicates a fault with the sea water pump. (Does not apply to the system on-board the Small Tug)
8	High Exhaust Temperature Indicator (HEXT)	Indicates that engine exhaust temperature is high. (Does not apply to system on-board the Small Tug)
9	Low Oil Level Indicator (LOL)	Indicates that oil level is low.
10	Low Coolant Level Indicator (LCL)	Indicates that coolant level is low.
11	High Engine Temperature (HET)	Indicates that engine temperature is too high.
12	Low Oil Pressure Indicator (LOP)	Indicates that oil pressure is low.

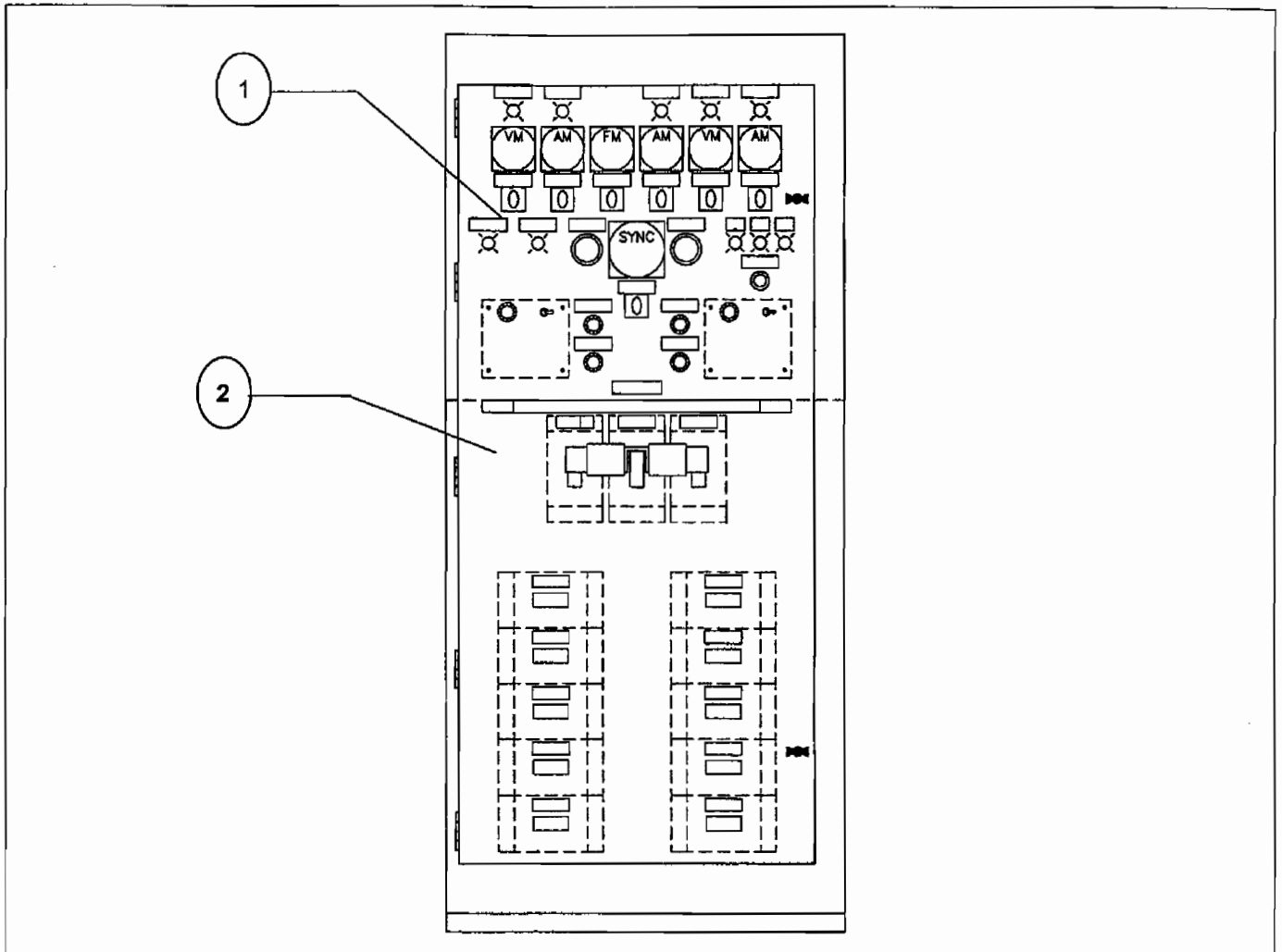


Figure 2-34. Main AC Switchboard.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Main AC Switchboard.		
1	Main Switchboard - Control Panel	Location of all electrical distribution controls and indicators
2	Main Switchboard - Circuit Breaker Panel	Location of all electrical distribution circuit breakers

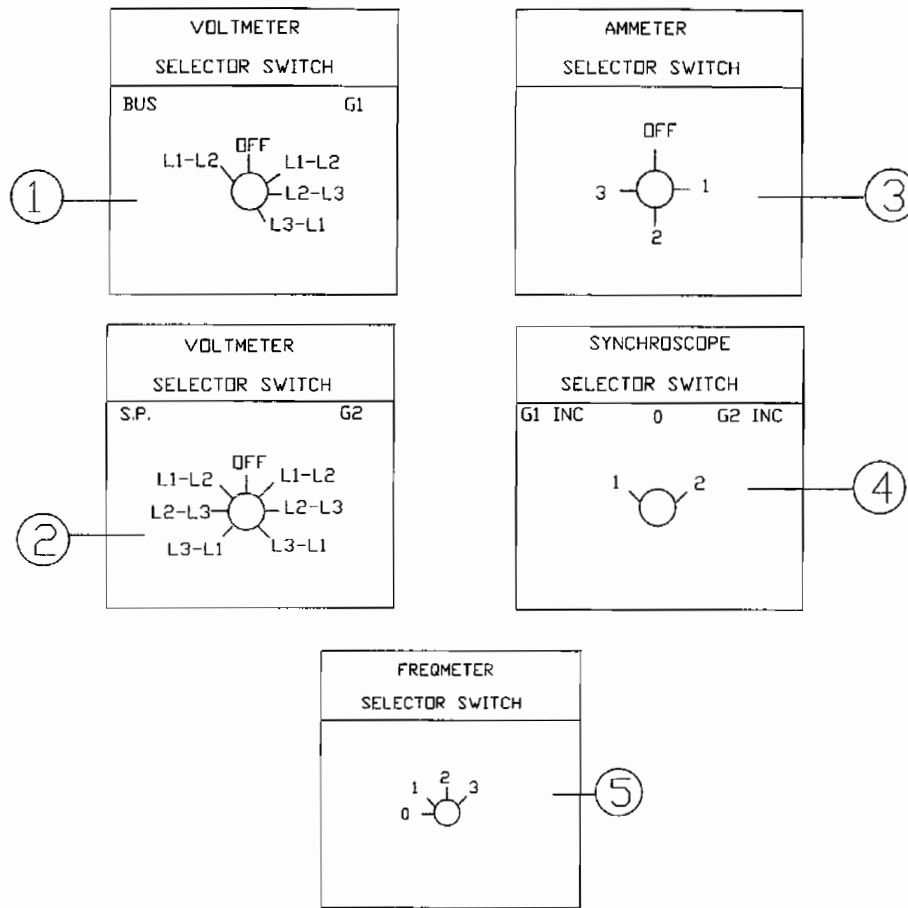


Figure 2-35. Main Switchboard Control Plate Details.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Main Switchboard Control Plate Details.		
1	Voltmeter Selector Switch-Generator #1	Used to obtain voltage readings phase to phase on the voltmeters.
2	Voltmeter Selector Switch-Generator #2	Used to obtain voltage readings phase to phase on the voltmeters.
3	Ammeter Selector Switch	Used to obtain current readings from the 150:5 current transformers.
4	Synchroscope Selector Switch	Used to select the paralleling combination of generators that is required.
5	Freqmeter Selector Switch	Used to select which generator or shore power the frequency meter will read.

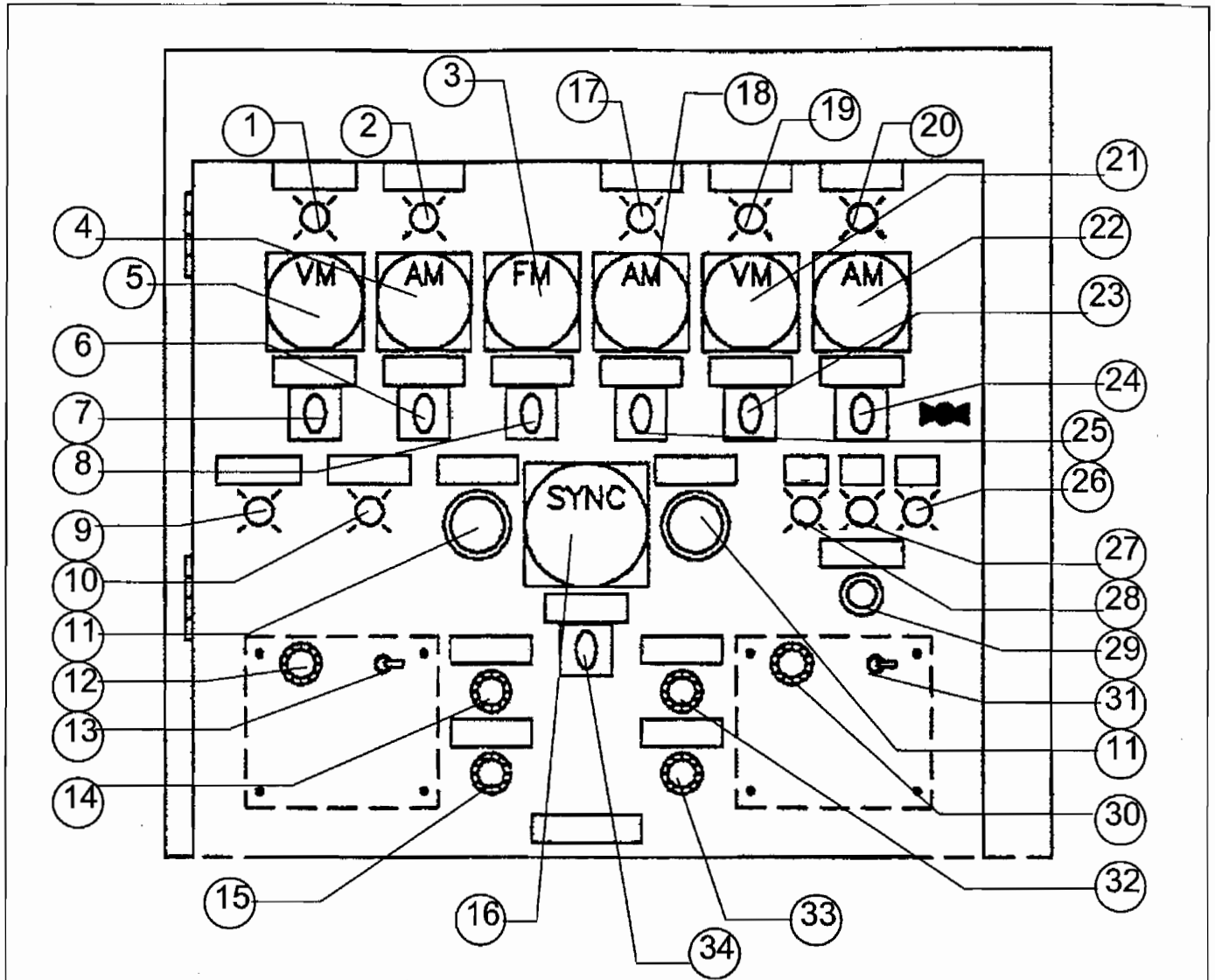


Figure 2-36. Main Switchboard - Control Panel.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Main Switchboard - Control Panel.		
1	Generator #1 Power Available Indicator Light (white)	Illuminates to indicate generator #1 power is available
2	Generator #1 Heater ON (white)	Illuminates to indicate heater for generator is operating
3	55-65Hz Frequency Meter	Indicates the current frequency (Hz) of its respective generator or shore power supply (via selector switch)

Key	Control or Indicator	Function
Main Switchboard - Control Panel.		
4	0-150A AC Ammeter	Indicates amperes on each phase (via ammeter selector switch) between 0-150amps
5	0-600V AC Voltmeter	Indicates voltage on each phase of generator #1, shore power, bus, and generator #2 (via selector switch)
6	Generator #1 Ammeter Selector Switch	Four position selector switch used to obtain current readings (amperes) from the 150:5 current transformers
7	Voltmeter Selector Switch Bus/G1	Eight position selector switch used to obtain voltage readings phase to phase on the voltmeters
8	Frequency Meter Selector Switch OFF/G1/G2/SP	Four position selector switch used to select which generator or shore power the frequency meter will read
9	Correct Phase Sequence Indicator Light (grn)	Illuminates to indicate three phases of the shore power supply are connected in the correct phase rotation A, B, C
10	Incorrect Phase Sequence Indicator Light (red)	Illuminates to indicate the three phases of shore power supply are connected in the incorrect phase rotation C, B, A
11	Synch Lamp	Used only when paralleling the generators (in conjunction with synchronizing switch and synchroscope); when the sync switch is placed in an "incoming" position and lamps are dark - indicates that the generators are in sync and can be paralleled; when lamps <i>are lit</i> in any manner - indicates that generators are not in sync and no attempt should be made in paralleling
12	Voltage Adjust Knob for Manual Voltage Regulator	Provides manual control of generator voltage when automatic voltage regulator is removed from the circuit (via three position selector switch)
13	3-Position Selector Switch for Manual Voltage Regulator	Selects mode of operation (voltage regulation): Manual/Off/Auto
14	Generator #1 Voltage Adjust Rheostat LOWER/RAISE	Provides control of generator output voltage
15	Generator #1 Speed Control LOWER/RAISE	Provides for the lowering or raising of the #1 Generators speed
16	Slow-Fast Synch Scope	Indicates when a generator being brought on-line is in correct phase sequence with the on-line bus.
17	Generator #2 Heater ON Indicator Light (wht)	Illuminates to indicate heater for generator #2 is operating
18	0-150A AC Ammeter	Indicates amperes on each phase (via ammeter selector switch) between 0-150amps
19	Generator #2 Power Available Indicator Light (wht)	Illuminates to indicate generator #2 power is available
20	Shore Power Available Indicator Light (amber)	Illuminates to indicate shore power is available
21	0-600V AC Voltmeter	Indicates voltage on each phase of generator #1, shore power, bus, and generator #2 (via selector switch)
22	0-150A AC Ammeter	Indicates amperes on each phase (via ammeter selector switch) between 0-150amps
23	Voltmeter Selector Switch (SP-G2)	Eight position selector switch used to obtain voltage readings phase to phase on the voltmeters
24	Shore Power Ammeter Selector Switch	Four position selector switch used to obtain current readings (amperes) from the 150:5 current transformers

Key	Control or Indicator	Function
Main Switchboard - Control Panel.		
25	Generator #2 Ammeter Selector Switch	Four position selector switch used to obtain current readings (amperes) from the 150:5 current transformers
26	Phase C Indicator Light (white)	Illuminates to indicate a correct phase for the on-line bus.
27	Phase B Indicator Light (white)	Illuminates to indicate a correct phase for the on-line bus.
28	Phase A Indicator Light (white)	Illuminates to indicate a correct phase for the on-line bus.
29	Ground Detect Push to Test Lamps push-button switch	Provides for the testing of the 3 phase lights.
30	Voltage Adjust Knob for Manual Voltage Regulator	Provides manual control of generator voltage when automatic voltage regulator is removed from the circuit (via three position selector switch)
31	3-Position Selector Switch for Manual Voltage Regulator	Selects mode of operation (voltage regulation): Manual/Off/Auto
32	Generator #2 Voltage Adjustment Rheostat LOWER/RAISE	Provides control of generator output voltage
33	Generator #2 Speed Control LOWER/RAISE	Provides for the lowering or raising of the #2 Generators speed
34	Synchroscope Selector Switch G1/INC/OFF/G2/INC	Provides for the selection of the generator to be brought on-line

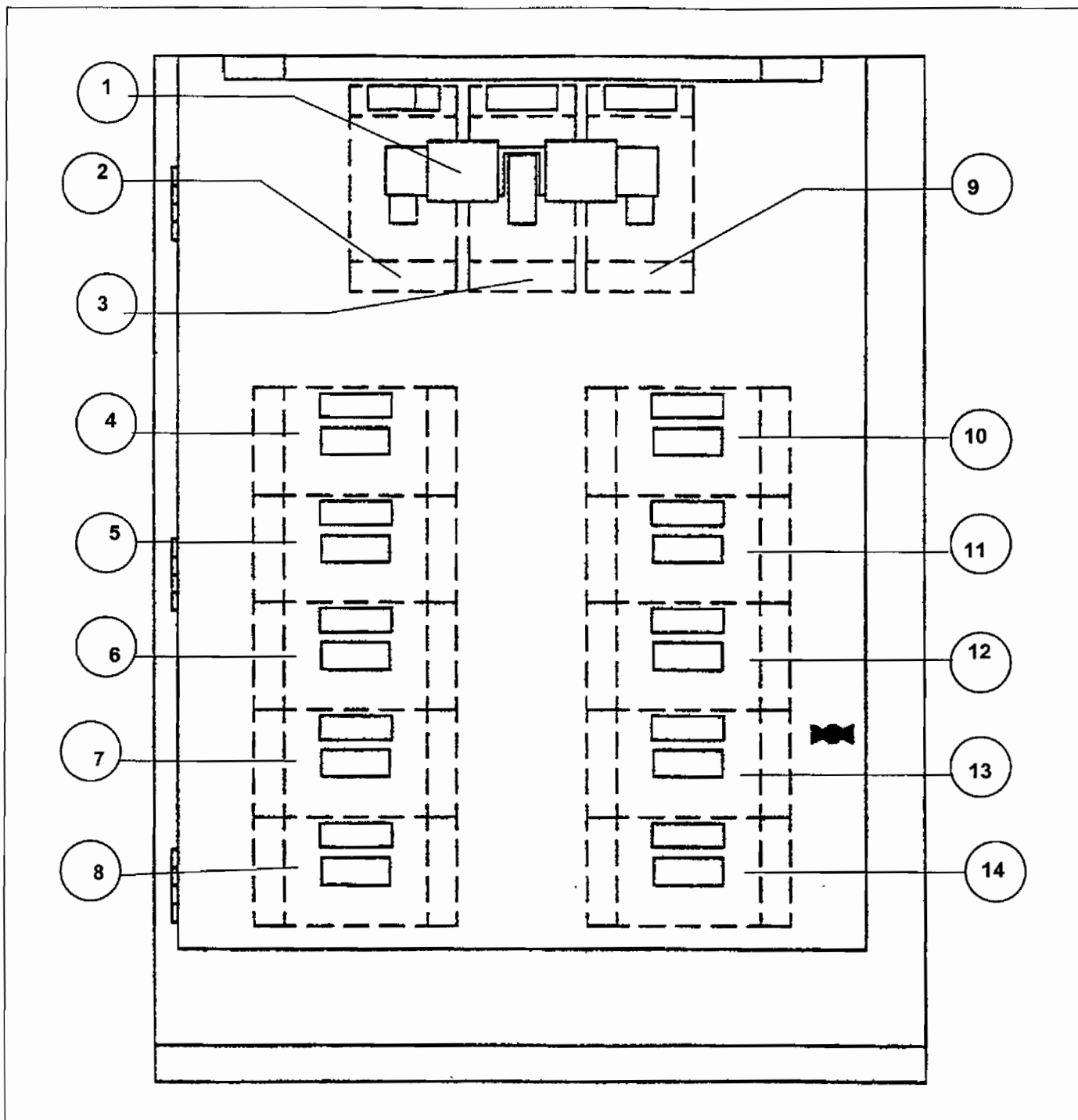


Figure 2-37. Main Switchboard - Circuit Breaker Panel.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Main Switchboard - Circuit Breaker Panel.		
1	Mechanical Interlock	Prevents the paralleling of shore power and generator power
2	Generator #1 Circuit Breaker	Open/closes circuit to generator #1
3	Generator #2 Circuit Breaker	Open/closes circuit to generator #2
4	Lower Engine Room Panel DP1 Circuit Breaker	Open/closes circuit to DP1 distribution panel
5	Steering/Flanking Hydraulic Power Pack#1 Circuit Breaker	Open/closes circuit to steering/flanking hydraulic power pack #1
6	Upper Engine Room Panel DP2 Circuit Breaker	Open/closes circuit to DP2 distribution panel
7	30KVA Transformer 450/208-120VAC Circuit Breaker	Open/closes circuit to transformer
8	Spare Circuit Breaker	Spare circuit breaker
9	Shore Power Circuit Breaker	Open/closes circuit to shore power connection
10	Receptacle Circuit Breaker	Open/closes circuit to receptacles
11	Steering/Flanking Hydraulic Power Pack #2 Circuit Breaker	Open/closes circuit to steering/flanking hydraulic power pack #2
12	30 Amp Switched Receptacle Circuit Breaker	Open/closes circuit to 30 amp switched receptacle(s)
13	Spare Circuit Breaker	Spare circuit breaker
14	Spare Circuit Breaker	Spare circuit breaker

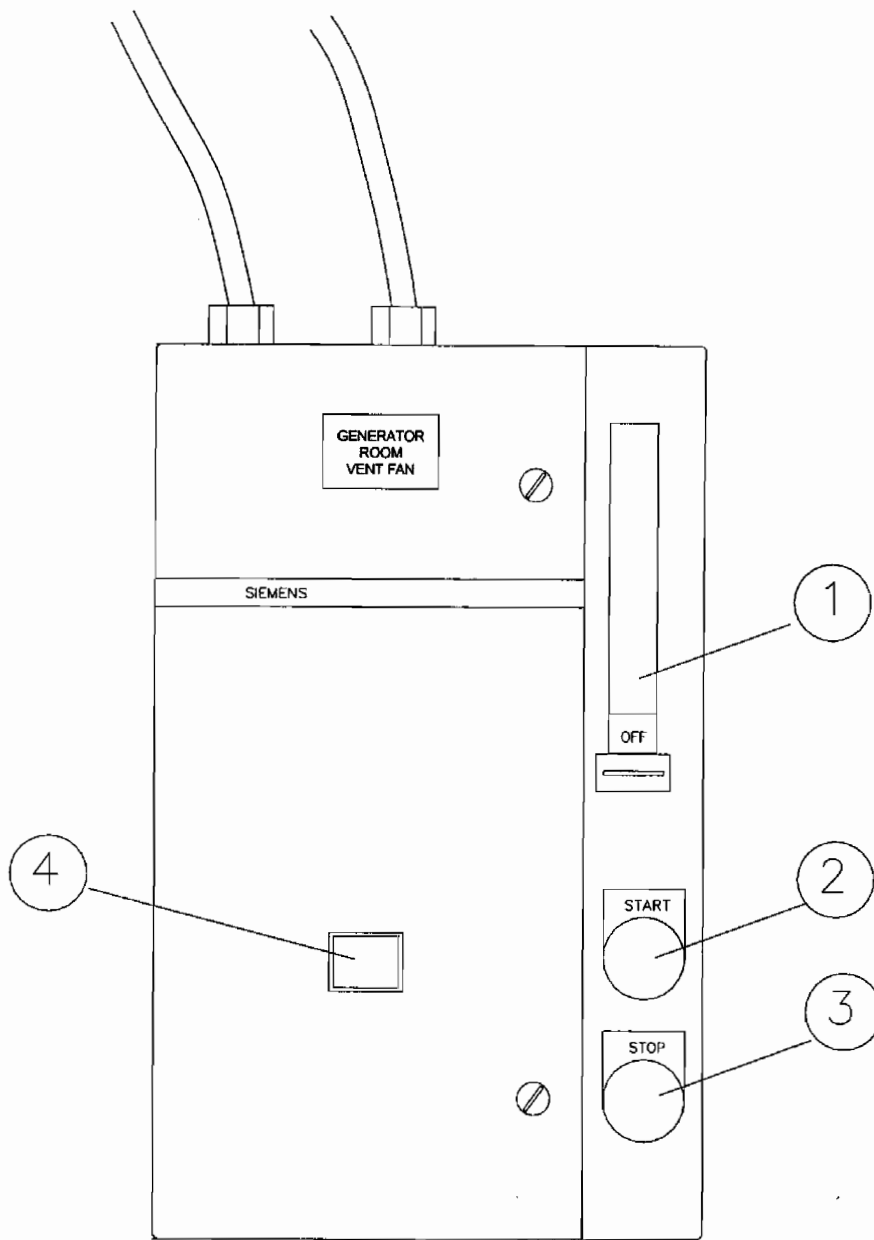


Figure 2-38. Generator Room Vent Fan Controller.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Generator Room Vent Fan Controller.		
1	Main Power Disconnect	Provides/Removes power from the panel.
2	Start Button (Green)	Starts the generator room vent fan controller
3	Stop Button (Red)	Stops the generator room vent fan controller
4	Reset Button (Blue)	Resets the panel after an overload

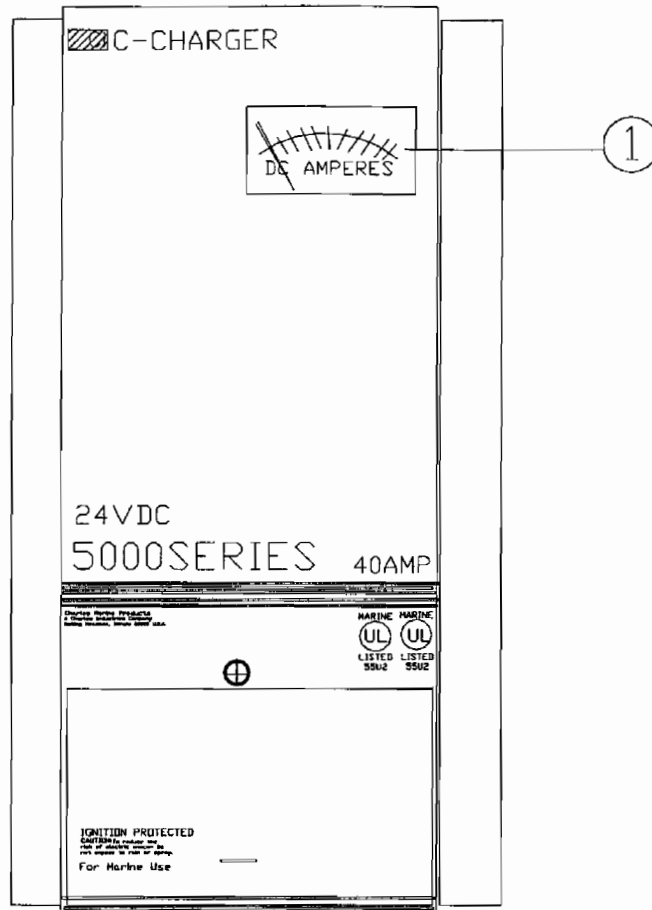


Figure 2-39. Battery Charger, Generator Set.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Battery Charger, Generator Set.		
1	DC Ammeter	Indicates the DC amperage being induced into the batteries.

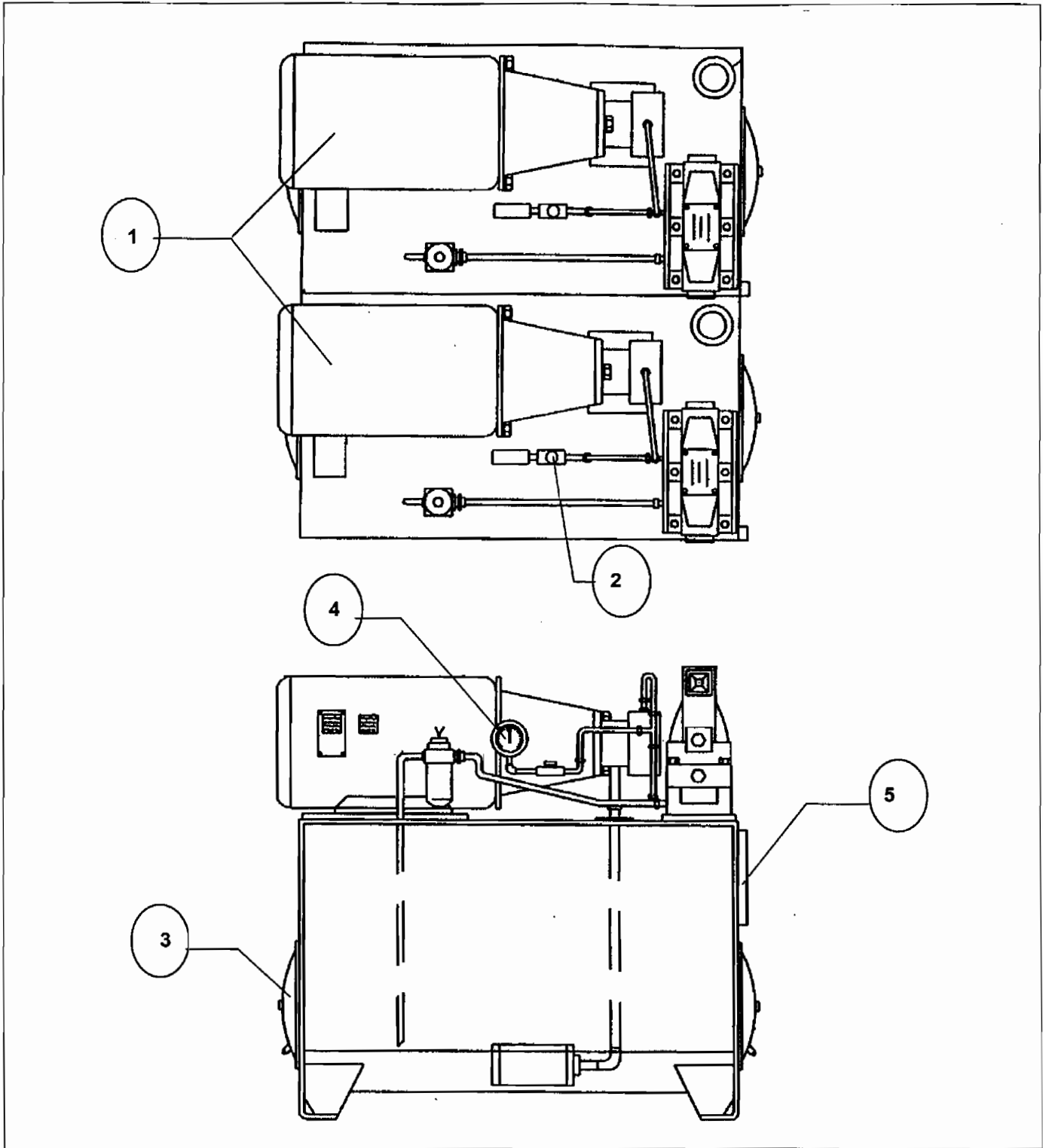


Figure 2-40. Hydraulic Steering Power Unit Arrangement.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Hydraulic Steering Power Unit Arrangement.		
1	Hydraulic Pump/Motor Assemblies 1 & 2	Provides primary and spare hydraulic power for steering
2	Gauge Shut-off Valves	Permits/Shuts-off flow to pressure gauge
3	Dual Reservoir Assembly (with divider & 2 baffles)	Holds hydraulic fluid
4	Pressure Gauge	Indicates hydraulic pressure
5	Level/Temperature Gauge	Indicates level and temperature of hydraulic fluid

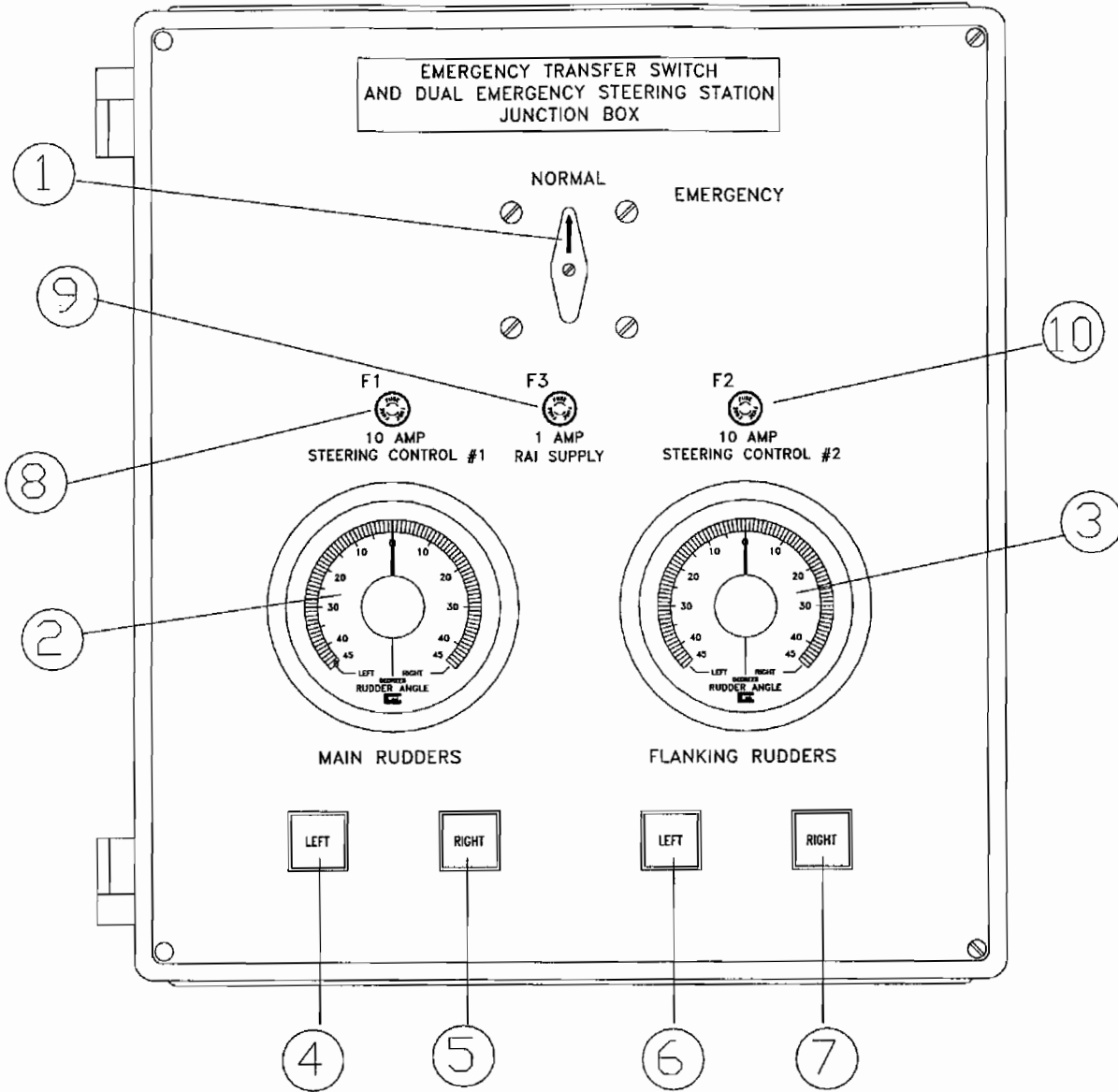


Figure 2-41. Emergency Steering Panel (Engine Room Junction Box).

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Emergency Steering Panel (Engine Room Junction Box).		
1	Steering Mode Selector Switch	Selects "Normal" or "Emergency" control of the steering gear
2	Main Rudder Angle Indicator Meter	Indicates angle of Main Rudder
3	Flanking Rudder Angle Indicator Meter	Indicates angle of Flanking Rudder
4	Main Rudder Left Pushbutton	Causes main rudder to steer left
5	Main Rudder Right Pushbutton	Causes main rudder to steer right
6	Flanking Rudder Left Pushbutton	Causes flanking rudder to steer left
7	Flanking Rudder Right Pushbutton	Causes flanking rudder to steer right
8	Fuse F1	Prevents damage to Steering Control #1 during an overload
9	Fuse F3	Prevents damage to RAI Supply during an overload
10	Fuse F2	Prevents damage to Steering Control #2 during an overload

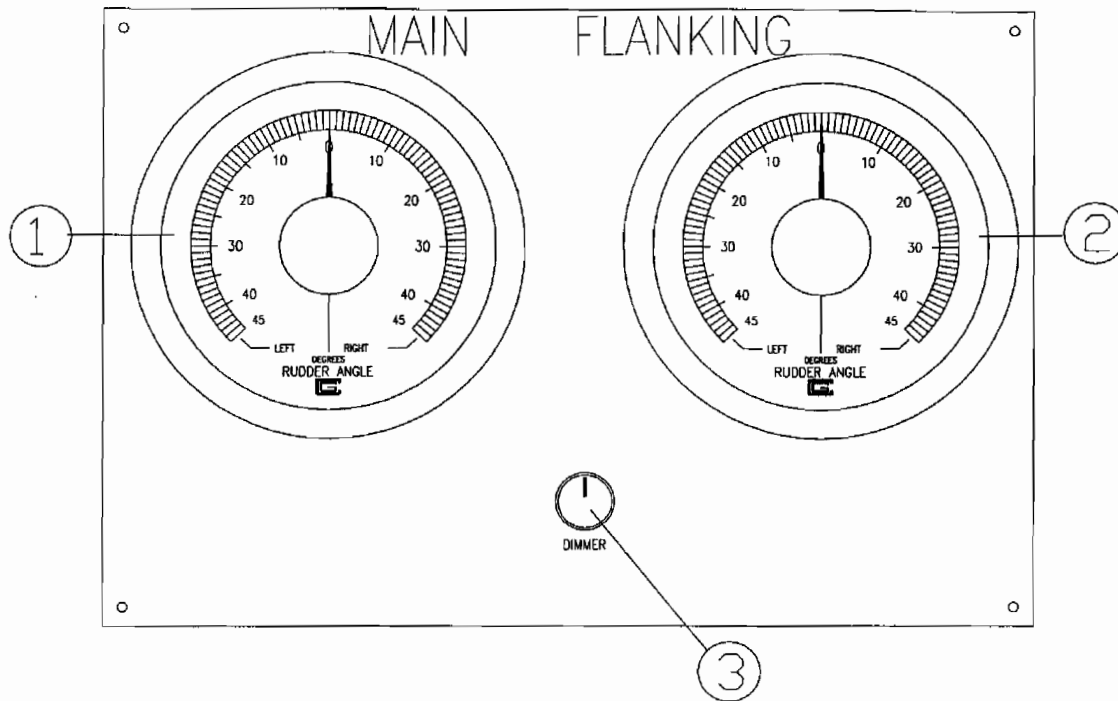


Figure 2-42. Rudder Angle Indicator Panel (Pilot House).

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Rudder Angle Indicator Panel.		
1	Main Rudder Angle Indicator Meter	Indicates angle of main rudders
2	Flanking Rudder Angle Indicator Meter	Indicates angle of flanking rudders
3	Lamp Dimmer Control	Adjusts luminous intensity of indicator lamps

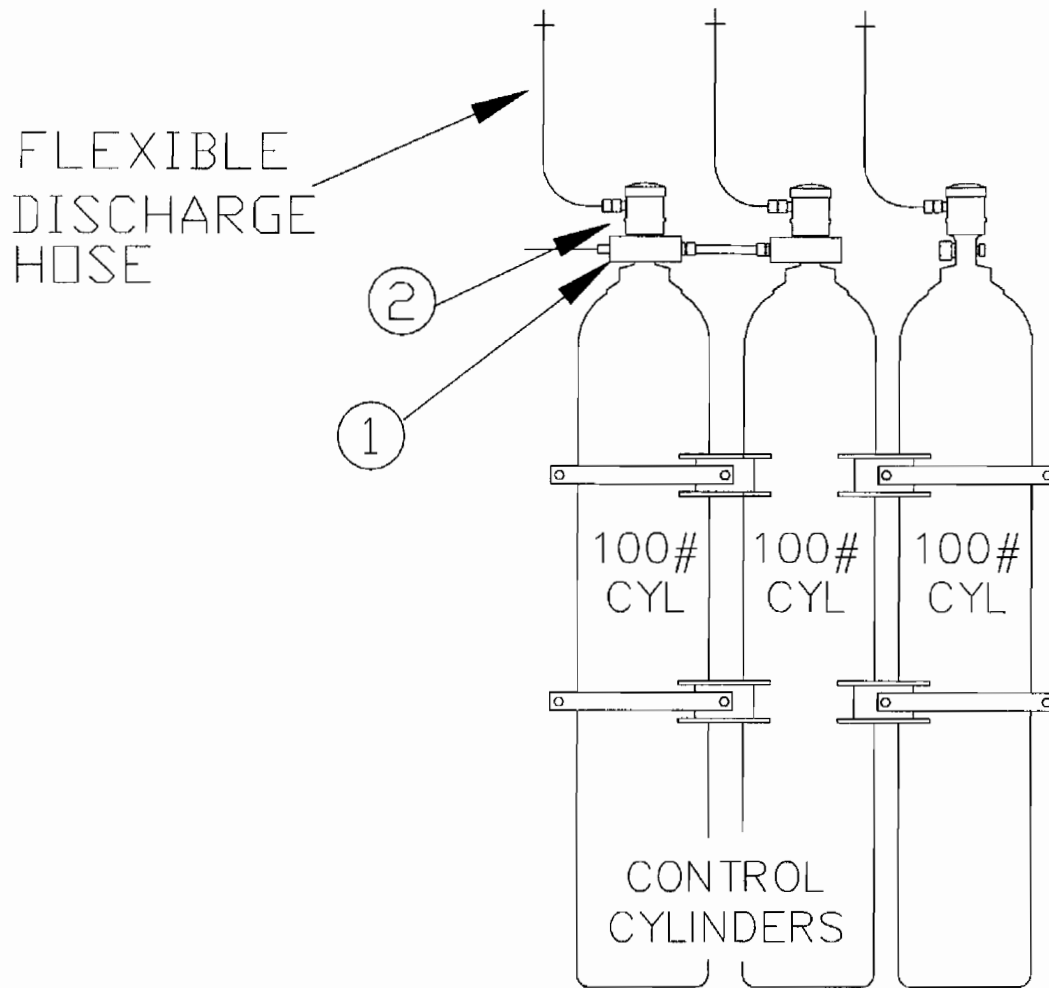


Figure 2-43. Cable Operated Control Head (CO₂ System).

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Cable Operated Control Head CO ₂ System.		
1	Cable Operated Control Head	Used to activate CO ₂ system from control cylinders.
2	Discharge Head	Discharges CO ₂

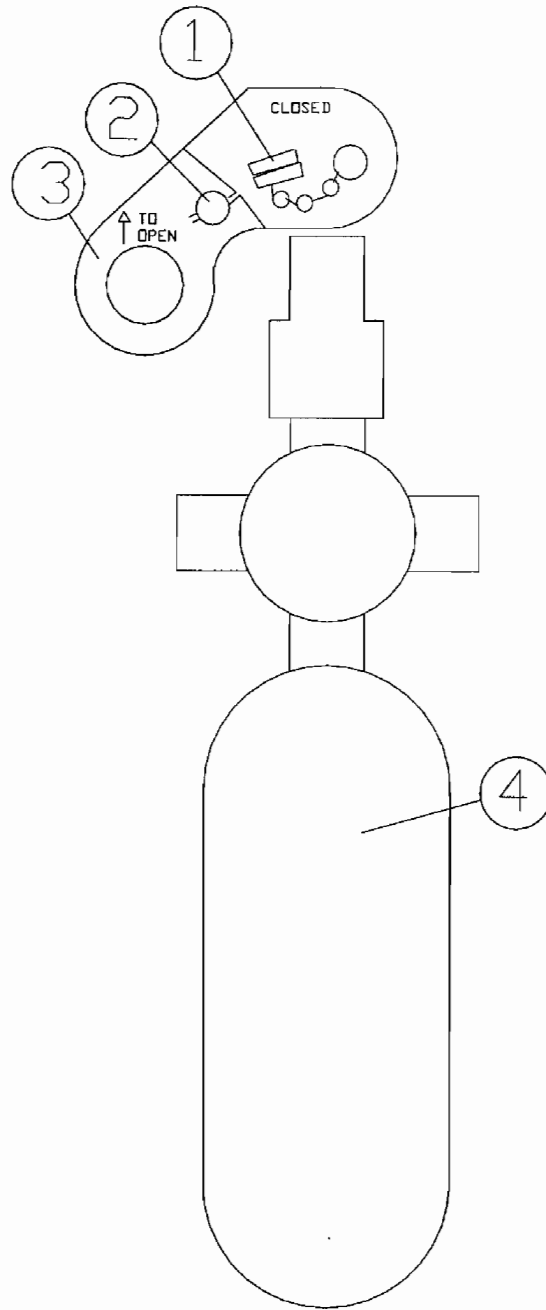


Figure 2-44. Lever or Pressure Operated Control Head (Manual Override Bottle) (CO₂ System).

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Lever or Pressure Operated Control Head (Manual Override Bottle) CO ₂ System.		
1	Locking Pin	Secures lever closed while allowing for quick release
2	Seal Wire	Secures lever closed while allowing for quick release
3	Manual Release Lever	Manually releases CO ₂ and overrides 45 second delay
4	Discharge Delay	Delays discharging of CO ₂ for 45 seconds

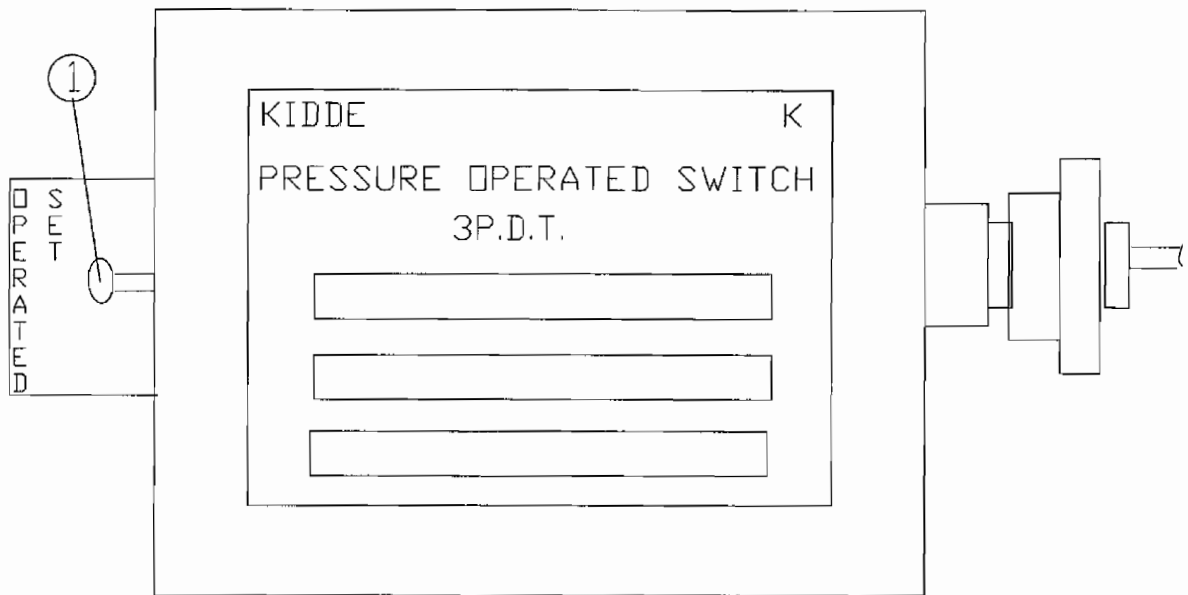


Figure 2-45. Pressure Operated Switch (CO₂ System).

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Pressure Operated Switch (CO ₂ System).		
1	Set Switch	Pull for manual operation

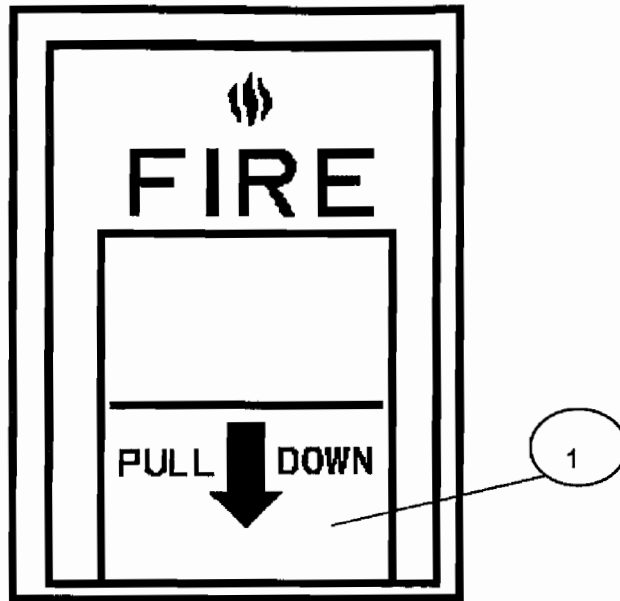


Figure 2-46. Manual Fire Alarm Pull Station.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Manual Fire Alarm Pull Station.		
1	Fire Alarm Activation Lever	Activates Fire Alarm

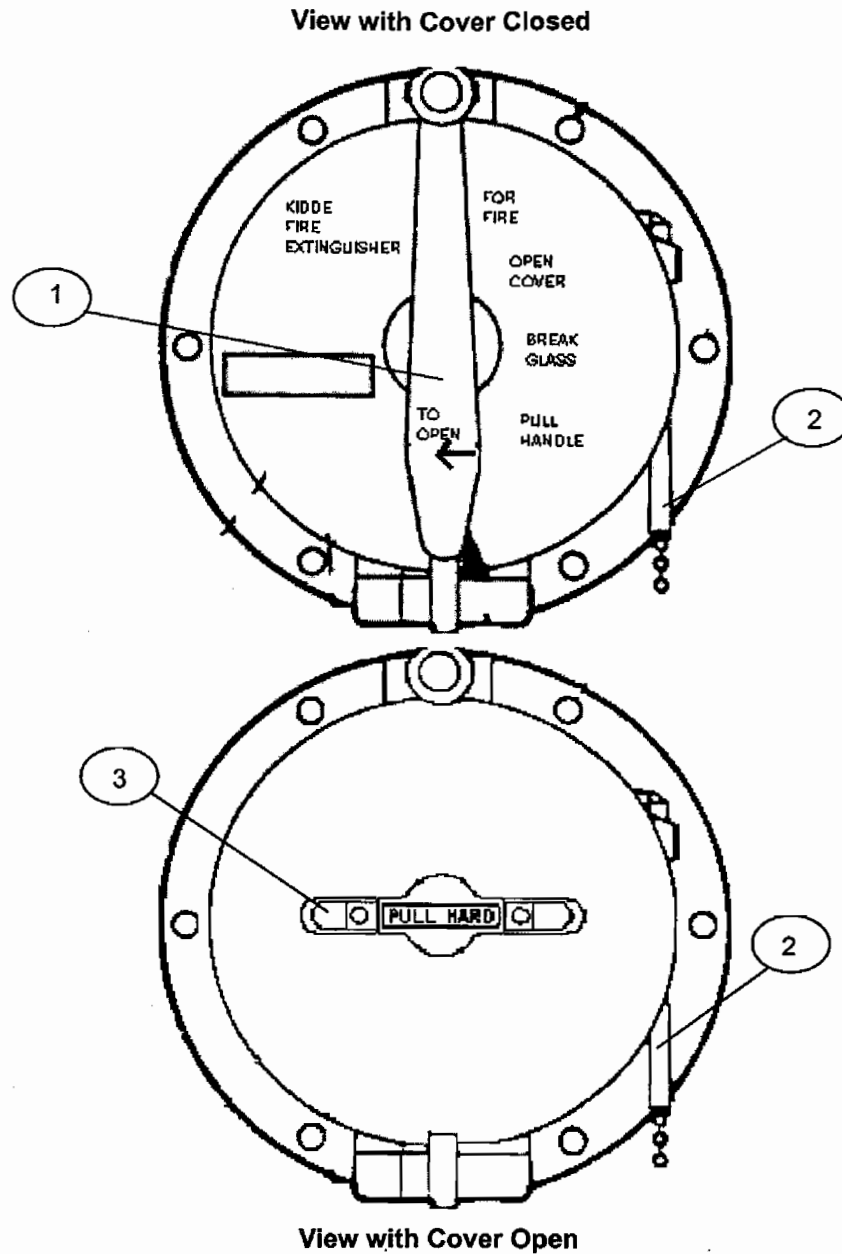


Figure 2-47. CO₂ Break Glass Pull Stations.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
CO ₂ Break Glass Pull Stations.		
1	Pull Handle	Opens cover to allow access to activation handle.
2	Hammer	Used to break glass.
3	Activation Handle	Activates CO ₂ system when pulled.

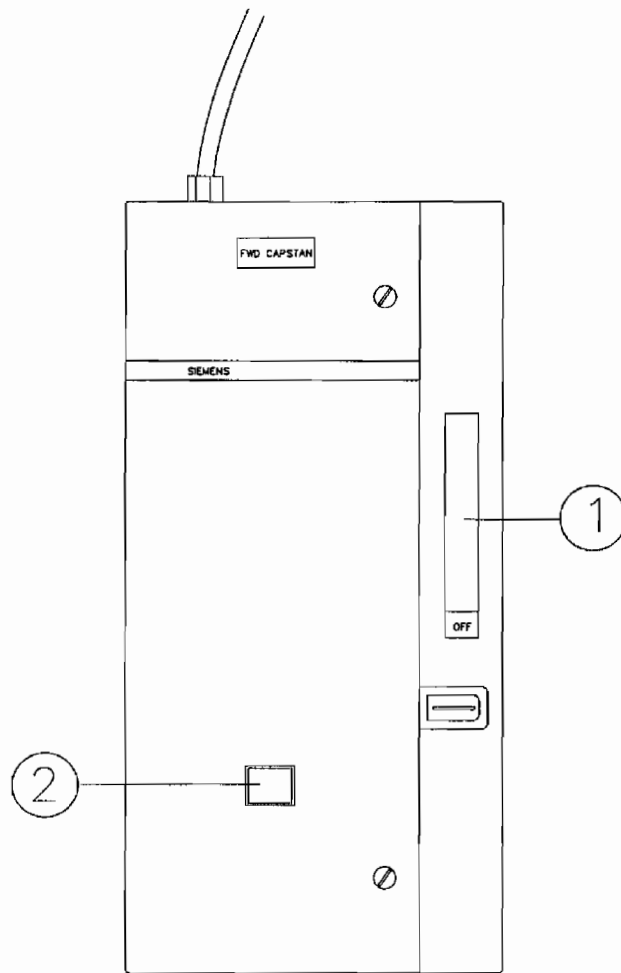


Figure 2-48. Forward Capstan Controller.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Forward Capstan Controller.		
1	Main Power Disconnect	Provides/Removes power from the capstan, which is locally operated.
2	Reset Button	Resets the circuit after a fault.

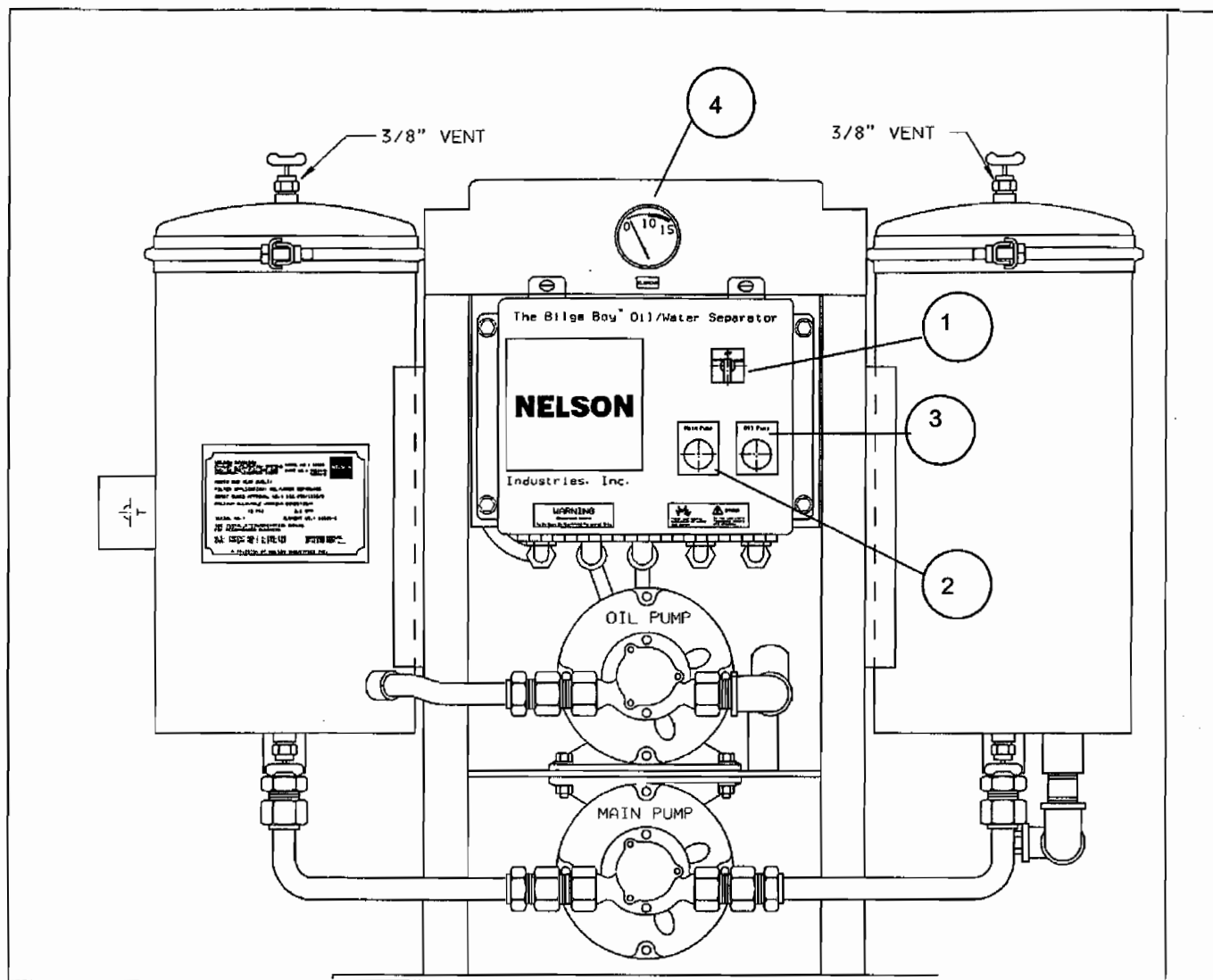


Figure 2-49. Oily Water Separator.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Oily Water Separator.		
1	Main ON/OFF Switch	Selector switch to energize unit, de-energize unit, or place in "auto" mode
2	Main Pump Indicator Light (white)	Illuminates when main pump is running
3	Oil Pump Indicator Light (blue)	Illuminates when oil pump is running
4	Differential Pressure Gauge	Monitors restriction of coalescer element

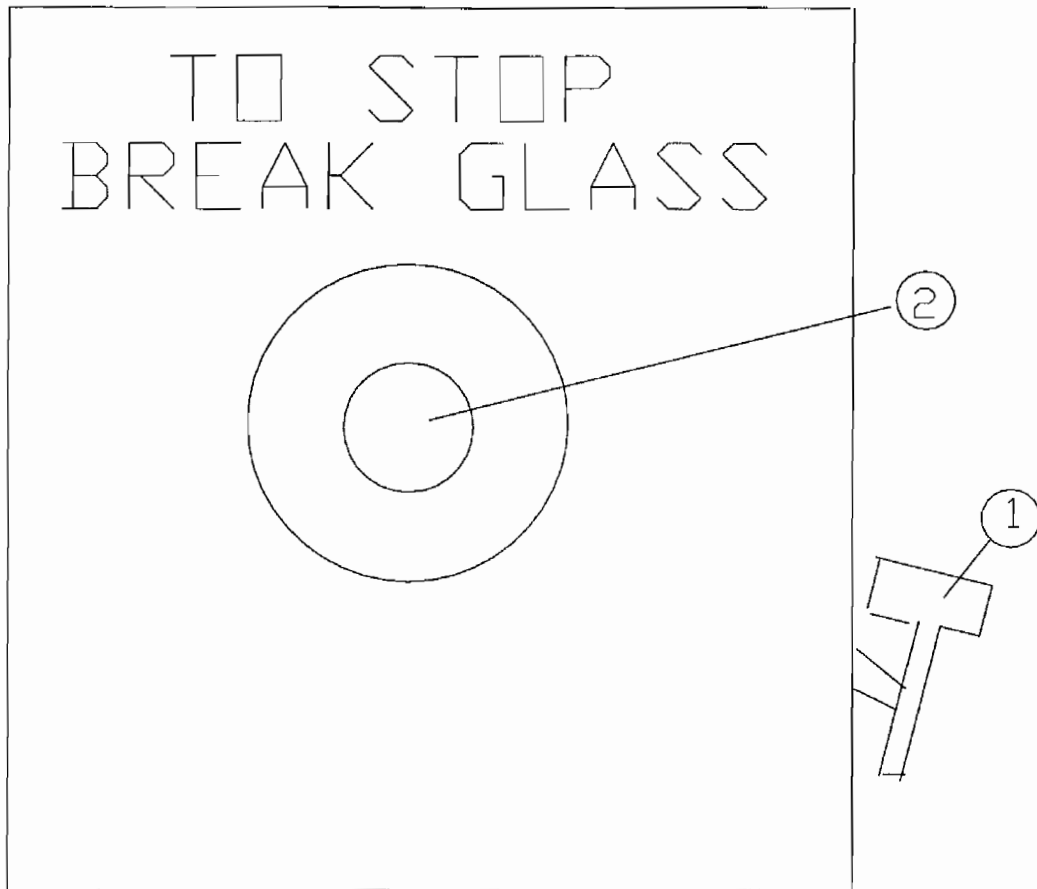


Figure 2-50. Ventilation Shutdown.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Ventilation Shutdown.		
1	Hammer	Used to break glass.
2	Push-Button	Shuts down ventilation fans.

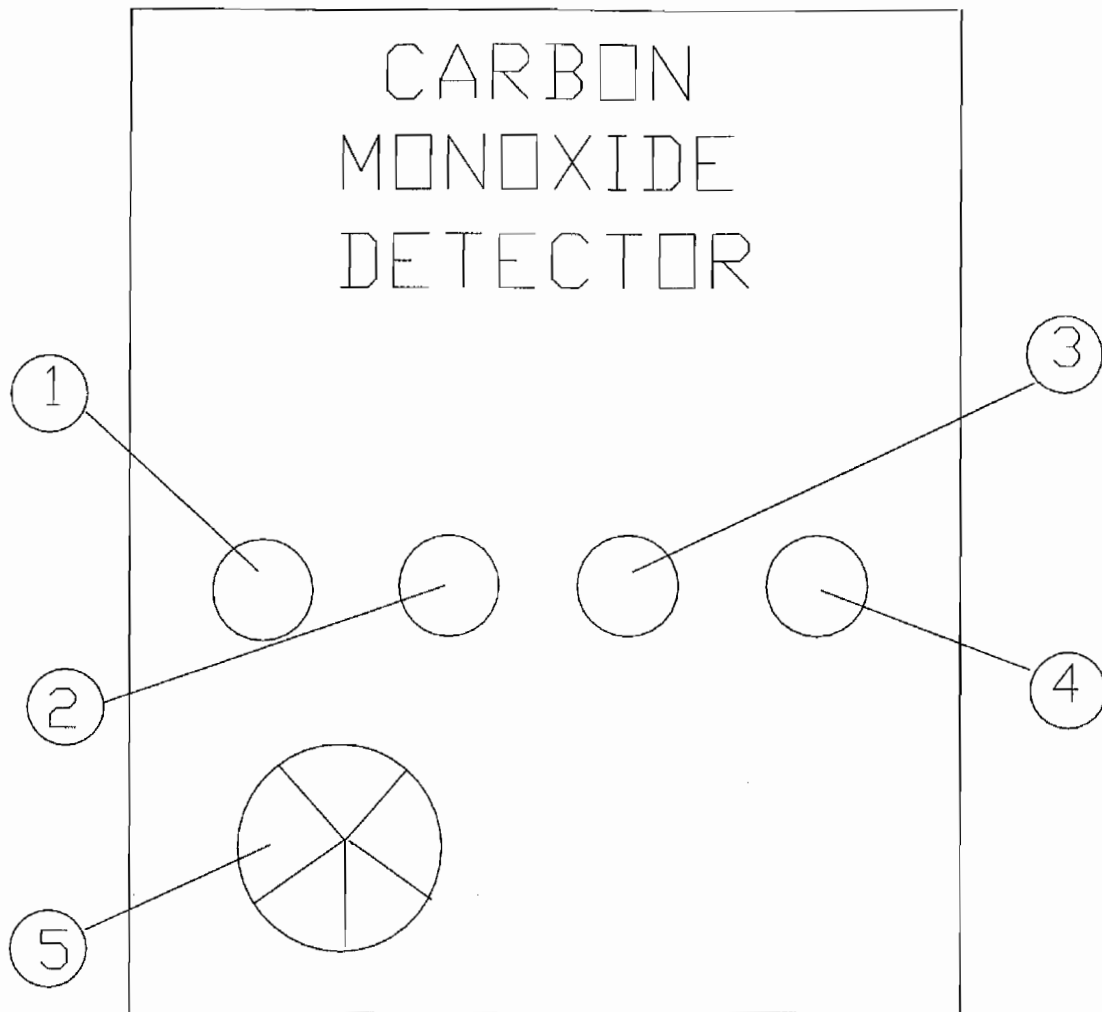


Figure 2-51. Carbon Monoxide Detector.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Carbon Monoxide Detector.		
1	Green Indicator Light	Illuminates to indicate power is ON.
2	Red Indicator Light	Illuminates to indicate an alarm condition.
3	Yellow Indicator Light	Illuminates to indicate a trouble condition.
4	White Push-button	Depresses to test or reset the detector.
5	Buzzer	Emits audible tone of alarm.

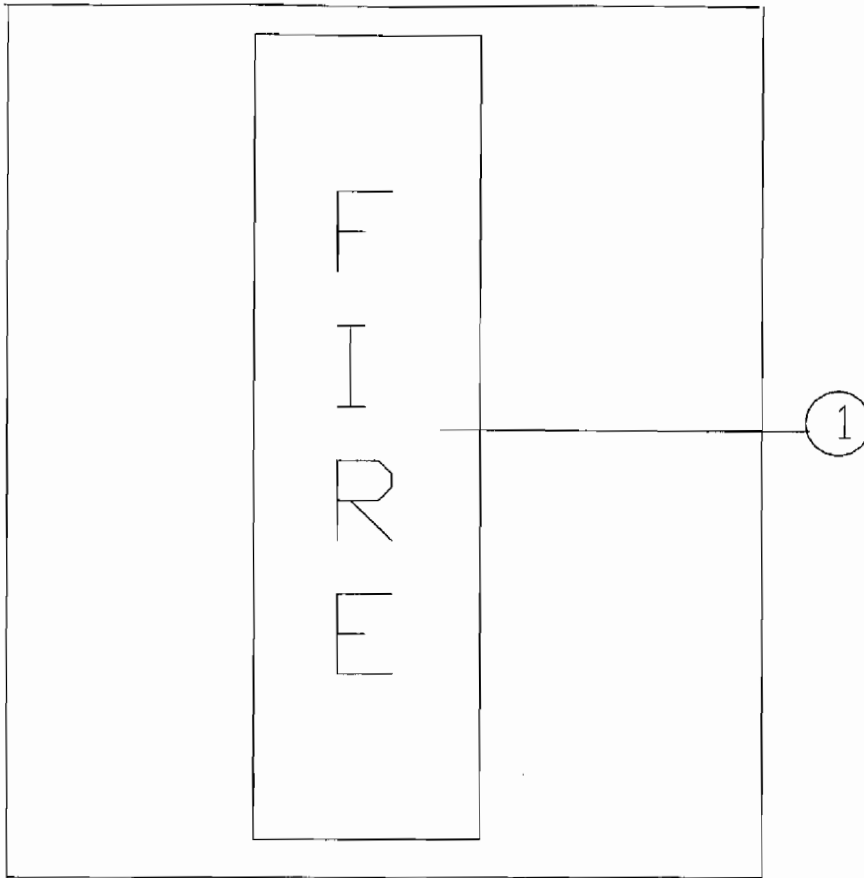


Figure 2-52. Fire Strobe.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Fire Strobe.		
1	Fire Strobe Light	Flashes to indicate there is a fire on-board the vessel.

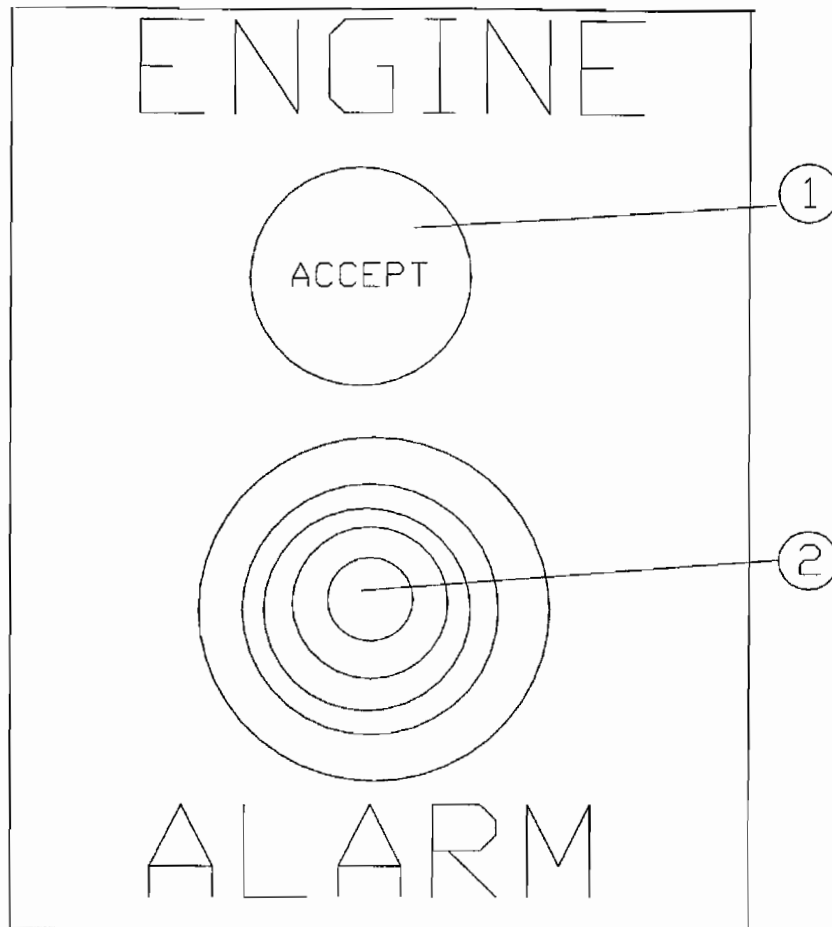


Figure 2-53. Engine Alarm

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Engine Alarm.		
1	Accept Push-Button	Allows user to acknowledge and silence alarm.
2	Buzzer	Emits audible tone of alarm.

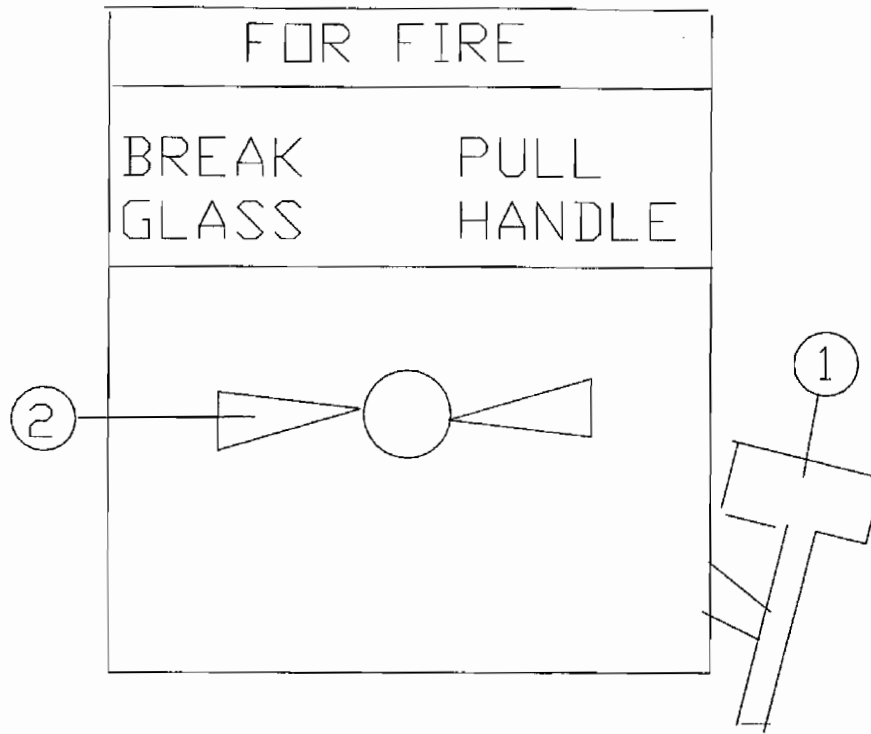


Figure 2-54. Emergency Shutdown for Diesel Engines.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
Emergency Shutdown for Diesel Engines.		
1	Hammer	Used to break glass.
2	Pull Handle	Used to activate emergency shutdown of diesel engines.

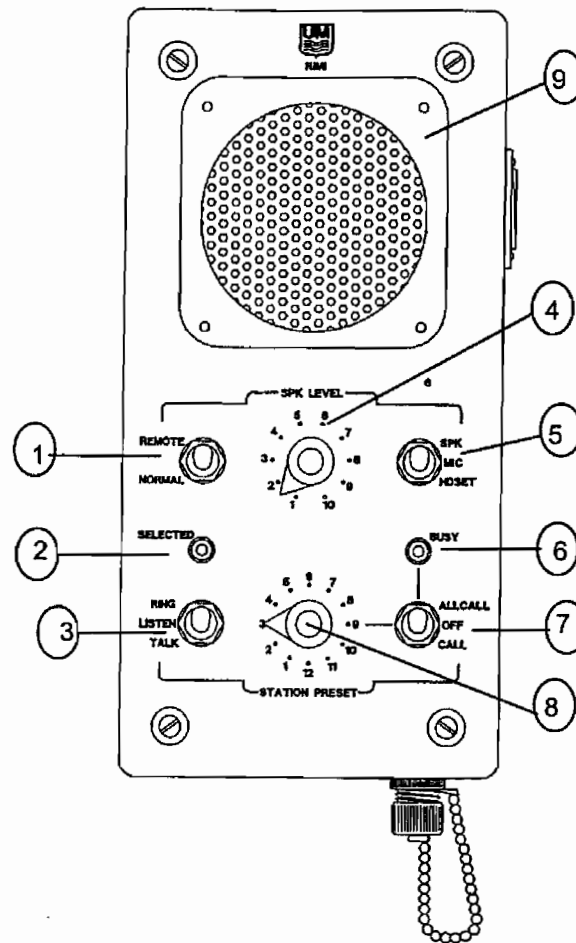


Figure 2-55. RIMI.

Table 2-1. Description of Operator's Control and Indicators - CONT

Key	Control or Indicator	Function
RIMI.		
1	Toggle Switch	Used to select Remote or Normal mode of operation.
2	Red Indicator Light	Indicates that another station is calling.
3	Toggle Switch	Used to select Ring, Listen, or Talk mode of operation.
4	Selector Switch	Used to adjust the volume of the speaker.
5	Toggle Switch	Used to select the Speaker, Microphone, or Headset.
6	Red Indicator Light	Indicates that the station being called is busy.
7	Toggle Switch	Used to select All-call, Off, or All mode of operation.
8	Selector Switch	Used to select the station being called.
9	Speaker	Allows audible sounds to be heard.

SECTION II.

OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) AND LUBRICATION

2.3. Preventive Maintenance Checks and Services (PMCS). To ensure that the ST is ready for operation at all times, it must be inspected on a regular basis so that defects may be found before they result in serious damage, equipment failure, or injury to personnel. This section contains systematic instructions on inspections, adjustments, and corrections to be performed by the operator/crew.

While performing PMCS, read and follow all safety instructions found in the Warning Summary at the front of this manual. Keep in mind all WARNINGS and CAUTIONS.

a. Perform PMCS, found in Table 2-2 at the following intervals:

- (1) Perform BEFORE PMCS just before operating the equipment. Any deficiencies noted will be corrected before equipment operation. Observe all warnings and cautions.
- (2) Perform DURING PMCS while equipment is operational to check for deficiencies. During services are checks on the vessel's performance. If any deficiencies are noted that will result in damage to the equipment, operation of that equipment should be stopped. Observe all warnings and cautions.
- (3) Perform AFTER PMCS immediately after operation of equipment at intervals based on normal operation. These services are basic preventive maintenance services. This service interval is based on normal operation of the equipment. Observe all warnings and cautions.

b. Reporting Defects.

All defects that the operator cannot fix must be reported on a DA Form 2404, Equipment Inspection and Maintenance Worksheet, immediately after completing PMCS. If a serious problem is found, IMMEDIATELY report it to your supervisor.

c. General PMCS Procedures.

- (1) Keep equipment clean. Dirt, oil, and debris may cover up a serious problem. Clean as you work and as needed.
- (2) While performing specific PMCS procedures, inspect the following components:
 - (a) Bolts, Nuts, and Screws. Ensure that they are not loose, missing, bent, or broken. Report loose or missing bolts, nuts, and screws to unit maintenance.
 - (b) Welds. Inspect for gaps where parts are welded together. Check for loose or shipped paint, rust, and cracks. Report bad welds to unit maintenance.
 - (c) Electric Conduit, Wires, or Connectors. Inspect for cracked or broken conduit insulation, bare wires, and loose or broken connectors. Report loose connections, and faulty wiring to unit maintenance.
 - (d) Hoses, Lines, and Fittings. Inspect for wear, damage, and leaks. Ensure that clamps and fittings are tight. Report any damage, leaks, or loose fittings and clamps to unit maintenance.
- (3) Check that components are adequately lubricated in accordance with Chapter 3, Section I.

d. Specific PMCS Procedures.

- (1) Operator PMCS are provided in Table 2-2. Always perform PMCS in the order listed. Once it becomes a habit, anything that is not right can be spotted in a minute.
- (2) Before performing PMCS, read all the checks required for the applicable interval and prepare all the tools needed. Have several clean rags handy. Perform ALL inspections at the applicable interval.
- (3) If anything wrong is discovered through PMCS, perform the appropriate troubleshooting task in Chapter 3, Section II. If any component or system is not serviceable, or if a given service does not correct the problem, notify your supervisor.
- (4) The columns in Table 2-2 are defined as follows:
 - (a) Item No. Provides a logical sequence for PMCS to be performed and is used as a source of item numbers for the "TM ITEM NO" column when recording PMCS results on DA Form 2404.
 - (b) Interval. Specifies the interval at which PMCS is to be performed. These include before, during, and after PMCS.
 - (c) Item To Check/Service. Lists the system and common name of items that are to be inspected.
 - (d) Procedure. This column includes specific servicing, inspection, or adjustment procedures to be followed.
 - (d) Not Mission Capable If. Explains when the equipment is not mission capable.

e. Leakage Definitions.

- (1) It is important to know how fluid leakage affects the status of the equipment. Following are types/classes of leakage an operator must know to determine whether the equipment is mission-capable.
 - (a) Class I. Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
 - (b) Class II. Leakage of fluid great enough to form drops, but not great enough to cause drops to drip from item being inspected.
 - (c) Class III. Leakage of fluid great enough to form drops that fall from item being inspected.

CAUTION

When operating with Class I or II leaks, continue to check fluid levels more frequently than required in PMCS. Parts without fluid stop working or may be damaged.

- (2) Equipment operation is allowed with minor (Class I or II) leakage. Fluid levels in an item/system affected with such leakage must be checked more frequently than required in PMCS. Report Class III leaks IMMEDIATELY to your supervisor.

Table 2-2. Operator Preventive Maintenance Checks and Services

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
					<p style="text-align: center;"><u>WARNING</u></p> <p>Electrical Hazards. The electrical system and the hydraulic system are dangerous when performing maintenance inspections. Be sure to observe all warnings to prevent injury or possible death of personnel.</p> <p style="text-align: center;"><u>CAUTION</u></p> <p>Equipment operation is allowable with minor leakages (Class I or II). Consider the fluid capacity in the system being checked/inspected. When in doubt, notify your supervisor.</p> <p>When operating with Class I or Class II leaks, continue to check fluid levels as required in PMCS.</p> <p>Class II leaks should be reported to your supervisor or unit level maintenance.</p> <p>Operating the equipment contrary to published instructions may cause damage and possible destruction of the equipment. Always be sure the equipment is operated properly.</p> <p style="text-align: center;">NOTE</p> <p>Before performing PMCS, review appropriate procedures to ensure that necessary tools, spare parts and equipment are on-hand.</p>	
				ENGINE ROOM	<p style="text-align: center;"><u>WARNING</u></p> <p>Before attempting any maintenance task on the propulsion system, ensure that the engine is shut down. Make sure that the starting circuits are disabled to avoid injury to personnel. Accidental starting of the generator set while working on it can cause severe injury or death. Prevent accidental starting by disconnecting the starting battery cables (negative (-) first).</p>	

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
					<p>WARNING</p> <p>Always remove the negative (-) cable first, and reconnect it last, to prevent arcing if a tool accidentally touches the frame or other grounded metal part while removing the positive (+) battery cable. Arcing can ignite the explosive hydrogen gas given off by the batteries, causing severe injury to personnel.</p>	
					<p>WARNING</p> <p>Do not operate a diesel engine where there are or can be combustible vapors. These vapors can be sucked into the air intake system and cause engine acceleration and over-speeding, which can result in a fire, an explosion, and extensive injury to personnel as well as damage to equipment. Operate the ventilator system to ensure engine room compartment is clear of fuel fumes. Operate the blowers for at least 5 minutes prior to starting engine.</p>	
	•	•	•		Inspect the engine room and interior structure for leaks.	Watertight integrity or operation is impaired.
1	•	•	•	Engine, Main Diesel	Check the engine for debris, foreign objects and loose or broken fittings.	
2	•	•	•	Engine Accessories and Connections	Inspect engine, fuel injection pumps and cooling pumps for loose or damaged connections or fittings. Inspect fluid lines and joints for leaks.	Debris, foreign objects or lodged in components.
	•				Inspect wiring and wiring harness for loose connections and worn or frayed wires. Check that guards are in place.	Damage effecting operations.
	•				Inspect engine-to-frame ground strap for good connections and condition.	Damaged or broken connections.
3	•			Engine Monitor System	Check the condition of gauges and replace if cracked or cannot be calibrated.	Gauges cracked/ unserviceable.
		•			While operating, frequently observe engine gauges for proper operation.	Gauges do not function.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
4	•			Main Engine Air Intake System	Visually check all air connections for loose clamps or connections, and tighten as required. Visually check all hoses and tubing for cracks, punctures, and tears, and replace as required. Visually check for collapsing hoses or tubing and other damage and replace as required.	
5	•			Engine Cooling	<p style="text-align: center;"><u>WARNING</u></p> <p>Check the coolant level only when the engine is stopped. Wait until the temperature is below 50°C (120°F) before removing the pressure cap. Failure to do so can cause personal injury from heated coolant spray.</p> <p>Check the coolant level at the expansion tank. Inspect cooling hoses and elbows for cracks and loose clamps.</p> <p style="text-align: center;">NOTE</p> <p>The water pump seal is lubricated by coolant in the cooling system. It is normal for a small amount of leakage to occur as the engine cools down and parts contract.</p>	Coolant level low.
6	•			Seachest Strainer	<p style="text-align: center;">NOTE</p> <p>Ensure that the seachest strainer valve is in the CLOSED position prior to cleaning the seachest strainer.</p> <p>Clean the raw water filter.</p>	
7	•			Cooling Grid	Ensure that the seawater grid cooler valve is in the OPEN position.	
8	•			Fuel Level	Check the fuel level in the day tank.	
9	•			Duplex Filters	Drain the water and sediment from the fuel filter.	

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
9	•	•	•	Duplex Filters-Continued	<p>Visually inspect exterior for obvious damage or leaks.</p> <p>Monitor pressure gauge for excessive differential pressure.</p>	<p>Any fuel leaks or damage.</p> <p>Differential pressure excessive.</p>
10	•			Lubricating Oil	<p>Check the oil level in the oil pan.</p>	<p>The oil level should be within the notches on the dip stick.</p>
11	•			Belts	<p>Visually inspect belts. Look for cracked, frayed, loose, or misaligned belts. Refer defects to your supervisor.</p>	
12	•			Hoses and Fittings	<p>Visually inspect hoses and connections. Look for cracks, punctures, or tears in hoses. Look for loose clamps or connections on fittings.</p> <p style="text-align: center;">CAUTION</p> <p>Do not bend or deform the hoses during inspection. This can cause the hoses to crack.</p> <p>Check for loose fittings and clamps, and signs of leakage. Tighten or replace as necessary (for replacement, refer to your supervisor).</p>	<p>Class III leaks</p>
13		•		Start Control	<p>Start engine and note action of starter mechanism, particularly whether mechanism has adequate cranking speed and whether it engages and disengages without unusual noise when the control is operated. Set throttle so that the engine will run at normal warm-up speed until prescribed operating temperature is reached.</p> <p style="text-align: center;">WARNING</p> <p>If the oil pressure gauges do not indicate the proper pressure as specified within 30 seconds, stop the engine.</p> <p>Monitor the engine oil pressure gauge. Normal idling operating oil pressure for the engine is 20 PSI (140kPa).</p>	<p>Low Oil Pressure</p>

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
14		•		Engine Operation	Monitor the engine and gauges after commencing normal operating range.	
		•			Monitor oil pressure gauge. Pressure should range from 50-90 PSI (340-620 kPa) during normal operating range.	Low Oil Pressure
		•			Monitor engine power output.	Low power
		•			Monitor water temperature gauge. Normal water temperatures should range from 74°C to 91°C (165°F to 195°F). Coolant temperature should not exceed 96°C (205°F).	Coolant temperature exceeds 96°C (205°F).
		•			Monitor the engine for unusual noises.	Any unusual noise develops.
		•			Monitor the engine for any fuel, coolant, or lubricant leaks.	Class III leaks
		•			Monitor the engine for excessive smoke.	Excessive smoke develops
		•			Monitor engine consumption of coolant, fuel or lubricating oil	Excessive consumption of coolant, fuel, or lubricating oil develops.
		•			Monitor the engine for excessive mechanical vibration	Excessive vibration develops.
15			•	Engine Shutdown	It is important to idle the engine 3 to 5 minutes prior to shutting it down to allow lubricating oil and water to carry heat away from the combustion chamber, bearings, shafts, etc.	
16	•			Reduction Gear	Visually inspect the unit for cracks or other damage. Check the mountings for tightness or damage such as cracks.	Damage to the unit effecting operation.
	•	•	•		Visually inspect fluid lines for leaky connections, kinks, cracks, or other damage.	Class III leaks.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
16	•			Reduction Gear-Continued	Check the oil level with the engine running at low idle with gear in neutral. Transmission oil should be in normal operating range prior to checking oil level.	Oil level is below the "LOW" mark.
		•			Check the oil level every 10 hours of operation. Check the oil level with the engine running at low idle with gear in neutral.	Oil level is below the "LOW" mark.
		•			Visually inspect the driveline and the input and output shaft oil seals for leakage.	Class III leaks.
		•			Monitor unit for unusual operating noises.	Unusual operating noises.
		•			Check for unusual vibrations.	Excessive vibrations.
17		•		Propulsion Shafting	Check for unusual vibrations.	Shaft is misaligned or bent or bearing is excessively worn.
18				Main Engine Controls	<p style="text-align: center;">NOTE</p> <p>Procedures are provided for the control stations in the Pilot House, Engine Room, and Aft Control Station.</p> <p style="text-align: center;">NOTE</p> <p>The tests below should be performed with the engines stopped.</p>	
	•				Energize the control system. The control head should produce an intermittent tone.	A steady tone signals, indicating a voltage problem or component failure.
	•				Depress the station button on the control head. The red indicator light on the control head will illuminate.	Red indicator light does not illuminate.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
18	•			Main Engine Controls-Continued	Move the control head lever full ahead and full astern. This will check that the control head is operating.	Ahead or Astern Control does not operate properly.
	•				Depress and hold the station button. Move the control head lever to the ahead detent position before releasing the station button. The red indicator light on the control head will blink, indicating that the control head has been placed in the neutral fast idle mode.	Red indicator light does not blink.
					NOTE The procedures below should be performed once the engines have been started.	
		•			Use neutral fast idle mode on each engine to confirm proper speed command.	Fast idle mode does not function properly.
		•			Use neutral fast idle to warm-up the engines. Gradually move the control head lever to full speed. Engines should be running within required RPM range.	Engines do not attain required RPM readings.
19				Backup Main Engine Controls	NOTE The procedures provided below are for the backup main engine controls located in the PilotHouse. NOTE The tests below should be performed with the engines stopped.	
	•				Energize the control system. The control head should produce an intermittent tone.	A steady tone signals, indicating a voltage problem or component failure.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
19	•			Backup Main Engine Controls-Continued	Rotate the backup selector switch to the "ON" position on the control head.	Red indicator light does not illuminate.
	•				Move the control head lever full ahead and full astern. This will check that the control head is operating.	Ahead or Astern Control does not operate properly.
					NOTE	
		•			Place backup clutch control switch in the neutral position. Use neutral fast idle mode on each engine to confirm proper speed command.	Fast idle mode does not function properly.
		•			Use neutral fast idle to warm-up the engines. Gradually move the control head lever to full speed. Engines should be running within required RPM range.	Engines do not attain required RPM readings.
20	•			Exhaust System	Inspect exhaust piping for damaged insulation, punctures, or cracks.	Excessive exhaust leaks into engine room.
21	•	•	•	Generator Room	Inspect the generator room and interior structure for leaks.	Watertight integrity or operational ability is impaired.
22				Power Generation System	WARNING Before attempting any maintenance task on the power generation system, ensure that generator engine is shut down. Make sure that the starting circuits are disabled to avoid injury to personnel. Accidental starting of the generator set while working on it can cause severe injury or death. Prevent accidental starting by disconnecting the starting battery cables (negative (-) first).	

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
22				Power Generation System-Continued	<p>WARNING</p> <p>Always remove the negative (-) cable first, and reconnect it last, to prevent arcing if a tool accidentally touches the frame or other grounded metal part while removing the positive (+) battery cable. Arcing can ignite the explosive hydrogen gas given off by the batteries, causing severe injury to personnel.</p>	
					<p>WARNING</p> <p>Do not operate a diesel engine where there are or can be combustible vapors. These vapors can be sucked into the air intake system and cause engine acceleration and over-speeding, which can result in a fire, an explosion, and extensive injury to personnel as well as damage to equipment. Operate the ventilator system to ensure generator room is clear of fuel fumes. Operate the blower for at least 5 minutes prior to starting engine.</p>	
					<p>WARNING</p> <p>Always be alert when generator set is running for problems that could lead to equipment damage or personal injury.</p>	
23				Generator Set	Tasks for the generator set include those tasks for the generator engine and the generator.	
24	•	•	•	Generator Engine	Check the engine for debris, foreign objects and loose or broken fittings.	Debris, foreign objects or lodged in components.
25	•	•	•	Engine Accessories and Connections	Inspect engine, fuel injection pumps and cooling pumps for loose or damaged connections or fittings. Inspect fluid lines and joints for leaks.	Damaged connections likely to cause malfunction
	•				Inspect wiring and wiring harness for loose connections and worn or frayed wires. Check that guards are in place.	
	•				Inspect engine-to-frame ground strap for good connections and condition.	

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
26	•			Engine Monitor System	Check the condition of gauges and replace if cracked or cannot be calibrated.	Gauges cracked or unserviceable.
		•			While operating, frequently observe engine gauges for proper operation.	Gauges do not function.
27	•			Generator Air Intake System	Visually check all air connections for loose clamps or connections, and tighten as required. Visually check all hoses and tubing for cracks, punctures, and tears, and replace as required. Visually check for collapsing hoses or tubing and other damage and replace as required.	
28	•			Engine Cooling	<p style="text-align: center;"><u>WARNING</u></p> <p>Check the coolant level only when the engine is stopped. Wait until the temperature is below 50°C (120°F) before removing the pressure cap. Failure to do so can cause personal injury from heated coolant spray.</p> <p>Check the coolant level at the expansion tank. Inspect cooling hoses and elbows for cracks and loose clamps.</p>	Coolant level low.
29	•			Seachest Strainer	<p style="text-align: center;"><u>NOTE</u></p> <p>Ensure that the seachest valve is in the CLOSED position prior to cleaning the seachest strainer.</p> <p>Clean the raw water filter.</p>	
30	•			Cooling Grid	Ensure that the seawater grid cooler valve is in the OPEN position.	
31	•			Fuel System	Check the fuel level in the day tank.	
	•				Depress the fuel primer to prime the engine.	
	•	•			Visually inspect the supply tank, fuel lines, fittings, shutoff valves, and filters for leaks. Check flexible fuel lines for cuts, cracks, and abrasions.	Class III leaks.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
32	•			Duplex Filters	Drain the water and sediment from the fuel filter.	
	•	•	•		Visually inspect exterior for obvious damage or leaks. Monitor pressure gauge for excessive differential pressure.	Any fuel leaks or damage. Differential pressure excessive.
33	•			Lubricating Oil	Check the oil level in the oil pan.	The oil level should be within the notches on the dip stick.
34	•			Belts	Visually inspect belts. Look for cracked, frayed, loose, or misaligned belts. Refer defects to your supervisor.	
35	•			Hoses and Fittings	Visually inspect hoses and connections. Look for cracks, punctures, or tears in hoses. Look for loose clamps or connections on fittings. CAUTION Do not bend or deform the hoses during inspection. This can cause the hoses to crack. Check for loose fittings and clamps, and signs of leakage. Tighten or replace as necessary (for replacement, refer to your supervisor).	Class III leaks

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
36		•		Start Control	<p>Start engine and note action of starter mechanism, particularly whether mechanism has adequate cranking speed and whether it engages and disengages without unusual noise when the control is operated. Set throttle so that the engine will run at normal warm-up speed until prescribed operating temperature is reached.</p> <p style="text-align: center;">WARNING</p> <p>If the oil pressure gauges do not indicate the proper pressure as specified within 30 seconds, stop the engine.</p> <p>Monitor the engine oil pressure gauge. Normal idling operating oil pressure for the engine is 20 PSI (140kPa).</p>	Low Oil Pressure
37		•		Engine Operation	Monitor the engine and gauges after commencing normal operating range.	
		•			Monitor oil pressure gauge. Pressure should range from 50-90 PSI (340-620 kPa) during normal operating range.	Low Oil Pressure
		•			Monitor engine power output.	Low power
		•			Monitor water temperature gauge. Normal water temperatures should range from 74°C to 91°C (165°F to 195°F). Coolant temperature should not exceed 96°C (205°F).	Coolant temperature exceeds 96°C (205°F).
		•			Monitor the engine for unusual noises.	Any unusual noise develops.
		•			Monitor the engine for any fuel, coolant, or lubricant leaks.	Class III leaks
		•			Monitor the engine for excessive smoke.	Excessive smoke develops
		•			Monitor engine consumption of fluids (coolant, fuel or lubricating oil).	Excessive consumption of fluids develops.
		•			Monitor the engine for excessive mechanical vibration	Excessive vibration.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
38			•	Engine Shutdown	It is important to idle the engine 3 to 5 minutes prior to shutting it down to allow lubricating oil and water to carry heat away from the combustion chamber, bearings, shafts, etc.	
39	•			Generator	Visually inspect the generator for foreign objects, obstructions to airways, damaged electrical connections, and other signs of damage.	Damage or obstructions to effect operations.
40	•			Switchboard and Generator Controls	Visually inspect exterior of switchboard for damaged or missing circuit breakers, label plates, meters, controls, or lights.	Missing or damaged parts effecting operations.
	•				The manual voltage adjust control should be set at "ZERO".	
	•				The manual voltage control switch should be in the "OFF" position.	
	•				The generator voltmeter switch should be in "GEN. 1-2" position.	
	•				The ammeter switch should be in position L1, L2, or L3.	
	•				All circuit breakers should be opened (no power to circuits).	
	•				The voltage adjusting pots should be set at mid-range.	
	•				The "HEATER ON" lights should be illuminated.	
	•				The synch selector switch should be in the "OFF" position.	
	•				The speed adjust control pots should be set in the mid-point position.	
		•			Generator voltage should be adjusted until the voltage is 450 volts.	Voltage is not 450 volts.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
40		•		Switchboard and Generator Controls-Continued	Once the generator has been started and brought up to 450 volts, ensure that the frequency meter reading is 60 HZ.	Frequency Meter reading is not 60 HZ.
41	•			Switchboard Distribution Panels	Visually inspect distribution panels for damaged or missing circuit breakers or label plates.	Any circuit breaker is damaged or missing.
				PILOT HOUSE SYSTEMS		
42	•			Navigation Light Panel	Inspect the panel for any damaged controls or indicators. Test the panel by turning on all navigation lights. All indicators should be illuminated. Remove the fuse of each light to be tested, one at a time. The indicator for the given light will be extinguished and an audible alarm will sound. Reinstall the fuse. Repeat for each lamp circuit controlled by the navigation light panel. Visually inspect to ensure that all navigation lights operate properly when the respective switch is selected.	Any control or indicator is unserviceable, effecting operation. If indicator lights should fail to illuminate or alarms fail to sound. Lights are inoperative or circuits are defective.
43	•			Hand Held VHF Radio	Visually inspect controls and indicators for damage. Seawater residue should be removed with a damp sponge or cloth and then the unit dried with a paper towel.	Any damage to controls or indicators which effect operation.
44				Sound Powered Phone System		

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
45	•			Handset	Visually inspect the handset and wiring for loose connections. Tighten as necessary. Visually inspect exterior for damage or dirt buildup. Clean using a soft, clean cloth.	Wiring is worn/frayed
46	•			Hardware	Inspect mounting hardware for tightness. Tighten as necessary.	
47	•			Rotary Switches	Check mechanical operation of each rotary switch. Document any worn part or incorrectly operating parts and refer to your supervisor.	Broken/missing switch
48	•			Head set-Chest set	Visually inspect head set connections to the chest set for frayed wiring on loose connections. Inspect ear cups for tears and cleanliness. Inspect neck straps for fraying or missing fasteners. Press push-button on mouthpiece and release. Observe push-button goes in and out. Visually inspect wire from chest set to jack plug for loose connections, cracks on damaged insulation. Clean using a soft clean cloth.	Wiring is worn/frayed; loose connections; broken components
49	•			Pilot House Console	Inspect console for cleanliness; clean as required. Look for any loose, missing, or broken switches or controls, gauges, indicator lights, or obvious damage. Ensure throttle controls operate smoothly and do not bind.	Any control or indicator is unserviceable, effecting operation.
50	• •			Steering Alarm and Control Panel	Inspect the panel for damaged controls or indicators. Press "TEST" pushbutton. All lights should illuminate. Use dimmer control to adjust lights as necessary.	Damage which could effect operation. One or more panel lights do not illuminate.
51	• •			Main Rudders Full Follow Up Controls	Check for damage. Ensure that control operates smoothly and does not bind. Ensure that control is in sync with rudder angle indicator.	Damage which could effect operation. Any binding or unusual operation.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
52	• •	•		Flanking Rudders Full Follow Up Controls	Check for damage. Ensure that control operates smoothly and does not bind. Ensure that control is in sync with rudder angle indicator.	Damage which could effect operation. Any binding or unusual operation.
53	• •	•		Main Rudders Non Follow Up Controls	Check for damage. Ensure that control operates smoothly and does not bind. Ensure that control returns to center upon release.	Damage which could effect operation. Any binding or unusual operation.
54	• •	•		Flanking Rudders Non Follow Up Controls	Check for damage. Ensure that control operates smoothly and does not bind. Ensure that control returns to center upon release.	Damage which could effect operation. Any binding or unusual operation.
55	• •	•		Rudder Angle Indicator Panel	Ensure that dimmer is capable of adjusting intensity of lights. Ensure that needle moves when joystick is moved.	Dimmer does not function. Needle does not move.
56	•			Pilot House 208 VAC Power Panel (DP5)	Visually inspect the panel for damaged circuit breakers.	Any circuit breaker is missing or unserviceable.
57	•			DC Distribution Panel	Visually inspect the panel for damage to controls, indicators, or circuit breakers.	Any damage to controls or indicators that could effect operation.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
58	•	•		Emergency Start/Stop Fire Pump	<p>Activate the pump by depressing the start button. The pump should operate and the indicator light should illuminate.</p> <p>Deactivate the pump by depressing the stop button. The pump should stop and the indicator light should go out.</p>	<p>Pump does not run.</p> <p>Pump does not stop.</p>
59	•			CO₂ Pull Station	Inspect pull station for structural damage.	Damage to station.
60	•			Watertight Door and Carbon Monoxide Alarm	<p>Visually inspect exterior of alarm panel for obvious damage.</p> <p>Test the alarm panel by depressing the "TEST" button. Each of the alarm points should display an alarm condition.</p>	<p>Damage to panel.</p> <p>Alarm points not activated on test.</p>
61	•			Emergency Fuel Valve Shutoff Station	Inspect shutoff station for structural damage.	Damage to station.
62	•			Propulsion Control System	See Main Engine Controls, Item 18 above.	
63	•		•	Main Engine Gauge Panels	<p>Check the condition of gauges and replace if cracked or cannot be calibrated.</p> <p>While operating, frequently observe engine gauges for proper operation.</p>	<p>Gauges cracked or unserviceable.</p> <p>Gauges do not function.</p>
64	•			Main Engine Emergency Stop Buttons	Inspect buttons for damage.	Obvious damage or broken indicators.
65	•			Generator Emergency Stop Buttons	Inspect buttons for damage.	Obvious damage or broken indicators.
66	•			Singuars Radio	Visually inspect unit for damage.	Damage to unit which effects operation.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
67	•			Marine Band VHF Radio Set DSC500	Visually inspect unit for damage. Clean the face of the unit using a liquid window cleaner followed by drying with a paper towel. Remove seawater residue from unit using a damp clean, soft cloth or sponge. NOTE Although transceiver case is watertight, the unit should not be directly washed down with running water. NOTE General cleaning should be done with a light spray of liquid window cleaner followed by drying with a paper towel. The face of the display will perform best when kept free of all foreign matter. Gently wipe the display with a soft paper towel moistened with isopropyl alcohol or liquid window cleaner. Do not use excessive pressure, which could scratch or break the glass.	Damage to unit which effects operation.
	•				Visually inspect the unit for damage.	Damage to unit effecting operation.
	•				Inspect mounting hardware for tightness. Tighten as needed.	
	•				Check the two-way capability of the master station. Select other stations on the system and conduct a two-way conversation. Transmissions should be clear, undistorted, and easily understood.	One or more unit malfunctions occur.
	•			Check the function of all alarms.	One or more unit malfunctions occur.	

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
68	•			Loudhailer/ Public Address System- Continued	Check the function of illuminated keypad.	
	•				Conduct a lamp test.	
	•				Check speaker volume adjustment.	
69	•			Fluxgate Compass	Visually inspect the unit for damage.	Damage to the unit effecting function.
70	•		•	Magnetic Compass	Carefully wipe the plexiglas dome with a damp cloth to remove seawater spray deposits and to keep display clear. Visually inspect the unit for damage. Check the function of the compass lighting.	Damage to the unit effecting function.
71	•			Radar Monitor	Visually inspect the unit for damage. WARNING High voltage components within the radar display must be kept clear and dust free to prevent the possibility of high voltage arcing. Diesel soot and dirt should be removed with a sash brush and dry cloth.	Damage to unit effecting operations.
	•		•		Clean the unit. Remove dirt, dust, and seawater residue from the unit.	
	•				Check all hardware/mountings for fastness.	Hardware or mountings are not fast.
	•				Check cable connections and terminals for cleanliness and tightness. Ensure that wiring is free from chafing or abrasions.	Connections are loose. Wiring is damaged.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
72	•	•		Search Light Controls	Have someone observe the operation of the searchlight. Operate the joystick to ensure the searchlight moves in the desired direction. Change the speed control and operate the joystick to ensure speed control operates properly. Operate beam focus switch to ensure searchlight can be properly focused.	Searchlight cannot be directed from control panel.
73	•			Depth Sounder	Inspect the unit for visible damage to controls and indicators. If necessary, clean the face of the unit using a soft, damp cloth.	Damage to controls or indicators effecting operations.
74	•			Pilot House Thermostat	Inspect the unit for visible damage to controls or indicators.	Damage to controls or indicators.
75	•			GPS	Inspect the unit for visible damage to controls or indicators.	Damage to controls or indicators.
76	•			Clearview Screen Controls	Visually inspect exterior of control box for obvious damage and secure mounting. Turn on motor switch. Ensure that "MOTOR" indicator is lit and that the screen spins. Turn on heater switch. Ensure that "HEATER" indicator is lit. After 5 minutes, ensure that warmth is felt in the proximity of the screen. Turn off motor switch. Ensure that "MOTOR" indicator is no longer lit and that the screen has stopped spinning. Turn off heater switch. Ensure that "HEATER" indicator is no longer lit and that the heater has stopped.	Control box damaged or not securely mounted. Window does not spin. Heat does not function.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
				LIFESAVING AND SAFETY		
77				Liferaft	<p style="text-align: center;">NOTE</p> <p>During inspection, immediately report noted defects to your supervisor. Your life and that of the crew may depend on this equipment working in an emergency.</p> <p style="text-align: center;">CAUTION</p> <p>Use caution when inspecting cylinder lanyard. Accidentally pulling this cable will cause the liferaft to inflate, which could injure personnel or damage the raft assembly.</p> <p>Visually inspect the liferaft container for dents or cracks that could leak water. Check cables and lanyards for chafing, cuts, or loose connectors.</p> <p>Visually inspect the liferaft cradle and launching mechanism, ensuring no obstructions exist and that the assembly is not damaged in any way.</p>	Container or deploying mechanism is damaged, may cause malfunction during an emergency.
78	•			Personal Floatation Devices	Inspect personal floatation devices for rips, oil stains, broken straps, fiber deterioration, and hull marking of vessel.	Personal floatation devices are unserviceable.
79	•			EPIRB	Visually inspect EPIRB for damage.	Damage to unit impairs operation.
80	•			Lifelines and Stanchions	Ensure that lifelines and stanchions are in good condition and are secured in place. Visually inspect safety chains for wear and corrosion.	
81	•			Life Rings	Inspect for damage and proper marking. Check that marker lights function when casing is turned upright.	Damage to life ring or marker lights does not function.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
				HVAC SYSTEM		
82	•	•		Ventilation Fans	Visually inspect ventilation fans for damage. Observe unit for unusual noises or excessive vibration.	Damage to the unit to effect operations. Unusual noises or excessive vibration.
83	•	•		Compressor Unit	Visually inspect unit for damage. Observe unit for unusual noises or excessive vibration.	Damage to the unit to effect operations. Unusual noises or excessive vibration.
84	•	•		Air Handling Unit	Visually inspect unit for damage. Observe unit for unusual noises or excessive vibration.	Damage to the unit to effect operations. Unusual noises or excessive vibration.
				Bilge/Ballast/ Fire System		
85	•			Bilge/Ballast/ Firemain Manifold	Visually inspect the manifold for cracks, leaks, and secure mounting.	Class III leaks or loose mounting.
86	•	•	•	Bilge/Ballast Pumps	Visually inspect pump for leaks, loose connections, and damage. Check valves for proper operation.	Pump or couplings are damaged to effect operation.
	•				Ensure that suction and discharge valves are open.	
		•			Ensure that gauges operate correctly and ensure that pressures are within normal system ranges.	Pump is defective or pressure readings out of range.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
86	•			Bilge/Ballast Pumps-Continued	Monitor pump for unusual operating noises.	Unusual operating noises are heard.
87	•	•	•	Fire Pump	Visually inspect pump for leaks, loose connections, and damage. Check sea chest valves for proper operation.	Pump or couplings are damaged to effect operation.
		•			Ensure that suction and discharge valves are open.	
		•			Monitor the pressure gauge to ensure that the pump is operating within normal system pressures.	Pump is defective or pressure readings out of range.
		•			Monitor pump for unusual operating noises.	Unusual operating noises.
				Sanitary and Sewage		
88	•	•	•	Gray Water Pump	Visually inspect the pump for leaks, loose connections, and damage. Visually inspect the pump gauge for damage and proper operating range.	Damage to the pump. Damage to the gauge or operation outside of normal range.
89	•	•	•	High Level Alarm	Visually inspect exterior of alarm panel for obvious damage. Test the alarm panel by depressing the "TEST" button. Each of the alarm points should display an alarm condition.	Damage to panel. Alarm points not activated on test.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
				Potable Water System		
90	•	•	•	Potable Water Pressure Pump	Visually inspect the pump for leaks, loose connections, and damage.	Damage to the pump.
	•	•			Visually inspect the pump gauge for damage and proper operating range.	Damage to the gauge or operation outside of normal range.
91	•			Tank High Level Alarm	Visually inspect exterior of alarm panel for obvious damage. Test the alarm panel by depressing the "TEST" button. Each of the alarm points should display an alarm condition.	Damage to panel. Alarm points not activated on test.
92	•			Water Heater	Visually inspect the unit, valves, fittings, piping, and electrical connections for damage.	Damage to unit, valves, fittings, or electrical connections; or Class III leaks.
					CAUTION Water heater tank must be full of water prior to turning power on. The heating element will be damaged if the unit is energized while the tank is dry. CAUTION Do not turn on water heater if cold water supply valve is shut off.	
	•	•			Ensure that the supply line valve and the hot water outlet valve are open.	
	•	•	•		Ensure that the area surrounding the water heater is kept free of flammable liquids.	

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
92				Water Heater-Continued	<p style="text-align: center;">WARNING</p> <p>Hydrogen gas can be produced in the hot water system served by this water heater that has not been used for a long period of time (two weeks or more). Hydrogen gas is extremely flammable. Do not smoke or use open flame near the faucet at this time.</p>	
	•				If water heater has not been used for a period of time (beyond two weeks), draw water from the system using a hot water faucet away from the heater. The water should be run for several minutes.	
				Fuel System		
93	•	•	•	Fuel Oil Transfer Pump	Visually inspect pump, gauges, and valves for leaks, loose connections, and damage.	Any fuel leaks or damage.
94	•	•	•	Fuel Oil Strainer	Visually inspect exterior for obvious damage or leaks.	Any fuel leaks or damage.
	•				Rotate the handle atop the filter one revolution in either direction to clean the filter. If handle is difficult or impossible to rotate, refer to unit maintenance.	Handle does not turn or is too hard to turn.
				Lube Oil System		
95	•			FLOCS Pump	The strainer should be serviced by removing the strainer clean out plug and then pulling the screen. The screen and plug should be cleaned using a cleaning solvent.	Strainer is unserviceable.
	•	•	•		Visually inspect the condition of the pump for signs of damage, leaks, or loose connections.	Class III leaks.
96	•			High Level Alarm	Visually inspect exterior of alarm panel for obvious damage.	Damage to panel.
	•				Test the alarm panel by depressing the "TEST" button. Each of the alarm points should display an alarm condition.	Alarm points not activated on test.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
				Oily Water System		
97				Oily Water Separator	<p style="text-align: center;">WARNING</p> <p>Ensure that the main power switch is in the "OFF" position, with the power disconnected at the source.</p> <p>Visually inspect the unit for damage to include all electrical connections, fittings, and piping.</p>	Damage to unit.
	•				Ensure that the supply tank has enough water so as to prohibit air from being drawn into the system. Use the seawater supply valve near the oily water separator.	Low water in tank.
		•			Apply power to the system. The oil pump should run for approximately 20 seconds. A blue indicator light on the control panel should confirm this.	Pump does not run.
		•			After 20 seconds, the oil pump should stop and the main pump will start. The blue light should be extinguished to indicate that the oil pump has stopped. A white light should be lit to indicate that the main pump has started.	Oil pump does not stop after 20 seconds or the main pump does not start.
98	•			Oil Content Bilge Alarm	Visually inspect the unit for broken or missing indicators.	Broken or missing indicators.
99	•			Pump Hand Oily Bilge	Inspect pump for leaks, loose connections, or damage.	Pump inoperative or leaking.
				Steering System		
100	•			Steering Alarm and Control Panel	Inspect the panel for damaged controls or indicators.	Damage which could effect operation.
	•				Press "TEST" pushbutton. All lights should illuminate. Use dimmer control to adjust lights as necessary.	One or more panel lights do not illuminate.

Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
101	•			Hydraulic Power Unit	Visually inspect for damage to the unit, hoses, fittings, connections, sight glasses, and filters.	Damage to unit or Class III leaks.
101	•				Visually inspect hydraulic fluid level in both tanks using sight glasses positioned on front of unit.	Fluid level low.
101	•	•		Hydraulic Power Unit-Continued	Visually inspect hydraulic lines throughout vessel for leaks.	Class III leaks.
102	•			Steering Controls	Inspect the panel for damaged controls or indicators. Press "TEST" pushbutton. All lights should illuminate. Use dimmer control to adjust lights as necessary.	Damage which could effect operation. One or more panel lights do not illuminate.
				Deck Fittings		
103	•			Towing Winch	Visually inspect spools, gears, controls, and clutches for foreign objects.	Foreign objects are wedged or lodged in assemblies.
	•	•	•		Visually inspect the unit, spools, gears, controls, and clutches for damage.	Damage to unit effecting operation.
104				Capstan	Visually inspect the unit, spool, and controls for damage.	Damage to the unit effecting operation.
	•				Check the oil level in the unit when the unit is cold.	Oil level low.
		•			Monitor the unit for unusual operating noises	Unusual operating noises.
	•	•	•		Visually inspect the unit for oil leaks.	Class III leaks.
105	•			Aft Control Station	Visually inspect gauges, housing, and controls for damage.	Damage effecting operations.

ITEM NO.	Interval			Item to Check/ Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
	•			Main Rudders Full Follow Up Controls	<p>Check for damage.</p> <p>Ensure that control operates smoothly and does not bind. Ensure that control is in sync with rudder angle indicator.</p>	<p>Damage which could effect operation.</p> <p>Any binding or unusual operation.</p>
	•			Flanking Rudders Full Follow Up Controls	<p>Check for damage.</p> <p>Ensure that control operates smoothly and does not bind. Ensure that control is in sync with rudder angle indicator.</p>	<p>Damage which could effect operation.</p> <p>Any binding or unusual operation.</p>
				Main Engine Controls	<p style="text-align: center;">NOTE</p> <p>Procedures are provided for the control stations in the Pilot House, Engine Room, and Aft Control Station.</p> <p style="text-align: center;">NOTE</p> <p>The tests below should be performed with the engines stopped.</p>	
	•				Energize the control system. The control head should produce an intermittent tone.	A steady tone signals, indicating a voltage problem or component failure.
	•				Move the control head lever full ahead and full astern. This will check that the control head is operating.	Ahead or Astern Control does not operate properly.
	•				Depress and hold the station button. Move the control head lever to the ahead detent position before releasing the station button. The red indicator light on the control head will blink, indicating that the control head has been placed in the neutral fast idle mode.	Red indicator light does not blink.
					<p style="text-align: center;">NOTE</p> <p>The procedures below should be performed once the engines have been started.</p>	

ITEM NO.	Interval			Item to Check/Service	Procedure	Not Mission Capable If:
	B E F O R E	D U R I N G	A F T E R			
		•			Use neutral fast idle mode on each engine to confirm proper speed command.	Fast idle mode does not function properly.
		•			Use neutral fast idle to warm-up the engines. Gradually move the control head lever to full speed. Engines should be running within required RPM range.	Engines do not attain required RPM readings.

Section III.

OPERATION UNDER USUAL CONDITIONS

2.4. General. The following information is provided for the guidance of personnel responsible for operation of the ST. It is essential that operator/crew know how to perform every operation of which the equipment is capable and to coordinate the basic motions to perform the specific tasks for which the ST was designed.

2.5. Assembly and Preparation for Use. Upon delivery of the ST remove all shipping braces, temporary closures and protective coverings, and solvent clean all protective coverings (such as cosmoline, heavy grease, etc.). The diesel engines should be started and all rotating machinery should be turned under its own power to demonstrate correct working order. All electrical panels should be opened, inspected, cleaned, and shown to be undamaged and in good working order.

2.6. Before You Operate This Equipment. The following operating procedures are in part sequential and in part parallel to allow any crewmember to bring the ST from a condition of being connected to shore power to a full ship power operating condition. Instructions are provided to systematically bring each subsystem/equipment into operation. Each subsystem/equipment will have the required PMCS performed by operator/crew before operating. The PMCS shall be performed as the vessel is prepared for operation. Shutdown procedures take the vessel from full power to dead in the water.

2.7. Initial Adjustments, Checks, and Self-Tests. The following sub-paragraphs include procedures for preparing the ST for start-up operation:

NOTE

For the purpose of these instructions, the ST is in a "dead ship" state: all systems, equipment, panels, etc. have been completely shut down and the only source of power is that supplied by the DC system.

If the ST is in a deactivated status, follow normal reactivation procedures.

- a. Pre-start Inspection. All operator/crew preventive maintenance checks and services (PMCS) for "before " interval should be performed prior to operation. In addition to preventive maintenance checks, inspect power generation system equipment for condition of:
 - (1) Switchboard(s) - ensure that all breakers/panels are off/incapable of taking initial load upon starting the generator diesel engine.
 - (2) Generator engine levels - fuel oil (day tank), coolant, engine oil (in accordance with the TM# 55-1925-253-14&P Onan Marine Operator's Manual; MCGBA/MCGCA/MCGCB/MCGDA/MCGDB/MCGGA; #960-0148).
 - (3) Engine coolant temperature - preheat if necessary (in accordance with TM# 55-1925-253-14&P Onan Marine Operator's Manual; MCGBA/MCGCA/MCGCB/MCGDA/MCGDB/ MCGGA; #960-0148 .
 - (4) Water supply - ensure lines/valves are open.
 - (5) Monitoring & Control system - ensure all controls are on/in pre-start-up status.
 - (6) Mechanical accessories - ensure all guards are in place; ensure against possible mechanical obstructions.

- b. Pre-start Adjustments. Make adjustments as necessary following pre-start inspection; for specific instructions/procedures per equipment, see TM# 55-1925-253-14&P.
- c. Pre-start Tests. Conduct pre-start tests as required by adjustments made if applicable; for test procedures, see TM# 55-1925-253-14&P.

2.8. Power Generation/Distribution System.

a. Operation.

(1) Start Generator Diesel Engine.

- (a) After determining which generator will be used select which battery bank will be used. This is done by using the selector switches mounted on the aft bulkhead above Generator #1. The starboard selector switch controls Generator #2 and the starboard main engine battery banks. The port selector switch controls Generator #1 and the port main engine battery banks.
- (b) If #1 on the selector switch is selected, this will use the generator battery bank to start the generator. If #2 on the selector switch is selected, this will use the main engine battery bank to start the generator. If "ALL" is selected on the selector switch, this will use both the generator and main engine battery banks to start the generator.

NOTE

If the selector switch is placed in the "OFF" position this will kill all power to the selector switch and battery chargers.

The selector switches CAN NOT be used to cross over from side to side. The starboard selector switch can only be used for the starboard main engine and Generator #2 and the port selector switch can only be used for the port main engine and Generator #1.

- (c) After determining which generator and battery bank will be used and all pre-start checks have been completed, push the START/RUN/STOP switch to the START position and hold until engine starts and accelerates to governed speed. The engine will continue to run when the control panel switch is released to the RUN position.
- (2) Check engine for running noises.
- (3) Check engine and external piping for leaks.
- (4) Check engine RPM, temperatures and pressures as outlined in Operator's and Maintenance Manual for Marine Generator Set TM# 55-1925-253-14&P.
- (5) Bring the generator up to normal operating conditions in accordance with the procedures outlined below:
- (a) Ensure that the manual voltage adjust knob is in the full counter clockwise position (it should remain set in that position). Flip the manual voltage control mode selector toggle switch from the "OFF" position to the "AUTO" position.
 - (b) Generator voltage should be at 450 volts. If the voltage is below 450 volts, slowly turn the manual voltage adjust knob clockwise to increase the generator voltage to 450 volts. If the voltage is above 450 volts, slowly turn the manual voltage adjust knob counterclockwise to

decrease the generator voltage to 450 volts. The frequency meter should read 60HZ. The generator power available light should be illuminated and the heater on light should be dark.

- (c) With the generator operating at 450V and 60HZ and the voltage control mode selector switch in the "AUTO" position, the automatic voltage regulator controls the generator voltage. If the voltage changes when switching to the "AUTO" position, this may be corrected with the voltage-adjusting rheostat located on the main switchboard. The generator is now ready to be connected to the dead main bus.

- (6) Connecting a generator to a dead bus.

With the generator producing 450 volts at 60HZ, move the appropriate generator circuit breaker toggle to the "ON" position. This will bring the selected generator onto the main bus and the mechanical interlock will prevent the shore power breaker from being closed. The ground detection lights should illuminate and a "BUS" voltage reading can be taken via the bus voltmeter switch (should read 450 volts). This same sequence can be followed for the second generator but only if the first generator is off line.

- (7) Parallel for transfer operating procedures. To connect two generators to the bus at the same time, this generator paralleling procedure must be followed:

CAUTION

Ensure that the generators are in synch prior to paralleling. Failure to execute the paralleling procedure correctly may result in catastrophic damage to equipment.

- (a) With one generator feeding the bus, start up the other generator and bring it up to operating voltage and frequency. If needed adjust the voltages and frequencies to match using the voltage adjusting pots and the governor control pots.
- (b) Once the voltages and frequency is matched, place the synch selector switch to the incoming generator position. The synch lamps will be alternating between dark, dim and bright and the synch scope will be rotating in a clockwise manner.
- (c) When the synch lamps are dark and the synch scope is at the 12 o'clock position (indication that the generators are in synch and can be paralleled), close the incoming generator breaker ("ON" position). The generators will now operate in parallel for approximately 5 seconds after which the initial generator circuit breaker will trip off line. Once the circuit breaker has tripped off line, place the sync selector switch to the "0" (Zero) position. This same procedure can be executed when transferring back to the other generator.

- (8) Transferring to shore power.

- (a) Connect shore power connector.

NOTE

Due to the mechanical interlock it is not possible to parallel the generators with shore power.

- (b) Whenever power is being switched to or from shore power it is necessary to have a dead bus condition. Before the shore power breaker can be closed, it is necessary to have the correct phase rotation on the shore power breaker to ensure compatibility with the switchboard.

- (c) Green correct phase sequence light should be illuminated.
- (d) Shift "manual interlock" to left most position, exposing shore power circuit breaker.
- (e) Trip "shore power" circuit breaker to on position.
- (f) Reset and close "upper engine room panel" circuit breaker.
- (g) Rotate voltmeter selector switch and frequency meter selector switch to "shore power" position.

NOTE

The digital control head in the Pilot House will automatically enter a trouble mode. Press "acknowledge" button on control head to silence alarm.

- (9) Monitor Main AC Switchboard frequency meter, voltmeter, and ammeter gauges to ensure readings of 450V, 3 phase and 60 hertz.

b. Shutdown.

- (1) Open appropriate circuit breaker(s) (shore power of generator) to disconnect from main bus.
- (2) Turn voltage control mode selector switch from "AUTO" to "OFF" position.
- (3) Momentarily push the generator control panel switch to "STOP", thereby causing the engine to come to a stop. Hold switch until engine stops completely.

2.9. Propulsion Plant. This paragraph provides operations and shutdown procedures for the main engines, reduction gear, and engine controls.

2.9.1 Main Engines.

a. Operation.

After all pre-start checks have been completed as outlined in Table 4-1 (Item 72) of Unit PMCS in this manual:

- (1) Two DC breakers in the Pilot House must be in "ON" position in order to energize port and starboard engine panels.
- (2) Energize Engine Instrument and Control Panel by placing the "POWER" switch to the "ON" position.
- (3) Check all reset buttons on control panel and reset accordingly.
- (4) Turn "SHUTDOWN/SHUTDOWN OVERRIDE" switch to the "SHUTDOWN" position.
- (5) Ensure that "MAINTAINED STOP" button is in the "OFF" (locked out) position.
- (6) Reset the timer to 5 minutes.
- (7) Press the "START" button and hold until engine starts and accelerates to governed speed.

NOTE

Initially the prelube pump will bypass the starter and provide lube oil, under pressure to lubricate the engine. Once this has taken place, the starter will engage and the engine will accelerate to governed speed. Release the start button once the engine has started.

- (8) Monitor Engine Instrument and Control Panel for proper RPM's, oil temperature, oil pressure, crankcase pressure, and reduction gear drive oil pressure.
- b. Shutdown.
- (1) Ensure that gear is not engaged and that engine is running at idle speed.
 - (2) Shut down the engine by switching the power toggle switch to the "OFF" position. This deenergizes the Engine Instrument and Control Panel. The engine may also be shut down by pressing the "MAINTAINED STOP" button and then switching the power toggle switch to the "OFF" position.
 - (3) After ensuring that the gear is not engaged and engine is shut down, turn OFF DC power supply in the Pilot House, on the "DC Control Panel." Place both the "Mathers Port" and "Mathers Starboard" breakers in the "OFF" position.

CAUTION

The above procedures will shut down the engine panel and the engines.

2.9.2 Engine Controls. The ST has four sets of main engine controls located as follows: Primary Station Controls are located at centerline on the Pilot House Console; Back-up Controls are located to port and starboard of the magnetic compass on the Pilot House Console; Engine Room Controls are located in the Engine Room on the forward bulkhead to the port of centerline; and Aft Station Controls are located on the 01Deck Aft Control Station. Operation and shutdown procedures for the Main Engine Controls are provided below.

a. Operation.

When control system DC power (power on Pilot House DC Panel) is turned on, an intermittent tone will sound at all remote stations, indicating that no station has command.

- (1) To take command at a station the operator must depress the station transfer button. The tone will stop at all stations and the red indicator will be lit at the Station-in-Command. Only one station has command at a time.
- (2) When transferring command from one remote station to another, the Control Head levers of the Station-in-Command may be left in any position. Depress the station transfer button at the station taking command. The red indicator will light indicating the station has taken command.
- (3) The operator has an option of two engine IDLE RPM settings. This feature allows the operator the option of toggling between Low Idle (generally the RPM set by the governor) and High Idle (a preset higher RPM). The operator selects High or Low by depressing the station transfer button (until light begins to flash) at the Station-in-Command, alternating the RPM between High and Low.
- (4) To select Back-up Control System operation turn the two-position selector switch to Back-up on each CH12431 single lever Back-up control head (throttle control) on either side of the magnetic

compass on the Pilot House console. A red indicator light on the control head will light, indicating Station-in-Command and the appropriate MS547 Processor will sound a three second audible tone and turn OFF the MS547 Processor. The port and starboard selector switches are used for clutch control.

- (5) To restore command to the MS547 Processor located in the Pilot House, place the two-position selector switch to NORMAL operation. The red indicator light on the CH12431 Control Head will go out, indicating this remote station is no longer in control. The appropriate MS547 Processor will activate and the operator can take control at another station.

b. Shutdown.

After ensuring that the gear is not engaged and engine is shut down, turn OFF DC power supply in the Pilot House, on the DC Control Panel. Place both the "Mathers Port" and "Mathers Starboard" breakers in the "OFF" position.

CAUTION

The above procedures will shut down the engine panel and the engines.

2.9.3. Stern Tube Vents.

- a. Operation. Prior to operating the propulsion shafting, ensure that the stern tube valves (port and starboard in the engine stores) are in the open position.

NOTE

Failure to open stern tube valves can result in a failure to shaft seals.

- b. Shutdown. If the ST is to be left in an unmanned state, then the stern tube valves should be closed.

2.10. Navigation System/Equipment. Once power has been supplied, turn on breakers (1P-L and 1P-N) in DP5 - Pilot House distribution panel and initiate pre-start checks and start-up procedures in accordance with appropriate owner's/vendor manual.

2.10.1. Radar. The Raytheon R40/41XX radar is an electronic system using super high-frequency radio waves; when reflected they show on a screen the position, size and distance of an object; radar is used at night and in bad visibility for both collision avoidance and navigation.

a. Operation.

- (1) Turn "Radar" breaker on DC Panel to the "ON" position.
- (2) Press the ST-BY key to place the radar in standby. When the countdown has expired, the displayed prompt of "ST-BY" should appear. Pressing the X-MIT / OFF key when ST-BY is displayed puts the radar in the transmitting mode.
- (3) Set the radar range via the Range "^" Range "V" keys to the 3 Nmi (5.559 Meters) range scale.
- (4) Turn the GAIN Control clockwise until targets appear and a light speckle of background noise is visible.

- (5) Adjust the TUNE Control to obtain the maximum (strongest pickup) display of targets. (Adjust TUNE in ranges greater than 0.75 Nmi; 1.38975 Meters only). If AUTO is displayed in the lower left corner under the range scale, then the tuning is automatic.
- (6) Reset the RANGE "V" key down to .75 Nmi (1.38975 Meters).
- (7) Turn the ANTI-CLUTTER / SEA Control clockwise as necessary to reduce (but not eliminate) sea clutter.
- (8) If rain echo returns are present and obscure targets, first reduce the GAIN Control slightly to see whether the rain clutter will disappear leaving targets still visible. If not, readjust the GAIN Control for best gain setting.
- (9) Then turn the ANTI-CLUTTER / RAIN Control clockwise to reduce or eliminate the rain, while retaining targets for best viewing.

b. Shutdown.

- (1) To turn off the Display and radar system, press both the ST-BY / OFF and the X-MIT / OFF keys simultaneously.
- (2) Turn "Radar" breaker on DC Panel to "OFF" position.

2.10.2. Depth Sounder. The Autohelm ST 50 Depth Plus Sounder is a device which transmits an ultrasonic energy wave into the water, listens for echoes from that ultrasonic wave, and then displays the returning echoes on the control head display. The elapsed time that it takes for the pulse energy to travel down through the water and be reflected back as echoes can be measured and converted into units of depth in the echo sounder. As it leaves the factory the ST50 Plus Depth is set with: depth units in feet, transducer offset to 10 feet (3.048 Meters), shallow alarm set to 10 feet (3.048 Meters), deep alarm set to 100 feet (30.48 Meters), low anchor alarm set to 50 feet (15.24 Meters) and high anchor alarm set to 50 feet (15.24 Meters).

a. Operation.

- (1) Turn breaker (1P-P) in DP-5 panel to "ON" position.

NOTE

When the unit is powered-up for the first time, water depth will be displayed.

- (2) To adjust the initial calibration for shallow, deep low anchor, high anchor and offset displays use the "OFFSET" and "RESET" keys.

(a) OFFSET KEY.

The offset value can be positive (+) or negative (-). Depth measured from the keel is negative (-) and depth to the waterline is positive (+).

The offset display will return to the water depth 8 seconds after the last key press.

- (3) The "ALARM" key is used to enable/disable the alarms.

(a) ALARM KEY.

- 1 The shallow alarm had priority over all alarms and will sound until it is silenced. The shallow alarm legend will continue to flash until the depth rises above the set threshold.

- (1) Perform the procedure in calm water.
 - (2) Press "PWR" key to turn unit on.
 - (3) Press "AUTO COMP" key with a pointed object.
 - (4) Rotate the vessel slowly and continuously in either direction through two turns. The slower and steadier the turn, the more accurate the result. One revolution should take approximately one minute to complete.
 - (5) When complete, the display will momentarily indicate "DONE" if the procedure has been performed correctly.
 - (6) If an error is encountered during the compensation, the display will indicate "ERR". The procedure should then be repeated, starting with Step 3.
 - (7) Check the digital or analog compass heading against known bearings to verify accuracy of the compensation. If a constant error is found, this indicates that the sensor is not aligned parallel with the centerline of the vessel. This alignment error can be easily corrected by rotating the sensor within its clamping ring.
- b. Shutdown. Press the "PWR" key to turn unit off. Remove power from the fluxgate compass by placing the "FLUXGATE COMPASS" breaker to the "OFF" position on the DP-5 panel.

2.10.5. Navigation Lights (Navigation Light Panel).

a. Operation.

- (1) Ensure "NAV LT PANEL" circuit breaker on the DC power panel is in the "ON" position.
- (2) Powering up the Navigation Light Panel should be accomplished as outlined in this procedure. The front panel of the Sea Marine Navigation Light Panel has a toggle switch labeled "POWER". This switch can be used to turn "ON/OFF" the power to all navigational lights and the panel. When the switch is in the "ON" position, the Navigational Light power is drawn from the primary power source. When the switch is in the "EMERG" position, the Navigational Light power is drawn from the secondary power source.
- (3) To turn "ON/OFF" a navigational light, execute the procedures outlined herein. The front panel of the Navigation Light Panel has a toggle switch labeled with the name of every navigational light. The appropriate switch for the selected navigation light can be used to turn "ON/OFF" the power to that light. When the switch is in the "ON" position, the indicator for that navigational light will be illuminated.
- (4) The Navigational Light Panel will give a visual and audible indication of a blown fuse, open lamp circuit or blown navigation lamp on any supervised circuit that is switched "ON". If there is a failure, the indicator for that lamp will be extinguished. To silence the audible alarm, the lamp must be switched "OFF", or the blown fuse must be replaced, or the open in the circuit wiring must be repaired or the lamp must be replaced.
- (5) To test the Navigation Light Panel, first turn on all navigational lights. All indicators should be illuminated. Remove the fuse of the first navigational light. The indicator will be extinguished and an audible alarm will sound. Replace the fuse. Repeat for each supervised lamp circuit.

b. Shutdown.

- (1) Move the toggle switch labeled "POWER" to the "OFF" position.
- (2) Ensure "NAV LT PANEL" circuit breaker on the DC power panel is in the "OFF" position.

2.10.6. Searchlight. Reference should be made to TM# 55-1925-249-14&P for additional information on the operation of the searchlight.

WARNING

Dangerous high voltage (120V) exists. Use extreme caution when installing, operating, testing, troubleshooting, or performing any maintenance work with the power supply door open.

WARNING

Electromagnetic radiation from the searchlight has the potential to produce serious radiation burns. Do not stand in the path of the searchlight beam.

a. Operation.

- (1) Supply power to searchlight panel by placing breaker labeled "Searchlight" in the DP-5 panel in the "ON" position.
- (2) Supply power to the searchlight by placing the power switch on the power panel (located forward in the HVAC room) to the "ON" position by rotating and then locking in position.
- (3) To turn on the lamp, turn the "START/OFF" switch on the searchlight panel (located on Pilot House console) to the "START" position momentarily.

NOTE

Do not hold in "START" position any longer than necessary to start lamp. Holding the switch in start position any longer than necessary may shorten lamp life.

- (4) Adjusting the speed of the searchlight is accomplished by rotating the "SPEED" adjustment control.
- (5) Positioning the beam is accomplished using the "UP/LEFT/DOWN/RIGHT" joystick on the searchlight panel on the Pilot House console.
- (6) Focusing of the beam is accomplished by moving the "BEAM FOCUS" toggle switch either forward or aft until the desired intensity is attained.
- (7) The "STANDBY/OFF" switch should be moved into the "STANDBY" position to place the searchlight in a low-power standby mode.

b. Shutdown.

- (1) Turn the lamp off by flipping the "STANDBY/OFF" toggle switch to the "OFF" position.
- (2) Remove power from the searchlight by placing the breaker on DP-5 panel to the "OFF" position.
- (3) Remove power from the searchlight panel by placing the "ON/OFF" switch on the power panel (in forward HVAC room) to the "OFF" position.

2.10.7. Clearview Screen Operations.

a. Operation.

- (1) Supply power to the system by placing breaker (1P-E) in DP-5 panel to the "ON" position.
- (2) If required, turn on the heater. This is accomplished by placing the heater toggle switch to the "ON" position. The heater indicator light (red) should illuminate.

NOTE

During icing conditions, turn heater on 20-30 minutes before starting motor.

- (3) To turn the unit motor on, place the "MOTOR" toggle switch in the "ON" position.

b. Shutdown.

- (1) Stop the motor by placing the "MOTOR" toggle switch in the "OFF" position.
- (2) Stop the heater by placing the "HEATER" toggle switch in the "OFF" position.
- (3) Remove power from the system by placing breaker (1P-E) in DP-5 panel in the "OFF" position.

2.11. Alarm Systems. This section provides operations and shutdown procedures for the various alarm systems on the ST.

2.11.1. Fire and Smoke Alarm System. The Cerberus Pyrotronics control panel model CP-35, located on the starboard bulkhead in the Pilot House, is the basic control unit for the System 3 universal alarm control.

a. Operation. Reference should be made to TM# 55-1925-254-14&P for additional information on the fire and smoke alarm system.

- (1) When AC operating power is supplied the green Power LED will illuminate to show that power is normal. Loss of the main AC operating power is signaled by the system audible and yellow visual trouble LED. Restoration of power returns the panel to normal condition. DC backup power is supplied by four (4) six-volt batteries connected in series to produce 24 VDC power.
- (2) The control panel alarm section circuitry responds to any zone module alarm input signal from the on-board zones. The alarm condition is "Locked In" within the control panel and is cleared only by operation of the control panel "Reset" switch. An alarm condition is indicated by:
 - (a) Change of state of the two Single Pole Double Throw (SPDT) alarm relay contacts.
 - (b) Illumination of the panel "Alarm" visual indicator.
 - (c) Energizing of both the silenceable and non-silenceable alarm outputs.
 - (d) Alarm signal output to the remote alarm and silence station. Operation of the momentary "Alarm Silence" switch causes both the silenceable alarm output to de-energize and the visual alarm indicator to flash.
- (3) The control panel audible trouble buzzer may be silenced by the control panel trouble silence switch.
- (4) Fire alarm zones are as follows:

- (a) Zone 1 is in the Pilot House and HVAC Room.
 - (b) Zone 2 is in the 2-person berth on the 01 deck.
 - (c) Zone 3 is the Mess Area, Head, 3-person berth, and Generator room.
 - (d) Zone 4 is the Hold deck.
 - (e) Zone 5 is the CO₂ pressure switch which is actuated when the CO₂ system is manually actuated.
- (5) Alarms may be actuated by any of the following means:
- (a) Manually at the pull stations.
 - (b) Automatically by smoke detectors.
 - (c) Automatically by heat detectors.
 - (d) Automatically by CO₂ system actuation.
- (6) The alarm panel may be silenced as followed:
- (a) In the fire alarm control panel, press both the silence rocker switches (located on the left hand side of the panel) simultaneously.
 - (b) The Reset Button should be pressed to reset the panel if primary AC power is momentarily lost. This button is located on the right side of the panel.
- (7) Remote Alarm Indicating Panel. A remote alarm indicating panel is located in the upper engine room (starboard side, just forward of the watertight door to the main deck). This panel provides remote indication of a fire alarm in any of the five zones identified in paragraph 4 above.
- (8) Manual Pull Stations.
- (a) Operation.
 - 1 To operate the manual pull station, pull down on the handle.
 - 2 The fire alarm will be actuated.
 - (b) Resetting.
 - 1 After a manual pull station has been actuated, it must be reset to silence the alarm. Otherwise, the alarm will be only momentarily silenced at the alarm panel.
 - 2 Resetting the manual pull station is accomplished by turning the allen screw (⁹/₆₄) in a counterclockwise fashion. The handle should spring up automatically.
 - 3 Once handle pops up, snug allen screw (⁹/₆₄) by turning in a clockwise fashion.
- b. Shutdown.
- Disconnect power supply by placing breaker (1P-5) in panel DP-5 to the "OFF" position.

2.11.2. Bilge Alarm/Tank Alarm. The SeaWatch 1500 Plus Alarm Panel labeled "Bilge System and Tank System" is located on the forward bulkhead of the engine room to the port of centerline.

a. Operation.

- (1) Supply power to the alarm panel by placing breaker "Bilge and Tank" on the DC power panel to the "ON" position.
- (2) When the "TEST" button is pressed, the SeaWatch 1500 will then display an alarm condition on each of the 14 alarm points. Releasing the "TEST" button will automatically allow each alarm point to revert to whatever type of alarm sending unit had been selected during initial set-up.
- (3) When an alarm is received there will be an immediate visual indication at the appropriate alarm point. The lights will start scrolling from bottom to top and, if there is no set for that point, the internal and external audio alarms will sound. To acknowledge an alarm, press the "SILENCE" button. This will cause the scrolling indication to cease and the top two indicators will now flash steadily. This allows operator to identify any new alarms that may occur while the first alarm is still active. New alarms will always appear as a scrolling of the indicators, while acknowledged alarms will appear as a flashing of the top two indicators.

b. Shutdown. In order to shut down the unit, disconnect the power supply by placing breaker in panel to the "OFF" position.

2.11.3. Carbon Monoxide and Watertight Door Alarm. The SeaWatch 1500 Plus Alarm Panel designated for Carbon Monoxide and Watertight Door Alarm, is located on the port side of the control console in the Pilot House.

a. Operation.

- (1) Supply power to the alarm panel by placing the "CO Panel" breaker on the DC power panel to the "ON" position. The alarm will sound momentarily.
- (2) When the "TEST" button is pressed, the SeaWatch 1500 will then display an alarm condition on each of the 14 alarm points. Releasing the "TEST" button will automatically allow each alarm point to revert to whatever type of alarm sending unit had been selected during initial set-up.
- (3) When an alarm is received there will be an immediate visual indication at the appropriate alarm point. The lights will start scrolling from bottom to top and, if there is no set for that point, the internal and external audio alarms will sound. To acknowledge an alarm, press the "SILENCE" button. This will cause the scrolling indication to cease and the top two indicators will now flash steadily. This allows operator to identify any new alarms that may occur while the first alarm is still active. New alarms will always appear as a scrolling of the indicators, while acknowledged alarms will appear as a flashing of the top two indicators.

NOTE

The watertight door alarm panel is configured so that an alarm (audible and visual) will be actuated when a watertight door is in the closed position.

b. Shutdown. To shut down the unit, remove the power supply by placing the "CO Panel" breaker on the DC panel to the "OFF" position.

2.11.4. CO₂ Alarm.

WARNING

All personnel must immediately evacuate spaces when CO₂ fire suppressant systems are activated. CO₂ displaces oxygen to smother combustion. It can cause death by suffocation if personnel do not evacuate within 45 seconds after activating handle is pulled.

Operation.

Automatically actuated audible alarms, located in the engine room, provide a warning of the release of fire extinguishing carbon dioxide gas. The manual-mechanical release is accomplished by the activation of pull handles located at midship on the Main Deck level port and starboard side, in the Pilot House on the starboard side of the control console, and locally at the bottles.

2.12. Communication Equipment.

2.12.1. Marine VHF Radio. Two Ross Engineering Digital Selective Call (DSC) Radio Set Model DSC500, marine VHF transceivers are located on the starboard side of the control console. The unit is an all-channel DSC FM transceiver operating in the VHF marine frequency range. The antenna for the unit is a reinforced fiberglass vertical whip antenna, Shakespeare Model 396-1. The antenna is used with the DSC500 for both transmitting and receiving over VHF frequencies.

a. Operation.

- (1) Supply power at the DC panel to VHF1 and VHF2 by placing switches in the "ON" position.
- (2) Rotate the "VOL" control clockwise. The beeper sounds and the self test display appears for approximately two seconds. Also, the display and keypad illuminates briefly. After self-test is complete, the Primary mode display appears indicating the channel in use when the transceiver was turned off. If a self test fails, a message describing the failure will be displayed.
- (3) Rotate the "SQ" control counterclockwise until background noise is heard. Then readjust the control clockwise until slightly beyond the point where noise is muted.
- (4) The display and keypad are backlit for nighttime use. There are four illumination levels including Off. The last illumination level is not remembered when the DSC 500 is turned Off. The lights are Off at Power On. Press the "DIM " key repeatedly to select Low, Medium, Bright or Off.
- (5) The Primary Mode is the basic communication mode of the transceiver. Operations in this mode are basically the same as using any marine VHF radio. In voice contacts, both calling and routine communication use the Primary Mode. Even when a DSC call is placed or received, the routine communications that follow the DSC operations use the Primary Mode.

In the Primary Mode Display the active channel number appears in large digits on the left-hand side of the display. A bar graph representing received signal strength or transmitter output power is on the right-hand side. "XMIT" appears in the center of the display when transmitting. Other information presented is time of day, power setting "HIGH" or "LOW", the frequency set "USA" or "INTL", and "MEM" if the channel has been entered into the Memory Scan list. If the Local receive mode is selected, a reverse video letter "L" appears in the lower line of the display. The lower line of the display, where time normally appears, may also display messages pertaining to DSC calls and operating status.

The Primary Mode may be selected in several ways. The simplest way is to press the "16" key. Any function, active or pending, is canceled and the Primary mode display appears with channel 16 selected.

An additional method involves pressing two channel number keys. In all modes, except open edits where alphanumeric entry is expected, pressing two channel number keys invokes the Primary mode and selects the entered channel number. A three-beep tone sounds if an invalid channel number is entered.

Still another way is to press the function key(s) for the current active mode again.

For example, to select the Hail mode, press the "FNC" and "HAIL/FUNC" keys. The HAIL display appears. To cancel the HAIL mode, press the "FNC" and "HAIL/FUNC" keys again. The primary mode display appears.

- (6) To select the calling and safety channel press the "16" key. The Primary mode display appears with channel 16 selected as the working channel.
- (7) To select a working channel press the " ^ " or " v " key or two number keys for the desired channel when the Primary mode is active. The three-beep error tone sounds if an invalid channel number is entered.

If the transceiver has another mode active, the scan menu for example, two options are available to select a new channel. Pressing the function keys for the active mode returns to the Primary mode with the current working channel active. Then press the arrow keys or two number keys to select the desired channel. Also, in most menu display modes, pressing two number keys corresponding to a desired channel changes to the Primary mode with the new channel active.

- (8) To transmit, hold the microphone near your lips and press the "PUSH TO TALK" button on the microphone. Speak slowly and clearly in a normal voice directly into the microphone. The "XMIT" annunciator appearing in the display verifies that transmission is taking place. The bar graph on the right-hand side of the display shows the relative power being transmitted. Release the "PUSH TO TALK" button at the end of the transmission. Transmission is automatically prevented on weather channels.

NOTE

The transmitter has an automatic timer, which limits continuous transmissions to five minutes, thereby preventing channel blockage from a stuck microphone button. An alarm message is displayed until the "PUSH TO TALK" button is released following the five minute period.

NOTE

Channel 70, the DSC communication channel, is listen only. No voice transmissions are allowed. The transmitter will not operate if the "PUSH TO TALK" button is pressed when Channel 70 is selected.

If a bad antenna condition is detected, the alarm message "ANT FAULT" appears in the lower line of the display as long as transmission is attempted. Note that the transceiver continues to attempt transmission even though the alarm message appears.

- (9) The DSC 500 may be operated on either USA or International frequencies. The current selection appears in the Primary mode display. To change the current frequency set press the

FNC $\frac{U/I}{DIM}$ keys while the Primary mode is active. The annunciator toggles between USA and INTL each time the keys are pressed.

- (10) The transmitter may be operated at either 25 Watts (high power) or 1 Watt (low power) output. The current power setting, "HIGH" or "LOW", appears in the Primary mode display. To change the current power setting select the Primary mode and press the "FNC" and " $\frac{H/L}{1}$ " keys.

The "HI/LOW SELECT" menu appears in the display. Press the " \wedge " or " \vee " key to position the selection bar on "TX POWER". Observe that the setting appearing in the display is the opposite of the current setting. Press the "ENT" key. The Primary mode display appears with the new power setting.

The "TRANSMIT POWER" control for channels 13 and 67 operate differently than all others. These channels are normally "LOW" power and the power setting cannot be changed. To transmit on "HIGH" power, the "FNC" and " $\frac{H/L}{1}$ " keys must be pressed and held while the microphone "PUSH TO TALK" button is pressed. The "HIGH" annunciator appears in the display while transmitting at 25 watts.

- (11) The Weather mode allows the DSC 500 to monitor ten weather broadcast channels. These are receive only channels so the transmitter is disabled. Press the FNC $\frac{WX}{16}$ keys to receive a recorded weather broadcast. The WEATHER display will appear and the last used channel will be selected. Press the " \wedge " or " \vee " key or a number key to select a different weather channel. Press the "FNC" and " $\frac{SCAN}{V}$ " keys to scan all weather channels. When activity is detected on a channel, the scan will stop. Three seconds after activity ceases the scan will resume. Since weather channels are usually continuous recordings, scanning may not resume automatically for some time. Press the " \wedge " key to force scanning to continue.

To stop scanning and return to a weather channel press FNC " $\frac{SCAN}{V}$ " again. To return to the primary mode press the FNC $\frac{WX}{16}$ keys. To select any other mode, press the function key(s) for that mode.

- (12) The Emergency mode may be used to send a distress call. The distress call automatically includes the vessel's DSC call sign and Lat/Lon position. The vessel's position can be sent only if the transceiver is properly connected to an operating navigation receiver.

Press and hold the " $\frac{EMER}{EMR}$ " key for 5 seconds. The transceiver will beep repeatedly while the key is pressed. After seconds (10 beeps) the radio will automatically transmit the distress signal on channel 70 and then switch to channel 16. DISTRESS will appear in the upper line of the display and ACTIVE will appear in the lower line while waiting for an acknowledgement. If a DSC acknowledgement is not received from a shore station within two minutes, the distress call will be automatically repeated. If, after five minutes from the second call, the distress call has not been acknowledged by a shore station or cancelled by the sender, Distress will be re-broadcast with an updated position. Distress will continue to be re-broadcast every five minutes until either acknowledged or cancelled. When acknowledgement is received, DISTRESS CALL ACKNOWLEDGED PRESS ANY KEY will be displayed and the distress call will be automatically cancelled. To manually cancel the Emergency mode press the CLR key or " $\frac{EMER}{EMR}$ " key while the channel 16 distress display is present. When a distress call is received the continuous Hi/Lo distress tone sounds. The transceiver switches to channel 16 and DISTRESS CALL RECEIVED, PRESS ANY KEY appears in the display. All information received in the distress call will be logged in the Distress Data directory.

Press any key. The distress tone is silenced and the distressed vessel's DSC ID number or name will appear in the display. If the distressed vessel's position is available, Lat/Lon coordinates will appear in the lower two lines of the display. If not, NO POSITION AVAILABLE will appear. If a second distress call is received from the same vessel, the receiving DSC will wait three minutes. If the distress message is not acknowledged or cancelled, the receiving vessel will automatically relay the distress call.

The DSC distress message transmits the DSC ID number and not the vessel's name. The distressed vessel's name will appear in another vessel's display only if the vessel receiving the call has the sending vessel's name and Ship Station Identity number entered into its own DSC Calling directory. The distress call is logged into the Distress Data directory with the time received. The Distress Data directory may be viewed using the DSC mode. To clear the display and revert to the Primary mode for voice communication, press any key.

- (13) The dual watch mode allows two channels to be selected and monitored simultaneously. Any channel may be selected as the working channel and any other channel may be selected as the priority channel. Press the FNC ^{D/W}/_^ keys. The current working channel and last used priority channel numbers appear in the display. The priority channel number appears in the smaller center digits of the display. The larger digits on the left of the display show the working channel. When activity is detected on the priority channel, the priority channel becomes the active channel. This will occur whether or not there is activity on the working channel. The radio will transmit only on the channel number displayed in the larger digits. Pressing the Push To Talk button will cancel the Dual Watch mode.

To change the working channel press the " ^ " or " v " key or appropriate number keys to select a working channel. A three beep tone will sound if an invalid channel is selected. Press the FNC ^{U/DIM}/_^ keys to change between USA and INTL frequencies. To select or change the priority channel press the ">" key. The smaller priority channel digits will begin flashing. The scan is halted while the digits are flashing. Press the " ^ " or " v " key or appropriate number keys to select a priority channel. Press the FNC ^{U/DIM}/_^ keys to change between USA and INTL frequencies for the priority channel. Press the "<" or ENT key to complete the priority channel selection. The transceiver will resume scanning. D/W flashing in display indicates that scanning is alive. Pressing the Push To Talk button on either channel will cancel the Dual Watch mode.

- (14) The All Channel Scan mode allows all channels to be sequentially scanned for activity. The scanning sequence will stop on an active channel for the duration of the activity. Three seconds after the activity stops, the scan sequence will resume. Press the FNC ^{SCAN}/_^ keys. SCAN SELECT display will appear. Press the " ^ " or " v " key to select MEMORY SCAN with selection bar. Press the ENT key to initiate scanning. Only channels previously assigned to Scan Memory will be scanned. Press the " ^ " key to override an active channel and resume scanning. Pressing the Push To Talk button or entering a channel number will cancel the Memory Scan mode and select the Primary mode. If the channel number is valid, the channel entered will be selected. If not valid, the channel being scanned at the first number key entry will become active.

- (15) Refer to TM# 55-1925-255-14&P (DSC 500) for additional information concerning VHF operation.

b. Shutdown.

- (1) Rotate the "VOL" control counterclockwise until it clicks. The display becomes blank and the transceiver does not receive any calls. Memory is protected by an internal battery.

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- (2) Remove power to VHF1 and VHF2 on the DC panel by placing the switches to the "OFF" position.

2.12.2. Integrated Communication System. The system installed on the ST is a United Marine System that includes a 1MC System, a 21MC System, and a General Alarm System. A marine integrated control cabinet and an intelligent digital control head facilitate key system interfaces and operations. Remote intercom stations are provided as well. These units provide communication from station to station, as determined by the user.

The digital control head (Loudhailer General Alarm) (United Marine Model HMUM-IDCH-7200) provides a base of operation for the 1MC System, 21MC System, and General Alarm. The control head is a microprocessor controlled station unit providing Pilot House users with access to public address, loudhailer, and talkback.

- a. Digital Control Head Operation. This section provides procedures for originating a public address announcement and all call paging with the loudhailer general alarm.
 - (1) Reference should be made to TM# 55-1925-255-14&P (Communication Equipment , Appendix B) for information concerning operation.
- b. Remote Intercom Stations Operations. Procedures for operating the remote intercom stations are outlined below.
 - (1) Remote Intercom Stations. Intercom stations on the ST are listed below:
 - (a) Station #1 Pilot House
 - (b) Station #2 Capt Qtrs
 - (c) Station #3 Crew Qtrs
 - (d) Station #4 Mess Area
 - (e) Station #5 Gen Room
 - (f) Station #6 Eng Room
 - (g) Station #7 Tank Space
 - (2) Station to Station calling is accomplished as such:
 - (a) Place the "REMOTE/NORMAL" locking toggle switch in the "NORMAL" position.
 - (b) Place the "SPK/MIC/HDSET" locking toggle switch in the desired position.
 - (c) Place the "ALLCALL/OFF/CALL" locking toggle switch in the "CALL" position. 2 red LED'S will illuminate.
 - (d) Rotate the "STATION PRE-SELECT" switch to the desired call station.
 - (e) Place the "RING/LISTEN/TALK" momentary toggle switch in the "RING" position until the selected station receives the call. The unit will emit an intermittent ringtone.
 - (3) Receiving a Station to Station call is accomplished as such:
 - (a) Ensure that the "REMOTE/NORMAL" locking toggle switch is in the "NORMAL" position.
 - (b) Ensure that the "SPK/MIC/HDSET" locking toggle switch is in the desired position.

- (c) When the station rings, ensure that the "RING/LISTEN/TALK" toggle switch is in the "LISTEN" position to receive the call.
- (d) To talk, push the "RING/LISTEN/TALK" toggle switch to the "TALK" position.
- (e) The volume of the speaker may be adjusted using the "SPK LEVEL" dial which is a variable adjusting control ranging from 1 to 10.

(4) All Call Paging is accomplished as such:

- (a) Place the "REMOTE/NORMAL" locking toggle switch in the "NORMAL" position.
- (b) Place the "SPK/MIC/HDSET" locking toggle switch in the "SPK" position.
- (c) Place the "ALLCALL/OFF/CALL" locking toggle switch in the "ALLCALL" position.
- (d) Place the "RING/LISTEN/TALK" momentary toggle switch in the "TALK" position for the duration of the page. After speaking, release the "RING/LISTEN/TALK" switch to its self-centered position.

(5) Remote Monitoring. Intercom stations may be remotely monitored as such:

- (a) Place the "REMOTE/NORMAL" toggle switch on the unit (station) to be monitored in the "REMOTE" position.
- (b) Place the station selector switch on the unit from which monitoring will take place in the desired position in order to monitor.

- b. Shutdown. Remove power from the components by placing the "ALLCALL/OFF/CALL" toggle switch to the "OFF" position. LED lights will extinguish.

2.12.3. Sound Powered Telephone. Designed to provide communication without use of batteries or any other outside sources of power to the system.

a. Operation.

- (1) To place a call, pick up the handset and depress the handset pushbutton switch to talk. Turn the station selector knob to the desired station and crank the magneto handle.
- (2) Picking up the handset and depressing the "PRESS-TO-OPERATE" pushbutton switch will put the handset in line with the calling party. Releasing the "PRESS-TO-OPERATE" pushbutton switch will disconnect the communication between the telephones. The called party will hear an audible device, such as the bell. The bell will ring only for the duration that the magneto generator is being cranked.

2.12.5. Emergency Positioning Indicating Radio Beacon (EPIRB). The EPIRB is located on the aft outboard bulkhead of the 2-person berth next to the CO₂ bottles. The EPIRB is capable of automatically floating out of its bracket and activating if the vessel sinks or is capsized.

When turned on, the Class 406 EPIRB transmits tone modulated signals on VHF 406.025 and 121.5 MHz simultaneously. Rescue aircraft or vessels equipped with suitable direction finding equipment can "home" to the transmitting unit. Another means of detection is by Search and Rescue Satellite-Aided Tracking (SARSAT) or COSPAS emergency surveillance systems.

a. Operation.

Removing the EPIRB from its bracket and placing it in an upright position will activate the EPIRB to transmit tone modulated signals (UHF243.0MHz / VHF 121.5MHz) simultaneously.

b. Shutdown.

When housed in its retaining bracket in an inverted position, the EPIRB is inactive.

2.13. HVAC System. The following sub-paragraphs provide operations and shutdown procedures for heating, ventilation, and air conditioning systems and equipment:

2.13.1. Air Conditioning and Heating System. The air conditioning and heating system consists of an air handling unit, a condenser, duct heaters, ductwork, and controls. The system is thermostatically controlled by a thermostat located on the starboard bulkhead in the Pilothouse.

WARNING

When the outside air temperature exceeds 80°F (26.4°C), the thermostat should not be set to run the heater, for damage to equipment may occur.

NOTE

The Air Conditioning and Heating System is designed to operate via thermostat. No special operations are required to convert from winter operation to summer operations. All that is required is to place the thermostat at the desired temperature level.

a. Operation. The system is thermostatically controlled.

- (1) Adjust the thermostat in the Pilot House to the desired temperature setting.
- (2) Supply power to the air handling unit in the HVAC Room and then press the START button on the air handling unit control panel.
- (3) Supply power to the condensing unit on the Pilot House deck. This is done by placing the lever on the condenser disconnect to the ON position.
- (4) Press the RESET button on the condenser panel.
- (5) The run indicator light (green) should illuminate.

NOTE

If vessel power should be disrupted for any reason (connection to shore power or switchover to generator power), a fault will be initiated at the condensing unit panel. The lockout indicator light (red) should illuminate. The air handling unit should resume running. If not, restart the air handling unit as outlined above. Then reset the condensing unit to operational status by depressing the "RESET" button on the condensing unit control panel. This will eliminate the fault and reenergize the condensing unit. The run indicator light (green) should illuminate.

WARNING

If the unit should stop running for no apparent reason (no loss of vessel power has occurred) and a fault ensues, do not reset the fault as damage to the unit could ensue. Under these circumstances, the condensing unit has detected a fault has occurred. Troubleshooting should be undertaken to establish and eliminate the problem prior to restarting the condensing unit as outlined in TM# 55-1925-252-14&P.

b. **Shutdown.**

- (1) The air conditioning and heating system may be shut down by first removing power from the condensing unit. This is accomplished by placing the lever on the condenser disconnect to the OFF position.
- (2) The air handling unit should be shut down by depressing the STOP button on the air handling unit controller.

2.13.2. **Ventilation.** Mechanical ventilation, using vaneaxial fans for supply and/or exhaust, designed for marine application is used to supply/exhaust air to/from the engine room, generator room, and forward storeroom. The ventilation system is designed to carry away the radiated heat of the machinery space equipment.

- a. **Operation.** Engine room intake and exhaust fans are controlled by two Siemens controllers located in the upper engine room on the forward starboard bulkhead. The generator room ventilation fan is located on the port bulkhead of the generator room. The controller for the forward storeroom supply fan is located on the starboard bulkhead. Pressing the START button on each controller will activate that respective fan motor.
- b. **Shutdown.** Press the STOP button on each controller to shutdown intake and exhaust fan motors.

2.14. **Potable Water System.** This paragraph provides operation and shutdown procedures for the potable water system.

2.14.1. **Potable Water Pressure Pump.** The pump is a Burks model HJS-1003 1 HP with a 25 GPM capacity at 74 feet (22.5552 Meters) of head, 38 PSI (21,093 Kilograms/Square Meters) cut-in and 62 PSI (35,155 Kilograms/Square Meters) cut-out.

- a. **Operation.** Ensure that that breaker (4P-H) in DP1 – Lower Engine Room distribution panel is in the "ON" position and turn the selector switch to "Auto" at the Potable Water Controller located on the inboard side of the grey water tank in the Tankage Space. Thereafter, the unit will automatically cycle on and off as required by system usage.
- b. **Shutdown.** In order to deenergize the system, turn the controller selector switch from the "AUTO" position to the "OFF" position and if necessary turn off breaker (4P-H) in DP1 – Lower Engine Room distribution panel.

2.14.2. **Water Heater.** This paragraph provides operation and shutdown procedures for the water heater.

a. **Operation.**

- (1) Fill water heater by making certain the drain valve is completely closed. Open the shut-off valve in cold water supply line. Open each hot water faucet slowly to allow air to vent from the water heater and piping. A steady flow of water from the hot water faucet(s) indicates a full water heater.

(2) After ensuring that water heater is full, close faucets and turn on breaker (IP-D) in DP-4 Lower Engine Room distribution panel.

b. Shutdown. Turn the breaker (IP-D) in DP-4 Lower Engine Room panel to the "OFF" position.

2.15. Bilge Pump. An overview of the operation and shutdown of the bilge pumps is provided below.

NOTE

Bilge/Ballast #1 is used as a primary pump and should be used as such.
Bilge/Ballast #2 is used as a secondary pump but may be used as needed.

a. Operation.

(1) Open the Bilge/Ballast Seawater Suction Valve.

(2) Open Bilge Pump shut-off valve (normally open).

(3) Ensure that the Bilge Overboard Discharge Valve is open (normally open).

(4) Breaker (4P-B) should be in "ON" position in DP-1 panel.

(5) Select and open appropriate manifold valve for the compartment to be pumped. A listing of compartment valves, from left to right, is provided below.

(a) #2 Void Bilge Suction

(b) #1 Void Bilge Suction

(c) Aft Store Room Bilge Suction

(d) Engine Room Bilge Suction

(e) Tankage Space Bilge Suction

(f) Forward Store Room Bilge Suction

(6) Press the "START" button on the Bilge/Ballast #1 controller.

b. Shutdown.

(1) Close selected compartment valve on the manifold.

(2) Press the "STOP" button on the Bilge/Ballast #1 controller.

(3) Close the sea suction valve.

2.15.1. Emergency Bilge Pump. Procedures are provided below for operation of the emergency bilge pump.

a. Operation.

(1) Open the "Emergency Seawater" valve to prime pump.

(2) Open the "Eng Room Emerg Bilge Suction" valve.

(3) Press the "START" button on the "Bilge/Ballast #2" controller.

(4) Monitor gauges for prime.

b. Shutdown.

(1) Press the "STOP" button on the "Bilge/Ballast #2" controller.

2.16. Ballast Pumps. Procedures are provided below for filling ballast tank and emptying ballast tank.

a. Filling Ballast Tank. Filling the ballast tank should be accomplished as such:

(1) Operation.

(a) Open Bilge/Ballast Seawater Suction Valve.

(b) Close the Bilge Overboard Discharge Valve (Overhead).

(c) Open the Forward Ballast Discharge Valve.

(d) Ensure breaker (4P-B) in DP-1 panel is in the "ON" position.

(e) Press the "START" button on the Bilge/Ballast #1 controller.

(f) Monitor pump pressures and have another crew member call when tank is full. The gauge should read approximately 28 PSI during operation.

(2) Shutdown.

(a) Press the "STOP" button on the Bilge/Ballast #1 controller.

(b) Close the Forward Ballast Discharge Valve.

(c) Close the Bilge Overboard Discharge Valve (Overhead).

(d) Ensure breaker (4P-B) in DP-1 panel is in the "OFF" position.

b. Emptying Ballast Tank. Emptying the ballast tank should be accomplished as such:

(1) Operation.

(a) Open Bilge/Ballast Seawater Suction Valve.

(b) Ensure Bilge Overboard Discharge Valve is open.

(c) Open the Fwd Ballast Suction Valve.

(d) Ensure breaker (4P-B) in DP-1 panel is in the "ON" position.

(e) Press the "START" button on the Bilge/Ballast #1 controller.

(f) Monitor pressure at pump until tank is empty. The pressure gauge should read approximately 28 PSI and the vacuum gauge should read approximately 10 PSI during operation.

(2) Shutdown.

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- (a) Close the Fwd Ballast Suction Valve.
- (b) Press the "STOP" button on the Bilge/Ballast #1 controller.
- (c) Close the Bilge/Ballast Seawater Suction Valve.
- (d) Ensure breaker (4P-B) in DP-1 panel is in the "OFF" position.

2.17. Fire Pumps. Procedures for operating the fire pump are provided below.

a. Operation.

- (1) Ensure that the Fire Pump Seawater Suction Valve is open.
- (2) Ensure that the Fire Main Valve is open (at the fire station on the main deck).
- (3) Make certain that hoses have been stretched out and that Fire Station valve is open.
- (4) Press the "START" button on the Fire Pump controller or energize from Pilot House pushbutton.

b. Shutdown.

Press the "STOP" button on the Fire Pump controller or on the Pilot House pushbutton.

2.18. Grey Water Pump. Procedures are provided below for grey water pump operations.

a. Operation.

- (1) Open the Grey Water Overboard Discharge Valve.
- (2) Open the Grey Water Tank Suction Valve.
- (3) Ensure breaker (4P-J) in DP-1 panel is in the "ON" position.
- (4) Press the "START" button on the Grey Water Pump controller.

b. Shutdown.

- (1) Press the "STOP" button on the Grey Water Pump controller.
- (2) Close the Grey Water Tank Suction Valve.
- (3) Close the Grey Water Overboard Discharge Valve.
- (4) Ensure breaker (4P-J) in DP-1 panel is in the "OFF" position.

2.19. CO₂ Fire Extinguishing System. Operational procedures for the fire extinguishing system are provided below.

WARNING

CO₂ FIRE SUPPRESSANT HAZARDS

All personnel must immediately evacuate spaces when CO₂ fire suppressant systems are activated. CO₂ displaces oxygen to smother combustion. It can

cause death by suffocation if personnel do not evacuate within 45 seconds after activating handle is pulled.

a. Operation.

- (1) The Carbon Dioxide Fire Suppression System is designed to allow remote manual-electric, and manual-mechanical carbon dioxide gas release. "FIRE" and "AGENT RELEASE" visual indicators on the control panel and audible alarms are installed in the Pilot House console. In the manual-electric mode of operation, the carbon dioxide gas is released by actuation of a switch on the fire control and monitoring panel.
- (2) CO₂ mechanical release is accomplished by the activation of any one of the three pull handles aboard, which involves breaking the glass on the panel and then pulling the handle. They are located on the starboard side of the Pilot House console and port and starboard of the Main Deck superstructure between Frames 16 and 17. The system is fitted with an approved delayed discharge arranged so that the alarm will be sounded for at least 45 seconds before the carbon dioxide gas is released in the protected space.
- (3) An additional pull handle is provided locally at the bottles. In the event of a fire, pull on the handle locally at the bottles to release CO₂.

2.20. Oily Water Separator.

a. Operation.

- (1) Oily water tank suction valve should be open.
- (2) Energize Oil Content Bilge Alarm by moving Power Toggle switch to "ON" position. A red recirculating LED should illuminate.
- (3) After completing pre-start checks in accordance with TM# 55-1925-251-14&P, apply power to the system and turn the main switch to "HAND". The oil pump should run first for about 20 seconds. The blue indicator light on the control panel should confirm this.

CAUTION

Do not let the oily water separator run when oily water tank level is below 6-inches.

CAUTION

If the system has air in the inlet plumbing or Gravity Separator, the oil pump impeller may be damaged if run dry for more than 30 seconds.

- (2) After about 20 seconds the oil pump should stop and the main pump will start. The white indicator light should confirm this.

NOTE

If the oil pump operates initially for more than 20 seconds., or very frequently (when little or no oil is entering the system), air may be entering the system. Turn the main switch to "OFF" immediately. Check for air leaks and refill the Gravity Separator if necessary.

NOTE

Automatic mode is inactive in this application.

b. Shutdown.

- (1) To shutdown unit, turn the main switch to "OFF".
- (2) Move the power toggle switch to "OFF" position on the oil content bilge alarm.
- (3) Close oily water tank suction valve.

2.21. Capstans. The Forward Capstan is a McElroy Machine & Mfg. Co. model MCR-12-3EN with 2000 pound (907 Kilograms) line pull at 43 feet per minute (FPM)/3 HP. The Forward Capstan is equipped with a 12-inch (0.3048 Meters) warping head. The Aft Capstan is a McElroy Machine & Mfg. Co. Model MCR-18-10EN with 10,000 pound (4,535 Meters) line pull at 30 FPM/10HP. The Aft Capstan has an 18-inch (0.4572 Meters) warping head and is coupled with a marine 460 VAC severe duty TEFC electric motor.

a. Forward Capstan.

- (1) Operation. Ensure that power is provided to the capstan from the Forward Capstan Disconnect located in the forward storeroom. This is accomplished by placing the lever on the disconnect in the ON position. Remove the foot pedal from its mounting and place it on the deck. Depress the foot pedal as long as the capstan is required to be rotated.
- (2) Shutdown. Once finished using the capstan, return the foot pedal to its mounting. If needed, remove power from the capstan by placing the lever on the Forward Capstan Disconnect in the OFF position.

b. Aft Capstan.

- (1) Operation. Ensure that power is provided to the capstan from the Aft Capstan Disconnect located in the engine stores compartment. This is accomplished by placing the disconnect in the ON position. To operate the aft capstan, depress the START button on the control station on the aft starboard bulkhead of the deckhouse.
- (2) Shutdown. Press the STOP button on the control station. If needed, remove power from the capstan by placing the Aft Capstan Disconnect in the OFF position.

2.22. Towing Winches (Makeup Winches). Two 20-ton deck winches (Nabrico Model #20-7HE) are located on the Main Deck, with one each port and starboard, between Frames 3 and 5.

a. Operation (from Main Deck).

- (1) Supply power to the towing winch by ensuring that Towing Winch Disconnect is in the "ON" position. The Towing Winch Disconnects are located on the starboard bulkhead of the forward storeroom.
- (2) Press "START" push button to start the electric motor.
- (3) To hoist in cable, rotate the top switch to the "IN" position and hold until the desired tension is reached.
- (4) To pay out cable, rotate the top switch to the "OUT" position and hold until the desired amount of cable has been unreeled.

b. Shutdown (from Main Deck).

- (1) Press the "STOP" push button to stop the motor.
- (2) If necessary, remove power from the towing winch by placing the lever on the Towing Winch Disconnect to the "OFF" position.

c. Operation (from Pilot House).

- (1) Ensure that power is provided to the towing winch by placing the Towing Winch Disconnects in the "ON" position. The towing winch disconnects are located in the forward storeroom.
- (2) Press the "START" push button on the Pilot House console.
- (3) To hoist in cable, press the "HEAVE" button on the Pilot House console.
- (4) To pay out cable, press the "HEAVE OUT" button on the Pilot House console.

d. Shutdown (from Pilot House).

- (1) Press the "STOP" button on the Pilot House console.
- (2) If necessary, remove power from the towing winches by placing the Towing Winch Disconnects in the "OFF" position.

2.23. Fuel Oil Transfer Pump. The fuel oil transfer pump (Roper Type I, Fig. 2AM12) is located on the starboard side between Frames 8 and 9. The transfer pump replenishes the Day Tank from the two storage tanks.

a. Operation.

NOTE

Panel DP-2 shuts down when fire alarms are actuated.

WARNING

Prior to transfer of fuel oil ensure that proper safety precautions are adhered to and proper signal is displayed above deck.

- (1) Open Day Tank Fill Valve.
- (2) Open either "PORT", "STBD", or "DAY TANK" Fuel Oil Tank Suction Valve below the work bench.
- (3) Ensure breaker (4P-D) in DP-2 panel (generator room) is in the "ON" position.
- (4) Turn on the Fuel Oil Transfer Pump by pressing the "START" button on the Fuel Oil Transfer Pump controller.
- (5) Monitor the sight glass on the appropriate tank(s).

b. Shutdown.

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- (1) Shutdown pump by pressing the "STOP" button on the Fuel Oil Transfer Pump controller.
- (2) Close Fuel Oil Tank Suction Valve to the storage tank being used.
- (3) Close the Day Tank Fill Valve.
- (4) Ensure breaker (4P-D) in DP-2 panel (generator room) is in the "OFF" position.

2.24. Lube Oil Fill and Transfer Piping System. The lube oil fill and transfer piping system is designed to provide lube oil to a discharge valve located in the engine room. From there, an oil bucket may be used to transport the lube oil to the desired engine for topping off the oil level. Operations of stripping oil from the engines and filling the engines with oil are accomplished using the Fast Lube Oil Change System (FLOCS).

a. Operation.

- (1) Open the upper lube oil supply valve located on the forward starboard engine room bulkhead.
- (2) Fill the container to the desired level.

b. Shutdown. Close the upper lube oil supply valve.

2.25 Fast Lube Oil Change System (FLOCS). The FLOCS facilitates rapid oil changes in the main diesel engines and the generator engines. This involves both evacuation of lube oil from the engines and filling the engines with new lube oil. Operational procedures for the FLOCS are provided in the paragraphs that follow.

a. Draining an Engine.

(1) Operation.

- (a) Connect the FLOCS pump suction hose coupling from the FLOCS pump to the FLOCS hose coupling on the engine. To connect the coupling, retract the knurled sleeve, push the coupling halves together and release the sleeve.
- (b) Open the Main Engine Oil Pan Valve and the FLOCS Pump Suction Valve.
- (c) Open the FLOCS Pump Discharge To Dirty Oil Valve.
- (d) Ensure breaker (1P-M) in DP-4 panel is in the "ON" position.
- (e) Press the "CYCLE START" button on the FLOCS controller to start the unit. The "CYCLE RUN" signal light will come on.

(2) Shutdown.

- (a) The unit will shut off automatically when all oil is evacuated.
- (b) The "CYCLE RUN" signal light will shut off.
- (c) Disconnect the evacuation line.
- (d) Ensure breaker (1P-M) in DP-4 panel is in the "OFF" position.

b. Filling an Engine.

(1) Operation.

- (a) Connect the hose (blue) from the FLOCS pump suction to the lower lube oil supply valve located on the forward starboard bulkhead.
- (b) Open the Lower Lube Oil supply valve and the FLOCS Pump suction valve.
- (c) Connect the hose from the FLOCS pump discharge (black) to the FLOCS hose on the engine.
- (d) Open the FLOCS Pump Discharge Valve.
- (e) Ensure breaker (1P-M) in DP-4 panel is in the "ON" position.
- (f) Press the "CYCLE START" button on the FLOCS controller.
- (g) Check engine oil level until desired level is reached.

(2) Shutdown.

- (a) Close the Lower Lube Oil supply valve when the desired oil level is reached. Close the FLOCS Pump Discharge Valve.
- (b) The unit will automatically stop.
- (c) The "CYCLE START" signal light will go out.
- (d) Disconnect the suction hose from the Lower Lube Oil Supply valve on the lube oil tank.
- (e) Ensure breaker (1P-M) in DP-4 panel is in the "OFF" position.

2.26. Steering System.

a. Operation.

- (1) Using the "PUMP SWITCH" on the Steering Panel on the Pilot House console, activate either Pump #1 or Pump #2 by rotating the selector switch to the desired position.
- (2) Select "NFU" (non follow-up), "FU" (follow-up), or "AFT STATION" by using the "MODE SELECT" switch. The mode selected is now operable and the rudders are activated.

b. Shutdown. Turn the "PUMP SWITCH" to the "OFF" position.

2.27. Hydraulic Power Unit.

a. Operation.

When the "PUMP SWITCH" on the Steering Panel is used to select a steering pump, the Hydraulic Power Unit becomes active.

b. Shutdown.

Turn the "PUMP SWITCH" to the "OFF" position.

2.28. Portable Fire Pump.

a. Preparation for Use.

CAUTION

The portable fire pump requires a 2-person lift to be transported.

- (1) De-mount unit from its mounting and carry to required location.
- (2) Ensure that suction, discharge, and exhaust hoses are properly connected.

b. Operation.

NOTE

The portable fire pump may also be used for de-watering in emergency situations.

- (1) Set the fuel tank isolation valve located under the fuel tank to "0" (open) position.
- (2) Set the engine throttle control to the "START" position.
- (3) Open the primer line shut-off valve between the primer jet, and the pump suction. (Valve is open when knob is in line with the air passage.)
- (4) Slowly pull on the recoil starter checking engine and pump for freedom of movement and priming the engine with lubricating oil. Depress the compression release lever ensuring that it remains depressed. The compression release lever will spring shut when the engine rotates during starting attempts.
- (5) Start the engine by pulling the recoil starter rope.

CAUTION

A strong deliberate pull is required to prevent engine kickback and possible starting in the reverse rotational direction. If this does occur, immediately shut down the engine. Operation in the reverse direction is characterized by the evidence of exhaust gases coming out of the intake filter. Reverse operation does not allow full power operation, positive priming, and will cause damage to the unit.

- (6) Once the engine is running, set the engine throttle control to the "RUN" position. This is located at any position between "START" and "STOP".

CAUTION

Never run the pump at high speeds, unless it is discharging water.

CAUTION

Never run the pump without water any longer than the short time required for priming. This should not exceed one minute.

NOTE

Start the engine and run at a fast idle to prime with lifts less than 10 feet (3.048 Meters). Start the engine and run at full throttle to prime with 10 (3.048 Meters) to 22 foot (6.7056 Meters) lifts.

- (7) Shift the exhaust valve to the prime position blocking the main exhaust opening. The exhaust valve is in the prime position when the handle is horizontal. When a steady stream of water appears at the discharge of the priming jet, close the primer line shut-off valve and return the engine exhaust valve to the normal position. Open the pump discharge valve.

Repeat the priming operation if the pump fails to hold its prime. If the pump does not deliver water within two minutes, stop the engine and check for air leaks at suction connections and / or the pump packing gland, or failure of the priming jet to produce vacuum.

c. Shutdown.

- (1) To stop the pump unit, reduce the engine speed to an idle speed and allow the engine to cool down for two minutes.
- (2) Return the engine throttle control to the "STOP" position. If engine continues to run, shut the fuel tank isolation valve.

NOTE

If available, operate pump with fresh water to flush pump and hoses and shut down pump as described in steps 1 and 2 above.

- (3) Remove, drain, and stow hoses and couplings.
- (4) Open petcock in pump casing and drain water.
- (5) Close petcock.

NOTE

If the pump is to remain inactive, drain fuel tank.

- (6) Re-stow pump and replace cover.

2.29 Towing Operations. The ST is configured with all deck equipment, fittings, chafing gear, guards and hardware required for barge work, barge towing, and assisting larger tugs in ship work. The barge displacement will range from light condition or empty to full load.

Barge towing features include hip tow on one and both sides, stern tow, and pushing. Each of these is discussed in the paragraphs that follow.

NOTE

These operational procedures only identify possible configurations for towing operations. These procedures are not intended to be a substitute for seamanship and experience, nor do they provide best case scenarios for all towing situations. Operator experience is a key to determining the appropriate methods for making up tow.

- a. Hip Towing. Hip towing consists of pushing one or more barges alongside the ST. Generally, tow is made up in such a case using port and starboard, aft, midship, and forward bits using tow lines. A typical arrangement for such an operation is provided in Figure 2-54.
- b. Stern Towing. Stern towing consists of towing one or more barges using the aft towing pad. The capstan may be used to make up tow as needed. A typical arrangement for such an operation is provided in Figure 2-55.

- c. Pushing. Pushing consists of towing by pushing ahead one or more barges using the push knees on the front of the ST and making up wire rope using the towing winches, button chocks, and barge towing chocks. Typically, a rope is made up from the forward bitt, through the bull nose, and to the center bitt on the barge. The capstan may be used for this operation if needed. A typical arrangement for such an operation is provided in Figure 2-56.

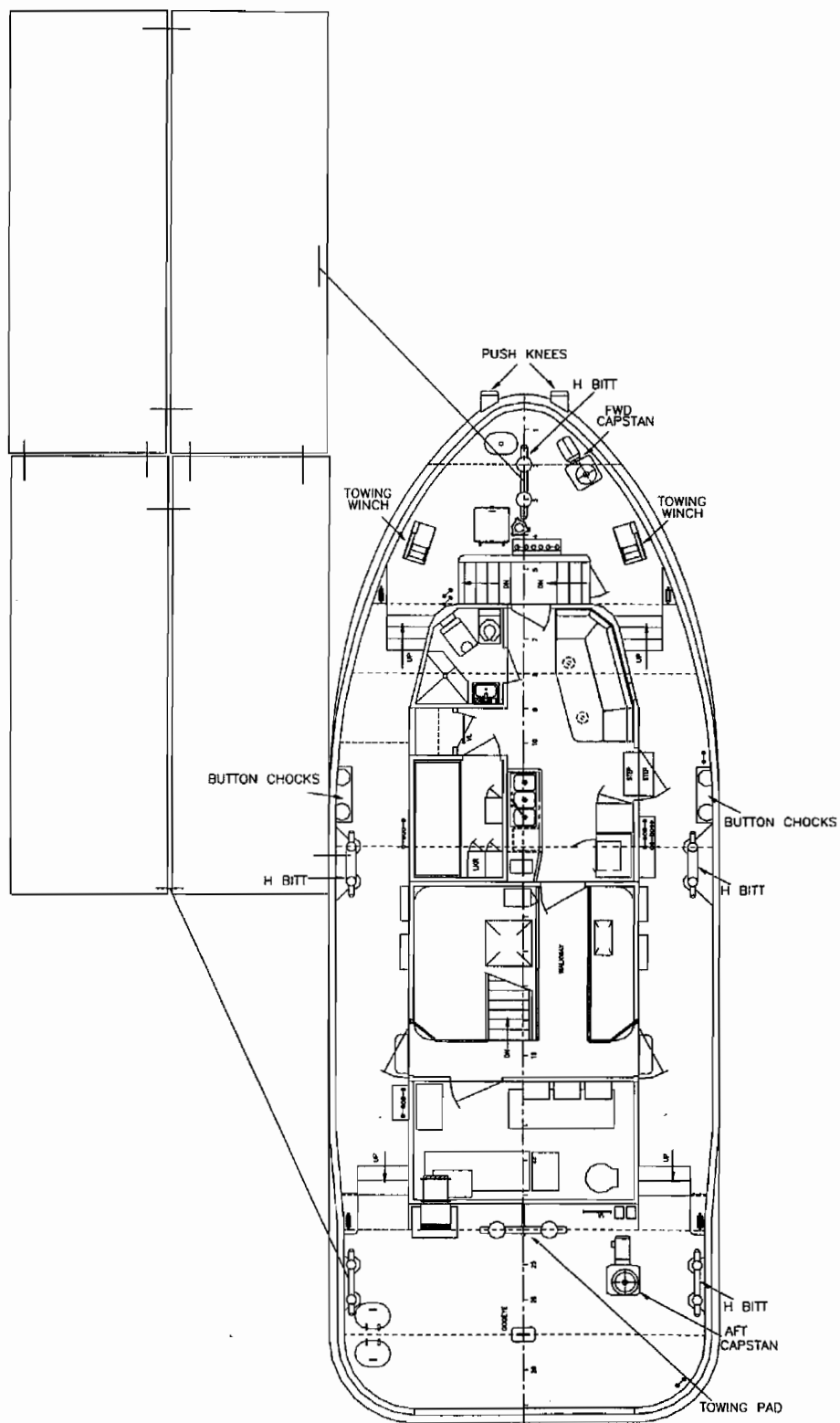


Figure 2-54 . Hip Towing Arrangement

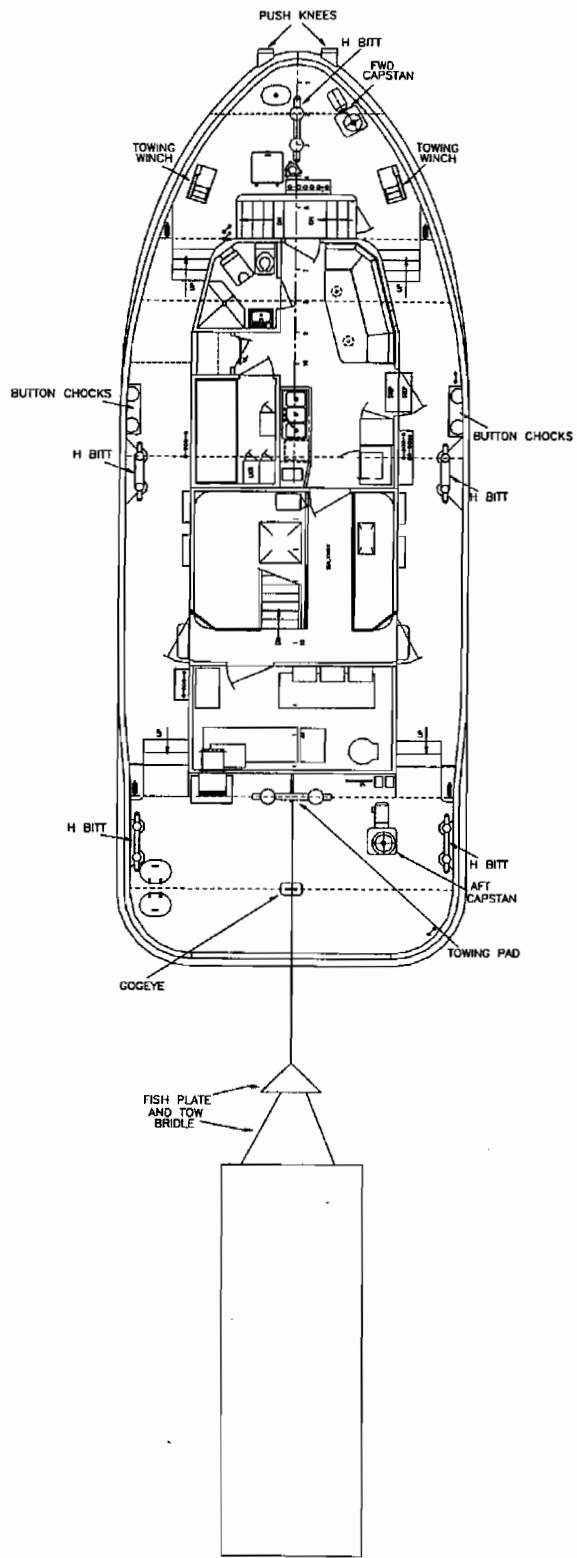


Figure 2-55. Stern Towing Arrangement

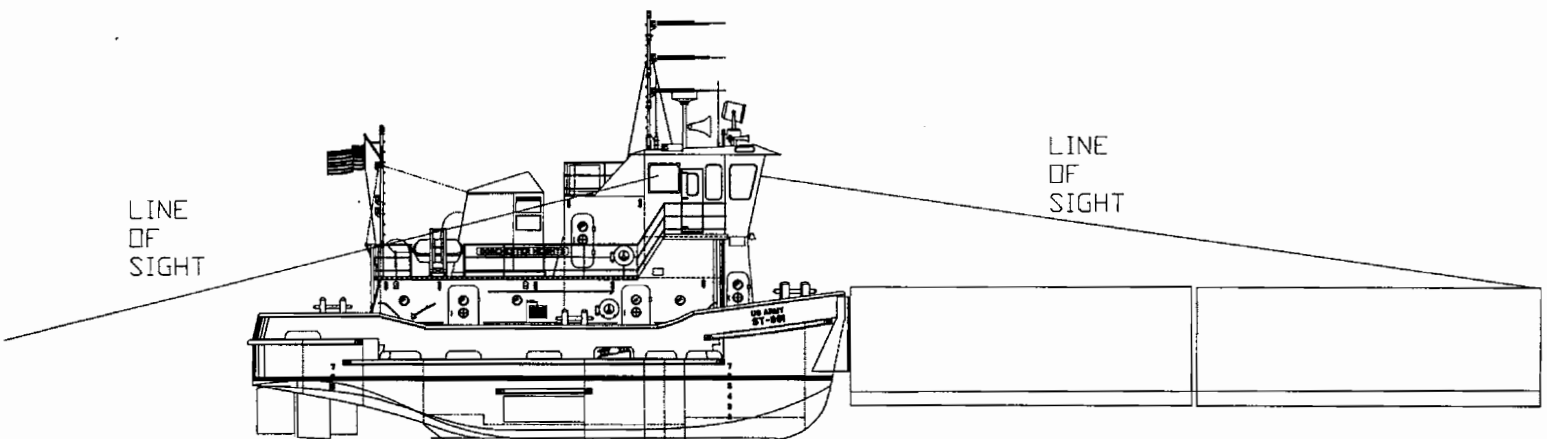


Figure 2-56. Pushing Ahead Configuration, Sheet 1 of 2.

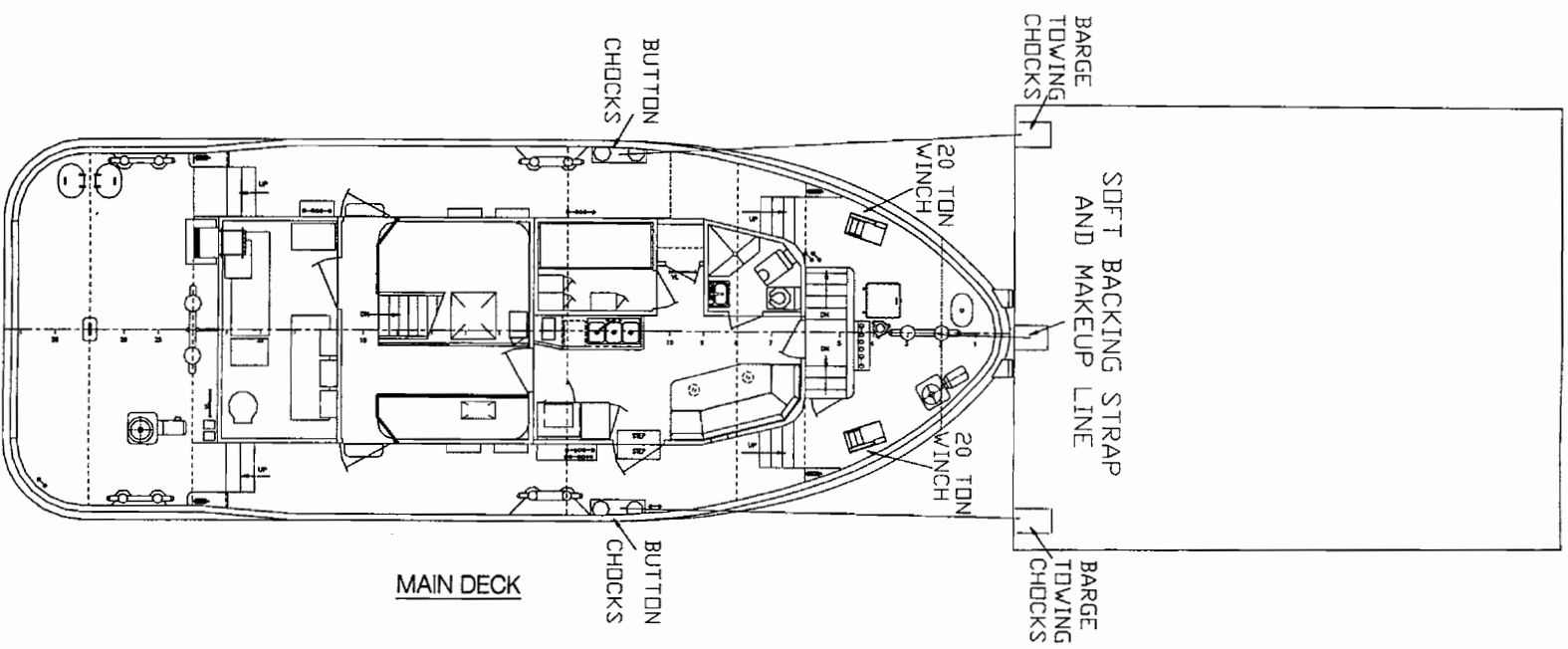


Figure 2- 56. Pushing Ahead Configuration, Sheet 2 of 2.

2.30. Decals and Instruction Plates. Each component of machinery and associated equipment, such as pumps, tanks, and engines are provided with a label plate to identify it by functional name. As required, label plates describing the operation of given components are provided locally at the component. These label plates are provided in a readily-visible location on or near the item they identify.

Special types of designation and marking are required for piping and valves. An overview of each of these is provided in the paragraphs that follow.

- a. Valve Label Plates. Label plates are provided for identifying all valves on the ST.
- b. Valve Handle Color Coding. Valve handwheels and operating levers for valves located in the interior of the ST are color coded. Color coding is painted with alkyd enamel paint (or covering with plastisol). These codes are identified below:
 - (1) Bilge/Ballast valves are identified in dark green
 - (2) Firemain valves are identified in red.
 - (3) Fuel oil valves are identified in yellow.
 - (4) Hot water valves are identified in black.
 - (5) Hydraulic fluid valves are identified in orange.
 - (6) Lube oil valves are identified in orange.
 - (7) Oily water separator suction valves are identified in yellow.
 - (8) Potable water valves are identified in light blue.
 - (9) Refrigerant lines for HVAC are identified in dark purple.
 - (10) Sea water valves are identified in dark green.
 - (11) Waste water discharge valves are identified in light gray.
- c. Pipe Marking. Pipes are marked for identification. Markings on piping are indicated by color with tape. Likewise direction of flow markings are affixed to the piping to aid in tracing flows.

2.31. Preparation for Movement. The ST is designed for sustaining a three-month inactive period between operation cycles, some of which will be less than the design mission (two to three days). These periods will involve absolutely no operation of equipment or systems and no preventive maintenance. As such, requirements for bringing the ST back to mission capability after a short-term shutdown are minimal. After conducting routine PMCS, the vessel is ready to return to service.

However, when the ST will be loaded aboard a ship for long-term storage (36 months), such as in the case of prepositioning, the vessel requires a preservation process. These procedures will ensure that the ST is preserved adequately for long periods of deactivation (up to 36 months at a time). At the same time, the design of the system is such that the reactivation cycle may be accomplished with a minimum number of personnel. Consideration has been given to the design to promote ease of access to equipment, piping systems, electrical wiring, HVAC, and etc. That shall facilitate these procedures. These special considerations include the following:

- a. The design of the ST provides for the compartmentation to be capable of isolation and dehumidification of all machinery spaces, operator and control spaces, work areas, storerooms, and living and commissary spaces.
- b. The design of the ST facilitates the connection of dehumidification ducting from an external source in order to provide dry air penetration throughout the sealed environment while allowing regress of moist air. This shall be accomplished utilizing threaded and/or capped pipe connections that are 4-inch (0.1016 Meters) nominal size.
- c. The design of the ST is such that in most cases, ducting delivers dry air through distributors and ventilation to reach the required compartments. Likewise, the design facilitates removal of moist air through remote pick-up which are routed to return to the dehumidification unit whenever suitable.
- d. The design of the ST piping systems, tanks, valves, etc. is such that all non-flammable fluids are capable of being fully drained. Where possible, these systems incorporate a means of exposing their elements to dehumidified compartment air through valves or spool piece openings.
- e. Likewise, the design of the ST is such that piping systems, tanks, valves, etc., which house flammable liquids are readily drained. However, these systems are not exposed to the dehumidified compartment air, but rather are vented to the weather/environment.
- f. Only those systems/equipment which are suitable for preservation and dehumidification have been included in the design of the vessel. As much as practical, only systems/equipment whose gaskets, seals, "O" rings, flexible connectors, etc., that are tolerant to the preservatives utilized for the inoperative period are incorporated into the design of the vessel.
- g. Systems requiring special exercise during the inoperative period are identified specifically in this plan. The design of the system/equipment shall be such that the interference required to the dehumidified area is minimal, if any.
- h. In order to facilitate the activation of systems, day tanks shall have fill lines that are situated outside of the dehumidified area.
- i. All bearing surfaces and other areas of moving contact shall be lubricated. For specific equipment, where manufacturers have identified the means of lubrication and/or the lubrication method is inherent to the design, the defined methods shall be utilized. For those systems/equipment where the method of lubrication has not been identified, lubrication shall be provided from an external source. These sources may include a grease gun, oilcan, etc. Those units that have lubricant that is integral to the equipment shall be handled accordingly.
- j. The ST design incorporates removable, bolted-on aluminum hard covers for protecting windows against damage during storage period. Each cover has a label plate for identifying the window to which it belongs. Each cover is fitted to the windows by permanently mounted studs and retaining clips. The configuration of the securing hardware facilitates installation and removal utilizing a minimum number of component parts. Installation and removal of covers is accomplished readily with the permanently installed walkways, accesses, and gratings for the equipment.
- k. Procedures

The ST should be preserved in accordance with the procedures that follow.

- (1) Diesel Engines. The successful preservation and reactivation of the diesel engines onboard the ST is vital to successful prepositioning. Procedures for preservation of the ST diesel engines are provided below:

- (a) Bring the engine to operating temperature and drain the old oil. Fill the engine with preservative oil MIL-L-21260, Type P-10 or equal.
 - (b) Disconnect fuel lines, fill two containers, one with diesel fuel and the second with preservative oil MIL-L-644 or equal. Place the lines in the containers and run the engine for 5 to 10 minutes on the preservative oil.
 - (c) Drain the fuel tank and install the drain plug and make a suitable cover for the filler vent.
 - (d) Inspect the engine coolant for rust. If it contains rust, drain and flush the system utilizing a water-soluble rust inhibitor.
 - (e) Remove the valve covers and apply preservative oil to the rocker levers, valve stems, springs, guides, cross heads, and push tubes. Install the covers.
 - (f) Cover all engine openings with a cover made of heavy paper and tape.
- (2) Valves. In order to prepare valves (excluding engine intake and exhaust valves), execute the tasks outlined below:
- (a) Turn all weather-exposed valves to fully open position.
 - (b) Coat the valve stems with Amoco Amolith multi-purpose grease No. 2 EP.
 - (c) Close the valve.
- (3) Pumps. Pumps should be prepared as such:
- (a) Water pumps should be drained and blown dry with compressed air and drain plugs reinstalled.
 - (b) For hydraulic pumps, the hydraulic oil in the pumps will protect the internal components of the pump. No preservation is required.
 - (c) Rotary hand pump (Fuel Piping) – Coat the shaft and all unpainted external surfaces with Tectyl 506G Rust Preventative. Cover and seal the pump with 8-mil vinyl sheeting and pressure sensitive tape.
- (4) Tanks. Preparation for tanks is outlined below:
- (a) Diesel Fuel Day Tank – The Diesel Fuel Day Tank will be drained and coated with P-10 grade 2 SAE30 preservative oil. Excess oil accumulating at the bottom of the tank shall be removed. Drain plugs are to be coated with P-10 grade 2 SAE30 preservative oil and the tank closed. Seal the level switch on top of the fuel tank with 8-mil vinyl sheeting and aluminum foil duct tape. Check that the fuel tank vent is open and free of obstructions.
 - (b) Fuel oil storage tanks should be prepared in the same fashion as the day tank, as listed above.
 - (c) The hydraulic reservoir shall be filled to operating level with ISO Grade 46 hydraulic oil. No other preservation is required.
 - (d) The diesel engine lube oil day tank shall be filled to operating level with SAE 15W40 API CE or CF oil. No other preservation is required.

- (e) Water tanks should be drained, flushed with fresh water and blown dry. Vents should be left open.
- (5) Wire Rope. Wire rope on the ST shall remain reeved and/or rigged. Wire rope which is on drums or similar gear shall be unwound, cleaned, and coated with rust resistant lubricant (MIL-G-18458). The exposed surfaces of the drums should also be cleaned and coated with the MIL-G-18458 lubricant.
- (6) Fire Protection/Detection System. Systems shall be ready for service. No preservation is required.
- (7) Portable Fire Extinguishers. Portable fire extinguishers will be stowed in the de-humidified areas. No additional preservation is required.
- (8) Switchboards and Panels. Tie all panel doors in the dehumidified area in the open position. No preservation is required.
- (9) Receptacles. Exterior receptacles will be sealed against the entrance of water by applying pressure sensitive tape over the receptacles. No preservation is required for interior receptacles.
- (10) Horns and Lights. All horns and lights used on the exterior of the ST are designed for outdoor use. No preservation is required.
- (11) HVAC. Air conditioning equipment, when exposed to high temperature environments, will require the removal of the refrigerant, and the substitution of dry nitrogen under positive pressure in order to prevent moisture from entering the system. During the reactivation process, the nitrogen should be removed and refrigerant replaced into the system. Refer to TM# 55-1925-252-14&P for information on this process.
- (12) Raw Water Piping Systems. Piping systems for the bilge and ballast, firefighting, sanitary, and engine cooling shall be flushed with fresh water and blown dry. All traps should be removed so that fluids may drain to the lowest levels in the systems. Lines which were broken or removed in order to aid draining or flushing shall be reinstalled in order for the piping systems to be ready for service.
- (13) Fresh Water Piping Systems. All fresh water systems including potable, heating and hot water shall be drained and blown dry with compressed air. Lines and/or fittings removed to aid in draining shall be reinstalled in order for the piping systems to be ready for service. This shall be done in conjunction with potable water pumps.
- (14) Fire Main System. The fire main pumping should be drained as outlined above. Procedures for the other fire main system components are provided in the paragraphs that follow.
- (15) Fire Main Pumps. In order to prepare the pump for storage, follow the procedures listed below:
 - (a) Force dry the hydraulic portion of the pump to remove all residual liquid. Dry the seal chamber using compressed air through the flush taps. If the pump is fitted with packing, remove it from the packing box and reinstall the gland.
 - (b) Coat the internal components of the pump with a nonhardening corrosion inhibitor that should be applied by spray mist into the suction and discharge openings.
 - (c) Cover and seal the suction discharge openings with pressure sensitive waterproof tape and plug any other tapped openings.

- (d) Wrap the shaft extension with pressure sensitive tape or cover with heavy waterproof protective grease.
- (e) Store the pump in a clean dry area where the ambient temperature shall remain between 60⁰F (15.4⁰C) and 100⁰F (37.4⁰C).
- (f) Where the pump has a rabbeted motor head, coat with heavy grease. Completely cover and seal the motor head with herculite (commercial trade name for Nylon Chloroprene, NSN 8305-00-926-1584). Doing so will protect the ball bearings in the head/power frame from corrosion.

(16) Strainers. Preservation procedures for strainers are outlined in the paragraph below:

- (a) Tightly close the valves on the inlet and outlet connections of the strainer.
- (b) Open the vent and/or drain valves to relieve liquid pressure in the strainer.
- (c) When pressure is relieved, drain the fluid through the bottom drain to a level below the basket seal.
- (d) Remove the cover.
- (e) Remove the basket.
- (f) Clean the basket by inverting the basket and washing out debris utilizing a stream of compressed air or water against the basket. Replace the basket if necessary.
- (g) Reinstall the basket squarely on the basket seat.
- (h) Ensure that the basket handle is sufficiently high to be compressed by the strainer cover.
- (i) Ensure that the cover O-ring is suitable for making an adequate seal. Clean or replace the O-ring as required.
- (j) Reinstall the cover and tighten cover stud.

(17) Oily Water Separator. In order to prepare the oily water separator for storage, follow these procedures:

- (a) Disconnect the unit from the power supply at the source.
- (b) Drain all fluid from the unit as well as from the plumbing to the inlet, outlet, and the slop oil tank.
- (c) Open and wipe clean both housings.
- (d) Remove and discard the coalescer element.
- (e) Remove the pump covers to drain the pumps.
- (f) Drain the pressure gauge lines.
- (g) Open the return-metering valve fully (counter-clockwise) and apply slight air pressure to the coalescer end of the return tubing, thereby clearing the tubing of oil and water.

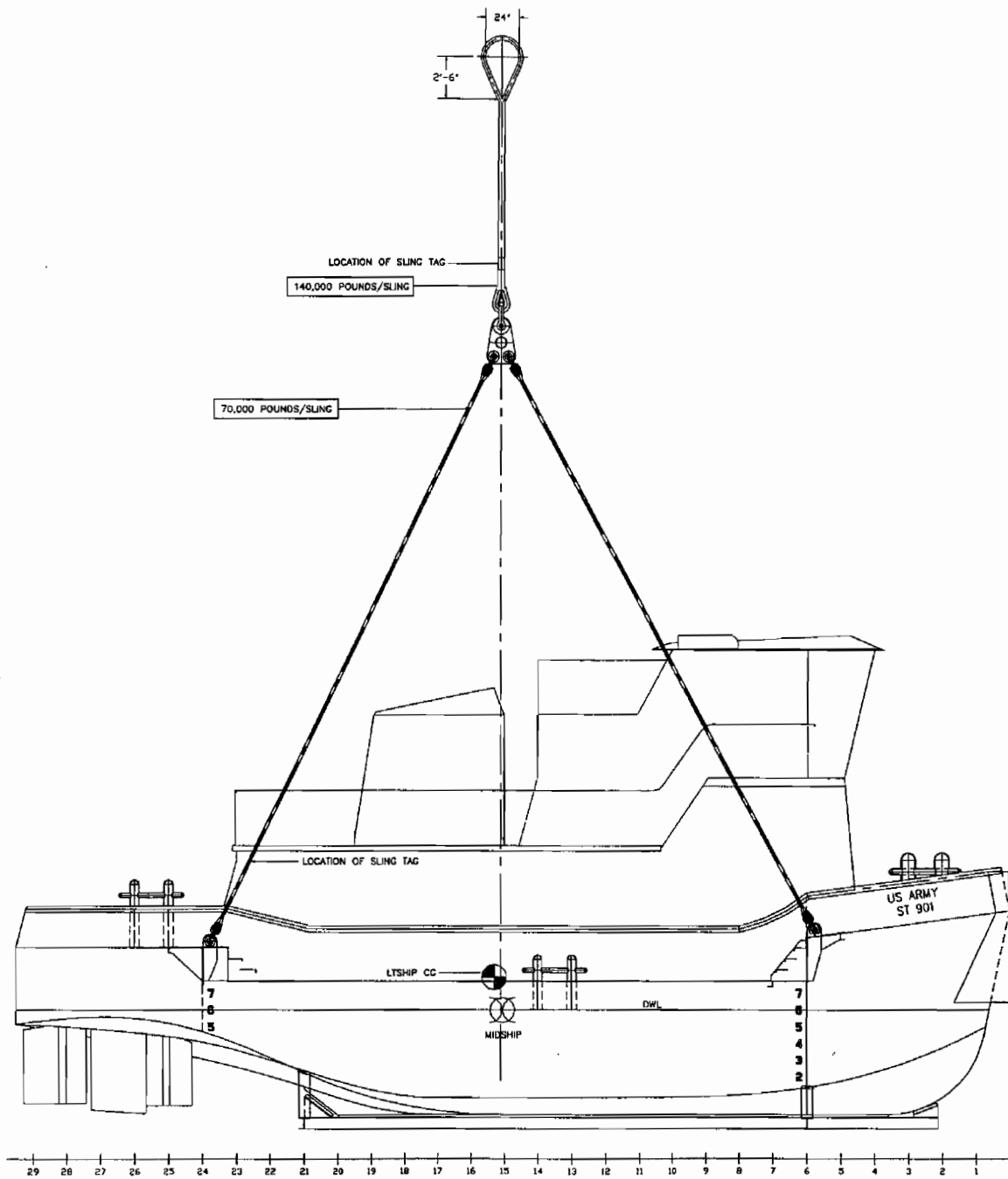
- (h) Oil or grease the pump impellers, thereby preventing damage to the impeller during the activation cycle. Silicone lubricant is recommended.
 - (i) Reinstall the pump gaskets and covers and tighten.
 - (k) Loosely reinstall the housing gaskets and covers.
- (18) Refrigerator/Freezer Unit. No preservation is required for this unit. Defrost the refrigeration unit if needed. Clean and dry the refrigerator. Doors on the refrigerator/freezer should be blocked and wired open.
- (19) Capstans and Winches. The above deck portions of this type of equipment such as gears, spindles, and so forth should be preserved as follows:
- (a) Non-precision gears should be coated with P-1 preservative.
 - (b) Precision gears should be coated with P-2 preservative.
 - (c) Oil lubricated gear cases shall be handled as such:
 - (1) Check the level of the lubricant in the case and check for evidence of water and contamination in the lubricant.
 - (2) If the lubricant is low, but not contaminated, add the appropriate lubricant until full.
 - (3) If the lubricant is contaminated, drain the lubricant and flush the housing with new lubricant. Refill to the proper level with the appropriate lubricant.
 - (4) After filling with lubricant, the gear case should be run under no load in order to ensure that all internal components are completely covered with lubricant.
 - (d) Brake drums and drums for which specific preservation procedures are not identified elsewhere in this document shall be coated with a thin film of rust inhibiting lacquer synthetic primer.
- (20) Deck Fittings. Flush deck fittings which are used for sounding, oil fill, water fill, and fuel fill shall be removed and cleaned. The threads should be coated with P-2 preservative.
- (21) Anchor. Any bare metal surfaces or unpainted fittings on anchor stowed on deck shall be coated with P-1 preservative.
- (22) Galley Equipment. Procedures for galley equipment, unless identified elsewhere, shall be performed in accordance with the paragraphs that follow:
- (a) Surfaces likely to be in contact with food shall be cleaned with soap and water and then rinsed with potable water.
 - (b) Install protective covers over the equipment.
 - (c) Block open microwave oven door so that it may be provided with dehumidified air with the compartment.
- (23) Fixed Carbon Dioxide (CO₂) Fire Fighting System. The fixed CO₂ fire fighting system requires no special preservation prior to storage.
- (24) Life Preservers. Life preservers should be placed in dry storage away from contaminants.

- (25) Hazardous Materials. Generally, hazardous materials include, but are not limited to, open or used containers of paint, thinners, solvents, or other flammable materials and pyrotechnics. These materials shall be handled in accordance with the procedures outlined below:
- (a) Open or partially used containers of paint, thinners, solvent, etc. shall be removed from the ST by the preserving activity. Disposal shall be accomplished in accordance with approved methods.
 - (b) Pyrotechnic materials shall be inventoried, boxed/packaged, identified as belonging to the ST and then removed from the craft. The pyrotechnics shall be forwarded to the HLPS ship for storage. Upon activation, these materials shall be returned to the ST.
- (26) Machinery and Miscellaneous Equipment Covers. Machinery and miscellaneous equipment shall be protected from the environment with protective covers made of herculite. These covers shall be fabricated by local vendors in accordance with measurements provided by the storing activity. The herculite covers should be manufactured with grommets and nylon drawstrings to secure the cover to the machinery and miscellaneous equipment. The seams of the covers are stitched with ultraviolet resistant thread that will prevent separation during storage. Covers will be securely tied down using the straps and grommets. In order to facilitate representation, these covers should be permanently tagged or stenciled in order to identify the item covered.
- (27) Batteries. After all other preservation has been accomplished and the need for batteries no longer exists, the battery cables shall be disconnected. Disconnect the negative cable first. All cable ends and terminals are to be coated with Amoco Amolith multi-purpose grease No. 2 EP. After cables and terminal ends are preserved, remove old batteries from banks. Install new batteries in banks (must be installed dry or empty). Provide in close proximity to each bank enough electrolyte to fill each bank.

2.32 Special Transportation Requirements. The ST is capable of being transported on the decks of commercial ships such as cargo ships, container ships, and float on float off (FLO-FLO) ships. On general cargo and container ships, the ST will be loaded and offloaded by crane. On FLO-FLO ships, the ST will be floated on and floated off. These operations can be accomplished at any loadout ranging from Light Ship to Full Load. This is accomplished using a single point lifting arrangement as depicted in Figure 2-57 to hoist the vessel to/from the specially designed stowage cradle shown in Figure 2-58 .

WARNING

The capacity of the slings is posted on the sling tag. Do not exceed these limits, otherwise death or injury to personnel and damage to equipment could occur.



LIGHT SHIP LIFTING = 228,480 POUNDS
 MAXIMUM LIFT = 280,000 POUNDS
 TEST TO 150% MAX. = 420,000 POUNDS

Figure 2-57. Single Point Hoisting Arrangement.

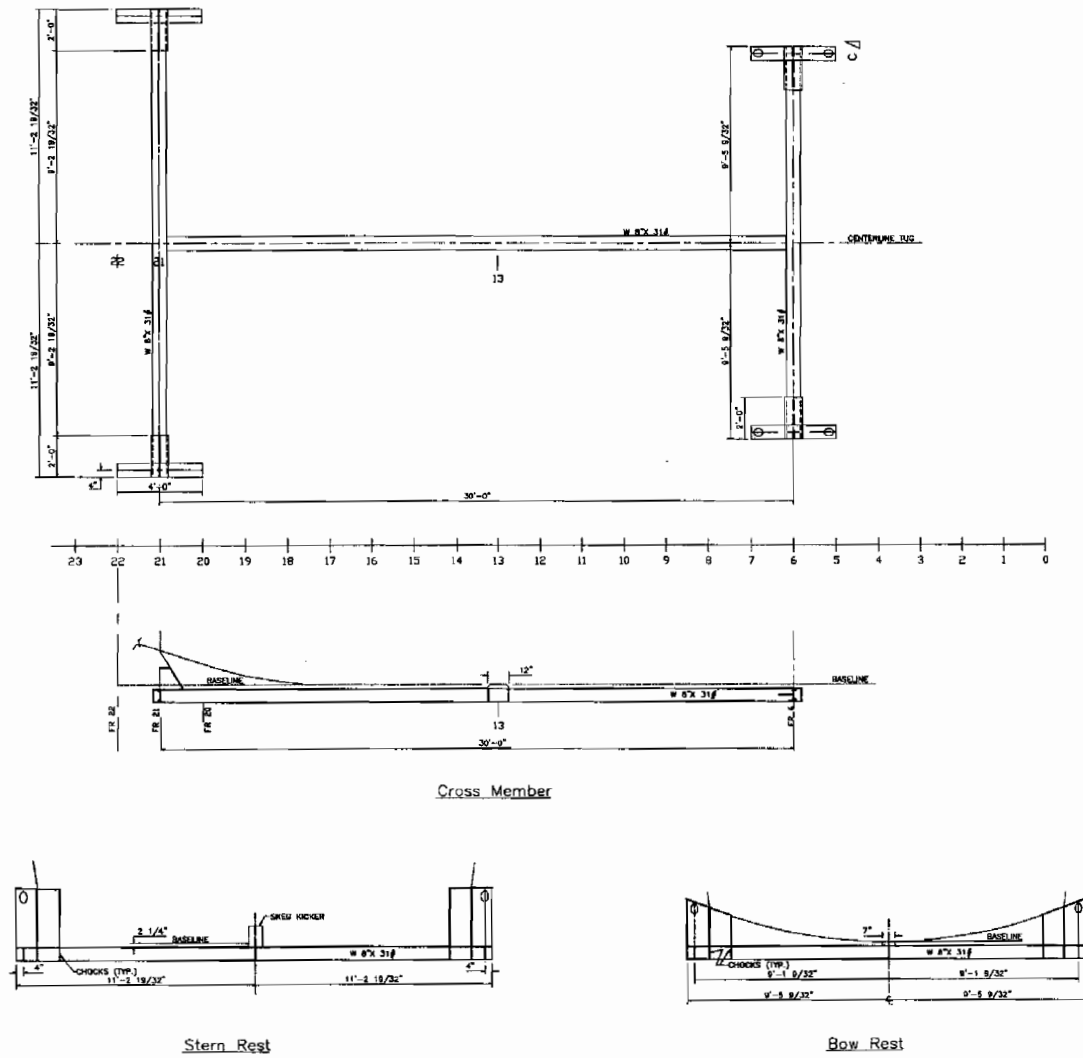


Figure 2-58. Stowage Cradle.

Section IV.

Operation Under Unusual Conditions

2.33. General. This section contains operating procedures for individual equipment during periods of equipment failure and periods of unusual weather conditions.

2.34. Unusual Environment and Weather and Emergency Procedures. The following sub-paragraphs provide standard operating procedures for ST systems and equipment while under unusual environment/weather conditions (conditions not considered as part of design parameters). The broad design parameters of the ST are such that the vessel and its equipment should operate normally under all probable conditions that it might encounter within the scope of its assigned mission. The design parameters are listed below:

- a. Weather air condition "Hot-Dry" (air temperature of 120° F (48.4°C) with relative humidity of 8%)
- b. Weather air condition "Hot Humid" (air temperature of 105°F (40.15°C) with relative humidity of 88%)
- c. Weather air condition "Basic Cold" (air temperature of -25° F (-31.35°C) with relative humidity of 100%)
- d. Seawater temperature ranging from 28° F (-2.20°C) to 95° F (34.65°C).
- e. Sea state 2 (SS2) Significant wave height 2.2 feet (0.67 Meters), modal period 4.1 seconds.
- f. Sea state 3 (SS3) Significant wave height 4.6 feet (1.40 Meters), modal period 5.9 seconds.

2.34.1 Any conditions outside of these parameters are outside of the vessel's design and should be handled in accordance with the paragraphs to follow:

- a. Operation Under Extreme Heat. If the ST should encounter temperature conditions above the design parameters stated above and its systems are already operational, operations should continue as usual. If the ST is shutdown and conditions exceed weather condition "hot dry" or weather condition "hot-humid", the ST should not be brought online until conditions fall within the operating parameters.
- b. Operation Under Extreme Cold. If the ST should encounter temperature conditions below its design capabilities and the ST and its systems are already operational, operations should continue as usual. If the ST is shutdown and temperatures are below weather condition "basic cold", then the ST should not be brought online until conditions fall within the operating parameters.
- c. Operation Under Extreme Sea-state. If the ST should encounter sea conditions beyond Sea State Three, cease all operations and seek safe haven (port, river, etc.).

2.35. Emergency Procedures. The following sub-paragraphs provide standard operating procedures for ST systems and equipment while under emergency operating conditions. Note that since it is impossible to predict all possible emergency situations that might occur, there may arise emergency situations that have not been addressed here directly. Careful and purposeful examination of the problem at hand and the information contained in this manual should provide solutions to most problems that could occur.

- a. Operation During Reduction in Power. The ST systems are designed in such a manner that should there be a reduction in power, the systems shall go off-line. Therefore, operations during a reduction in power are not practical.

- b. Operation During Full Loss Of Power. The ST systems are designed in such a manner that should there be a total (full) loss of power, the systems should go off-line. Power should then be transferred to the secondary generator set.

2.36 Nuclear, Biological, and Chemical (NBC) Decontamination Procedures. The ST is not required to be equipped for protection against nuclear, chemical, or biological fallout. However, the ST is designed and equipped to operate within the NBC contaminated environment (i.e. MOPP IV clothing, as defined in U.S. Army Training Manual, STP21-1-SMCT, Soldiers Manual of Common Tasks, Skill Level 1), and is provided with equipment to decontaminate at the earliest opportunity (i.e. a washdown hose). All exterior components, equipment, and machinery shall be capable of withstanding a seawater washdown.

The ST is designed to accommodate performance of the daily maintenance inspections, safety checks, and operations by personnel dressed in MOPP IV protective clothing. Following is a listing of typical daily/shift checks that are required for the PT and shall be considered in accommodating operations in a NBC environment:

- (1) Visually inspect berthing/mooring lines
- (2) Visually inspect top side of craft
- (3) Visually inspect firefighting system
- (4) Visually inspect general hardware
- (5) Visually inspect systems/components for fuel, oil, and water leaks
- (6) Visually inspect walkways/ladders/handrails
- (7) Visually inspect hoses/lines
- (8) Visually inspect fuel
- (9) Visually inspect hotel power
- (10) Visually inspect housekeeping
- (11) Visually inspect engines and generator sets
- (12) Visually inspect lubrication
- (13) Visually inspect batteries
- (14) Visually inspect lights
- (15) Visually inspect glass
- (16) Visually inspect certification papers
- (17) Visually inspect operating instructions/safety list
- (18) Visually inspect gauges
- (19) Visually inspect warning/indicator lights
- (20) Visually inspect visibility
- (21) Check operation of safety devices

- (22) Check operation of warning devices
- (23) Operationally check for unusual noises
- (24) Check volume operations of all interior communication equipment

As a minimum, operators shall be capable of satisfactorily performing all operations associated with pre-startup, start-up, mission operations, shutdown, and post shutdown during day or night.

For further guidance on NBC contamination, see U.S. Army regulation AR 70-71 Nuclear Biological and Chemical Contamination of Army Material.

CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

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Section I.

LUBRICATION INSTRUCTIONS

- 3.1. General. Lubrication instructions are found in the PMCS. All lubrication instructions are mandatory.

SECTION II.

OPERATOR TROUBLESHOOTING PROCEDURES

- 3.2. General. This section provides information for identifying and correcting malfunctions that may develop while operating ST.
- a. Before performing troubleshooting, read and follow all safety instructions found in the Warning Summary at the front of this manual.
 - b. This section cannot list all of the malfunctions/symptoms that may occur, or all of the probable causes and corrective actions. If a malfunction/symptom is not listed, or is not corrected by the listed corrective actions, notify your supervisor.
 - c. When troubleshooting a malfunction/symptom:
 - (1) Find the troubleshooting procedure for the malfunction in question.
 - (2) Perform in the order listed until the malfunction is corrected. DO NOT perform any maintenance task unless the troubleshooting procedure tells you to do so.
 - d. The format used in this section is defined as follows:

SYSTEM EVALUATED

SYSTEM COMPONENT

1. MALFUNCTION. A visual or operational indication that something is wrong with the item.

PROBABLE CAUSE: A procedure that could isolate the problem in a component or assembly.

TEST OR INSPECTION/CORRECTIVE ACTION: A procedure to correct the problem.

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MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.3 REMOTE FIRE PUMP BUTTONS (PILOT HOUSE)

1. Fire Pump will not start from Pilot House but will start from Tankage Room.

Defective start button.

Replace start button (refer to 4.44 in unit level maintenance).

2. Fire Pump will not stop from Pilot House but will stop from Tankage Room.

Defective stop button.

Replace stop button (refer to 4.44 in unit level maintenance).

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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3.4 120/208/460 VOLT POWER DISTRIBUTION PANELS

1. Circuit breaker continually trips.

Defective distribution panel circuit breaker.

WARNING

In order to prevent death or serious injury, use extreme caution while attempting to conduct the following troubleshooting tasks as these procedures are to be accomplished with high voltages present.

Using volt/ohmmeter, check for voltage on line side of breaker with power on to panel. If proper voltage is not present, replace breaker (refer to 2.17 in Direct Support maintenance).

Defective or overloaded equipment causing breaker to trip.

Correct equipment failure.

2. No power to Distribution Panel.

Main switchboard breaker to distribution panel is in OFF position.

Turn on main switchboard breaker.

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.5 EXHAUST SYSTEM

Excessive exhaust leaks into the engine room.

Exhaust piping has damaged insulation, punctures, or cracks.

Inspect all piping for damaged insulation, punctures, or cracks.

Exhaust flange gaskets are defective in exhaust system.

Replace defective gaskets (refer to 4.37 in unit level maintenance).

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.6 BATTERY CHARGER

Battery charger is inoperable.

Breaker in circuit breaker panel is OFF.

Turn on appropriate breaker.

Fuse(s) is/are blown.

Replace fuse (refer to 3.27 in operator level maintenance).

Defective charger.

Replace charger (refer to 2.16 in Direct Support maintenance).

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.7 CONSOLE

Any control or indicator is unserviceable, effecting operation

Console has loose, missing, or broken switches or controls, gauges, indicator lights, or obvious damage.

Inspect console components for damage and replace damaged components as needed.

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.8 BEACON

Beacon light will not luminate.

Lamp is burnt/broken.

Inspect Beacon light for damage and replace lamp(s) (refer to 3.32, 3.33, or 3.34 in operator level maintenance).

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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3.9 ANTENNA

Radio will not transmit.

Antenna is defective.

Inspect and replace defective antenna (refer to 3.39 or 3.40 in operator level maintenance).

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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3.10 SEARCHLIGHTS

Lights are inoperative.

Respective switch is not turned to "ON" position.

Check to insure correct switch is turned to the ON position.

Searchlight lamp is burnt.

Inspect lamp and replace burnt lamp as needed; Refer to TM#55-1925-249-14&P

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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3.11 ELECTRIC HORN

Horn will not sound when activated.

Loose connection.

Inspect and test all connections; clean and tighten any loose connections.

Defective horn.

Replace defective horn (refer to 3.38 in operator level maintenance).

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.12 LIFERAFT

Life raft lines unserviceable.

Weak link line is frayed or parted.

Replace weak link line as necessary (refer to 3.37 in operator level maintenance).

Safety tie down line is frayed or parted.

Replace safety tie down line as necessary (refer to 3.37 in operator level maintenance).

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.13 LIGHTING SYSTEM

Flourescent/Incandescent Fixtures

1. Compartment light not operable.

- a. Lighting panel breaker is in "OFF" position.

Place breaker in "ON" position.

- b. Defective bulkhead switch.

Replace defective bulkhead switch (refer to 4.35 in unit level maintenance).

2. One or more lights (not all) are dim, flicker, or do not illuminate at all.

Lamp is defective.

Replace defective lamp.

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.14 FIRE PUMP

1. Pump does not deliver water.

- a. Pump not primed.

Make sure pump is primed and that pump case and suction line are full of water.

- b. Pump or suction pipe not completely filled with liquid.

Make sure pipe is not obstructed by foreign debris.

- c. Strainer clogged.

Remove strainer and clean.

- d. Defective pump.

Replace pump (refer to 4.42 in unit level maintenance).

2. Insufficient capacity delivered.

- a. Pump or suction pipe not completely filled with liquid.

Make sure pipe is not obstructed by foreign debris.

- b. Excessive amount of air in liquid.

Check the suction strainer for debris.

- c. Air leaks in suction line.

Check suction piping.

- d. Air leaks into pump through mechanical seal, sleeve gaskets, casing gasket or pipe plugs

Check all seals, gaskets and plugs for leaks and replace as needed

- e. Defective pump.

Replace pump (refer to 4.42 in unit level maintenance).

3. Pump loses prime after starting.

- a. Pump or suction pipe not completely filled with liquid.

Make sure strainer is not obstructed by foreign debris.

- b. Excessive amount of air in liquid.

Check the suction strainer for debris.

- c. Air leaks in suction line

Check suction piping

- d. Air leaks into pump through mechanical seal, sleeve gaskets, casing gasket or pipe plugs

Check all seals, gaskets and plugs for leaks and replace as needed

- e. Defective pump.

Replace pump (refer to 4.42 in unit level maintenance).

4. Pump vibrates or is noisy.

- a. Pump or suction pipe not completely filled with liquid.

Make sure strainer is not obstructed by foreign debris.

- b. Defective pump.

Replace pump (refer to 4.42 in unit level maintenance).

5. Pump overheats and seizes.

- a. Pump not primed.

Be sure that pump case and suction line are full of water.

- b. Operation at very low capacity

Check to insure that no debris is impeding suction strainer.

- c. Defective pump.

Replace pump (refer to 4.42 in unit level maintenance).

6. Motor will not start.

- a. Check to ensure fire pump breaker (4P-A) is in the "ON" position.

Turn breaker "ON".

- b. Defective motor.

Replace motor (refer to 4.42 in unit level maintenance).

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.15 FIRE PUMP CONTROLLER

1. Controller will not operate.

- a. Controller is in "OFF" position.

Switch lever to "ON" position.

- b. Controller overload relay tripped.

Push controller "RESET" push button.

- c. Controller fuse(s) blown.

WARNING

High voltages present; before attempting any troubleshooting, ensure that power being supplied from distribution panel is turned off and locked out against unauthorized start-up or else death or serious injury could occur.

Replace fuse(s) (refer to 3.41 in operator level maintenance).

- d. Defective controller

Replace controller (refer to 2.20 in Direct Support level maintenance).

MALFUNCTION/SYMTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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3.16 BILGE PUMP**1. Failure to pump.**

- a. Pump not properly primed.

Be sure that pump case and suction line are full of water.

- b. Defective pump.

Replace pump (refer to 4.39 in unit level maintenance).

2. Reduced capacity and/or head.

- a. Air pockets or leaks in suction line.

Check the line for air leaks.

- b. Strainer clogged.

Clean strainer.

- c. Defective pump.

Replace pump (refer to 4.39 in unit level maintenance).

3. Pump loses prime.

- a. Air leaks in suction line.

Check suction piping.

- b. Defective pump.

Replace pump (refer to 4.39 in unit level maintenance).

4. Motor will not start

- a. No electric current at motor

Check the power supply and turn on the panel breaker and controller.

- b. Defective motor.

Replace motor (refer to 4.39 in unit level maintenance).

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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3.17 BILGE/BALLAST PUMP CONTROLLER(S)

1. Controller will not operate.

- a. Controller is in "OFF" position.

Switch lever to "ON" position.

- b. Controller overload relay tripped.

Push controller "RESET" push button.

- c. Defective controller.

Replace controller (refer to 2.20 in Direct Support level maintenance).

**MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION**

3.18 SHAFT SUMP 1" PUMP

1. Pump does not come "on".

- a. Power supply to pump in "OFF" position.

Make sure power supply is in the "ON" position.

- b. Wire connections are faulty.

Check all wire connections.

- c. Float valve stuck in the "DOWN" position.

Check float valve to ensure that it is not obstructed.

- d. Defective pump.

Replace pump (refer to 3.36 in operator level maintenance).

2. Pump does not shut off.

Float valve on pump is stuck.

Make sure float valve is not obstructed keeping it from moving up or down.

3. If pump comes "on" but impeller will not turn.

Impeller inside of pump is jammed.

Open bottom of pump and check for debris inhibiting impeller from turning.

MALFUNCTION/SYMP TOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.19 GREY WATER PUMP

1. Motor will not start or run.

- a. Blown fuse.

Replace fuse (refer to 3.41 in operator level maintenance).

- b. Thermal overload has opened circuit.

Push restart on controller.

- c. Defective motor.

Replace motor (refer to 4.43 in unit level maintenance).

2. Pump will not prime.

- a. No priming water in casing.

Fill pump casing.

- b. Leak in suction line.

Check suction line.

- c. Discharge valve line is closed and priming air has nowhere to go.

Open discharge line.

- d. Suction valve is closed.

Open suction valve.

- e. Defective pump.

Replace pump (refer to 4.43 in unit level maintenance).

3. Little or no discharge.

- a. Casing not filled with water.

Fill pump casing with liquid.

- b. Air leak in suction line.

Tighten suction line fittings.

- c. Suction or discharge valve closed.

Open suction and/or discharge valve.

- d. Defective pump.

Replace pump (refer to 4.43 in unit level maintenance).

4. Loss of suction.

- a. Air leak in suction line.

Tighten suction line fittings.

- b. Clogged strainer.

Clean strainer.

- c. Defective pump.

Replace pump (refer to 4.43 in unit level maintenance).

5. Pump vibrates and/or makes excessive noise.

- a. Mounting plate bolts loose.

Tighten mounting bolts.

- b. Defective pump.

Replace pump (refer to 4.43 in unit level maintenance).

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
---------------------	----------------	--------------------------------------

3.20 GREY WATER PUMP CONTROLLER

1. Controller will not operate.

- a. Controller is on "OFF" position.

Switch lever to the "ON" position.

- b. Controller overload relay tripped.

Push controller "RESET" push button.

- c. Controller fuse(s) blown.

WARNING

High voltages present; before attempting any troubleshooting ensure that power being supplied from distribution panel is turned off and locked out against unauthorized start-up or else death or serious injury could occur.

Replace fuse(s) (refer to 3.41 in operator level maintenance)

- d. Defective controller.

Replace controller (refer to 2.20 in Direct Support level maintenance).

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
---------------------	----------------	--------------------------------------

3.21 MAIN ENGINE COOLING SYSTEM**Overheating problems.**

- a. Rubber hose part of piping between engine and cooling system collapsed.
Replace hose with wire reinforced rubber hose.
- b. The thermostat is stuck or wrong thermostat is being used.
Check and replace is wrong/defective.
- c. Expansion tank is low.
Check water level in the expansion tank.
- d. Moored at dock.
Check to insure that engine temperature is not rising while vessel is moored at dock.

NOTE

This procedure may require engaging the propeller to circulate water past the grid cooler after the proper safety precautions have been taken.

- e. Glycol (Antifreeze) is low.
Check level of Glycol in system.

NOTE

Always premix Glycol with water before adding it to the cooling system.

- f. Oil deposits.
Check the cooling system for oil if the vessel has experienced any engine problems.

MALFUNCTION/SYMP TOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
----------------------	----------------	--------------------------------------

3.22 GENERATOR COOLING SYSTEM

Overheating problems.

- a. Rubber hose part of piping between engine and cooling system collapsed.
Replace hose with wire reinforced rubber hose.
- b. The thermostat is stuck or wrong thermostat is being used.
Check and replace if wrong/defective.
- c. Expansion Tank low.
Check water level in the expansion tank.
- d. Moored at Dock.
Check to insure that engine temperature is not rising while vessel is moored at dock.

NOTE

This procedure may require engaging the propeller to circulate water past the grid cooler after the proper safety precautions have been taken.

- e. Glycol (Antifreeze) is low.
Check level of Glycol in system.

NOTE

Always premix glycol with water before adding it to the cooling systems.

- q. Oil deposits.
Check the cooling system for oil if the vessel has experienced any engine problems.

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
----------------------------	-----------------------	---

3.23 POTABLE WATER PRESSURE PUMP

The pump will not run.

Pressure switch out of adjustment.

Adjust pressure switch to proper setting (refer to 3.35 in operator level maintenance).

Potable water pressure pump breaker is in the "OFF" position.

Turn breaker to the "ON" position.

Defective pump.

Replace pump (refer to 4.40 in unit level maintenance).

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.24 POTABLE WATER PRESSURE TANK

1. Tank is losing/not maintaining pressure.

- a. Air charge valve or Butyl diaphragm is defective

Check air charge valve and/or Butyl diaphragm to see if air is by-passing these two systems. Replace tank as needed (refer to 2.19 in Direct Support level maintenance).

- b. Loss of air in tank.

Drain and refill tank (refer to 3.43 in operator level maintenance).

2. Water and air are mixing.

Diaphragm seal locking retainer ring is leaking.

Replace tank (refer to 2.19 in Direct Support level maintenance).

3. Rust is in water reservoir.

Plastic lining is leaking.

Replace tank (refer to 2.19 in Direct Support level maintenance).

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

3.25 HIGH LEVEL ALARMS

Alarm sounds and cannot be silenced.

Alarm panel defective.

Repair alarm panel; Refer to TM#55-1925-246-14&P.

**MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION**

3.26 FUEL TRANSFER PUMP

1. No liquid delivered.

- a. Rotating in wrong direction.

Change rotation of pump.

- b. Foreign matter under valve seat or poppet.

Remove and clean poppet and valve seat (refer to 4.41 in unit level maintenance).

CAUTION

If poppet or seat is damaged it must be remachined or replaced.

2. Rapid wear.

Excessive pressure.

Check pressure relief valves to make sure they are releasing proper amount of pressure.

3. Excessive noise.

- a. Relief valve chatter.

Check pressure setting.

- b. Improper mounting.

Check alignment thoroughly.

4. Insufficient liquid delivered.

- a. Air leaks through packing or mechanical seal.

Check all packings and seals for damage and repair as needed.

- b. Pump damaged by foreign matter or misalignment.

Check pump and remove foreign matter and replace damaged part(s) as needed (refer to 4.41 in unit level maintenance). Check misalignment due to pump being bumped or moved.

- c. Excessive clearance in pump caused by wear or corrosion.

Check all valves, seals and lines for damage and repair as needed (refer to 4.41 in unit level maintenance).

- d. Relief valve set too low, or stuck partially open.

Check valve for appropriate setting and blockage by foreign debris.

5. Pump takes too much power.

- a. Operating pressure higher than specified.

Check gauge at the pump outlet and adjust pressure relief valve as needed.

- b. Mechanical defect, such as bent shaft, packing gland too tight, or misalignment of piping.

Check shaft for damage and replace motor as needed (refer to 4.41 in unit level maintenance). Check packing gland and/or piping and loosen/realign as needed.

- c. Relief valve not operating properly.

Check relief valve for damage and proper settings.

Section III.

OPERATOR'S MAINTENANCE PROCEDURES

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3.27 Battery Charger.

This Task Covers: a. Repair

Tools: General Mechanic's Tool Kit;
Electrician's Tool Kit

Equipment Condition: Isolated, and
de-energized and locked-out

Materials/Parts: AC or DC Fuse

General Safety Instructions: See
WARNING

a. Repair (Refer to Figure 3-1 and Figure 3-2)

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE. DC voltage may still be present from battery to charger control. Use caution when removing fuses.

- (1) Remove screw (1) from charger front panel.
- (2) Slide inspection door (2) up to reveal circuit board with fuses.
- (3) Remove defective AC (3) or DC (4) fuse; using volt/ohmmeter check fuse for continuity, if meter indicates open condition then replace fuse.
- (4) Install new fuse.
- (5) Lower inspection door (2) to closed position.
- (6) Replace screw (1) in front panel.
- (7) Energize and test for normal operation.

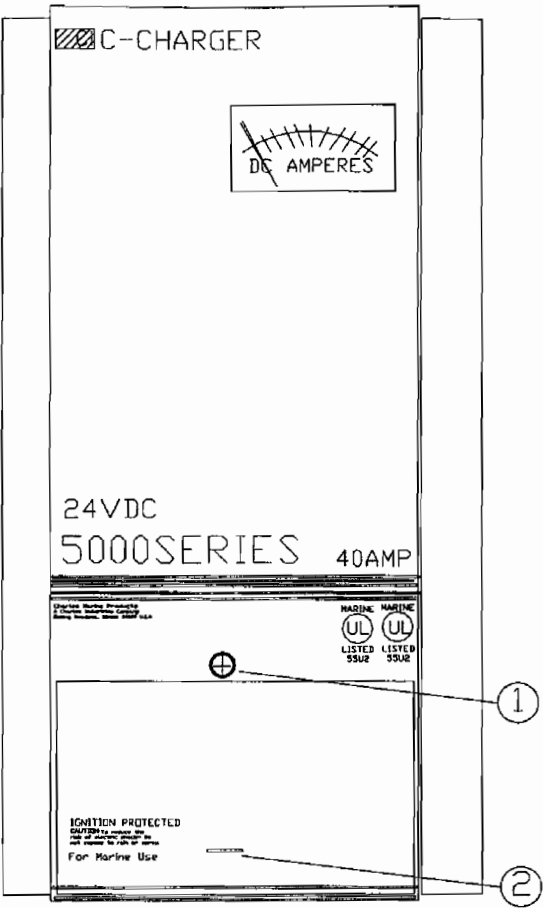


Figure 3-1. 40-AMP Battery Charger

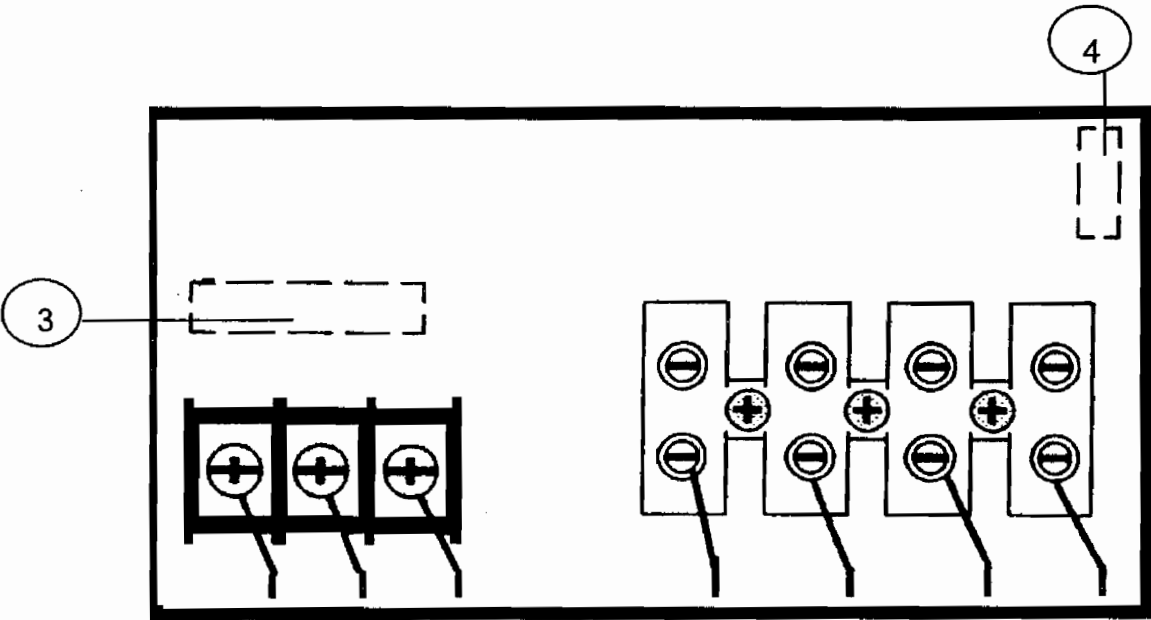


Figure 3-2. 40-AMP Battery Charger Circuit Board

3.28 Navigation Lights (Red, Green, White and Yellow).

This Task Covers: a. Replace

Tools: General Mechanic's Tool Kit;

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Navigation Lamp

General Safety Instructions: See
WARNING

a. Replace Lamp

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Unscrew top of navigation light fixture.
- (2) Remove defective lamp and install new lamp.
- (3) Install top portion of navigation lamp fixture.

3.29 Valves.

This Task Covers: a. Replace

Tools: General Mechanic's Tool Kit, Pipe Wrench

Equipment Condition: Isolated (supply and discharge closed)

Materials/Parts: Replacement valve (type required)
Sealant/Gasket

General Safety Instructions:

a. Replace

Valve(s) (procedure applies to all valve types within system).

- (1) Shut-off the flow into and out of the valve.
- (2) Remove the valve.
- (3) Apply sealant and/or gasket to the valve fittings as necessary.
- (4) Install new valve.
- (5) Reestablish flow into and out of the valve.
- (6) Check for leaks.

3.30 Fuel Oil Tank Level Indicator.

This Task Covers: a. Replace

Tools: General Mechanic's Tool Kit

Equipment Condition: Isolated (valves closed)

Materials/Parts: Replacement level indicator

General Safety Instructions:

a. Replace (Refer to Figure 3-3)

- (1) Close valves (1) at top and bottom of the sight glass.
- (2) Open plug at base of sight glass to drain sight glass.
- (3) Unscrew sight glass retaining screws (2) at top and bottom of fuel tank sight glass.
- (4) Remove broken sight glass (3) and o-ring.
- (5) Install new sight glass (3) and o-ring.
- (6) Install sight glass retaining screws (2) at top and bottom of sight glass.
- (7) Close plug at base of sight glass.
- (8) Open valves (1) at top and bottom of sight glass.
- (9) Check for leakage.

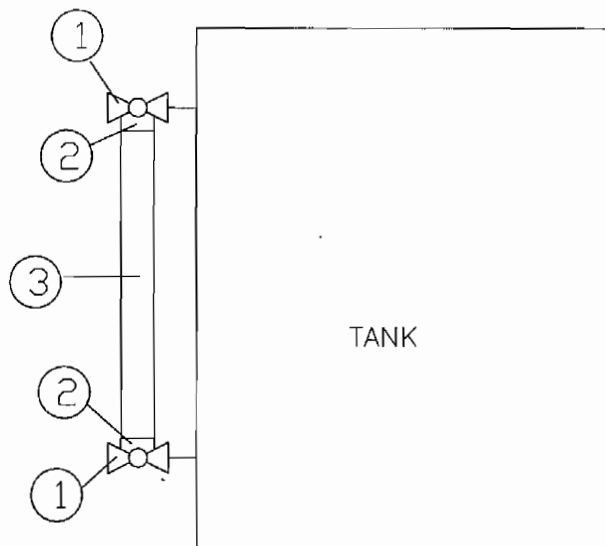


Figure 3-3. Tank Level Indicator (Sight Glass)

3.31 **Beacon Lights (Sound Powered Phone).**

This Task Covers: a. Repair

Tools: General Mechanic's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement lamp

General Safety Instructions: See
WARNING

a. Repair

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE.

- (1) Shut off power to light in breaker panel.
- (2) Remove lens retaining clamp and lens.
- (3) Remove defective lamp.
- (4) Install new lamp.
- (5) Install lens using retaining clamp.
- (6) Turn on power and test for operation.

3.32 Beacon Lights (General Alarm).

This Task Covers: a. Repair

Tools: General Mechanic's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement lamp

General Safety Instructions: See WARNING

a. Repair

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE.

- (1) Turn off power to light in breaker panel.
- (2) Loosen (3) lens screws and rotate lens to remove.
- (3) Unplug lamp from lamp socket.

NOTE

Bulb pulls straight down, it does not turn.

- (4) Install new lamp.
- (5) Install lens and tighten (3) screws.
- (6) Turn on power and test for operation.

3.33 Beacon Lights (Murphy Panel).

This Task Covers: a. Repair

Tools: General Mechanic's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement lamp

General Safety Instructions: See WARNING

a. Repair (Refer to Figure 3-4)

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE.

- (1) Turn off power to light at breaker panel.
- (2) Remove two lens retaining screws (1) and remove lens (2).
- (3) Remove defective lamp.

NOTE

Removal of lamp is accomplished by pulling up.

- (4) Install new lamp noting configuration of bulb leads.
- (5) Install lens (2) by using lens retaining screws (1).
- (6) Turn power on and test for operation.

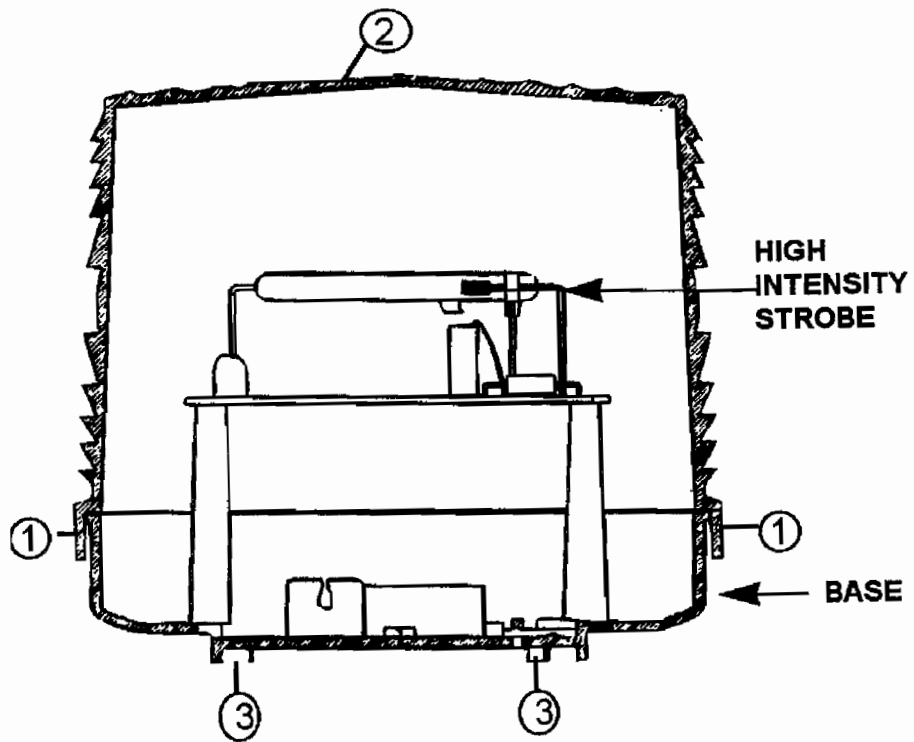


Figure 3-4. Murphy Panel Beacon Light

3.34 Oily Water Hand Pump.

This Task Covers: a. Replace

Tools: General Mechanic's Tool Kit; Pipe Wrench

Equipment Condition: Isolated (supply and discharge valves closed)

Materials/Parts: Replacement Pump

General Safety Instructions:

a. Replace

- (1) Remove union on pump.
- (2) Remove (2) mounting bolts on pump mounting frame.
- (3) Remove all piping from defective pump (note configurational piping).
- (4) Remove defective pump.
- (5) Install piping on new pump (as configurated prior to removal).
- (6) Install new pump on mounting frame with (2) mounting bolts.
- (7) Install union on pump.
- (8) Test for normal operation.

3.35 Potable Water Pressure Switch.

This Task Covers: a. Adjustment

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts:

General Safety Instructions: See
WARNING

a. Adjustment (Refer to Figure 3-5)

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE.

- (1) Turn off power to pump at the breaker panel.
- (2) Remove pressure switch cover.
- (3) Adjust the cut-off pressure (high pressure limit) designated as #1 (big spring).

Turn clockwise to raise the pressure and counter-clockwise to lower the pressure.

The switch should be set at 40 P.S.I.

- (4) Adjust the cut-in pressure (low pressure limit) designated as #2 (small spring).

Turn clockwise to raise the pressure and counter-clockwise to lower the pressure.

The switch should be set at 20 P.S.I.

- (5) Replace pressure switch cover.
- (6) Turn on power and observe cut-in and cut-out pressure.
- (7) Re-adjust as necessary.

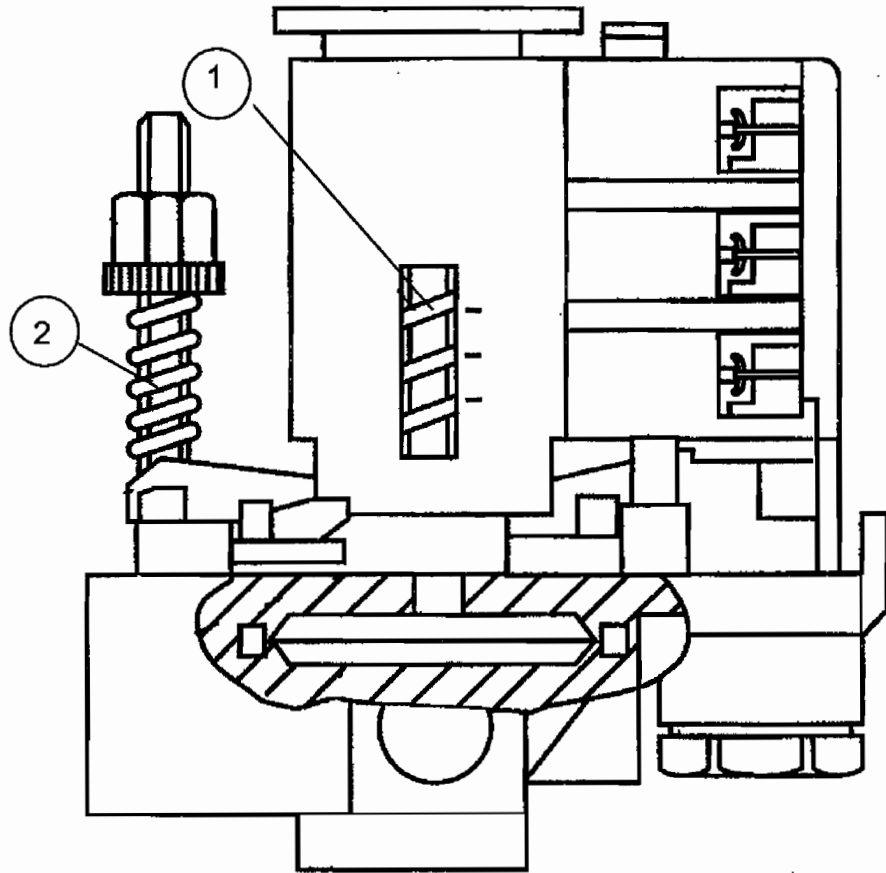


Figure 3-5. Potable Water Pressure Switch

3.36 Shaft Pump.

This Task Covers: a. Replace

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Pump

General Safety Instructions: See WARNING

a. Replace

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE.

- (1) Turn off power to pump at breaker panel.
- (2) Remove junction box cover.
- (3) Tag and remove pump leads.
- (4) Remove hose clamps and flex hose from piping.
- (5) Remove pump.
- (6) Install flex hose on new pump.
- (7) Attach to piping with hose clamp.
- (8) Install leads to new pump and seal with water proof sealant.
- (9) Connect pump leads as tagged.
- (10) Install junction box cover.
- (11) Turn on power and test for normal operation.

3.37 Life Raft.

This Task Covers: a. Replace

Tools: General Mechanic's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement weak link and safety line *General Safety Instructions:*

a. Replace (Refer to Figure 3-6)

NOTE

Secure life raft to cradle prior to performing the below tasks.

Weak Link (1)

- (1) Remove shackle holding weak link to cradle.
- (2) Cut frayed weak link from life raft line.
- (3) Splice new weak link to life raft line.
- (4) Attach weak link to shackle.
- (5) Attach shackle to cradle.

Safety Line (2)

- (1) Remove shackle holding safety line to cradle hold down.
- (2) Cut frayed safety line from life raft hold down strap.
- (3) Splice new safety line to life raft hold down strap.
- (4) Attach shackle to hold down strap.

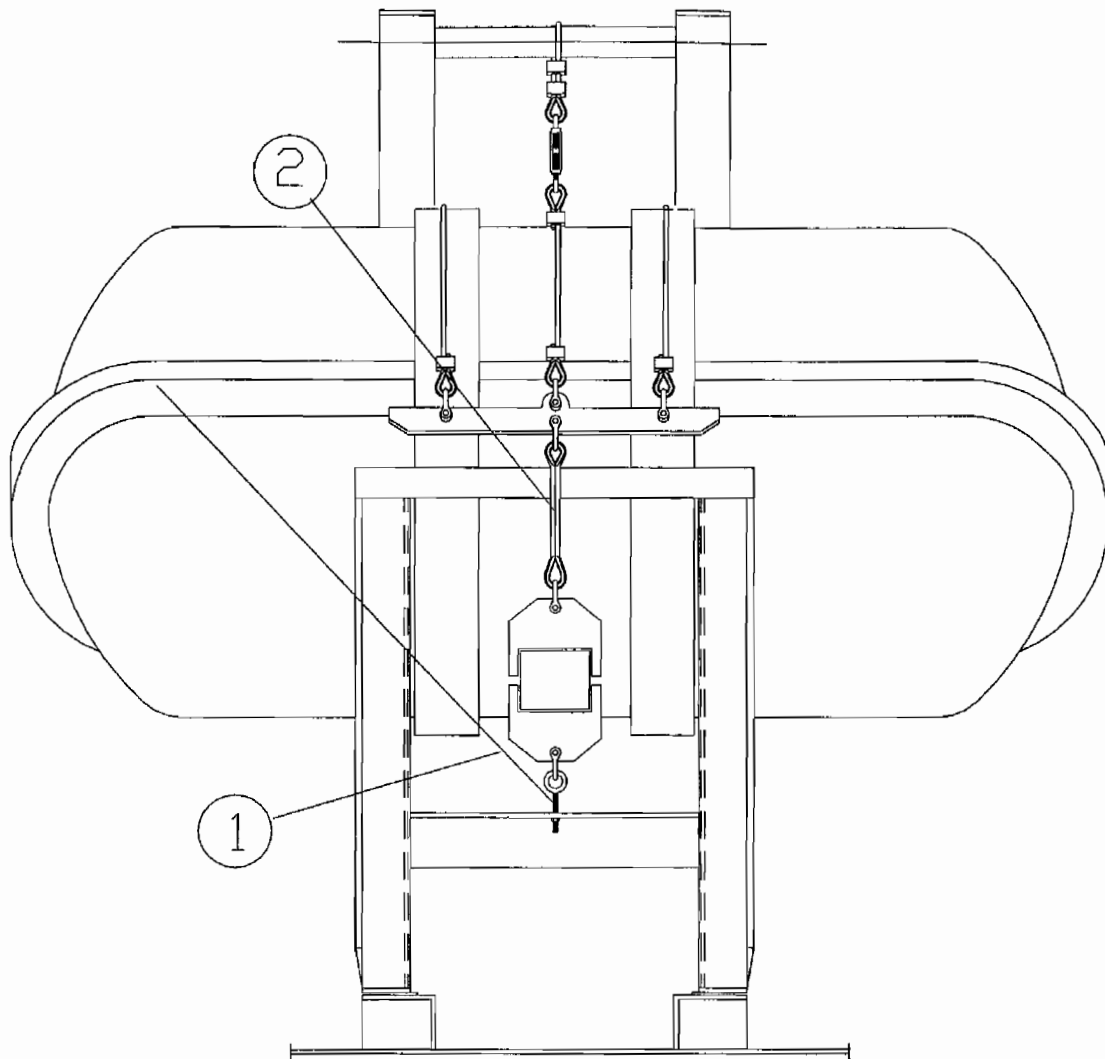


Figure 3-6. Life Raft

3.38 Horn.

This Task Covers: a. Replace

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement horn

General Safety Instructions: See
WARNING

a. Replace

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE.

- (1) Turn off power to horn and safety light junction box.
- (2) Remove (4) horn mounting bolts.
- (3) Remove (5) screws from face plate of horn.
- (4) Tag and remove power leads to horn.
- (5) Install leads to new horn as tagged.
- (6) Assemble new horn faceplate to horn back-plate using (5) screws.
- (7) Mount horn on mounting plate using (4) bolts.
- (8) Turn on power and test for normal operation.

3.39 Antenna (Ross DSC 500).

This Task Covers: a. Replace

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement antenna

General Safety Instructions: See WARNING

a. Replace

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE.

- (1) Turn off power to equipment with defective antenna.
- (2) Remove antenna wire from equipment.
- (3) Pull antenna wire through top of Pilot House.
- (4) Unbolt (4) screws from antenna base mounting bracket and remove defective antenna.
- (5) Install new antenna on mounting bracket using (4) mounting screws.
- (6) Route new antenna wire through top of Pilot House fitting to equipment.
- (7) Seal antenna wire and Pilot House fitting using waterproof sealant.
- (8) Connect antenna wire to equipment.
- (9) Turn on power and test for operation.

3.40 Antenna (GPS Radio).

This Task Covers: a. Replace

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement antenna

General Safety Instructions: See WARNING

a. Replace

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE.

- (1) Turn on power to equipment with defective antenna.
- (2) Remove (4) mounting bolts from antenna.
- (3) Lift antenna from base.
- (4) Remove wire from bottom of antenna.
- (5) Remove defective antenna.
- (6) Install wire on bottom of new antenna.
- (7) Place antenna on base and attach with (4) mounting bolts.
- (8) Turn on power and test for normal operation.

3.41 Controller Fuses.

This Task Covers: a. Replace

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Fuses

General Safety Instructions: See WARNING

a. Replace

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE.

- (1) Turn off power to controller at breaker panel.
- (2) Open controller door.
- (3) Remove defective fuse.
- (4) Using volt/ohmmeter check fuse for continuity. If meter indicates open condition then replace fuse.
- (5) Close controller door.
- (6) Turn on power and test for normal operation.

3.42 Watertight Door Selector Switch.

This Task Covers: a. Replace

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Switch

General Safety Instructions: See
WARNING

a. Replace

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE.

- (1) Turn off power to switch at DC panel in Pilot House.
- (2) Remove four screws and remove switch cover plate.
- (3) Tag and remove all electrical leads.
- (4) Remove two mounting bolts from switch mounting plate.
- (5) Install new switch using two mounting bolts.
- (6) Remove new switch plate cover and install all electrical leads as marked.
- (7) Install four screws on switch plate cover.
- (8) Adjust switch contact arm to proper position to indicate alarm condition when door in closed position.
- (9) Turn on power and test for normal operation by closing and dogging watertight doors and monitoring alarm conditions.

3.43 Potable Water Pressure Tank.

This Task Covers: a. Repair

Tools: General Mechanics Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts:

General Safety Instructions: See
WARNING

a. Repair (Putting air in tank)

WARNING

To prevent injury or death, ensure that all switches and circuit breakers are in the OFF position and tagged OUT OF SERVICE.

- (1) Turn off all power to potable water system.
- (2) Shut valve to pressure tank.
- (3) Open discharge and drain all water from pressure tank.
- (4) Close discharge valve.
- (5) Open fill valve to tank and fill tank with potable water.
- (6) Turn on power to system.
- (7) Adjust pressure setting as necessary.
- (8) Test for normal operation.

Chapter 4 UNIT MAINTENANCE INSTRUCTIONS

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SECTION I. REPAIR PARTS, TOOLS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT REPAIR (TMDE)

4.1. Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970, or CTA 8-100, as applicable to your unit.

4.2. Special Tools, TMDE, and Support Equipment. Reference should be made to Appendix B Maintenance Allocation Chart for a listing of special tools, TMDE, and support equipment.

4.3 Repair Parts. Repair parts for this equipment are listed and illustrated in the RPSTL, TM 55-1925-236-24P. Repair parts which are automatically replaced when the maintenance task is performed, such as gaskets, "O" rings, lock-washers, etc., are referenced in Appendix G of this manual (Mandatory Replacement Parts).

SECTION II.

SERVICE UPON RECEIPT

4.4 Site and Shelter Requirements. Should it become necessary that the ST be shut down for short periods of time, no special shelter requirements exist. All that is required is that the vessel is appropriately moored and shore power or vessel power is available in order to ensure that systems may be properly maintained and operated as necessary.

4.5 Service Upon Receipt of Material. The ST should have been made fully operational and intact following delivery and prior to acceptance. It should be clean, with all loose items stowed. All systems should be fully operational with no service upon receipt necessary.

4.6 Checking Unpacked Equipment. Inspect the equipment for damage done in shipment. Report any damage on SF 364 (Report of Discrepancy). Check equipment against the packing slip to make sure the shipment is complete. Report all discrepancies in accordance with DA PAM 738-750 or DA PAM 738-751 as applicable.

SECTION III

UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

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4.7. General. To ensure that the equipment is ready for operation at all times, it must be inspected on a regular basis so that defects may be found before they result in serious damage, equipment failure, or injury to personnel. This section contains systematic instructions on inspections, adjustments, and corrections to be performed by unit maintenance.

4.8. Service Intervals. Perform PMCS, found in Table 4-1., at the following intervals:

- a. Perform Daily PMCS on a regular daily basis.
- b. Perform Weekly PMCS on a regular weekly basis.
- c. Perform Monthly PMCS on a regular monthly basis or as defined in hourly intervals.
- d. Perform Semi-Annual PMCS once every six months or as defined in hourly intervals.

- e. Perform Annual PMCS once a year or as defined in hourly intervals.

4.9. Reporting Repairs. Report all defects and corrective actions on DA Form 2404. If a serious problem is found, report it to your supervisor immediately.

4.10. General PMCS Procedures. Keep equipment clean. Dirt, oil, and debris may cover up a serious problem. Clean as you work and as needed. Use soap and water on rubber, plastic, and painted surfaces.

While performing PMCS, inspect the following components:

- a. Bolts, Nuts, and Screws. Ensure that they are not loose, missing, bent, or broken. Tighten any that are loose.
- b. Welds. Inspect for gaps where parts are welded together. Report bad welds to your supervisor.
- c. Electric Wires or Connectors. Inspect for cracked or broken insulation, bare wires, and loose or broken connectors. Make repairs or replace as required.
- d. Hoses, Lines, and Fittings. Inspect for wear, damage, and leaks. Ensure that clamps and fittings are tight. If a leak originates, from a loose fitting or connector, tighten it. If a component is broken or worn, correct problem if authorized by the Maintenance Allocation Chart (MAC) (Appendix ?). If not authorized, report it to your supervisor.

4.11. Specific PMCS Procedures.

- a. Unit level PMCS are provided in Table 4-1 Always perform PMCS in the order listed. Once it becomes a habit, anything that is not right can be spotted in a minute. If anything is discovered through PMCS, perform the appropriate troubleshooting task. If any component or system is not serviceable, or if given service does not correct problem, notify your supervisor.
- b. Before performing preventive maintenance, read all the checks required for the applicable interval and prepare tools needed to make all checks. Have several clean rags handy. Perform all inspections at the applicable interval.
- c. The columns in Table 4-1 are defined as follows:
 - (1) Item No - Provides a logical sequence for PMCS to be performed and is used as a source of item numbers for the "TM ITEM NO" column on DA Form 2404 in recording PMCS results.
 - (2) Interval - Specifies interval at which PMCS is to be performed.
 - (3) Item to be Inspected - Lists the system and common name of items that are to be inspected. Included in this column are specific servicing, inspection, replacement, or adjustment procedures to be followed.
 - (4) Procedures - Tells you how to do the required check or service.

4.12. Lubrication Instructions. Lubrication instructions are found in the PMCS. All lubrication instructions are mandatory.

4.13. Mandatory Replacement Parts. See Appendix G.

Table 4-1. Operator/Crew Preventive Maintenance Checks and Services

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

Table 4-1. Unit Preventive Maintenance Checks and Services

D- Daily W - Weekly M - Monthly S-Semi-Annually A- Annually

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
							<p style="text-align: center;"><u>WARNING</u></p> <p>Electrical Hazards. The electrical system is dangerous when performing maintenance or inspections. Be sure to observe all warnings to prevent injury or possible death of personnel.</p> <p style="text-align: center;"><u>CAUTION</u></p> <p>Equipment operation is allowable with minor leakages (Class I or II). Consider the fluid capacity in the item/system being checked/inspected. When in doubt, notify the section supervisor.</p> <p>When operating with Class I or Class II leaks, continue to check fluid levels as required in the PCMS.</p> <p>Class II leaks should be reported to your supervisor or unit maintenance.</p> <p>Operating the equipment contrary to published instructions will cause damage and possible destruction of the equipment. Always be sure the equipment is operated properly.</p> <p style="text-align: center;"><u>NOTE</u></p> <p>Before performing preventative maintenance checks and services, review appropriate procedures to ensure that necessary tools, spare parts and equipment are on-hand.</p>	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
Pilot House Overhead								
1.1			•			Mast	Inspect mast foundation for damage or cracks, and ensure that mast is secure and free of from excessive vibration in operation.	Structural cracks are present.
1.2			•				Inspect for any damage or leakage in/around junction boxes, electrical connections or lights.	Electrical shorts occur due to water leakage. Mast winch is inoperable. Mast is damaged to extent that navigational systems are not properly supported.
1.3				•			Ensure that mast and antennas fold easily for ship docking work.	
2			•			Navigation Lights	Determine if lamps are good and of proper size. Inspect light housings for damage or leaking.	Lamp is blown. No power supply to lamp.
3.1						Searchlight	<p>WARNING</p> <p>High pressure exists inside lamp, especially when hot and under certain conditions it could explode. Handle lamp only in its protective cover.</p> <p>Remove protective cover from lamp before energizing circuits. Protect the eyes and wear gloves when removing cover from lamp. An industrial type face mask is recommended for eye and face protection.</p> <p>Avoid direct exposure from the powerful direct and reflected radiations given off by the lamp. The front cover glass provides protection from these radiations.</p> <p>Do not stand too close to search light front cover glass when lamp is lighted. In the event of lamp explosion the front cover glass could break.</p>	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
3.1						Searchlight Continued		
							<u>CAUTION</u> Operation of lamp with finger marks or grease on the surface will cause deterioration of the quartz bulb.	
3.2		•				Lamp	See Operation and Maintenance Manual for Manual Control Searchlight, Navigational Aids/Equipment TM55-1925-14&P.	
3.3		•				Reflector	See Operation and Maintenance Manual for Manual Control Searchlight, Navigational Aids/Equipment TM55-1925-249-14&P.	
3.4		•				Front Cover Glass	See Operation and Maintenance Manual for Manual Control Searchlight, Navigational Aids/Equipment TM55-1925-249-14&P.	
3.5		•				Housing	See Operation and Maintenance Manual for Manual Control Searchlight, Navigational Aids/Equipment TM55-1925-249-14&P.	
4.1			•			Radar Scanner	Inspect for secure mounting and that no obvious damage exists. Scanner face should be free of paint. Refer to unit maintenance regarding buildup of salt, corrosion or rust.	
4.2			•			Cleaning	See Operation and Maintenance Manual for Manual Control Searchlight, Navigational Aids/Equipment TM55-1925-249-14&P.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
						Radar Scanner Continued		
4.3			•			Wiring	See Operation and Maintenance Manual for Manual Control Searchlight, Navigational Aids/Equipment TM55-1925-249-14&P.	
4.4				•		Radome Lubrication	See Operation and Maintenance Manual for Manual Control Searchlight, Navigational Aids/Equipment TM55-1925-249-14&P.	
5			•			Antennas	Check to determine if mounting brackets and bolts are secure. Inspect for any cracks or breaks. Ensure there is no chafing to wires and that electrical connections are secure and corrosion free.	Antenna is broken or if coaxial cable/connection is not properly tight.
6.1		•				External Structures	Inspect for structural damage. Inspect superstructure, bulwarks, railings and similar structures to ensure they are suitably recessed or sloped inboard to prevent damage during docking and undocking of ships with high flare. Special care shall be given to mast, stacks and antenna protection.	Watertight integrity or operational capability is impaired.
6.2		•						
7		•				Loudhailer Horn	Inspect for secure mounting and that no obvious damage exists. Ensure that electrical connections are tight and free of salt and corrosion.	
8		•				Electric Horn	Inspect for secure mounting and that no obvious damage exists. Ensure that electrical connections are tight and free of salt and corrosion.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
Pilot House Deck (Interior)								
9.1		•				Warning, Operating and Instruction Plates	Inspect pilot house for pertinent warning, operating and instruction plates for equipment including, but not limited to the following: 1. Pilot House Controls; 2. Electronic Equipment; 3. Systems, as necessary; The plates for each piece of equipment shall contain instructions to cover the following as applicable. 1. Safety precautions; 2. Starting procedure; 3. Operating instructions; 4. Securing procedure; 5. Emergency procedure;	
9.2		•						
10		•				Windows and Gaskets	Inspect for any damage to glass that would cause leakage or impair visibility. Ensure that all gaskets seal properly and are watertight.	Glass is chipped, cracked or broken. Gaskets are unserviceable.
11.1			•			Sound Powered Telephones	Check the two-way voice capability of the unit. Select other stations and conduct a two-way conversation. a. Transmission and receptions should be clear, undistorted and easily understood. b. Check the audible alarms and indicators, where applicable. On model SWRL the indicator light should light along with the calling signal. Document all observed unit malfunctions and refer to unit maintenance.	
11.2			•					
11.3			•					
12.1		•				Sound Powered Phone Head Chest Set	Visually inspect head set connections to the chest set for frayed wiring or loose connections. Inspect ear cups for tears and cleanliness. Inspect neck straps for fraying or missing fasteners.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
						Sound Powered Phone Head Chest Set Continued		
12.2		•				Pushbutton	Press pushbutton on mouthpiece and release. Observe pushbutton on goes in and out. Visually inspect wire from chest set to jack plug for loose connections, cracks, or damaged insulation.	
12.3		•					Check the two-way voice capability of the headset. Select another station on the system and conduct a two-way conversation. Transmission and receptions should be clear, undistorted, and easily understood.	
13			•			Magnetic Compass	Check that deviation card is current and annual deviation card is located in immediate vicinity of compass. Check deviation whenever metal structural changes are made to vessel or when electronic equipment is added/removed. Check compensating magnets and if found damaged or missing, refer to unit maintenance.	Magnetic compass is inoperative. Compass will not swing freely in gimbal.
14			•			Fluxgate Compass	Visually inspect unit for obvious damage.	Unit is damaged or unserviceable.
15.1	•					Steering Controls	Visually inspect controls for obvious damage.	Any damage which could effect operation. Rudders do not move.
15.2	•				Operation	Ensure controls operate smoothly and do not bind. Ensure controls and rudder angle indicator are synchronized.		
15.3	•					Test to determine if system is capable of moving, stopping and holding rudders, forward and aft of the propeller, at any angle within the operating range with the vessel going ahead or astern.		

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
16.1			•			Integrated Communication System	Visually inspect exterior for damage, water accumulation or dirt build-up. Clean using a soft cloth.	
16.2			•			Hardware	Inspect mounting hardware for tightness. Tighten as necessary.	
16.3			•			Switches	Check mechanical operation of each switch. Replace any worn or incorrectly operating parts.	
16.4		•				Unit Performance	Check the two-way voice capability of the master station. Select other stations on the system and conduct a two-way conversation.	
16.5		•					a. Transmissions and receptions should be clear, undistorted and easily understood.	
16.6		•					b. Check the indicator lamps. The CALL lamps at the called station(s) should be lit. The Selected and/or Busy lamp at the calling station should be lit.	
16.7		•					c. Check the control switches. Vary VOLUME control switch during reception and verify intensity of the received speech is controlled.	
16.8		•					d. Check the hands free capability by operating hands free with another station in the system.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
17		•				Steering Alarm and Control Panel	Press panel test button. All lights should light. Adjust intensity of lights using DIMMER control.	
18		•				Main Engine Gauge Panels	Inspect gauges for cleanliness; clean as required. Check mounting for tightness.	
19		•				Rudder Angle Indicator	With power supplied to steering system, ensure that the rudder angle indicators indicate rudder travel. Lights should light. Adjust intensity of lights using DIMMER control.	Lights do not light. Light intensity cannot be adjusted.
20		•				Main Engine Controls and Emergency Backup Controls	Inspect controls and indicator lights for obvious damage. Ensure throttle, command transfer and steering controls operate smoothly and do not bind.	
21		•				Searchlight Control Panel	Have another crewmember observe searchlight. Operate joystick to ensure searchlight moves in desired direction. Change SPEED control and operate joystick to ensure SPEED control operates properly. Operate focus switch to ensure searchlight can be focused.	Searchlight cannot be directed from control panel.
22.1		•				Depth Sounder	Inspect the unit for cleanliness. Look for any visible damage to the unit.	
22.2			•		Inspect all cables for chafing and damage to the outer shield and, where necessary replace and reseal.			
23.1		•				Navigation Lighting Panel	Visually inspect to ensure that all navigation lights operate properly when the respective light switches on the navigation lighting panel are in the primary and secondary position. Refer corrective actions to unit maintenance.	Lights are inoperative. Circuits are defective.
23.2			•			Alarm Test	See Operation and Maintenance Manual for Manual Control Searchlight, Navigational Aids/Equipment TM55-1925-249-14&P.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
24			•			General Alarm	Sound alarm. Ensure all sirens and lights operate in all compartments.	Siren or light does not operate.
25			•			Emergency Stop Switches (Exhaust and Recirculation Fan)	Inspect break glass unit for obvious damage that might effect operation.	Obvious damage
26			•			Emergency Fuel Shutoff Valve	Inspect break glass unit for obvious damage that might effect operation	Obvious damage
27.1			•			Emergency Stop Buttons (Main Engines and Generators)	Inspect for obvious damage that might effect operation.	Obvious damage
27.2		•				Operation	Test for operation to ensure that buttons stop engines.	Buttons do not stop engines.
28		•				Fire Alarm Panel	Visually inspect for obvious damage. Press ALARM TEST button. Verify alarm indications. See Operation and Maintenance Manual for CO2 Fire Suppression System and Fire Alarm System TM55-1925-254-14&P.	Obvious damage. Alarms do not occur.
29		•				Pilothouse Console	Inspect console for cleanliness; clean as required. Look for any loose, missing or broken switches, controls, gauges, indicator lights or obvious damage. Ensure throttle controls operate smoothly and do not bind.	Any control or indicator unserviceable.
30			•			Portable Fire Extinguishers	Inspect for tight mounting, full charge, corroded nozzles and closed valves with untampered seals and proper certification. Ensure that each unit is of proper type and is marked correctly.	Extinguisher is damaged or seal is broken. Certification is out of date.

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
31.1			•			Radar Monitor	Inspect for secure mounting and that no obvious damage exists.	
31.2			•			Cleaning	See Operation and Maintenance Manual for Manual Control Searchlight, Navigational Aids/Equipment TM55-1925-249-14&P.	
31.3			•			Wiring	Check cable connections and terminal strip connections for cleanliness and tightness. Ensure that wiring is free from Chafing or abrasions. See Operation and Maintenance Manual for Manual Control Searchlight, Navigational Aids/Equipment TM55-1925-249-14&P.	
31.4					•	Connector Lubrication	See Operation and Maintenance Manual for Manual Control Searchlight, Navigational Aids/Equipment TM55-1925-249-14&P.	
32.1		•				Clearview Screen Controls	Visually inspect exterior of control box for obvious damage and secure mounting.	
32.2		•			Turn on motor switch. Ensure that "MOTOR" indicator is lit and that the screen spins.			
32.3		•			Turn on heater switch. Ensure that "HEATER" indicator is lit. After 5 minutes, ensure that warmth is felt in the proximity of the screen.			
32.4		•			Turn off motor switch. Ensure that "MOTOR" indicator is no longer lit and that the screen has stopped spinning.			
32.5		•			Turn off heater switch. Ensure that "HEATER" indicator is no longer lit and that the heater has stopped.			

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
Pilothouse Deck & 01 Deck Exterior								
33						HVAC System		
33.1				•		Condenser (Located on Pilot House Deck Exterior)	Check that condenser mountings are secure and there is no obvious damage. Ensure compressor operates when turned on.	Compressor does not operate when turned on.
33.2				•			Check the condenser coils, the evaporator coils, the refrigerant charge, the lubrication, the controls, and the electrical contacts. If any of the equipment is dirty or worn out, it should be cleaned or replaced.	
33.3			•			Supply and Exhaust Fans (Throughout ST)	Check units for unusual noises or excessive vibration. Intake/exhaust screens are clean and free of debris.	Unusual noise or excessive vibration.
33.4			•			Ventilation Fans	Give two (2) shots of grease monthly. Do not use a grease gun with greater than 40 PSI. Do not over grease. NOTE The fans to be greased include the generator fan, the engine room supply fan #1, engine room supply fan #2, and engine room exhaust fan. The engine room fans are lubricated by grease zerks located on the 01 Deck, forward of the exhaust stack at centerline. The generator room fan is lubricated locally in the generator room on the side of the fan housing.	
33.5			•			Thermostat (Located in Pilot House)	Visually check thermostat for signs of wear, dirt buildup, damage and corrosion.	

33.6			•		Air Handling Unit (Located on 01 Deck HVAC Room)	Check that the air handling unit mountings are secure and there is no obvious damage. Ensure air-handling unit operates when turned on.	Unit does not operate when turned on.
33.7			•			Check the filter for cleanliness. Clean or replace as needed.	
33.8			•			Check belts for proper tension and check for signs of wear.	
33.9			•			Check bearing and fan set screws for tightness.	
33.9			•		Ductwork	Check the ductwork to ensure that there are no leaks.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
34.1			•			External Structures	Inspect for structural damage.	Watertight integrity or operational ability is impaired.
34.2			•				Inspect superstructure, bulwarks, railings and similar structures to ensure they are suitably recessed or sloped inboard to prevent damage during docking and undocking of ships with high flares.	
35.1					•	Liferaft	<p>Servicing must be carried out every 12 months at a USCG approved facility and comply with requirements of USCG Specifications. Crew servicing is limited to visual inspections only.</p>	
							<p>WARNING</p> <p>During inspection, immediately report noted defects to your supervisor.</p> <p>Your life and that of the crew may depend on this equipment working in an emergency.</p>	
							Use caution when inspecting cylinder lanyard connected to eyebolt on deck. Accidentally pulling this cable will cause liferaft to inflate, which could injure personnel or damage raft assembly.	
							<p>NOTE</p> <p>Liferaft shall be installed such that it can be effectively and rapidly deployed by an individual crewmember.</p>	
35.2		•				Liferaft, Container Exterior; Seals, Cables, Lanyards, Hydrostatic Release, Retainer Clips and Pins.	Visually inspect container for dents or cracks that could leak water. Check cables and lanyards for chafing, cuts or loose connectors. Document and report all defects and discrepancies to unit maintenance.	Damage or defect of seals, hydrostatic release or retainer clips and pins which could cause liferaft to malfunction during emergency.

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
36.1			•			Aft Mast	Inspect mast foundation for damage or cracks. Inspect navigational (towing lights) for mechanical damage.	Structural cracks present or navigation lights damage.
36.2			•				Inspect Bilge Alarm Light for mechanical damage.	Bilge Alarm Light is damaged.
37.1			•			Ring Buoys	Inspect for damage and proper marking. Check that marker lights function when casing is turned upright.	Water lights are dead or weak and need replacing.
37.2			•				Check that lanyard lengths are correct and that they are stowed properly for rapid deployment.	
38			•			Lifelines, Stanchions and Grabrails	Ensure lifelines are in good condition and are securely in place. Visually inspect safety chains for wear and corrosion. Ensure safety chains, handrails and grabrails are utilized where the needed for safe movement, convenience and operation of the PT.	Lifeline, stanchion, handrails or grabrails are missing where needed.
39.1		•				Aft Control Station	Inspect control station for cleanliness; clean as required. Look for any loose, missing or broken switches, controls, gauges, indicator lights or obvious damage. Ensure panel cover is tight. Ensure throttle, command transfer and steering controls operate smoothly and do not bind.	
39.2		•				Rudder Angle Indicator	Ensure dimmer is able to adjust intensity of lights.	
39.3		•				Propulsion Indicator Panel	Press and hold LAMP TEST button. All lights should light. Adjust intensity of lights using DIMMER control.	Any light does not light. Light intensity cannot be adjusted.

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
40		•				Floodlights	Inspect for secure mounting and proper operation.	Floodlights do not operate due to lack of power supply or blown bulb.
41			•			Emergency Position Indicating Radio Beacon	Verify battery condition and operational status by depressing test button and observing illumination of indicator light.	Battery is weak or dead. Antenna is missing.
42		•				Exterior Lights	Inspect exterior lights for proper operation and ensure all have waterproof clear (or red) globes and protective cages.	Lamps are blown, globes are broken or waterlogged or if protective cages are missing.
43		•				Stack; Engine Room Air Intake and Exhaust	Inspect to ensure stack vents are free of obstructions.	Vents are covered or closed off and air-flow is restricted or shut off.
44.1			•			Ammunition Locker	Inspect to determine if doors are watertight and that gaskets are clean and serviceable.	Hinges or dogs are seized.
44.2			•		Check for proper installation, missing/defective fasteners.			
44.3			•		Ensure that dogs, hinges and handles are free of corrosion and well lubricated.			
44.4			•		Check that locker is properly marked.			

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
Main Deck								
45.1			•			External Structures	Inspect for structural damage.	Watertight integrity or operational ability is impaired.
45.2			•				Inspect superstructure, bulwarks, railings and similar structures to ensure they are suitably recessed or sloped inboard to prevent damage during docking and undocking or ships with high flare.	
45.3			•				Inspect hull structure to determine that it is reinforced as necessary in way of local loads, stress concentrations, mooring and towing fittings and other high loads and shall be of sufficient strength and configured to prevent damage.	
46			•			Ship's Bell	Inspect for secure mounting and obvious damage.	If clapper is missing.
47.1			•			Watertight Doors/Hatches	Inspect to determine that all watertight doors and hatches are fitted with retained neoprene gaskets.	Gaskets are missing or unserviceable.
47.2			•				Test to ensure that all operating and securing devices are fast so that vibration or shock cannot release them.	
47.3			•				Inspect the finish of all operating handles and dogs to ensure they are smooth, without burrs or projections.	
47.4			•				Check that a means is provided to secure all dogs in the open position.	
47.5			•				Ensure that dogs, hinges and handles are free of corrosion and are well lubricated.	
47.6			•				Check that all watertight door/hatches are properly marked.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
48						Fire Stations	<u>WARNING</u> During inspections, immediately report any defects to your supervisor and correct without delay or refer to unit maintenance.	
48.1			•				Ensure that all fire stations are painted red and have titles, e.g. FIRE HYDRANT, FIRE VALVE etc. in 1 inch red letters above them on the bulkhead on which they are mounted.	
48.2			•			Hose Inspection	Remove hose from rack for inspection and/or testing. Inspect for tears, fraying, cuts or holes. Check nozzle handle for proper operation. Check hose connections for tightness, using spanner wrench if necessary.	Hoses are defective or connections will not attach properly.
49			•			Emergency Pull Stations For CO ² System	Inspect box and pull station for damage.	Damage or condition that makes pull station inoperable.
50.1		•				Forward and Aft Capstans	Test to see that the local controls function properly. Visually inspect control station for obvious damage. Ensure that the foot pedal or pushbutton switches are securely mounted. Observe that the foot pedal control operates smoothly, does not bind and returns to OFF position when released.	No power to system. Local or pilothouse controls are inoperative.
50.2		•					Ensure motor housings are well sealed and free of leakage; that there is no buildup of salt, rust or corrosion. Inspect grease zerks and lubricate as per unit maintenance instruction.	Not securely mounted or obvious damage. Control binds or does not operate smoothly.
50.3	•						Check capstan for any foreign object that would jam or bind spool.	Foreign objects are wedged or lodged in assemblies.

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
51.1		•				20 Ton Winches (Make-up winches)	Test to see that all local and pilothouse controls function properly.	No power to system. Local or pilothouse controls are inoperative.
51.2		•					Ensure that all moving parts are well lubricated.	
51.3		•					Inspect the condition of each cable.	
51.4	•						Check winches for any foreign object that would jam or bind gears.	Foreign objects are wedged or lodged in gears.
52			•			Anchor	Inspect anchor and ground tackle to ensure proper stowage and easy access.	
53			•			Dual Turning Buttons (Button Chocks)	Inspect turning buttons for secure mounting. Ensure no sharp edges are present which would kink, cut or chaff cable.	Structural cracks in foundation or sharp edges present.
54			•			Forward and Aft H-Bitts	Inspect H-Bitts for secure mounting. Ensure no sharp edges are present that would cut or chaff. Check welds and foundation for structural cracking.	Structural cracks in foundation or sharp edges present.
55.1		•				Emergency Hatches	Inspect for watertightness. Ensure that all hinges and handles move freely and that condition of gaskets is satisfactory.	Hatch cover is obstructed.
55.2		•					Inspect emergency hatches for proper markings.	
56		•				Exterior Lights	Inspect exterior lights to ensure all have clear (or red) waterproof globes and protective cages.	Lamps are blown, globes are broken or waterlogged or if protective cages are missing.

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
57.1		•				Watertight Doors/Hatches	Inspect to determine that doors/hatches are watertight and that gaskets are clean and serviceable.	Hinges or dogs are seized.
57.2		•			Check for proper installation, missing or defective fasteners.			
57.3		•			Ensure that dogs, hinges and handles are free of corrosion and well lubricated.			
57.4		•			Check that all watertight doors/hatches are properly marked.			
58.1			•			Vents	Inspect vents for secure mounting check welds and foundation/base for structural cracking.	Structural cracking in base is present.
58.2			•		Ensure that proper floats and screens have been installed in vents.			
58.3			•		Check that all vents have been properly marked.			
59.1				•		Ring Buoys	Inspect for damage and proper markings. Check that marker lights function when casing is turned upright.	Watertight batteries are dead or weak and need replacing.
59.2				•	Check that lanyard lengths are correct length and are stowed properly for rapid deployment.			
60						Shore Power Connector	<u>WARNING</u>	
60.1		•			Defer PMCS when shore power operation is in progress. High voltages could cause injury or death.			
60.2		•			Visually check terminal box (exterior) for damage and corrosion. Ensure receptacle is securely fastened.			
60.3		•			Visually check cable connectors (internal) for damage and corrosion.			
							Visually check condition of cable. Check for cracked or damaged insulation.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
Mess Area								
61		•				Portable Fire Extinguisher	Inspect for tight mounting, full charge, corroded nozzle and closed valve with untampered seal and proper certification. Ensure each unit is of proper type and is marked correctly.	Extinguisher is damaged or seal is broken. Certification is out of date.
62						Microwave Oven	CAUTION Never use abrasive or harsh cleaners of scouring pads. Damage to oven will result.	
62.1		•				Exterior Surfaces	Clean the outside of the oven of grease and soil build-up with mild soap and water; rinse and dry with a soft cloth. Do not use any type of household or abrasive cleaner.	
62.2		•				Interior	Check for odors. Odors can be eliminated from the inside of the oven by boiling a solution of one cup of water and several tablespoons of lemon juice in the oven for 5 to 7 minutes. Wipe out excess moisture after every use.	
							CAUTION Handle turntable support carefully. If dropped, damage to turntable support will result.	
62.3			•			Turntable Support	Remove turntable and turntable support for cleaning. Clean floor of oven with mild soap and water; rinse and dry with a soft cloth. Clean turntable and support in mild sudsy water or in dishwasher. Dry with a soft cloth.	
62.4			•			Touch Control Panel	CAUTION Oven door must be open when cleaning Touch Control Panel to prevent oven operation. Operation of oven without any contents will result in permanent damage to oven.	
62.5			•			Vents	Clean vents by wiping with soft cloth.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
Crew Rest Areas (includes berthing and sanitary spaces)								
63						Berthing Area		
63.1			•			Portable Fire Extinguisher	Inspect for tight mountings, full charge, corroded nozzle and closed valve with untampered seal and proper certification. Ensure each unit is of proper type and is marked correctly.	Extinguisher is damaged or seal is broken. Certification is out of date.
63.2			•			Latching and Securing Devices	Inspect all cabinet doors and drawers for latching devices that will provide adequate restraint while underway.	Latching devices missing.
64.1			•			Sanitary Spaces (Shower Drain)	Visually inspect all faucets on wash basins and showers for leaks. Inspect shower and wash basin drains to ensure they are unstopped. If Class III leakage is observed refer to supervisor or unit maintenance.	Class III leaks or
64.2	•					Toilet	Inspect incinerator toilet for damage and ensure that it is clean. Clean the unit using a damp cloth.	Damage to incinerator toilet.
64.3	•						Empty the ashpan as frequently as required.	
64.4				•			Check level of catalyst and stir it. Add catalyst if needed.	
64.5	•					Urinal	Inspect urinal for damage and ensure that it is clean. Clean the unit using a damp cloth.	
64.6	•						Empty the ashpan frequently as required.	
64.7				•			Check level of catalyst and stir it. Add catalyst if needed.	
Generator Room								
65						Ship Service Diesel Generator Set		
65.1	•						Check the engine and generator for debris, foreign objects, leaks, loose or broken fittings, guards and components.	Debris, foreign objects wedged or lodged in components.

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
65						Ship Service Diesel Generator Set Continued		
65.2		•				Generator Cleanliness	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.3					•	Exciter Stator	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.4					•	Exciter Rectifier Bridge	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.5					•	Exciter Rotor	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.6					•	Main Rotor	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.7					•	Main Stator	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
						Generator Engine	<p style="text-align: center;">NOTE</p> <p>The procedures provided below should be performed every 3 months or 250 hours (whichever comes first).</p>	
65.8			•			Air Intake System	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.9			•			Battery Specific Gravity Checking	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
65						Generator Engine Continued		
65.10			•			Battery Terminal Connections	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.11			•			Coolant System	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.12			•			Engine Mounts	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.13			•			Lubricating Oil and Filter Change	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.14			•			Wiring Inspection	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.15			•			Zinc Plug	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
						Generator Engine Continued	NOTE The procedures provided below should be performed every 6 months or 500 hours (whichever comes first).	
65.16				•		Air Cleaner	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.17				•		Cooling System	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.18				•		Fuel Filter	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.19				•		Fuel System	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
65						Generator Engine Continued	<p style="text-align: center;">NOTE</p> The procedures provided below should be performed every 6 months or 500 hours (whichever comes first).	
65.20				•		Fuel/Water Separator Element	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.21				•		Injection Pump	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.22				•		Light Duty Air Cleaner	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.23				•		Low Pressure Lines and Fuel Filter	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.24				•		Medium/Heavy Duty Element	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
						Generator Engine Continued	<p style="text-align: center;">NOTE</p> The procedures provided below should be performed every 12 months or 1000 hours (whichever comes first).	
65.25				•		Coolant Heaters	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.26				•		Drive Belt and Tension Bearing	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.27				•		Valve Adjustment	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
65						Generator Engine Continued	<p style="text-align: center;">NOTE</p> <p>The procedures provided below should be performed every 24 months or 2000 hours (whichever comes first).</p>	
65.28					•	Coolant System	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
65.29					•	Vibration Damper	See Operation and Maintenance Manual for Marine Generator Set TM55-1925-253-14&P.	
66.1			•			Power Distribution System	<p style="text-align: center;"><u>WARNING</u></p> <p>Electrical wiring, panels and components contain high voltages that can cause severe injury or death.</p> <p style="text-align: center;">NOTE</p> <p>Electrical wiring checks and services consist of visual inspections only. Observe all CAUTION and WARNING labels on electrical equipment.</p>	
66.2			•			Wiring	Visually inspect all accessible wiring, fuse terminal blocks and connections. Ensure hardware and connections are securely supported, clean and undamaged. Visually inspect cables and wiring insulations. Ensure insulation is not worn, chafed or damaged. Visually inspect conduits and shielding. Ensure conduits are securely supported and undamaged; shielding is unfrayed and properly grounded.	
66.3		•				Switchboard	Visually inspect exterior of switchboard for damaged or missing circuit breakers, meters, controls, indicators, or lights.	Any part is missing, or meters are unserviceable.

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
66						Power Distribution System Continued		
66.4			•			Panels	Inspect power and lighting panels, motor controllers and other electrical panels for secure mounting. Visually inspect panel surface for damage. Check operation of indicators and ground detection circuit.	Panel is not securely mounted or has damaged which could affect operation. Indicators or ground detection circuits do not operate.
66.5			•			Interior and Exterior Lighting	Inspect lighting fixtures for secure mountings and obvious damage. Ensure fixtures operate when turned on.	Lighting fixtures do not operate when turned on.
66.6	•					Electrical Grade Mats	<p>WARNING</p> <p>Inspect to ensure that electrical grade mats are installed in front of and behind electrical panels when applicable, switchboards, electric plant control panel, electric equipment racks, etc.</p>	
67						Battery Chargers	<p>NOTE</p> <p>Top cover of battery box must be removed to check batteries.</p>	
67.1			•				<p>Check battery charger for proper connections to battery. Ammeter should read near 0 for a trickle charge. If the reading is above 3 AMPS, refer to unit maintenance.</p> <p>NOTE</p> <p>A high reading indicates the batteries are weak and are being recharged or that one or more batteries are unserviceable.</p>	
68.1			•			Battery Box	Visually inspect battery box for obvious damage. Ensure vent is not obstructed.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
69.1			•			Batteries	<p align="center">WARNING</p> <p>Do not smoke when observing battery electrolyte level. Batteries give off fumes that can explode. Electrolyte is an acid and can cause personal injury if it contacts skin or eyes. Wear approved goggles, gloves and apron.</p> <p align="center">NOTE</p> <p>Top cover of battery box must be removed to check batteries.</p>	
69.2		•	•			Batteries, Cables and Terminals	Inspect batteries, terminals, connections, cables and vent caps for cleanliness and tightness. Clean or tighten terminal connections as required. Clean battery as required.	
69.3		•	•			Electrolyte	Check electrolyte level and check specific gravity of electrolyte with hydrometer.	
Engine Room								
70						Engine Room Engine Room and Interior Structures	<p align="center">WARNING</p> <p>Operate the ventilators to ensure hull compartments and engine room are clear of fuel fumes. Operate the blowers for at least 5 minutes before starting engine.</p>	
70.1	•						Inspect the engine room and interior structures for leaks.	Engine room is taking on water or Class III leaks develop.
							<p align="center">WARNING</p> <p>Do not use hand held aerosol canister diesel starting fluids to start engines.</p> <p>Check the engine for debris, foreign objects and loose or broken fittings.</p>	
70.2	•						Inspect the cooling system pipes and lines for leaks. If repair is necessary refer to unit maintenance.	Coolant level is low.

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
71.1	•					Fuel Oil System	Check engine fuel supply. Inspect fuel system for leaks, loose or worn hoses and loose fuel line clamps and fittings that are properly clamped and tight.	
71.2	•						Drain water and sediment from fuel storage tanks on a daily basis to ensure clean fuel only enters the fuel system.	Leaks, breads or cracks in cooling system pipes or lines.
72						Main Propulsion Engines	NOTE The procedures provided below should be performed every 6 months or 250 hours, whichever comes first.	
72.1				•		Light Duty Air Cleaner	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.2				•		Heavy Duty Air Cleaner	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.3				•		Air Intake System	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.4				•		Antifreeze Concentration	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.5				•		Battery Specific Gravity Check	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.6				•		Battery Terminal Connections	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.7				•		Belt Inspection	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.8				•		Belt Replacement	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
72.9				•		Belt Tension	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.10				•		Coolant Filter	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.11				•		Coolant System	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.12				•		Crankcase Breather Cleaning and Rechecking for Use	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.13				•		Fuel Filters/Fuel Water Separator Replacement	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.14				•		Lubricating Oil and Filter Change (Full Flow and By Pass)	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.15				•		Lubricating Oil Filter Inspection	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.16				•		Wiring Inspection	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.17				•		Zinc Plug Inspection	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
						Main Propulsion Engines Continued	NOTE The procedures provided below should be performed seasonally, as required.	
72.18				•		Antifreeze Checking	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.19				•		Engine Coolant Preheater	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.20				•		Oil Pan Heater	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.21				•		Hoses, Checking	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.22				•		Raw Water Strainer, Cleaning	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.23				•		Steam Clean the Engine	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
						Main Propulsion Engines	NOTE The procedures provided below should be performed every 12 months or 1500 hours, whichever comes first.	
72.24				•		Engine Coolant Preheater	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.25				•		Oil Pan Heater	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.26				•		Crankshaft End Clearance	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
						Main Propulsion Engines Continued	NOTE The procedures provided below should be performed seasonally, as required.	
72.27					•	Engine Mounting Bolts and Nuts	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.28					•	Engine Protection System	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.29					•	Heat Exchanger Element Cleaning	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.30					•	Hoses, Cleaning and Inspection	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.31					•	Impeller Inspection	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.32					•	Raw Water Pump Inspection	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.33					•	Raw Water Strainer Inspection/ Cleaning	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.34					•	Steam Cleaning Engine	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.35					•	Valves, Injectors, and Crossheads – Adjusting	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
						Main Propulsion Engines	NOTE The procedures provided below should be performed every 24 months or 6000 hours, whichever comes first.	
72.36					•	Coolant System	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.37					•	Fuel Pump	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.38					•	Injectors	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.39					•	Rubber Vibration Dampers	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.40					•	Thermostat	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.41					•	Throttle Travel	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.42					•	Turbocharger	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.43					•	Viscous Vibration Damper	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
72.44					•	Water Pump	See Operation and Maintenance Manual for Propulsion Plant TM55-1922-250-14&P.	
73						Reduction Gear		
73.1		•				Oil Seals	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
						Reduction Gear Continued		
73.2	•					System Oil Level	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
73.4				•		Oil and Filter Change	See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
73.5				•		Oil Screen Filter	The oil screen filter should be removed and cleaned at every oil change or sooner if necessary. See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
73.6				•		Torsional Coupling	Visually inspect the element after the first 100 hours of operation. Then every 2000 hours or six months (whichever comes first) thereafter. See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
73.7			•			Heat Exchanger	Inspect the zinc rods in the heat exchanger every 90 days. See Operation and Maintenance Manual for Propulsion Plant TM55-1925-250-14&P.	
74.1				•		Bulkhead Seal/Stuffing Box	Inspect bulkhead seal/stuffing box for adequate amount of packing material, tightness and over or under lubrication.	Leakage is excessive due to lack of packing.
75.1			•			Battery Box	Visually inspect battery box for obvious damage. Ensure vent is not obstructed.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
76.1			•			Batteries	<p>WARNING</p> <p>Do not smoke when observing battery electrolyte level. Batteries give off fumes that can explode. Electrolyte is an acid and can cause personal injury if it contacts skin or eyes. Wear approved goggles, gloves and apron.</p> <p>NOTE</p> <p>Top cover of battery box must be removed to check batteries.</p>	
76.2			•			Batteries, Cables and Terminals	Inspect batteries, terminals, connections, cables and vent caps for cleanliness and tightness. Clean or tighten terminal connections as required. Clean battery as required.	
76.3			•			Electrolyte	Check electrolyte level and check specific gravity of electrolyte with hydrometer.	
77						Battery Chargers	<p>NOTE</p> <p>Top cover of battery box must be removed to check batteries.</p>	
77.1			•				<p>Check battery charger for proper connections to battery. Ammeter should read near 0 for a trickle charge. If the reading is above 3 AMPS, refer to unit maintenance.</p> <p>NOTE</p> <p>A high reading indicates the batteries are weak and are being recharged or that one or more batteries are unserviceable.</p>	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
78						Oily Water Separator		
78.1		•				Exterior	Visually inspect unit for leaks, loose connections and damage.	Class III leaks.
78.2			•			Coalescer Element	Inspect the coalescer element using an op gauge to determine if element must be changed. See Operation and Maintenance Manual for Oily Water Separator System TM55-1925-251-14&P.	
78.3					•	Oil Detector Probe	See Operation and Maintenance Manual for Oily Water Separator System TM55-1925-251-14&P.	
78.4		•				Oil Content Bilge Alarm	Visually inspect unit for damage to controls and indicators.	Broken or missing indicators.
78.5			•			Cleaning Sensing Module Windows	The cleaning sensing module windows should be cleaned as required. The interval at which this should be accomplished can be determined only after system use. Thereafter, cleaning should be defined a regular PMCS interval. See Operation and Maintenance Manual for Oily Water Separator System TM55-1925-251-14&P.	
79		•				FLOCS Pump	Visually inspect pump and coupling for leaks, loose connections and damage.	
80		•				Oily Water Hand Pump	Visually inspect pump for leaks, loose connections and damage.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
Engine Stores Compartment								
81.1		•				Hydraulic Power Unit	Visually inspect unit for damaged, loose or missing parts or leaks.	Class III leaks or damaged or missing parts.
81.2			•			Filters	Each filter in the hydraulic system should be replaced at least once every three months. The intervals at which this should be accomplished can best be determined upon pump usage. Thereafter, lubrication should be defined a regular PMCS interval. See Operation and Maintenance Manual for Electro-Hydraulic Steering System TM55-1925-248-14&P.	
81.3					•	Suction Strainers and Magnetic Plugs	Suction strainers and magnetic plugs should be changed every 5000 hours of operation. See Operation and Maintenance Manual for Electro-Hydraulic Steering System TM55-1925-248-14&P.	
81.4	•				•	Oil Level	Oil level should be maintained in reservoirs at all times. Initially the oil should be check for contamination after the first 100 hours. Then, the oil should be changed every 3000 to 4000 hours. See Operation and Maintenance Manual for Electro-Hydraulic Steering System TM55-1925-248-14&P.	
81.5			•			Grease Fitting on Cylinder Rod and Clevis Pin	Every three months. See Operation and Maintenance Manual for Electro-Hydraulic Steering System TM55-1925-248-14&P.	
81.6			•			Grease Fittings on Hydraulic Power Unit	Every three months. See Operation and Maintenance Manual for Electro-Hydraulic Steering System TM55-1925-248-14&P.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
Tankage Space								
82		•				Bilge & Ballast Pump	Visually inspect pump and gauges for leaks, loose connections and damage.	
83		•				Fuel Oil Transfer Pump	Visually inspect pump and gauges for leaks, loose connections and damage.	
84		•				Fuel Oil Day Tank	Check for any evidence of fuel leaks.	Any fuel leaks.
85		•				Fuel Oil Manifold	Visually inspect manifold for cracks, leaks and secure mounting.	Any fuel leaks or loose mounting.
86			•			Potable Water Pressure Set	Check the condition of the pump and tank. Check for leaks or other signs of damage.	
87.1			•			Water Heater	Visually inspect heater for leaks of obvious damage.	Class III leaks or damage which could affect serviceability.
87.2					•	Pressure Relief Valve	See Operation and Maintenance Manual for Incinerator Toilet/Urinal, Galley Equipment, Electric Water Heater TM55-1925-257-14&P.	
87.3			•			Tank Draining to Eliminate Deposits	See Operation and Maintenance Manual for Incinerator Toilet/Urinal, Galley Equipment, Electric Water Heater TM55-192525-257-14&P.	
87.4					•	Anode Rod Inspection	See Operation and Maintenance Manual for Oily Water Separator System TM55-1925-251-14&P.	
88		•				Grey Water Pump	Visually inspect pump and coupling for leaks, loose connections and damage.	

Table 4-1. Unit Preventive Maintenance Checks and Services-CONT

Item No.	D	W	M	S	A	Item to be Inspected	Procedure	Not Mission Capable If:
89.1		•				Fire Pump	Visually inspect pump and coupling for leaks, loose connections and damage.	Any fluid leaks.
89.2			•			Lubricate Bearings	Lubricate the motor while it is running. The motor should be lubricated as required. The intervals at which this should be accomplished can best be determined upon pump usage. Thereafter, lubrication should be defined a regular PMCS interval.	

SECTION IV.

UNIT TROUBLESHOOTING PROCEDURES

4.14. General. This section provides information for identifying and correcting malfunctions that may develop while operating the vessel. Before performing troubleshooting, read and follow all safety instructions found in the Warning Summary at the front of this manual. This section cannot list all malfunction/symptom is not listed, or is not corrected by the listed corrective actions, notify your supervisor. These are related to topics that may be found by unit maintenance personnel.

When troubleshooting a malfunction/symptom:

- a. Find the troubleshooting procedure for the malfunction in question. Headings at top of each page show how each troubleshooting procedure is organized: MALFUNCTION/SYMPTOM, PROBABLE CAUSE (in step number order), and TEST OR INSPECTION/CORRECTIVE ACTION.
- b. Perform in the order listed until the malfunction is corrected. DO NOT perform any maintenance task unless the troubleshooting procedure tells you to do so.
- c. The format in Table 4-1 is defined as follows:

SYSTEM EVALUATED

SYSTEM COMPONENT

1. **MALFUNCTION.** A visual or operational indication that something is wrong with the item.

PROBABLE CAUSE: A procedure that could isolate the problem in a component or assembly.

TEST OR INSPECTION/CORRECTIVE ACTION: A procedure to correct the problem.

Table 4-1. Unit Level Troubleshooting.

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

4.15 LIGHTING SYSTEM

Compartment light not operable.

Defective bulkhead switch.

Replace switch (refer to 4.35 in unit level maintenance).

Table 4-1. Unit Troubleshooting.

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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4.16 FIRE PUMP**1. Pump does not deliver water.**

- a. Wrong direction of rotation.

Check the wiring diagram on the motor nameplate.

- b. Foreign matter in impeller.

Inspect impeller and remove any foreign debris impeding impeller (refer to 4.42 in unit maintenance).

2. Insufficient capacity delivered.

- a. Pump or suction pipe not completely filled with liquid.

Make sure pipe is not obstructed by foreign debris.

- b. Foreign matter in impeller.

Inspect impeller and remove any foreign debris impeding impeller (refer to 4.42 in unit maintenance).

- c. Impeller damaged or eroded.

Inspect impeller (refer to 4.42 in unit maintenance).

3. Insufficient pressure delivered.

Impeller damaged or eroded.

Inspect impeller (refer to 4.42 in unit maintenance).

4. Pump requires excessive power.

- a. Speed too high.

Check voltage at motor terminals.

- b. Wrong direction of rotation.

Check the wiring diagram on the motor nameplate.

- c. Foreign matter in impeller.

Inspect impeller and remove any foreign debris impeding impeller (refer to 4.42 in unit maintenance).

- d. Shaft bent.

Inspect shaft and replace as needed (refer to 4.42 in unit maintenance).

- e. Shaft running off center because of worn bearings or misalignment.

Replace motor (refer to 4.42 in unit maintenance).

5. Mechanical seal leaks excessively.

- a. Misalignment of pump/motor shaft.

Re-align pump/motor.

- b. Shaft bent.

Inspect shaft (refer to 4.42 in unit maintenance).

- c. Bearings worn in motor.

Replace motor (refer to 4.42 in unit maintenance).

- d. Leakage under sleeve due to gasket and o-ring failure.

Inspect gasket and o-ring and replace as needed (refer to 4.42 in unit maintenance).

- e. Shaft sleeve worn or scored due to running off center.

Check shaft alignment and replace as needed (refer to 4.42 in unit maintenance).

- f. Mechanical seal improperly installed.

Reinstall seal properly.

- g. Shaft running off center because of worn bearings or misalignment.

Check bearings for wear and replace motor as needed (refer to 4.42 in unit maintenance); check alignment of shaft.

- h. Impeller out of balance resulting in vibration.

Inspect motion of impeller and correct balance if needed (refer to 4.42 in unit maintenance).

- i. Internal misalignment of parts preventing seal washer and seat from mating properly.

Inspect pump to make sure it has not been moved or jarred.

- j. Mechanical seal was run dry.

Replace mechanical seal (refer to 4.42 in unit maintenance).

- k. Internal misalignment due to improper repairs causing impeller to rub.

Realign shaft to correct impeller rubbing (refer to 4.42 in unit maintenance).

6. Mechanical seal has short life.

- a. Shaft bent.

Inspect shaft (refer to 4.42 in unit maintenance).

- b. Impeller damaged or eroded.

Inspect impeller (refer to 4.42 in unit maintenance).

- c. Shaft running off center because of worn bearings or misalignment.

Check bearings for wear and replace motor as needed (refer to 4.42 in unit maintenance); check alignment of shaft.

- d. Impeller out of balance resulting in vibration.

Inspect motion of impeller and correct balance if needed (refer to 4.42 in unit maintenance).

- e. Internal misalignment of parts preventing seal washer and seat from mating properly.

Inspect pump to make sure it has not been moved or jarred.

- f. Mechanical seal was run dry.

Replace mechanical seal (refer to 4.42 in unit maintenance).

- g. Internal misalignment due to improper repairs causing impeller to rub (refer to 4.42 in unit maintenance).

Realign shaft to correct impeller rubbing.

7. Pump vibrates or is noisy.

- a. Speed too low.

Check the voltage at motor terminals.

- b. Speed too high.

Check the voltage at motor terminals.

- c. Foreign matter in impeller.

Inspect impeller and remove any foreign debris impeding impeller (refer to 4.42 in unit maintenance).

- d. Shaft bent.

Inspect shaft (refer to 4.42 in unit maintenance).

- e. Rotating part rubbing on stationary part internally.

Inspect rotation of shaft and realign as needed (refer to 4.42 in unit maintenance).

f. Bearings worn in motor.

Inspect bearings and replace motor as needed (refer to 4.42 in unit maintenance); check alignment of shaft.

g. Impeller damaged or eroded.

Inspect impeller (refer to 4.42 in unit maintenance).

h. Shaft sleeve worn or scored due to running off center.

Check shaft alignment and replace sleeve if needed (refer to 4.42 in unit maintenance).

i. Shaft running off center because of worn bearings or misalignment.

Check bearings for wear and replace motor as needed (refer to 4.42 in unit maintenance); check alignment as needed.

j. Impeller out of balance resulting in vibration.

Inspect motion of impeller and correct balance if needed (refer to 4.42 in unit maintenance).

8. Pump overheats and seizes.

a. Rotating part rubbing on stationary part internally.

Inspect rotation of shaft and realign as needed (refer to 4.42 in unit maintenance).

b. Bearings worn in motor.

Inspect bearings and replace motor as needed (refer to 4.42 in unit maintenance).

c. Shaft running off center because of worn bearings or misalignment.

Check bearings and replace motor as needed (refer to 4.42 in unit maintenance); check alignment of shaft.

d. Impeller out of balance resulting in vibration.

Inspect motion of impeller and correct balance if needed (refer to 4.42 in unit maintenance).

Table 4-1. Unit Troubleshooting.

MALFUNCTION/SYMP TOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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4.17 BILGE PUMP

1. Failure to pump.

- a. Speed too low.

Check voltage at motor terminals.

- b. Motor running in wrong direction.

Check the wiring diagram on the motor nameplate.

2. Reduced capacity and/or head.

- a. Clogged impeller.

Remove and clean (refer to 4.39 in unit maintenance).

- b. Excessively worn impeller.

Replace impeller (refer to 4.39 in unit maintenance).

3. Motor will not start.

- a. No electric current at motor.

Check the power supply. Turn on panel breaker and motor controller.

- b. Motor hums but will not start.

Check the pump to see that it turns freely.

- c. Motor damaged.

Replace motor (refer to 4.39 in unit maintenance).

Table 4-1. Unit Troubleshooting.

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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4.18 GREY WATER PUMP

1. Motor will not start or run.

- a. Improperly wired.

Check wiring diagram on motor.

- b. Stone or foreign object lodged in impeller.

Disassemble pump and remove foreign object (refer to 4.43 in unit maintenance).

- c. Motor defective.

Replace motor (refer to 4.43 in unit maintenance).

2. Motor runs slowly; will not get up to speed.

Motor wired improperly.

Check wiring diagram on motor; make internal wiring changes in wiring compartment.

3. Pump will not prime.

- a. Mechanical seal is leaking.

Replace seal (refer to 4.43 in unit maintenance).

- b. Pump is defective.

Replace pump (refer to 4.43 in unit maintenance).

4. Little or no discharge.

- a. Impeller plugged.

Disassemble pump and clean impeller (refer to 4.43 in unit maintenance).

- b. Rotation incorrect.

Check wiring diagram on motor and correct rotation.

- c. Impeller damaged.

Replace impeller (refer to 4.43 in unit maintenance).

- d. Motor wired incorrectly.

Check wiring diagram on motor.

- e. Casing gasket leaking.

Replace gasket (refer to 4.43 in unit maintenance).

- f. Suction and/or discharge valve closed.

Open suction and/or discharge valve.

5. Pump vibrates and/or makes excessive noise.

- a. Foreign material in pump.

Disassemble pump and clean (refer to 4.43 in unit maintenance).

- b. Impeller damaged.

Replace impeller (refer to 4.43 in unit maintenance).

- c. Worn motor bearings.

Replace motor (refer to 4.43 in unit maintenance).

6. Pump leaks at shaft.

Worn mechanical seal.

Inspect seal and replace as needed (refer to 4.43 in unit maintenance).

Table 4-1. Unit Troubleshooting.

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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4.19 POTABLE WATER PRESSURE PUMP**1. The motor will not run.**

- a. The power is not on.

Check for blown fuses and replace as necessary (refer to 3.41 in operator level maintenance).

- b. Defective motor.

Replace motor (refer to 4.40 in unit level maintenance).

2. The motor runs but no water is pumped.

- a. Inspect the following areas.

Check the pump to see if primed. Check the suction line for air leaks. Check the water level in the tanks.

- b. Defective pump.

Replace pump (refer to 4.40 in unit level maintenance).

3. The pump starts and stops too often, or cycles rapidly.

- a. Tank is waterlogged.

Check for air leaks in the upper part of the pressure tank. If tank is not leaking, the air volume control is probably faulty and should be replaced. Add air cushion to the tank (refer to 3.43 in operator level maintenance).

- b. Defective pump.

Replace pump (refer to 4.40 in unit level maintenance).

4. The pump operates normally, but falls a few pounds short of developing enough pressure to shut off.

- a. Adjustment of pressure switch is incorrect.

Adjust pressure switch (refer to 3.35 in operator level maintenance).

- b. Pressure switch faulty.

Replace pressure switch (refer to 4.40 in unit level maintenance).

Table 4-1. Unit Troubleshooting.

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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4.20 POTABLE WATER PRESSURE PUMP CONTROLLER

Controller will not operate.

- a. Controller is in "OFF" position.
Switch lever to "ON" position.
- b. Controller overload relay tripped.
Push controller "RESET" push button.
- c. Controller fuse(s) blown.

WARNING

High voltages present; before attempting any troubleshooting ensure that power being supplied from distribution panel is turned off and locked out against unauthorized start-up or else death or serious injury could occur.

Replace blown fuse(s) (refer to 3.41 in operator level maintenance).

- d. Defective controller.
Replace controller (refer to 2.20 in Direct Support level maintenance).

Table 4-1. Unit Troubleshooting.

MALFUNCTION/SYMPTOM
PROBABLE CAUSE
TEST OR INSPECTION/CORRECTIVE ACTION

4.21 FUEL SYSTEM KNIFE STRAINER

Liquid moving slowly.

Strainer is plugged.

Rotate T-handle clockwise (3) turns to clean the sides of the strainer.

Table 4-1. Unit Troubleshooting.

MALFUNCTION/SYMP TOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
----------------------	----------------	--------------------------------------

4.22 FUEL OIL TRANSFER PUMP**1. No liquid delivered.**

- a. Clogged inlet line strainer.

Check inlet line strainer for debris and clean as needed.

- b. Air leaks in inlet line.

Check line for leaks and tighten fittings as needed.

- c. Defective pump.

Replace pump (refer to 4.41 in unit level maintenance).

2. Excessive noise.

- a. Air leaks in inlet line.

Check line for leaks and tighten fittings as needed.

- b. Defective pump.

Replace pump (refer to 4.41 in unit level maintenance).

3. Insufficient liquid delivered.

- a. Air leaks in inlet line.

Check line for leaks and tighten fittings as needed.

- b. Partial air pockets or vapor lock.

Open strainer to relieve pressure.

- c. Defective pump.

Replace pump (refer to 4.41 in unit level maintenance).

4. Pump takes too much power.

- a. Operating pressure higher than specified.

Check gauge at the pump outlet.

- b. Outlet line obstructed.

Check for proper valve alignment.

- c. Defective pump.

Replace pump (refer to 4.41 in unit level maintenance).

5. Motor will not start.

Defective motor.

Replace motor (refer to 4.41 in unit level maintenance).

Table 4-1. Unit Troubleshooting.

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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4.23 FUEL OIL TRANSFER PUMP CONTROLLER**1. Controller will not operate.**

- a. Controller is in "OFF" position.

Switch lever to "ON" position.

- b. Controller overload relay tripped.

Push controller "RESET" push button.

- c. Defective controller.

Replace controller (refer to 2.20 in Direct Support level maintenance).

Table 4-1. Unit Troubleshooting.

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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4.24 FLOCS PUMP

1. Unit operates approximately 25 seconds then shuts off before all the oil is out of the engine.

- a. Oil may have too heavy viscosity due to heavyweight oil or cold oil.

Start the engine and run to heat the oil above 70°F or set the time delay switch to hold the pump engaged longer than the standard 25 second factory setting.

- b. Strainer screen may be plugged with foreign material.

Clean strainer in diesel fuel.

- c. Hose connections may not be tight at the pan plug.

Check and tighten hose to plug union connections.

2. Unit does not go into the evacuation cycle when the "CYCLE RUN" button is pushed.

- a. Wiring is broken or disconnected.

Check all wiring to be sure there are no broken or disconnected wires.

- b. Breaker is not "ON".

Turn on breaker in Lower Engine Room Panel (DP-4).

3. Evacuation is not fully completed when the unit shuts off.

- a. Flow switch may be set too high and be too sensitive to the lower stream of oil near the completion of evacuation.

Adjust flow switch.

- b. Air is entering into the suction line causing premature shut off.

Tighten all fittings and run a second cycle by resetting the cycle start button.

- c. Cold oil in the pan is slowly draining down the oil pan and allowing the FLOCS unit to shut off prematurely.

Start the engine and warm the oil above 70°F before evacuating.

4. Unit will not operate.

Defective FLOCS unit.

Replace FLOCS unit (refer to 2.18 in Direct support level maintenance).

Table 4-1. Unit Troubleshooting.

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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4.25 HIGH LEVEL ALARMS**1. Alarm sounds under normal conditions.**

Respective tank is full.

Silence alarm and clear high level condition.

2. Alarm sounds under false condition.

Defective sending unit.

Silence alarm and replace defective sending unit (refer to 4.34 in unit level maintenance).

Table 4-1. Unit Troubleshooting.

MALFUNCTION/SYMPTOM	PROBABLE CAUSE	TEST OR INSPECTION/CORRECTIVE ACTION
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4.26 MICROWAVE

Microwave inoperable.

Control panel breaker in "OFF" position.

Turn "ON" breaker at control panel.

Microwave defective.

Replace microwave.

SECTION V.

UNIT MAINTENANCE PROCEDURES

4.27. General. These general maintenance instructions contain general shop practices and specific methods you must be familiar with to properly maintain your vessel. You should read and understand these practices and methods before performing any unit maintenance tasks. Before beginning a task, find out how much repair or replacement is needed to fix the equipment. Sometimes the reason for the equipment failure can be seen right away, and complete tear down is not necessary. Disassemble equipment only as far as necessary to repair or replace broken or damaged parts.

The following "Initial Setup" information applies to each procedure:

- a. Resources are not listed unless they apply to the procedure.
- b. Personnel are listed only if more than one technician is required to complete the task. If "Personnel Required" is not listed, one technician can complete the task.
- c. All tags and forms attached to equipment must be checked to learn the reason that the equipment was removed from service. Modification Work Orders (MWOs) and Technical Bulletins (TBs) for equipment changes and updates must be applied to equipment before return to service.

4.28. Work Safety. Observe all WARNINGS and CAUTIONS. Always use power tools carefully. Protect yourself against injury. Wear eye protection and safety shoes at all times when performing maintenance. When cleaning components rubber gloves and protective clothing should be worn. When lifting heavy parts, have someone help you. Ensure that lifting/jacking equipment is working properly, is suitable for the assigned task, and is secured against slipping. Keep tools and equipment used on various components separated from those used to maintain other parts of the ST.

4.29. Inspection Instructions.

NOTE

All damaged areas should be marked for repair or replacement.

- a. All components and parts must be carefully checked to determine if they are serviceable for use, can be repaired, or must be replaced.
- b. Inspect drilled and tapped (threaded) holes for the following:
 - (1) Wear, distortion, cracks, and any other damage in or around holes.
 - (2) Threaded areas for distortion (stretching), and evidence of cross-threading.
- c. Inspect metal lines, flexible lines (hoses), and metal fittings for the following:
 - (1) Metal lines for sharp kinks, cracks, bad bends, and dents.
 - (2) Flexible lines for cuts, fraying, evidence of leakage, and loose metal fittings or connectors.
 - (3) Metal fittings and connectors for thread damage and worn or rounded hex heads.

- d. Inspect castings, forging, and machined metal parts for the following:
 - (1) Machined surfaces for nicks, burrs, raised metal, wear, and other damage.
 - (2) Inner and outer surfaces for breaks and cracks.
- e. Inspect bearings in accordance with TM-9-214.
- f. Inspect air lines, fittings, and connectors for leaks using a leak detector compound. No leakage is permissible.

4.30 Repair Instructions.

- a. Repair casting, forging, and machined metal parts using the following instructions:
 - (1) Repair minor cracked casting or forging in accordance with TM 9-237.
 - (2) Repair minor damage to machined surfaces with a fine mill file or an abrasive cloth dipped in dry cleaning solvent.
 - (3) Replace any deeply nicked machined surfaced that could affect the assembly operation.
 - (4) Repair minor damage to threaded cap screw holes with thread tap of same size to prevent cutting oversize.
- b. After repair, clean all parts thoroughly to prevent dirt, metal chips, or other foreign material from entering any working parts.

4.31 BEACON LIGHT (GENERAL ALARM).

This Task Covers: a. Replace

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Beacon Light

General Safety Instructions: See WARNING

a. Replace

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Turn off power to equipment at breaker panel.
- (2) Remove junction box cover; tag and remove all electrical leads.
- (3) Loosen (3) lens screws and rotate lens to remove.
- (4) Remove base plate screws and remove base plate from fixture.
- (5) Unscrew fixture from junction box.
- (6) Remove fixture from junction box.
- (7) Install new fixture on junction box.
- (8) Connect electrical leads as tagged.
- (9) Replace junction box cover.
- (10) Install base plate mounting screws.
- (11) Install lens and tighten retaining screws.
- (12) Turn on power and test for operation.

4.32 **BEACON LIGHT (SOUND POWERED PHONE).**

This Task Covers: a. Replace

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Beacon Light

General Safety Instructions: See WARNING

a. Replace

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Turn off power to equipment at breaker panel.
- (2) Remove retaining rings and remove lens.
- (3) Remove base plate mounting screws.
- (4) Tag and remove all electrical leads.
- (5) Remove electrical leads from stuffing tube.
- (6) Remove (2) fixture mounting bolts.
- (7) Remove fixture.
- (8) Install new lighting fixture with (2) mounting bolts.
- (9) Remove lens retaining ring.
- (10) Remove base plate mounting screws.
- (11) Install wire in stuffing tube.
- (12) Connect all electrical leads as tagged.
- (13) Install base plate mounting screws.
- (14) Install lens and retaining clamp.
- (15) Turn on power and test for normal operation.

4.33 BEACON LIGHT (MURPHY PANEL).

This Task Covers: a. Replace

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Beacon Light

General Safety Instructions: See WARNING

a. Replace (Refer to Figure 4-1)

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Turn off power to equipment at breaker panel.
- (2) Remove two lens retaining screws (1) and remove lens (2).
- (3) Tag and disconnect electrical leads from inside of Murphy Panel.
- (4) Remove fixture mounting screws (3).
- (5) Remove defective fixture.
- (6) Install new fixture using mounting screws (3).
- (7) Install all electrical leads as tagged to terminal block.
- (8) Install lens (2) using two lens retaining screws (1).
- (9) Turn on power and test for normal operation.

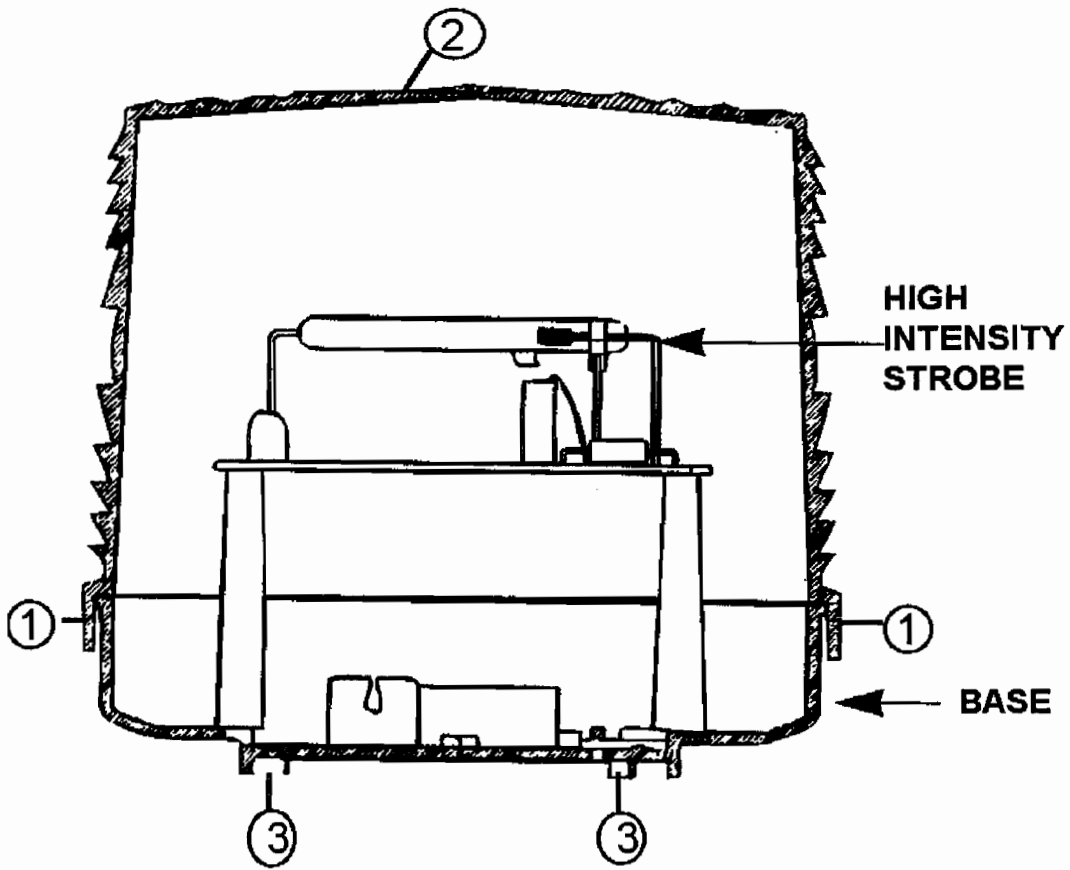


Figure 4-1. Murphy Panel Beacon Light

4.34 HIGH LEVEL ALARM(S) SENDING UNIT.

This Task Covers: a. Replace

Tools: General Mechanic's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Sending Unit

General Safety Instructions: See WARNING

a. Replace

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Turn off power to equipment at breaker panel.
- (2) Drain fluid level of tank below sending unit inlet.
- (3) Remove sending unit junction box cover.
- (4) Tag and remove sending unit leads from junction box.
- (5) Remove junction box.
- (6) Loosen union.
- (7) Remove sending unit from tank.

NOTE

Some associated sending unit piping may require disassembly depending upon application to enable sending unit to be removed from tank.

- (8) Install new sending unit in tank.
- (9) Install all removed piping to configuration prior to disassembly.
- (10) Install junction box cover.
- (11) Connect sending unit leads as tagged.
- (12) Turn on power and test for operation.

4.35 LIGHT SWITCH.

This Task Covers: a. Replace

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Light Switch

General Safety Instructions: See WARNING

a. Replace

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Turn off power to defective switch.
- (2) Remove switch cover.
- (3) Remove (2) switch mounting screws.
- (4) Tag and remove electrical leads from back of defective switch.
- (5) Install leads as marked on new switch.
- (6) Install switch in junction box using (2) mounting screws.
- (7) Replace cover.
- (8) Turn on power and test for normal operation.

4.36 NAVIGATIONAL LIGHT FIXTURE.

This Task Covers: a. Replace

Tools: General Mechanic's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Light Fixture

General Safety Instructions: See WARNING

a. Replace

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Unplug defective navigational light power cord.
- (2) Remove cord tie-downs on mast as applicable.
- (3) Remove four mounting bolts from navigational light mounting base.
- (4) Tag and remove power cord leads from defective navigational light.
- (5) Install power cord leads as tagged on new navigational light fixture.
- (6) Seal power cord opening at base of navigational light fixture with waterproof sealant.
- (7) Install navigational light on mounting base using four mounting bolts.
- (8) Install cord tie-downs on mast as applicable.
- (9) Plug in navigational light power cord to appropriate receptacle.
- (10) Turn on power and test for normal operation.

4.37 EXHAUST FLANGE GASKETS.

This Task Covers: a. Replace

Tools: General Mechanic's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Gaskets

General Safety Instructions: See WARNING

a. Replace

WARNING

Before attempting any maintenance, ensure that power supply to engine has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury could occur.

- (1) Turn off power to main engine on main panel.
- (2) Disconnect battery leads.
- (3) Remove lagging around defective gasket area.
- (4) Remove flange bolts.
- (5) Remove defective gasket.
- (6) Install new gasket.

NOTE

Some flanges may require gasket fabrication.

- (7) Install flange bolts.
- (8) Install lagging; clips will require new housing wires.
- (9) Connect battery leads.
- (10) Turn on power and test for leaks.

4.38 LEVEL INDICATORS (Potable Water Tank, Oily Water Tank, Lube Oil Tank, Dirty Oil Tank).

This Task Covers: a. Replace

Tools: General Mechanic's Tool Kit

Equipment Condition: Isolated (supply and discharge valves closed)

Materials/Parts: Replacement Level Indicators
(Sight Glass)

General Safety Instructions:

a. Replace (Refer to Figure 4-2)

- (1) Close valves at top and bottom of level indicator.
- (2) Open plug at base of level indicator to drain level indicator.
- (3) Unscrew gland nut at top and bottom.
- (4) Remove broken level indicator.
- (5) Remove O-rings from broken level indicator.
- (6) Install both gland nuts on new level indicator.
- (7) Install O-rings on either end of level indicator.
- (8) Install level indicator.
- (9) Tighten gland nuts.
- (10) Close plugs at base of level indicator.
- (11) Open valves at top and bottom of level indicator.
- (12) Check for leakage.

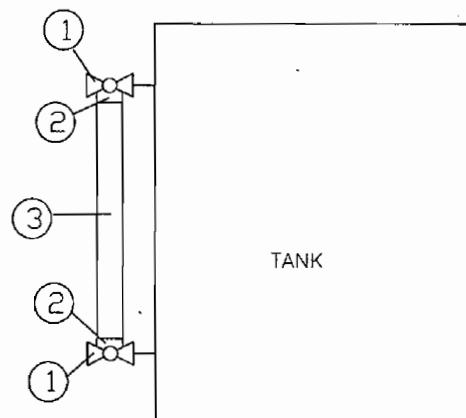


Figure 4-2. Tank Level Indicator (Sight Glass)

4.39 BILGE/BALLAST PUMP.

This Task Covers: a. Replace

Tools: General Mechanic's Tool Kit; Pipe Wrench

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Pump Motor Assembly

General Safety Instructions: See WARNING

a. Replace (Refer to Figure 4-3)

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Close suction and discharge valves.
- (2) Disconnect suction and discharge lines at flanges by removing flange bolts.
- (3) Remove associated piping.
- (4) Remove terminal box cover; disconnect and tag motor leads.
- (5) Remove four mounting bolts (1) on pump face plate mounting brackets and four mounting bolts on pump motor from base of assembly.
- (6) Remove priming line and pressure gauge.
- (7) Remove pump (2) and motor unit (3) from mounting plate.
- (8) Remove bolts from pump face plate.
- (9) Remove impeller (6).
- (10) Remove four bolts (4) from adapter plate (5).
- (11) Remove pump (2) from motor shaft.
- (12) Remove seal.
- (13) Lubricate motor shaft and install new seal from pump face plate.

NOTE

Be careful not to damage seal.

- (14) Install four bolts (4) on adapter plate (5).
- (15) Install impeller (6) on motor shaft.

- (16) Install pump housing.
- (17) Set motor (3) and pump (2) back on shock mounts.
- (18) Install piping and bolt back flanges.
- (19) Install gauge and pump priming line.
- (20) Connect wiring as tagged.
- (21) Install terminal box cover.
- (22) Open suction and discharge valves.
- (23) Energize and test for operation.

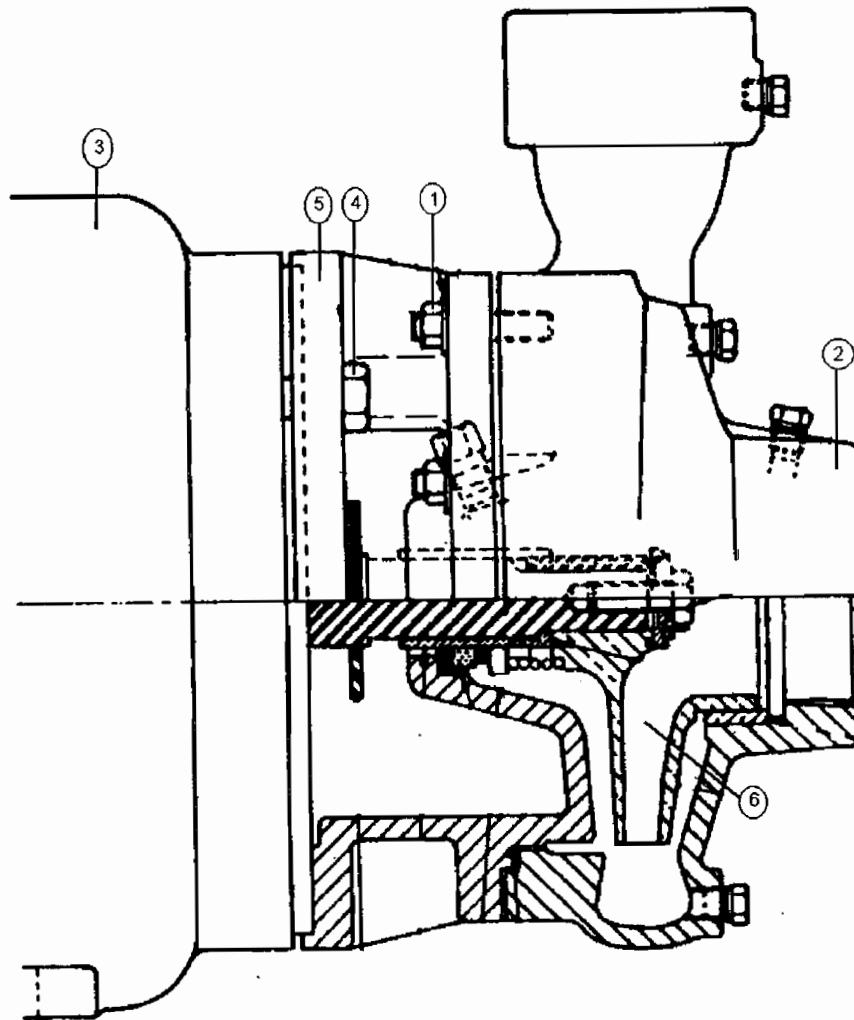


Figure 4-3. Bilge/Ballast Pump

4.40 POTABLE WATER PRESSURE PUMP.

This Task Covers: a. Replace

Tools: General Mechanic's Tool Kit; Pipe Wrench

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Motor or Pump

General Safety Instructions: See WARNING

a. Replace Motor (Refer to Figure 4-4)

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Turn off power to system.
- (2) Close all supply and discharge valves.
- (3) Remove flex couplings and remove piping from pump housing.
- (4) Remove pilot pressure line (8) between pressure set switch (1) and pump (4).
- (5) Remove pressure set switch cover.
- (6) Tag and remove pressure switch wires and motor leads.
- (7) Remove three pump and motor assembly mounting bolts from base of assembly.
- (8) Remove pump (4) and motor (2).
- (9) Remove four pump housing bolts (5).
- (10) Unscrew impeller (6) from faulty motor (2).
- (11) Remove four bolts (9) from pump face plate (7).
- (12) Carefully remove pump face plate (7) from motor (2).
- (13) Remove old seal from pump face plate (7).

NOTE

Caution should be taken not to damage new seal.

- (14) Lightly oil new motor shaft prior to installation to prevent damage.
- (15) Carefully install new seal in pump face plate (7).
- (16) Install pump face plate (7) on motor shaft.

- (17) Install four pump face plate bolts (9).
- (18) Install impeller (6) on motor shaft.
- (19) Install pump housing and four bolts (5).
- (20) Install motor and pump assembly on shock mounts with three bolts.
- (21) Install pilot pressure line (8) between pressure switch (1) and pump (4).
- (22) Install electrical leads to pressure switch (1) and motor (2) as tagged.
- (23) Install flex couplings and piping to pump housing.
- (24) Open discharge and suction valves.
- (25) Turn on power and test for normal operation.

b. Replace Pump (Refer to Figure 4-4)

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Close all supply and discharge valves.
- (2) Remove flex couplings and remove piping from pump housing.
- (3) Remove pilot pressure line (8) between pressure set switch (1) and pump (4).
- (4) Remove pressure set switch cover.
- (5) Tag and remove pressure switch wires and motor leads.
- (6) Remove three pump and motor assembly shock mounting bolts from base of assembly.
- (7) Remove pump (4) and motor (2).
- (8) Remove four pump housing bolts (5).
- (9) Unscrew impeller (6) from faulty motor (2).
- (10) Remove four bolts (9) from pump face plate (7).
- (11) Carefully remove pump face plate (7) from motor (2).
- (12) Remove old seal from pump face plate (7).

NOTE

Caution should be taken not to damage new seal.

- (13) Lightly oil new motor shaft prior to installation to prevent damage.

- (14) Install new face plate (7) with seal on motor (2).
- (15) Install new impeller (6) on motor shaft.
- (16) Install new pump housing with four mounting bolts (5) to pump face plate (7).
- (17) Install motor and pump assembly on shock mounts with three bolts.
- (18) Install pilot pressure line (8) between pressure set switch (1) and pump (4).
- (19) Install electrical leads to pressure switch (1) and motor (2) as tagged.
- (20) Install flex couplings and piping to pump housing.
- (21) Open discharge and suction valves.
- (22) Energize and test for normal operation.

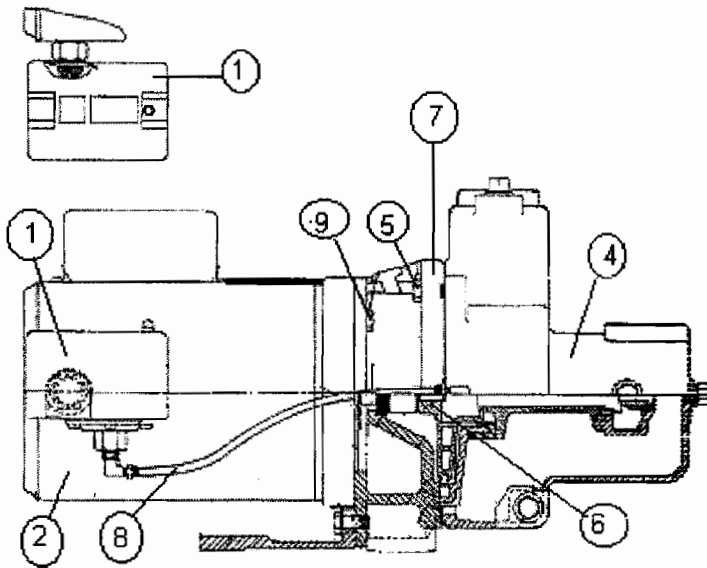


Figure 4-4. Potable Water Pressure Pump

4.41 **FUEL OIL TRANSFER PUMP.**

This Task Covers: a. Replace b. Repair

Tools: General Mechanic's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Motor, Pump, or Mechanical Seal

General Safety Instructions: See WARNING

a. Replace Motor (Refer to Figure 4-5)

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Turn off power to fuel oil transfer system.
- (2) Remove shaft guards by removing connecting bolts.
- (3) Remove four motor mount screws, tag and mark location of shims and slide motor back to clear shaft coupling.
- (4) Remove motor terminal cover plate.
- (5) Tag and disconnect motor leads and remove from terminal box.
- (6) Remove motor.
- (7) Replace shims as marked.
- (8) Install new motor by aligning motor and pump shaft coupling; mount using four mounting screws.
- (9) Install shaft guards.
- (10) Connect motor wiring leads as tagged.
- (11) Energize and check for proper motor rotation.
- (12) If rotation is incorrect turn off power.
- (13) Switch any two motor leads.
- (14) Turn on power, verify rotation and install terminal box cover plate.

b. Replace Pump (Refer to Figure 4-5)

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Turn off power to fuel oil transfer system.
- (2) Remove shaft guards by removing mounting bolts.
- (3) Close all suction and discharge valves.
- (4) Break swivel fittings on flex hose on suction and discharge sides of pump.
- (5) Remove pump mounting bolts.
- (6) Remove pump.
- (7) Remove piping from faulty pump.
- (8) Mount new pump using mounting bolts and align with the motor coupling.
- (9) Install piping on new pump.
- (10) Install shaft guards with mounting bolts.
- (11) Open suction and discharge valves.
- (12) Turn on power and test for normal operation by observing pressure gauge on discharge side of pump.

c. Repair (Mechanical Seal, Refer to Figure 4-6)

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

NOTE

When replacing or servicing a mechanical seal, take particular care not to mar or scratch the sealing surfaces or injure the bellows. If the seal has been used, do not put it back into service unless both sealing surfaces are perfectly flat and smooth or else replace.

- (1) Remove the key, cap screws and bearing cage with the stationary seal face.
- (2) Remove burrs and sharp edges from the end of shaft and keyway and clean the shaft.
- (3) Remove the seal rotating parts from the shaft.
- (4) Lubricate (with light machine oil) the section of the shaft over which the seal is to be mounted.
- (5) Slide the rotating element onto the shaft; be sure it is properly positioned against the retaining ring.
- (6) After checking the stationary seal face and o-ring, and replacing, if required, coat the sealing surface with light machine oil.
- (7) Install bearing cage and gasket and secure with cap screws.

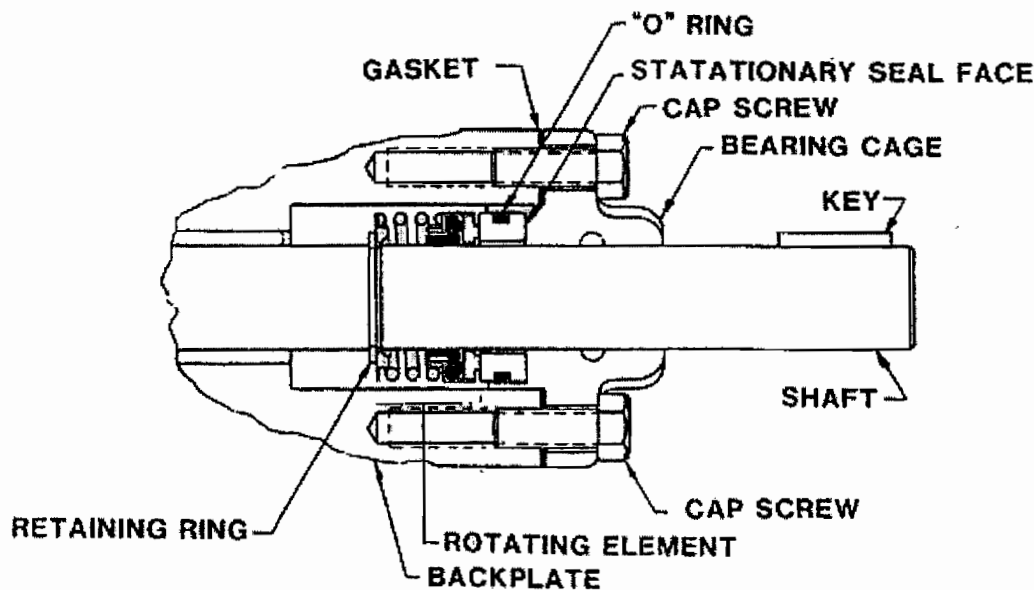


Figure 4-6. Mechanical Seal (Fuel Oil Transfer Pump).

4.42 FIRE PUMP.

This Task Covers: a. Replace b. Repair

Tools: General Mechanic's Tool Kit; Pipe Wrench

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Pump Motor Assembly

General Safety Instructions: See WARNING

a. Replace (Refer to Figure 4-7)

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Turn off power to fire pump system.
 - (2) Close suction and discharge valves.
 - (3) Disconnect suction and discharge lines at flanges.
 - (4) Remove pump housing piping.
 - (5) Remove terminal box cover; disconnect and tag motor lead wires.
 - (6) Remove pump motor assembly mounting bolts shock mounts and remove assembly.
 - (7) Install replacement pump motor assembly on shock mounts.
 - (8) Install piping and connect flanges.
 - (9) Connect motor lead wires as tagged.
 - (10) Open suction and discharge valves.
 - (11) Turn on power and test for proper rotation.
 - (12) If pump operates in wrong direction, de-energize and switch any two leads.
 - (13) Turn on power and test for proper rotation.
 - (13) Replace terminal box cover.
- b. Repair
- (1) Close suction and discharge valves.
 - (2) Disconnect suction and discharge lines at flanges.

- (3) Remove pump housing piping.
- (4) Remove terminal box cover; disconnect and tag motor lead wires.
- (5) Remove pump motor assembly mounting bolts shock mounts and remove assembly.
- (6) Remove cap casing screws (6 and 7) which hold casing (19) to adapter (3).
- (7) Pry casing (19) from adapter (3) with pry bar or large screwdriver and remove casing.
- (8) Using a suitable holder to keep impeller (14) from turning, remove impeller cap screw washer (16) and gaskets. Be careful not to damage precision surfaces of impeller.
- (9) Remove impeller (14) and impeller key (10) from shaft.
- (10) With impeller and key removed, the shaft sleeve (8) and the mechanical seal assembly (9) can be removed as a unit.
- (11) Remove adapter cap screws (6 and 7) that hold adapter to motor or frame.
- (12) Remove adapter (3) from motor (1) by prying with pry bar or screw driver.
- (13) With adapter removed, the seal (9) and seat ring (5) can be pushed out with the fingers.
- (14) Stainless steel adapter ring (4) can be removed from rear with a drift pin and a hammer. (Casing may be used as a support).
- (15) Casing ring (25) can be removed through the suction opening by the same method as for the adapter ring. Use a specially sharpened drift pin or split the ring by drilling holes in it.

CAUTION

Do not strike the shaft, impeller, or shaft sleeve with a hammer. This will damage the ball bearing and may bend the shaft.

NOTE

Make sure all of the parts are ready for assembly. This means no dirt or pieces of old gasket in the joints between the motor, adapter and casing. Make sure the parts around the mechanical seal are clean. Dirt and misalignment will ruin a mechanical seal.

- (16) Install the shaft sleeve o-ring (2) in place against the motor shaft shoulder. Do not let it be cut by the sharp edges of the keyway.
- (17) Press in the adapter ring (4), beveled edge first, using a pressing tool which will hold the ring square with the adapter bore. A little molybdenum disulfide lubricant will ease pressing. Be careful not to gouge or distort the ring.
- (18) Push the mechanical seal seat (5) squarely into the adapter. Use fingers only. A little oil can be wiped on the outside of the seat ring to make it slip easily in to position. Do not install the adapter on the motor face yet.

- (19) Check the shaft sleeve (8) fit on the motor. It should slide easily into place. If it does not, find out why. Do not try to drive the shaft sleeve on to the shaft with a hammer. Check to make sure there are no score marks or scratches on the sleeve.
- (20) Install the adapter (3) and tighten the cap screws that hold it to the motor face. Make sure the nameplate is properly positioned.
- (21) Remove any dirt particles and coat the lapped face of the mechanical seal seat with clean SAE 10 or SAE20 oil. DO NOT USE GREASE.
- (22) Slide the shaft sleeve (8) on the shaft (1) so that it covers the shaft sleeve o-ring (2) and butts against the shoulder.
- (23) Coat the shaft sleeve (8) lightly with clean oil or grease.
- (24) Carefully remove any particles from the lapped face of the carbon washer (part of the mechanical seal) and coat it with clean SAE 10 or SAE 20 oil. DO NOT USE GREASE.
- (25) Install the mechanical seal (9) on the shaft sleeve (8) by hand. A twisting motion may be needed to make it ride smoothly over the shoulders on the sleeve. Push it by hand until it contacts the seat. Make sure the spring and spring holder line up properly.
- (26) Install the snap ring (11) using one hand to hold the snap ring pliers and the other hand to compress the spring. When the spring pressure is released, the spring will push the shaft sleeve o-ring to view temporarily.
- (27) Install the impeller key (10), first twisting the shaft sleeve on the shaft until both keyways line up.
- (28) Install the shaft sleeve gasket (12).
- (29) Place the impeller (14) on the shaft engaging the key.
- (30) Put the screw gasket (17), impeller washer (16), and impeller washer gasket (15) together on the impeller screw (18) as a subassembly.
- (31) Install the impeller screw (18) subassemblies. With one hand, push the impeller (14) back against the mechanical seal spring (21) and with the other hand turn the impeller screw (18) in band tight.
- (32) Now check to see if the shaft sleeve (8) had moved to its final position covering most of the shaft sleeve o-ring (2). If the impeller screw (18) or inducer has to be tightened with a wrench to make the shaft sleeve cover the shaft sleeve o-ring (2), then the oil will be squeezed out from between the carbon washer and the mechanical seal (9). This means that the impeller must be taken off and the sleeve must be pulled back so that more oil can be put on the carbon washer and mechanical seal seat faces.
- (33) Tighten the impeller screw (18) and lubricate the threads.
- (34) Install the casing gasket (13) on the shoulder of the adapter.
- (35) Install the casing (19) and tighten all casing cap screws (6 and 7).

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- (36) Turn the motor shaft (1) and check for any bindings or rubs caused by such things as damaged or misaligned parts. Any such conditions must be corrected before the pump is run.
- (37) Install pump motor assembly on shock mounts.
- (38) Install piping and connect flanges.
- (39) Connect motor lead wires as tagged.
- (40) Open suction and discharge valves.
- (41) Turn on power and test for proper rotation.
- (42) If pump operates in wrong direction, de-energize and switch any (2) leads.
- (43) Turn on power and test for proper rotation.
- (44) Replace terminal box cover.

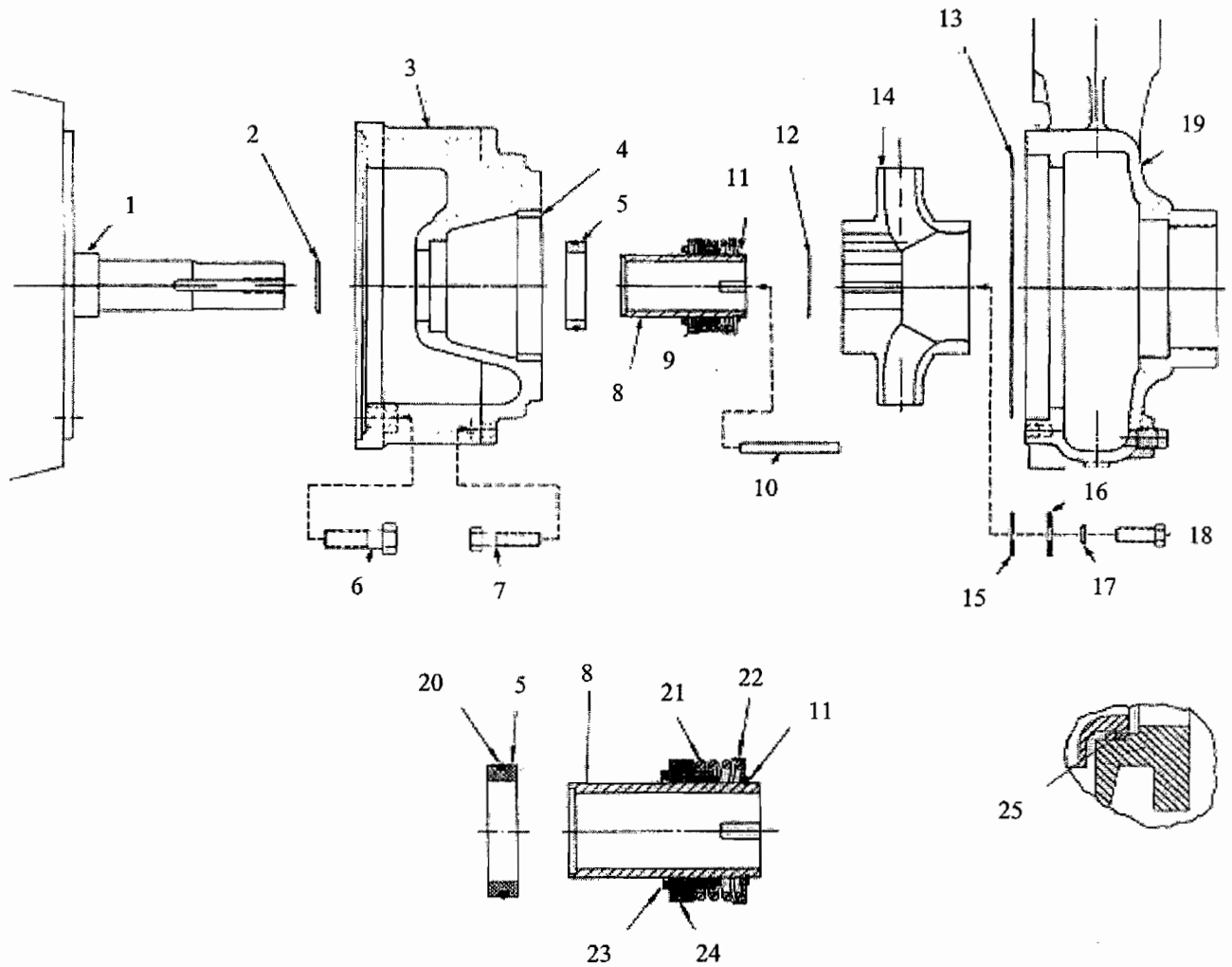


Figure 4-7. Fire Pump

4.43 GREY WATER PUMP.

This Task Covers: a. Replace b. Repair

Tools: General Mechanic's Tool Kit; Pipe Wrench

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Pump Motor Assembly

General Safety Instructions: See WARNING

a. Replace (Refer to Figure 4-8)

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Turn off power to greywater pump system.
- (2) Close suction and discharge valves.
- (3) Disconnect suction and discharge lines at flanges.
- (4) Remove associated piping.
- (5) Remove terminal box cover; disconnect and tag motor leads.
- (6) Remove (4) mounting bolts on pump motor.
- (7) Remove pump and motor unit from bed plate.
- (8) Remove bolts from pump face plate.
- (9) Remove impeller.
- (10) Remove (4) bolts from adapter plate.
- (11) Remove pump from motor shaft.
- (12) Remove seal.
- (13) Lubricate motor shaft and install new seal from pump face plate.

NOTE

Be careful not to damage seal.

- (14) Install (4) bolts on adapter plate.
- (15) Install impeller on motor shaft.

- (16) Install pump housing.
- (17) Set motor and pump back on shock mounts.
- (18) Install piping and bolt back flanges.
- (19) Connect wiring as tagged.
- (20) Install terminal box cover.
- (21) Open suction and discharge valves.
- (22) Turn on power and test for operation.

b. Repair (Mechanical Seal, Refer to Figure 4-8)

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Unthread capscrews (2, 5, 7, 19) and remove casing (16) and o-ring (8).
- (2) Unscrew impeller locknut (15) from the motor shaft (locknut unscrews counter-clockwise looking at the motor shaft).
- (3) Unscrew impeller (13) from motor shaft. Remove the impeller o-ring (14) and clear all sediment from impeller. Inspect the impeller o-ring; replace if deeply scarred or worn. Also, remove shims (9) but **DO NOT LOSE ANY SHIMS**.
- (4) Pry seal seat from recess of impeller.
- (5) Remove the adapter (3) and casing (16) from the rear of the casing cover (6).
- (6) Press seal cartridge (10,11) from the rear of the casing cover.
- (7) Clean casing cover (6) and impeller seal recesses and motor shaft. Make certain all surfaces are perfectly clean before installing new seal parts.

CAUTION

Handle seal parts with extreme caution and keep them clean. Do not touch seal faces (either ceramic or carbon) with your hands. Do not apply lubricants on seal faces. This could cause a leak or premature seal failure.

- (8) Apply a light coat of sealing compound to new seal cartridge and press it into the casing cover recess using the proper size tube or installation tool. **DO NOT** press on carbon face or top of metal cup of the seal cartridge. Install using flange only.
- (9) Slide the adapter (3) and casing cover assembly (6) onto the motor shaft and mounting face. Fasten with (4) fasteners.
- (10) Press new seal seat squarely into the impeller recess. Avoid scratching the ceramic surface.

NOTE

Use a soft, clean piece of cloth on seal seat face when installing to prevent marring.

- (11) Replace any shim washers (9) that may have been removed in disassembly. Screw the impeller (13) back in place, tightening until it is firmly seated.
- (12) Install the impeller o-ring (14) and install and tighten impeller locknut (15).
- (13) Install o-ring seal on casing cover rabbet. Mount casing with fasteners (2, 5, 7, 19).
- (14) Turn on power and test for normal operation.

NOTE

Always flush pump thoroughly before use so as not to contaminate liquid being pumped.

CAUTION

If the impeller is replaced, the seal assembly should also be replaced as the seal is usually damaged in disassembly.

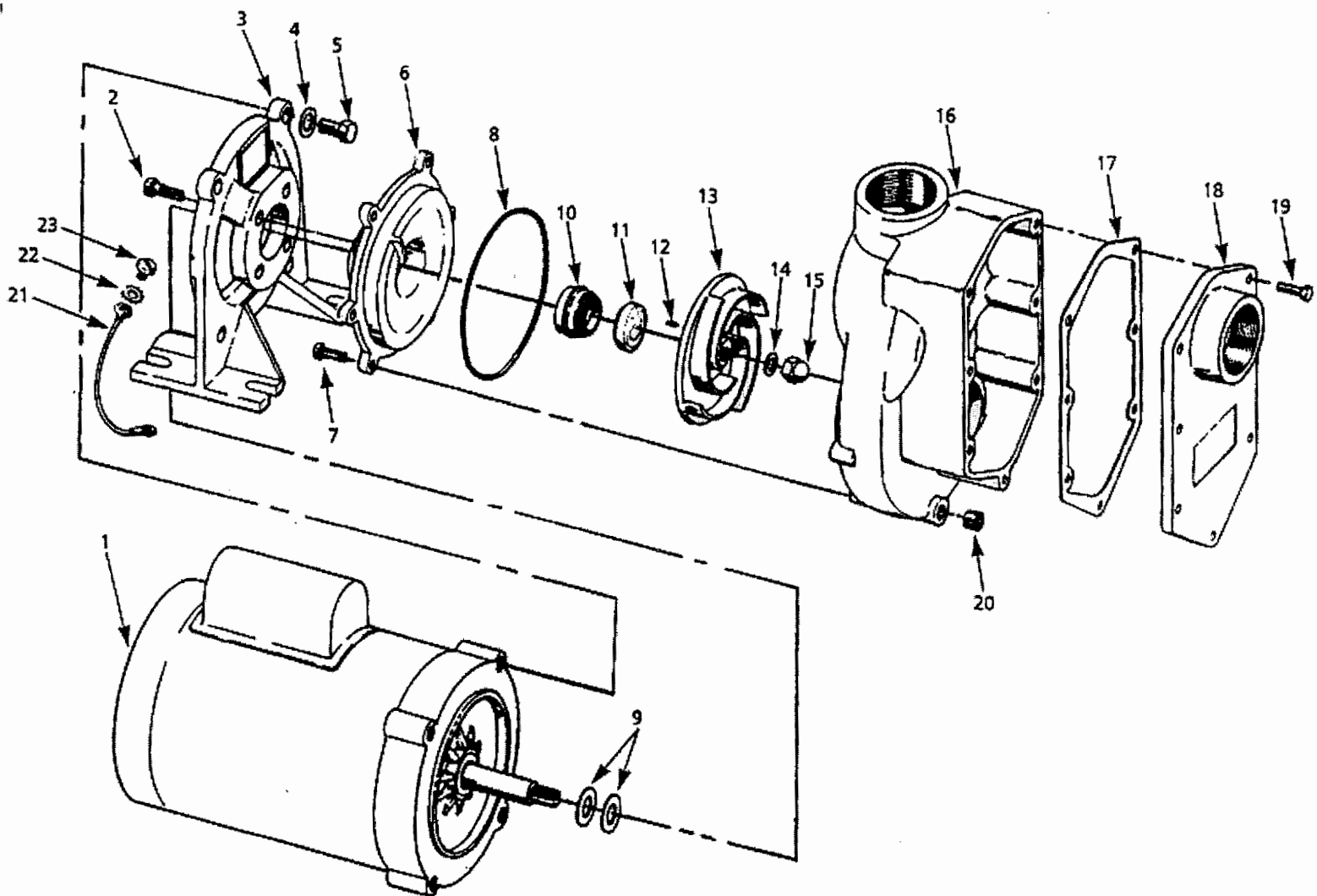


Figure 4-8. Grey Water Pump Assembly

4.44 FIRE PUMP START/STOP BUTTONS (PILOT HOUSE).

This Task Covers: a. Replace

Tools: Electrician's Tool Kit

Equipment Condition: Isolated, de-energized and locked-out

Materials/Parts: Replacement Start/Stop button

General Safety Instructions: See WARNING

a. Replace

WARNING

Before attempting any maintenance, ensure that power supply has been disconnected and locked out against unauthorized accidental start-up or else death or bodily injury due to electrical shock could occur.

- (1) Place controller in OFF position.
- (2) Remove push button from console by unscrewing the lock nut.
- (3) Remove push button from console; disconnect and tag all electrical leads.
- (4) Connect all electrical leads as tagged to new push button.
- (5) Install new push button in console.
- (6) Turn on power and test for normal operation.

SECTION VI.

PREPARATION FOR STORAGE AND SHIPMENT

4.45. General. Reference Chapter 2, Section 3, Paragraph 2.29.

4..1 Special Instructions For Administrative Storage. Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period, appropriate maintenance records shall be kept. Before placing the equipment in administrative storage, current preventive maintenance checks and services should be completed, shortcomings and deficiencies should be corrected, and all Modification Work Orders (MWOs) should be applied. Storage site selection: Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans, conex containers, and other containers may be used.

APPENDIX A

REFERENCES

A-1. SCOPE. This appendix lists all forms, field manuals, technical manuals and miscellaneous publications referenced in this manual and/or required for operation and maintenance.

A-2. FORMS.

Recommended Changes to Publications and Blank Forms	DA Form 2028
Recommended Changes to Equipment Publications and Blank Forms	DA Form 2028-2
The Army Maintenance Management System (TAMMS-A)	DA Pam 738-750
Product Quality Deficiency Report	SF 368
Warranty Information Logbook	DA Form 2408-9
Equipment Inspection and Maintenance Worksheet	DA Form 2404
Modified Table of Organization and Equipment	MTOE

A-3. FIELD MANUALS.

First Aid For Soldiers.....	FM 21-11
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A-4. TECHNICAL MANUALS.

Depreservation and Reactivation Instructions	TB 740-97-4
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Alarm Panels for Tank Level, Bilge Level, Carbon Monoxide and Watertight Doors.....	TM55-1925-246-14&P
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Main Generator Switchboard	TM55-1925-247-14&P
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Electro-Hydraulic Steering System	TM55-1925-248-14&P
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Manual Control Searchlight, Navigational Aids/Equipment.....	TM55-1925-249-14&P
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Propulsion Plant	TM55-1925-250-14&P
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Oily Water Separator System	TM55-1925-251-14&P
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Heating, Ventilation and Air Conditioning System.....	TM55-1925-252-14&P
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Marine Generator Set.....	TM55-1925-253-14&P
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for CO2 Fire Suppression System and Fire Alarm System.....	TM55-1925-254-14&P
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Communication Equipment	TM55-1925-255-14&P
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Capstans and Winches.....	TM55-1925-256-14&P
Operator, Unit, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Incinerator Toilet/Urinal, Galley Equipment, Electric Water Heater	TM55-1925-257-14&P

APPENDIX B

MAINTENANCE ALLOCATION CHART (MAC)

SECTION I.

INTRODUCTION

B-1 General.

a. This introduction provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

b. The Maintenance Allocation Chart (MAC) in section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Unit – includes two sub-columns, C (operator/crew) and O (unit maintenance).

Direct Support – includes an F sub-column.

General Support – includes an H sub-column.

Depot – includes a D sub-column.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2. Maintenance Functions. Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item/end item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one which is certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove an item when required to perform service or other maintenance functions.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the 3rd position code of the Source Maintenance and Recoverability (SMR) code.

i. Repair. The application of maintenance services¹, including fault location/troubleshooting², removal/installation, and disassembly/assembly³ procedures, and maintenance actions⁴ to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e. DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

B-3. Explanation of Columns in the MAC, Section II

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group shall be "00."

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2.

¹ Services – Inspect, test, service, adjust, align, calibrate, and/replace.

² Fault location/troubleshooting – The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

³ Disassembly/assembly – The step by step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration.

⁴ Actions – Welding, grinding, riveting, straightening, facing, machining, and or resurfacing.

d. Column 4, Maintenance Level. Column 4 specifies each level of maintenance authorized to perform each function listed in Column 3, by indicating work time required (expressed as man-hours in whole hours or decimals) in the appropriate subcolumn. This work-time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work-time figures are to be shown for each level. The work-time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

C	Operator or crew maintenance
O	Unit maintenance
F	Direct support maintenance
L	Specialized Repair Activity (SRA)
G	General support maintenance
D	Depot maintenance

e. Column 5, Tools and Test Equipment reference code. Column 5 specifies, by code, those common tool sets (not individual tools), common TMDE, and special tools, special TMDE, and support equipment required to perform the designated function. Codes are keyed to tools and test equipment in section III.

f. Column 6, Remarks. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks contained in section IV.

B-4. Explanation of Columns in Tools and Test Equipment Requirements, Section III.

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code in the MAC, Section II, Column 5.

b. Column 2, Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number, model number, or type number.

B-5. Explanation of Columns in Remarks, Section IV.

a. Column 1, Remarks Code. The code recorded in column 6, Section II

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

**SECTION II.
U.S. ARMY SMALL TUG MAINTENANCE ALLOCATION CHART**

The MAC is provided in the pages that follow.

APPENDIX B MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
00	SMALL TUG								
01	HULL & STRUCTUAL								
0101	DOOR WEATHERTIGHT	INSPECT SERVICE	0.5 0.5						
0102	DOOR WEATHERTIGHT	INSPECT SERVICE	0.5 0.5						
0103	DOOR WATERTIGHT	INSPECT SERVICE	0.5 0.5						
0104	DOOR WATERTIGHT	INSPECT SERVICE	0.5 0.5						
0105	DOOR WATERTIGHT	INSPECT SERVICE	0.5 0.5						
0106	DOOR WATERTIGHT	INSPECT SERVICE	0.5 0.5						
0107	DOOR WATERTIGHT	INSPECT SERVICE	0.5 0.5						
0108	DOOR WATERTIGHT	INSPECT SERVICE	0.5 0.5						
0109	SCREEN, CLEARVIEW	INSPECT SERVICE	0.5 0.5						
0110	WINDOWS	INSPECT SERVICE	0.5 0.5						
0111	HATCHES	INSPECT	0.5						
02	PROPULSION SYSTEM	INSPECT	1						
0201	ENGINE, MAIN DIESEL	TESTING SERVICE REMOVE		2 1		12	1,3,4 2	B C D	

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
020101	BLOCK,CYLINDER	REPLACE	.			24		2	A
		INSPECT	1					5	E
		SERVICE REPLACE REPAIR		1		8	24		F
02010101	LINER,CYLINDER	INSPECT			1			9,12,13	K
		REMOVE			1			8	J
		REPLACE			2			10,11	L
020102	PULLEY,ACCESSORY DR	INSPECT		1					
		REMOVE	1					14	M
		REPLACE REPAIR	1					15	N
020103	GEAR,IDLER	INSPECT			1				
		REPLACE			2				
		REPAIR			2				
020104	GEAR,IDLER	INSPECT			1				
		REPLACE			2				
		REPAIR			2				
020105	CRANKSHAFT,ENGINE	INSPECT			1				P
		REMOVE			9			16	Q
		REPLACE			17				
		REPAIR			4				
020106	LEVER,ROCKER	INSPECT	1						
		SERVICE			1			19	S
		REMOVE			1			20	T
		REPLACE			1			16	U
020107	LEVER,REMOTE CONTROL	INSPECT	1						
		REPLACE			1				
		REPAIR			1				
020108	PUMP,LUBE OIL	INSPECT			1			3	BB
		TEST			1			22	DD
		REMOVE			1			21	CC
		REPAIR			2				

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MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
020109	BREATHER,CRANKCASE	INSPECT	1					23	EE
		TEST		1					
		REMOVE		1					
020110	DAMPER,VIBRATION	INSPECT	1					24	FF
		REMOVE		1					
		REPLACE		2					
		REPAIR		2					
020111	ALTERNATOR	INSPECT	1					26	HH
		TEST		1					
		REMOVE	1					25	GG
		REPLACE	1						
020112	PANEL,INSTRUMENT	INSPECT	1					10	JJ
		SERVICE	1						
020113	HOUSING,FLYWHEEL	INSPECT	1					28	LL
		REMOVE		2					
		REPLACE		3					
		REPAIR		3					
020114	PUMP,FUEL	INSPECT	1					4,30,34,36 32,35 31	MM,RR PP,QQ NN
		TEST		1					
		SERVICE		1					
		REPLACE		2					
020115	FLYWHEEL	INSPECT	1						
		REPLACE			7				
		REPAIR			3				
020116	CORE,COOLER								
020117	CORE,AFTERCOOLER	INSPECT		1					
		REMOVE		2					
		REPLACE		2					
020118	THERMOSTAT&HOUSING	INSPECT	1						
		REPLACE	1						
020119	HEAD,LUBO FILTER	INSPECT	1						
		SERVICE	1						

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
020120	ELEMENT,LUBE OFLTR	INSPECT	1					40	TT
		REMOVE	1					27	UU
		REPLACE	1						
020121	HEAD,BYPASS OFLTR	INSPECT	1						
		SERVICE	1						
020122	ELEM,BYPASS OFLTR	INSPECT	1						
		REMOVE	1					27	VV
		REPLACE	1						WW
020123	PAN,OIL	INSPECT	1						
		SERVICE	2						
		REPLACE	3						
020124	ROD,ENGINE CONN	REPLACE			4			45	XX
		REPAIR			3				
020125	KIT,ENGINE PISTON	TESTING			1				
		REPLACE			10				
		REPAIR			10				
02012501	SET,PISTON RING	INSPECT			1			44	ZZ
		REPLACE			13			42,43	YY
020126	CAMSHAFT	REMOVE			12				
		REPLACE			22				
02012601	GEAR,CAMSHAFT	INSPECT			1				
		REMOVE			1			45	AAA
020127	HEAD,CYLINDER	INSPECT			1			5	BBB
		TEST		1				46,50,51	CCC
		REMOVE			3			47,48,49,52	DDD
		REPAIR			2				
020128	INJECTOR	INSPECT	1					58	HHH
		REMOVE	1					56	JJJ
		REPLACE	1						
020129	KIT,TURBOCHARGER	INSPECT		1				3,60	LLL
		REPLACE		2					
		REPAIR			4				

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
020130	MANIFOLD,EXHAUST	INSPECT	1						
		REMOVE		2					
		REPLACE		2					
020131	MOTOR,STARTING	INSPECT	1				29	MMM	
		TEST		1					
		REMOVE		1					
		REPLACE		1					
020132	FILTER ELEM, FLUID	INSPECT	1						
		REMOVE	1						
		REPLACE	1						
020133	OIL, COOLER	INSPECT		1					
		TEST		1					
		REPLACE		1					
		REPAIR			2				
020134	HEAD,FUEL FILTER								
02013401	FILTER,FUEL	REPLACE	1				27	KK	
020135	PICKUP, MAGNETIC	INSPECT	1				29		
		REPLACE	1.5						
020136	ASSY,AFC	INSPECT	1				37,38		
020137	HEAT EXCHANGER,LUBO	INSPECT	1.5						
		SERVICE	2						
020138	PUMP,SEA WATER								
020139	PUMP,WATER	INSPECT	1.5						
		SERVICE	2						
		REPLACE		1					
020140	AIR CLEANER	INSPECT	1.5						
		SERVICE	1						
020141	MAGNETIC SWITCH								
020142	GASKET SET								
020143	GASKET KIT								

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level				(5) Tools and Equipment Ref Code	(6) Remark Code	
			Unit		Direct Support	General Support			Depot
			C	O	F	H			D
020144	INJECTOR								
0202	GEAR, REDUCTION	INSPECT	0.5					LZ	
0203	SHAFTING, PROP	INSPECT REPAIR	0.5					RRR	
0204	PROPULSION CONT SYS	INSPECT REPAIR	0.5		1			RRR	
0205	KORT NOZZLE/ STRUT	INSPECT REPAIR				0.5		RRR	
0206	EXHAUST SYSTEM	INSPECT REPAIR	0.5	1					
03	GENERATOR SET,SHIP	INSPECT TEST SERVICE	0.5 0.5 1						
0301	GENERATOR	INSPECT TEST REMOVE REPLACE	0.5			0.5 2 4		AZ AZ AZ AZ	
030101	ASSY,ROTOR	INSPECT TEST REMOVE REPLACE				0.5 1 1 2		AZ AZ AZ AZ	
0302	ENGINE,DIESEL	INSPECT SERVICE REMOVE REPLACE	0.5 1			9 18		AZ AZ AZ AZ	
030201	BLOCK, CYLINDER	INSPECT SERVICE REPLACE REPAIR				0.5 2 18 9		AZ AZ AZ AZ	
03020101	BUSHING,CAMSHAFT	REMOVE				9		AZ	

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
03020102	KIT,BLOCK	REPLACE				11		AZ	
		TEST				1		AZ	
		REMOVE REPLACE				1 2		AZ AZ	
030202	CRANKSHAFT	SERVICE				2		AZ	
		REPLACE				8		AZ	
		REPAIR				3		AZ	
03020201	GEAR,CRANKSHAFT	INSPECT				0.5		AZ	
		REMOVE				1		AZ	
		REPLACE				1		AZ	
030203	ROD ASSY,ENG CONN	REPLACE				9		AZ	
		REPAIR				2		AZ	
030204	ASSY,ENG PISTON	TEST				1		AZ	
		REPLACE				9		AZ	
		REPAIR				2		AZ	
030205	CAMSHAFT	REMOVE				8		AZ	
03020501	GEAR,CAMSHAFT	INSPECT				1		AZ	
		REMOVE				1		AZ	
		REPLACE				1		AZ	
030206	HOUSING,GEAR	INSPECT			0.5			AZ	
		REMOVE				1.5		AZ	
		REPLACE				3		AZ	
		REPAIR				1		AZ	
030207	COVER,ACCESS	INSPECT		0.5				AZ	
		REPLACE				1		AZ	
		REPAIR				1		AZ	
030208	HEAD,CYLINDER	INSPECT				1		AZ	
		TEST				1		AZ	
		SERVICE				1		AZ	
		REPAIR				3		AZ	

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MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level				(5) Tools and Equipment Ref Code	(6) Remark Code	
			Unit		Direct Support	General Support			Depot
			C	O	F	H			D
030209	HSG,ROCKER LEVER	INSPECT SERVICE			0.5 1			AZ AZ	
030210	HSG,CAM FOLLOWER	INSPECT REPLACE REPAIR				0.5 2 2		AZ AZ AZ	
030211	ASSY, FUEL PUMP	INSPECT TEST SERVICE REPLACE REPAIR		0.5 1 1 3 2				AZ AZ AZ AZ AZ	
030212	ACTR, ELEC GOVERNOR	INSPECT REPLACE REPAIR					1 2	AZ AZ AZ	
030213	ASSY,INJECTOR	INSPECT SERVICE REMOVE			0.5		1 1	AZ AZ AZ	
030214	FILTER,FUEL	INSPECT SERVICE REMOVE REPLACE	0.5 0.5 0.5 0.5					AZ AZ AZ AZ	
030215	PAN,OIL	INSPECT REPLACE		0.5	1			AZ AZ	
030216	FILTER,LUBO	INSPECT SERVICE REMOVE REPLACE	0.5 0.5 0.5 0.5					AZ AZ AZ AZ	
030217	ASSY,OIL COOLER	INSPECT TEST REMOVE REPLACE		0.5	0.5 3 6			AZ AZ AZ AZ	
030218	PUMP,LUBE OIL	INSPECT TEST		0.5	0.5			AZ AZ	

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code	
			Unit		Direct Support	General Support	Depot			
			C	O	F	H	D			
030219	ASSY,WATER PUMP	REMOVE			2				AZ	
		REPAIR			1				AZ	
		INSPECT		0.5						AZ
		TEST			0.5					AZ
030220	THERMOSTAT	REPLACE			3				AZ	
		REPAIR			2				AZ	
030221	RESISTOR,CORROSION	TEST	0.5						AZ	
		REPLACE	0.5						AZ	
030222	CLEANER,AIR	INSPECT	0.5						AZ	
		SERVICE		1					AZ	
030223	PUMP, SUMP	INSPECT		0.5					AZ	
		REPLACE			1				AZ	
030224	ASSY,INSTPN	INSPECT		0.5					AZ	
		REPAIR			1				AZ	
030225	FLYWHEEL	INSPECT					1		AZ	
		REPLACE					6		AZ	
		REPAIR					3		AZ	
030226	SEAL,REAR OIL	REMOVE					2.5		AZ	
		REPLACE					5		AZ	
030227	PUMP,WATER-SEA									
030228	EXCHANGER,HEAT	INSPECT		0.5					AZ	
		TEST			0.5				AZ	
		REMOVE			1				AZ	
		REPLACE			2				AZ	
030229	STARTER	INSPECT	0.5						AZ	
		TEST		0.5					AZ	
		REMOVE		1					AZ	
		REPLACE		2					AZ	

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
030230	ALTERNATOR	INSPECT	0.5						AZ
		TEST		0.5					AZ
		REMOVE		0.5					AZ
		REPLACE		1					AZ
030231	GOVERNOR, ELECTRIC	INSPECT		0.5					AZ
		TEST			0.5				AZ
		REMOVE			1				AZ
		REPLACE			2				AZ
030232	INJECTION PUMP								
030233	INJECTOR								
030234	STARTER,ENGINE								
030235	WATER PUMP								
04	CONSOLE	INSPECT	0.5						
0401	MARINE VHF RADIO	INSPECT	0.5						
		REPLACE			1				MZ
0402	MONITOR, RADAR	INSPECT	0.5						
		REPLACE			1				CZ
0403	DEPTH SOUNDER	INSPECT	0.5						
		REPLACE			1				CZ
0404	TELEPHONE,SND PWR	INSPECT	0.5						
		REPLACE			1				BZ
		REPAIR			0.5				BZ
040401	SOUND POWERED TELE	INSPECT	0.5						
		REPLACE			1				BZ
		REPAIR			0.5				BZ
040402	BEACON	INSPECT	0.5						
		REPLACE			1				BZ
		REPAIR			0.5				BZ
0405	ANTENNA	INSPECT	0.5						
		REPLACE			1				

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(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
0406	SEARCH LIGHTS	INSPECT	0.5						CZ
		REPLACE	0.5						CZ
		REPAIR	0.5						CZ
0407	COMPASSES	INSPECT	1.0						CZ
		REPLACE			1.0				CZ
05	LIFESAVING & SAFETY	INSPECT	0.5						
0501	ELECTRIC HORN	INSPECT	0.5						
		REPLACE		0.5					
06	SWITCH&GEN.CONTROLS	INSPECT	0.5						
		SERVICE			1				
0601	SWITCHBOARD	INSPECT	0.5						DZ
		SERVICE	0.5						DZ
		REPLACE			1				DZ
		REPAIR			1				DZ
0602	PANEL,DISTRIBUTION	INSPECT	0.5						DZ
		SERVICE	1						DZ
		REPLACE			1				DZ
		REPAIR			1				DZ
07	LIGHTING SYSTEM	INSPECT	0.5						
		SERVICE	1.5						
		REPAIR	0.5						
08	INTERCOMMUNICATIONS	INSPECT	0.5						BZ
		SERVICE			1				BZ
0801	1MC LOUDHAILER P/A	INSPECT	0.5						BZ
		REPLACE			1				BZ
		REPAIR			1				BZ
0802	21MC INTERCOM	INSPECT	0.5						BZ
		REPLACE			1				BZ
		REPAIR			1				BZ
0803	GENERAL ALARM	INSPECT	0.5						BZ
		SERVICE	1						BZ
		REPLACE			1				BZ
		REPAIR			1				BZ

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level				(5) Tools and Equipment Ref Code	(6) Remark Code	
			Unit		Direct Support	General Support			Depot
			C	O	F	H			D
09	HVAC	INSPECT SERVICE	0.5		1			EZ EZ	
0901	HEATING SYSTEM	INSPECT	0.5					EZ	
		SERVICE	1					EZ	
		REPLACE REPAIR			1 1			EZ EZ	
0902	AIR HANDLING UNIT	INSPECT	0.5					EZ	
		SERVICE	0.5					EZ	
		REPAIR REPLACE	0.5	1	1 1			EZ EZ	
090201	CONDENSING UNIT								
090202	HARTZELL FANS	INSPECT	0.5					EZ	
		SERVICE	0.5					EZ	
0903	AIR CONDITIONING	INSPECT	0.5					EZ	
		SERVICE		0.5				EZ	
		REPAIR			1			EZ	
10	BILGE/BALLAST/FIRE	INSPECT	0.5						
1001	PUMP, FIRE	INSPECT	0.5						
		REPLACE		1					
		REPAIR		1					
100101	CONTROLLER, FIRE	INSPECT	0.5						
		SERVICE			1				
		REPAIR		.5	1				
1002	PUMP,BILGE	INSPECT	0.5						
		REPLACE		1					
		REPAIR		1					
100201	CONTROLLER, BILGE	INSPECT	0.5						
		REPLACE			1				
		REPAIR		.5	1				
1003	STRAINER 3"	INSPECT	0.5						
		SERVICE	0.5						

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level				(5) Tools and Equipment Ref Code	(6) Remark Code	
			Unit		Direct Support	General Support			Depot
			C	O	F	H			D
1004	STRAINER 2"	INSPECT SERVICE	0.5 0.5						
1005	PUMP, SHAFT SUMP 1"	INSPECT REPLACE	0.5 0.5						
1006	STRAINER 1 1/2"	INSPECT SERVICE	0.5 0.5						
1007	STRAINER 1"	INSPECT SERVICE	0.5 0.5						
11	SEWAGE & SANITARY	INSPECT	0.5						
1101	PUMP, HOLDING GREYW	INSPECT SERVICE REPLACE	0.5 1 1						
1102	CONTROLLER, GREY WTR	INSPECT REPLACE REPAIR	0.5 1 .5		1				
1103	INCINOLET TOILET	INSPECT REPAIR REPLACE	0.5 0.5		0.5 1			FZ FZ FZ	
1104	INCINOLET URINAL	INSPECT REPAIR REPLACE	0.5 0.5		0.5 1			FZ FZ FZ	
1105	HIGH LEVEL ALARM	INSPECT REPLACE	0.5 1					KZ KZ	
12	ENGINE COOLING SYS	INSPECT	0.5						
1201	MAIN ENG GRID COOL	INSPECT REPLACE REPAIR	0.5 					RRR RRR	
1202	GEN GRID COOLER	INSPECT REPLACE REPAIR	0.5 					RRR RRR	
13	POTABLE WATER SYS	INSPECT	0.5						

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
		SERVICE		1					
1301	ELECT. HEATER	INSPECT	0.5						
		REPLACE			2			FZ	
		REPAIR		1	0.5			FZ	
								FZ	
1302	POTW PRESS PUMP	INSPECT	0.5						
		SERVICE	0.5						
		REPLACE		1					
		REPAIR		1					
1303	POTW PRESS TANK	INSPECT	0.5						
		SERVICE	0.5						
		REPLACE			1				
130301	CONTROLLER, POTABLE PRESS	INSPECT	0.5						
		SERVICE			1				
		REPLACE			1				
		REPAIR		.5	1				
1304	HIGH LEVEL ALARM	INSPECT	0.5						
		SERVICE		1					
		REPLACE		1				KZ	
								KZ	
14	FUEL & LUBE SYSTEM	INSPECT	0.5						
1401	FILTER, DUPLEX FUEL	INSPECT	0.5						
		SERVICE	0.5						
1402	FO KNIFE STRAINER	INSPECT	0.5						
		SERVICE	1						
1403	PUMP, FUEL XFER	INSPECT	0.5						
		SERVICE	1						
		REPLACE	1						
		REPAIR		1					
140301	CONTROLLER, FUEL XFER	INSPECT	0.5						
		SERVICE	1						
		REPLACE			1				
		REPAIR		.5	1				

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
1404	VALVE RMT ACT	INSPECT	0.5						
		SERVICE	1						
		REPLACE	1						
1405	LUBE OIL SYSTEM	INSPECT	0.5						
		SERVICE	1						
		REPAIR		1					
140501	FLOCS PUMP	INSPECT	0.5						
		SERVICE	0.5						
		REPLACE			1			GZ	
		REPAIR			1			GZ	
140502	SIGHT GLASS	INSPECT	0.5						
		REPLACE	1						
140503	HIGH LEVEL ALARM	INSPECT	0.5						
		SERVICE		1				KZ	
		REPLACE		1				KZ	
1406	OILY WATER SYS	INSPECT	0.5					GZ	
140601	OILY WATER SEPARATO	INSPECT		0.5					
		SERVICE		1					
		REPLACE			2			GZ	
		REPAIR		3	0.5			GZ	
140602	PUMP, HAND OILY BIL	INSPECT	0.5						
		REPLACE	1						
140603	MONITOR, OILY WTR	INSPECT	0.5						
		REPLACE			0.5			GZ	
15	FIRE SUPPRESSION	INSPECT	1.5						
		SERVICE	2.5					HZ	
1501	CYLINDER	INSPECT	0.5						
		REPLACE			1			HZ	
16	FIRE DETECTION SYS	INSPECT	1						
		SERVICE	1.5					HZ	

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
1601	PYROTRONICS SYS	INSPECT REPAIR	0.5		1				HZ HZ
17	STEERING SYS	INSPECT SERVICE REPAIR	0.5 1		1.5				IZ IZ IZ
1701	HYDR PWR UNIT,5HP	INSPECT SERVICE REPLACE REPAIR	0.5 1		2				IZ IZ IZ IZ
170101	MOTOR CONTROLLER	INSPECT REPAIR	0.5	1					
1702	CONT PANEL	INSPECT SERVICE REPLACE REPAIR	0.5 1		1.5				IZ IZ IZ IZ
1703	CYLINDER,STEERING	INSPECT SERVICE REPLACE REPAIR	0.5 1				2 1.5		IZ IZ IZ IZ
1704	CYLINDER,FLANKING	INSPECT SERVICE REPLACE REPAIR	0.5 1				1.5 1		IZ IZ IZ IZ
1705	RUDDERS	INSPECT SERVICE REPLACE REPAIR	0.5 1				2 1.5		RRR RRR RRR RRR
18	DECK FITTINGS	INSPECT SERVICE	0.5 0.5						
1801	CAPSTAN 6" LINE	INSPECT SERVICE		0.5 1					JZ JZ

**APPENDIX B
MAINTENANCE ALLOCATION CHART**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remark Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
180101	ELECTRIC MOTOR	REMOVE		1.5					JZ
		REPLACE			1.5				JZ
		REPAIR			2				JZ
1802	CAPSTAN 4" LINE	INSPECT	0.5						JZ
		REPLACE			2				JZ
180201	ELECTRIC MOTOR	INSPECT	0.5	0.5					JZ
		SERVICE	0.5						JZ
		REMOVE		1.5					JZ
		REPLACE			1.5				JZ
1803	20 TON WINCH	REPAIR			2				JZ
		INSPECT	0.5						JZ
1804	SGL PT HST ARR	SERVICE	1						JZ
		REPLACE			2				JZ
		REPAIR			1.5				JZ
19	COMMISSARY SPACES	INSPECT	0.5						FZ
1901	REFRIG/FREEZER	INSPECT	0.5						FZ
		SERVICE	0.5						FZ
		REPLACE			0.5				FZ
		REPAIR			1				FZ
1902	MICROWAVE	INSPECT	0.5						FZ

TOOLS AND TEST EQUIPMENT

ENGINE,MAIN DIESEL

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER
1	O	FIXTURE,ENG LIFTING	3940-01-397-0670	3822512
2	H	HOOK, LIFTING		3376879
3	O	TRACER, FLOURESCEN		3376891
4	O	LIGHT, BLACK		3377253
5	C	BLOCK, GAUGE	5210-01-157-3091	ST547
8	F	PULLER, LINER	5120-01-143-2032	3376015
9	F	KIT, CRACK DETECTION	2915-00-670-2283	337532
10	F	SEALANT		3377132
11	F	TOOL, LINER INSTALLA	4910-01-171-3915	3375422
12	F	CLAMP, CYLINDER LINE		3376944
13	F	BLOCK, GAUGE	5120-01-156-4183	3376220
14	C	PULLER, STANDARD	5120-00-499-1483	ST647
15	C	KIT, PULLEY INSTALLA	5120-01-156-4183	3376326
16	F	KIT, LIGHT DUTY PULL	5180-01-104-2760	3375784
19	F	ACTUATOR, ROCKER LEVER	4910-01-327-0561	3822574
20	F	DRIVER, WATER TUBE	5120-01-171-3905	ST1319
21	F	TOOL, PRESS REGULAT		3375055
22	F	TESTER, VALVE SPRING	4910-01-142-4929	3375182
23	C	TOOL, BLOWBY		3377143
24	C	KIT, CRACK DETECTION		3375434
25	O	ANALYZER,CRANK DETECTION		3377193
26	C	GAUGE, BELT TENSION	6635-01-329-7445	ST1293
27	C	WRENCH, OIL FILTER	5120-01-160-8863	3375049
28	O	FIXTURE, DRILL REAM	4910-01-139-4092	ST1232
29	C	MULTIMETER, DIGITAL		3376898
30	C	TACHOMETER, DIGITAL	6680-01-171-7757	3375631
31	O	TOOL, FUEL PMP IDLE	4910-00-150-5805	3375981
32	O	DYNAMOMETER, DR LINE	4910-01-180-6171	3375710
34	C	GAUGE, VACUUM	6685-00-866-7807	ST434
35	O	DEVICE, FUEL MEAS	4910-00-999-1496	3376375
36	C	GLASS, SIGHT	4910-01-142-0195	ST998
37	C	TACHOMETER	6680-00-112-0696	3377462
38	C	PUMP, PRESSURE		3375515
40	C	CUTTER, TUBE	5120-01-262-7305	3376579
42	F	EXPANDER, RING	5120-01-171-3952	ST1269
43	F	COMPRESS,PISTON RING	5120-01-262-7315	3375342
44	F	GAUGE, PISTON RING	5210-00-999-1209	ST560
45	F	PINS, GUIDE ROD	5315-01-171-3914	3375098
46	O	PLATE, ADAPTER	5120-01-171-3913	3375070
47	F	COMPRESS,VALVE SPR	5120-01-145-7293	ST448
48	F	PLATE, COMPRESSOR		3375043
49	F	STAND, VALVE SPRING	4910-01-326-3204	ST1022
50	O	TESTER, HYDROSTATIC	4910-00-029-8784	ST1012
51	O	PLATE, UPPER ADAPT	5180-01-194-6434	3375071
52	F	EXTRACT, DOWEL PIN	4910-00-150-5848	ST1134
56	C	PULLER, INJECTOR	5120-00-116-7604	3376497
58	C	ACTUAT,ROCKER LEV	4910-01-394-0391	3375522
60	O	LIGHT, BLACK		3377394

REMARKS CODE	REMARKS
A	LOCATED IN BULLETIN 3810307, PAGE 9-6 (TM55-1925-250-14&P)
AAA	LOCATED IN BULLETIN 3810307, PAGE 7-155 (TM55-1925-250-14&P)
AZ	MARINE GENERATOR SET (TM55-1925-253-14&P)
B	LOCATED IN BULLETIN 3810307, PAGE 7-45 (TM55-1925-250-14&P)
BB	LOCATED IN BULLETIN 3810307, PAGE 2-49 (TM55-1925-250-14&P)
BBB	LOCATED IN BULLETIN 3810307, PAGE 7-59 (TM55-1925-250-14&P)
BZ	COMMUNICATION EQUIPMENT (TM55-1925-255-14&P)
C	STEAM CLEAN EVERY 6000 HOURS.
CC	LOCATED IN BULLETIN 3810307, PAGE 2-49 (TM55-1925-250-14&P)
CCC	LOCATED IN BULLETIN 3810307, PAGE 7-61 (TM55-1925-250-14&P)
CZ	NAVIGATIONAL AIDS (TM55-1925-249-14&P)
D	LOCATED IN BULLETIN 3810307, PAGE 9-5,9-6 (TM55-1925-250-14&P)
DD	LOCATED IN BULLETIN 3810307, PAGE 2-48 (TM55-1925-250-14&P)
DDD	LOCATED BULLETIN 3810307, PG 7-51, 7-61 (TM55-1925-250-14&P)
DZ	MAIN GENERATOR SWITCH BOARD (TM55-1925-247-14&P)
E	LOCATED IN BULLETIN 3810307,7-115 (TM55-1925-250-14&P)
EE	LOCATED IN BULLETIN 3810307, PAGE 7-9 (TM55-1925-250-14&P)
EZ	HVAC SYSTEM (TM55-1925-252-14&P)
F	SERVICE AS REQUIRED
FF	CHECK FOR CRACKS EVERY 6000 HRS. REPLACE EVERY 1500 HRS.
FZ	INCINERATOR TOILET/URINAL, GALLEY EQUIPMENT, ELECTRIC WATER HEATER (TM55-1925-257-14&P)
GG	LOCATED IN BULLETIN 3810307, PAGE 6-14 (TM55-1925-250-14&P)
GZ	OILY WATER SEPARATOR (TM55-1925-251-14&P)
HH	BULLETIN 3810307, PG 6-12 CHNG EVERY 250 HRS (TM55-1925-250-14&P)
HHH	BULLETIN 3810307, PG 7-71 ADJUST EVERY 1500 HRS CLEAN/CALIBRATE EVERY 6000 HRS. (TM55-1925-250-14&P)
HZ	CO2 FIRE SUPPRESSION (TM55-1925-254-14&P)
IZ	ELECTRO HYDRAULIC STEERING (TM55-1925-248-14&P)
J	LOCATED IN BULLETIN 3810307, PAGE 7-109 (TM55-1925-250-14&P)
JJ	LOCATED IN BULLETIN 3810307, PAGE 7-148 (TM55-1925-250-14&P)
JJJ	LOCATED IN BULLETIN 3810307, PAGE 5-35 (TM55-1925-250-14&P)
JZ	CAPSTANS & WINCHES (TM55-1925-256-14&P)
K	LOCATED IN BULLETIN 3810307, PAGE 7-110 (TM55-1925-250-14&P)
KK	LOCATED IN BULLETIN 3810307, PAGE 5-44 (TM55-1925-250-14&P)
KZ	ALARM PANELS FOR TANK LEVEL, BILGE LEVEL, CO AND WATERTIGHT DOORS (TM55-1925-246-14&P)
L	LOCATED IN BULLETIN 3810307, PAGE 7-117 (TM55-1925-250-14&P)
LL	LOCATED IN BULLETIN 3810307, PAGE 7-223 (TM55-1925-250-14&P)
LZ	PROPULSION PLANT (TM55-1925-250-14&P)
LLL	LOCATED IN BULLETIN 3810307, PAGE 3-7. INSPECT EVERY 6000 HRS. (TM55-1925-250-14&P)
M	LOCATED IN BULLETIN 3810307, PAGE 7-120 (TM55-1925-250-14&P)
MM	LOCATED IN BULLETIN 3810307, PAGE 5-19 (TM55-1925-250-14&P)
MMM	LOCATED IN BULLETIN 3810307, PAGE 6-8, 6-10 (TM55-1925-250-14&P)
MZ	LOCATED IN OPERATING MANUAL DSC 500 DIGITAL SELECTIVE CALL MARINE VHF TRANSCEIVER
N	LOCATED IN BULLETIN 3810307, PAGE 7-121 (TM55-1925-250-14&P)
NN	LOCATED IN BULLETIN 3810307, PAGE 5-19 (TM55-1925-250-14&P)
P	CHECK END CLEARANCE EVERY 1500 HRS. WITH A DIAL INDICATOR.
PP	LOCATED IN BULLETIN 3810307, PAGE 5-23, 5-26 (TM55-1925-250-14&P)
QQ	LOCATED IN BULLETIN 3810307, PAGE 7-134 (TM55-1925-250-14&P)
QQ	LOCATED IN BULLETIN 3810307, PAGE 5-24 (TM55-1925-250-14&P)
RR	LOCATED IN BULLETIN 3810307, PAGE 5-69, 5-70, 5-71, 5-56, 5-66 (TM55-1925-250-14&P)
RRR	DONE DURING OCCM
S	LOCATED IN BULLETIN 3810307, PAGE 5-18 (TM55-1925-250-14&P)
T	LOCATED IN BULLETIN 3810307, PAGE 7-37 (TM55-1925-250-14&P)
TT	LOCATED IN BULLETIN 3810307, PAGE 2-9. CHANGE EVERY 250 HRS. (TM55-1925-250-14&P)
U	LOCATED IN BULLETIN 3810307, PAGE 7-39 (TM55-1925-250-14&P)
UU	LOCATED IN BULLETIN 3810307, PAGE 2-15 (TM55-1925-250-14&P)
VV	CHANGE EVERY 250 HRS.
WW	LOCATED IN BULLETIN 3810307, PAGE 2-15 (TM55-1925-250-14&P)
XX	LOCATED IN BULLETIN 3810307, PAGE 7-100 (TM55-1925-250-14&P)
YY	LOCATED IN BULLETIN 3810307, 7-100 (TM55-1925-250-14&P)
ZZ	LOCATED IN BULLETIN 3810307, PAGE 7-107 (TM55-1925-250-14&P)

APPENDIX C.**COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS**

SECTION I. INTRODUCTION

a. **Scope.** This appendix lists components of the end item and basic issue items for the Barge Derrick to help you inventory the items for safe and efficient operation of the equipment.

SECTION II. COMPONENTS OF END ITEM

This listing is for information purposes only, and is not authority to requisition replacements. These items are part of the Small Tug. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

Explanation of Columns

1. Column (1), Illus Number , gives you the number of the item illustrated.
2. Column (2), National Stock Number, identifies the stock number of the item to be used for requisitioning purposes.
3. Column (3), Description and Usable On Code, identifies the Federal item name (in all capital letters) followed by a minimum description when needed.
4. Column (4) is the FSPT (the part number and the Commercial and Government Entity Code (CAGE). The CAGE Code is a five-digit number represented in bold type.
5. Column (5), U/I (Unit of Issue), indicates how the item is issued for the National Stock Number shown in column two.
6. Column (6), Qty Req, indicates the quantity required.

COMPONENTS OF END ITEMS LIST (COEI)

ILLUS NO	NSN	DESCRIPTION, CAGE, AND REFERENCE NUMBER	UOC	U/I	QTY REQ
	5996-01-423-8204	AMPL, ELECTC (OF6M5) 301112	FPU	EA	1
	- - -	AMPLIFER WITH (37958) E-17750-FS	FPU	EA	1
	5985-00-974-5834	ANTENNA (23657) 396-1	FPU	EA	2
	5985-01-329-7763	ANTENNA (23657) 424-MK1	FPU	EA	1
	6130-01-223-6133	CHARGE, BATTERY (05351) BC-354	FPU	EA	1
	4210-01-078-3699	CYL, CARBON DIOXIDE (0KDP7) 870269 100LB	FPU	EA	3
	- - -	DEPTH SOUNDER (7H422) ST50	FPU	EA	1
	- - -	ELECTRIC HORN (64189) 11017 24V	FPU	EA	1
	- - -	EXTERNAL SPEAKERS (79051) FLB #15	FPU	EA	4
	- - -	FLDT, HALOGEN W/LAMP (95405) QS1605 120VAC,500W	FPU	EA	3
	- - -	HANDHELD PORT, VHF RADIO (01KG6) EPH5202X	FPU	EA	1
	- - -	HEADSETS, (37958) X-1	FPU	EA	2
	- - -	INCINOLET, TOILET (23989) WB 120/208/240V	FPU	EA	1
	6320-01-421-7826	INDICATOR, ANGLE (OF6M5) 301147	FPU	EA	2
	6320-01-272-4028	LIGHT, DESK (95405) F1018RV	FPU	EA	1
	- - -	MAGNETIC COMPASS (50967) CMP R1TYB500 5"	FPU	EA	1
	- - -	MARINE VHF TRANS/CIEVER (0WF67) DSC 500	FPU	EA	2
	- - -	MICROWAVE (79051) RFS11MP2 1100WATT	FPU	EA	1
	- - -	POWER SUPPLY (05351) 115-12-8	FPU	EA	2
	6310-01-284-1575	POWER SUPPLY (05351) PS-35 24VDC	FPU	EA	1
	5840-01-375-8725	RADAR SET GROUP (7H422) R40XX	FPU	EA	1
	- - -	REFR/FREEZER (66682) R6F3-2M-ADS 115V	FPU	EA	1
	6230-01-270-3725	SEARCHLIGHT (10741) X-9398-RF 500W	FPU	EA	1

COMPONENTS OF END ITEM LIST (COEI)-CONTINUED

ILLUS NO	NSN	DESCRIPTION, CAGE, AND REFERENCE NUMBER	UOC	U/I	QTY REQ
	6350-00-256-4061	SHIP'S BELL (79051) 20	FPU	EA	1
	- - -	STROBE,HORN (05351) MTS-15/75	FPU	EA	7
	5805-01-438-6629	TELE,SOUND POWERED (73274) SELR-86	FPU	EA	1
	- - -	URINAL,ELEC INCINER (23989) UR	FPU	EA	1

ON-BOARD SPARES

ON-BOARD SPARE PARTS.

On-board spare parts are those items recommended by the contractor and manufacturer to be kept on-hand for quick and immediate maintenance access.

EXPLANATION OF COLUMNS IN ON-BOARD SPARES.

The following provides an explanation of the columns found in the tabular listings of the RSPL:

1. Column (1) – Illustration Number (ILLUS NO). This column indicates the number of illustration in which the item is shown.
2. Column (2) – National Stock Number (NSN). This column indicates the national stock number assigned to the item and will be used for requisitioning purposes.
3. Column (3) – Description (DESCRIPTION, CAGE, AND REFERENCE NUMBER). This column indicates the federal item name and, as required, a minimum description to identify and locate the item. The last line for each item indicates the CAGE (in parentheses) followed by the part number.
4. Column (4) – Usable On Code (UOC). This column indicates the applicability of assemblies and parts to multiple APLs produced from a single PPL.
5. Column (5) - Unit of Measure (U/M). This column indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two character alphabetical abbreviation. (e.g., ea, in, pr)
6. Column (6) – Quantity Required (QTY REQ). This column indicates the quantity of the item authorized to be used with the equipment.
7. Column (7) – Production Lead Time (PLT). This column indicates the amount of time (in weeks) that will take to receive an item from a supplier once purchased.
8. Column (8) – Unit Price (UP). This column indicates the estimated amount (in US dollars) a single item (unit) cost when purchased.
9. Column (9) – Component Assembly (COMPONENT ASSY). This column indicates the parent or top assembly component of the item referenced.

ON-BOARD SPARES

ILLUS NO	NSN	DESCRIPTION	UOC	UM	QA	PLT	UP	CompAssy
	2940-01-262-9490	AIR CLEANER INTAKE (15434) 3017002	FPU	EA	1	3	247.00	AIR CLEANER
	- - -	ASSY,FLR BRTHR (0F6M5) ABB-10-6S	FPU	EA	1	1	48.19	HYDR PWR UNIT,5HP
	3030-01-042-9537	BELT,V RIBBED (15434) 206996	FPU	EA	1	1	22.11	ALTERNATOR
	- - -	BELT,V-RIBBED (15434) 3911560	FPU	EA	1	3	26.51	ALTERNATOR
	- - -	BULB (95405) F8T5 8W	FPU	EA	4	1	2.11	LIGHTING SYSTEM
	- - -	BULB (95405) 100A/RS 100W	FPU	EA	10	1	2.11	LIGHTING SYSTEM
	- - -	BULBS (46576) 374-002 24V,30W	FPU	EA	6	1	10.52	LIGHTING SYSTEM
	- - -	C.A.V.INJECTION PMP (15434) 3912861	FPU	EA	1	1	1376.00	ENGINE, GENERATOR
	- - -	CLAMP,HOSE (79051) 54235K59 2"	FPU	EA	2	3	11.20	ENGINE COOLING SYS
	- - -	CLAMP,HOSE (79051) 54235K67 4"	FPU	EA	2	3	16.98	ENGINE COOLING SYS
	2920-01-241-7251	COIL,ELECTRICAL (15434) 3034572	FPU	EA	1	3	116.19	PICKUP, MAGNETIC
	4440-00-626-0141	CORE,FILTER DRIER (78462) RC4864	FPU	EA	1	1	16.32	AIR HANDLING UNIT
	5960-01-386-9583	ELECTRON TUBE (7H422) 5VMAA00049	FPU	EA	1	3	659.65	RADAR
	- - -	ELEMENT,FUEL (44940) 149-2406	FPU	EA	4	1	34.48	GENERATOR
	- - -	ELEMENT,MICRON (55752) 2040TMOR	FPU	CS	4	1	5.48	FILTER, DUPLEX FUEL
	2940-01-019-4513	FILTER ELEM,FLUID (15434) 3313279	FPU	EA	8	1	13.94	ELEMENT,LUBE OFLTR
	2940-01-145-9455	FILTER ELEM,FLUID (15434) 3313283	FPU	EA	4	1	14.95	ELEM,BYPASS OFLTR
	2910-00-304-3427	FILTER ELEM,FLUID (15434) 3315847	FPU	EA	8	1	5.61	FILTER,FUEL
	2940-01-117-5552	FILTER ELEM,FLUID (15434) 3318319	FPU	EA	4	1	21.03	RESISTOR,CORROSION
	- - -	FILTER ELEMENT (04386) 921999	FPU	EA	2	1	17.14	STEERING SYS
	- - -	FILTER,CARTRIDGE (15434) 3908615	FPU	EA	4	1	5.73	FILTER,LUBO
	- - -	FILTER,ELEMENT GSKT (44940) CV1000SK	FPU	EA	2	1	22.20	GENERATOR
	- - -	FLDT,HALOGEN W/LAMP (95405) QS1605 120VAC,500W	FPU	EA	3	2	273.06	LIGHTING SYSTEM
	2910-01-192-4622	FLTR ELEMENT,FLUID (15434) 3903410	FPU	EA	4	1	6.65	FILTER,FUEL
	2910-00-238-0033	FLTR ELEMENT,FLUID (15434) 3903640	FPU	EA	4	1	6.26	FILTER,FUEL
	- - -	FUSE (71400) ABC3/4 0.75AMP	FPU	EA	5	1	0.73	OILY WATER SEPARATO

ON-BOARD SPARES-CONTINUED

ILLUS NO	NSN	DESCRIPTION	UOC	UM	QA	PLT	UP	CompAssy
	- - -	FUSE (71400) NON-3/4	FPU	EA	2	1	1.49	HEATING SYSTEM
	- - -	FUSE (71400) A00177 10AMP	FPU	EA	1	1	1.22	LUBE OIL SYSTEM
	- - -	FUSE (76700) Q62020 10AMP	FPU	EA	2	1	4.88	OILY WATER SEPARATO
	- - -	FUSE (10741) 4107A5 5A	FPU	EA	2	1	0.90	SEARCH LIGHTS
	- - -	FUSE (10741) 4113A30 30AMP, 250V	FPU	EA	2	1	2.82	SEARCH LIGHTS
	5920-01-398-1561	FUSE,CARTRIDGE (71400) KTK-3/10	FPU	EA	1	1	5.61	HEATING SYSTEM
	5920-01-435-3862	FUSE,CARTRIDGE (71424) SBS-3 3AMP	FPU	EA	1	1	2.54	SWITCHBOARD
	5920-00-280-8342	FUSE,CARTRIDGE (71400) AGC-1 1AMP	FPU	EA	1	1	0.31	STEERING SYS
	5920-00-553-5732	FUSE,CARTRIDGE (71400) MDL6 6.25AMP	FPU	EA	5	1	0.63	OILY WATER SEPARATO
	5920-00-411-7635	FUSE,CARTRIDGE (71400) MDL7 7AMP	FPU	EA	5	1	0.73	OILY WATER SEPARATO
	5920-01-442-0588	FUSES (21574) SBS-3 3AMP	FPU	EA	3	1	1.82	CONTROLLER
	- - -	GASKET (95405) GKT5001	FPU	EA	1	1	3.65	LIGHTING SYSTEM
	- - -	GASKET (76700) Q59398	FPU	EA	2	1	0.85	OILY WATER SEPARATO
	- - -	GASKET (66682) GB61V	FPU	EA	1	1	42.98	REFRIG/FREEZER
	- - -	GASKET (66682) GB62V	FPU	EA	1	1	50.56	REFRIG/FREEZER
	5330-00-873-6746	GASKET (58923) D11-257	FPU	EA	2	1	1.10	PUMP, FUEL XFER
	- - -	GASKET (95405) GKT6089-30.75 300-500W	FPU	EA	1	1	10.44	LIGHTING SYSTEM
	- - -	GASKET (79051) 4 "	FPU	EA	1	1	50.00	LIFESAVING & SAFETY
	- - -	GASKET (79051) 6"	FPU	EA	2	1	50.00	ENGINE COOLING SYS
	5330-00-882-1398	GASKET (15472) 22120-31	FPU	EA	2	1	7.10	STRAINER,CUNO AUTO
	5330-01-207-0298	GASKET (76700) 58403	FPU	EA	1	1	3.93	OILY WATER SEPARATO
	5330-00-132-0276	GASKET (15434) 193736	FPU	EA	18	1	0.61	INJECTOR
	5330-01-043-5605	GASKET (15434) 201048	FPU	EA	1	1	1.54	KIT,TURBOCHARGER
	5330-01-043-4242	GASKET (15434) 201049	FPU	EA	1	1	1.54	KIT,TURBOCHARGER
	5330-01-043-5604	GASKET (15434) 206576	FPU	EA	1	1	3.77	KIT,TURBOCHARGER
	5330-01-019-3248	GASKET (15434) 553856	FPU	EA	1	1	0.60	PICKUP, MAGNETIC

ON-BOARD SPARES-CONTINUED

ILLUS NO	NSN	DESCRIPTION	UOC	UM	QA	PLT	UP	CompAssy
	5330-01-318-8198	GASKET (15434) 3008832	FPU	EA	1	1	0.68	HEAT EXCHANGER,LUBO
	5330-01-326-1923	GASKET (15434) 3010918	FPU	EA	1	1	2.82	HOUSING,THERMOSTAT
	5330-01-318-8199	GASKET (15434) 3011325	FPU	PG	1	1	15.66	HEAT EXCHANGER,LUBO
	5330-01-312-3755	GASKET (15434) 3011332	FPU	PG	1	1	32.59	HEAT EXCHANGER,LUBO
	5330-01-326-0989	GASKET (15434) 3032161	FPU	PG	1	1	46.70	MANIFOLD,EXHAUST
	5330-01-304-5180	GASKET (15434) 3040721	FPU	EA	6	1	3.26	LEVER,REMOTE CONTRO
	5330-01-201-3662	GASKET (15434) 3043097	FPU	EA	6	1	5.87	MANIFOLD,EXHAUST
	5330-01-231-9270	GASKET (15434) 3202283	FPU	EA	1	1	1.33	PUMP,WATER
	- - -	GASKET (15434) 3907617	FPU	EA	1	1	8.74	HSG,CAM FOLLOWER
	- - -	GASKET (15434) 3914304	FPU	EA	1	1	0.43	ASSY, FUEL PUMP
	- - -	GASKET (15434) 3914389	FPU	EA	1	1	0.65	ASSY, FUEL PUMP
	- - -	GASKET SET (15434) 3802363	FPU	EA	1	1	168.49	ENGINE,DIESEL
	- - -	GASKET SET (15434) 3802363	FPU	EA	1	1	168.49	ENGINE, GENERATOR
	5330-01-313-0299	GASKET SET (15434) 3803598	FPU	SE	1	1	158.61	ENGINE, DIESEL
	- - -	GASKET,CARBON FBR (79051) 9800 3"	FPU	EA	8	1	100.00	EXHAUST SYSTEM
	- - -	GASKET,CARBON FBR (79051) 9800 6"	FPU	EA	4	1	100.00	EXHAUST SYSTEM
	- - -	GASKET,DRAIN (15434) 102-1147	FPU	EA	1	1	1.43	PUMP, SUMP
	- - -	GASKET,FULL FACE (79051) 2 1/2"	FPU	EA	2	1	190.00	BILGE/BALLAST FIRE
	- - -	GASKET,KIT (93232) 773	FPU	EA	1	1	17.08	PUMP, FIRE
	- - -	GASKET,RCK LVR CVR (15434) 3629140	FPU	EA	6	3	7.87	BREATHING,CRANKCASE
	- - -	GASKETS,CARBON FBR (79051) 9800 8"	FPU	EA	4	1	100.00	EXHAUST SYSTEM
	- - -	HEATING ELEM GSKT (17702) 2	FPU	EA	1	1	18.90	ELECT. HEATER
	- - -	HEATING ELEMENT (17702) 1	FPU	EA	1	1	7.26	ELECT. HEATER
	- - -	HEATING ELEMENT (17702) 6	FPU	EA	1	1	18.90	ELECT. HEATER
	- - -	HOSE ASSY (00624) 1C03716KMM1800A	FPU	EA	1	1	158.30	FLOCS PUMP
	- - -	HOSE, FLEXIBLE (15434) AK5042SS	FPU	EA	1	3	44.37	HEAT EXCHANGER,LUBO
	- - -	HOSE,FUEL (44940) 501-0573	FPU	EA	1	1	60.39	GENERATOR

ON-BOARD SPARES-CONTINUED

ILLUS NO	NSN	DESCRIPTION	UOC	UM	QA	PLT	UP	CompAssy
	- - -	HOSE,FUEL (15434) 501-0573	FPU	EA	1	1	60.39	FILTER,FUEL
	- - -	HOSE,FUEL,SUPPLY (15434) 501-0586	FPU	EA	1	1	68.20	ENGINE,DIESEL
	4720-01-306-1015	HOSE,NONMETALLIC (15434) 63223	FPU	EA	1	3	13.49	HEAT EXCHANGER,LUBO
	4720-01-119-4180	HOSE,NONMETALLIC (15434) 107063	FPU	EA	1	3	11.15	HEAT EXCHANGER,LUBO
	4720-01-306-1014	HOSE,NONMETALLIC (15434) 3016142	FPU	EA	1	1	29.80	MANIFOLD,EXHAUST
	4720-01-241-5507	HOSE,NONMETALLIC (15434) 3024128	FPU	EA	1	3	22.44	PUMP,SEA WATER
	- - -	INJECTOR (15434) 3087587	FPU	EA	6	3	751.60	INJECTOR
	- - -	KIT,GASKET (15434) 3801007	FPU	EA	1	1	158.61	ENGINE, DIESEL
	- - -	KIT,TURBOCHARGER (15434) 3803796	FPU	KT	1	3	3161.86	KIT,TURBOCHARGER
	- - -	LAMP (95405) INX3521 500W	FPU	EA	3	2	16.25	LIGHTING SYSTEM
	- - -	LAMP,CLEAR (05351) 125-216154 24VDC	FPU	EA	10	1	21.05	FIRE DETECTION SYS
	6240-01-361-8138	LAMP,INCANDESCENT (91929) CV15201	FPU	EA	1	1	8.78	OILY WATER SEPARATO
	6240-01-328-0576	LAMP,INCANDESCENT (10983) P951-57	FPU	EA	1	1	4.04	OILY WATER SEPARATO
	- - -	LAMPS (93332) 656-120V	FPU	EA	6	1	0.61	SWITCHBOARD
	- - -	MECH SEAL KIT (58923) N24-154	FPU	EA	1	1	46.97	PUMP, FUEL XFER
	- - -	MOTOR,STARTER (15434) 3916854	FPU	EA	1	2	500.00	ENGINE, GENERATOR
	2910-01-448-6911	NOZ,FUEL INJECTION (15434) 3802328	FPU	EA	6	1	460.00	ENGINE, GENERATOR
	5330-01-214-5090	O-RING (55752) RK11341	FPU	KT	10	1	2.20	FILTER, DUPLEX FUEL
	- - -	O-RING (76700) Q59213	FPU	EA	4	1	0.71	OILY WATER SEPARATO
	- - -	O-RING (44940) 509-0266-01	FPU	EA	1	0	3.42	GENERATOR
	5330-01-318-8183	O-RING (15434) 3011337	FPU	EA	1	1	38.54	HEAT EXCHANGER,LUBO
	5330-01-201-8685	O-RING (15434) 3023066	FPU	EA	2	1	12.92	KIT,TURBOCHARGER
	5330-01-326-4775	O-RING (15434) 3029820	FPU	PG	1	1	17.28	HEAD,LUBO FILTER
	5330-01-201-3617	O-RING (15434) 3201125	FPU	PG	1	1	7.69	HEAD,LUBO FILTER
	- - -	O-RING SEAL (16327) 2105-023-00	FPU	EA	1	1	7.41	PUMP, HOLDING GRAYW
	- - -	O-RINGS (0F6M5) SAE-12	FPU	EA	2	1	4.88	CYLINDER,STEERING

ON-BOARD SPARES-CONTINUED

ILLUS NO	NSN	DESCRIPTION	UOC	UM	QA	PLT	UP	CompAssy
	- - -	O-RINGS (76700) 211	FPU	EA	2	1	0.71	OILY WATER SEPARATO
	- - -	OVHD FLUOR FIXTURE (95405) FPS320 20WATT	FPU	EA	4	1	198.13	LIGHTING SYSTEM
	- - -	OVHD FLUOR FIXTURE (95405) FPS340 40WATT	FPU	EA	4	1	223.21	LIGHTING SYSTEM
	5330-01-147-6003	PACKING,PREFORMED (55752) 13350	FPU	EA	10	1	0.46	FILTER, DUPLEX FUEL
	5330-01-293-6223	PARTS KIT,SEAL (15434) 3802376	FPU	KT	1	1	95.56	ENGINE, GENERATOR
	4730-00-678-4749	PLUG,PIPE (01276) 2082-12S	FPU	EA	1	1	1.78	FLOCS PUMP
	4320-01-323-2441	PUMP,CENTRIFUGAL (15434) 3201988	FPU	EA	1	3	2231.73	PUMP,WATER
	- - -	PUMP,FLOCS (00624) FF9516-01 3/4HP	FPU	EA	1	1	1857.34	FLOCS PUMP
	2910-01-384-6174	PUMP,FUEL MTR&DISTR (15434) 3883776	FPU	EA	1	3	3660.12	PUMP,FUEL
	- - -	PUMP,FUEL TRANSFER (15434) 3904374	FPU	EA	1	2	50.01	ASSY, FUEL PUMP
	- - -	PUMP,WATER (15434) 3802358	FPU	EA	1	1	1276.00	ENGINE, GENERATOR
	6685-01-327-1196	PYROMETER,IND (15434) 3036576	FPU	EA	1	3	342.01	PANEL,INSTRUMENT
	2815-01-042-9986	RING SET,PISTON (15434) 3803472	FPU	SE	2	3	89.10	SET,PISTON RING
	5325-00-608-9393	RING,RETAINING (58923) G41-148	FPU	EA	2	1	1.10	PUMP, FUEL XFER
	5325-00-871-4387	RING,RETAINING (58923) G41-43	FPU	EA	1	1	1.10	PUMP, FUEL XFER
	- - -	RING,RETAINING (15434) 3900242	FPU	PG	4	1	1.71	HSG,ROCKER LEVER
	5325-00-804-2769	RING,RETAINING (15434) 3901706	FPU	EA	4	1	0.35	ASSY,ENG PISTON
	- - -	RING,SET,PISTON (15434) 3802230	FPU	SE	2	1	23.96	ASSY,ENG PISTON
	- - -	SEAL (15434) 3923331	FPU	EA	1	1	2.75	THERMOSTAT
	- - -	SEAL,THERMO (15434) 186780	FPU	EA	2	0	6.62	HOUSING,THERMOSTAT
	- - -	SOLENOID,FUEL (44940) 3905125 24V	FPU	EA	1	1	227.59	GENERATOR
	- - -	SOLENOID,SHUT OFF (15434) 307-2725-01	FPU	EA	1	1	522.10	FILTER,FUEL
	6110-01-150-2676	STARTER,MOTOR (15434) 3021038	FPU	EA	1	3	1960.02	MOTOR,STARTING
	6620-00-827-9477	THERMO,FLOW CONTROL (15434) 135675	FPU	EA	2	3	32.96	HOUSING,THERMOSTAT
	- - -	THERMOSTAT (15434) 3917324	FPU	EA	1	1	21.23	THERMOSTAT

SECTION III. BASIC ISSUE ITEMS (BII) LIST

These essential items are required to place the Small Tug in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the Small Tug during operation and when it is transferred between property accounts. This list is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

Explanation of Columns

1. Column (1) – Illustration Number (ILLUS NO). This column indicates the number of illustration in which the item is shown.
2. Column (2) – National Stock Number (NSN). This column indicates the national stock number assigned to the item and will be used for requisitioning purposes.
3. Column (3) – Description (DESCRIPTION, CAGE, AND REFERENCE NUMBER). This column indicates the federal item name and, as required, a minimum description to identify and locate the item. The last line for each item indicates the CAGE (in parentheses) followed by the part number.
4. Column (4) – Unit of Measure (U/I). This column indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two character alphabetical abbreviation. (e.g., ea, in, pr)
5. Column (5) – Quantity Required (QTY REQ). This column indicates the quantity of the item authorized to be used with the equipment.

Basic Issue Items (BI) List

ILLUS NO	NSN	DESCRIPTION, CAGE, AND REFERENCE NUMBER	UOC	U/I	QTY REQ
	4210-00-372-0865	APPLICATOR 10' (00912) 2072-US-0-1-03-004		EA	1
	4210-00-372-0864	APPLICATOR 4' (00912) 2070-US-0-1-03-006		EA	1
	8415-00-082-6108	APRON,RUBBER,CHEM PROTECTION (64067) A-A-5506		EA	1
	8465-01-316-5706	BAG, FIREMEN UTILITY		EA	1
	8345-00-74-0453	BALL BLACK		EA	1
	5120-00-293-0665	BAR,WRECKING,30",55-130 (57068) 55-13		EA	2
		BARGE LIGHT, CLEAR, MOD 120 (46576) 1350 SECTORED LENS		EA	1
		BARGE LIGHT, GREEN, MOD 120 (46576) 11250 SECTORED LENS		EA	1
		BARGE LIGHT, RED, MOD 120 (46576) 11250 SECTORED LENS		EA	1
		BARGE LIGHT, YELLOW, MOD 120 (46576) 2000 SECTORED LENS		EA	1
	7520-00-281-5911	BASKET WASTE PAPER (58536) A-A-18		EA	3
		BATTERY CHARGER MODEL TCB-4		EA	1
		BATTERY CHARGER, RADIO LAA0325		EA	1
	6140-00-635-3824	BATTERY FILLER JUG TYPE (72853) 74-4		EA	1
		BATTERY, RADIO LAA109		EA	4
	6650-00-530-0974	BINOCULAR: 7X50 (19200) 670251		EA	1
		BLANKET WOOL OD (6X047) MILB84		EA	10
	7610-00-263-9714	BOOK: MODERN MARINE ENG-1		EA	1
		BOOK: MODERN MARINE ENG-2 ISBN-087-033-3070		EA	1
	7610-00-244-8719	BOOK: MODERN SEAMANSHIP		EA	1
	7610-00-263-9736	BOOK: PILOTING/SEAMANSHIP		EA	1
		BOOK: PRIMER OF NAVIGATION ISBN-09-393-03585		EA	1
	7610-00-263-9715	BOOK:MODERN MARINE ENGINEERS MANUAL (OCOJ6) 87033307		EA	1
	7610-00-263-9721	BOOK:PRIMER OF NAVIGATION (OCOJ6) 87033307		EA	1
	8430-00-753-5941	BOOT, FIREMAN, SIZE 11 (58536) A-A-50371		EA	1
	7330-00-272-2481	BOWL,VACUUM COFFEE MAKER (25628) B-8-B		EA	1
	4240-01-297-5986	BREATHING APPARATUS (2J495) 120320		EA	2
		BURN DRESSING KIT (04DF1) MIL-C-2493		KT	1
		CABLE, INTERFACE RADIO LAA0725		EA	1
	7240-00-160-0438	CAN ASH & GARBAGE 10 GAL W/COV (58536) A-A-167		EA	1
	7330-00-224-8081	CAN OPENER (81348) FF060		EA	1

Basic Issue Items (BI) List-Continued

ILLUS NO	NSN	DESCRIPTION, CAGE, AND REFERENCE NUMBER	UOC	U/I	QTY REQ
	7240-00-282-8411	CAN,FLAMMABLE WASTE 6GL (58536) A-A-5046		EA	2
	4220-00-174-1365	CANISTER, OBA GREEN (55799) 92908		EA	18
	4240-00-238-9959	CANISTER, TRAINING (RED) (55799) 454013		EA	1
	5120-00-529-4124	CARRIER STORAGE BATTERY HAND (58536) A-A-50460		EA	1
		CASE RADIO HANDHELD LAB 0436		EA	4
		CLEANER, VACUUM, ELECTRIC (GSA)		EA	1
	6605-01-110-9164	CLINOMETER (50926) 2056		EA	1
	6545-01-432-0052	CLOCK, MARINE, 24 HR (11755) 40097		EA	4
		CODE FLAG SET (00XC0) MODEL 16993		EA	1
	7350-01-036-5431	COFFEE CUPS (80244) LT48CL2TM		DZ	1
	7210-00-230-1041	COVER, MATTRESS (81348) DDD-C-628		EA	5
	8405-01-286-6337	COVERALL FIRE RETARDANT SZ36R (2T217) MILC2494		EA	1
	8405-01-286-6339	COVERALL, FIRE RETARDANT 38REG (2T217) MILC2494		EA	1
	8405-01-286-6349	COVERALL, FIRE RETARDANT 44LONG (2T217) MILC2494		EA	1
	8405-01-286-6342	COVERALL, FIRE SIZE 40 REG (81349) MIL-C-24945		EA	1
	8405-01-286-6346	COVERALL, FIRE SIZE 42 LONG (81349) MIL-C-24945		EA	1
		COVERALL,ANTI-EXPOSURE, MEDIUM (63806) MODEL IFS-58		EA	2
		COVERALL,ANTI-EXPOSURE,LARGE (63806) MODEL IFS-58		EA	2
		COVERALL,ANTI-EXPOSURE,X-LARGE (63806) MODEL IFS-58		EA	1
	8415-01-300-6558	COVERALLS, FIREMANS LARGE (81349) MIL-C-2493		EA	1
	8415-01-300-6559	COVERALLS, FIREMANS X-LARGE (81349) GGG-C-77		EA	1
	5110-00-224-7058	CUTTER, WIRE ROPE, HYD (81348) GGG-T-800		EA	1
	5180-00-596-1038	CUTTING AND FLARING SET (81348) 28925A2		EA	1
	5136-00-357-7504	DIE AND TAP SET (81348) GGG-T-330		EA	1
	5136-00-357-7494	DIE AND TAP SET (81348) GGG-T-330		SE	1
	5345-00-641-6050	DISPENSER, SUGAR, 12 OZ. (58536) A-A-106		EA	1
	6675-00-641-3531	DRAFTING SET, INSTRUMENT (81348) GG-D-600		SE	1
	5133-00-293-0983	DRILL SET:TWIST;29EA (80244) MILF1637		SE	1
	5130-00-283-3231	DRILL,ELECTRIC: 1/2" AC/DC (3A054) GGG-D-75		EA	1
	7290-00-224-8308	DUST PAN (58536) A-A-30		EA	2

Basic Issue Items (BII) List-Continued

ILLUS NO	NSN	DESCRIPTION, CAGE, AND REFERENCE NUMBER	UOC	U/I	QTY REQ
	4240-00-022-2946	EAR PROTECTOR (58536) A-A-58084		EA	6
	4240-01-116-9888	EMERGENCY ESCAPE DEVICE (53711) 802300-01		EA	6
	4220-01-251-6466	EXPOSURE/SURVIVAL SUIT (63806) ISS-59		EA	7
		EXTENSION CORD,50FT (04KQ3) PRIEC50183		EA	4
	4240-00-542-2048	FACESHIELD, INDUSTRIAL (58536) A-A-1770		EA	1
	2040-00-821-0808	FENDER, MARINE 16" DIA (80064) 805-1340571-16X36IN		EA	6
	5180-00-223-8860	FID, 18 INCH (81349) MIL-F-3113		EA	2
	4210-00-142-4949	FIRE AX. PICKHEAD (15852) GGGA926TYPE2		EA	2
	4210-00-889-2491	FIRE EXTINGUISHER, 10 LB (58536) A-A-393		EA	4
	6545-00-168-6893	FIRST AID KIT, SMALL (64616) IRR-O-1978		EA	1
	8345-00-656-1434	FLAG, NATIONAL (81348) DDD-F-416		EA	1
	8345-00-262-2408	FLAG, ORGANIZATIONAL (22571) 5-6-2		EA	4
	6230-00-269-3034	FLASHLIGHT EXPLOSION PROF (N351B) 8460		EA	2
	6230-00-264-8261	FLASHLIGHT:WATERTIGHT:2 CELL (21108) MX-99I		EA	4
	6545-01-155-1598	FLOTATION SUPPORT KIT ASSY (04624) G-OSR-4-8/82LITTER		EA	1
	4820-30-540-2381	FOOT VALVE, 3" W/STRAINER		EA	1
	7340-00-241-8169	FORKS (80244) RRF450TY1TM2ST		BX	1
	7240-00-527-9868	FUNNEL 1QT W/STRAINER (58536) A-A-106		EA	1
	7240-00-161-1150	GARBAGE CAN COVER (58536) A-A-1067		EA	1
	8415-01-335-7904	GLOVES, FIREMENS LARGE (0A8Y1) GVGT07L		EA	2
	8415-01-335-7902	GLOVES, FIREMENS SMALL (81349) MIL-G-29635		EA	1
	8415-00-266-8677	GLOVES, PROTECTIVE (81348) ZZ-G-38		PR	1
	8415-01-267-9661	GLOVES,ANTI-FLASH (82125) MIL-G-287		EA	6
	8415-01-335-7903	GLOVES,FIREFIGHTERS,MEDIUM (81349) MILG8707		EA	2
	2040-00-287-9645	GRAPNEL, MARINE, 4 LB		EA	1
	5120-00-203-4656	HAMMER HAND 2 1/2LB (80244) GGG-H-86TY10CL		EA	1
	5120-00-892-5485	HAMMER, HAND CARPENTER 1 LB (80244) GGG-H-8		EA	1
	7920-00-263-0328	HANDLE, ACME THREADED END (58536) A-A-3082		EA	1
	7920-00-141-5452	HANDLE, CIRCULAR TAP END (82733) 0896		EA	1
	7920-00-177-5106	HANDLE,SQUEEGEE (80244) 177510		EA	2

Basic Issue Items (BI) List-Continued

ILLUS NO	NSN	DESCRIPTION, CAGE, AND REFERENCE NUMBER	UOC	U/I	QTY REQ
	8415-00-935-3136	HARD HAT, ORANGE (58536) A-A-226		EA	3
	8415-00-935-3139	HARD HAT, WHITE, (58536) A-A-226		EA	3
	4240-01-421-0859	HARNESS SAFETY, TORSO (55119) 185-		EA	2
	8415-01-271-8069	HELMET, FIRE FIGHTER'S (10256) 660		EA	2
	3950-00-937-7978	HOIST, LEVER AND RATCHER (93601) 115		EA	2
	6230-00-578-7401	HOLDER, BHD MOUNTED (24446) N400P5		KT	6
	8415-01-268-3473	HOOD, ANTI-FLASH (64067) MIL-H-2493		EA	6
	2040-00-268-9250	HOOK BOAT, 10 FT (21530) H389		EA	2
	4720-00-202-6482	HOSE ASSY NONMAG 3/4" X 50 FT (39428) GRADE		EA	3
	4210-01-248-8822	HOSE PORTABLE WATER 1 1/2X50FT (81348) MILH2460		EA	4
		HOSE, FILL WATER		EA	1
	4210-01-131-0249	HOSE, FIRE 1 1/2" X 50 FT (30951) ORANG		EA	3
		HOSE, FITTINGS		EA	1
		HOSE, FUEL FILL		EA	1
		HOSE, GREYWATER		EA	1
	4720-00-232-6482	HOSE, NOZZLE 3/4" BRASS (3A054) 7484T		EA	1
	4210-00-725-9234	HOSE, SUCT, 3" DIA X 10 FT (96400) 592223		EA	1
	4210-00-725-9234	HOSE, SUCTION, P100 (96400) 592223		EA	2
	6320-01-406-6098	INDICATOR, SHIP'S PO (EPIRB) (4AA26) S-100		EA	1
	4730-00-470-6625	KIT FITTING, COPPER TUBE (30327) 51025		EA	1
	4730-01-414-6976	KIT PIPE REPAIR (19092) MILR-17882		EA	1
	7340-00-241-8170	KNIVES (80244) RRF450TY1TM1ST		BX	1
	6230-01-141-2901	LANTERN ELEC;6VDC1500 (86796) 150		EA	6
	4240-00-022-2518	LANYARD, SAFETY HARNESS (81349) MILH2446		EA	2
	4240-00-022-2521	LANYARD, SAFETY HARNESS (86809) 50101		EA	2
	4220-00-200-0538	LIFE PRESERVER, VEST ADULT (81349) MIL1804		EA	7
	4220-00-276-8926	LIFE PRESERVER, VEST, ORANGE (81349) MIL-L-17653		EA	6
		LIFERAFT, VIKING DK-16		EA	1
	6230-01-143-4778	LIGHT MARKER DISTRESS (63607) L-264		EA	4
	6260-01-086-8077	LIGHT, DISTRESS, PERSONNEL (83289) 95270-5		BX	1

Basic Issue Items (BII) List-Continued

ILLUS NO	NSN	DESCRIPTION, CAGE, AND REFERENCE NUMBER	UOC	U/I	QTY REQ
	6230-00-095-3674	LIGHT,EXTENSION (81349) ISS-59		EA	1
	1095-00-270-6019	LINE, THROWING DEV. 22 CAL (85097) CG85		SE	1
	4020-01-344-0552	LINE,HEAVINGSAFETY 100 FT (0GU87) NIS-G-021		EA	2
	4020-00-530-0698	LINE,RETRIEVING,RING BUOY (81349) MIL-R-2404		RL	1
	6530-00-042-8131	LITTER, RIGID, STOKES (89875) 1643		EA	1
	4930-00-253-2478	LUBRICATING GUN HAND 16OZ (81349) MIL-G-385		EA	1
	5120-00-221-2731	MARLINESPIKE 8" (81349) A-A-160		EA	1
	7220-00-238-8852	MAT, FLOOR, RUBBER, 18" X 29" (81348) ZZ-M-4		EA	3
	7210-00-139-6517	MATTRESS, BED 72 1/2 X 26 X 4 ((58536) A-A-2957		EA	5
	5120-00-255-1476	MAUL SHIP 5LB (58536) A-A-128		EA	1
	7240-00-233-6025	MEASURE, LIQUID 1 GAL. (58536) 107		EA	1
	7240-00-233-6013	MEASURE, LIQUID 1QT. (58536) A-A-160		EA	1
	8465-00-238-3344	MEGAPHONE HAND 18IN (X1768) 30015BLAC		EA	1
	7920-00-893-5869	MOPPING OUTFIT (81348) RR-M-107		EA	2
	6625-01-015-6072	MULTIMETER (AMMETER AC/DC) (16734) TIF10000LED		EA	1
	6625-01-370-7247	MULTIMETER (VOLTS/OHMS/HZ) (89536) FLUKE-29-2		EA	2
	4210-00-392-2943	NOZZLE FIRE HOSE WATER 1 1/2"3 (58536) A-A-106		EA	3
	4010-00-285-9901	OBA TENDING LINE (81349) MIL-W-290		EA	2
	6625-00-141-3558	OHMETER (MEGGER) (07239) 21259		EA	1
	7240-00-160-0455	PAIL UTILITY METAL 3 1/2 GAL (81348) RR-P-3		EA	2
	7210-01-015-5190	PILLOW BED (58536) A-A-5207		EA	5
	7210-00-292-2326	PILLOWCASE (X0920) LOTPI		EA	15
	7350-00-249-5165	PITCHER, WATER 2 QT (58536) A-A-424		EA	2
	5120-00-239-8251	PLIERS LINEMAN 8" (75347) 201		EA	1
	5120-00-293-2513	PLIERS, RETAINING RING (81348) GGG-P-480		EA	1
	5120-00-595-9555	PLIERS, RETAINING RING (10001) 41P992-52		EA	1
	5610-00-260-8953	PLUG, SOFT WOOD 1" X 3" (80064) 803-461043		EA	10
	5510-00-260-8949	PLUG, SOFT WOOD 10" X 12" (80064) 38800-461043		EA	5
	5510-00-250-5958	PLUG, SOFT WOOD 2" X 4" (80064) 803-461043		EA	5
	5510-00-260-8962	PLUG, SOFT WOOD 3" X 8" (80064) 803-461043		EA	10

Basic Issue Items (BII) List-Continued

ILLUS NO	NSN	DESCRIPTION, CAGE, AND REFERENCE NUMBER	UOC	U/I	QTY REQ
	5510-00-260-8968	PLUG, SOFT WOOD 7" X 10" (80064) 803-461043		EA	5
	5510-00-260-8973	PLUG, SOFT WOOD 8" X 10" (80064) 803-461043		EA	5
	5120-00-595-9305	PULLER, MECHANICAL, GEAR (81348) GGGP787		EA	2
	4930-00-263-9988	PUMP DISPENSER, HAND		EA	2
	4320-01-387-2869	PUMP, PORTABLE, P100 (15852) 2BE104DN		EA	1
	5110-00-449-7313	PUNCH SET, HOLLOW (55719) PGH8A		EA	1
		RADIO, HANDHELD (01KG6) LAA 1735		EA	4
	2040-00-298-2856	RAT GUARD		EA	4
	4210-00-143-4353	REDUCER, 2-1/2" TO 1-1/2" (63734) 54-14573		EA	1
	4240-00-329-8199	RESPIRATOR, AIR FILTER		EA	1
	4220-00-275-3157	RING, BUO, 30" O/S DIA, SUB160.050 (81340) CG160.050-30I		EA	5
	5330-00-641-3051	RUBBER SHEET SOLID 1/16IN (94519) MILG114		SH	1
	5330-00-729-5103	RUBBER SHEET SOLID 1/8IN (94519) MILG114		SH	1
	6675-00-191-1509	RULE, PARALLEL NAVIGATION 18" (81348) GG-P-118		EA	15
	7510-00-161-6215	RULER, WOOD 12" LG (58536) A-A-35		EA	1
	5130-00-857-8526	SANDER DISC ELEC SIZE 7 (81348) 00S9		EA	2
	5130-00-288-6577	SCALING & CHIPPING TOOL (81348) MIL-S-1987		EA	1
	7350-00-240-7068	SHAKER PEPPER 6OZ ALUMINUM (81348) RRK26		EA	1
	7350-00-240-7069	SHAKER SALT 6OZ ALUMINUM (80244) RRK260TY8ST		EA	1
	7520-00-162-6178	SHARPENER, PENCIL (80244) 162617		EA	2
	5110-00-161-6906	SHEARS, STRAIGHT		EA	2
	7210-00-148-1017	SHEET BED		EA	30
	2090-00-058-8737	SHORING STEEL, ADJUSTABLE		EA	3
	1370-01-030-8330	SIGNAL DISTRESS (10001) DL3139734		EA	12
	5850-00-107-6671	SIGNAL LAMP		EA	1
	1670-01-226-5300	SLING, RESCUE (30003) 1554A5201-1		EA	1
		SOCKET SET (12PT, 13 PC, 3/4" DR) 4131MDY		SE	1
		SOCKET SET (12PT, 7 PC, 1/2" DR) 3071MDYA		SE	1
		SOCKET SET (6 PT, 27 PC, 3/4" DR) 427IMY		SE	1
		SOFTWARE, HANDHELD RADIO (01KG6) LAA 1735		EA	1

Basic Issue Items (BII) List-Continued

ILLUS NO	NSN	DESCRIPTION, CAGE, AND REFERENCE NUMBER	UOC	U/I	QTY REQ
	3439-00-930-1638	SOLDERING GUN, ELECTRIC (11103) 460		EA	1
	5120-00-277-9078	SPANNER WRENCH (81348) GGG-W-665		EA	1
	7330-00-254-4791	SPATULA STEEL 8" (80244) 254479		EA	2
		SPILL KIT KESP1532		EA	1
	7340-00-241-8171	SPOON DESSERT 24 IN BOX (80244) RRF450TY1M3ST		BX	1
	7340-00-240-7080	SPOON FOOD SERVICE 15" (80244) 240708		EA	4
	7340-00-205-1421	SPOON FOOD SERVICE SLOTTED (80244) 205142		EA	2
	7340-00-205-3341	SPOON TABLE CRES (80244) RRF450TY1M3ST		BX	1
	7920-00-267-4639	SQUEEGEE, WINDOW (3A054) 7334T1		EA	2
	7520-00-296-7043	STENCIL SET, MARKING		EA	1
	6530-00-783-7600	STRETCHER, NEIL ROBERTSON (81349) MIL-L-16815		EA	1
	4030-01-052-9365	SWIVEL EYE AND LINK (95975) 636113-GALV		EA	1
	6680-00-171-4584	TACHOMETER, MECHANICAL JX5500 (57737) JX5500		EA	1
		TANK, P100		EA	1
	6630-00-074-0394	TEST KIT, CHROMATE (59728) 9859-N42		EA	1
	5180-00-357-7514	TEST KIT, OIL (81348) GGG-T-581		EA	1
	6620-00-171-5126	TESTER BATTERY ELECTROLYTE SOL (81348) GGT-25		EA	1
	6630-00-105-1418	TESTER, ANTIFREEZE (78039) 7584L		EA	1
	5180-00-629-9783	THREADING SET, PIPE (50980)		KT	1
	7330-00-616-0997	TONGS FOOD SERVING SIZE 3 (81349) MILT-4009		EA	1
	5180-01-046-4980	TOOL KIT, ELECTRONIC (96508) TC-100/ST		EA	1
	5180-00-629-5783	TOOL KIT, GENERAL MECH		KT	2
	3437-00-542-0531	TORCH KIT SOLDERING, L.P. (81348) GGT57		EA	1
	4240-01-116-9889	TRAINING UNIT (EEBD) (2J495) 802300-XX		EA	1
	7350-00-195-7334	TRAY MESS COMPARTMENTED (81349) MIL-T-4		EA	12
	7350-00-823-7301	TRAY SERVICE PLASTIC (X1632) 082-141802		DZ	1
	6675-00-190-5867	TRIANGLE: PLASTIC 30 TO 60 DEG (81348) GGT67		EA	2
	6675-00-190-5862	TRIANGLE: PLASTIC 45 DEG 8" LG (81348) GGT671/		EA	2
		TUMBLER, PLASTIC 12 OZ 6026		DZ	12
	5420-00-221-1117	WISE, MACHINIST, 5" JAW (81348) GGG-V-410		EA	1

Basic Issue Items (BII) List-Continued

ILLUS NO	NSN	DESCRIPTION, CAGE, AND REFERENCE NUMBER	UOC	U/I	QTY REQ
	5510-00-268-3475	WEDGE PLUG 1 1/2" X 12" (80064) S8800-461043		EA	10
	5510-00-268-3476	WEDGE PLUG 1 1/2" X 12" (80064) S8800-461043		EA	10
	5510-00-268-3479	WEDGE PLUG 2" X 8" (80064) S8800-461043		EA	10
	5510-00-268-3481	WEDGE PLUG 3" X 8" (80064) S8800-461043		EA	10
	5510-00-268-3485	WEDGE PLUG 4" X 8" (80064) S8800-461043		EA	10
	8465-00-254-8803	WHISTLE, PLASTIC (58536) A-A-55106		EA	14
	5120-00-277-1486	WRENCH PIPE 14" (81348) GGG-W-651		EA	2
	5120-00-277-1484	WRENCH PIPE 8" (81348) GGG-W-651		EA	1
	5120-00-277-1461	WRENCH PIPE ADJUSTABLE 18IN (81348) GGG-W-655		EA	2
	5120-00-204-1999	WRENCH SET, SOCKET 3/4" (81348) GGG-W-641		SE	1
	5120-00-277-9075	WRENCH SPANNER, ADJ (81348) GGG-W-665		EA	4
	5120-00-247-2540	WRENCH, TORQUE 0-150 FT/LB (58536) A-A-2417		EA	1
	5120-01-396-6090	WRENCH, TORQUE 0-150 IN/LB (58536) A-A-1274		EA	1
	5120-00-640-6365	WRENCH, TORQUE 0-250 FT/LB (58536) A-A-50374		EA	1

APPENDIX D.

ADDITIONAL AUTHORIZATION LIST (AAL)

The Additional Authorization List (AAL) is not applicable.

APPENDIX E.

EXPENDABLE AND DURABLE ITEMS LIST

SECTION I. INTRODUCTION

E – 1 Scope. This appendix lists expendable/durable supplies and materials required to operate and maintain the ST.

E – 2 Explanation of Columns.

Column 1 – Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material.

Column 2 – Level. This column identifies the lowest level of maintenance that requires the listed item.

- C Operator/Crew
- O Organizational Maintenance
- F Direct Support Maintenance
- H General Support Maintenance

Column 3 – National Stock Number (NSN). This is the standard National Stock Number assigned to the item.

Column 4 – Description. Indicates the Federal Item Name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parenthesis followed by the part number.

Column 5 – Unit of Measure (U/I). This column indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr, etc.).

SECTION II. EXPENDABLE AND DURABLE ITEMS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item Name, Description, CAGE Code, Part Number	(5) U/M
1	C	6135-00-0503-280	BATTERY DRY,EMERGENCY LIGHT,6V	EA
2	C	6135-00-835-7210	BATTERY, FLASHLIGHT,SIZE D,ALK	PG
3	C	6135-00-100-0413	BATTERY, RING BUOY LIGHT	EA
4	C	6140-01-134-2531	BATTERY,STOR,ENGINE START,12V	EA
5	C	7920-00-291-8305	BROOM, UPRIGHT, CORN(12PERU/1)	EA
6	C	7920-00-267-2967	BROOM,RATTAN,16"(6PERU/1)SZ 11	EA
7	C	7920-00-772-5800	BRUSH, SANITARY, (12 PER U/1)	EA
8	C	7920-00-240-7174	BRUSH, SCRUB (36 PER U/1)	EA
9	C	7920-00-243-3407	BRUSH, SWEEPING, 18"(12PERU/1)	EA
10	C	7920-00-240-6358	BRUSH,DUSTING,BENCH,(12PERU/1)	EA
11	C	7920-00-291-5815	BRUSH,WIR,CURV HANDL(12PER UA)	EA
12	C	5130-00-293-0263	BRUSH,WIR,ROTARY WHL,1/2"ARBOR	EA
13	C	7520-00-240-5503	CLIP BOARD	EA
14	C	7230-00-576-4934	CURTAIN, SHOWER, 48" X 72"	EA
15	C	7930-00-880-4454	DISHWASHING COMPOUND, HAND	BX
16	C	6840-00-810-6396	DISINFECTANT (FOOD SERVICE)	DZ
17	C	8415-00-266-6432	GLOVES, BATTERY SVC CHEM PROTE	PR
18	C	8415-00-634-4658	GLOVES, CABLE HANDLING	PR
19	C	4240-00-190-6432	GOGGLE,IND,NO VENTS(CHEM SPLAS	EA
20	C	8465-01-328-8268	GOGGLE,SAFETY,WIND,DUST SAND	EA
21	C	4240-00-190-6432	GOGGLES, BATTERY SERVICE	EA
22	C	4240-00-052-3776	GOGGLES,IND,PLASTIC SAFETY	PR
23	C	4930-00-287-5419	GUN,FLUID,DIR DELIVERY,30 OZ.	EA
24	C	7920-00-205-1170	HANDLE, MOP, WOOD (12 PER U/1)	EA
25	C	4210-00-725-9234	HOSE,SUCT,3"IDX10FTLG,592223	EA
26	C	7920-00-171-1148	MOPHEAD, COTTON	EA
27	C	8540-00-530-3770	PAPER, TOILET	BX
28	C	7930-00-205-0442	POWDER, SCOURING	CN
29	C	7920-00-205-1711	RAG, WIPING, 50 LB BALE	BE

EXPENDABLE AND DURABLE ITEMS LIST-CONTINUED

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item Name, Description, CAGE Code, Part Number	(5) U/M
30	C	6300-01-012-4093	SANITIZER TEST KIT(CHLOR,IODIN	KT
31	C	8520-00-129-0803	SOAP, TOILET, SALT WATER	BX
32	C		ANTIFREEZE	
33	C	8105-00-200-0195	BAG, PLASTIC, 10 GAL	BX
34	C	8105-01-386-2290	BAG, PLASTIC, 25 GAL	BX
35	C	6135-00-643-1310	BATTERY, DRY 6 V	PG
36	C	6135-00-835-7210	BATTERY, DRY FLASHLIGHT	PG
37	C	6810-00-286-3783	BATTERY WATER	GL
38	C	5110-00-277-4591	BLADES, HAND, HACKSAW	PG
39	C	7920-00-291-8305	BROOM, UPRIGHT, CORN, TYPE 2	EA
40	C	7920-00-165-7277	BRUSH, DUSTING, BENCH	EA
41	C	7920-00-240-7171	BRUSH, SCRUB, DECK	EA
42	C	7920-00-240-7174	BRUSH, SCRUB, FLOOR	EA
43	C	7920-00-291-5815	BRUSH, WIRE, CURVED HANDLE	EA
44	C	7930-01-306-8369	CLEANER, ALL PURPOSE	GL
45	C	5990-00-195-9689	CLIP, ELECTRICAL, CROCODILE	PG
46	C	7520-00-240-5503	CLIPBOARD, FILE, 9" X 17"	EA
47	C	7930-00-880-4454	COMPOUND, DISHWASHING, HAND, LIQUID	GL
48	C	8030-00-616-7694	COMPOUND, ANTISEIZE (PIPE JOINT AND THREAD)	LB
49	C	8030-00-231-2345	COMPOUND, CORROSION PREVENTATIVE	GL
50	C	4020-00-240-2146	CORD, NYLON	CL
51	C	7930-00-985-6945	DEGREASER	GL
52	C	5345-00-881-8377	DISK, ABRASIVE, NO. 36	EA
53	C	5345-00-196-1693	DISK, ABRASIVE, NO. 50	EA
54	C		FLUID HYDRAULIC	
55	C	7930-01-326-8110	GLASS CLEANER	EA
56	C	8145-00-634-4658	GLOVES, CLOTH, LEATHER PALM	PR
57	C	4240-00-052-3776	GOGGLES, INDUSTRIAL, CLEAR	EA
58	C	9150-00-190-0906	GREASE, AUTO AND ARTILLERY	CN
59	C	9150-00-235-5555	GREASE, BALL AND ROLLER BEARING	LB

EXPENDABLE AND DURABLE ITEMS LIST-CONTINUED

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item Name, Description, CAGE Code, Part Number	(5) U/M
60	C	9150-00-530-6814	GREASE, WIRE ROPE	CN
61	C	7920-00-267-1218	HANDLE, MOP 54", TYPE II	EA
62	C	6810-00-598-7316	HYPOCHLORITE SOLUTION	GL
63	C		CORROSION INHIBITOR	
64	C	8520-00-228-0598	LIQUID SOAP	GL
65	C	7920-00-171-1148	MOPHEAD, WET, COTTON, TYPE 1	EA
66	C	8540-00-279-7777	NAPKIN, TABLE PAPER	PK
67	C	5330-00-085-1701	PACKING 25' IN SELF DISPENSING CAN 5/32"	CN
68	C	8540-01-055-6094	PAPER, TOILET	BX
69	C	6850-00-001-4194	PASTE, WATER INDICATING	OZ
70	C	7930-00-266-7136	POLISH, METAL TYPE 2, CLASS 1	PT
71	C	7930-00-721-8592	POWDER, SCOURING	CN
72	C	4020-00-968-1357	ROPE, NYLON	RL
73	C	7510-00-285-1787	RUBBER BANDS	BX
74	C	7510-00-205-0842	RUBBER BANDS	BX
75	C	8030-00-081-2330	SEALING COMPOUND	EA
76	C	8135-00-984-1127	SHEET, PLASTIC WRAP	RL
77	C	4240-00-542-2048	SHIELD, FACE, INDUSTRIAL	EA
78	C	3439-00-188-6986	SOLDER, LEAD ALLOY, ACID CORE	PK
79	C	3439-00-188-6988	SOLDER, LEAD ALLOY, ROSIN CORE	LB
80	C	5640-00-409-4265	TAPE DUCT	RO
81	C	5970-00-543-1154	TAPE, ELECTRICAL	RO
82	C	7510-00-266-6710	TAPE, MASKING 2"	RO
83	C	7510-00-266-6709	TAPE, MASKING 1"	RO
84	C	9390-01-078-8660	TAPE, REFLECTIVE	RL
85	C	8340-00-205-3323	TARPAULIN, DROP CLOTH	EA
86	C	8046-01-068-2423	TAPE ADHESIVE	EA
87	C	9390-01-379-8660	TAPE RETROREFLECTIVE 3IN X 50FT	EA
88	C	8540-00-262-7178	TOWEL PAPER	EA

EXPENDABLE AND DURABLE ITEMS LIST-CONTINUED

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item Name, Description, CAGE Code, Part Number	(5) U/M
86	C	8030-00-889-3534	TEFLON TAPE	EA
87	C	8540-00-291-0392	TOWELS, PAPER, C-FOLD	EA
88	C	7920-00-823-9773	TOWELS, PAPER MACHINERY WIPING	PK
89	C	4020-00-243-3156	TWINE, COTTON	LB
90	C	4020-00-233-5984	TWINE, COTTON	LB
91	C	7920-00-205-1711	WIPING RAGS	BL

APPENDIX F.

ILLUSTRATED LIST OF MANUFACTURED ITEMS

This appendix is not applicable (the Small Tug contains no "M" source coded items as authorized by the RPSTL).

APPENDIX G.

MANDATORY REPLACEMENT PARTS

This appendix is not applicable to the Small Tug system manual. However, mandatory replacement parts may be required when maintenance is performed on vessel equipment. These parts, if required, will be identified in the individual equipment technical manuals accompanying the vessel.

APPENDIX H.

TORQUE LIMITS

H-1. GENERAL

NOTE

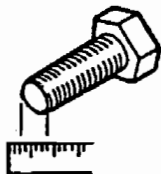
The torque tables provided below should be used only in the absence of official manufacturer's recommendations.

Bolt torquing should be accomplished within equipment manufacturer's recommendations. In the absence of manufacturer's instructions, follow the procedures below:

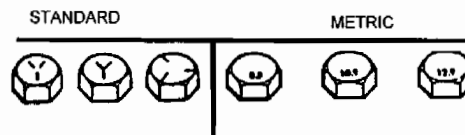
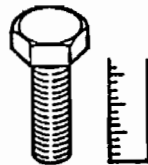
- a. Measure the diameter of the screw and count the number of threads per inch or use a pitch gauge. See Figure H-1.

Figure H- 1. Measuring Bolt Sizes

Measuring the diameter of the screw.



Counting number of threads per inch.



- b. Use the diameter and number of threads to find the bolt size in the table.
- c. To find the grade screw you are installing, match the markings on the head to the correct picture of Capscrew Head Markings shown in Figure H-2.
- d. Look down the column under the grade until you find the torque limit for the diameter and threads per inch of the screw you are installing.

Figure H- 2. Bolt Grades

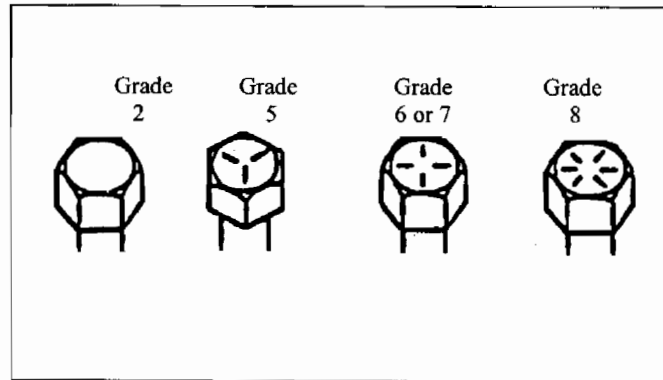


Table H- 1. Torque Table 1

Bolt Size	18-18 Stainless Steel	Brass	Silicon Bronze	Aluminum 2024 T4	316 Stainless Steel	Monel	Nylon*
	In.-Lbs.	In.-Lbs.	In.-Lbs.	In.-Lbs.	In.-Lbs.	In.-Lbs.	In.-Lbs.
2-56	2.5	2.0	2.3	1.4	2.8	2.5	.44
2-64	3.0	2.5	2.8	1.7	3.2	3.1	
3-48	3.9	3.2	3.6	2.1	4.0	4.0	1.19
3-56	4.4	3.5	4.1	2.4	4.6	4.5	
4-40	5.2	4.3	4.8	2.9	5.5	5.3	2.14
4-48	6.5	5.4	6.1	3.6	6.9	6.7	4.3
5-40	7.7	6.3	7.1	4.2	8.1	7.8	5.61
5-44	8.4	7.7	8.7	5.1	9.8	9.5	8.2
6-32	9.6	7.9	8.9	5.3	10.1	9.8	16.0
6-40	12.1	9.9	11.2	8.6	12.7	12.3	20.8
8-32	19.5	16.2	18.4	10.8	20.7	20.2	34.9
8-36	22.0	18.0	20.4	12.0	23.0	22.4	
10-24	22.5	18.6	21.2	13.8	23.8	25.9	
10-32	31.7	25.9	29.3	19.2	33.1	34.9	
1/4" -20	75.2	61.5	68.8	45.6	78.6	85.3	
1/4" -28	94.0	77.0	87.0	57.0	99.0	106	
3/16" -16	132	107	123	80	138	149	
3/16" -24	142	116	131	86	147	160	
3/8" -16	238	192	219	143	247	268	
3/8" -24	259	212	240	157	271	294	
7/16" -14	376	317	349	228	393	427	
7/16" -20	400	327	371	242	418	451	
1/2" -13	517	422	480	313	542	584	
1/2" -20	541	443	502	326	565	613	
9/16" -12	632	558	632	415	713	774	
9/16" -18	752	6515	697	486	787	855	
5/8" -11	1110	907	1030	715	1160	1330	
5/8" -16	1244	1018	1154	796	1301	1492	
3/4" -10	1530	1249	1416	980	1582	1832	
3/4" -16	1490	1220	1382	958	1556	1790	
7/8" -9	2328	1905	2140	1495	2430	2775	
7/8" -14	2378	1895	2130	1490	2420	2755	
1" -8	3440	2815	3185	2205	3395	4130	

Table H-1. Torque Table 1-Continued

Bolt Size	18-18 Stainless Steel	Brass	Silicon Bronze	Aluminum 2024 T4	316 Stainless Steel	Monel	Nylon*
1"-14	3110	2545	2685	1995	732	3730	
	Ft.-Lbs.	Ft.-Lbs.	Ft. -Lbs.	Ft. -Lbs.	Ft. -Lbs.	Ft. -Lbs.	
1 1/8"-7	431	413	383	265	432	499	
1 1/8"-12	390	390	361	251	408	470	
1 1/4"-7	523	523	485	336	546	627	
1 1/4"-12	4810	490	447	306	504	575	
1 1/2"-5	588	588	822	570	930	1054	
1 1/2"-12	703	703	851	450	732	840	

Table H- 2. Torque Table 2

Fastener	Grade Designation	Minimum Tensile Strength	Material	SCREW, STUD, OR BOLT DIAMETER																
				6	8	10	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
Cap Screw	SAE 2 ASTM A307	64,000 psi	Low Carbon Steel				6	11	19	30	45	66	93	150	202	300	474	659	884	1057
Cap Screw	SAE 5 ASTM A449 GR5	105,000 psi	Medium Carbon Steel or Low Alloy Heat Treated				9	18	31	50	75	110	150	250	378	583	782	1097	1461	1748
Cap Screw	ASTM A325	150,000 psi	Medium Carbon Alloy Quenched Tempered								100		200	355	525	790	1060	1495	1960	2600
Cap Screw	SAE J429 GR8	150,000 psi	16-6				13	28	46	75	115	165	225	370	591	893	1410	1964	2633	3150
Cap Screw	ASTM A364-BD A490		316 Series						55	90	138	198	270	444	709	1071	1692	2360	3159	3780
Cap Screw and Machine Screw	Stainless Steel		CU63 ZN37	9.6 in-lbs.	20 in-lbs.	23 in-lbs.	75 in-lbs.	132 in-lbs.	20 in-lbs.	31	43	57	92	124	194	259	390	480		703
Cap Screw and Machine Screw	Stainless Steel	50,000 psi	1010 Etc. Not Heat Treated	10 in-lbs.	21 in-lbs.	24 in-lbs.	79 in-lbs.	138 in-lbs.	21 in-lbs.	33	45	59	97	130	202	271	408	504		732
Cap Screw and Machine Screw	Yellow Brass	55,000 psi		8 in-lbs.	16 in-lbs.	19 in-lbs.	62 in-lbs.	107 in-lbs.	16 in-lbs.	26	35	47	76	102	158	212	318	394		575
Machine Screw	Steel			11 in-lbs.	20 in-lbs.	32 in-lbs.	75 in-lbs.	140 in-lbs.												

Note: The torque values listed in this table are for permanent fastenings on steel structures. Torque figures are in foot pounds unless otherwise noted.

GLOSSARY

SECTION I. ABBREVIATIONS

#	Number
%	Percent
°	Degrees
@	At
'	Feet
"	Inches
A	Amps
AC	Alternating Current
BHP	Brake Horsepower
BIIL	Basic Issue Items List
BTU	British Thermal Units
C	Centigrade/Celcius
CFM	Cubic Feet Per Minute
CL	Centerline
CO ₂	Carbon Dioxide
COTS	Commercial Off-The-Shelf Manual
CPC	Corrosion Prevention and Control
CU-FT	Cubic Feet
DA	Department of the Army
DE	Diesel Engine
DP	Distribution Panel
EIR	Equipment Improvement Recommendation
F	Fahrenheit
FLO/FLO	Float On/Float Off
FLOCS	Fast Lube Oil Change System
FM	Frequency Modulated
FPM	Feet Per Minute
FS	Fire Station
Ft	Feet
FWD	Forward
GAL	Gallon
GPM	Gallons Per Minute
GPM	Gallons Per Minute
GPS	Global Positioning System
HP	Horsepower
HR	Hour
HVAC	Heating, Ventilation, and Air Conditioning
KVA	Kilo Volt Ampere
KW	Kilo Watt
LB	Pound
LIT	Liter
LP	Lighting Panel
LPM	Liters Per Minute
LRU	Lowest Replaceable Unit
MAC	Maintenance Allocation Chart
MM	Millimeter
NBC	Nuclear, Biological, and Chemical
No.	Number
PA	Public Address
PMCS	Preventive Maintenance Checks and Services

SECTION I. ABBREVIATIONS-CONTINUED

PPM	Parts Per Million
PSF	Per Square Foot
PSI	Pounds Per Square Inch
PWR	Power
RPM	Revolutions Per Minute
STBD	Starboard
TEFC	Totally Enclosed Fan Cooled
UL	Underwriter's Laboratories
V	Volts
VAC	Volts Alternating Current
VDC	Volts Direct Current
VHF	Very High Frequency
W	Watts
W/	With
WOT	Wide Open Throttle

SECTION II. DEFINITIONS

Aft	Near or at the stern
Amidships	In the center, the center portion of the vessel
Ballast	Additional weight placed low in the hull to improve stability, may be either internal or external.
Beam	The width of a vessel
Bilge	The lowest portion of a vessel's interior hull
Bitt	A strong post on the deck, bow or stern, to which anchor, mooring, or towing lines may be fastened
Bow	The forward part of the vessel
Bulkhead	A transverse wall in the hull; the interior compartmentalization of the hull; may be watertight
Capstan	A vertical winch on deck, used for hauling anchor line and so forth
Chock	A rigging fitting, essentially shape like a "U" or an "O", normally mounted on the deck or in the toe rail to control a rigging or mooring line
Coaming	A raised edge, as around part or all of a hatch that prevents seawater from entering the vessel
Fender	A cushioning device hung between a vessel and a pier or other vessel
Galley	The kitchen on a vessel
Hatch	A deck opening providing access to the space below
Holding Tank	Storage tank for wastewater, slop oil, or sewage so that it will not be discharged overboard
Inboard	Toward the center of the vessel
Mooring	Permanent ground tackle
Outboard	Opposite or away from a vessel's hull ; opposite of inboard
Port	Left side of the vessel looking forward
Scupper	Drain holes on deck, in the toe rail, or in bulwarks, or (with drain pipes) in the deck itself
Sheave	A grooved wheel or pulley over which rope or rigging wire runs
VHF Radio	A very high frequency electronic communications and direction finding system
Windlass	A special form of winch, a rotating drum device for hauling a line or chain

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By Order of the Secretary of the Army:

Official:



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9930808

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RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA						Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: (Forward to proponent of publication or form) (Include ZIP Code)						FROM: (Activity and location) (Include ZIP Code)	
PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS							
PUBLICATION/FORM NUMBER						DATE	TITLE
ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON	
TYPED NAME, GRADE OR TITLE					TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE

TO: <i>(Forward direct to addressee listed in publication)</i>	FROM: <i>(Activity and location) (Include ZIP Code)</i>	DATE
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PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigrams = .035 ounce
 1 dekagram = 10 grams = .35 ounce
 1 hectogram = 10 dekagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
 1 deciliter = 10 centiliters = 3.38 fl. ounces
 1 liter = 10 deciliters = 33.81 fl. ounces
 1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
 1 cu. meter = 1000 cu. decimeters = 35.31 feet

Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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