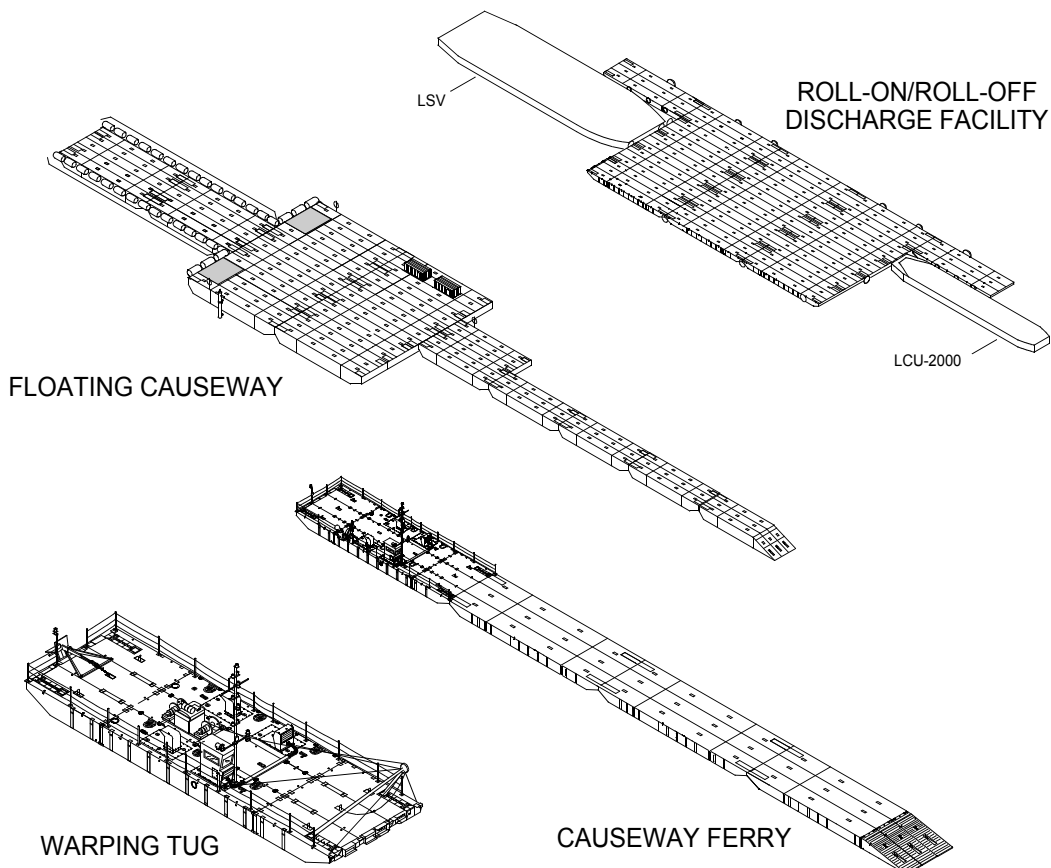


TM 55-1945-205-10-3

TECHNICAL MANUAL OPERATORS MANUAL FOR

MODULAR CAUSEWAY SYSTEM (MCS) WARPING TUG (WT) WT-1 NSN 1945-01-473-2285



This manual supersedes TM 55-1945-205-10 dated 29 August 1997 including all changes.

DISTRIBUTION STATEMENT A - Approved for public release, distribution is unlimited.

**HEADQUARTERS, DEPARTMENT OF THE ARMY
13 SEPTEMBER 2003**

WARNING SUMMARY

NO SMOKING

Smoking is prohibited aboard this vessel.

JEWELRY

Remove rings, bracelets, wristwatches, and neck chains before working around or on a unit.

HEAVY OBJECTS

Handling heavily weighted objects can cause bodily injury. Do not lift materials or equipment over 50 lbs without using appropriate material handling equipment.

BATTERIES

Do not smoke around batteries. Personnel must wear goggles and chemical resistant gloves when adding electrolyte and cleaning up spills.

HAZARD REPORTING

Report all hazards. It is your responsibility to report hazards through your chain-of-command.

HIGH VOLTAGE

Use extreme caution when checking energized circuits. Always place power off warning tags on power supply switches so that no one will apply power while performing maintenance.

HAZARDOUS FUMES IN CONFINED SPACES

The lazaret, engine, fuel and storage compartments are confined spaces and may contain hazardous fumes. Refer to FM 55-502 before entering a confined space. Never enter a confined space before checking the confined space with a gas free meter. Operate the exhaust plenum ventilation fan to remove fumes.

NUCLEAR, BIOLOGICAL OR CHEMICAL

In the event equipment has been exposed to Nuclear, Biological or Chemical warfare, the equipment shall be handled with extreme caution and decontaminated in accordance with FM 3-5, instructions for Immediate, Operational and Through decon procedures adapted for the marine environment. Unprotected personnel can experience injury or death if residual toxic agents or radioactive material are present. If equipment is exposed to radioactive, biological or chemical agents, personnel must wear protective mask, hood, protective overgarments, chemical gloves and chemical boots in accordance with MOPP - level prescribed by the OIC or NCOIC.

FUELS

Personnel must wear chemical resistant gloves when handling fuels. Promptly wash exposed skin and change fuel-soaked clothing.

COOLANTS

Before opening coolant system, allow time to cool and wear effective hand, eye and skin protection.

ICE BUILDUP

Cold weather operations could create ice buildup on exposed surfaces producing hazardous footing conditions. Use extreme care when operating under icing conditions; death or serious injury to personnel could occur.

SAFETY WARNING ICONS



EYE PROTECTION

EYE PROTECTION - Person with goggles shows that the material will injure the eyes.



HEAVY OBJECTS

HEAVY OBJECTS - Human figure stooping over heavy object shows physical injury potential from improper lifting technique.



HEAVY PARTS

HEAVY PARTS - Foot with heavy object on top shows that heavy parts can crush and harm.



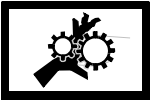
HEAVY PARTS

HEAVY PARTS 3 - Heavy object on human figure shows that heavy parts present a danger to life or limb.



HELMET PROTECTION

HELMET - Arrow bouncing off head with helmet shows that falling parts present a danger.



MOVING PARTS

MOVING PARTS 2 - Hand with fingers caught between gears shows that the moving parts of the equipment present a danger to life or limb.



VEST

VEST - Life preserver on human figure shows life preserver must be worn to prevent drowning.

HAZARDOUS MATERIAL WARNING ICONS



CHEMICAL

CHEMICALS - Drops of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.



EXPLOSION

EXPLOSION - Rapidly expanding symbol shows that the material may explode if subjected to high temperatures, sources of ignition or high pressure.



FIRE

FIRE - Flame shows that a material may ignite and cause burns.



POISON

POISON - Skull and crossbones shows that a material is poisonous or is a danger to life.



VAPOR

VAPOR - Human figure in a cloud shows that material vapors present a danger to life or health.

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TECHNICAL MANUAL

**OPERATORS MANUAL
FOR**

**MODULAR CAUSEWAY SYSTEM (MCS)
WARPING TUG (WT)
WT-1
NSN 1945-01-473-2285**

Current as of 13 November 2002

This manual supersedes TM 55-1945-205-10 dated 29 August 1997 including all changes.

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 2028-2 (Recommended Changes to Equipment Technical Publications), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is <http://aeps.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 website. Fill out the form and click on "SUBMIT". Using this form on the AEPS website will enable us to respond quicker to your comments and better manage the DA Form 2028-2 program. You may also mail, E-mail or fax your letter, DA Form 2028, or DA Form 2028-2 directly to: Commander, U.S. Army Tank-Automotive and Armaments Command, ATTN: AMSTA-LC-CIP-WT, Rock Island, IL 61299-7630. The E-mail address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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HOW TO USE THIS MANUAL

This manual contains certain features to improve the convenience of using this manual and increase the user's efficiency. These features include:

a. Accessing Information

Information is accessed by referring to the Table of Contents, located in the front of this manual, or by looking in the Alphabetical Index, located in the back of this manual.

b. Illustrations

Various methods are used to locate and repair components. Locator illustrations in Controls and Indicator tables, PMCS tables, exploded views and cut-away diagrams make the information in the manual easier to understand and follow.

c. Using This Manual

When using this manual, read and understand the entire maintenance action before performing the task. Also, read and understand all warnings, cautions and notes as well as general safety precautions that apply to the task to be performed. The warning summary will inform personnel of hazards associated with the equipment to be worked on. However, the summary is not all inclusive and personnel should be aware at all times of hazardous conditions that may arise.

Prior to starting the procedures in this manual, the initial setup requirements are located directly above each procedure. The information is given to ensure all materials, expendables, tools and any other equipment necessary are readily available for use. The initial setup will be accomplished prior to starting the actual steps of each maintenance procedure.

Locating Major Components

Obtain the manual for the system to be worked on. Open to the Table of Contents located in the front of this manual. Find Chapter 1, *Description and Theory of Operation*. Under the chapter title you will find the work package titled *Location and Description of Major Components*. Turn to the work package indicated. This work package will give a brief description of the major components, and show an illustration of what the component looks like and its location.

The Alphabetical Index, located in the back of this manual, contains an alphabetical list of all sections of this manual. *Location and Description of Major Components* is found in section L. The work package is found on the right side of the title where the *Location and Description of Major Components* is located. Turn to the work package indicated to find the description and location of each component.

Operator Instructions

To locate an operator task, open the manual to the Table of Contents located in the front of this manual. Locate the procedure that is to be performed. Next to the procedure, on the right, locate the work package number. Turn to the work package number in the manual. Perform the initial setup by obtaining the expendables, tools, materials and other items listed prior to starting the task. Perform the listed steps in order. The Alphabetical Index can also be used to locate the item and procedures to follow.

Tools: Lists all tools (standard or special) required to perform the task. Tools are identified with an item number and work package number from the *Tool Identification List* located in Chapter 4, *Supporting Information*.

Materials/Parts: Lists all parts or materials necessary to perform the task. Expendable and durables are identified with an item number from the applicable work package located in Chapter 4, *Supporting Information*.

Personnel Required: Lists all personnel necessary to perform the task.

Equipment Condition: Notes the conditions that must exist before starting the task. The equipment condition will also include any prerequisite maintenance tasks to be performed with reference to the work package number or to the TM number.

References: Includes any other manuals necessary to complete the task. When there are no references listed, all steps necessary to complete the task are contained within this manual. A listing of reference materials is contained in the work package *References* in Chapter 4, *Supporting Information*.

Location of Controls and Indicators

To locate a particular control and/or indicator, open the manual to the Table of Contents located in the front of the manual. Find Chapter 2, *Operator Instructions*. Locate the work package titled *Description and Use of Operator Controls and Indicators*. Turn to the work package indicated. Locate the control and, or indicator that you are attempting to identify. Take note of the number pointing to the control or indicator. Refer to the table below the picture and find the number in the column on the far left hand side. Reading from left to right, find the number that matches the number from the picture, then read the name of the control/indicator and following function of the item, as detailed in the far right hand column.

Troubleshooting Procedures

The Table of Contents or Alphabetical Index may be used to locate sections within this manual. To locate a particular troubleshooting procedure, open the manual to the Table of Contents located in the front of this manual. Find Chapter 3, *Troubleshooting Procedures*. Under this section, find a work package titled *Troubleshooting Index*. Turn to the work package indicated, which lists all of the troubleshooting procedures. Look down the list until you find the appropriate work package for the problem you are trying to solve. To the right side of the procedure will be a work package number. Turn to the work package indicated and follow the steps to complete the troubleshooting procedure. The procedures list the malfunction, symptom and the corrective action. The corrective action will indicate which maintenance procedure to go to for the repair of the symptom or what level of maintenance is capable of repair of the problem. Follow the procedures indicated to complete the task. At the top of the task you will have a section called INITIAL SETUP. There are five basic headings listed under INITIAL SETUP.

Test Equipment: Lists all test equipment (standard or special) required to troubleshoot, test and inspect the equipment covered in this manual. The test equipment is identified with an item number and work package number from the *Tool Identification List* located in Chapter 4, *Supporting Information*.

Tools: Lists all tools (standard or special) required to perform the task. Tools are identified with an item number and work package number from the *Tool Identification List* located in Chapter 4, *Supporting Information*.

Personnel Required: Lists all personnel necessary to perform the task.

Equipment Condition: Notes the conditions that must exist before starting the task. The equipment condition will also include any prerequisite maintenance tasks to be performed with reference to the work package number or to the TM number.

References: Includes any other manuals necessary to complete the task. When there are no references listed, all steps necessary to complete the task are contained within this manual. A listing of reference materials is contained in the work package *References* in Chapter 4, *Supporting Information*.

Maintenance Instructions

To locate a maintenance procedure, open the manual to the Table of Contents located in the front of this manual. Find Chapter 4, *Maintenance Instructions*. Look down the list and find the maintenance procedure to be accomplished. On the right side of the maintenance procedure will be a work package number. Turn to the work package indicated.

Before beginning the maintenance task, look through the procedure to familiarize yourself with the entire maintenance procedure. At the top of the task you will have a section called INITIAL SETUP. There are five basic headings listed under INITIAL SETUP.

Tools: Lists all tools (standard or special) required to perform the task. Tools are identified with an item number and work package number from the *Tool Identification List* located in Chapter 4, *Supporting Information*.

Materials/Parts: Lists all parts or materials necessary to perform the task. Expendable and durables are identified with an item number from the applicable work package located in Chapter 4, *Supporting Information*.

Personnel Required: Lists all personnel necessary to perform the task.

References: Includes any other manuals necessary to complete the task. When there are no references listed, all steps necessary to complete the task are contained within this manual. A listing of reference materials is contained in the work package *References* in Chapter 4, *Supporting Information*.

Equipment Condition: Notes the conditions that must exist before starting the task. The equipment condition will also include any prerequisite maintenance tasks to be performed with reference to the work package number or to the TM number.

Test Equipment: Lists all test equipment (standard or special) required to troubleshoot, test and inspect the equipment covered in this manual. The test equipment is identified with an item number and work package number from the *Tool Identification List* located in Chapter 4, *Supporting Information*.

CHAPTER 1

DESCRIPTION AND THEORY OF OPERATION

FOR

MODULAR CAUSEWAY SYSTEM (MCS)

WARPING TUG (WT)

**OPERATOR MAINTENANCE
WARPING TUG
GENERAL INFORMATION**

SCOPE

This manual contains descriptions and instructions for the Warping Tug (WT).

Type of Manual: Operators Manual.

Purpose of Equipment: The purpose of the WT is for towing, anchor mooring and recovery, craft salvage during Logistics-Over-the-Shore (LOTS) deployment and handling of supplies between ship and beach.

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) and AR 700-138, Army Logistics Readiness and Sustainability.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If any component in your system needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368, Product Quality Deficiency Report.

CORROSION PREVENTION AND CONTROL (CPC)

CPC of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem 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 the materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using SF 368, Product Quality Deficiency Report. Use of key words, such as "corrosion", "rust", "deterioration" or "cracking", will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA PAM 738-750, Functional Users Manual for The Army Maintenance Management System (TAMMS).

OZONE DEPLETING SUBSTANCES (ODS)

The continued use of ODS has been prohibited by Executive Order 12856 of 3 August 1993.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

The procedures for destruction of Army materiel to prevent enemy use are contained in TM 750-244-6.

PREPARATION FOR STORAGE AND SHIPMENT REFERENCE

Reference WP 0037 00 through 0051 00 for preparation for storage or shipment of the WT.

LIST OF ABBREVIATIONS/ACRONYMS

| Abbreviation/Acronym | Name |
|-----------------------------|--|
| AC | Alternating Current |
| ANS | Answer |
| ANT | Antenna |
| AOAP | Army Oil Analysis Program |
| BII | Basic Issue Items |
| C | Centigrade |
| CAGEC | Commercial and Government Entity Code |
| CLR | Clear |
| cm | Centimeters |
| CO2 | Carbon Dioxide |
| COEI | Components of End Item |
| CPC | Corrosion Prevention Control |
| CCW | Counterclockwise |
| CW | Clockwise |
| dB | Decibels |
| DC | Direct Current |
| Deg | Degrees |
| DSC | Digital Selective Calling |
| EIR | Equipment Improvement Recommendations |
| ESD | Electrostatic Discharge |
| F | Fahrenheit |
| FCC | Federal Communications Commission |
| fl | Fluid |
| FNC | Function |
| FSS | Fast Sealift Ship |
| ft | Feet |
| ft lbs | Foot Pounds |
| FWD | Forward |
| GAL | Gallon |
| GFI | Ground Fault Indicator |
| GND | Ground |
| GPH | Gallons Per Hour |
| H | Height |
| H/L | High/Low |
| HP | Horse Power |
| Hz | Hertz |
| IAW | In Accordance With |
| ICM | Intercommunication (short-form) |
| ID | Identification |
| in. | Inches |
| in. lbs | Inch Pounds |
| INTL | International |
| ISO | International Standards Organization |
| ISOPAK | International Standards Organization Package |
| lb | Pounds |
| LCD | Liquid Crystal Display |
| Kg | Kilograms |
| kHz | Kilohertz |
| KW | Kilowatt |
| LASH | Lighter Aboard Ship |
| LOTS | Logistics-Over-the-Shore |

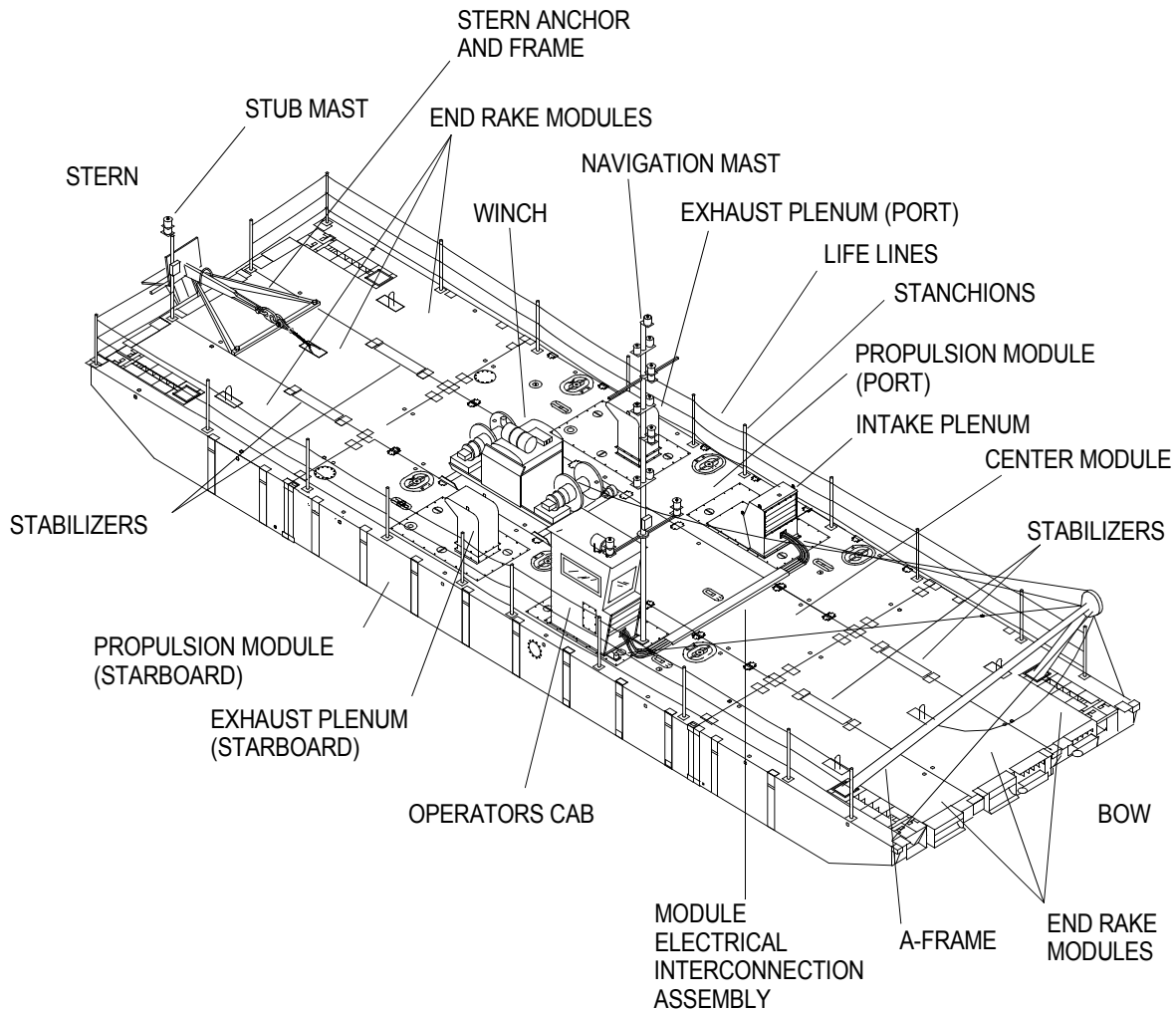
LIST OF ABBREVIATIONS/ACRONYMS (CONT'D)

| Abbreviation/Acronym | Name |
|-----------------------------|---|
| M | Meters |
| mA | Milliampere |
| MCS | Modular Causeway System |
| MEM | Memory |
| Mhz | Megahertz |
| ML | Milliliters |
| MTBE | Methyl Tertiary Butyl Ether |
| MTO&E | Modified Table of Organization and Equipment |
| NATO | North Atlantic Treaty Organization |
| NEMA | National Electrical Manufacturers Association |
| NI-CA | Nickel Cadmium |
| NL | Navy Lighter |
| Nm | Newton-Meters |
| NOAA | National Oceanic and Atmospheric Administration |
| NSA | National Security Agency |
| ODS | Ozone Depleting Substance |
| oz | Ounces |
| PLGR | Precision Lightweight Global Positioning Receiver |
| PMCS | Preventive Maintenance Checks and Services |
| PSI | Pounds Per Square Inch |
| PTT | Push To Talk |
| PWR | Power |
| rcv | Receive |
| RF | Radio Frequency |
| RPM | Revolutions Per Minute |
| RPSTL | Repair Parts and Special Tools List |
| SCR | Scrambler |
| SINCGARS | Single Channel Ground and Airborne Radio |
| STBD | Starboard |
| sw | Switch |
| TAMMS | The Army Maintenance Management System |
| TEL | Telephone |
| TO&E | Table of Organization and Equipment |
| Tx | Transmit |
| UTC | Coordinated Universal Time |
| uV | Ultra Violet |
| VAC | Voltage, Alternating Current |
| VDC | Voltage, Direct Current |
| VHF/FM | Very High Frequency/Frequency Modulation |
| W | Width |
| WT | Warping Tug |
| XMIT | Transmit |

**OPERATOR MAINTENANCE
WARPING TUG
DESCRIPTION AND DATA**

EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES

The Warping Tug (WT) system consists of two propulsion (powered) modules and one non-powered center module, that are 8 ft wide, 40 ft long and 4 ft 6 in. high, and six end rakes (two right, two left and two center), that are 8 ft wide and 20 ft long. The individual modules are connected by male and female locking assemblies located around the perimeter of each module. The WT is composed of an operators cab, a deck winch, A-frame, intake and exhaust plenums, main navigation mast, stub mast, stern anchor assembly and life lines. It provides the Modular Causeway System (MCS) with the capability of using the WT for towing, anchor mooring and recovery and craft salvage. All components are transported in ISO (International Standards Organization) containers for assembly.



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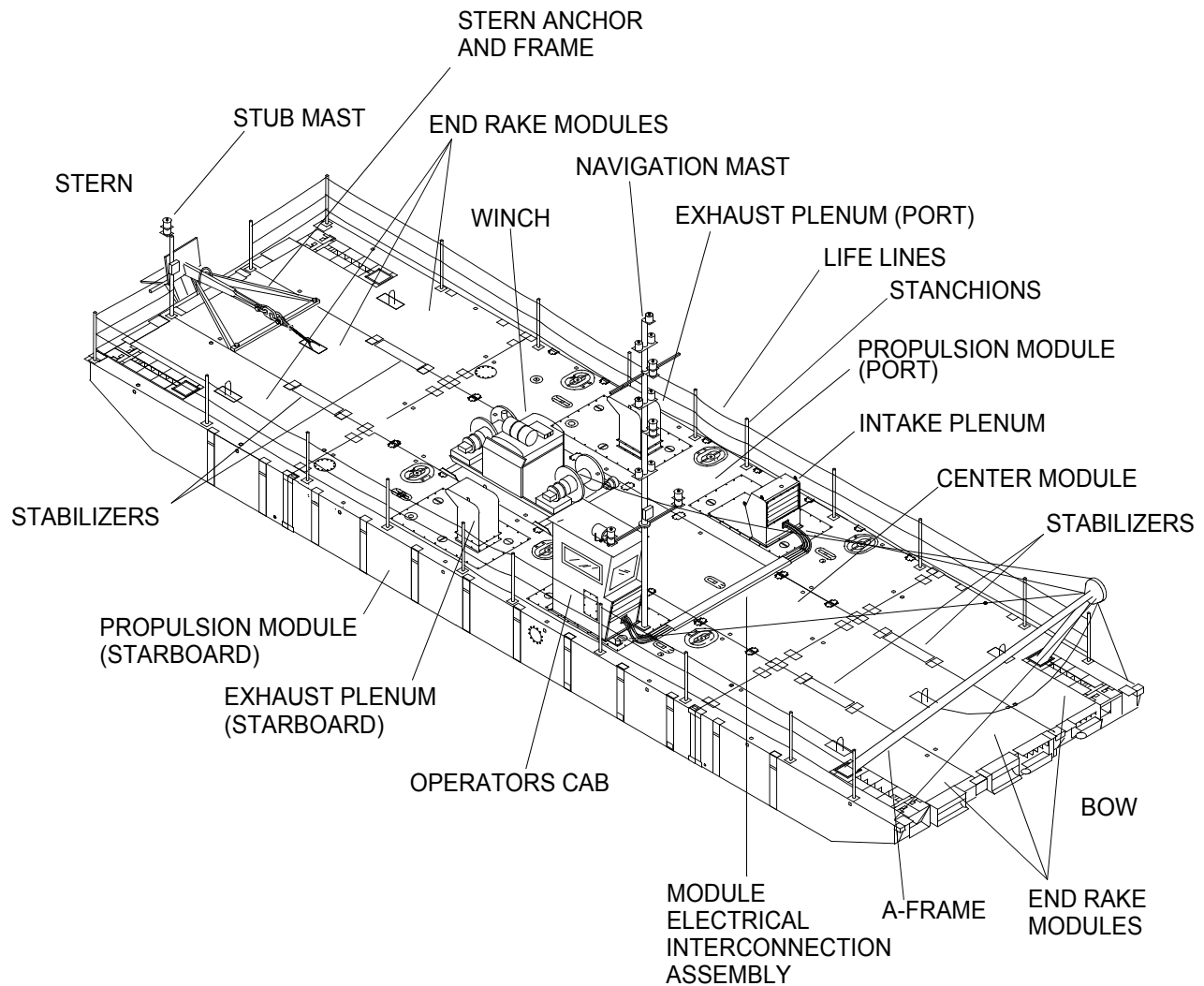
**OPERATOR MAINTENANCE
WARPING TUG
DESCRIPTION AND DATA**

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

The warping tug (WT) consists of two propulsion modules, one non-powered center module, six rake modules (two right, two left and two center) connected together by male/female connector assemblies. At each connector location there are upper and lower engagement points. Both engagement points are actuated simultaneously by lifting the guillotine bar vertically from the deck. The pairs of vertical connectors are spaced evenly around the perimeter of each module allowing for universal module configuration. The male connector assembly contains a retractable connector pin designed to be flush with the surface when in a stowed position. In the stowed position, the tapered shear lugs of the lock housings protrude around the pin housing. In the retracted position, the pin is compressed against the deployment spring and is held in place by the guillotine bar. The female connector assembly receives the male connector pin and, when locked, forms a positive mechanical interlock. The female connector assembly can be identified by the projecting shear lug which completely surrounds the housing. The female connector shear lug is internally tapered and sized to fit tightly with the mating lugs on the opposing male connector. This arrangement enhances the strength of the connectors, enabling it to withstand heavy shear loads.

The propulsion modules and the center module are each 8 ft wide, 40 ft long and 4 ft 6 in. high. The end rake modules are each 8 ft wide, 20 ft long, 4 ft 6 in. high and are configured as right rake assemblies, center rake assemblies and left rake assemblies. All non-powered center modules are fully ISO-compatible and are completely interchangeable. The propulsion modules are the prime mover for the WT and each is propelled by a 8 cylinder, 600 hp water cooled, turbo charged, diesel marine engine driving a 360° steerable, 5000 lb output pump-jet.

The following items complete the WT assembly. The operators cab, with controls, is a self-contained unit designed to be removed for transport and can be mounted on either port or starboard propulsion module. Plug-in type electrical connectors are provided to tie electrical control into the cab location. A module electrical interconnect assembly is the electrical control link between the cab to the propulsion module opposite the cab. Navigation lighting is provided in the form of a 28½ ft main navigational mast mounted on the cab and a 8½ ft stub mast that is installed at the extreme aft end of the powered section. Both masts are removable for shipment. Air intake and exhaust plenums are installed on the powered modules to provide air flow through the machinery spaces. One air intakes is integral to the cab. The deck equipment includes a winch, an A-frame and a stern anchor. The deck winch is a dual drum diesel hydraulic reversible winch with capstan that provides pull for the A-frame and stern anchor. Four stabilizes are installed, two forward and two aft, to provide some stability during operation at sea. A hand held portable fire extinguisher mounts to either exhaust plenum. A removable personnel safety railing system, made up of stanchions and life lines, is installed along both sides and across the aft end of the powered section. The powered section, completely assembled and without fluids, weighs approximately 95 tons.



PROPULSION MODULE

The propulsion module is the prime module in the WT and is divided into three compartments separated by watertight bulkheads with hatches. The center (machinery) compartment is the largest and contains engine cooling and exhaust components, the drive train, hydraulic system and all electrical components with the exception of one bilge pump, a single bilge pump control panel and a pressure operated switch that are located in the lazaret end compartment.

The drive train consists of a diesel engine, marine gear, transfer case and pump-jet. Guarded drive shafts connect the marine gear to the transfer case and the transfer case to the pump-jet.

The engine cooling and exhaust system consists of a sea chest (raw water inlet integral with the structure of the module), a butterfly valve, a duplex strainer, engine raw water pump, fuel cooler, engine cooler heat exchanger, marine gear oil cooler, exhaust water shut-off valve, transfer case oil cooler, transfer case shut-off ball valve, water cooled muffler and exhaust flappers.

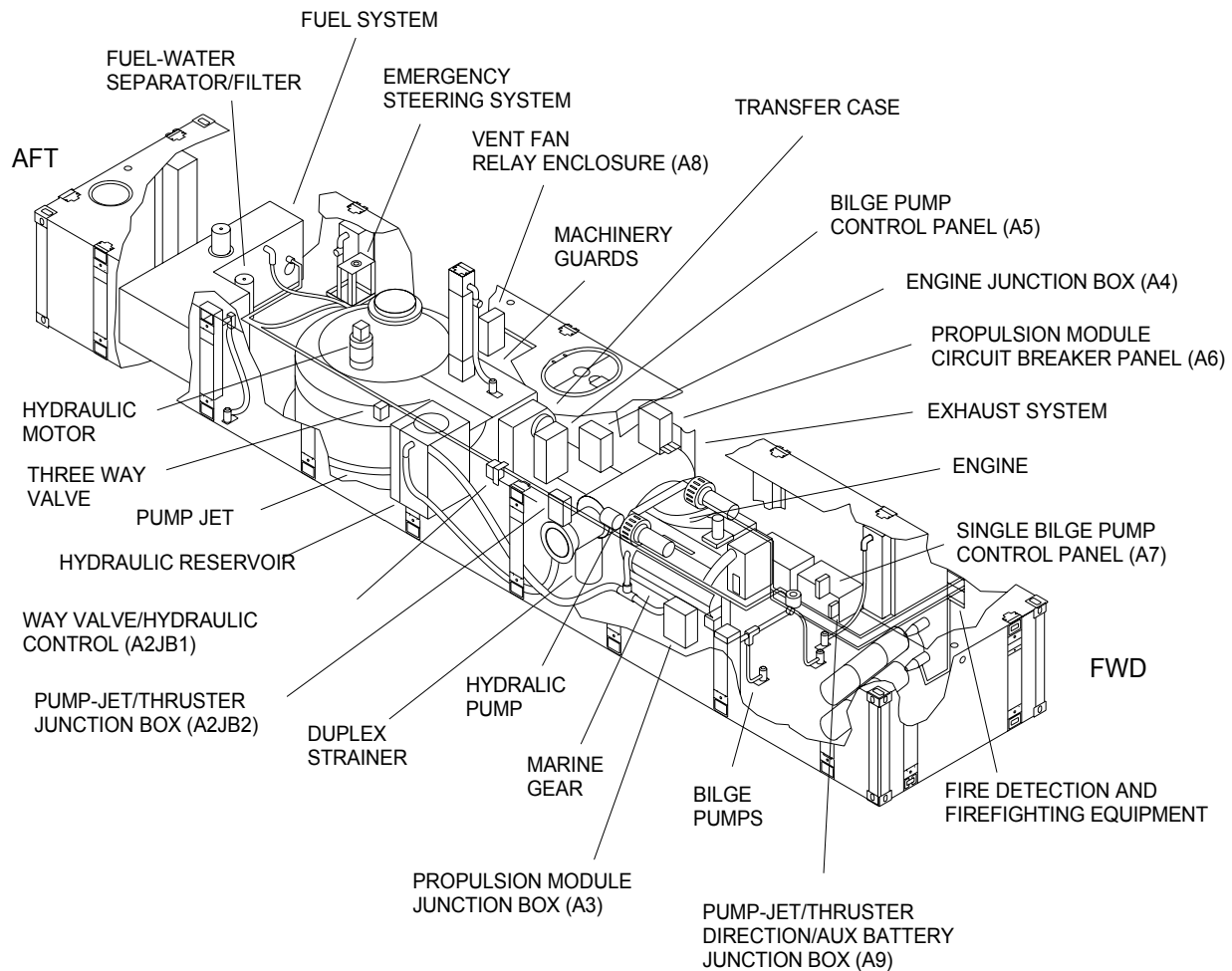
The hydraulic system consists of a hydraulic pump driven by the marine gear, a hydraulic motor that drives the primary steering planetary gearbox mounted on the pump-jet, a hydraulic brake which is integral to the auxiliary steering planetary gearbox mounted on the pump-jet, an electrically actuated way-valve with auxiliary manual control, manually operated ball valve, needle valve, braking valve unit, pressure filter and a hydraulic reservoir with return line filter. A manual hydraulic hand pump is also provided for manual release of the hydraulic brake in case of system malfunction.

The propulsion module electrical system consists of an engine mounted alternator, four lead-acid storage batteries, propulsion module circuit breaker panel A6, bilge pump control panel A5, single bilge pump control panel A7, engine junction box with emergency stop control A4, engine mounted emergency stop push button, propulsion module junction box A3, pump-jet thruster junction box A2jb2, vent fan relay enclosure A8, pump-jet thruster direction/auxiliary battery junction box A9, fire detection system consisting of two thermal detectors and a thermal switch electrically tied into the cab controls. If the temperature inside reaches 225°F, a fire alarm will sound in the cab. In the event of a fire, a manually activated fire suppression system will flood this compartment with CO₂. This compartment is also equipped with five electrically operated bilge pumps.

The aft (fuel) compartment contains the fuel tank, fuel/water separator and fuel system shutoff valves. This compartment is also protected by the fire detection system. It is important to note that there are no electrical connections, controls or operating devices in this compartment. A bilge pump is not provided in this compartment. Fire detection is accomplished by means of a probe extending through the bulkhead that separates the fuel and machinery compartments with all electrical terminations made on the machinery compartment side. In the event of fire, this compartment is flooded with CO₂ upon activation of the fire suppression system.

The forward compartment (lazaret) contains the fire suppression system control and agent storage components and provides stowage for the emergency steering assembly when not in use. This compartment is equipped with a bilge pump and is not protected by the fire suppression system.

Each propulsion module has six 3700 gph, submersible bilge pumps; five in the machinery compartment and one in the lazaret. The pumps are locally controlled from control stations mounted in the machinery compartment and lazaret or remotely controlled from the operators cab. The pump-jet is driven by an 8 cylinder, marine diesel engine delivering 600 hp at 2100 RPM on the output shaft. Weight of the propulsion module is approximately 41,100 lbs dry or 45,000 lb fully loaded. Listed below are detailed descriptions of the major components found in each propulsion module.



PROPULSION MODULE MAJOR INTERNAL COMPONENTS

Engine

The engine is an 8 cylinder, water cooled, turbo charged, after cooled, two-cycle diesel marine engine delivering 600 hp at 2100 RPM. All operator controls of the engine is accomplished from the operators cab, with the exception of below deck emergency stop push buttons and emergency stop actuation control of the fire suppression system.

Exhaust System

The propulsion module exhaust system consists of a water cooled muffler assembly with inputs directly coupled from both engine turbocharger exhaust ports. The muffler is supplied with two exit ports. One is plugged and one is ported to the exhaust flapper for configuration as either a port or starboard exhaust system. The piping between the turbocharger, muffler and exhaust flapper is a flexible silicon hose to accommodate for thermal expansion in the system.

Fuel System

Each propulsion module is equipped with a 400 gallon stainless steel fuel tank permanently welded inside the fuel compartment. Fuel suction and return lines are fitted with shut-off ball valves to isolate fuel to the tank when not in use or during repairs to the fuel system. A filler neck/strainer basket, located on top of the fuel tank, is accessible through a deck hatch from outside the fuel compartment. A dual purpose fuel-water separator and filter is located near the fuel tank in the fuel tank compartment at the rear of the module to remove water and contaminants from the diesel fuel.

Fuel-Water Separator/Filter

A dual purpose fuel-water separator and filter is located near the fuel tank in the fuel tank compartment at the rear of the module. Its main function is to remove water and contaminants from the diesel fuel.

Marine Gear

The marine gear provides the capability to reverse the directional rotation of the other drive train components making it possible to backflush the pump-jet. It is mounted directly to the flywheel housing of the diesel engine. The transmission is equipped with an integral hydraulic system consisting of a pump, shifting valve and internal hydraulic cylinders. The pump utilizes the transmission lubricating oil to operate hydraulic cylinders which shifts the gears to the backflush, neutral or engaged configurations. The shifting valve is solenoid actuated from a toggle control switch in the operators cab. In addition to powering the shifting cylinders, the pump also circulates case oil through an oil cooler that is plumbed into the engine raw water cooling system. In the event of electrical power loss to the marine gear shifting solenoids, an emergency engagement capability is provided for the marine gear by replacing a shifting valve solenoid with an emergency lock-up plug that locks the marine gear transmission gearing. The lock-up plug is used to provide independent forward or backflush capabilities and is mounted externally to the shifting valve solenoid housing.

Transfer Case

The transfer case compensates for offset alignment between the output flange of the marine gear and the input flange of the pump-jet. It has a 1:1 gear ratio, utilizing spur gears throughout, and is equipped with an oil pump that circulates lubricating oil from its gear case through an oil cooler plumbed off of the engine raw water cooling system and back to the top of the transfer case to lubricate the upper gearing. The transfer case is connected to the marine gear and the pump-jet via drive shafts.

Machinery Guards

Removable metal machinery guards cover the drive shafts, engine flywheel and alternator belt to protect personnel from contact with rotating parts.

Pump-Jet

Each propulsion module is equipped with a 360° steerable pump-jet propulsion unit capable of delivering 5000 lb of thrust. The pump-jet works on the principal of a rotary pump and consists of a drive shaft that drives an upper gearbox assembly which drives an impeller. Water is sucked into the pump-jet through a feeding funnel on the bottom of the module and fed into the enclosed pressure casing, whose bottom plate is provided with three systematically arranged outlet nozzles from which water is ejected at a 13° angle. A hydraulic steering motor drives a spur gear through a planetary gearbox to rotate the pressure casing and steering nozzles, located on the bottom, in both senses of rotation without limitation. A second planetary gearbox is provided to facilitate emergency steering. The emergency steering control stand is mounted above deck and interfaces with the through shaft of the planetary gearbox. The emergency steering gearbox contains a spring set, hydraulically released disc brake. The brake maintains the position of the steering nozzle until rotation is called for by the operator. In the event of hydraulic system failure, the brake can be released via the hydraulic hand pump to facilitate emergency steering. An

electromechanical feedback unit monitors relative steering position of the steering nozzle and transmits that position to a dial indicator in the operators cab. An electric sensor monitors the oil level in the upper gearbox and sends a signal to an indicating light in the operators cab when the oil level is below the required level.

Duplex Strainer

The duplex strainer is located by the diesel engine and is considered part of the raw water system. Its purpose is to collect debris from raw seawater and prevent it from entering the water pump.

Hydraulic System

The hydraulic system contained within each propulsion module provides the steering control for the pump-jet. The system includes an axial piston hydraulic pump mounted off the marine gear, a fixed displacement hydraulic motor mounted to the planetary gear drive off the pump-jet, hydraulic brake, control valves, filters and a 26 gallon hydraulic reservoir. The reservoir is fitted with an external sight level, in-tank suction strainer and in-tank return line filter. A pressure filter is located between the hydraulic pump and the way-valve control block. The interconnect piping between components includes a short section of hose to minimize the effects of vibration.

Hydraulic Pump

A flange mounted, axial piston hydraulic pump, driven by the marine gear, provides hydraulic pressure to operate the hydraulic steering motor and normal release of the hydraulic steering brake.

Hydraulic Motor

A fixed displacement, axial piston hydraulic motor is flange mounted on the input shaft of the pump-jet steering planetary gearbox. Hydraulic flow from the hydraulic pump is directed through the way-valve unit to drive the hydraulic motor in a clockwise or counterclockwise direction to rotate the steering nozzles.

Way-Valve Unit

The way-valve is controlled hydraulically by means of electrically operated pressure control valves or manually by means of a control lever mounted on the valve unit assembly. The way-valve directs hydraulic fluid via the load retaining valve to the hydraulic motor to control the direction in which the hydraulic motor rotates. A brake valve located on the pump-jet directs hydraulic pressure to the emergency steering planetary gearbox to release the hydraulic brake when rotation of the hydraulic motor is initiated.

Three-Way-valve

A manually operated control handle on the valve is positioned to select normal hydraulic operation or to isolate the normal hydraulics so that the emergency steering hydraulic hand pump can be used to release the hydraulic brake in the emergency steering mode.

Hydraulic Reservoir

The hydraulic reservoir is a 26 gallon holding tank for the system hydraulic fluid. The tank is equipped with a fill and drain port for replenishment of the fluid, a sight gauge to determine fluid level and a return line filter with dirt indicator to filter hydraulic fluid returning to the tank and outlet line strainer. The tank has a removable access panel to facilitate cleaning. A float switch monitors fluid level and lights an indicating light in the operators cab if the fluid level is below the required level.

Bilge Pumps

Each propulsion module is equipped with six bilge pumps, each capable of pumping 3700 gph in the event the propulsion module takes on water. Five are located in the machinery compartment and one in the forward lazaret. The pumps can be controlled remotely from the operators cab by toggle switches and can be tested locally at the bilge pump control panels.

Fire Detection and Fire Fighting Equipment

A fixed CO2 fire suppression system is designed to flood the engine and pump-jet compartment and the fuel storage compartment with CO2 in the propulsion module units if fire breaks out. Thermal detection probes activate an alarm in the operators cab if the temperature in the propulsion module reaches 225° F. One is mounted through the bulkhead behind the pump-jet to monitor the fuel compartment. The other one is mounted below the deck to monitor the machinery compartment. There is no thermal detector in the lazaret compartment. On the terminal strip A4, the fire alarm horn speaker will sound. The lower control panel in the operators cab has PORT FIRE ALARM and STBD FIRE ALARM red indicator lights. Above deck manual activation is accomplished using a remote cable pull box recessed in the deck and located directly in front of the access hatch and forward of the operators cab. Pulling the handle activates the fire suppression system and floods the compartment with CO2. A below deck manual release is located on the upper 50 lb bottle. When any of the fire suppression controls are manually pulled, four events occur:

- (1) Activates fixed time delayed CO2 fire suppression system that, 30 seconds later, discharges into propulsion module to suffocate fire.
- (2) Disconnects cable from intake plenum inner vent cover causing it to close and shut off oxygen sources.
- (3) Cable action shuts off relay for exhaust fan in exhaust plenum.
- (4) Activates pressure trip mechanism to shut off diesel engine.

A portable CO2 fire extinguisher is mounted on either exhaust plenum.

Emergency Steering System

Each propulsion module is equipped with an emergency steering system consisting of a mounting stand, shaft with pillow block bearing support and hand crank. It is stored in the aft lazaret and is used to manually maneuver the WT in the event of a hydraulic system failure.

Pump-Jet Thruster Junction Box (A2jb2)

The pump-jet thruster junction box is mounted opposite the personnel access hatch approximately midway in the machinery compartment. The box contains relays and circuitry necessary to operate the way-valve steering solenoids circuit breakers for over-current protection.

Pump-Jet Thruster Direction/Aux. Battery Junction Box (A9)

The pump-jet thruster direction/aux. battery junction box is mounted on the machinery compartment side of the bulkhead that separates the machinery compartment and the forward lazaret. The box contains an isolation diode, voltage regulator/battery charging circuit, 24 VDC voltage regulator, two 24 VDC auxiliary battery packs, control relay and two terminal blocks. The enclosure is vented due to possible off-gassing of the batteries.

Propulsion Module Junction Box (A3)

The propulsion module junction box is located forward in the machinery compartment opposite the main storage batteries. The box is the termination point for connection of three of the four main power cables that connect the propulsion modules to the cab.

Engine Junction Box (A4)

The engine junction box is located inboard and next to the personnel access hatch. It is a steel enclosure that contains the diesel engine governor controller, terminal strips and two relays controlling the emergency stop air flap solenoid and the emergency malfunction bell. An engine emergency stop push button is mounted to the enclosure cover.

Bilge Pump Control Panel (A5)

The bilge pump control panel is mounted very near the center line of the propulsion module inboard of the personnel access hatch. The panel consists of a steel enclosure with five toggle switches, one for each bilge pump located in the machinery compartment.

Propulsion Module Circuit Breaker Panel (A6)

The propulsion module circuit breaker panel is located in the machinery compartment, opposite the engine junction box, next to the personnel access hatch. The panel is a steel enclosure with 14 circuit breakers mounted to the enclosure cover. Thirteen circuit breakers are protected by a plexiglas guard plate mounted with stand-offs. Access slots permit operation of the circuit breakers while protecting them from accidental shut off or damage. The propulsion module main circuit breaker (A6CB1) and operators cab circuit breaker (A6CB11) must both be in the on position for the operators cab circuit breaker panel (A3) to receive power.

Single Bilge Pump Control Panel (A7)

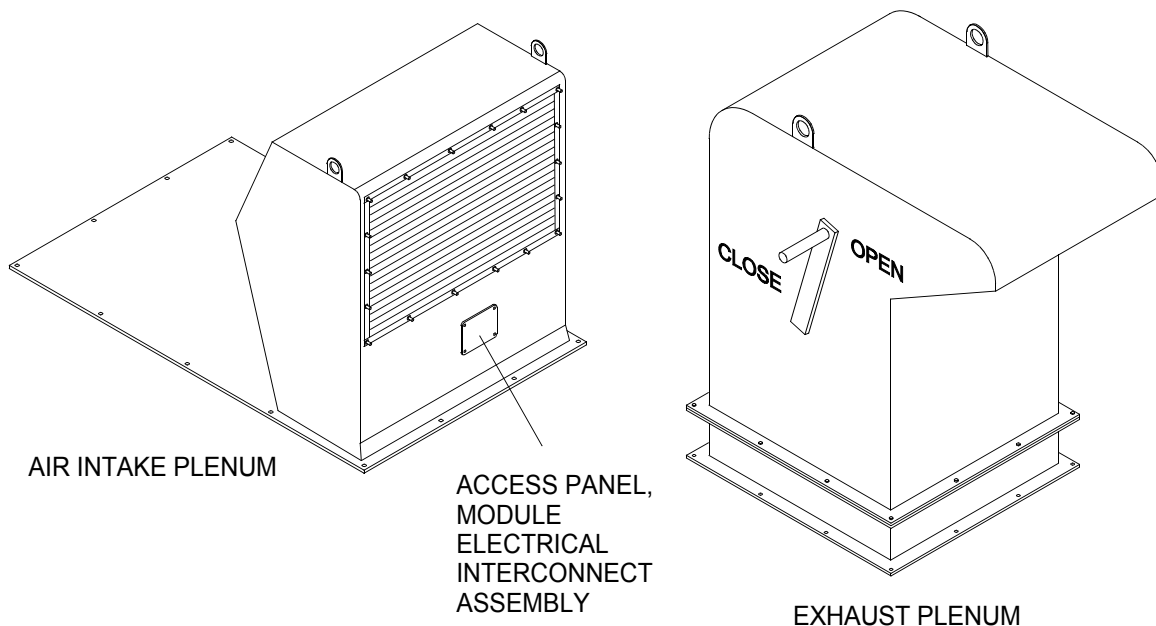
The single bilge pump control panel is located in the lazaret and consists of a steel enclosure mounted to the bulkhead that separates the lazaret from the machinery compartment. A single toggle switch for the lazaret bilge pump operation is mounted to the enclosure cover.

Vent Fan Relay Enclosure (A8)

The vent fan relay enclosure is located in the machinery compartment, just forward of the pump-jet on the same side as the personnel access hatch. The assembly consists of a steel enclosure with a plug-in type receptacle located on the bottom. The enclosure is the power source for vent fan operation and contains the relay for fan operation. Once the exhaust plenum is mounted, the power cord that is hard wired to the fan can be plugged into the receptacle to complete the installation. A screw-on cover protects the receptacle when not in use. The power cord from the fan is equipped with a screw cap that matches the receptacle thread to secure the cord to the enclosure.

VENTILATION

Although not a part of the propulsion module itself, the intake plenum is mounted over the engine. (The other air intake is located in the operators cab). The intake plenum access panel allows connection of the module electrical interconnect cable to the engine operating receptacles. The exhaust plenums are mounted over the pump-jet. The plenums are to facilitate the fresh air flow through the compartment and limit the engine compartment to a temperature rise of 20°F above ambient temperature. The exhaust plenum has a flapper door (damper) that is manually opened and closed. It is closed to eliminate a second source of air to any fire below deck.



OPERATORS CAB

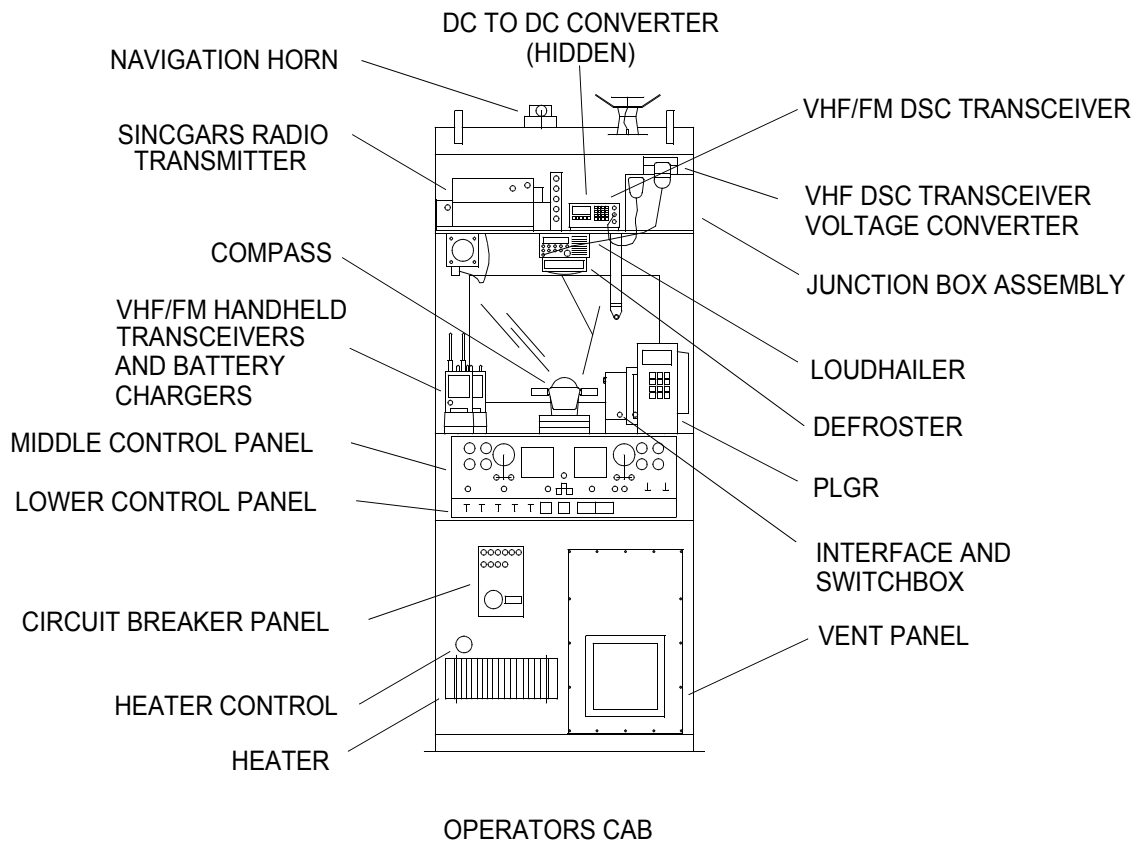
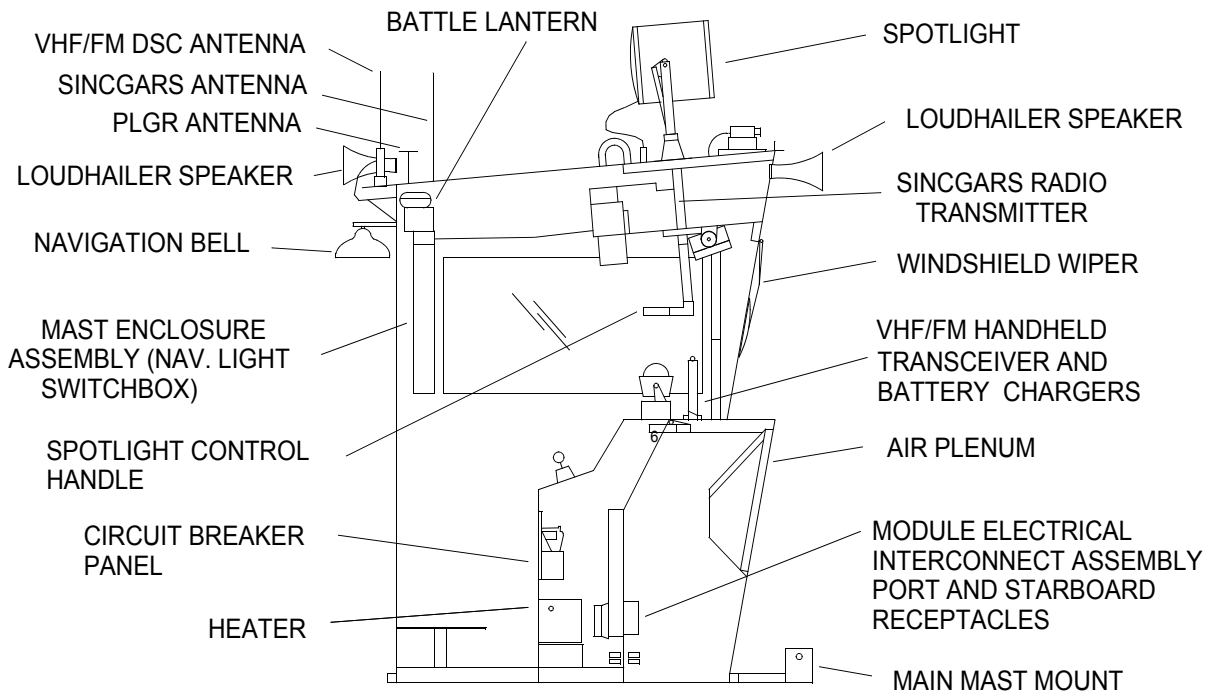
The operators cab is a portable steel fabricated unit which can be mounted on either the port or starboard propulsion module. It houses the middle control panel A1, lower control panel A2, the operators cab circuit breaker panel A3, the mast enclosure assembly A7 (navigation light switch box) that contains primary and spare main and stub mast navigational light controls and indicators, a battle lantern and a magnetic compass. A module electrical interconnect assembly is the electrical control link that allows control of both propulsion modules from the operators cab. The receptacles for the interconnect assembly are located within a operators cab access panel and intake plenum access panel.

Communications and electronic equipment required to operate the WT include the VHF/FM DSC (Digital Selective Calling) transceiver programmable with weather channel, VHF DSC transceiver voltage converter, AN/VRC-88D SINCGARS radio transmitter, two VHF/FM handheld transceivers with hands free capability and their associated battery chargers, public address set (loudhailer), AN/PSN-11(V)1 precision lightweight global positioning receiver (PLGR), AN/PSN-11 PLGR interface and switchbox and a DC to DC converter.

Antennas for the VHF/FM DSC transceiver, AN/PSN-11(V)1 PLGR and AN/VRC-88D SINCGARS radio transmitter, along with a navigation horn, 2 public address set (loudhailer) hailer horns (forward and aft) and a 12 inch diameter 24 VDC marine duty spot light are all located on the cab roof. The spotlight can be controlled by a manual remote lever control which penetrates through the cab roof for the operator. An electric toggle switch in the middle control panel activates the spotlight.

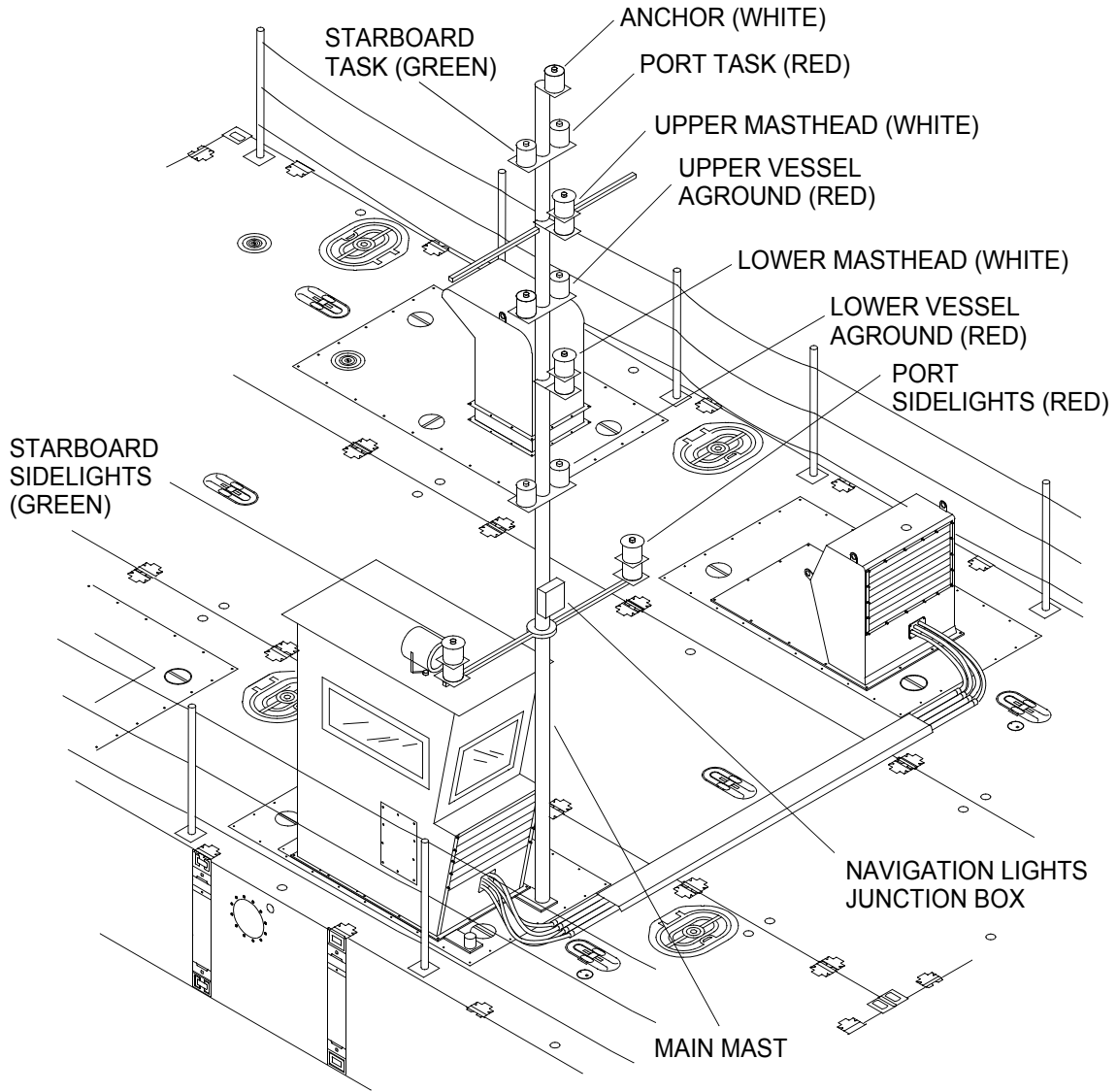
The operators cab contains a heater to maintain temperature at 65°F minimum in an ambient temperature or -10°F. Both the heater and the defroster require hot water which comes from the diesel engine's glycol cooling system. There are hot water shutoff valves for the operators cab heating system which must be open for water to flow and the heating system on to provide heat. The defroster has inlet, outlet and bleeder valves. Electric toggle switches on the lower control panel activate the heater and defroster.

The main navigational mast mounting clamps and supports are externally mounted to the operators cab. Miscellaneous cab equipment include a window defroster and a windshield wiper.

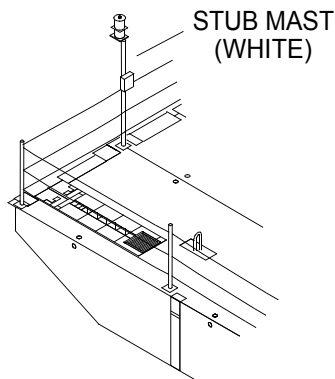


NAVIGATION LIGHTS

The main navigational mast is mounted on the front and to the inboard side of the operators cab and the stub mast is mounted on the aft of the WT. These masts provide the necessary navigational running lights for signal and safety while the WT is in operation.



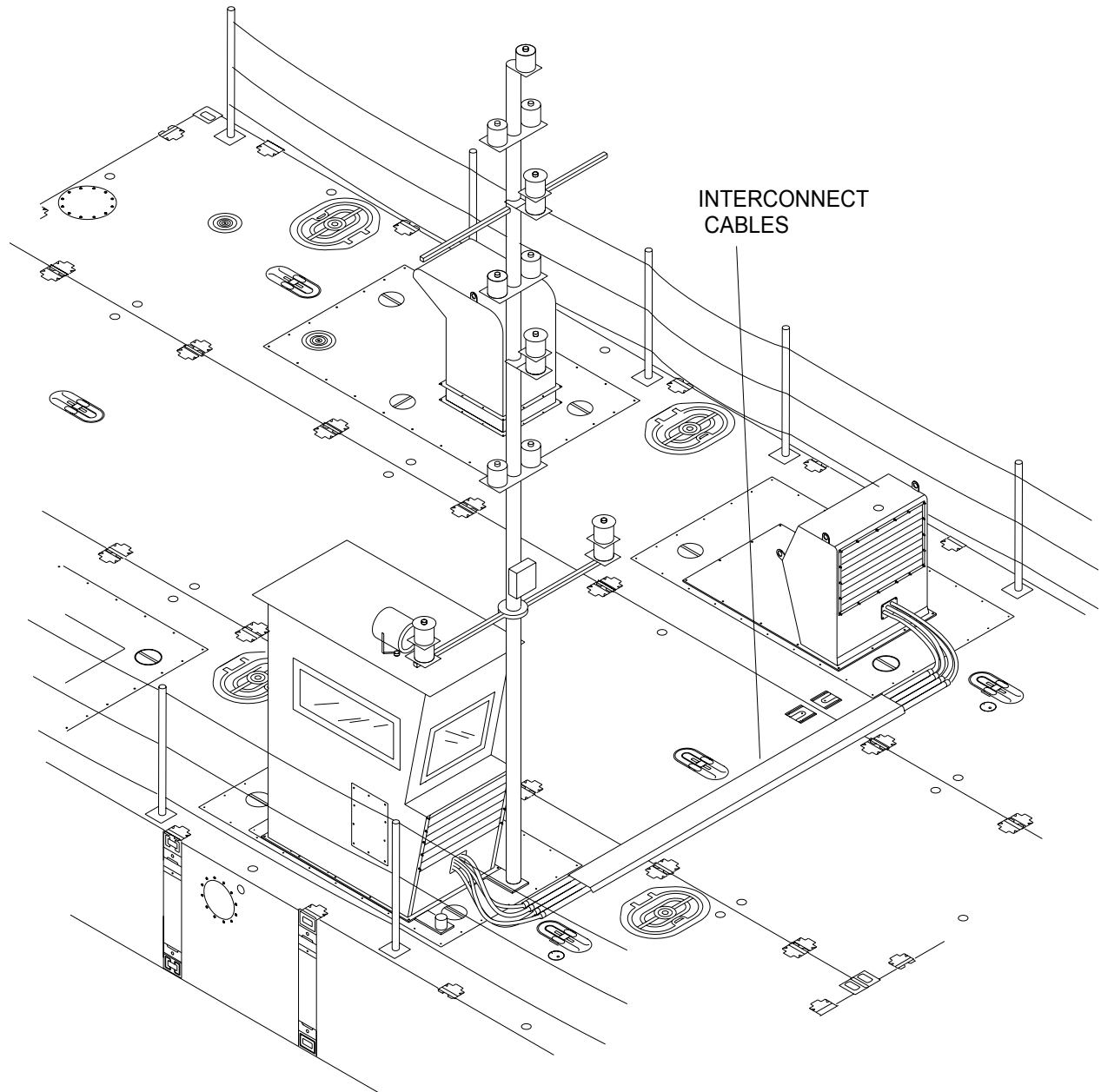
MAIN NAVIGATION MAST



STUB MAST

MODULE ELECTRICAL INTERCONNECT CABLES

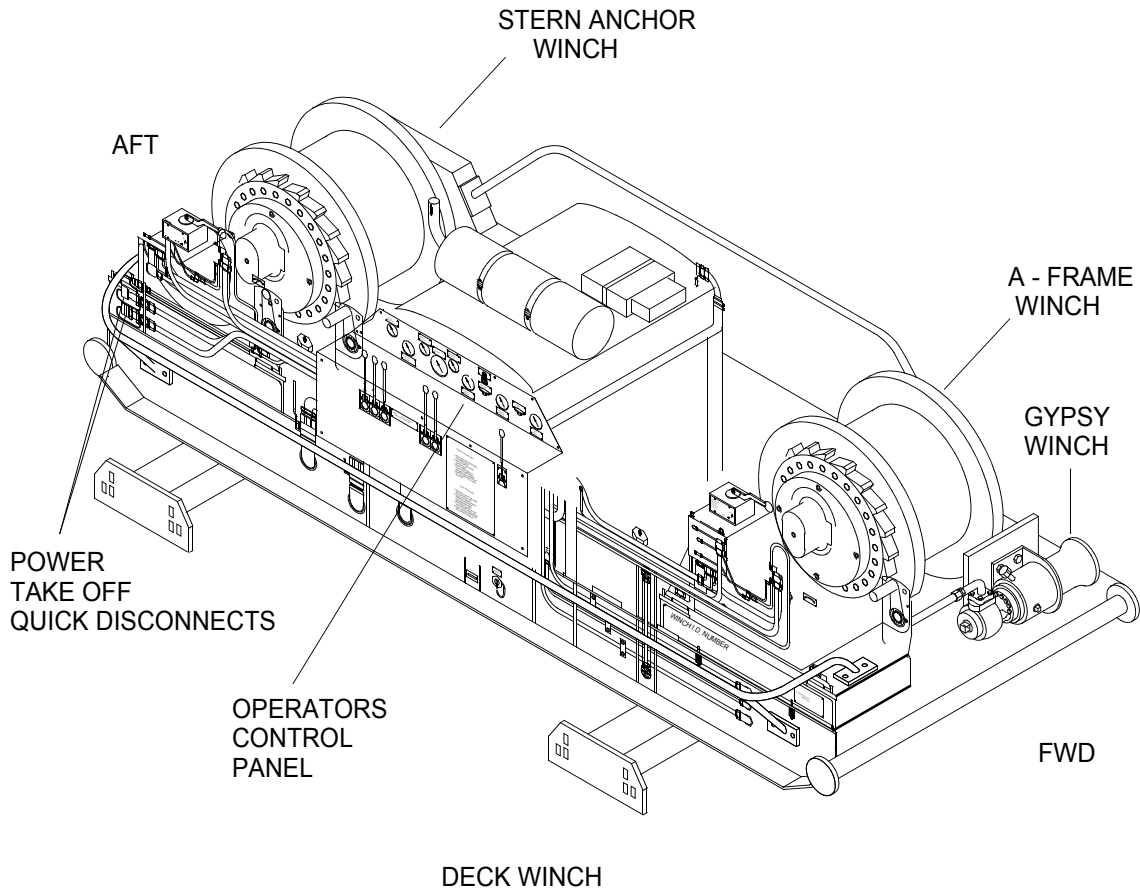
The two propulsion modules are linked together with a reinforced and hardened set of interconnect cables. The interconnect cable allows operation commands to be transmitted from the operators cab to both propulsion module engines and pump-jet thrusters. The interconnect cable is connected to the receptacles located in front of the operators cab and the front of the intake plenum on the opposite propulsion module.



MODULE ELECTRICAL INTERCONNECT CABLES

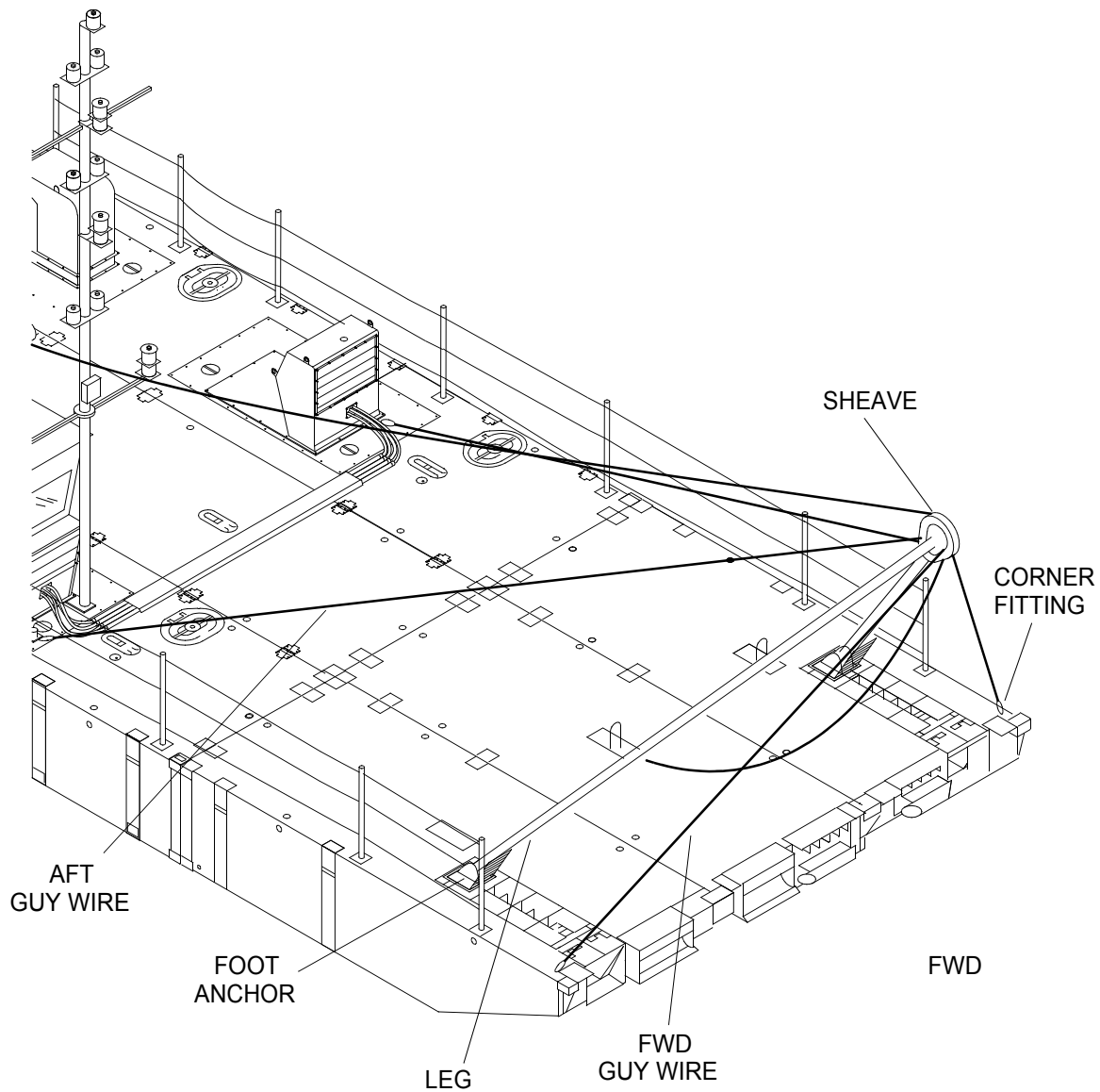
DECK WINCH

The WT's primary working tool is a dual drum diesel-hydraulic reversible winch with a capstan. The winch is installed aft of the operators cab on the centerline. It provides the line pull for the A-frame and the stern anchor. The forward drum is used with the A-frame and the aft drum is used with the stern anchor. The winch's rated line pull is 27,000 lbs bare drum and 19,500 lbs full drum. Each drum carries 700 foot of 1 in. diameter wire rope. A 12 in. diameter gypsy (drum capstan) winch is located at the forward end, with a rated line pull of 5000 lbs. A power take-off is included with the winch to provide power to ancillary equipment and tools that are used on the WT.



A-FRAME

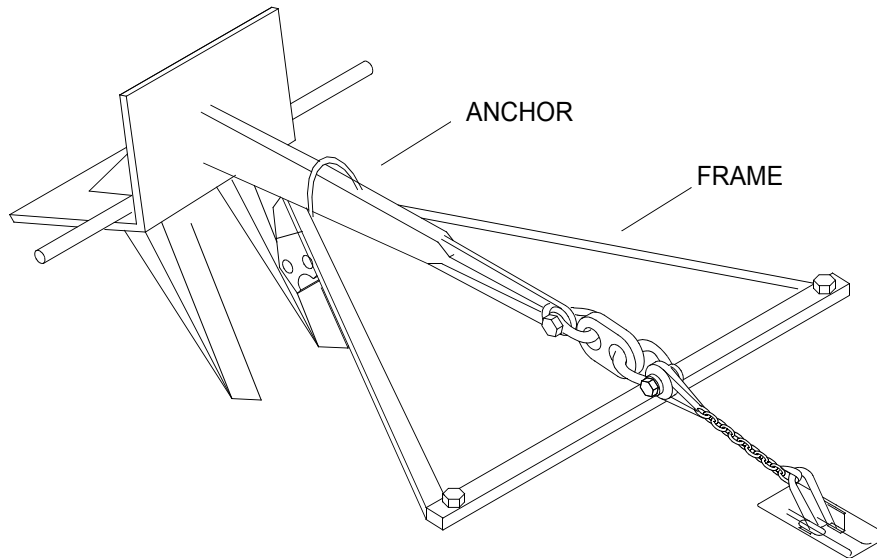
The WT A-frame has a lifting capacity of 27,000 lbs when the load is forward of the plane of the A-frame legs. The safe working load for loads aft of the plane of the A-frame legs is 12,000 lbs. The A-frame assembly includes two legs, a sheave, two foot anchors, two after guy assemblies, two forward guy assemblies and two corner fitting lugs. An elevating pole and an elevating pole guy assembly (not illustrated) are used to elevate the A-frame during assembly and disassembly.



A-FRAME

STERN ANCHOR

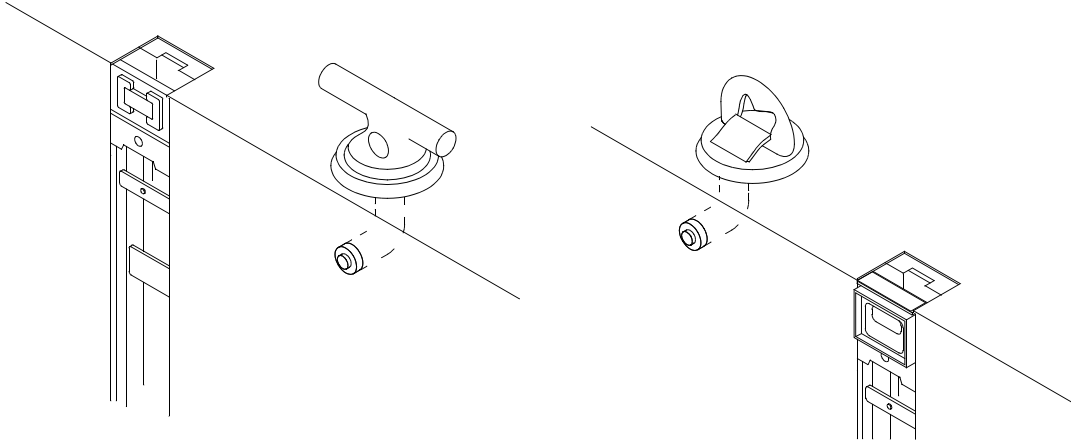
The WT stern anchor is a NAVMOOR 1000 lb anchor (dry weight = 1120 lb). It is housed and deployed from a stern anchor frame that is secured to the after center rake module.



STERN ANCHOR

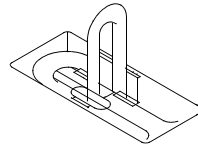
DECK FITTINGS

WT assemblies are provided with deck fittings to meet various operational needs. Available fittings include deck cleats and a combination D-ring/cloverleaf. These fittings have a 15,000 lb load capacity. There are 10 tube turns, for installing the deck fittings, on each center and propulsion module and five on end rakes. The WT modules are provided with recessed lift shackles welded into the deck structure. The propulsion module lift shackles have a safe working load capacity of 35 tons. The center and end rake modules lift shackles have a safe working load capacity of 5 tons. There are two shackles on each center and propulsion module and one on the end rake. When stowed, the shackles fold down flush with the deck. Fittings are also available for the A-frame, stern anchor and deck winch.



DECK CLEAT

CLOVERLEAF/D-RING



LIFT SHACKLE

DECK FITTINGS

**OPERATOR MAINTENANCE
WARPING TUG
DESCRIPTION AND DATA**

EQUIPMENT DATA

The following tables provides data applicable to major component levels.

Table 1. WT Equipment Data.

| ITEM CHARACTERISTIC | DESCRIPTION |
|---|--|
| WARPING TUG | |
| Length | 80 ft |
| Beam | 24 ft |
| Depth | 4 ft 6 in. |
| Freeboard (unloaded) | 40 ± 2 in. |
| Freeboard (loaded) | 12 ± 2 in. |
| Weight | 95.3 tons dry, 97.2 tons wet |
| Maximum Speed | 6 knots, Sea State 2 |
| Cargo Capacity | 350 short tons |
| Fuel Tank Capacity (Each) | 800 gallons |
| POWERED SECTION | |
| Length | 40 ft |
| Beam | 8 ft |
| Depth | 4 ft 6 in. |
| Weight | 20.55 tons dry, 22.5 tons wet |
| Engine (2 per section) | 8V92TA 2 cycle, diesel |
| Rated Horse Power (each) | 600 hp at 2100 RPM at output shaft |
| Cylinders | 8 |
| Starting System | 24 volt electric |
| Fuel Capacity | 800 gallons (400 gallons per tank) |
| Average Operating Time Per Tank Of Fuel | 10 hours |
| Marine Gear | Twin Disc Model DD-5111V |
| Pump-Jet (2 Per Section) | Model SPJ-82-T |
| Pump-Jet Output (Each) | 5000 lb horizontal thrust at ship's speed of 6 knots |
| Steering | 360° |
| Total Thrust | 10,000 lbs at 2100 engine RPM |

Table 1. WT Equipment Data. (Continued)

| ITEM CHARACTERISTIC | DESCRIPTION |
|-----------------------------------|---------------------------------------|
| Electrical System | 24 volt 65 amps |
| Bilge Pumps | 12 each at 3,700 GPH |
| Fire Suppression System | Manually Activated CO2 |
| Deck Winch | Model 27DH50DD5G |
| Weight | 10,000 lbs |
| Dimensions | 13 ft (L) x 7 ft (W) x 5 ft 3 in. (H) |
| Drum Storage Capacity | 700 ft of 1 in. wire rope |
| Rated Line Pull/Speed | 19,000 lbs (full drum) at 70 ft/min |
| Gypsy Winch Rated Line Pull/Speed | 5000 lbs at 80 ft/min |
| A-Frame | 27,000 lbs capacity |
| Stern Anchor | 1000 lb NAVMOOR anchor |
| CENTER MODULE | |
| Length | 40 ft |
| Beam | 8 ft |
| Depth | 4 ft 6 in. |
| Weight | 11.25 Tons (Approximate) |
| ISO Compatible | Yes |
| Sea State Operation | SS 2 |
| END RAKE MODULES | |
| Length | 20 ft |
| Beam | 8 ft |
| Depth | 4 ft 6 in. |
| Weight | 6.25 Tons (Approximate) |
| ISO Compatible | Yes |
| Sea State Operation | SS 2 |

**OPERATOR MAINTENANCE
WARPING TUG
THEORY OF OPERATION**

SYSTEM OPERATION

Operation of the WT revolves around the diesel engine (power) and the pump-jet movement and direction. When the diesel engine is running, the marine gear engages the transfer case into gear, which changes the engine speed to shaft speed. Seawater is brought into the pump-jet through the inlet grating at relatively low velocity in order to minimize the ingesting of debris. Seawater travels through the heliconic converter at high head and moderate velocity, thus reducing the losses due to turbulent flow. Seawater then flows through the discharge port, which contains a hydraulically actuated, specially designed steering nozzle. The accelerated water mass provides a reactive force acting on the hull of the vessel. Direction is controlled by rotation of the steering nozzle. Thrust is increased or decreased by varying the speed of the diesel engine. Control and indicators necessary to operate the pump-jet are located in the operators cab. The following paragraphs provides the theory of operation of the WT subsystems.

DRIVE TRAIN

The drive train consists of the engine, marine gear, transfer case and pump-jet. Guarded drive shafts connect the marine gear to the transfer case and the transfer case to the pump-jet.

Engine

The engine is an 8 cylinder, water cooled, turbo charged, after cooled, two cycle, diesel marine engine, delivering 600 hp at 2100 RPM. All operator controls of the engine is accomplished from the operators cab.

Marine Gear

The marine gear is mounted directly to the flywheel housing of the diesel engine and provides the capability to reverse the directional rotation of the other drive train components, making it possible to backflush the pump-jet. The transmission is equipped with an integral hydraulic system consisting of a pump, shifting valve and internal hydraulic cylinders. The pump utilizes the transmission lubricating oil to operate hydraulic cylinders, which shifts the gears to the backflush, neutral or engaged configurations. The shifting valve is solenoid actuated from a toggle control switch in the operators cab. In addition to powering the shifting cylinders, the pump also circulates case oil through an oil cooler that is cooled by the engine raw water cooling system. In the event of electrical power loss to the marine gear shifting solenoids, an emergency engagement capability is provided for the marine gear by replacing a shifting valve solenoid with an emergency lock-up plug that locks the marine gear gearing. The lock-up plug is used to provide independent forward or backflush capabilities and is mounted externally to the shifting valve solenoid housing.

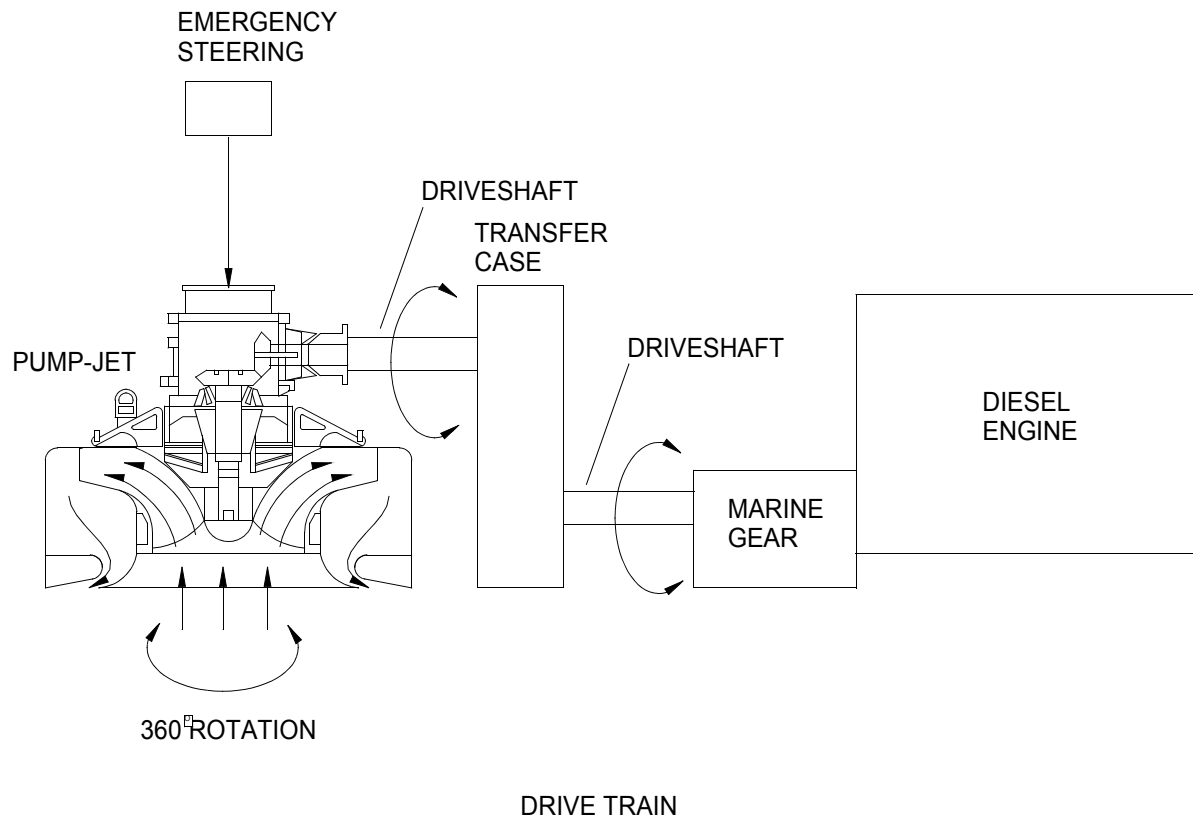
Transfer Case

The transfer case compensates for off-set alignment between the output flange of the marine gear and the input flange of the pump-jet. It has a 1:1 gear ratio, utilizing spur gears throughout, and is equipped with an oil pump that circulates lubricating oil from its gearcase through an oil cooler that is cooled by the engine raw water cooling system and back to the top of the transfer case to lubricate the upper gearing. The transfer case is connected to the marine gear and the pump-jet via drive shafts.

Pump-Jet

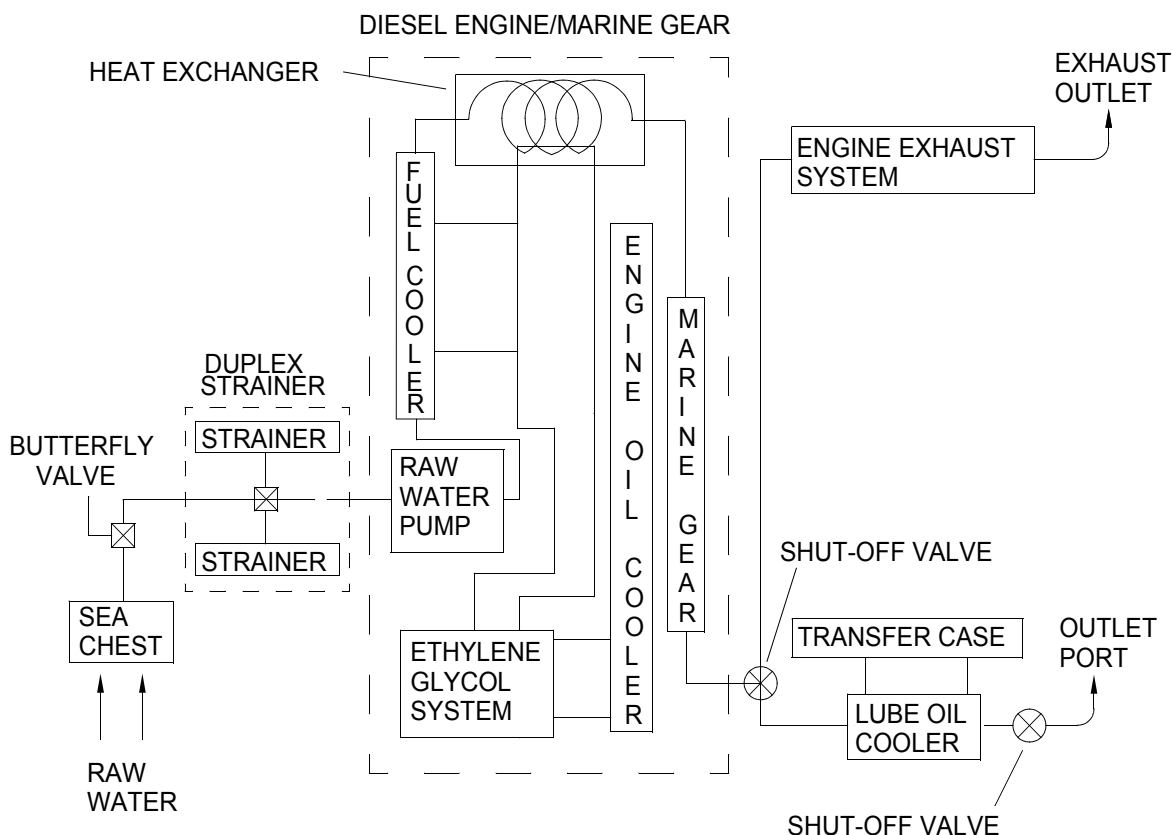
Each propulsion module is equipped with a 360° steerable pump-jet propulsion unit capable of delivering 5,000 lb of thrust. The pump-jet works on the principal of a rotary pump and consists of a drive shaft that drives an upper gearbox assembly that drives an impeller. Water is sucked into the pump-jet through a feeding funnel on the bottom of the module and fed into the enclosed pressure casing, whose bottom plate is provided with three systematically arranged outlet nozzles from which water is ejected at a 13° angle. A hydraulic steering motor drives a spur gear through a planetary gearbox to rotate the pressure casing and bottom plate (steering nozzles) in both senses of rotation

without limitation. A second planetary gearbox is provided to facilitate emergency steering. The emergency steering control stand is mounted above deck and interfaces with the through shaft of the planetary gearbox. The emergency steering gearbox contains a spring set, hydraulically released disc brake. The brake maintains the position of the steering nozzle until rotation is called for by the operator. In the event of hydraulic system failure, the brake can be released via the hydraulic hand pump to facilitate emergency steering. An electromechanical feedback unit monitors relative steering position of the steering nozzle and transmits that position to a dial indicator in the operators cab. An electric sensor monitors the oil level in the upper gearbox and sends a signal to an indicating light in the operators cab when the oil level is below the required level.



COOLING AND EXHAUST (SEA WATER) SUBSYSTEM

The engine and exhaust system consists of the sea chest (raw water inlet, integral with the structure of the module), butterfly valve, duplex strainer, engine raw water pump, aftercooler, fuel cooler, engine coolant heat exchanger, marine gear oil cooler, exhaust water shut-off valve, transfer case oil cooler, transfer case shut-off ball valve, water cooled muffler and exhaust flappers. The water cooling system dissipates heat generated by the diesel engine, engine exhaust, marine gear and transfer case. This is accomplished by circulating raw (sea) water through the engine raw water pump, engine heat exchanger, marine gear oil cooler, transfer case oil cooler and muffler. The system is an open loop, drawing naturally cool sea water in one side and discharging heated sea water out of the other in a continuous cycle. The process requires the interaction of the following five subsystems.



COOLING SYSTEM SCHEMATIC DIAGRAM

Raw Water (Sea Water) Subsystem

An engine driven raw water pump draws sea water from the sea chest in the bottom of the hull through a duplex strainer to a heat exchanger at the front of the engine. A fuel cooler is located in the raw water system between the raw water pump and the heat exchanger. Fresh water (ethylene glycol) cooling lines are passed through the heat exchanger. The raw water circulates around the engine coolant lines, lowering the temperature of the ethylene glycol coolant. Raw water exiting the heat exchanger is channeled through the marine gear oil cooler. Lubricating oil lines from the marine gear oil cooler is then channeled in two directions. A portion of the water is piped into the exhaust inlets to the muffler, cooling the muffler and exiting the module via the thru hull assembly. The remaining water is piped through the transfer case lube oil cooler and exits the module via an outlet port.

Fresh Water (Ethylene Glycol) Subsystem

Coolant is drawn by the engine water pump from the heat exchanger and is circulated through the fuel cooler, engine lube oil cooler, cylinder block, cylinder heads and exhaust manifolds to the thermostat housings. A bypass from the thermostat housings to the inlet side of the water pump permits circulation of coolant through the engine when thermostats are closed. When the thermostats are open, the coolant flows through the heat exchanger where it is cooled. Thermostats control and regulate the flow of coolant within the fresh water cooling system to control engine temperature.

Marine Gear Oil Cooler

Raw water exiting the engine heat exchanger passes through the marine gear lube oil cooler. A gear pump, integral to the marine gear, circulates case oil from the marine gear through external lines to a heat exchanger type oil cooler and back to the transmission. Seawater passing through the oil cooler is circulated around the heat exchanger, lowering the temperature of the lube oil. The bearings, clutches and gears are lubricated and cooled by the returning lube oil.

Water Cooled Muffler

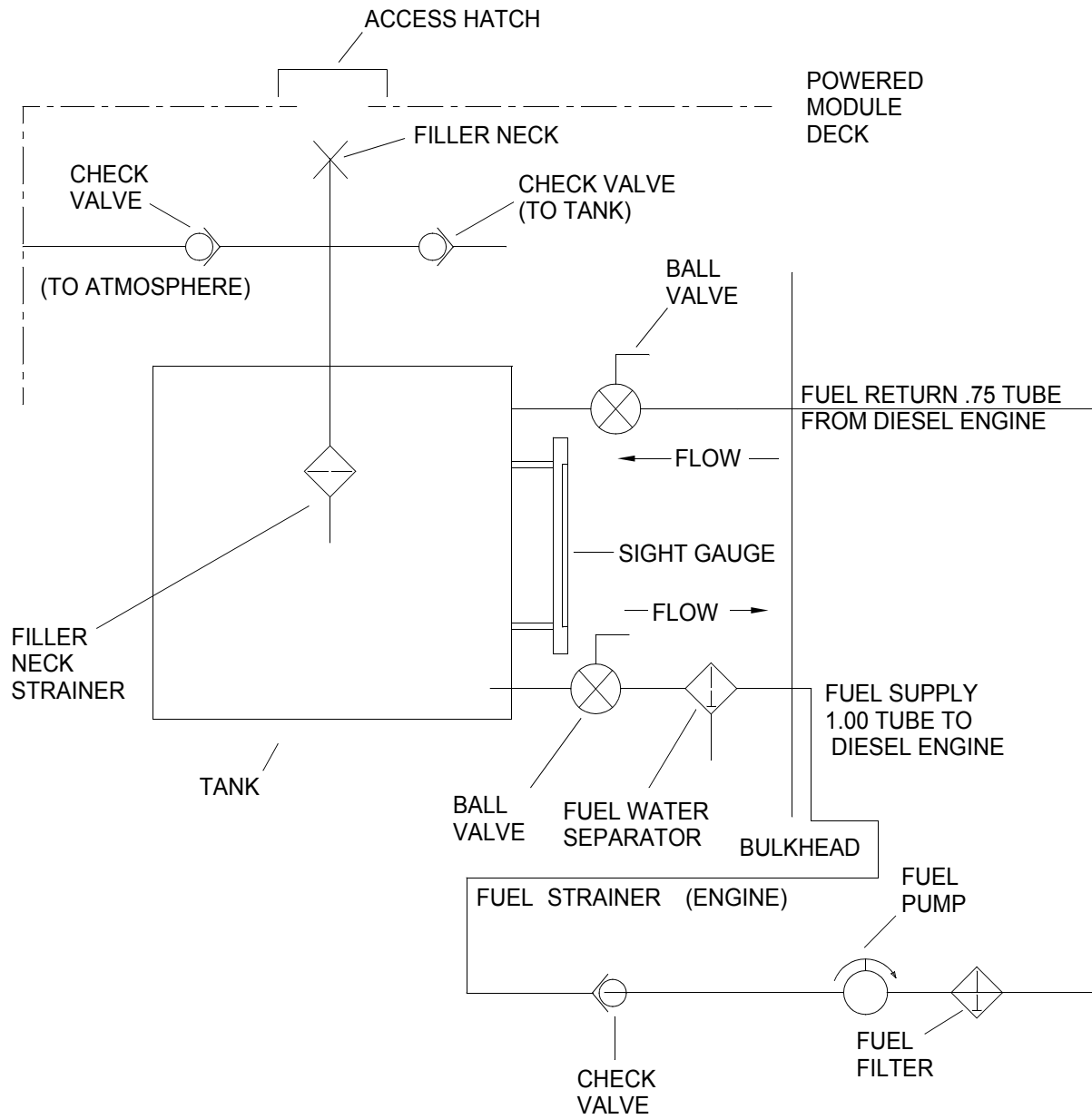
A normally open ball valve allows raw water exiting the marine gear oil cooler to be pumped into the exhaust system between the turbo chargers and the muffler, filling the muffler with water and cooling prior to being expelled through the exhaust flapper port with the engine exhaust fumes. In addition to cooling the muffler, the water also acts as a noise dampening media within the muffler itself.

Transfer Case Lube Oil Cooler

A normally open ball valve allows raw water exiting the marine gear oil cooler to be pumped through the transfer case oil cooler. A gear driven pump, operated by rotation of the transfer case gearing, circulates lube oil from the transfer case through external lines to the heat exchanger type transfer case lube oil cooler and back to the transfer case. Seawater passing through the heat exchanger cools the lube oil. The cooled oil is returned to the top of the transfer case, lubricating the upper gears and bearings and cooling the unit simultaneously.

FUEL SYSTEM

The fuel system provides a filtered fuel supply to the diesel engine and is identical for port and starboard propulsion modules. A fabricated steel fuel tank stores 400 gallons of diesel fuel. The level of fuel in the tank can be viewed through a sight gauge located on the side of the tank. Fuel is added to the tank through a filler neck and filtered through a mesh strainer and plug, located on the top of the tank. The filler neck is accessible from the deck of the propulsion module through an 8 in. hatch. During refueling, air is vented from the tank through a check valve. Another check valve allows air to be drawn into the fuel tank as fuel is consumed. Fuel supply and return lines are sized to reduce fuel line pressures. During operation, fuel flows out of the tank through a 1 in. diameter fuel supply line to a fuel/water separator to remove water (condensation or other moisture) from the fuel. Fuel then travels through the supply line and is drawn through a secondary fuel filter mounted on the engine before entering the inlet fuel manifold, then through the fuel pipes to the inlet side of the fuel injectors. Surplus fuel returns from the outlet side of the fuel injectors to the fuel return manifold and then back to the fuel tank through a 0.75 in. diameter fuel return line. A fitting in the fuel outlet manifold in one of the cylinder heads maintains fuel system pressure. A check valve in the supply line prevents fuel from draining back to the tank when the engine is not running. Ball valves are provided on the supply and return lines to shut off the flow of fuel during maintenance and when the WT is not in operation.



FUEL SYSTEM SCHEMATIC DIAGRAM

VENTILATION SYSTEM

The ventilation system draws outside air and directs it below deck around the engine and other propulsion module components, removing heat and toxic fumes aft to be expelled to the atmosphere through the exhaust plenums. In addition, the intake plenum flapper door closes when the fire suppression system is activated, shutting off the supply of air to the machinery compartment. A secondary purpose of the system is to provide service access to the components below deck through large, removable deck covers. The WT ventilation system is comprised of the following components and operating mechanisms listed below.

Air Intake Plenum

The air intake plenum accepts outside air and directs it below deck to the machinery compartment. It is mounted on the engine hatch of the propulsion module facing forward. The plenum may be located on either the port or starboard side, depending on placement of the operators cab for that section. An air intake plenum is built into the front of the operators cab. The intake plenums also include the conduit entry plates for the electrical interconnect when the propulsion modules are assembled into a powered section.

Air Intake Plenum Flapper Door (Damper)

The intake plenum contains a flapper door which works in conjunction with the fire suppression system. A wire rope, attached to the flapper door within the intake plenum, is released when the fire suppression system is activated. This allows the flapper door to fall due to its own weight and rotate about 45° downward, closing the door and preventing oxygen from feeding a fire within the machinery compartment of the propulsion module.

Ventilation Fan (Exhaust Fan)

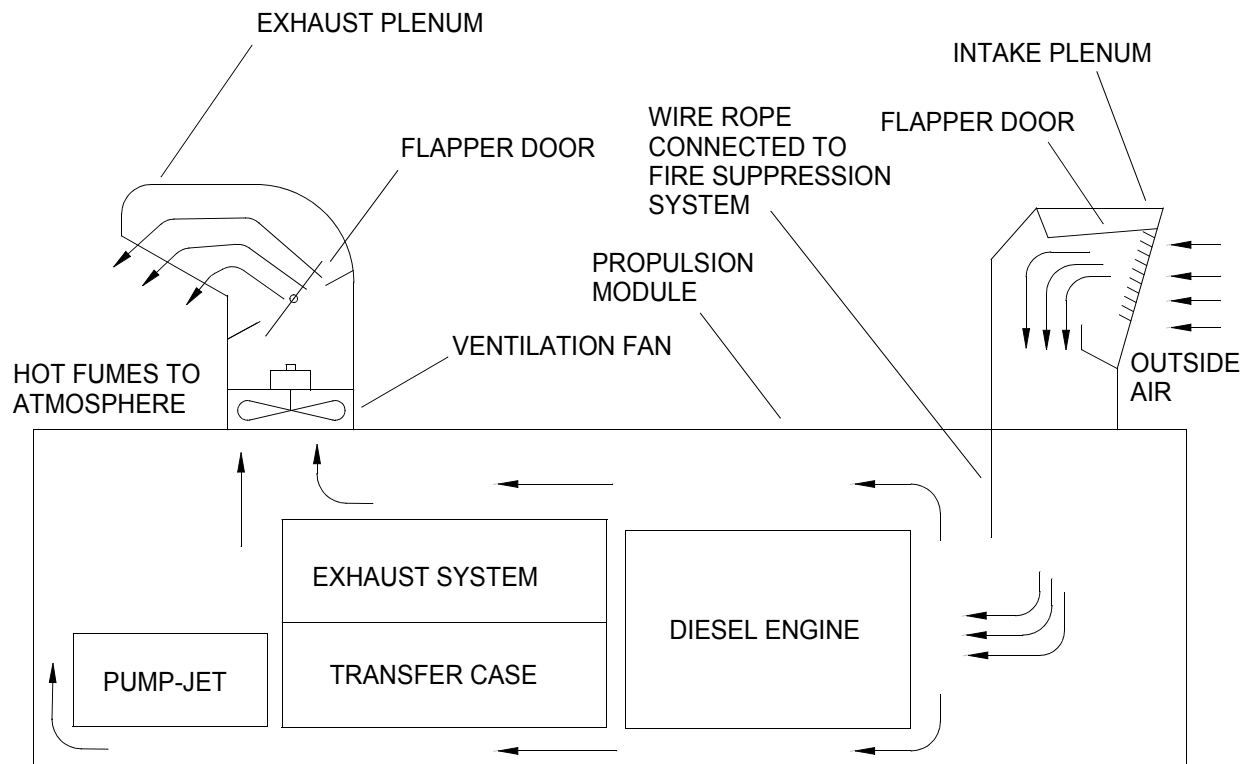
A ventilation fan draws hot fumes from below deck within the machinery compartment of the propulsion module. The blower moves air through the exhaust plenum at 3075 cubic ft per minute. It removes heat from the engine, pump-jet and drive train components, forcing the hot fumes above deck and expelling them to the atmosphere. The marine duty 18 in. inner diameter ventilation fan has a cast aluminum alloy fan and is located at the intake side of the exhaust plenum. The blower has a ¾ hp, 24 VDC motor and runs at 1750 RPM. Under normal operating conditions, the blower is controlled from a toggle switch located in the operators cab. If the fire suppression system is activated, power to the blower is disconnected automatically.

Exhaust Plenum

A welded metal structure, the exhaust plenum contains a ventilation fan and a flapper door. It is mounted on the thruster hatch of the propulsion module facing aft and provides ventilation for the machinery compartment of the propulsion module. A ventilation fan at the intake end of the plenum draws air from below deck, creating a vacuum which draws air through the intake plenum and expels hot, toxic fumes to the atmosphere.

Exhaust Plenum Flapper Door (Damper)

A hinged flapper is housed within the plenum. It is manually opened and closed. If the fire suppression system is activated, the flapper has to be closed manually, eliminating a second source of air to any fire below deck.



VENTILATION SYSTEM FUNCTIONAL DIAGRAM

WT ELECTRICAL SYSTEM

The WT propulsion units are supplied with a 24 VDC main power source. This provides power to the engine starter solenoid and the operating systems. The main power source is charged from the engine regulator/alternator system via the isolation diode. The propulsion units are also equipped with an auxiliary 24 VDC power supply that is used to operate the pump-jet thruster indicator directional system. The two 12 VDC auxiliary batteries are also charged from the engine regulator/alternator via the isolation diode. The auxiliary battery system provides power in case the main 24 VDC power source fails. The main power source provides power to the propulsion module circuit breaker panel A6 for distribution to the operating systems. The power cables feed from the propulsion module through the electrical interconnection box up to the cab.

Ventilation

Both port and starboard units are equipped with a ventilation system. This system circulates outside air from the intake plenum through the engine compartment and out the exhaust plenum. The ventilation system is operated by a blower equipped with a $\frac{3}{4}$ hp, 24 VDC motor. The unit is powered by the 24 VDC main power system, main circuit breaker, CO₂ pressure switch, operator switch and vent fan relay enclosure A8K1 relay.

Bilge Flood Warning and Control System (Port or Starboard)

The system is powered by the main 24 VDC power source. The power is fed through the propulsion module circuit breaker panel A6 to the bilge pump control panel A5 and single bilge pump control panel A7 up to the cab control. The float switches provide the signal to the cab control that allows the operator to hear the alarm and check the red activated indicator(s) for location of flooding. The alarm silence switch should also be activated. The pump run switch provides power to the pump start relay contacts that start the pump and activates the green indicating lamp.

Communications

AN/VRC-88D SINGARS RADIO. The AN/VRC-88D SINGARS radio receives 24 VDC power from the main power system via the cab circuit breaker panel. The signal output of the transmitter is generated from the outdoor antenna.

VHF/FM DSC TRANSCEIVER. The VHF/FM DSC transceiver receives 12 VDC power from the main power system via the VHF/FM DSC transceiver voltage converter. This circuit is protected by an inline 10 amp fuse that is fed through a ferrite line interference conditioner from the cab circuit breaker panel. The signal output of the transceiver is generated from the transceiver antenna.

VHF/FM HANDHELD TRANSCEIVER. The VHF/FM handheld transceiver receives its power from a self-contained, replaceable and rechargeable nickel-cadmium battery pack. The battery packs are recharged by battery chargers. The battery chargers receive 12 VDC power from the main power system via the DC to DC converter.

Public Address Set (Loudhailer). The loudhailer receives 12 VDC power from the main power system via the DC to DC converter.

VHF/FM DSC TRANSCEIVER VOLTAGE CONVERTER. The 24 VDC to 12 VDC voltage converter receives 24 VDC power from the main power system and reduces the voltage to 12 VDC to power the VHF/FM DSC transceiver.

DC TO DC CONVERTER. The 24 VDC to 12 VDC voltage converter receives 24 VDC power from the main power system and reduces the voltage to 12 VDC to power the loudhailer, interface and switchbox and VHF/FM handheld transceiver battery chargers.

AN/PSN-11 INTERFACE AND SWITCHBOX. The AN/PSN-11 interface and switchbox receives 12 VDC power from the main power system via the DC to DC converter.

AN/PSN-11(V)1 PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR). The AN/PSN-11(V)1 PLGR receives 12 VDC power from the AN/PSN-11 interface and switchbox.

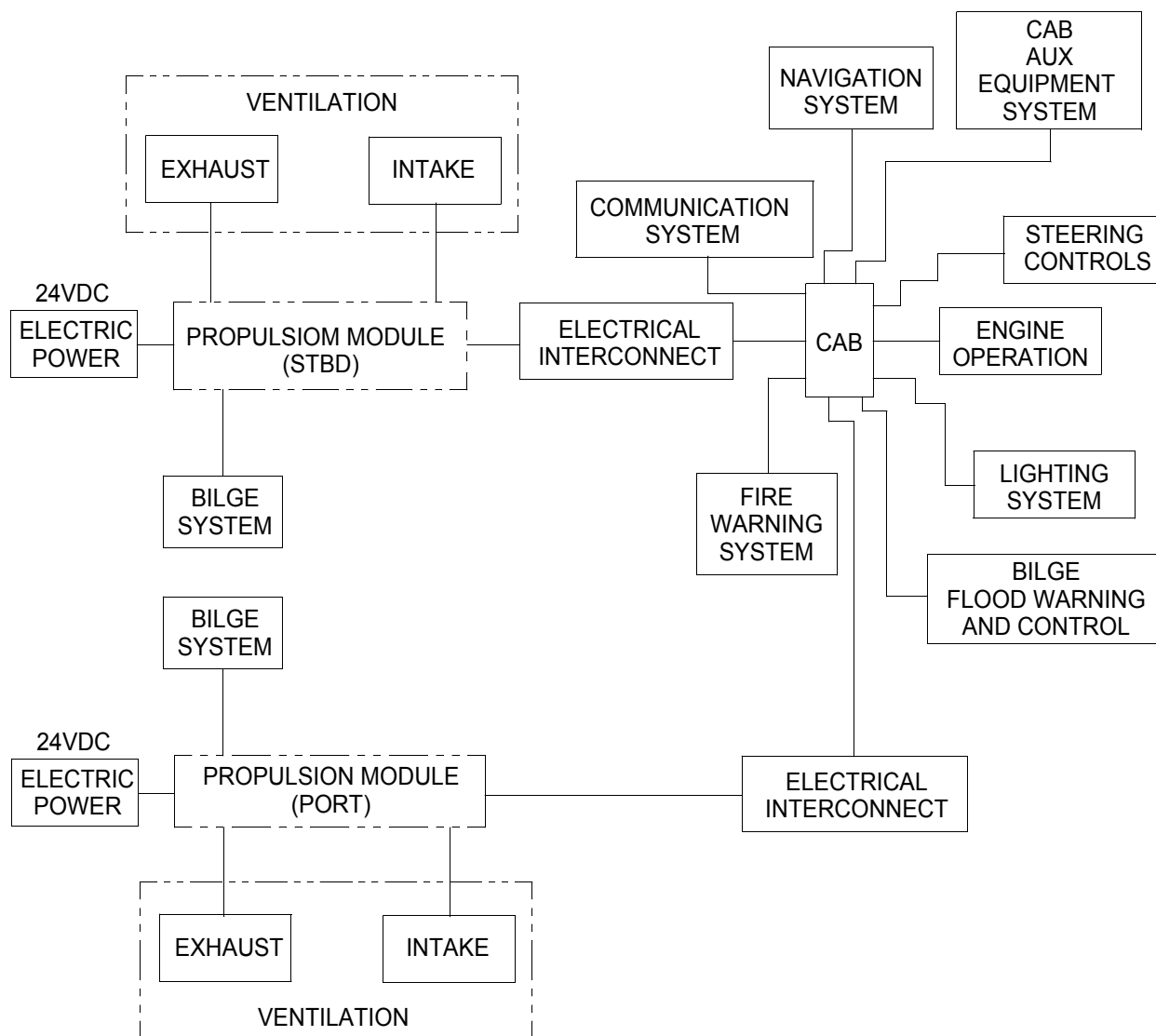
Navigation System

NAVIGATION LIGHTS. The main mast and stub mast navigation lights receive 24 VDC power from the main power system via the cab circuit breaker panel A3 through the mast enclosure assembly A7. The enclosure contains the switches, warning lights and alarm system for controlling the main mast and stub mast lights.

HORN. The outside horn receives 24 VDC power from the main power system via the cab circuit breaker panel A3 and the operator control push button on the middle control panel A1.

COMPASS. The compass contains an operation light that is powered from the panel dimmer switch fed by the cab circuit breaker panel A3.

SPOTLIGHT. The spotlight receives 24 VDC power from the main power system via the cab circuit breaker panel A3 and the operator control switch on the middle control panel A1.



WT ELECTRICAL BLOCK DIAGRAM

Engine Operation (Port and Starboard)

The engine receives 24 VDC power from the main power system that operates the engine starter motor, starter contact B1, and engine starter solenoids L3, which is activated by a “K” relay-operator control. During cold weather conditions (-25° F or less), an engine cold pack starting aid automatically supplies ether into the air inlet housing of the blower. In case of extreme cold weather starting conditions, the engine power system is also equipped with a NATO jumper cable receptacle. The engine contains the following operation switches of sending units that provide signals to the operator controls listed below.

FUEL OIL PRESSURE SWITCHES. The fuel oil pressure switches provide signals to the operator console for starting or stopping of the engine.

LOW OIL PRESSURE SWITCH. The low oil pressure switch provides a signal to the operator console to activate the “K2” relay that activates the engine alarm bell and light.

HIGH WATER TEMP SWITCH. The high water temp switch provides a signal to the operator console to activate the “K2” relay that activates the engine alarm bell and light.

WATER TEMP SENDING UNIT. The water temp sending unit provides a signal to the operator console for engine water temperature readout.

OIL TEMP SENDING UNIT. The oil temp sending unit provides a signal to the operator console for engine oil temperature readout.

OIL PRESSURE SENDING UNIT. The oil pressure sending unit provides a signal to the operator console for engine oil pressure readout.

ENGINE NORMAL STOP PUSH BUTTONS. The engine normal stop push buttons disconnect the 24 VDC signal to the governor controller that will stop the engine under normal conditions.

ENGINE HOUR METER. The engine hour meter receives 24 VDC power from the main power system and is energized when the fuel oil pressure switch is closed, the engine power switch is turned on and the circuit breaker switch is activated.

Engine Alternator

The engine alternator provides power to recharge the main battery and auxiliary battery systems. It is controlled by the thruster direction/auxiliary junction box assembly A9VR1 voltage regulator and distributed through the A9IS1 isolation diode. The alternator also provides a signal to the operator console for the engine RPM/tachometer readout. The operator’s console ammeter(s) indicate the system batteries charge and discharge in amps.

Electronic Speed Switch

The electronic speed switch provides a signal to the system via the engine magnetic pick-up. This system activates the emergency stop circuit by energizing the air flap solenoid, tripping the air flap closed when the engine RPM exceeds 2300 RPM. The power source is 24 VDC power from the main power system operated through the fuel oil pressure switch from the main breaker.

Engine Governor

The engine governor provides a minimum/maximum speed range (800 - 2100 RPM) for normal engine operation. The power source is 24 VDC power from the main power system operated through the engine power switch on the middle control panel A1 and propulsion module circuit breaker panel A6.

Operator Engine Control, Alarms and Indicator System

The following items extend the engine system for engine operation.

ENGINE GAUGES. The engine gauges receive their signals from the engine and are powered from the fuel oil pressure switch via the main breaker panel and the engine power switch.

ENGINE GAUGES TEST SWITCHES. The engine gauges test switches provide power from the main circuit breaker to the power side of the gauges to activate them during test prior to start-up.

ENGINE POWER SWITCHES. The engine power switches provide power from the main circuit breaker to the engine starting, stopping and fuel oil pressure switch for gauge operation.

ENGINE START SWITCHES. The engine start switches provide power to the engine start relay A1K1 from the main breaker panel through the engine power switch through the clutch deenergized normally closed relay. If the clutch switch is not disengaged from either the engaged forward or backflush positions, the engine will not start.

ENGINE ALARM WARNING/INDICATING SYSTEM. The engine alarm warning/indicating system, upon receiving an alarm from the port or starboard engine high water temp or low oil pressure, will activate an indicating light and bell. At this point, the alarm/silence/test switch can be actuated.

ALARM/SILENCE/TEST SWITCH. The alarm/silence/test switch, when moved from the alarm to the silence position, cuts power to the bell A4LS1 and provides power to the indicating light. When the alarm condition is cleared, the indicating light will go out and the switch can be moved back to the alarm position. The test position will provide power to the bell and the indicating light via the circuit breaker panel. This test position is a monetary contact.

ENGINE THROTTLE CONTROL. The engine throttle control provides a signal to the engine governor that tells the engine to speed up or to slow down. The power source for this control comes from the governor.

MARINE GEAR (FORWARD/DISENGAGED/BACKFLUSH). The marine gear (forward/disengaged/backflush) provides power to shift the gear solenoids. This power comes from the main breaker panel and activates the forward solenoid or backflush solenoid. The engine junction box A4K2 port and A4K3 starboard relays activate an indicating light. If the clutch is left in the forward or backflush position, the engine starting system will not work because the clutch relay contacts in the starting circuit will be open and the engine will not start.

Lighting System

OPERATOR STATIONS. The operator station's middle and lower control panel lights receive 24 VDC power from the main power system via the cab circuit breaker panel A3. The lights are activated by their switch control source and controlled by a dimmer switch. The operation lights used for the gauges are red and require no dimming effect. The operation lights are powered from the same circuit, except don't go through the dimmer switch.

CAB SPOTLIGHT. The cab spotlight receives 24 VDC power from the main power system via the cab circuit breaker panel A3 and the operator control switch and is used for deck night work and navigation buoy night identification.

BATTLE LANTERNS. The battle lanterns are powered by six VDC batteries. The cab light has a red lens and below deck lights have white lenses.

Steering (Port and Starboard) Systems

PUMP-JET THRUSTER DIRECTIONAL CONTROL. The pump-jet thruster directional controls are manually controlled joysticks on the operator console, receiving 24 VDC power from the main power system to direct port and starboard pump-jet thrusters. The joysticks move forward and backward only. The system is controlled from the main breaker panel through the thruster junction box breaker, which operates the clockwise and counterclockwise rotation relays and contacts K1 and K2 that operate the hydraulic power units thruster solenoids A2jb1-L4 and L5. The reaction speed of the solenoids are controlled by variable resistors A2jb2-R1 and R2.

PUMP-JET THRUSTER DIRECTIONAL INDICATORS. The pump-jet thruster directional indicators receives 24 VDC power from the alternator and the auxiliary 24 VDC battery supply through the propulsion module circuit A6CB14 and is activated by the A9K1 relay contact, which is controlled by the engine starting system. The 24 VDC power to the pump-jet thruster directional signal and indicator has a line converter that stabilizes the 24 VDC power source. The pump-jet thruster directional signal comes from the feed back resistor control.

FIRE ALARM SYSTEM (PORT AND STARBOARD). The fire alarm system (port and starboard) receives 24 VDC power from the propulsion module circuit breaker A6CB4. The circuit is activated by two temperature switches S8 and S9 that send signals up to the operator console and activates the fire alarm horn and warning light. The circuit also has an alarm/silence/test switch which when moved from the alarm to the silence position, cuts power to the alarm horn and provides power to the indicating light. When the alarm condition has cleared, the indicating light will go out and the switch can be moved back to the alarm position. The test position will provide power to the horn and indicating light via the cab circuit breaker panel. This test position is a momentary contact.

Cab Auxiliary Systems

HYDRAULIC OIL LOW LEVEL INDICATOR (PORT AND STARBOARD) UNITS. The hydraulic oil low level indicators (port and starboard units) receive a signal from a float switch sending unit in the hydraulic tank, which provides a signal up to the operator console via the main breaker 24 VDC power system.

PUMP-JET GEARCASE LOW OIL LEVEL INDICATOR. The pump-jet gearcase low oil level indicator receives its signal from the oil level sending unit. The 24 VDC power comes from the main breaker panel through the sending unit and activates the low level indicator.

WINDSHIELD WIPER. The operator control switch provides power to the wiper motor from the cab circuit breaker panel main 24 VDC power system.

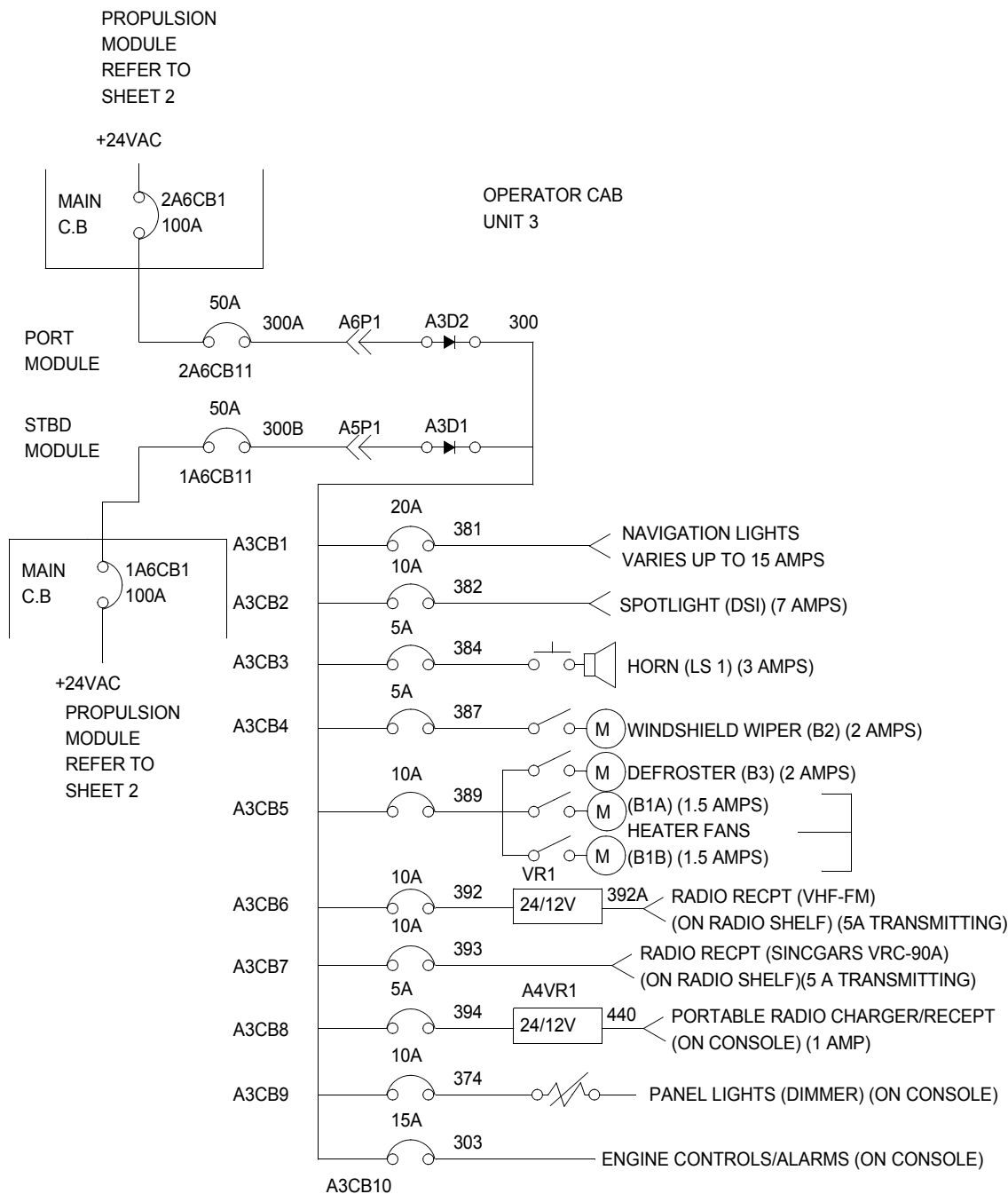
CAB HEATER. Water, heated by the engine cooling system, is circulated through the cab heater. The operator control switch low/off/high provides power to the heater blower motor from the 24 VDC main power system through the cab breaker panel. The blower moves air around the heater coils, heats it and circulates the hot air through the cab.

WINDOW DEFROSTER. Heated air from the engine provides defrosted air. The operator control switch turns 24 VDC ON or OFF to the blower motor from the cab breaker panel via the main power system.

CAB CIRCUIT BREAKER TEST PANEL. The operators cab circuit breaker panel provide circuit protection for all electrical circuits in the operators cab. The panel also provides testing jacks for testing the operators cab electrical circuits.

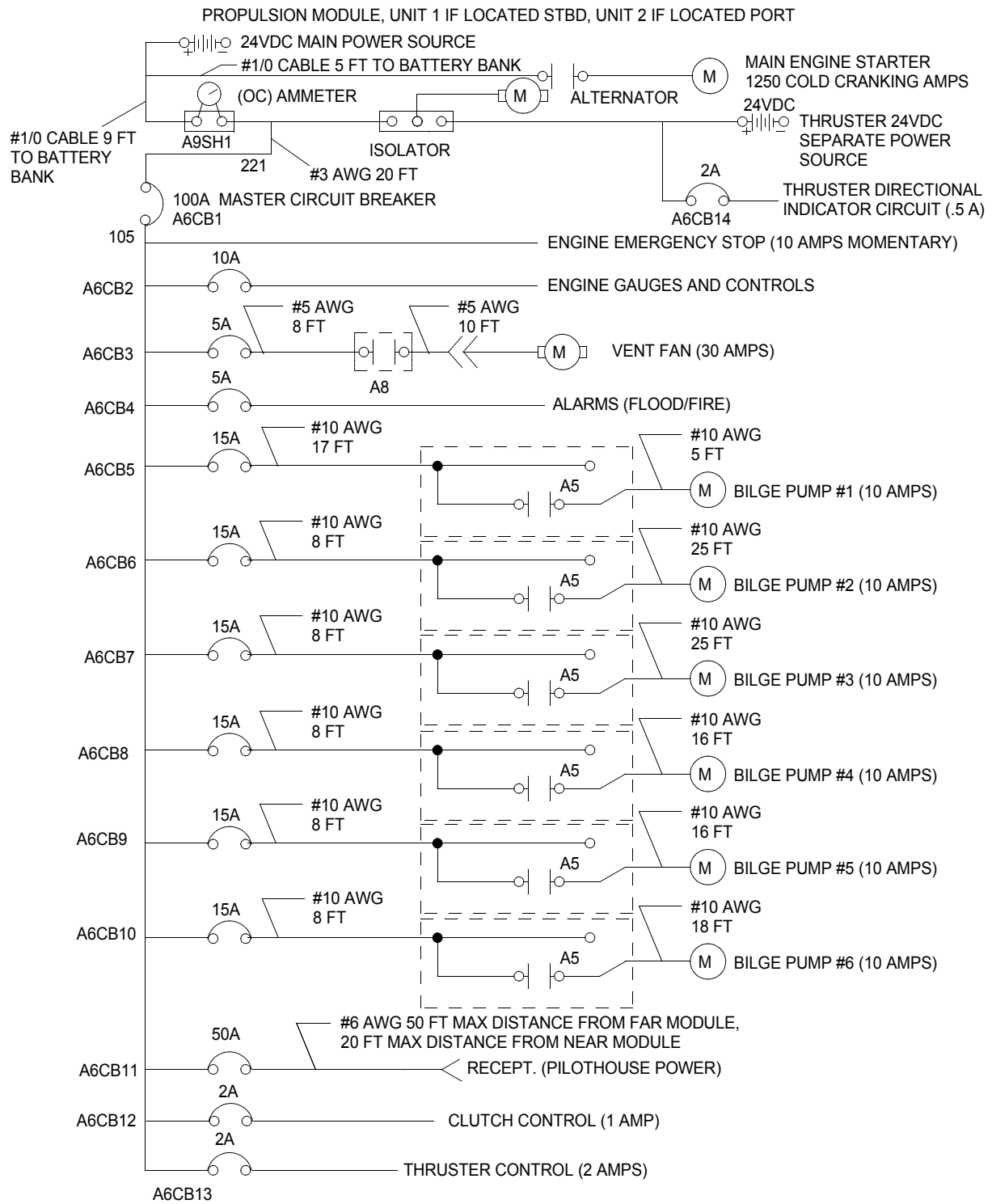
Electrical Interconnect System

This cable cross deck connection provides power and signal information between the cab twist lock plug/receptacles A5/A6 and the air intake plenum twist lock plug/receptacles A5/A6. Interconnection is determined by operators cab location port or starboard.



NOTE: ALL INTERNAL HOOK-UP WIRE IS 14 OR 16 AWG
SOME DEVICES ARE PROVIDED WITH PRE-WIRED PIGTAILS FOR CONNECTIONS

ELECTRICAL ONE-LINE DIAGRAM (SHEET 1 OF 2)



ELECTRICAL ONE-LINE DIAGRAM (SHEET 2 OF 2)

HYDRAULIC SYSTEM

Powered (Normal) Operation

The hydraulic system contained within each propulsion module provides the steering power and control for rotation of the pump-jet discharge nozzle. The four subsystems comprising this system include: 1) the reservoir system that stores, cools and filters the hydraulic fluid being pumped through the system; 2) the pump drive system, which provides the power to the steering motor; 3) the way-valve assembly, which protects the hydraulic system from over pressurization and controls the actuation of the hydraulic steering motor and; 4) the hydraulic steering motor drive system, which turns the discharge nozzle through 360° continuous rotation in both directions.

Emergency (Manual) Operation

In the event of loss of steering control at the cab due to an electrical failure, the steering system can be manually operated by one of two methods: 1) the use of a manual control lever on the way-valve unit and; 2) the fit-up of the emergency steering unit on the auxiliary planetary gearbox with manual release of the hydraulic brake.

Hydraulic Reservoir

In addition to storing the system hydraulic fluid, the hydraulic reservoir also cools 26 gallons of fluid with open air to all sides, including top and bottom. It also filters the oil through the suction line strainer, return line filter and filler neck screen. The reservoir is equipped with an external sight level gauge to determine actual fluid level and an in-tank float switch to monitor fluid level within and to notify the operator via an indicating light in the cab when it falls below the required level.

Hydraulic Pump

The axial piston hydraulic pump provides the power to drive the hydraulic motor. The pump is driven off the marine gear and is fitted with a flow control regulator. The drive shaft of the hydraulic pump drives a cylinder block causing the pistons within to move in an axial direction. The stroke of the pistons is limited by an internal swash plate which adjusts around the vertical axis of the input shaft, varying the displacement of oil flow infinitely.

Way-Valve Unit

The proportional way-valve is controlled by means of the electrically operated proportional pressure valves or manually by means of the lever on the valve unit. The way-valve guides the hydraulic oil via the dual braking valve to the hydraulic motor.

Dual Braking Valve

The dual braking valve (load retaining valve) avoids uncontrolled rotation of the hydraulic motor caused by negative loads and locks the lines to the hydraulic motor tightly when the way-valve is in the rest position.

Hydraulic Motor

The hydraulic motor is mounted on the input shaft of the pump-jet steering planetary gearbox. The axial piston motor is a constant speed unit with fixed oblique discs supporting nine pistons configured as a rotor.

Three-Way-Valve

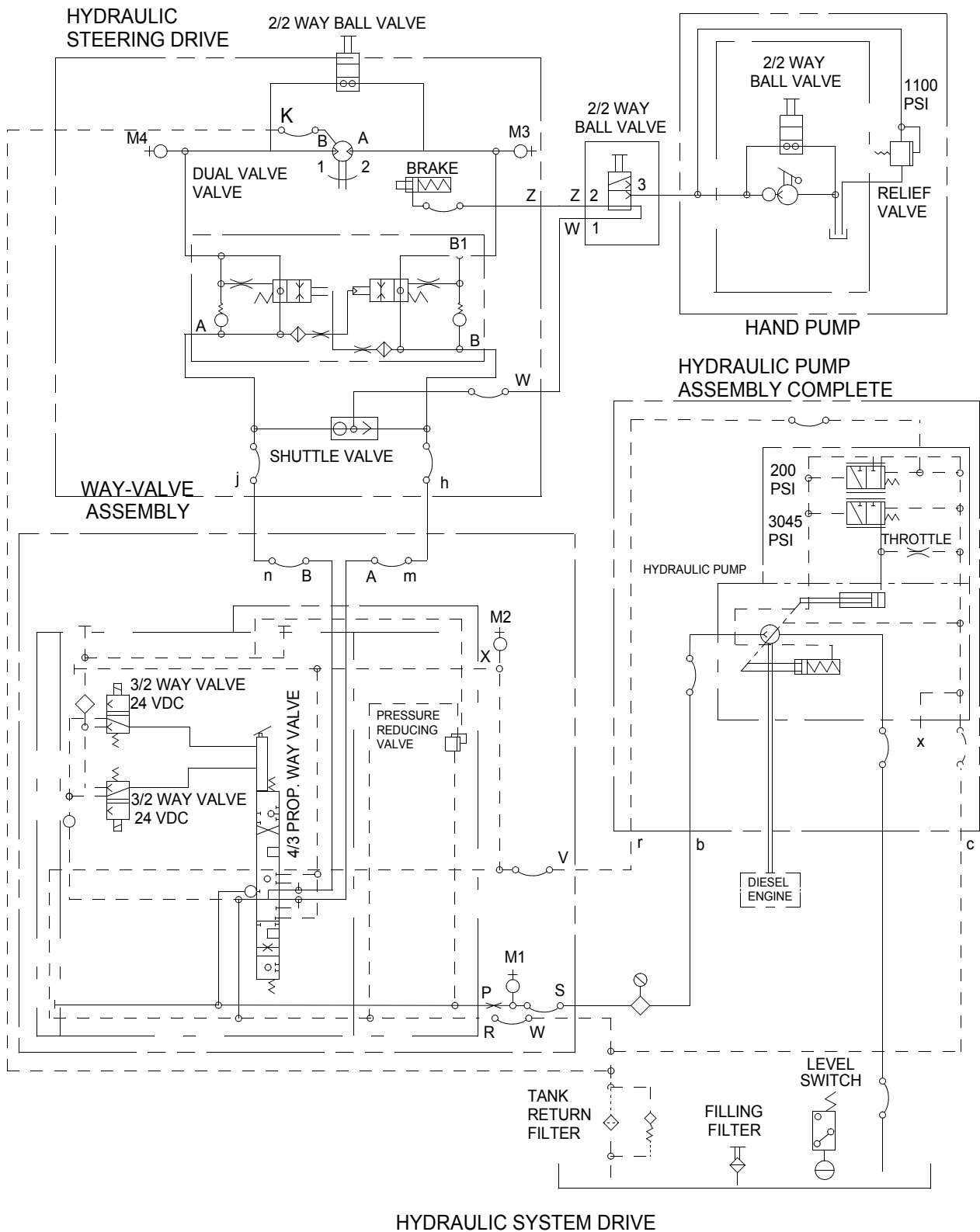
A manually operated, lever actuated, three-way-valve is positioned to select normal hydraulic operation or to isolate the normal hydraulic system, so the manual hydraulic hand pump can be used to release the hydraulic brake for emergency steering operation.

Two-Way-Valve

A two-way (needle) valve in the closed position during normal operation must be opened to allow for the manual releasing of the hydraulic brake via the hydraulic hand pump.

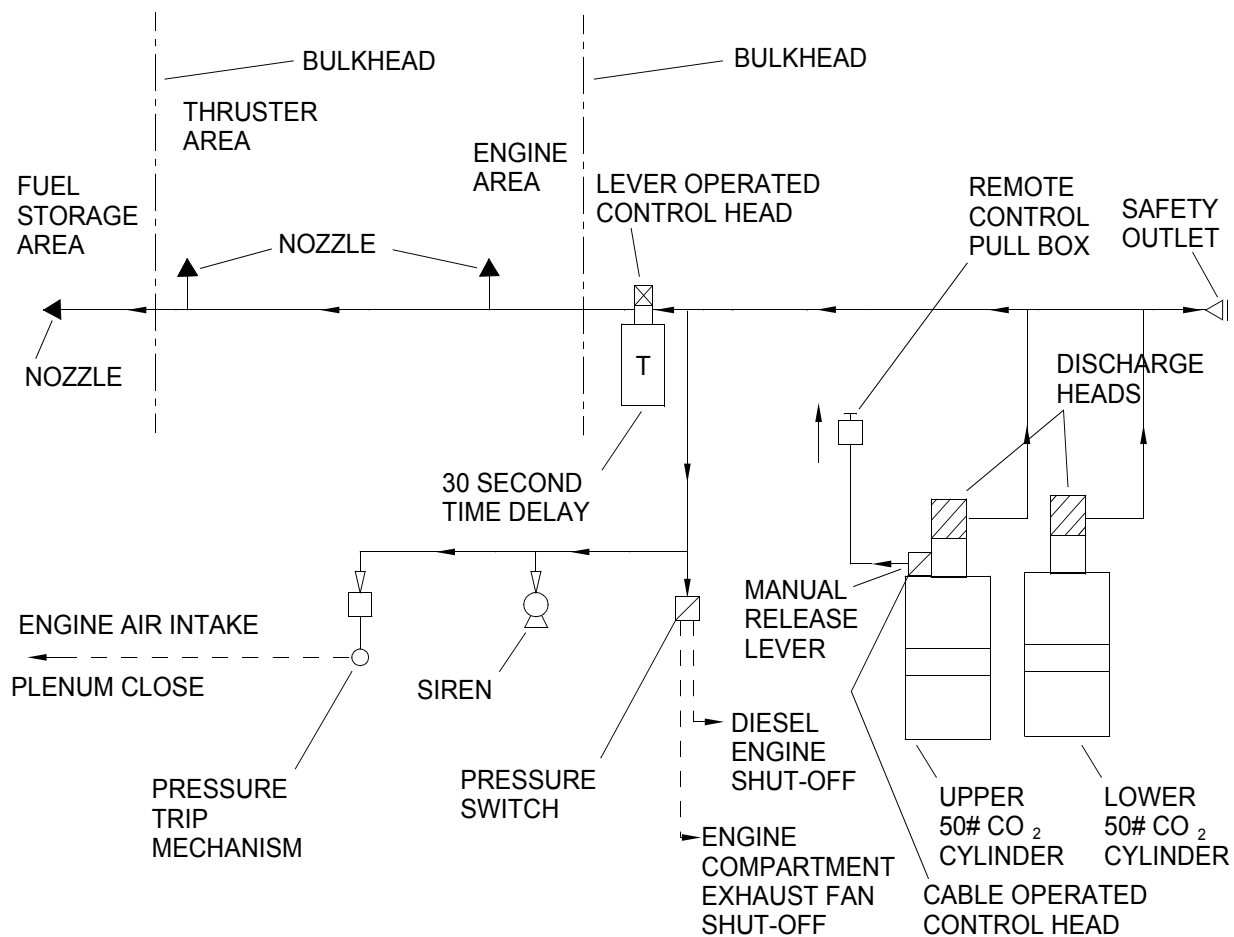
Manual Hydraulic Hand Pump

The hydraulic hand pump used to release the hydraulic brake for emergency steering operation is equipped with its own small hydraulic reservoir, pressure relief valve and oil level dipstick.



FIRE SUPPRESSION SYSTEM

The fire suppression system is designed to flood the powered module machinery and fuel storage compartments with carbon dioxide (CO₂) if a fire occurs. System activation is accomplished manually using a remote control pull box recessed in the deck directly forward of the operators cab and air intake plenum. Manual activation is also provided below deck in the lazaret, where the agent is stored, but not dispersed. The upper 50 lb CO₂ cylinder is equipped with a manual release lever, which initiates discharge the same way as the remote control pull box handle. The 30 second time delay device is also equipped with a manual release handle. However, actuation using this control will bypass the 30 second time delay. Upon activation, CO₂ is released into the system. The discharged CO₂ is directed down two circuit paths. One circuit directs the agent to a pressure operated switch, which immediately shuts off the diesel engine and machinery compartment exhaust fan. The flow of CO₂ also activates a warning siren and operates a pressure trip mechanism to close off the machinery compartment air intake plenum opening. The second circuit directs CO₂ to a 30 second time delay device to allow evacuation time for personnel prior to CO₂ discharge into the protected compartments via the three nozzles. It also provides the delay time needed for the other circuit to shut-down the engine and close all air intake and exhaust systems.



FIRE SUPPRESSION SYSTEM SCHEMATIC

DECK EQUIPMENT

Equipment on board the deck of WTs include a winch, A-frame, stern anchor and fittings for the assemblies.

Deck Winch

A WT's primary working tool is a dual drum diesel-hydraulic reversible winch with a capstan. The winch is installed aft of the operators cab on the centerline. It provides the line pull for the A-frame and the stern anchor. The winch's rated line pull is 27,000 pounds bare drum and 19,500 pounds full drum. Each drum carries 700 feet of 1 in. diameter wire rope. The deck winch also has a 12 inch diameter gypsy at the forward end. The gypsy rated line pull is 5,000 pounds. A power take-off is included with the winch to provide power to ancillary equipment and tools that are used on the WT.

A-Frame

The WT A-frame has a lifting capacity of 27,000 pounds when the load is forward of the plane of the A-frame legs. The safe working load for loads aft of the plane of the A-frame legs is 12,000 pounds. The A-frame assembly includes two legs, a sheave, two foot anchors, two after guy assemblies, two forward guy assemblies and two corner fitting lugs. An elevating pole and elevating pole guy assembly are used for lifting the A-frame during assembly and disassembly, then removed and stowed.

Stern Anchor

The WT stern anchor is a NAVMOOR 1,000-pound anchor (Dry weight = approximately 1,120 pounds). It is housed and deployed from a frame that is secured to the aft center rake module.

Deck Fittings

WT assemblies are provided with deck fittings to meet various operational needs. Available fittings include deck cleats and a combination Cloverleaf/D-ring. These fittings have a 30,000-pound load capacity. There are 10 tube turns per non-powered nodule and five per End Rake. The WT modules are provided with recessed lift shackles welded into the deck structure. Shackles have a safe working load capacity of 35 tons. There are two shackles per center and propulsion module and one per end rake. When stowed, the shackles fold down flush with deck. Fittings are also available for the A-frame, stern anchor, and the deck winch.

CHAPTER 2

OPERATOR INSTRUCTIONS

FOR

MODULAR CAUSEWAY SYSTEM (MCS)

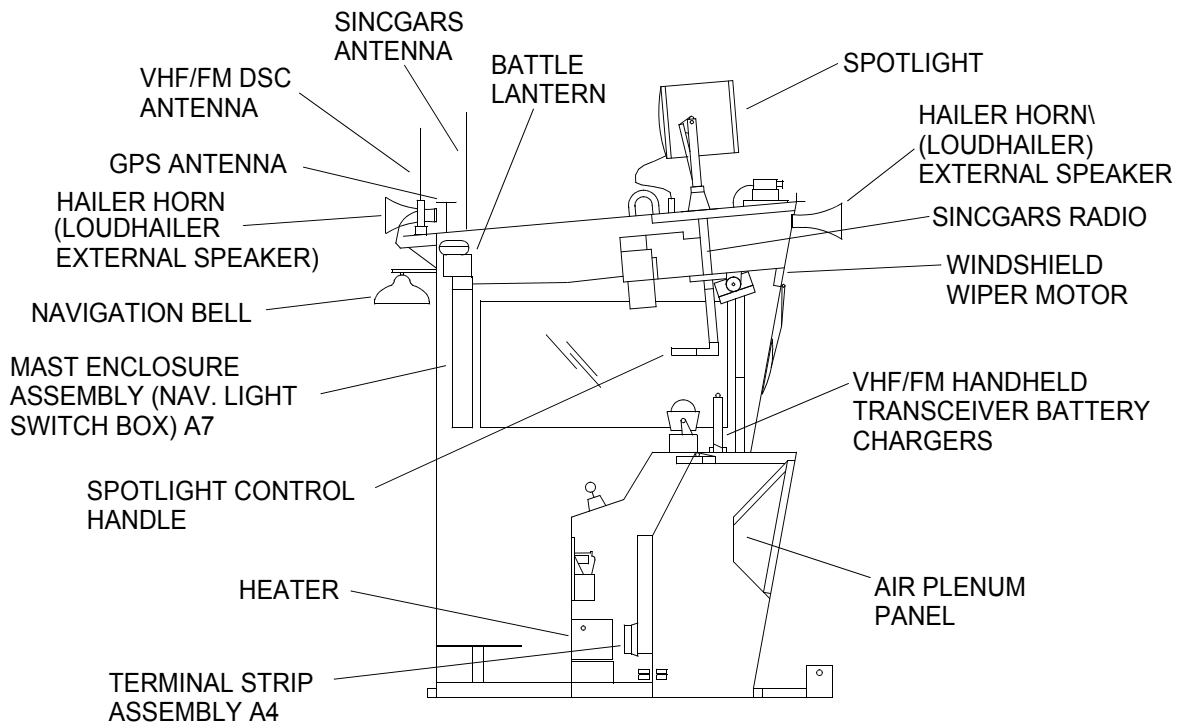
WARPING TUG (WT)

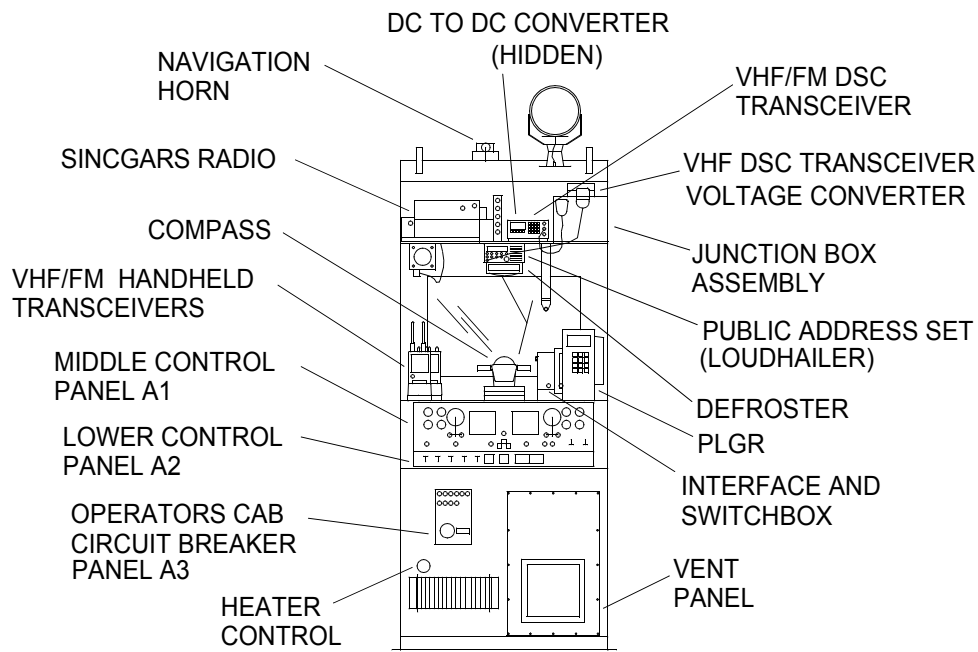
**OPERATOR MAINTENANCE
WARPING TUG
OPERATOR INSTRUCTIONS
DESCRIPTION AND USE OF OPERATOR
CONTROLS AND INDICATORS**

INTRODUCTION

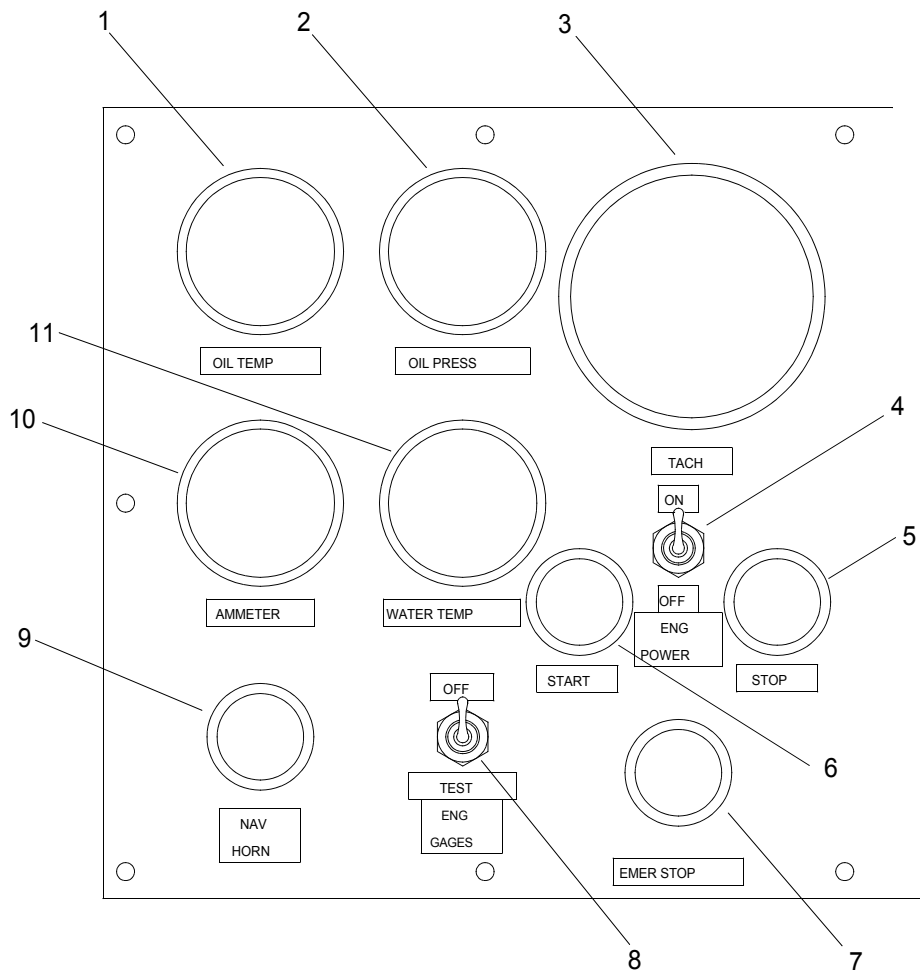
The following paragraphs contain illustrations that show the location of each control and indicator for operation of the WT, broken down into three major areas: operators cab and above deck, below deck and emergency equipment. Each control and indicator is clearly labeled as it appears on the equipment. Numbers on illustrations are keyed to the tabular listing which contains the name, based on the equipment markings, and the functional description of each control and indicator.

OPERATORS CAB AND ABOVE DECK CONTROLS AND INDICATORS (OVERVIEW)





DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, MIDDLE CONTROL PANEL (A1)



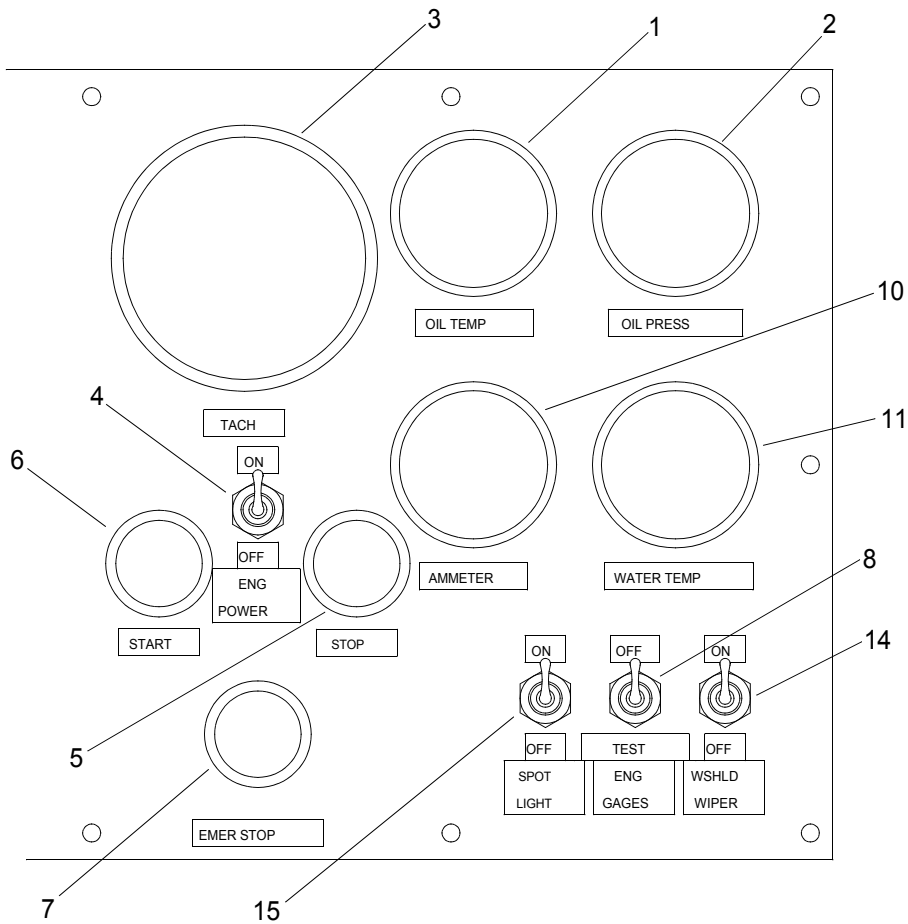
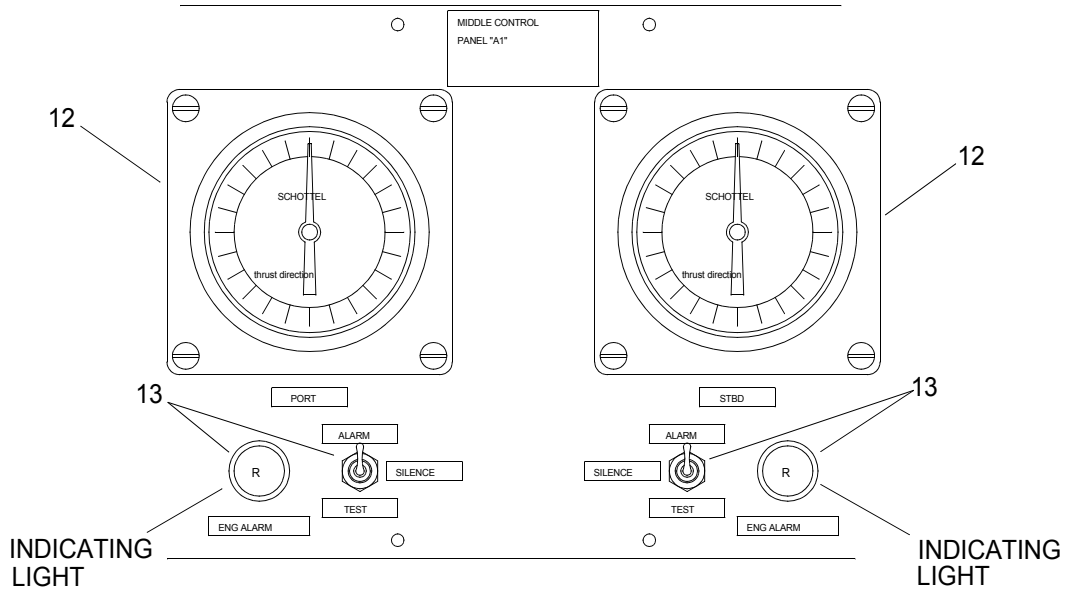
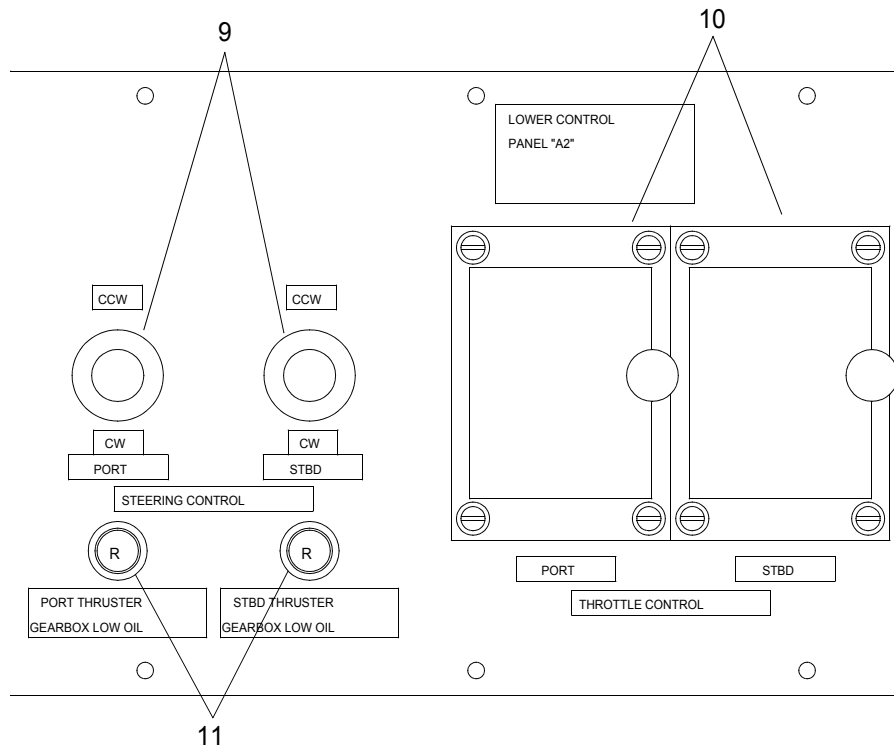
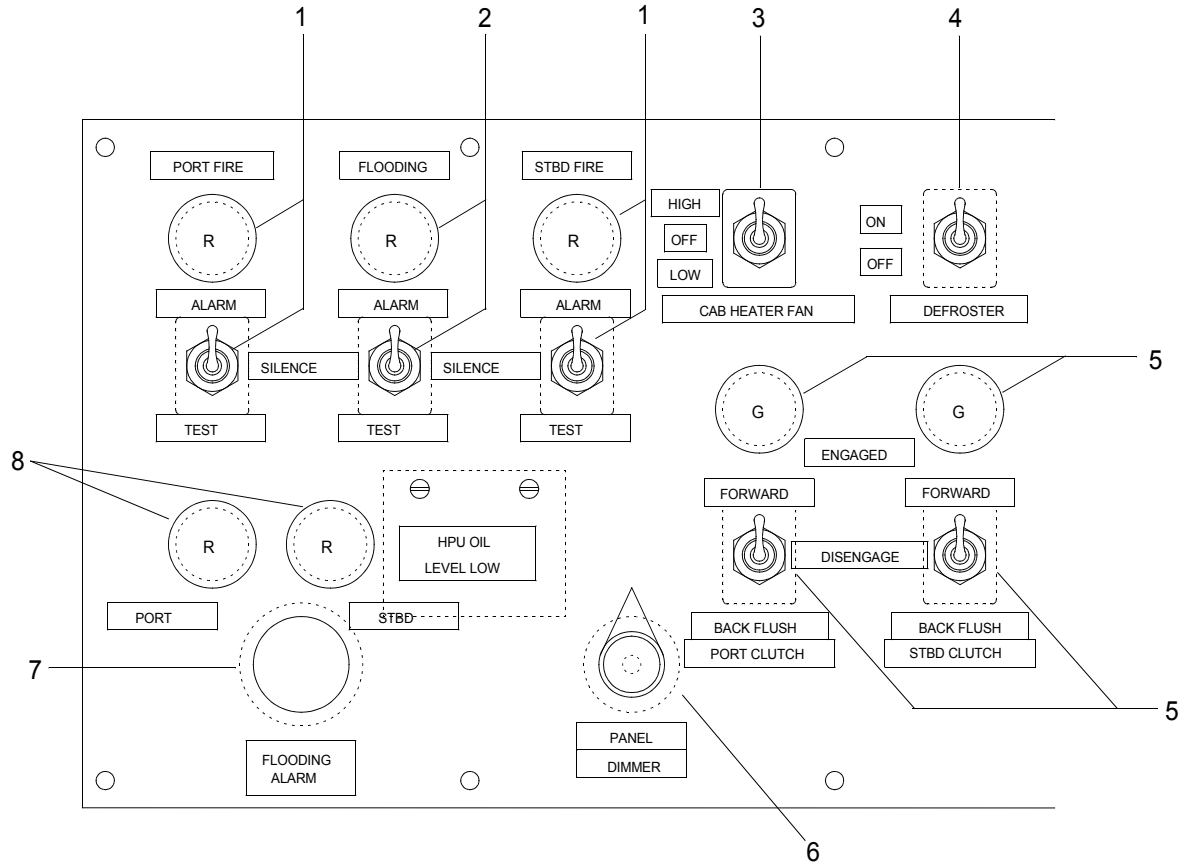


Table 1. Middle Control Panel (A1) Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|---|--|
| 1 | OIL TEMP Gauges (Port and Starboard) | Indicates engine oil temperature (normal operating 215 - 230°F). |
| 2 | OIL PRESS Gauges (Port and Starboard) | Indicates engine oil pressure (normal operating 50 - 70 PSI). |
| 3 | TACH Gauges (Port and Starboard) | Indicates engine speed (0 - 4000 RPM). |
| 4 | ENG POWER Toggle Switches (Port and Starboard) | Turns power ON/OFF to electrical system. |
| 5 | STOP Push Buttons (Port and Starboard) | When depressed, shuts down electrical circuit to stop the engine. |
| 6 | START Push Buttons (Port and Starboard) | When depressed, completes electrical circuit to start engine. |
| 7 | EMER STOP Push Buttons (Port and Starboard) | When depressed, shuts down engine by cutting off air supply. |
| 8 | ENG GAGES Toggle Switches (Port and Starboard) | Allows engine gauges indicating oil pressure, water temperature and amperage to be read without engine(s) running (TEST). Otherwise, toggle left in OFF position. |
| 9 | NAV HORN Push Button | When depressed, navigation horn sounds. |
| 10 | AMMETER Gauges (Port and Starboard) | Indicates battery charge and discharge. |
| 11 | WATER TEMP Gauges (Port and Starboard) | Indicates engine water temperature (normal operating 170 - 185°F). |
| 12 | THRUST DIRECTION Dial Indicators (Port and Starboard) | Indicates direction of the thrust by the pump-jet thrusters (clockwise and counterclockwise) that control CF movement. |
| 13 | Engine ALARM Toggle Switches with Red Indicator Lights (Port and Starboard) | Engine Alarm System. Audible alarm bell sounds and red light illumination indicates low oil pressure or high water temperature. If alarm is sounded, operator must visually observe port and starboard engine alarm indicator lights to determine which engine is indicating a problem. ALARM = bell sounds and red light on. SILENCE = bell alarm silenced, red light remains on. TEST (momentary) = bell sounds, red light goes on. |
| 14 | WSHLD WIPER Toggle Switch | Turns windshield wiper ON/OFF. |
| 15 | SPOTLIGHT Toggle Switch | Turns spotlight ON/OFF. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, LOWER CONTROL PANEL (A2)



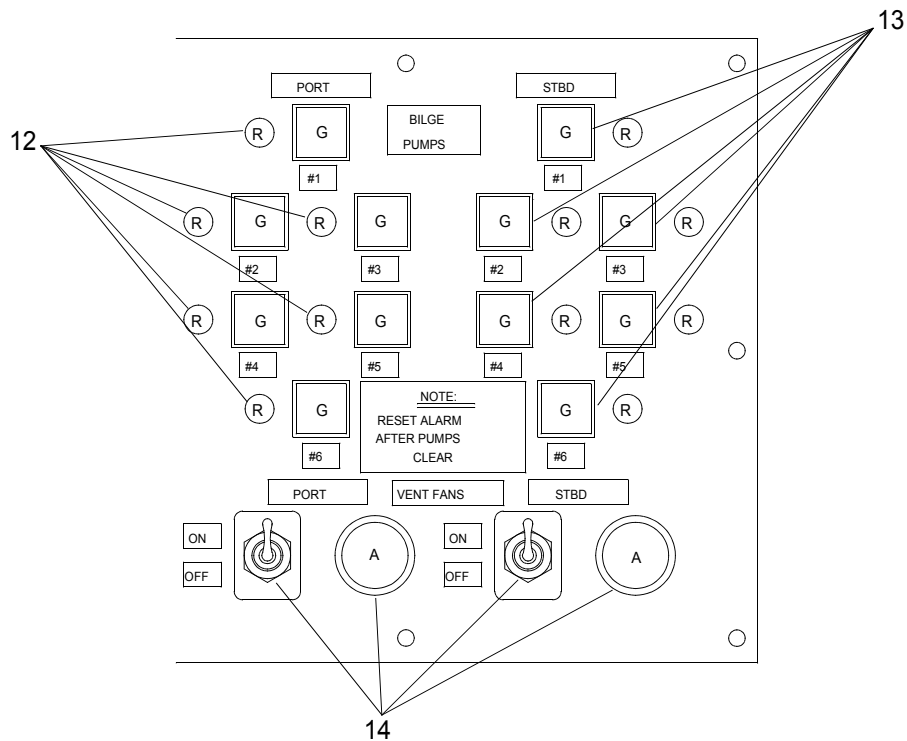


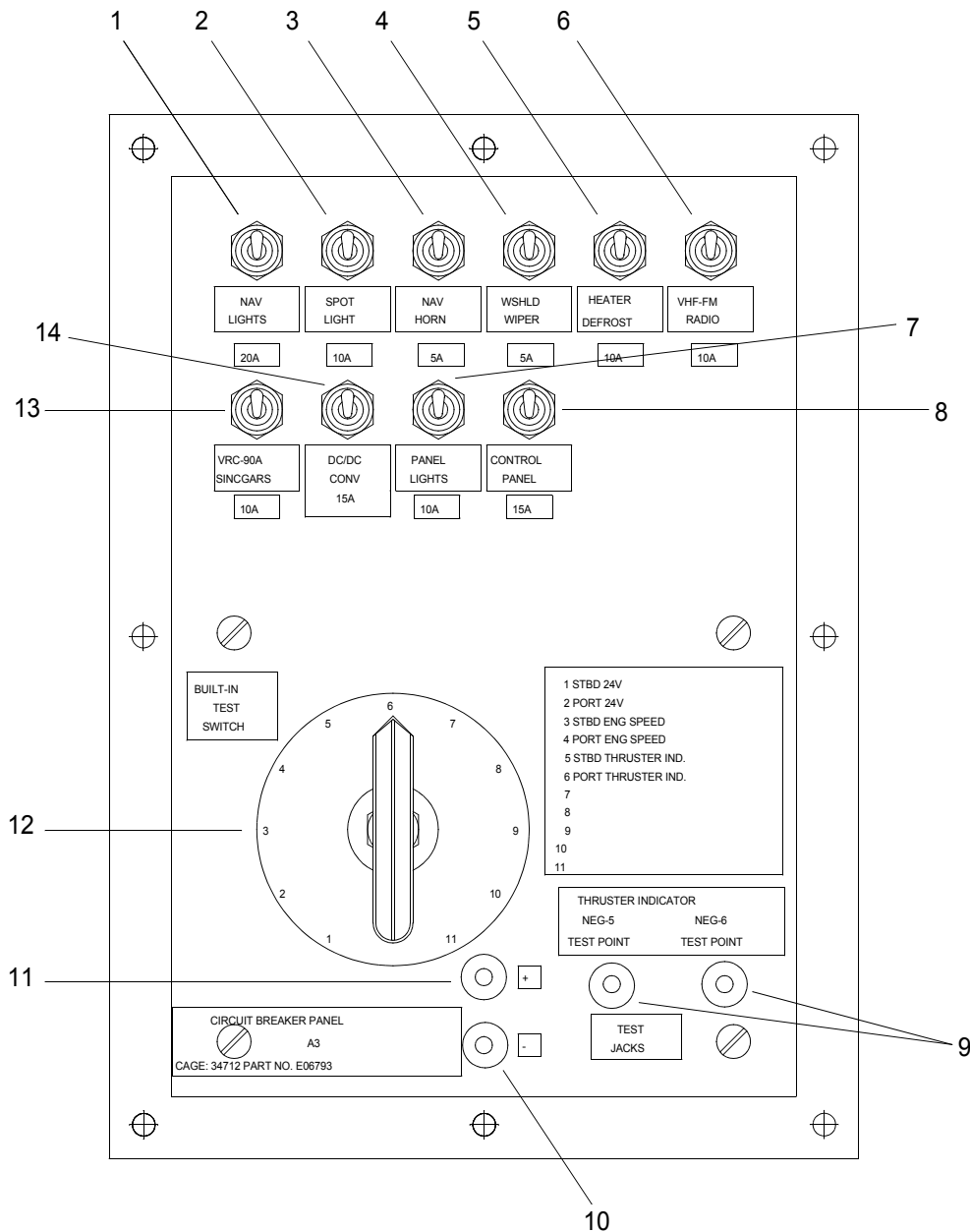
Table 2. Lower Control Panel (A2) Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|--|---|
| 1 | PORT FIRE and STBD FIRE Toggle Switches with Red Indicator Lights | Audible alarm (horn) indicates below deck temperature above 225°F. indicates a possible fire in port and/or starboard propulsion module. ALARM = horn sounds and red light on. SILENCE = horn silenced, red light remains on. TEST (momentary) = horn sounds, red light goes on. Reset to ALARM when normal conditions exist. |
| 2 | FLOODING Toggle Switch with Red Indicator Light | Audible alarm (pulse beeper) indicates possible flooding in port and/or starboard propulsion module. ALARM = pulse beeper sounds and red light on. SILENCE = pulse beeper is silenced, red light on. TEST (momentary) = pulse beeper sounds, red light on. Reset to ALARM when normal conditions exist. |
| 3 | CAB HEATER FAN Toggle Switch | HIGH = high speed control of heater fan. OFF = heater fan is off. LOW = low speed control of heater fan. |
| 4 | DEFROSTER Toggle Switch | Turns power ON/OFF to operators cab defroster fan. |
| 5 | PORT and STBD CLUTCH Toggle Switches with Green (ENGAGED) Indicator Lights | Control clutch engagements. To engage clutch FORWARD, position toggle switch up. Green light comes on. To DISENGAGE, return toggle to center position. Green light goes off. To engage clutch to BACKFLUSH, lift up on switch handle and position toggle switch down. Green light comes on. |

Table 2. Lower Control Panel (A2) Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|---|--|
| 6 | PANEL DIMMER Rotating Switch | Controls brightness of green and amber indicator lights, thrust direction dial indicator lights, compass and gauge control lights on both middle and lower panels for night operations. |
| 7 | FLOODING ALARM Pulse Beeper w/Speaker | Audible pulse beeper that sounds when flooding of the powered module occurs and the FLOODING toggle switch is set to ALARM (Item 3). |
| 8 | HPU OIL LEVEL LOW Red Indicator Lights (Port and Starboard) | Red light illuminates when hydraulic power unit (HPU) oil level is below required operating level. |
| 9 | PORT and STBD STEERING CONTROL Joystick Levers | Control directional rotation of the pump-jet steering nozzles. Pull level back to produce clockwise CW rotation. Push lever forward to produce counterclockwise CCW rotation. Thrust direction indicators located on the middle control panel will rotate accordingly. |
| 10 | PORT and STBD THROTTLE CONTROL Levers | Levers control engine RPMs which are indicated on tachometer gauges. Push forward for higher RPMs or pull back to reduce RPMs. |
| 11 | PORT and STBD THRUSTER GEARBOX LOW OIL Red Indicator Lights | Red light illuminates when pump-jet gearbox oil level is below required operating level. |
| 12 | Bilge Pump Red Indicator Lights (Port and Starboard) | Six red indicator lights for each module (total of 12 on the control panel) illuminates when a float switch is tripped by water. |
| 13 | PORT and STBD BILGE PUMPS Buttons with Green Indicator Lights | Six green buttons for each module (total of 12 on the control panel) control the operation of bilge pumps and illuminate when pumps are functioning. |
| 14 | PORT and STBD VENT FANS Toggle Switches with Amber Indicator Lights | ON/OFF control of exhaust plenum vent fans. Amber light is illuminated when switch is on and vent fans are functioning. |

**DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, OPERATORS CAB
CIRCUIT BREAKER PANEL (A3)**



OPERATORS CAB CIRCUIT BREAKER PANEL

Table 3. Operators Cab Circuit Breaker Panel (A3) Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|---------------------------------|--|
| 1 | NAV LIGHTS Circuit Breaker, 20A | Up (On)/Down (Off) = Controls electrical power to the mast enclosure (navigation light switch box). |
| 2 | SPOTLIGHT Circuit Breaker, 10A | Up (On)/Down (Off) = Controls electrical power to the spotlight toggle switch on the middle control panel. |

Table 3. Operators Cab Circuit Breaker Panel (A3) Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|--|--|
| 3 | NAV HORN Circuit Breaker, 5A | Up (On)/Down (Off) = Controls electrical power to the navigational horn push button on the middle control panel. |
| 4 | WSHLD WIPER Circuit Breaker, 5A | Up (On)/Down (Off) = Controls electrical power to windshield wiper toggle switch on the middle control panel. |
| 5 | HEATER DEFROST Circuit Breaker, 10A | Up (On)/Down (Off) = Controls electrical power to the cab heater fan and defroster toggle switch. |
| 6 | VHF-FM Radio Circuit Breaker, 10A | Up (On)/Down (Off) = Controls electrical power to VHF/FM DSC transceiver in operators cab. |
| 7 | VRC-90A SINCGARS Circuit Breaker, 10A | Up (On)/Down (Off) = Controls electrical power to SINCGARS radio transmitter in operators cab. |
| 7 | PANEL LIGHTS Circuit Breaker, 10A | Up (On)/Down (Off) = Controls electrical power to panel lights dimmer control located on lower control panel. |
| 8 | DC/DC CONV Circuit Breaker, 15A | Up (On)/Down (Off) = Controls electrical power to the DC to DC converter. |
| 8 | CONTROL PANEL Circuit Breaker, 15A | Up (On)/Down (Off) = Controls electrical power to alarms, emergency stops and bilge pumps in operators cab. |
| 9 | THRUSTER INDICATOR NEG-5 and NEG-6 Jack Plug TEST JACKS | Negative Plug ins = Two connections for diagnostic tester. |
| 10 | - Jack Plug (Negative) | Negative Plug in = Connection for diagnostic tester. |
| 11 | + Jack Plug (Positive) | Positive Plug in = Connection for diagnostic tester. |
| 12 | BUILT IN TEST SWITCH | 11 rotary contact function switch to troubleshoot controls. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, VHF/FM DSC TRANSCEIVER

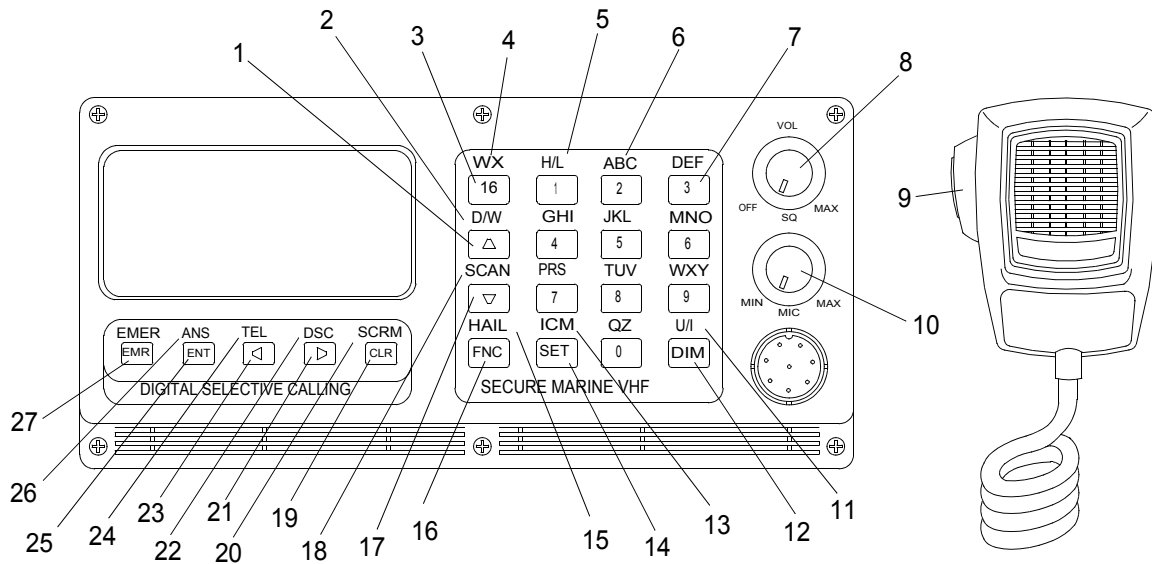


Table 4. VHF/FM DSC Transceiver Controls and Indicators.

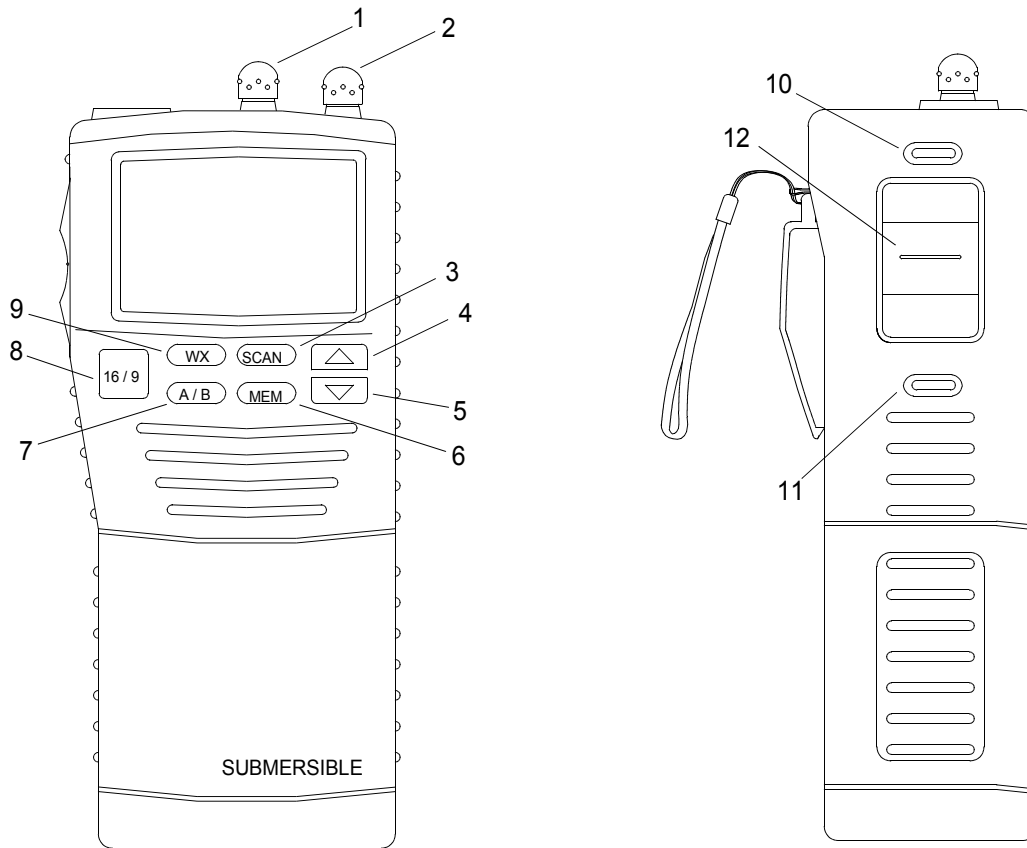
| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|--------------------------------|--|
| 1 | Up Arrow Key | Used to select the next higher channel number or move selection bar upward in menus. |
| 2 | D/W Key | Dual Watch. Allows any two channels to be selected and monitored simultaneously. |
| 3 | 16 Key | Sets the transceiver to transmit and receive on channel 16 and overrides any other function when pressed. |
| 4 | WX Key | Allows 10 weather channels to be selected individually or scanned. |
| 5 | H/L Key | High/Low. Selects HIGH (25 watt) or LOW (1 watt) transmit power. Also selects LOCAL or DISTANCE receive mode. |
| 6 | Letter Keys | Used for entry of names into directories. |
| 7 | Number Keys | Used for channel selection and entry of numeric values. |
| 8 | Off/Volume Knob | Turns power on and off. Adjusts speaker volume level. |
| 9 | Microphone Push To Talk Button | Press the button to transmit. Release button to receive. A transmit timer limits continuous transmission to 5 minutes. |
| 10 | Squelch Knob | Sets the threshold level (squelch) of received signals that will produce audio output from the speaker. |
| 11 | U/I Key | USA or International. Selects USA or International frequency sets. |
| 12 | DIM Key | Selects any of four display backlighting levels; Low, Medium, High or Off. |

Table 4. VHF/FM DSC Transceiver Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|--------------------------|--|
| 13 | ICM Key | Intercom. Activates the INTERCOM mode. Remote station speakers required. |
| 14 | SET Key | Displays USER SETUPS menu. Choose from Clock, Viewing Angle, User Options, NMEA Position and Security Code. |
| 15 | HAIL Key | Activates the HAIL mode. Remote speaker required. |
| 16 | FNC Key | Function key. Selects the second function for a key. The second function is shown above the key. Does not select the letters above keys 2 thru 0. |
| 17 | Down Arrow Key | Used to select the next lower channel number or move selection bar downward in menus. |
| 18 | SCAN Key | Displays SCAN SELECTION menu. Choose MEMORY SCAN, ALL CHANNELS or SCAN REVIEW. |
| 19 | CLR Key | Clear key. Clears erroneous entries. Clears displayed channel from MEMORY SCAN memory. Stops call ringing. |
| 20 | SCRM Key | Scrambler. Displays the SCRAMBLER selections menu. Choose INDIVIDUAL, GROUP SCRAMBLE or SEARCH for directory entry. |
| 21 | Right Arrow Key | Used to change pages in multiple page menus and advance the entry position when entering or editing data. |
| 22 | DSC Key | Displays the DSC CALLING and several other menus regarding DSC operations. Use arrow keys to make selection. |
| 23 | Left Arrow Key | Used to change pages in multiple page menus and backspace the entry position when entering or editing data. |
| 24 | TEL Key | Displays the TELEPHONE and COAST STATION menus. Choose any existing entry, new entry or search for individual telephone numbers and coast station DSC ID numbers. |
| 25 | ENT Key | Enter. Used to complete selections and terminate multiple key entries. Enter displayed channel into MEMORY SCAN memory. |
| 26 | ANS Key | Answer. Displays the CALL WAITING menu. Select any entry to respond. |
| 27 | EMR Key | Emergency key. Displays the EMERGENCY menu. When SEND DISTRESS is selected and button is pushed and held in for five seconds, transmits emergency message on channel 70. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, AN/VRC-88D SINGARS RADIO TRANSMITTER

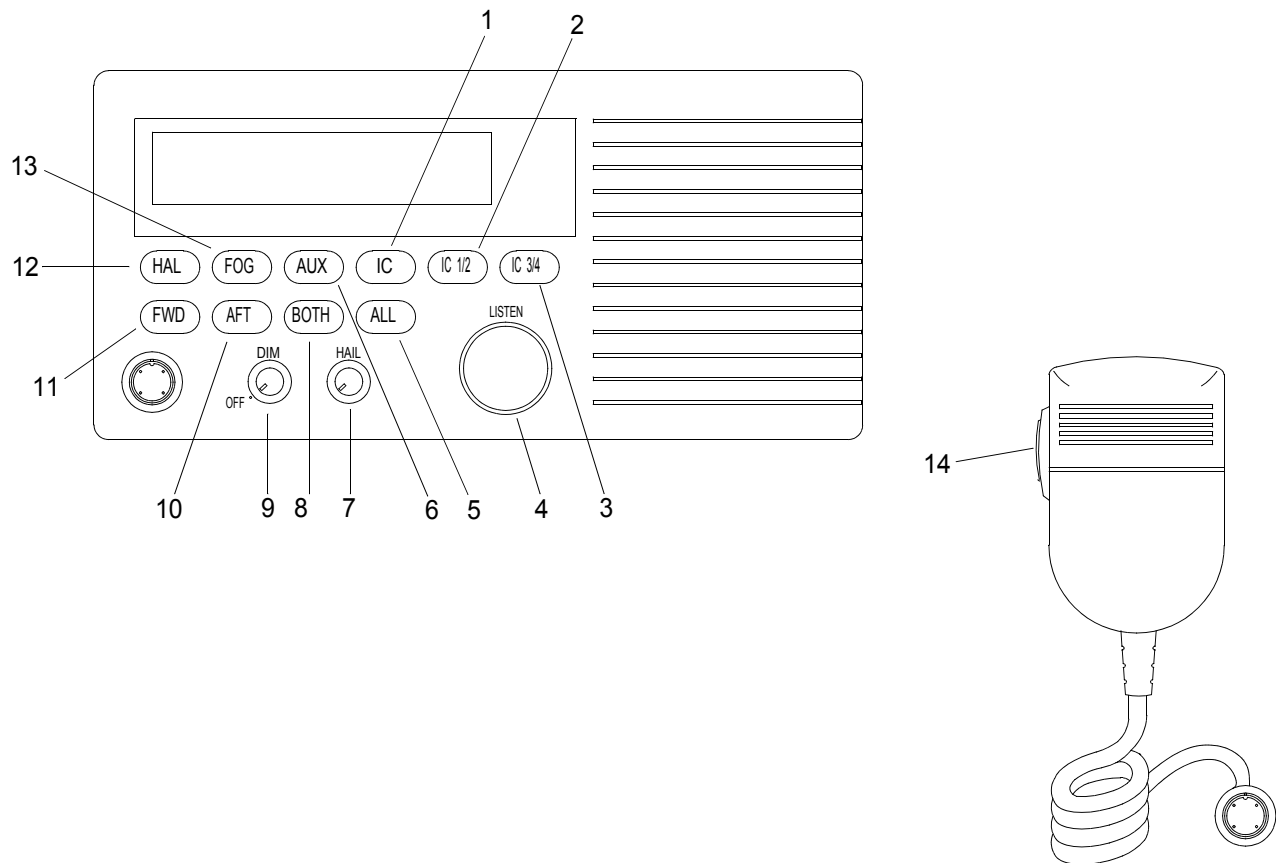
Refer to AN/VRC-88D SINGARS Radio Operators Manual, TM 11-5820-890-10-8, for controls and indicators.

**DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, VHF/FM
HANDHELD TRANSCEIVER**

Table 5. VHF/FM Handheld Transceiver Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|----------------------|---|
| 1 | SQUELCH CONTROL Knob | Sets the threshold level of signals that will produce audio output from the speaker. |
| 2 | POWER/VOLUME Knob | Turns power on and off. Adjusts speaker level. |
| 3 | SCAN Key | Starts scanning programmed channels. Press key for at least one second to turn on and off priority scan during scan. |
| 4 | Up Arrow Key | Selects the desired channel. Each press increases the channel number. When held down, the channels increase continuously. |
| 5 | Down Arrow Key | Selects the desired channel. Each press decreases the channel number. When held down, the channels decrease continuously. |
| 6 | MEM Key | Memorizes the selected channel. When pressed again, deletes the selected channel. |
| 7 | A/B Key | Immediately recalls two user assigned channels from any channel location. |

Table 5. VHF/FM Handheld Transceiver Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|--------------------------------------|---|
| 8 | 16/9 Key | Immediately recalls channel 16 from any channel location. Holding this key down recalls channel 9. When the WX key is pressed while holding this key, the mode toggles between USA, International and Canada. |
| 9 | WX Key | Immediately recalls a weather channel from any channel location. Recalls the previous channel when the WX key is pressed again. |
| 10 | LAMP/KEY LOCK Key | Turns the display lamp on and off. Hold down key to lock the displayed channel. Key symbol appears in display. Hold down until key symbol in display disappears to unlock. |
| 11 | H/L Key | Toggles between high and low power. To change from low power to high power, hold down key on Canada channel 13, USA channel 13 or 67. |
| 12 | Microphone PUSH TO TALK (PTT) Switch | Press the PUSH TO TALK switch to transmit. Release button to receive. A transmit timer limits continuous transmissions to 5 minutes. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, PUBLIC ADDRESS SET (LOUDHAILER)

Table 6. Public Address Set (Loudhailer) Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|---------------------|--|
| 1 | IC Key | Intercom. Pressing this key puts the loudhailer in the intercom mode. |
| 2 | IC1/2 Key | Selects between intercom station one and two. |
| 3 | IC 3/4 Key | Selects between intercom station three and four. |
| 4 | LISTEN Control Knob | Rotating the knob clockwise increases the volume to the internal speaker, rotating the knob counterclockwise decreases the volume to the internal speaker. |
| 5 | ALL Key | Selects the input/output circuitry to all speaker stations for use simultaneously during foghorn, hailer, or public address operations. When selecting intercom operations, select ALL intercom stations only. |
| 6 | AUX Key | When pressed, allows radio transmissions received on VHF/FM DSC transceiver to be monitored using the loudhailer external horn. |

Table 6. Public Address Set (Loudhailer) Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|--------------------------------|---|
| 7 | HAIL Output Knob | Rotating the knob clockwise increases the volume to the hailer horns, rotating the knob counterclockwise decreases the volume to the hailer horn. |
| 8 | BOTH Key | Selects both forward and aft loudhailer horns. |
| 9 | ON/OFF and DIMMER Knob | Rotating the knob clockwise turns the loudhailer on, rotating the knob counterclockwise turns the loudhailer off. Rotating the knob adjusts the display backlighting level. |
| 10 | AFT Key | Selects the aft loudhailer horn. |
| 11 | FWD Key | Forward. Selects the forward loudhailer horn. |
| 12 | HAIL Key | Pressing this key puts the loudhailer into the HAIL mode. HAILER is displayed on the LCD. |
| 13 | FOG Key | Pressing the FOG key sequentially selects one of nine different horn or automatic fog signals. |
| 14 | Microphone PUSH TO TALK Switch | When pressed allows operator to transmit. Allows listening when not pressed. |

**DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, AN/PSN-11(V)1
PRECISION GLOBAL POSITIONING RECEIVER (PLGR)**

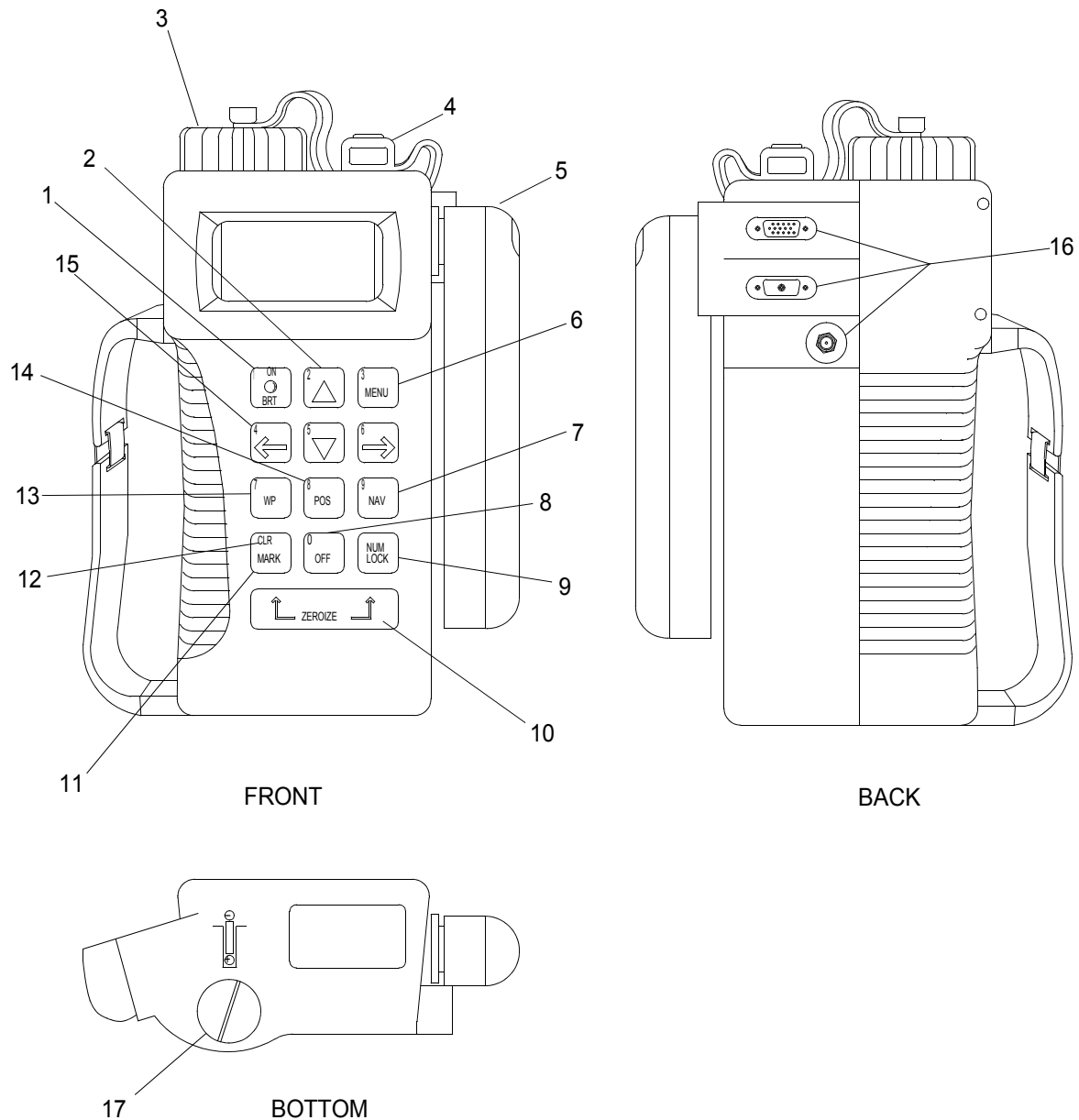


Table 7. AN/PSN-11(V)1 PLGR Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|------------------------|--|
| 1 | ON/BRT Key | Turns the PLGR on. Also adjusts the brightness of the display backlighting. |
| 2 | Up and down Arrow Keys | Used to change display pages, change alphanumeric field values and activate functions. |
| 3 | Battery Compartment | Powers the PLGR when external power is not used. Battery must be removed before external power is applied. |
| 4 | KYK-13 Encryption Port | When loaded, allows user to receive or read encrypted data. |

Table 7. AN/PSN-11(V)1 PLGR Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|----------------------------|--|
| 5 | Integral Antenna | Receives GPS signal when external antenna is not used. |
| 6 | MENU Key | Displays the system menu. Changes to new menu page. |
| 7 | NAV Key | Brings up the NAV menu displays. Key is inoperable until waypoints are loaded. |
| 8 | OFF Key | Turns the PLGR off. |
| 9 | NUM LOCK Key | Toggles the keyboard between control mode and numeric mode. |
| 10 | ZEROIZE Key | Destroys all data that has been entered into, collected or stored by the PLGR. |
| 11 | MARK Key | Activates the MARK and Man Overboard (MOB) waypoint selection page. |
| 12 | CLR KEY | Used in numeric mode. Moves the cursor to the left. |
| 13 | WP Key | Displays the WAYPOINT menu. |
| 14 | POS Key | Brings up the POSITION menu. Changes position display pages. |
| 15 | Left and Right Arrow Keys | Moves the cursor from field to field in the display. |
| 16 | J2, J3 and J4 Ports | Allows PLGR to be used with external power and provides external output of GPS data. Provides a receptacle for connecting PLGR to a data terminal. |
| 17 | Memory Battery Compartment | Contains memory battery which retains PLGR memory when the PLGR is turned off. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, AN/PSN-11 PLGR INTERFACE AND SWITCHBOX

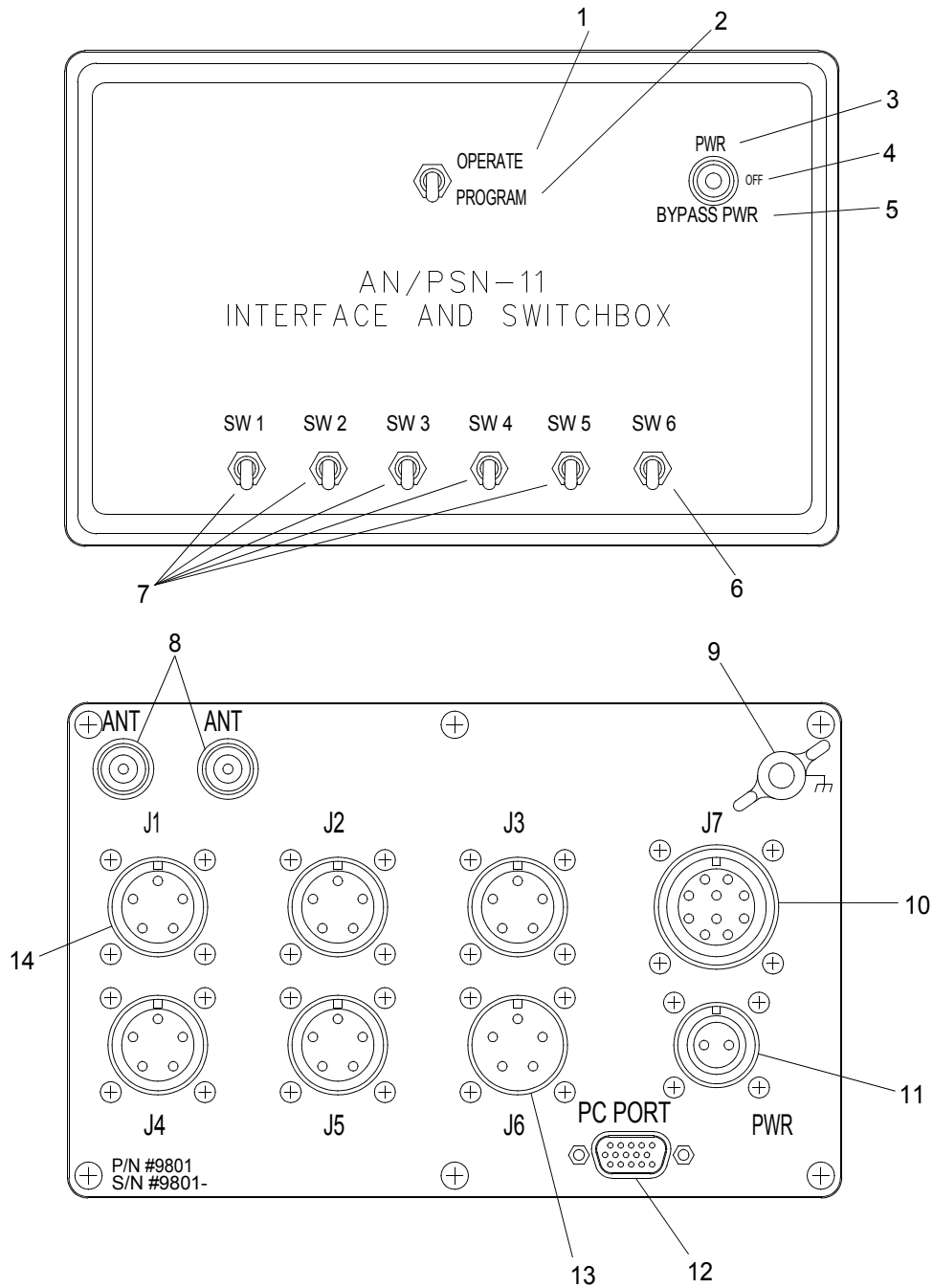


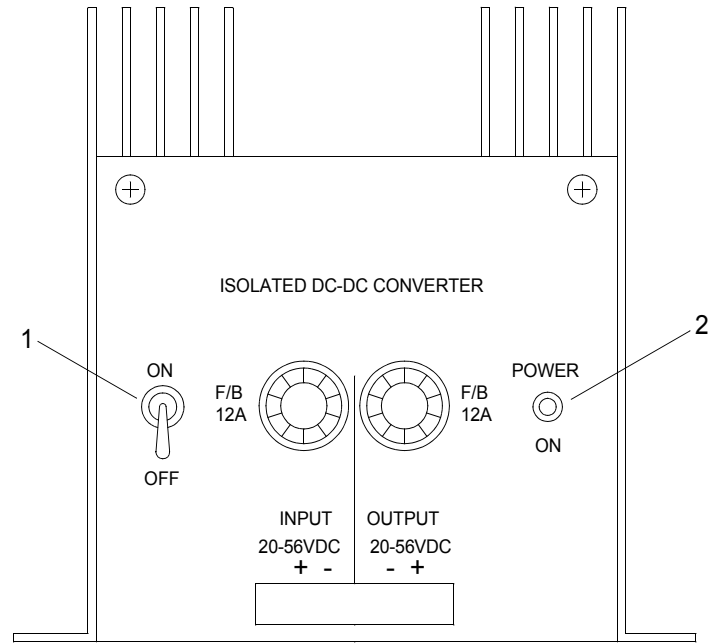
Table 8. AN/PSN-11 PLGR Interface and Switchbox Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|--|--|
| 1 | Operate/Program Switch in OPERATE Position | Normal switch position for the interface and switchbox when installed in the navigation location. |
| 2 | Operate/Program Switch in PROGRAM Position | This switch position is not used when the interface and switchbox is installed in the navigation location. |

Table 8. AN/PSN-11 PLGR Interface and Switchbox Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|-------------------------------------|--|
| 3 | Power Switch in PWR Position | Allows the interface and switchbox to receive power from ship's power source and supplies regulated power to the PLGR. |
| 4 | Power Switch in OFF Position | Allows the interface and switchbox to receive ship's power, but does not allow power output to PLGR. |
| 5 | Power Switch in BYPASS PWR Position | Allows interface and switchbox to receive ship's power and supplies unregulated power to the PLGR. |
| 6 | SW6 | Allows interface of GPS differential signal data. Switch up for on, switch down for off. |
| 7 | SW1 - SW5 | SW3 switches GPS signal on and off for VHF/FM transceiver. SW1, SW2, SW4 and SW5 not used. |
| 8 | ANT Connectors | Antenna connections for PLGR signal input and output. Connections are interchangeable. |
| 9 | Grounding Point | Grounding point for grounding the interface and switchbox to the vessel. |
| 10 | J7 Connector | Provides ship's power to PLGR. |
| 11 | PWR Connector | Receives power from ship power source to operate PLGR. |
| 12 | PC PORT Connector | Provides data terminal interface with PLGR for programming PLGR from data terminal. |
| 13 | J6 Connector | Allows input of GPS differential data. |
| 14 | J1 - J5 Connectors | J3 provides GPS signal to VHF/FM transceiver. J1, J2, J4 and J5 not used. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, DC TO DC CONVERTER



DC TO DC CONVERTER

Table 9. DC to DC Converter Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|------------------------------|---|
| 1 | ON/OFF Switch | Turns the converter on (up) or off (down). |
| 2 | POWER ON Red Indicator Light | Red light indicates that the converter is on. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, VHF/FM HANDHELD TRANSCEIVER BATTERY CHARGER

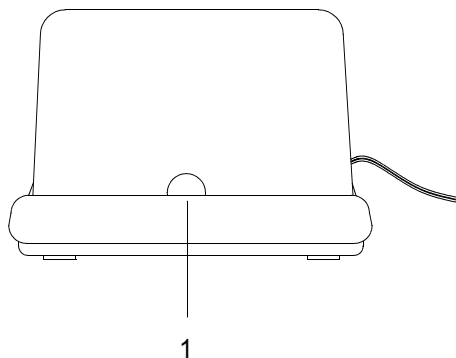
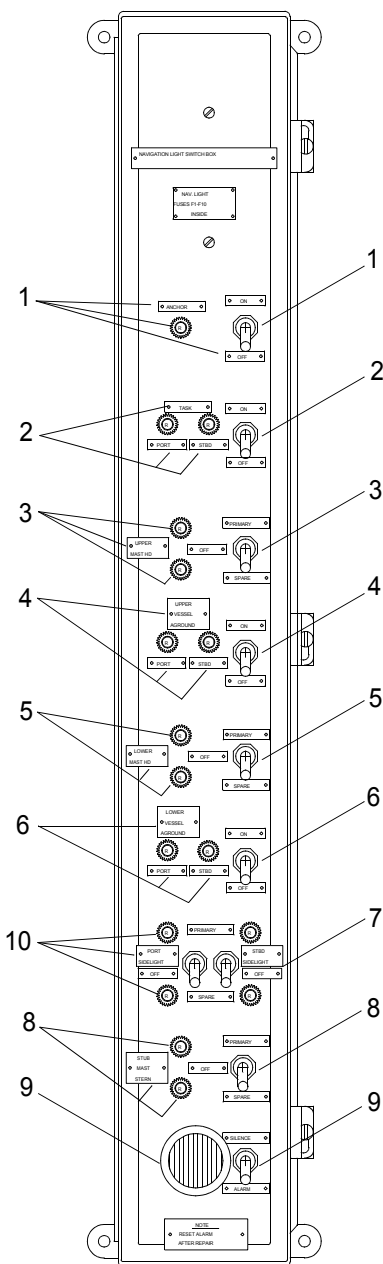


Table 10. VHF/FM Handheld Transceiver Battery Charger Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|---|---|
| 1 | Power On/Recharging Red Indicator Light | Red light indicates the handheld radio is charging. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, MAST ENCLOSURE ASSEMBLY A7



MAST ENCLOSURE ASSEMBLY A7

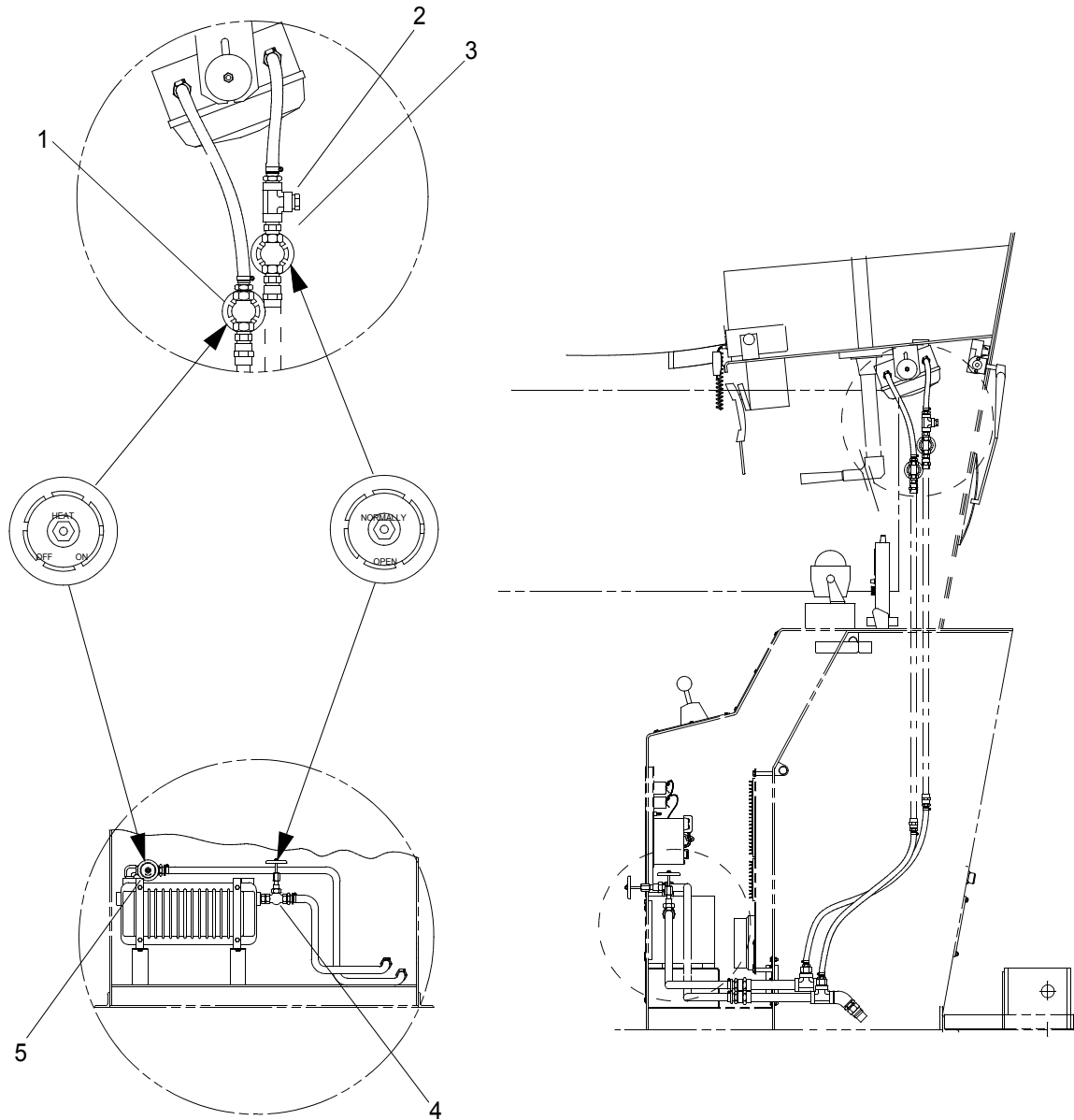
Table 11. Mast Enclosure Assembly A7 Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|---|--|
| 1 | ANCHOR Toggle Switch with Red Indicator Light | ON = illuminates anchor navigation light. OFF = light is extinguished. |
| 2 | TASK Toggle Switch with Red Indicator Lights | ON = illuminates port and starboard task lights, OFF = lights are extinguished. |

Table 11. Mast Enclosure Assembly A7 Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|--|--|
| 3 | UPPER MAST HD Toggle Switch with Red Indicator Lights | PRIMARY = illuminates primary upper mast head light. OFF = light is extinguished. SPARE = illuminates spare upper mast head light. |
| 4 | UPPER VESSEL AGROUND Toggle Switch with Red Indicator Lights | ON = illuminates upper port and starboard vessel aground lights. OFF = lights are extinguished. |
| 5 | LOWER MAST HD Toggle Switch with Red Indicator Lights | PRIMARY = illuminates primary lower mast head light. OFF = light is extinguished. SPARE = illuminates spare lower mast head light. |
| 6 | LOWER VESSEL AGROUND Toggle Switch with Red Indicator Lights | ON = illuminates port and starboard lower vessel aground lights. OFF = lights are extinguished. |
| 7 | STBD SIDELIGHT Toggle Switch with Red Indicator Lights | PRIMARY = illuminates primary starboard sidelight. OFF = light is extinguished. SPARE = illuminates spare starboard sidelight. |
| 8 | STUB MAST STERN Toggle Switch with Red Indicator Lights | PRIMARY = illuminates primary stub mast stern light. OFF = light is extinguished. SPARE = illuminates spare stub mast stern light. |
| 9 | ALARM/SILENCE Toggle Switch with Speaker | ALARM = pulse beeper alarm activates if a primary mast light becomes inoperative. SILENCE = pulse beeper audible alarm inactivated. |
| 10 | PORT SIDELIGHT Toggle Switch with Red Indicator Lights | PRIMARY = illuminates primary port sidelight. OFF = light is extinguished. SPARE = illuminates spare port sidelight. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, ACCESSORIES



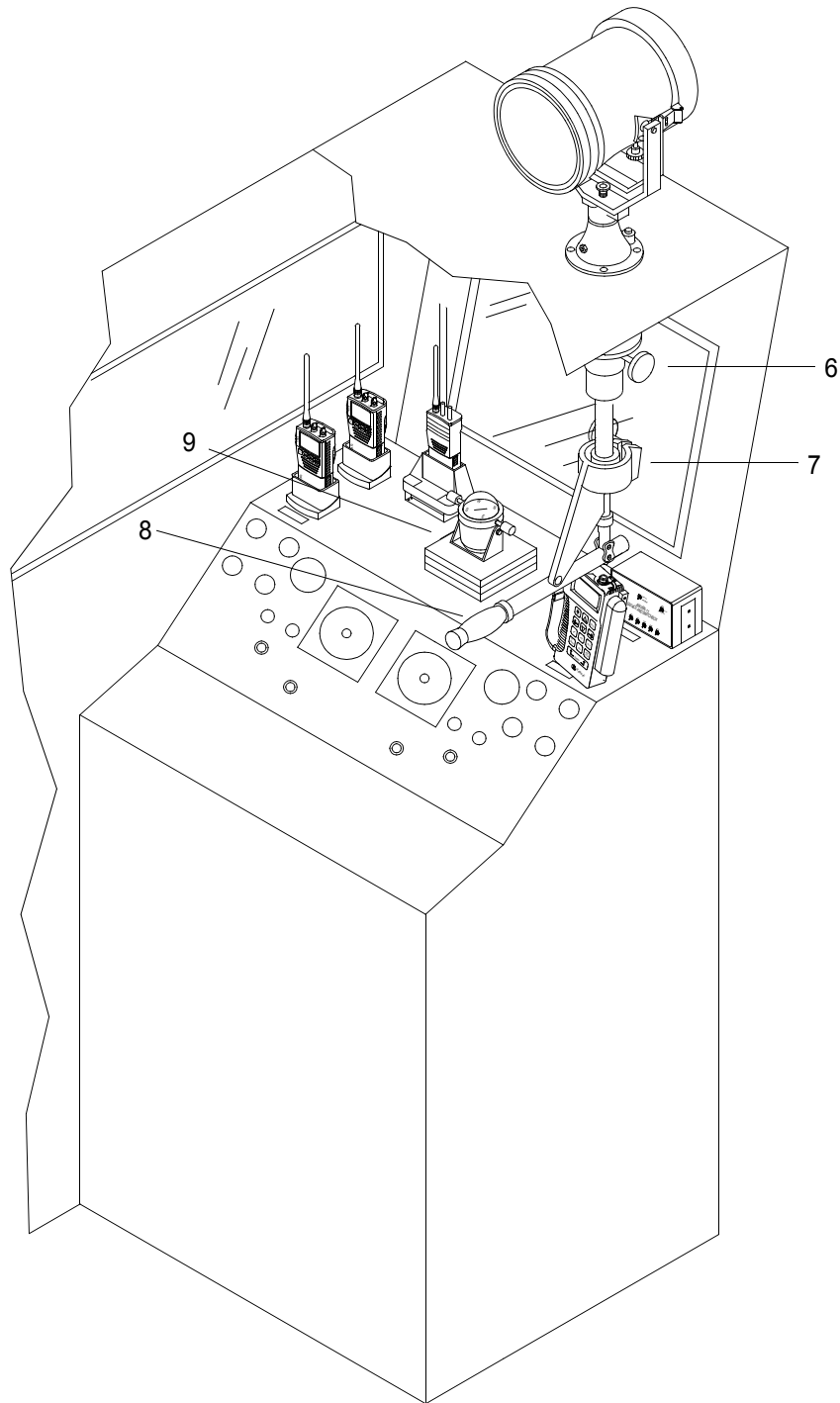


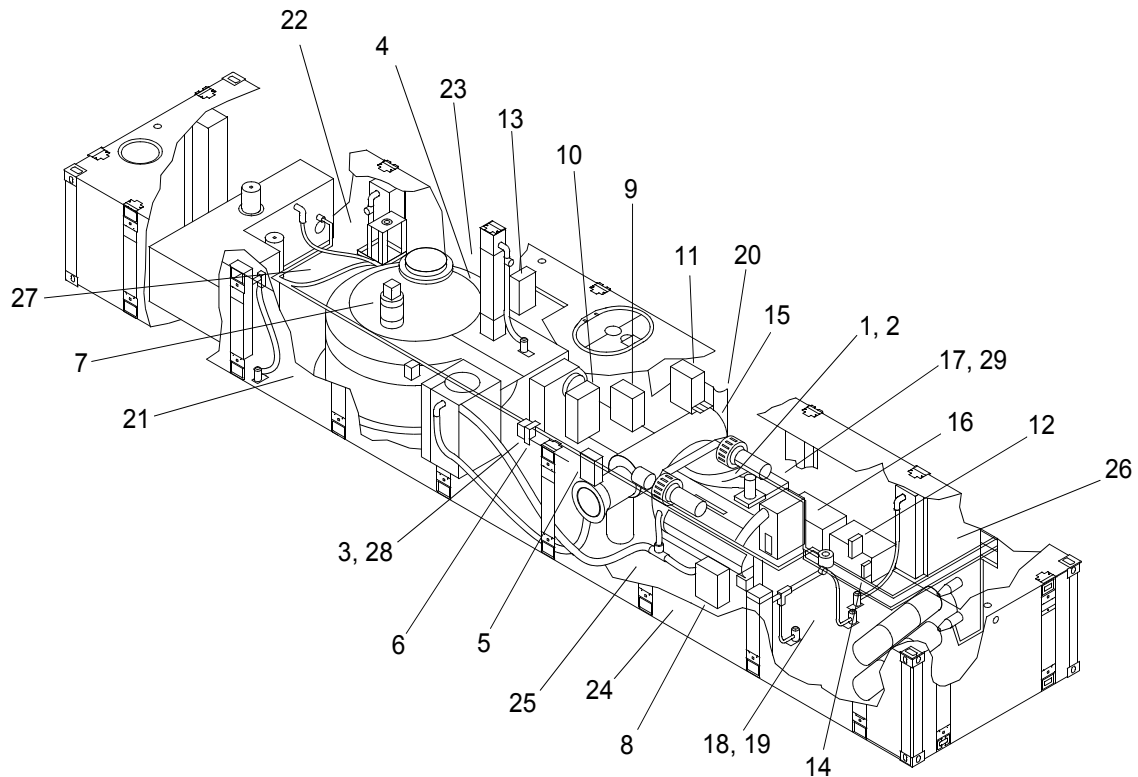
Table 12. Accessory Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|-------------------------------|--|
| 1 | HEAT ON/OFF Valve (Defroster) | Allows antifreeze mixture to flow into cab defroster core from engine freshwater system. |
| 2 | Bleeder Valve (Defroster) | Allows air to be bled from the defroster system. |

Table 12. Accessory Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|---------------------------------|---|
| 3 | NORMALLY OPEN Valve (Defroster) | Allows antifreeze mixture to flow out of defroster core and return to engine freshwater system. |
| 4 | NORMALLY OPEN Valve (Heater) | Allows antifreeze mixture to flow out of heater core and return to engine freshwater system. |
| 5 | HEAT ON/OFF Valve (Heater) | Allows antifreeze mixture to flow into cab heater core from engine freshwater system. |
| 6 | Spotlight Angle Lock Knob | Holds vertical angle of spotlight to WT deck. |
| 7 | Spotlight Up and Down Lock Knob | Holds left/right (port/starboard) position of spotlight. |
| 8 | Spotlight Control Handle | Allows vertical and horizontal movement of spotlight from inside the cab when the lock knobs are not locked down. |
| 9 | Compass | Operator directional indicator. |

BELOW DECK CONTROLS AND INDICATORS (OVERVIEW)

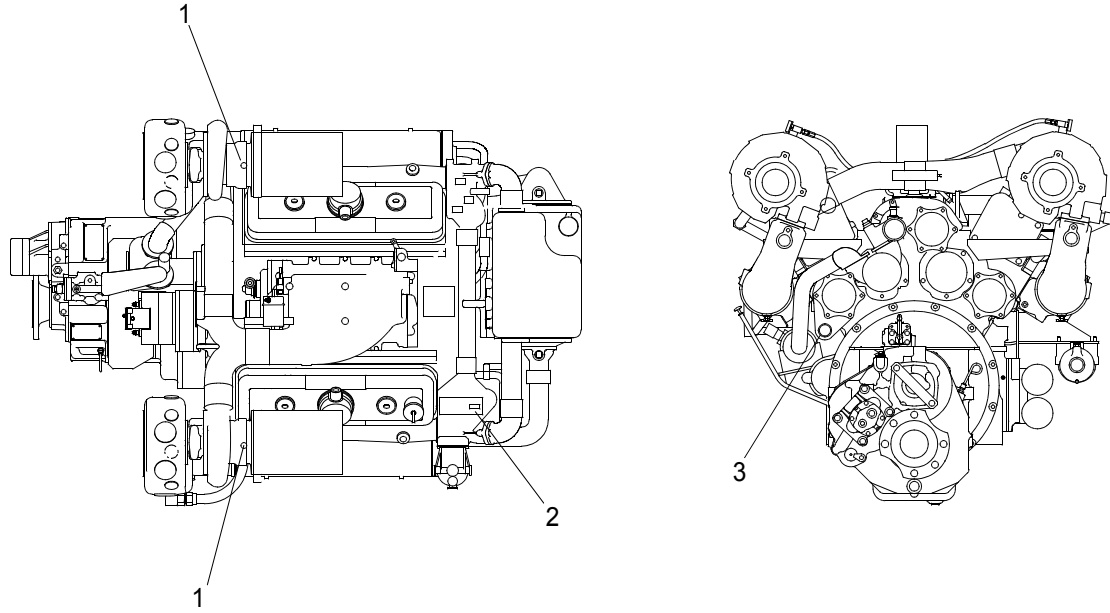


BELOWDECK CONTROLS AND INDICATORS

Table 13. Below Deck Controls and Indicators.

| KEY | DESIGNATOR | COMPONENT |
|-----|------------|---|
| 1 | A1 | The engine's actuator for speed governor, electronic overspeed switch, pressure switches, temperature and pressure sending units, etc. are wired to the engine in wire harness K-MB1. |
| 2 | A1B1 | Engine Starter |
| 3 | A2 | Thruster and Components |
| 4 | A2B1 | Thruster Steering Position Synchro |
| 5 | A2jb2 | Thruster Junction Box (E26929) |
| 6 | A2jb1 | Hydraulic Control (Note: Hydraulic control box connects to steering solenoids.) |
| 7 | A2S2 | Thruster Gear Box Oil Level Switch |
| 8 | A3 | Propulsion Module Junction Box (E28803) |
| 9 | A4 | Engine Junction Box and E Stop Switch (E08913) |
| 10 | A5 | Bilge Pump Control Panel (E08893) |
| 11 | A6 | Propulsion Module Circuit Breaker Panel (E06793) |
| 12 | A7 | Single Bilge pump Control Panel (E08903) |
| 13 | A8 | Vent Fan Relay Enclosure (E23703) for Vent Fan Motor (B1) |
| 14 | A9 | Thruster DIR/AUX Battery Junction Box Assembly Enclosure (E28253) |
| 15 | B1 | Vent Fan Motor |
| 16 | BT | Batteries (total 4) |
| 17 | G1 | Alternator |
| 18 | JB1 | Junction Box for #1 Bilge Pump (B2) |
| 19 | JB2 | Junction Box for #3 Bilge Pump (B4) |
| 20 | JB3 | NATO Receptacle |
| 21 | JB5 | Junction Box for #5 Bilge Pump (B6) |
| 22 | JB6 | Junction Box for #6 Bilge Pump (B7) |
| 23 | JB8 | Junction Box for #4 Bilge Pump (B5) |
| 24 | L1 | Cold Start Solenoid |
| 25 | L2/L3 | Clutch Engage Forward/Backflush Solenoids |
| 26 | S2 | CO2 Pressure Switch |
| 27 | S8 | Aft Fire Thermal Detector |
| 28 | S9 | Middle Fire Thermal Detector |
| 29 | VR1 | Regulator for Alternator |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, DIESEL ENGINE

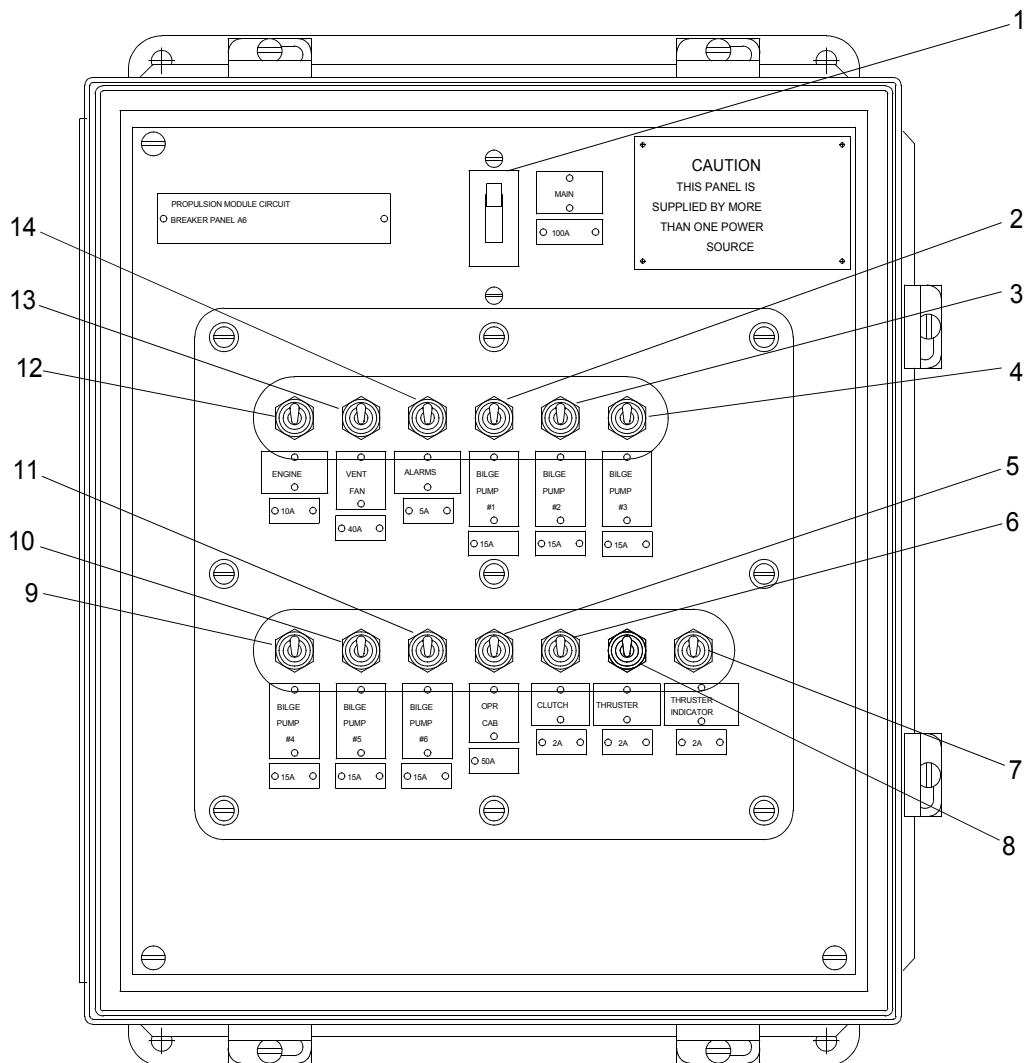


DIESEL ENGINE MOUNTED CONTROLS

Table 14. Diesel Engine Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|----------------------------------|---|
| 1 | Air Inlet Restriction Indicators | Red button pops out when filters are dirty and need to be changed. Each turbocharger has one indicator. |
| 2 | NORMAL STOP Switch | When depressed and held down, the fuel supply is cut off, stopping the engine. |
| 3 | Engine Hour Meter | Totals the number of hours the engine has been run. Hours are entered in the engine logbook. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, PROPULSION MODULE CIRCUIT BREAKER PANEL (A6)



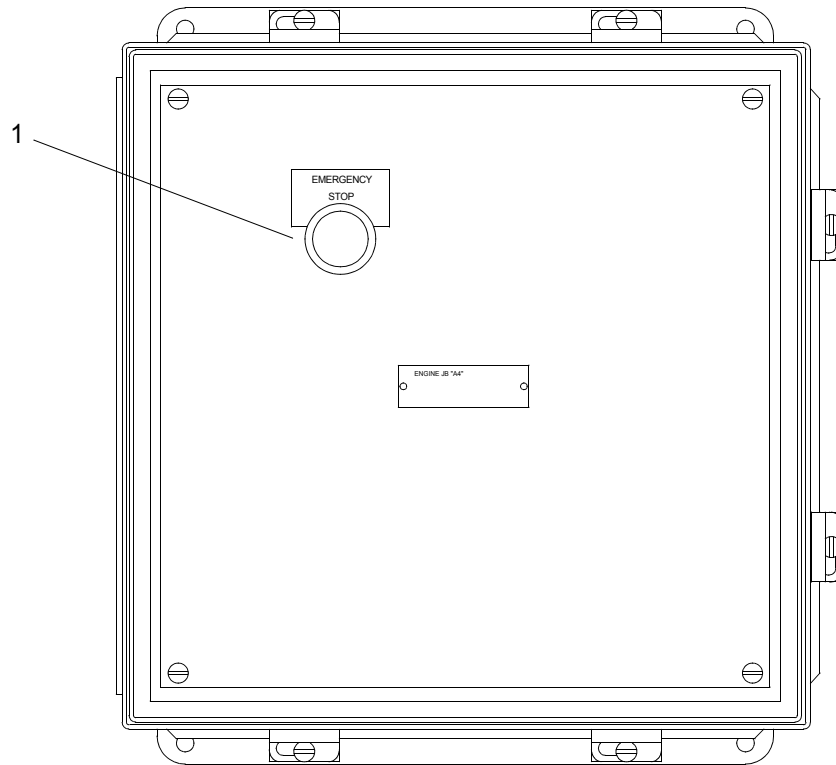
PROPULSION MODULE CIRCUIT BREAKER PANEL (A6)

Table 15. Propulsion Module Circuit Breaker Panel (A6) Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|------------------------------------|--|
| 1 | MAIN Circuit Breaker, 100A | Up (On)/Down (Off) = Controls all electrical power distribution. |
| 2 | BILGE PUMP #1 Circuit Breaker, 15A | Up (On)/Down (Off) = Controls electrical power to operators cab for lazaret bilge pump #1 (located on lower control panel). |
| 3 | BILGE PUMP #2 Circuit Breaker, 15A | Up (On)/Down (Off) = Controls electrical power to operators cab for fwd port machinery compartment bilge pump #2 (located on lower control panel). |
| 4 | BILGE PUMP #3 Circuit Breaker, 15A | Up (On)/Down (Off) = Controls electrical power to operators cab for fwd stbd machinery compartment bilge pump #3 (located on lower control panel). |

Table 15. Propulsion Module Circuit Breaker Panel (A6) Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|--|---|
| 5 | OPR CAB Circuit Breaker, 50A | Up (On)/Down (Off) = Controls electrical power to panels in operators cab, except for engine power (see engine power switch, Item 2 of this table). |
| 6 | CLUTCH Circuit Breaker, 2A | Up (On)/Down (Off) = Controls electrical power to operators cab for port and starboard clutch engagement switches (located on lower control panel). |
| 7 | THRUSTER INDICATOR Circuit Breaker, 2A | Up (On)/Down (Off) = Controls electrical power to operators cab for port and starboard pump-jet thruster direction indicators (located on middle control panel). |
| 8 | THRUSTER Circuit Breaker, 2A | Up (On)/Down (Off) = Controls electrical power to operators cab for port and starboard pump-jet thruster steering control joystick levers (located on lower control panel). |
| 9 | BILGE PUMP #4 Circuit Breaker, 15A | Up (On)/Down (Off) = Controls electrical power to operators cab for center port machinery compartment bilge pump #4 (located on lower control panel). |
| 10 | BILGE PUMP #5 Circuit Breaker, 15A | Up (On)/Down (Off) = Controls electrical power to operators cab for aft stbd machinery compartment bilge pump #5 (located on lower control panel). |
| 11 | BILGE PUMP #6 Circuit Breaker, 15A | Up (On)/Down (Off) = Controls electrical power to operators cab for aft port machinery compartment bilge pump #6 (located on lower control panel). |
| 12 | ENGINE Circuit Breaker, 10A | Up (On)/Down (Off) = Controls electrical power to operators cab for engine START/STOP switches port and starboard (Located on middle control panel). |
| 13 | VENT FAN Circuit Breaker, 40A | Up (On)/Down (Off) = Controls electrical power to operators cab for Vent Fan switches port and starboard (Located on lower control panel). |
| 14 | ALARMS Circuit Breaker, 5A | Up (On)/Down (Off) = Controls electrical power to operators cab for alarm system switches port and starboard (located on middle and lower control panels). |

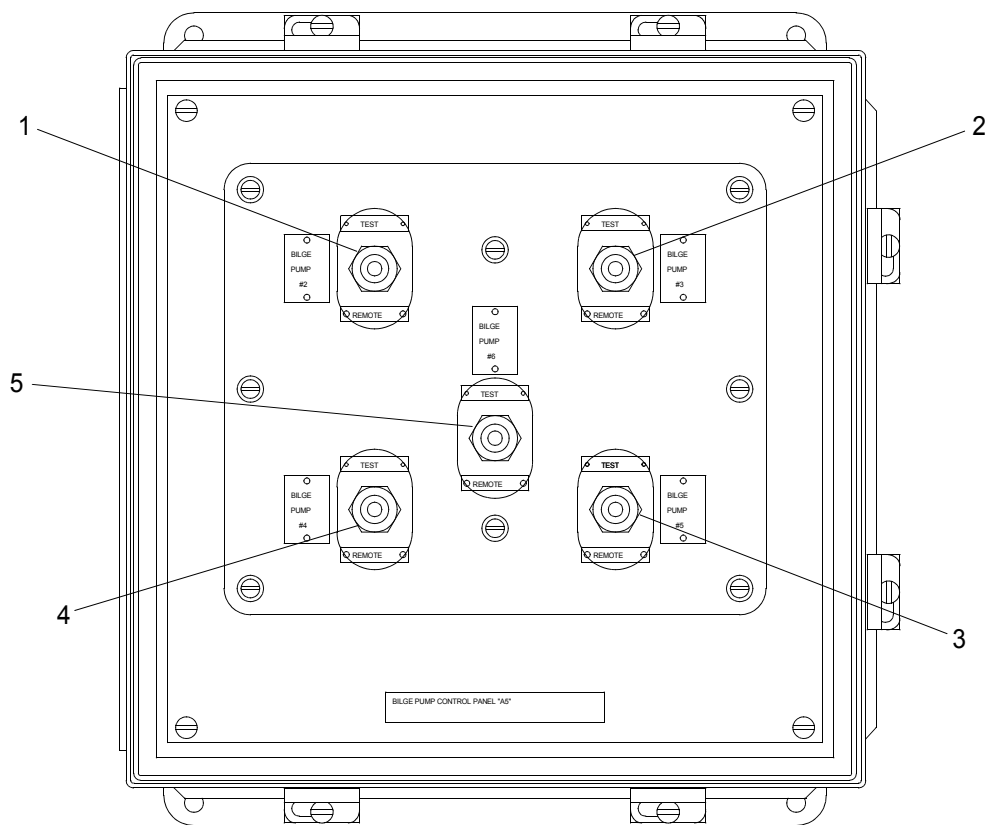
DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, ENGINE JUNCTION BOX ASSEMBLY (A4)


ENGINE JUNCTION BOX ASSEMBLY (A4)

Table 16. Engine Junction Box Assembly (A4).

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|---|--|
| 1 | Engine EMERGENCY STOP (Red) Push Button | When depressed, closes air shut-off valve to eliminate air supply to engine, stopping engine. This should only be used in extreme emergency. |

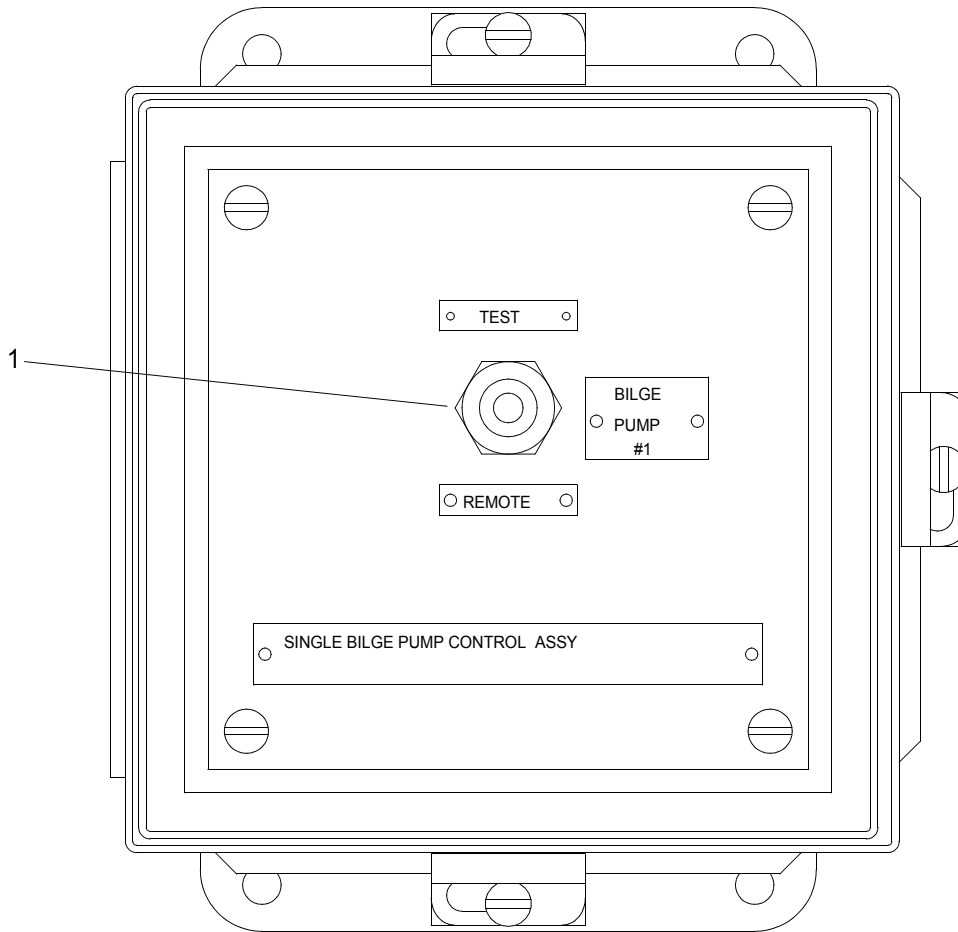
DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, BILGE PUMP CONTROL PANEL ASSEMBLY (A5)



BILGE PUMP CONTROL ASSEMBLY (A5)

Table 17. Bilge Pump Control Panel Assembly (A5) Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|-----------------------------|--|
| 1 | BILGE PUMP #2 Toggle Switch | TEST = allows momentary, local operation of bilge pump #2 located fwd port in machinery compartment. REMOTE = allows operation from operators cab. |
| 2 | BILGE PUMP #3 Toggle Switch | TEST = allows momentary, local operation of bilge pump #3 located fwd stbd in machinery compartment. REMOTE = allows operation from operators cab. |
| 3 | BILGE PUMP #5 Toggle Switch | TEST = allows momentary, local operation of bilge pump #5 located aft stbd in machinery compartment. REMOTE = allows operation from operators cab. |
| 4 | BILGE PUMP #4 Toggle Switch | TEST = allows momentary, local operation of bilge pump #4 located center port in machinery compartment. REMOTE = allows operation from operators cab. |
| 5 | BILGE PUMP #6 Toggle Switch | TEST = allows momentary, local operation of bilge pump #6 located aft port in machinery compartment. REMOTE = allows operation from operators cab. |

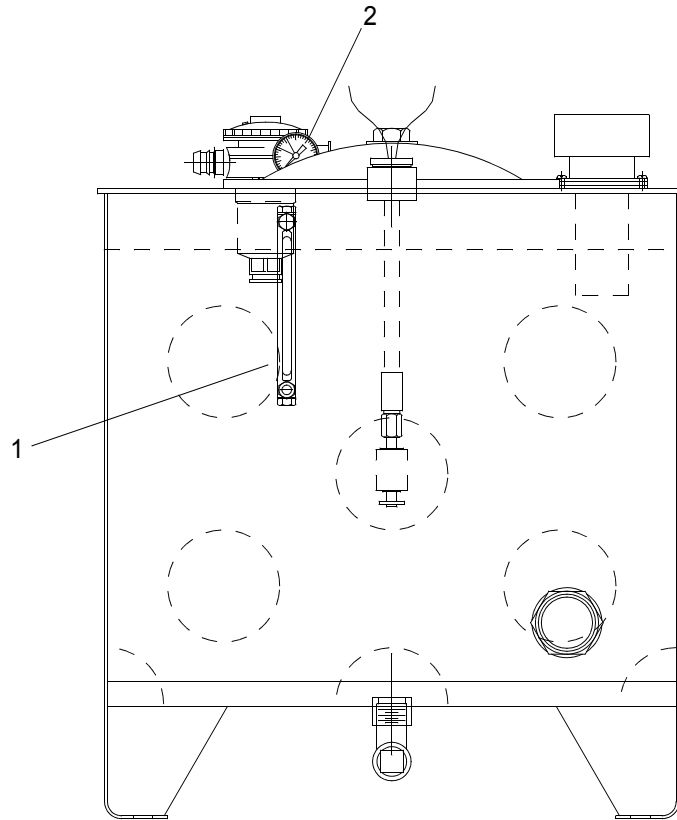
DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, SINGLE BILGE PUMP CONTROL PANEL ASSEMBLY (A7)


SINGLE BILGE PUMP CONTROL ASSEMBLY (A7)

Table 18. Single Bilge Pump Control Panel Assembly (A7) Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|-----------------------------|--|
| 1 | BILGE PUMP #1 Toggle Switch | TEST = allows momentary, local operation of bilge pump #1 in lazaret compartment. REMOTE = allows operation from operators cab. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, HYDRAULIC STEERING SYSTEM

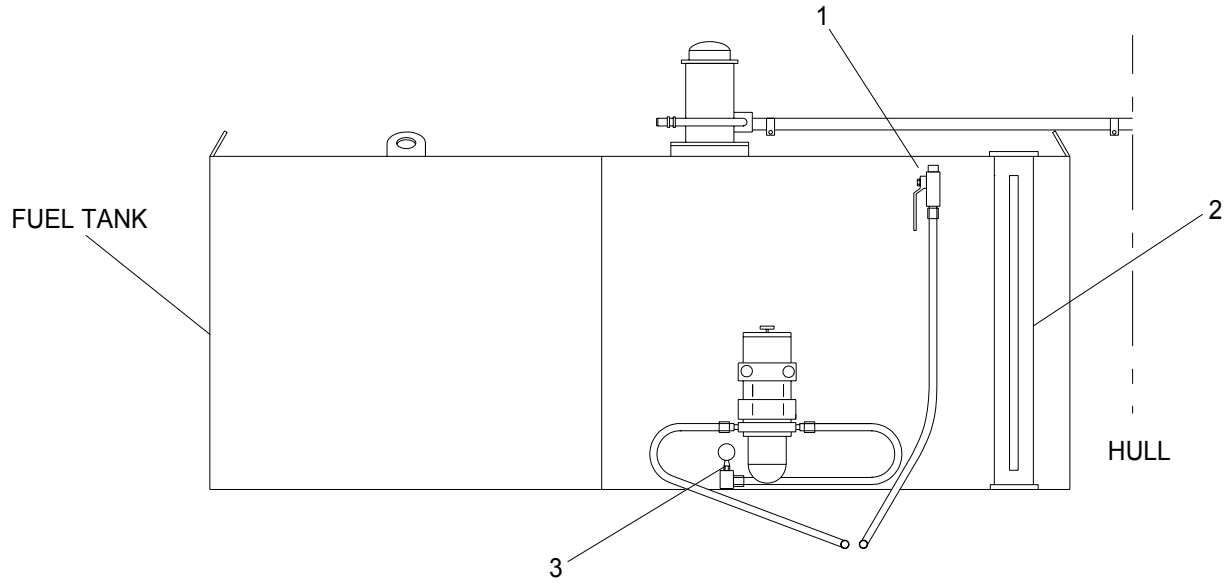


HYDRAULIC STEERING SYSTEM INDICATORS

Table 19. Hydraulic System Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|-------------------------------|--|
| 1 | Sight Gauge | Indicates the level of hydraulic fluid in the storage reservoir. |
| 2 | Dirt Indicator, Return Filter | Indicates that when the arrow is in the red zone, the hydraulic reservoir fluid filter is dirty and needs replacing. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, FUEL SYSTEM



FUEL SYSTEM CONTROLS

Table 20. Fuel System Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|--------------------------|---|
| 1 | Fuel Ball Valve (Return) | Allows return of unused fuel back into fuel tank. |
| 2 | Sight Gauge | Indicates level of fuel in the fuel tank. |
| 3 | Fuel Ball Valve (Supply) | Allows fuel to be transferred to the diesel engine. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, RAW WATER SYSTEM

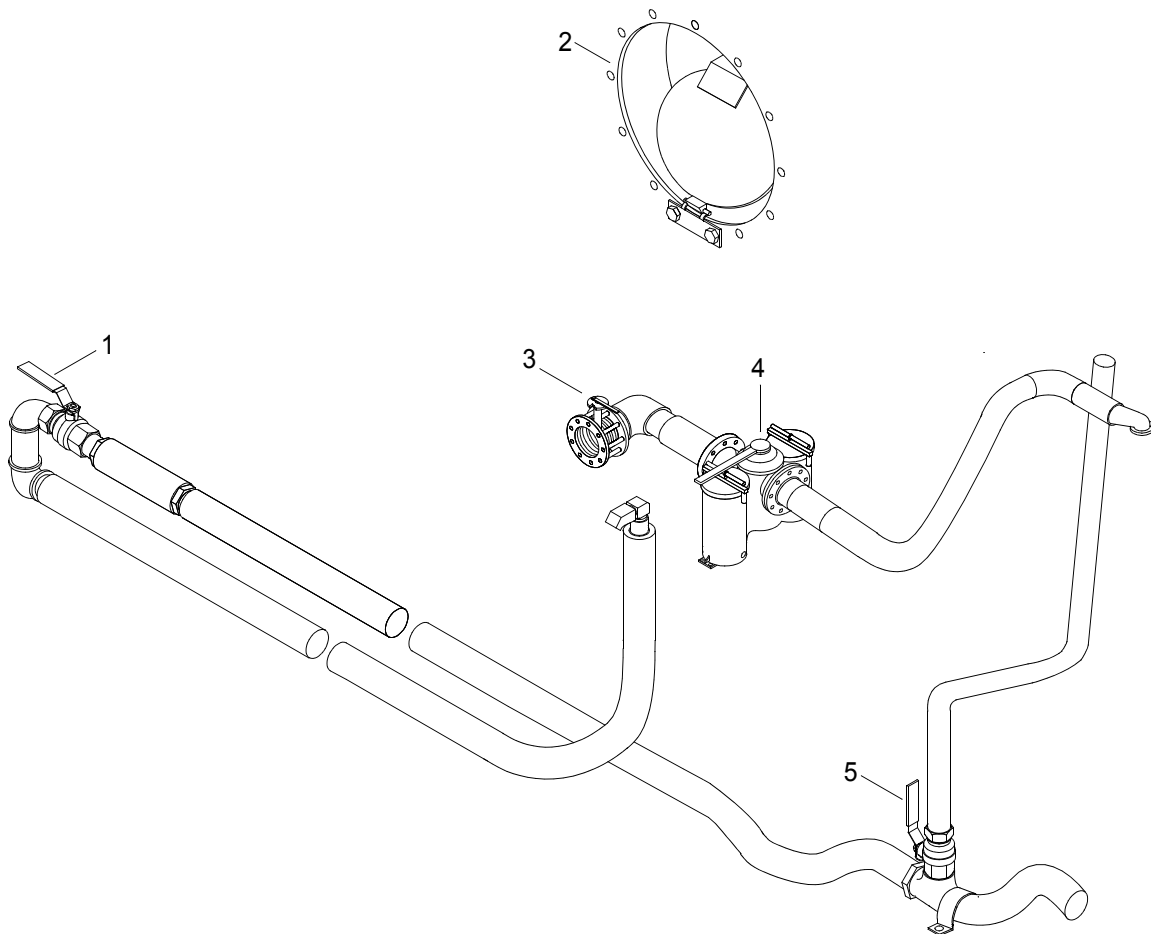


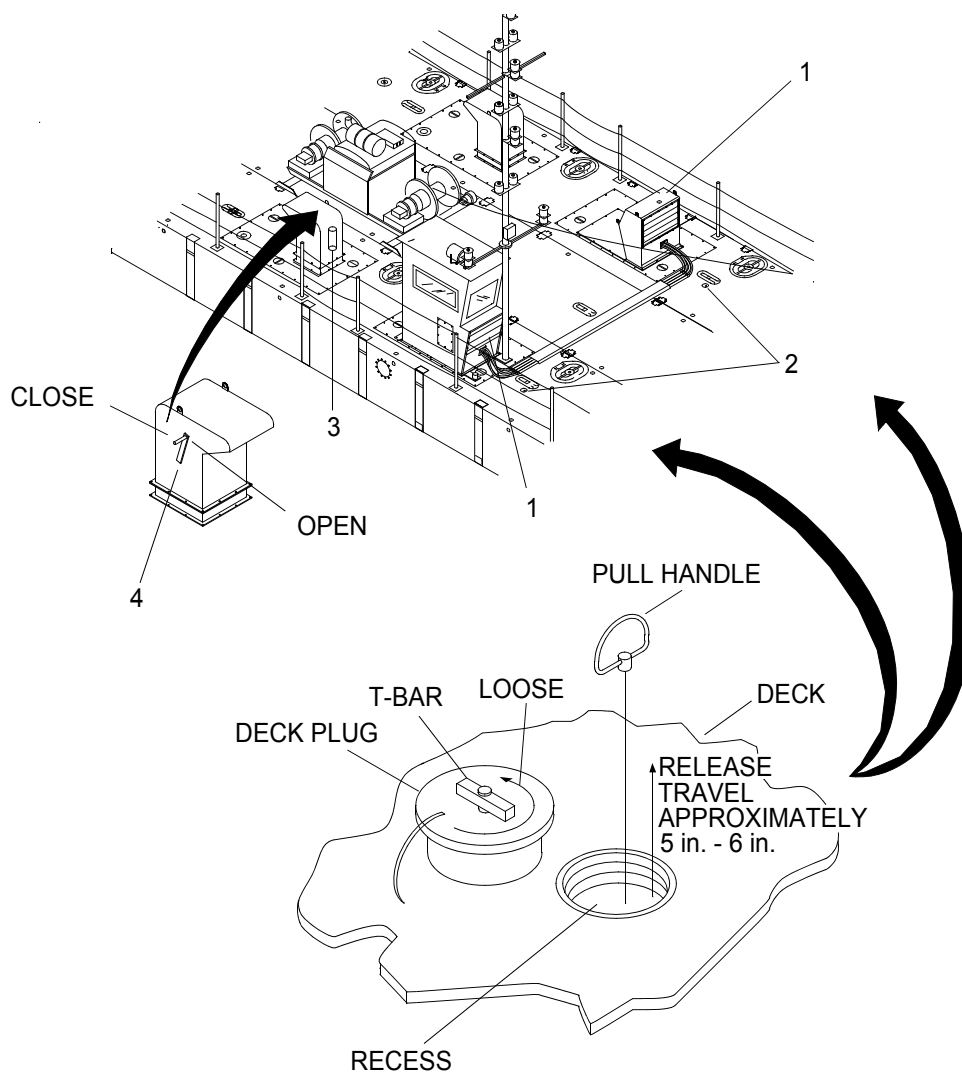
Table 21. Raw Water System Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|--------------------------------------|---|
| 1 | Raw Water System Transfer Case Valve | Allows the flow of raw water into the transfer case. |
| 2 | Exhaust Port Flapper Latch | Holds flapper closed when the powered module is not in use. |
| 3 | Sea Chest Butterfly Valve | When in the OPEN position, allows sea water to be drawn from the sea chest into the raw water cooling system. |
| 4 | Duplex Strainer Valve | Selects between two strainer baskets. This allows on-the-run changing of strainers if one strainer becomes clogged. In center position, water is drawn through both at the same time. |
| 5 | Raw Water System Exhaust Valve | Allows the flow of raw water into the exhaust system. |

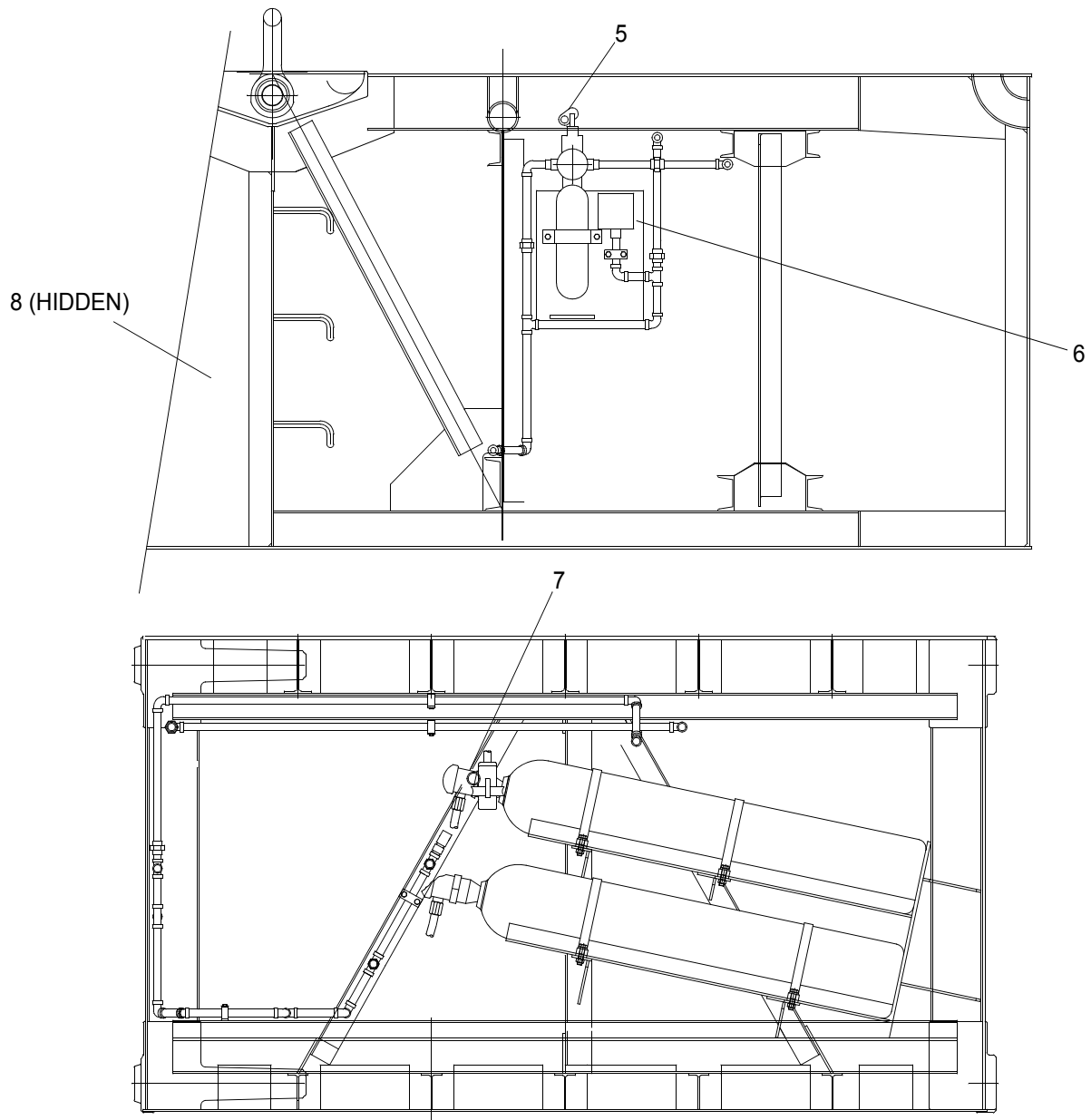
Table 22. Fire Detection System Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|--|---|
| 4 | STBD FIRE ALARM/SILENCE/ TEST Toggle Switch | Audible alarm (horn) indicates below deck temperature above 225°F or possible onboard fire in starboard propulsion module. ALARM = horn sounds and red light on in operators cab. SILENCE = alarm horn silenced, red light remains on. TEST (momentary) = alarm horn sounds and red light on. Reset to ALARM when normal conditions exist. |
| 5 | PORT FIRE ALARM/SILENCE/ TEST Toggle Switch | Audible alarm (horn) indicates below deck temperature above 225°F or possible onboard fire in port propulsion module. ALARM = alarm horn sounds and red light on in operators cab. SILENCE = alarm horn silenced, red light remains on. TEST (momentary) = Alarm horn sounds and red light on. Reset to ALARM when normal conditions exist. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, FIRE SUPPRESSION SYSTEM



FIRE SUPPRESSION AND INDICATORS



FIRE SUPPRESSION CONTROLS AND INDICATORS

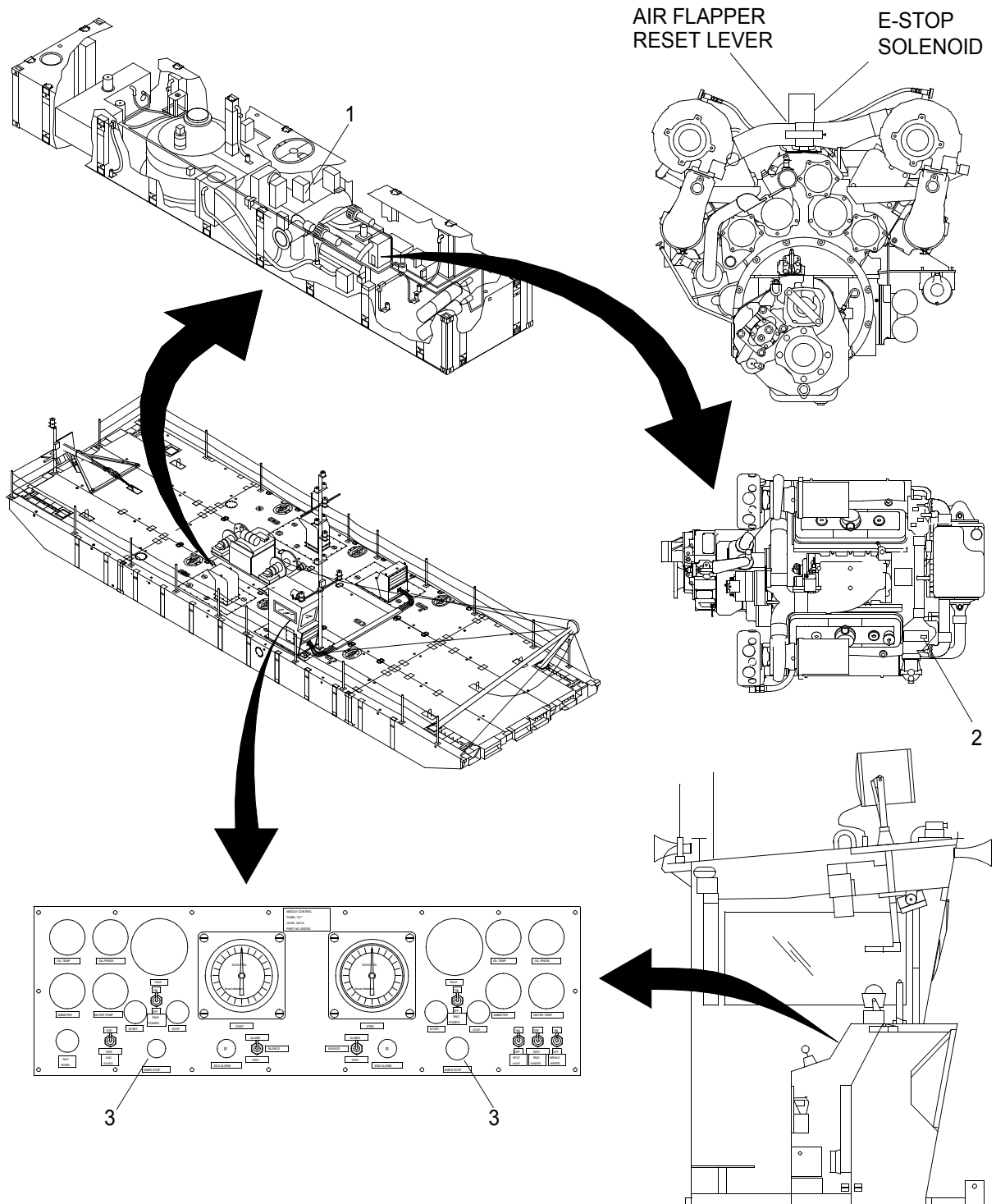
Table 23. Fire Suppression System Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|----------------------------|---|
| 1 | Air Intake Plenum | CO ₂ pressure automatically actuates the pressure trip mechanism to close vent flap. Vent flap must be manually reset to open position before resuming normal operation. |
| 2 | Remote Cable Pull Handle | Pull handle, fire suppression system activated. 30 seconds later CO ₂ will discharge. |
| 3 | Portable Fire Extinguisher | Located on the exhaust plenum aft of operators cab. Point nozzle at base of flame, remove lock pin and squeeze handle. |

Table 23. Fire Suppression System Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|--|--|
| 4 | Exhaust Plenum Vent Control Handle | Place handle in CLOSED position to shut off oxygen source. |
| 5 | Control Head Lever, Time Delay | Pull pin, pull lever, fire suppression system activated. 30 seconds later CO2 will discharge. |
| 6 | Pressure Switch | Senses pressure and actuates engine emergency stop. Must be manually reset when normal conditions exist. |
| 7 | Control Head Lever, 50 lb Bottle with Safety Pin | Pull pin, pull lever, fire suppression system activated. 30 seconds later CO2 will discharge. |
| 8 | Alarm Siren | Siren in machinery compartment activated by CO2 pressure. |

**DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, DIESEL ENGINE
EMERGENCY STOP**

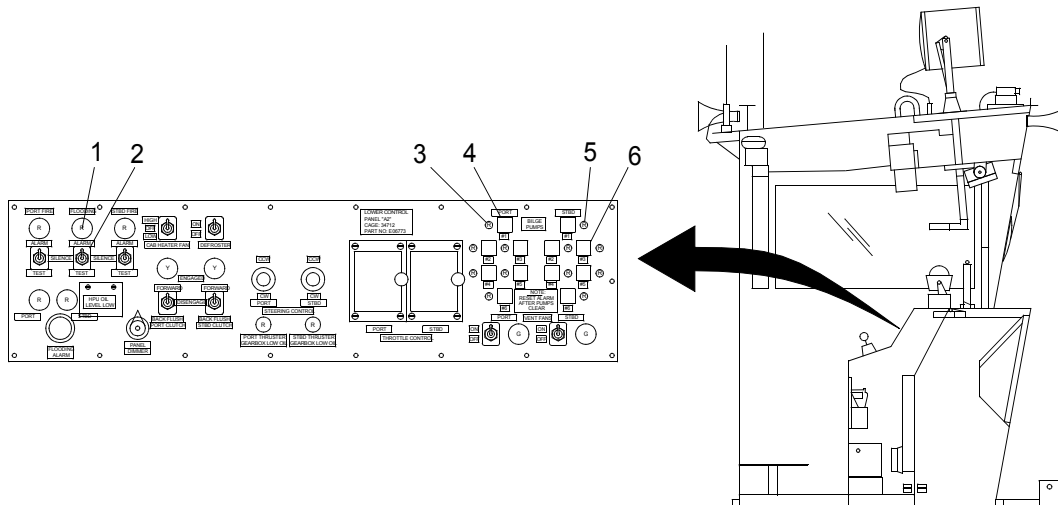


DIESEL ENGINE EMERGENCY STOP LOCATIONS

Table 24. Diesel Engine Emergency Stop Controls and Indicators.

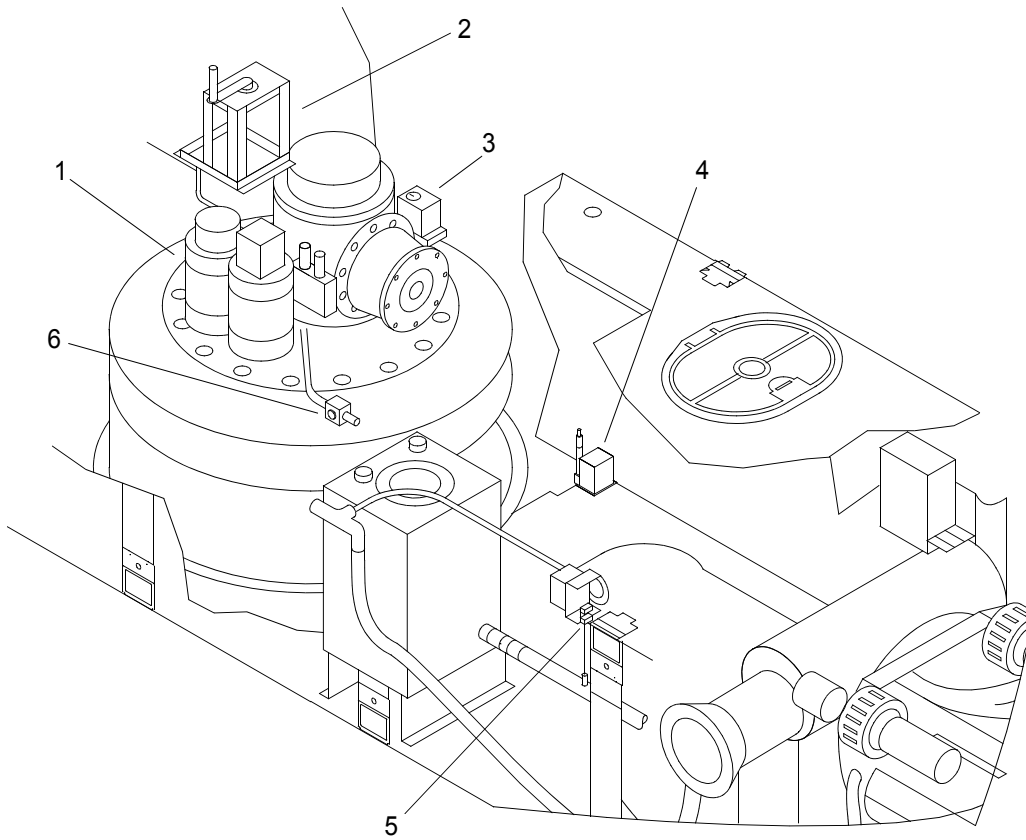
| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|---|---|
| 1 | EMERGENCY STOP - Engine Junction Box Assembly (A4) | <p>When red push button is depressed, the air shut-off valve closes, stopping engine.</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">The engine emergency stop is automatic when the fire suppression system is actuated or on an overspeed condition.</p> <p style="text-align: center;">The air manifold intake flapper door must be manually reset by moving reset lever downward when normal conditions resume.</p> |
| 2 | (Emergency) Normal Push Button, Diesel Engine | <p>When red push button located on right-front of diesel engine is depressed, it closes the air shut-off valve, stopping engine.</p> |
| 3 | EMER STOP Push Buttons, Middle Control Panel (Port and Starboard) | <p>When red push button is depressed, it closes the air shut-off valve, stopping engine.</p> <p style="text-align: center;">NOTE</p> <p style="text-align: center;">The engine emergency stop is automatic when the fire suppression system is actuated or on an overspeed condition.</p> <p style="text-align: center;">The air manifold intake flapper door must be manually reset by moving reset lever downward when normal conditions resume.</p> |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, BILGE PUMP SYSTEM


BILGE PUMP SYSTEM CONTROLS AND INDICATORS
Table 25. Bilge Pump System Controls and Indicators.

| ITEM | CONTROL/INDICATOR | FUNCTION |
|------|---|---|
| 1 | FLOOD ALARM Red Indicator Light | Illuminates when a bilge pump float switch is actuated. Illuminates until bilge pump float switch is deactivated, indicating dry bilges. |
| 2 | FLOODING ALARM SILENCE/TEST Toggle Switch | Audible alarm (pulse beeper) indicates possible flooding in port and/or starboard propulsion module. ALARM = pulse beeper sounds and red light on. SILENCE = pulse beeper is silenced, red light on. TEST (momentary) = pulse beeper sounds, red light on. Reset to ALARM when normal conditions exist. |
| 3 | PORT BILGE PUMP(s) Red Indicator Light(s) | Light(s) will illuminate indicating flooded bilge location(s) within the port side propulsion module via activated bilge pump float switch(s). |
| 4 | PORT BILGE PUMP Push Button(s) with Green Indicator Light(s) | Controls operation of bilge pumps in port propulsion module, illuminates when depressed, indicating each pump is working. Allows any bilge pump to be energized that has a red illuminated light (flood location). |
| 5 | STBD BILGE PUMP(s) Red Indicator Light(s) | Light(s) will illuminate indicating flooded bilge location(s) within the stbd propulsion module via activated bilge pump float. |
| 6 | STBD PORT BILGE PUMP Push Button(s) with Green Indicator Light(s) | Controls operation of bilge pumps in starboard propulsion module, illuminates when depressed, indicating each pump is working. Allows any bilge pump to be energized that has a red illuminated light (flood location). |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, EMERGENCY SHIFTING AND STEERING



EMERGENCY SHIFTING AND STEERING CONTROLS AND INDICATORS

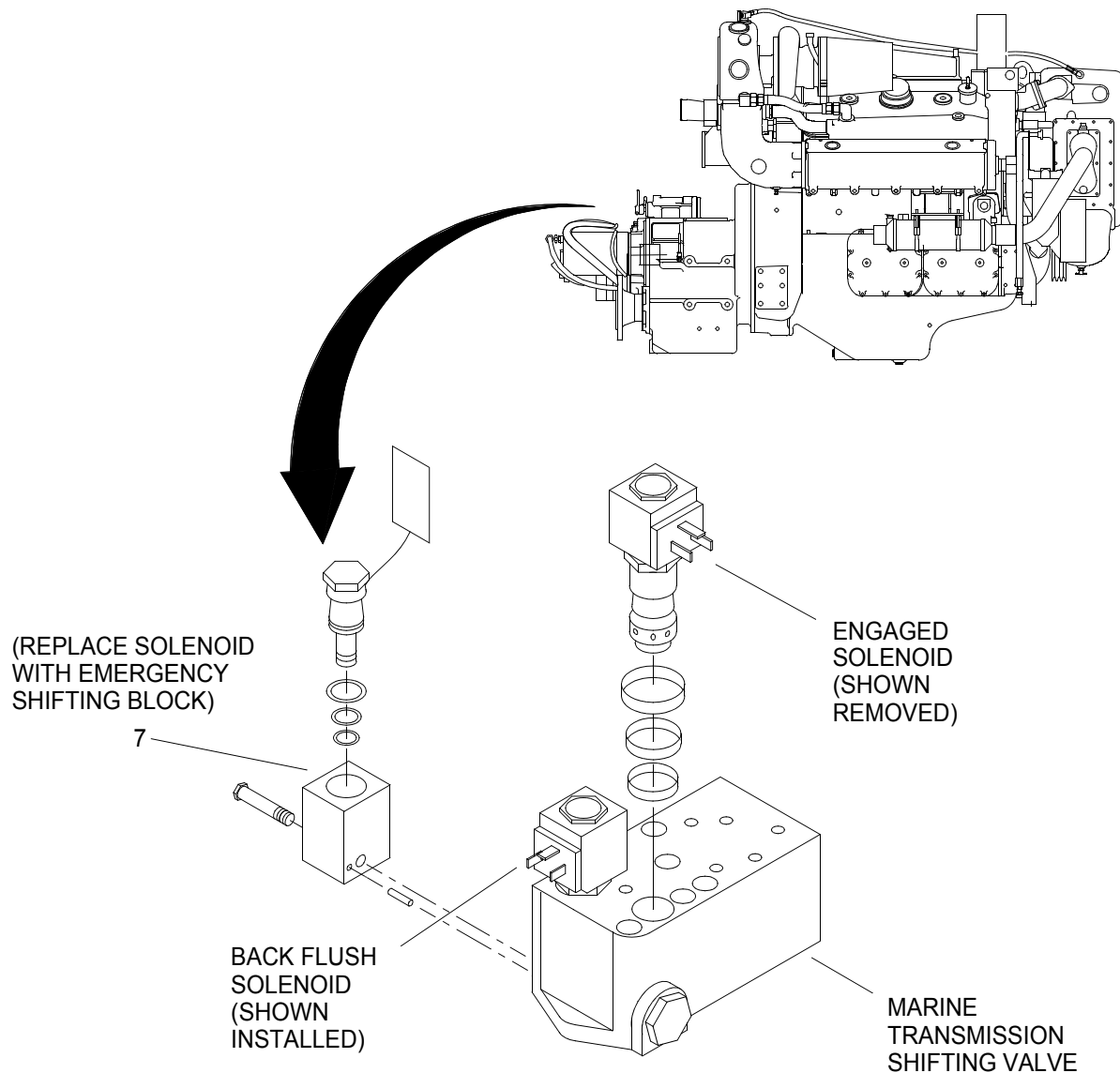


Table 26. Emergency Shifting and Steering Controls and Indicators.

| KEY | CONTROL/INDICATOR | FUNCTION |
|-----|---------------------------|--|
| 1 | Needle Valve | Normally closed, this valve opens to allow manual steering with the portable tiller arm. |
| 2 | Emergency Steering Handle | Found in lazaret compartment, this handle assembly is fitted with an assembly socket for the 1.5 in. square head on the top of the pump-jet steering motor so that the directional pump-jet thruster nozzle can be manually positioned clockwise or counter-clockwise in the event power is interrupted. |
| 3 | Feedback Unit | Mechanical link to the pump-jet nozzle and allows operator of steering handle assembly to observe positioning of pump-jet nozzle as it is being rotated. |
| 4 | Hand Pump | Generates the hydraulic pressure to release the pump-jet hydraulic brake. |

Table 26. Emergency Shifting and Steering Controls and Indicators. (Continued)

| KEY | CONTROL/INDICATOR | FUNCTION |
|------------|---|--|
| 5 | Way-Valve | Allows manual override of steering controls. |
| 6 | 3/2 Ball Valve | Accommodates hand pump by shutting off rest of system so hydraulic pressure generated by the hand pump goes directly to the hydraulic brake. |
| 7 | Emergency Shifting Block for Selector Valve | On marine gear, if electronic solenoid for either FORWARD or BACKFLUSH clutching becomes inoperative, it can be replaced with the emergency shifting block to open the required port, allowing hydraulic pressure flow to engage the clutch. |

DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS, DECK WINCH

For winch engine controls and indicators, refer to Operator's Manual for Detroit Diesel Engine Series 53, TM 5-2815-258-10. For winch controls and indicators, refer to Unit, Direct Support and General Maintenance Manual for Winch, Warring Tug, TM 55-3950-204-14&P.

**OPERATOR MAINTENANCE
WARPING TUG
MODULE ISOPAK
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

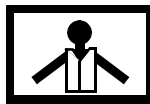
Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Ladder (Item 43, WP 0108 00)

Personnel Required

Seaman 88K

PREPARATION FOR USE - DISASSEMBLY OF MODULE ISOPAK**DISASSEMBLE MODULE ISOPAK**

WARNING



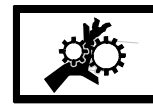
VEST



HELMET PROTECTION



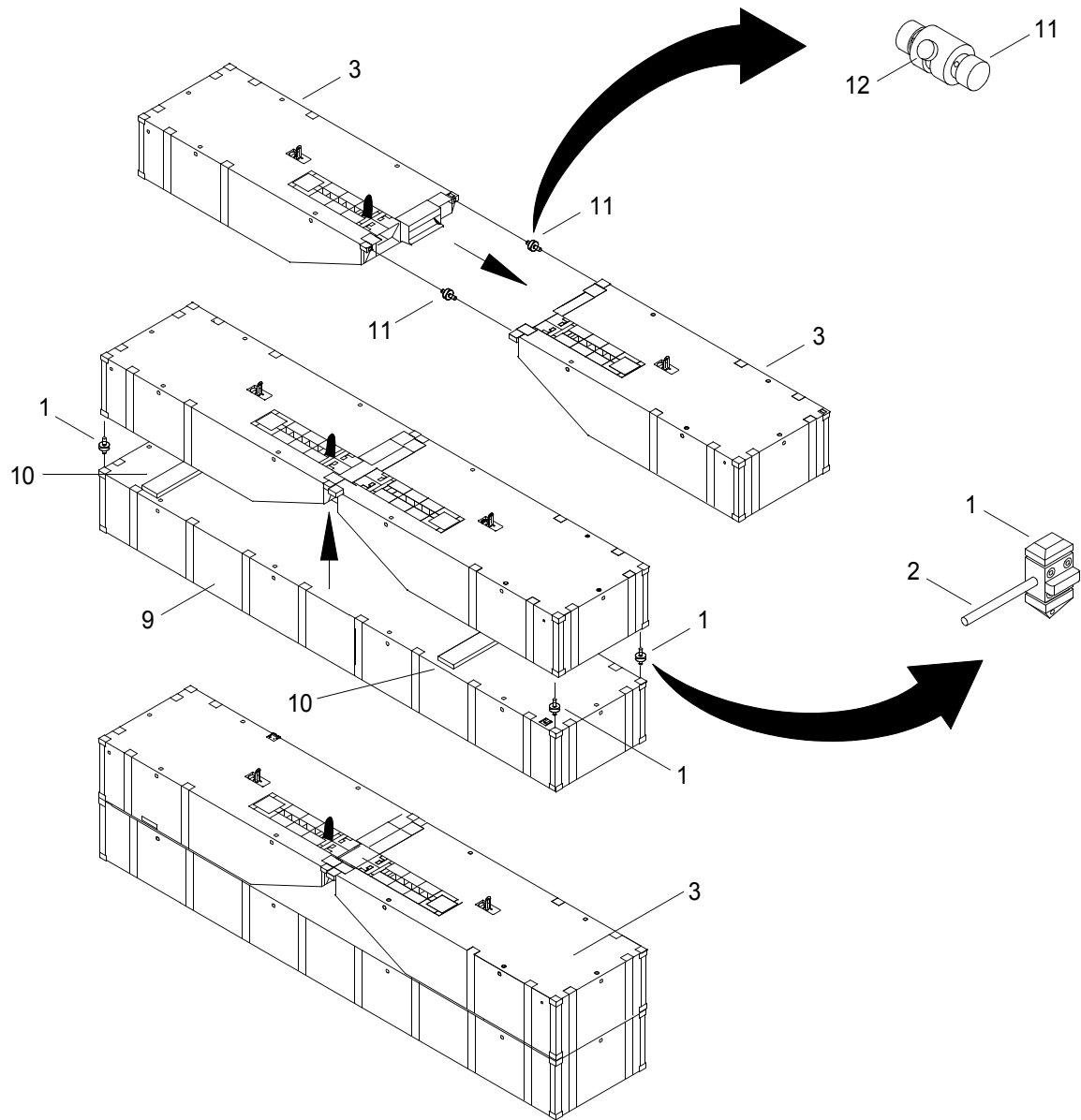
HEAVY PARTS



MOVING PARTS

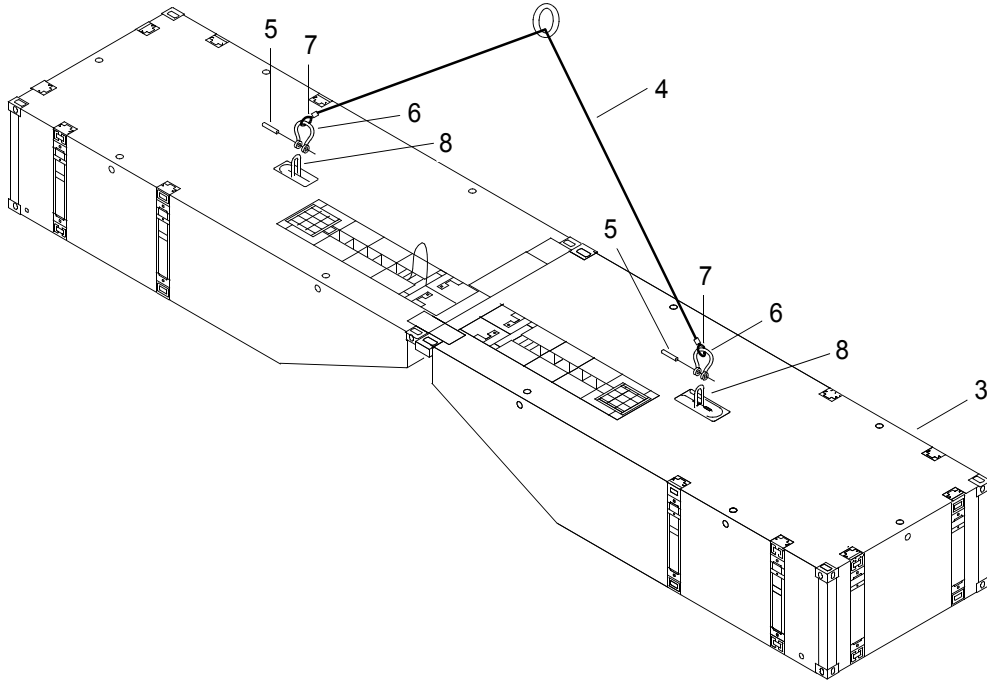
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Unlock four ISOPAK vertical connectors (1), one at each corner, by moving the lever (2).



2. Obtain ladder from BII container and climb to top of connected end rake modules (3).

3. Attach sling (4) to connected end rake modules (3).



- a. Remove shackle pins (5) from shackles (6).
 - b. Insert shackle (6) and sling eye (7) through module lifting shackle (8).
 - c. Install shackle pins (5) in shackles (6).
4. Descend from top of module ISOPAK and remove ladder.

WARNING

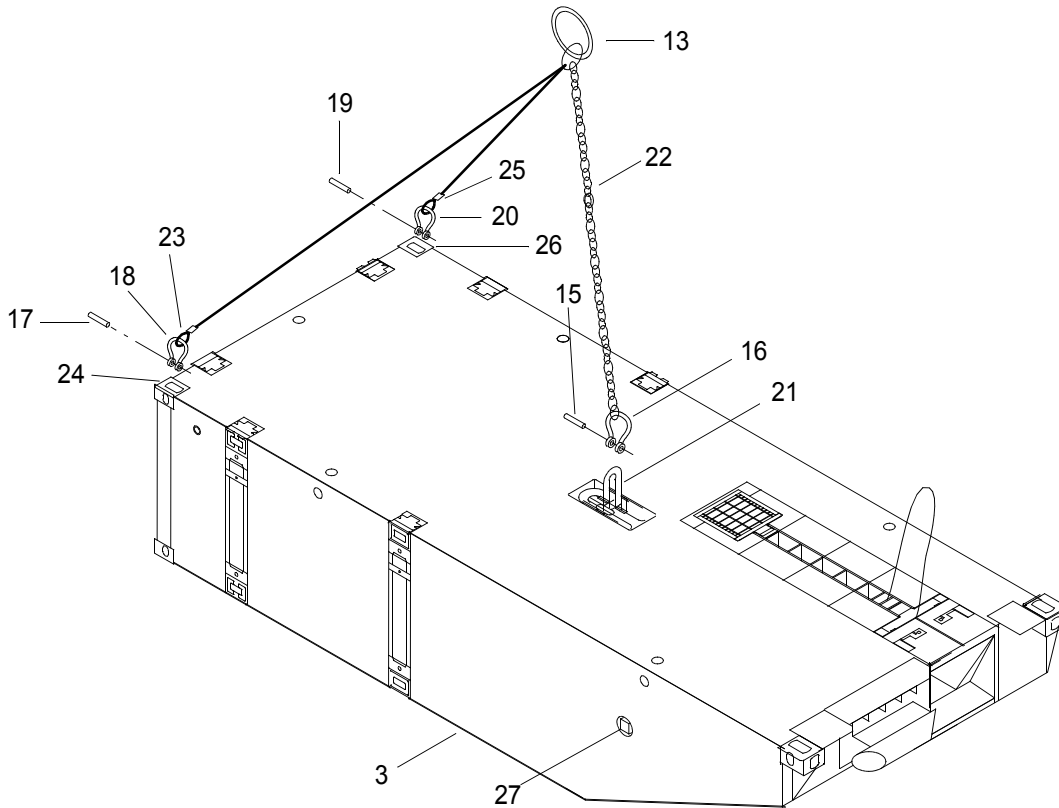


HEAVY PARTS

5. Using crane, lift connected end rake modules (3) by two leg sling (4) and remove from top of center module (9).
6. Remove connectors (1) and dunnage (10) from corners of center module (9).
7. Unlock the two horizontal ISOPAK connectors (11) by moving the lever (12).

WARNING**HEAVY PARTS**

8. Install three leg sling (13) on end rake module (3).



- a. Remove shackle pin (15) from shackle (16).
- b. Remove shackle pin (17) from shackle (18).
- c. Remove shackle pin (19) from shackle (20).
- d. Insert shackle (16) through module lifting shackle (21) and chain (22).
- e. Install shackle pin (15) in shackle (16).
- f. Insert shackle (18) through sling eye (23) and module ISO fitting (24).
- g. Install shackle pin (17) in shackle (18).
- h. Insert shackle (20) through sling eye (25) and module ISO fitting (26).
- i. Install shackle pin (19) in shackle (20).

WARNING**HEAVY PARTS**

9. Using crane and three leg sling (13), lift and separate end rake modules (3).
10. Remove ISOPAK horizontal connectors (11).

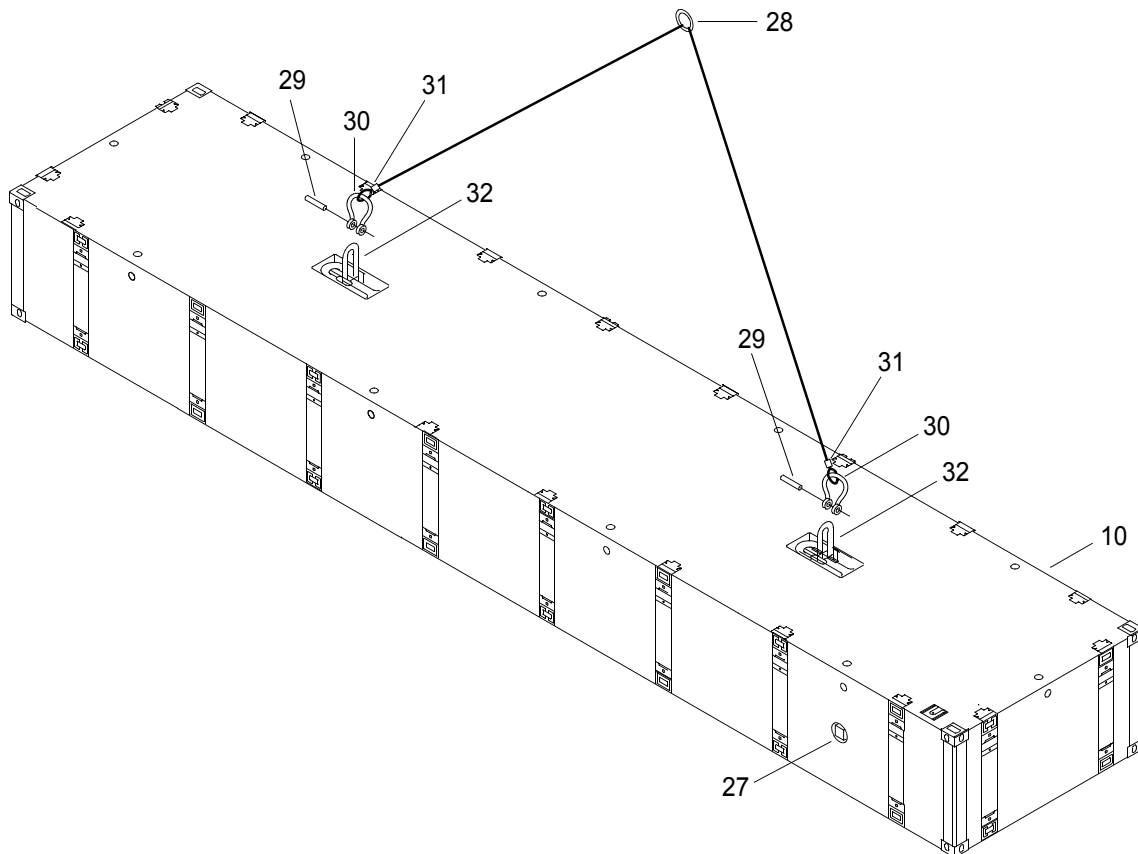
NOTE

Drain plug location may vary.

11. Inspect modules to ensure drain plugs (27) are installed and tight in all modules.

WARNING**HEAVY PARTS**

12. Install two leg sling (28) on center module (10).



- a. Remove shackle pins (29) from shackles (30).
- b. Insert shackle (30) and sling eye (31) through module lifting shackle (32).
- c. Install shackle pins (29) in shackles (30).

WARNING



HEAVY PARTS

- d. Using crane and two leg sling (28), lift center module (10).

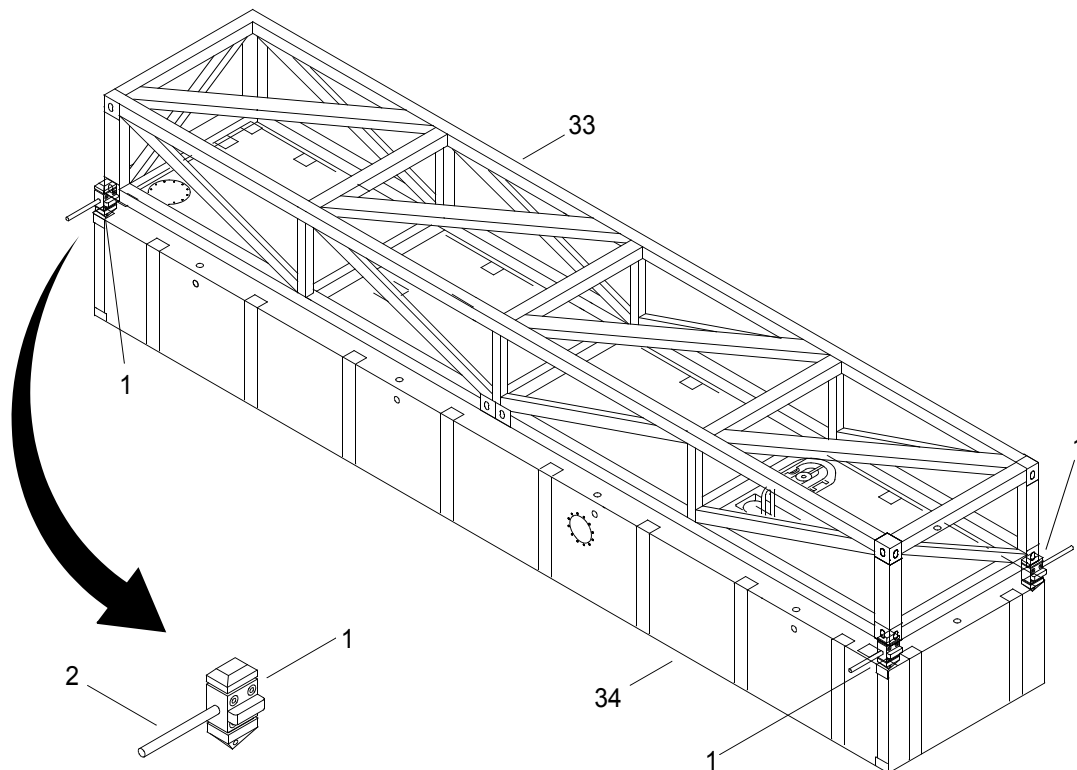
REMOVE EMPTY SHIPPING FRAME FROM POWERED MODULE

WARNING



HEAVY PARTS

1. Using ISOPAK ladder, climb on top of module ISOPAK and attach slings to shipping frame (33).
2. Descend from top of shipping frame and remove ladder.
3. Unlock four ISOPAK vertical connectors (1), on corners of powered module (34), by moving the lever (2).

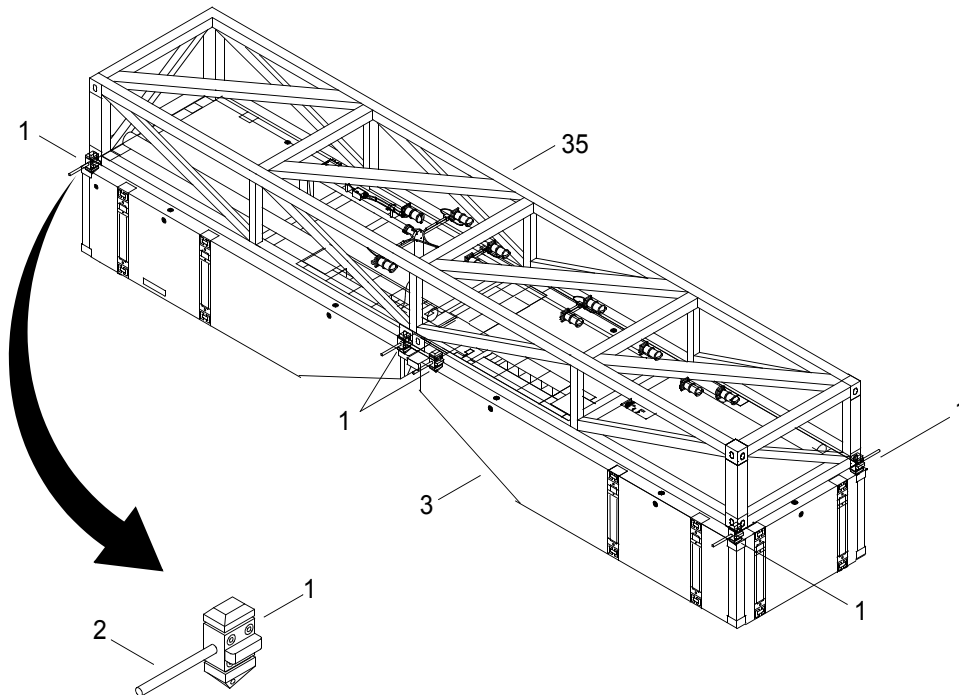


WARNING**HEAVY PARTS**

4. Using crane and slings, remove shipping frame (33) from powered module (34).
5. Remove four ISOPAK vertical connectors (1) from corners of powered module (34).

REMOVE MAIN MAST SHIPPING FRAME FROM END RAKES

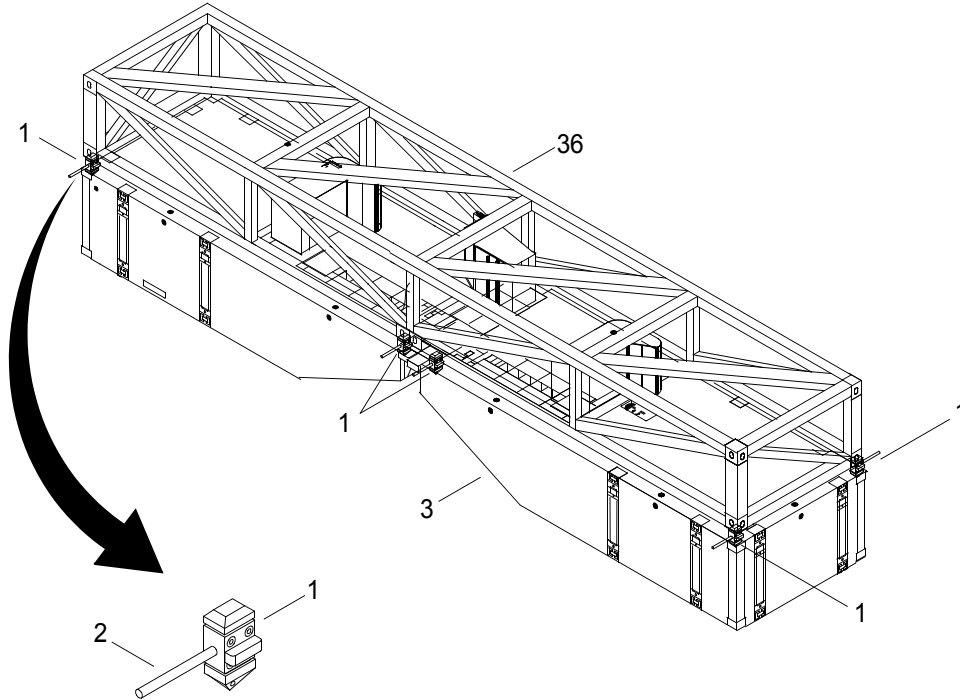
1. Using ISOPAK ladder, climb on top of module ISOPAK and attach slings to shipping frame (35).
2. Descend from top of shipping frame and remove ladder.
3. Unlock eight ISOPAK vertical connectors (1) on corners of end rakes (3) by moving the lever (2).

**WARNING****HEAVY PARTS**

4. Using crane and slings, remove shipping frame (35) from end rakes (3).
5. Remove eight ISOPAK vertical connectors (1) from end rakes (3).

REMOVE PLENUMS SHIPPING FRAME FROM END RAKE MODULES

1. Using ladder, climb on top of module ISOPAK and attach slings to shipping frame (36).
2. Descend from top of shipping frame, remove and stow ladder in BII container.
3. Unlock eight ISOPAK vertical connectors (1) on corners of end rake (3) by moving the lever (2).



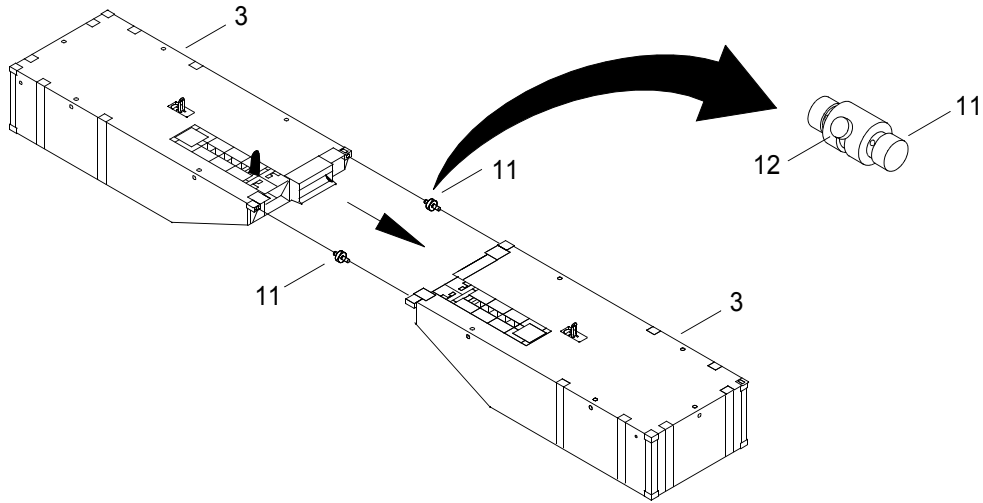
WARNING

**HEAVY PARTS**

4. Using crane and slings, remove shipping frame (36) from end rakes (3)
5. Remove eight ISOPAK vertical connectors (1) from end rakes (3).

SEPARATING END RAKES

1. Unlock the two horizontal ISOPAK connectors (11) by moving the lever (12).

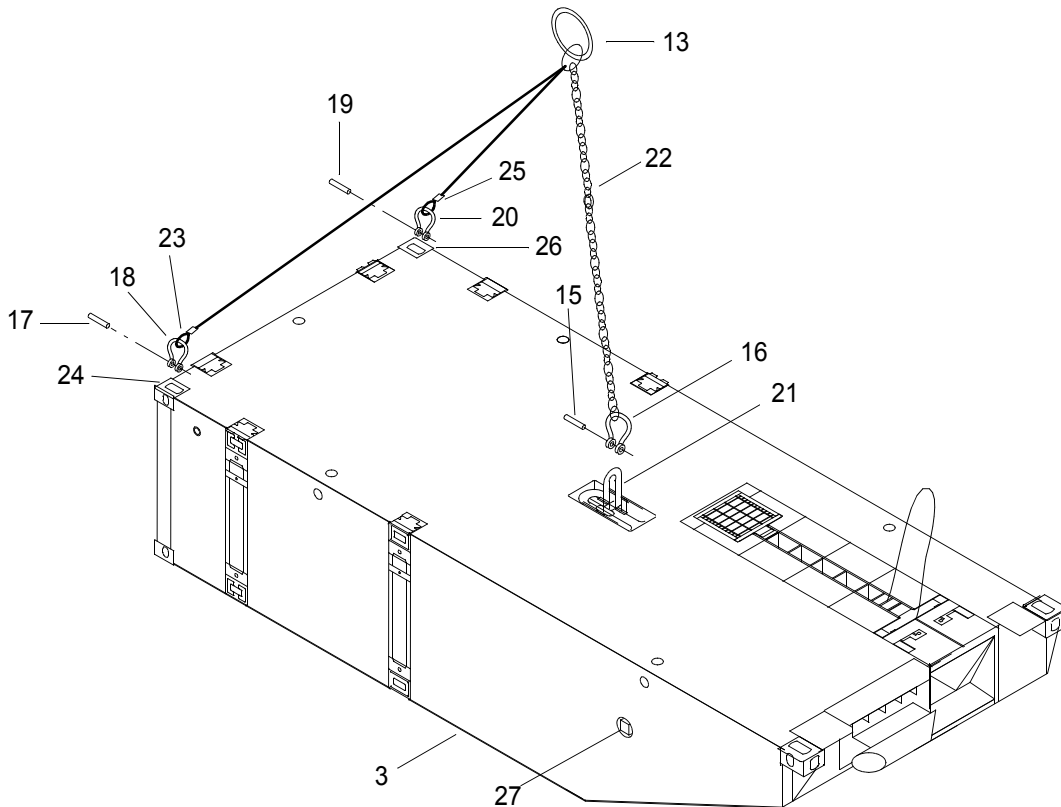


WARNING



HEAVY PARTS

2. Install three leg sling (13) on end rake module (3).



- a. Remove shackle pin (15) from shackle (16).
- b. Remove shackle pin (17) from shackle (18).
- c. Remove shackle pin (19) from shackle (20).
- d. Insert shackle (16) through module lifting shackle (21) and chain (22).
- e. Install shackle pin (15) in shackle (16).
- f. Insert shackle (18) through sling eye (23) and module ISO fitting (24).
- g. Install shackle pin (17) in shackle (18).
- h. Insert shackle (20) through sling eye (25) and module ISO fitting (26).
- i. Install shackle pin (19) in shackle (20).

WARNING

**HEAVY PARTS**

3. Using crane and three leg sling (13), lift and separate end rake modules (3).
4. Remove ISOPAK horizontal connectors (11).

NOTE

Drain plug location may vary.

5. Inspect modules to ensure drain plugs (27) are installed and tight in all modules.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
MALE AND FEMALE GUILLOTINE CONNECTORS
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Crowbar (Item 15, WP 0108 00)
 Hammer, Hand (10 lb Sledge) (Item 36, WP 0108 00)

Personnel Required

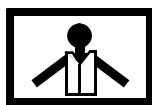
Seaman 88K

Equipment Condition

Module ISOPAK Disassembled. (WP 0007 00)

PREPARATION FOR USE - OPERATE MALE AND FEMALE GUILLOTINE CONNECTORS

WARNING



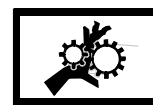
VEST



HELMET PROTECTION



HEAVY PARTS



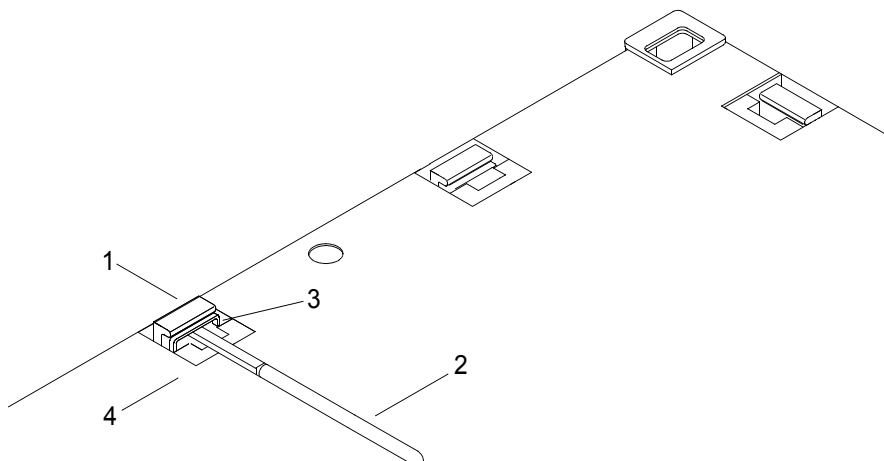
MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes, and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

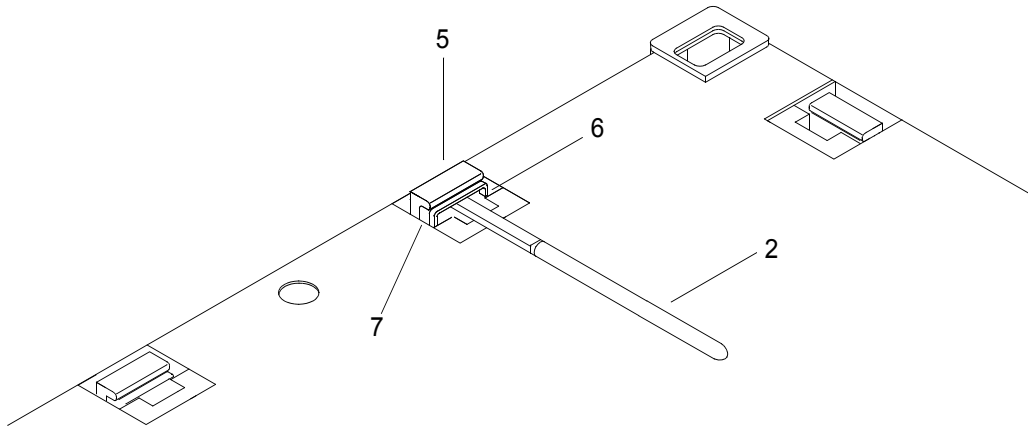
NOTE

The following procedure is typical for all module side and end connectors.

1. Raise the female guillotine bars (1).



- a. Insert crowbar (2) behind the spring bar (3) under the female guillotine bar (1).
 - b. Rotate the crowbar (2) downward to clear spring bar (3) from deck overhangs (4) and allow the female guillotine bar (1) to move upward.
 - c. Raise the female guillotine bar (1) approximately 6 in. until it stops.
2. Raise the male guillotine bars (5).



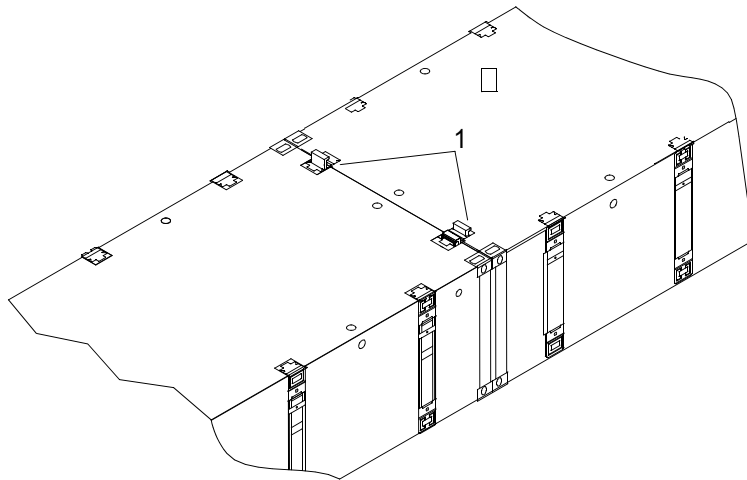
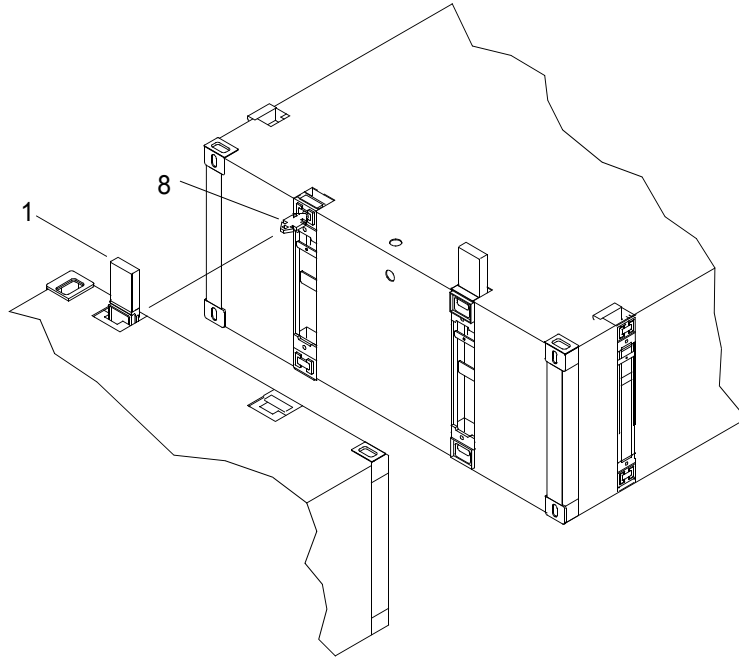
- a. Insert crowbar (2) behind the spring bar (6) under the male guillotine bar (5).
- b. Rotate the crowbar (2) downward to clear spring bar (6) from deck overhangs (7) and allow male guillotine bar (5) to move upward.

NOTE

Personnel should hear two clicks as both pins extend or, if the module is in the water, personnel should see the first pin extend and continue to pull up until one can hear or feel the second lower pin extend.

- c. Raise the male guillotine bar (5) approximately 6 in. until it stops, allowing male connector pins to fully extend.
- d. Remove the crowbar (2).
- e. Drive the guillotine bar (5) back into stowed position using a sledgehammer to secure the male connector pins (8) in the fully extended position.

3. Position the modules to be connected so that the male connector pins (8) and female connectors (1) are aligned.



4. Using a sledgehammer drive each female guillotine (1) connector down.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
WARPING TUG
D-RING/CLOVERLEAF AND DECK CLEAT FITTINGS
OPERATION UNDER USUAL CONDITIONS

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Crowbar (Item 15, WP 0108 00)
 Hammer, Hand (10 lb Sledge) (Item 36, WP 0108 00)

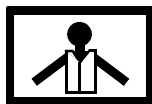
Personnel Required

Seaman 88K

Equipment Condition

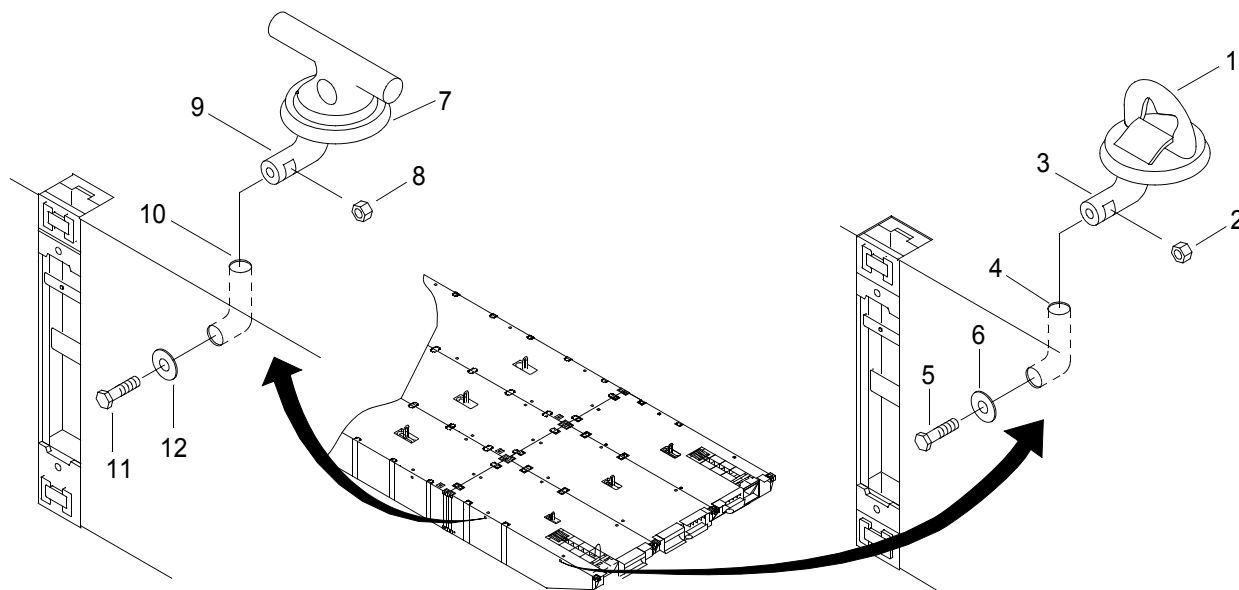
Module ISOPAK Disassembled. (WP 0007 00)

Operation Of Male And Female Guillotine Connectors. (WP 0008 00)

PREPARATION FOR USE - INSTALL D-RING/CLOVERLEAF AND DECK CLEAT FITTINGS**WARNING****VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes, and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Install D-ring/Cloverleaf fittings (1) on modules as follows:



- a. Place nut (2) in slot in the tailpiece (3) of the D-ring/Cloverleaf fitting (1).
- b. Insert D-ring/Cloverleaf fitting (1) into module turn tube (4).

WARNING

Beware of other craft or objects coming alongside while working outboard installing the bolt and washer. Serious injury may result if body parts are crushed between module and other craft or objects.

Use extreme caution while working outboard and lifting heavy objects as the possibility of falling overboard exists, which could cause serious injury or death.

- c. Insert bolt (5) through keeper plate (6) and thread it into nut (2) in tailpiece (3).
 - d. Tighten bolt (5).
2. Install deck cleat fitting (7) on modules as follows:
- a. Place nut (8) in slot in the tailpiece (9) of the deck cleat fitting (7).
 - b. Insert deck cleat fitting (7) into module turn tube (10).

WARNING

Beware of other craft or objects coming alongside while working outboard installing the bolt and washer. Serious injury may result if body parts are crushed between module and other craft or objects.

Use extreme caution while working outboard and lifting heavy objects as the possibility of falling overboard exists, which could cause serious injury or death.

- c. Insert bolt (11) through keeper plate (12) and thread it into nut (8) in tailpiece (9).
- d. Tighten bolt (11).

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
MODULE STRINGS
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Crowbar (Item 15, WP 0108 00)
 Hammer, Hand (10 lb Sledge) (Item 36, WP 0108 00)

Personnel Required

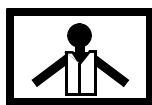
Seaman 88K

Equipment Condition

Module ISOPAK Disassembled. (WP 0007 00)
 OperatiOn Of Male And Female Guillotine Connectors. (WP 0008 00)

PREPARATION FOR USE - ASSEMBLY OF MODULE STRINGS

WARNING



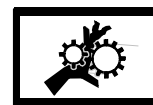
VEST



HELMET PROTECTION



HEAVY PARTS



MOVING PARTS

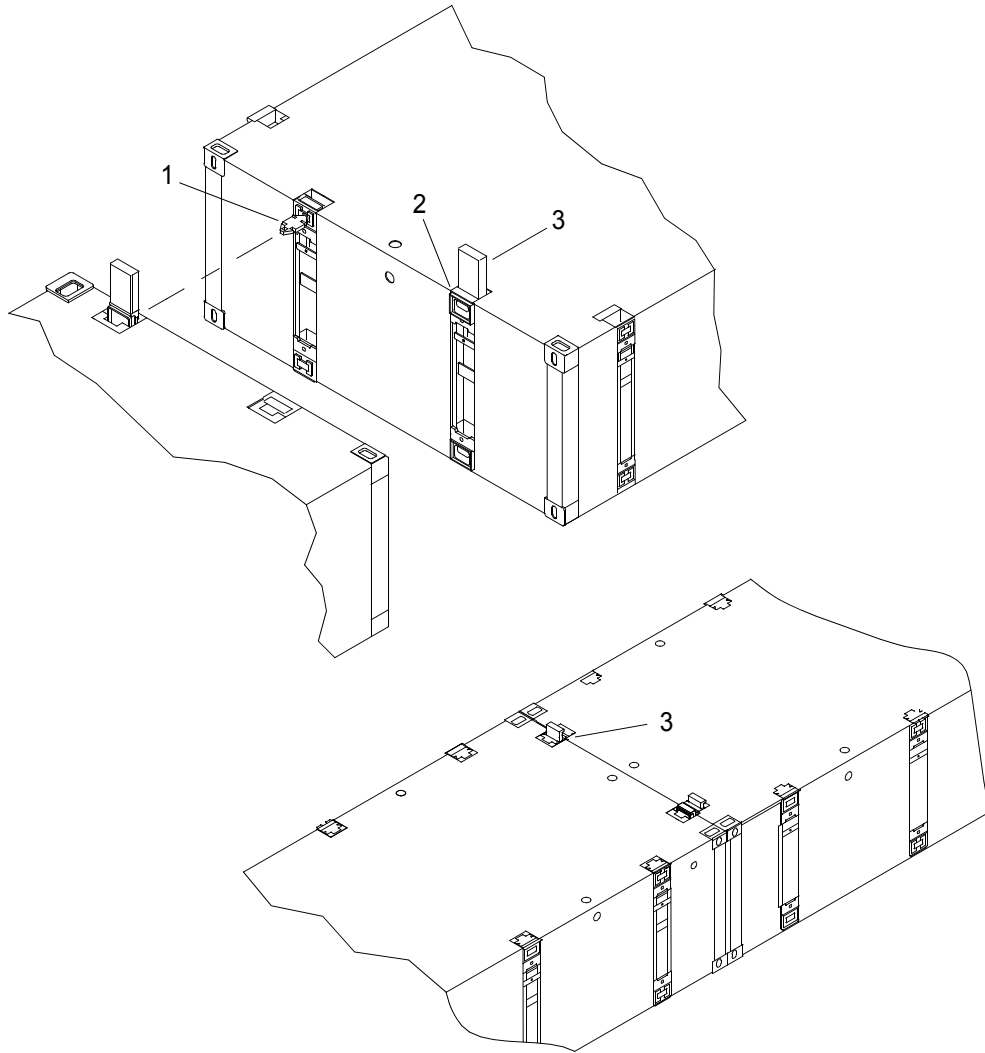
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

NOTE

The following procedure is typical for both powered and non-powered strings.

1. Align male connector pins (1) and female connectors (2) on end rake module with connectors on center module.

2. Ensure that end rake modules and center module are completely aligned before locking guillotine connectors.



3. As the extended and lock connector pins enter the female lock housing, use a sledgehammer to drive the female guillotine bar (2) downward into engagement with the extended connector pin (1).
4. Lift male guillotine bar 2 to 3 in. and repeat step two if female guillotine does not close completely.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
ASSEMBLY OF WARPING TUG
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Crowbar (Item 15, WP 0108 00)
 Hammer, Hand (10 lb Sledge) (Item 36, WP 0108 00)

Personnel Required

Seaman 88K

Equipment Condition

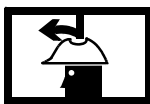
Module ISOPAK Disassembled. (WP 0007 00)
 Operation Of Male And Female Guillotine Connectors. (WP 0008 00)
 D-Ring/cloverleaf And Deck Cleat Fittings Installed. (WP 0009 00)
 Module String Assembled. (WP 0010 00)

PREPARATION FOR USE - ASSEMBLY OF WARPING TUG

WARNING



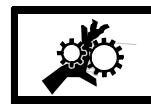
VEST



HELMET PROTECTION



HEAVY PARTS



MOVING PARTS

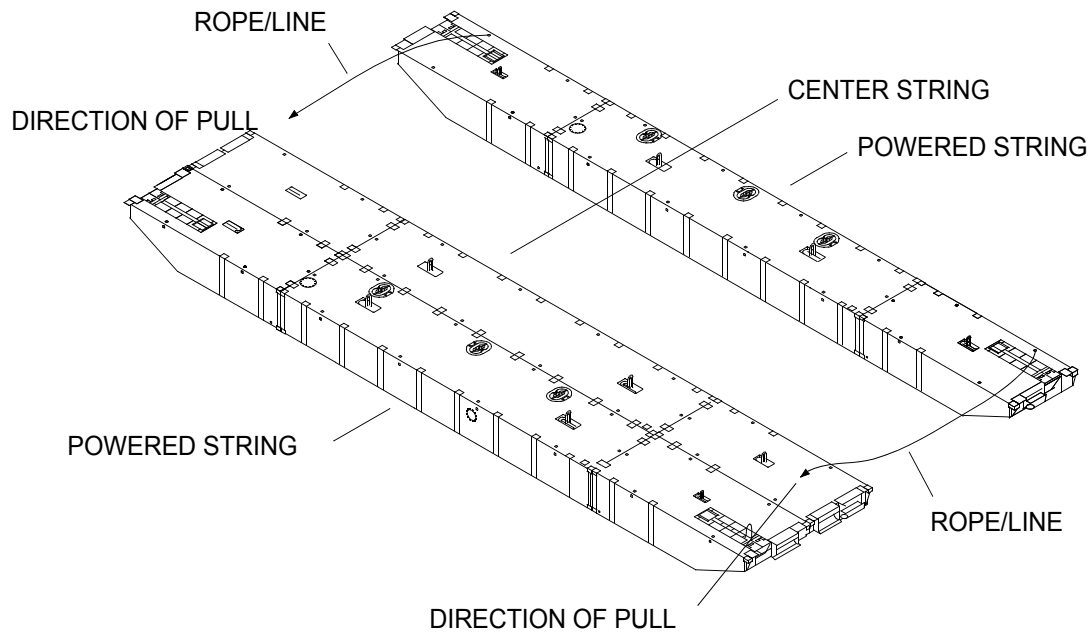
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

Do not handle ropes/lines by placing hands in bight of the line where it feeds into cleats, etc. Place the hands on top or on the outside so that in an emergency the lines can be released quickly to preclude being pulled into the equipment. Failure to observe these precautions could result in serious injury or death.

NOTE

Utilize fenders when bringing strings along side.

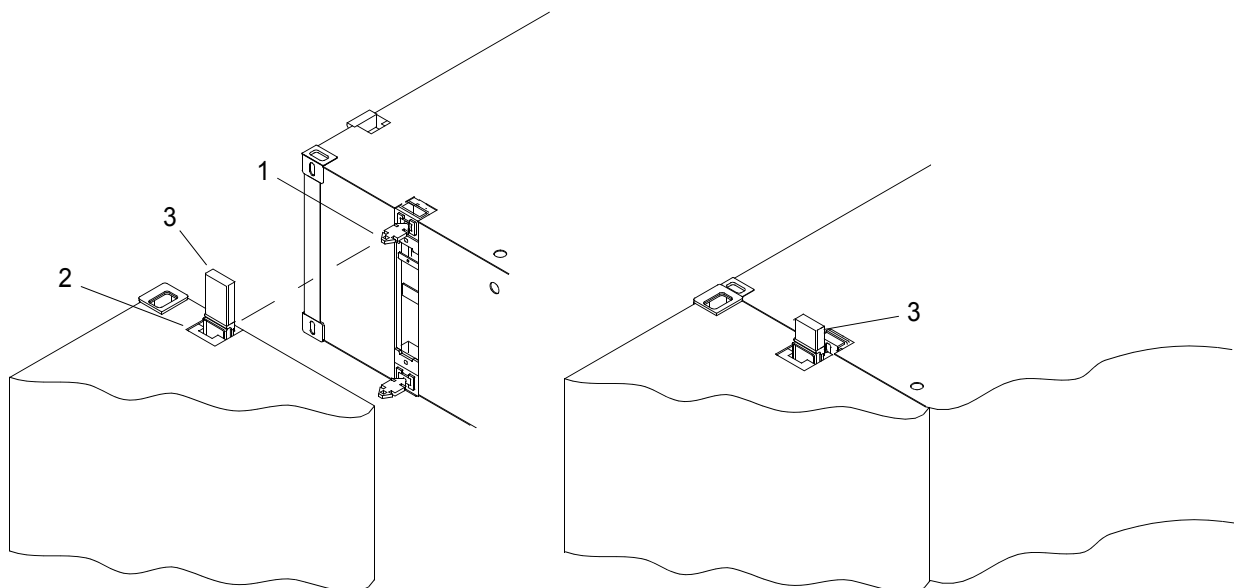
1. Pull strings together using ropes/lines, align male and female guillotine connectors so that the tapered surfaces of each connector is in general alignment.



NOTE

If female guillotine does not close completely, lift male guillotine bar 2 to 3 in. and repeat step two.

2. Ensure the strings are completely aligned before locking the connectors.
3. As the locked male connector pin (1) enters the female lock housing (2), use a sledgehammer to drive the female guillotine bar (3) downward into engagement with the extended connector pins.



END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
STABILIZERS
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Crowbar (Item 15, WP 0108 00)
 Hammer, Hand (10 lb Sledge) (Item 36, WP 0108 00)
 4 $\frac{3}{4}$ Ton $\frac{3}{4}$ in. Shackle (Item 5, WP 0108 00)
 Sling, Lifting, 5300 lbs (Green) (Item 68, WP 0108 00)

Personnel Required

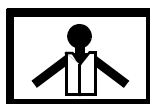
Seaman 88K

Equipment Condition

Module ISOPAK Disassembled. (WP 0007 00)
 Operation Of Male And Female Guillotine Connectors. (WP 0008 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Installed. (WP 0009 00)
 Module String Assembled. (WP 0010 00)
 Warping Tug Assembled. (WP 0011 00)

PREPARATION FOR USE - INSTALL WARPING TUG STABILIZERS**REMOVE WARPING TUG CONVERSION KIT PALLETS FROM ISO CONTAINER**

WARNING



VEST



HELMET PROTECTION



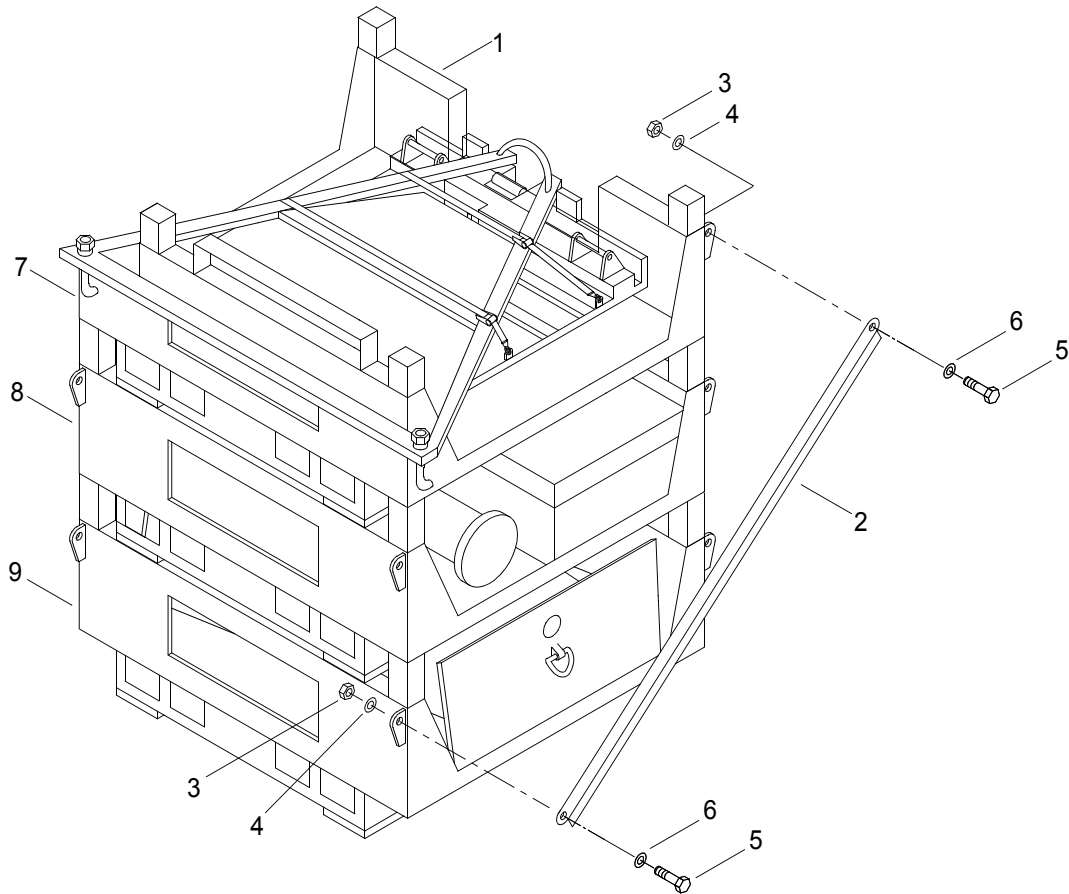
HEAVY PARTS



MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Loosen ratchet straps securing pallet stack (1) to ISO container.

**WARNING****HEAVY PARTS**

2. Using a forklift, remove pallet stack (1) from ISO container.
3. Remove pallet tie bar (2).
 - a. Remove two nuts (3) and washers (4).
 - b. Remove two bolts (5) and washers (6).
 - c. Remove tie bar (2).
4. Repeat steps to remove tie bar from opposite side of pallet.

WARNING

**HEAVY PARTS**

- Using a forklift, remove top pallet (7) from ISO container.

WARNING

**HEAVY PARTS**

- Using a forklift, remove center pallet (8).

WARNING

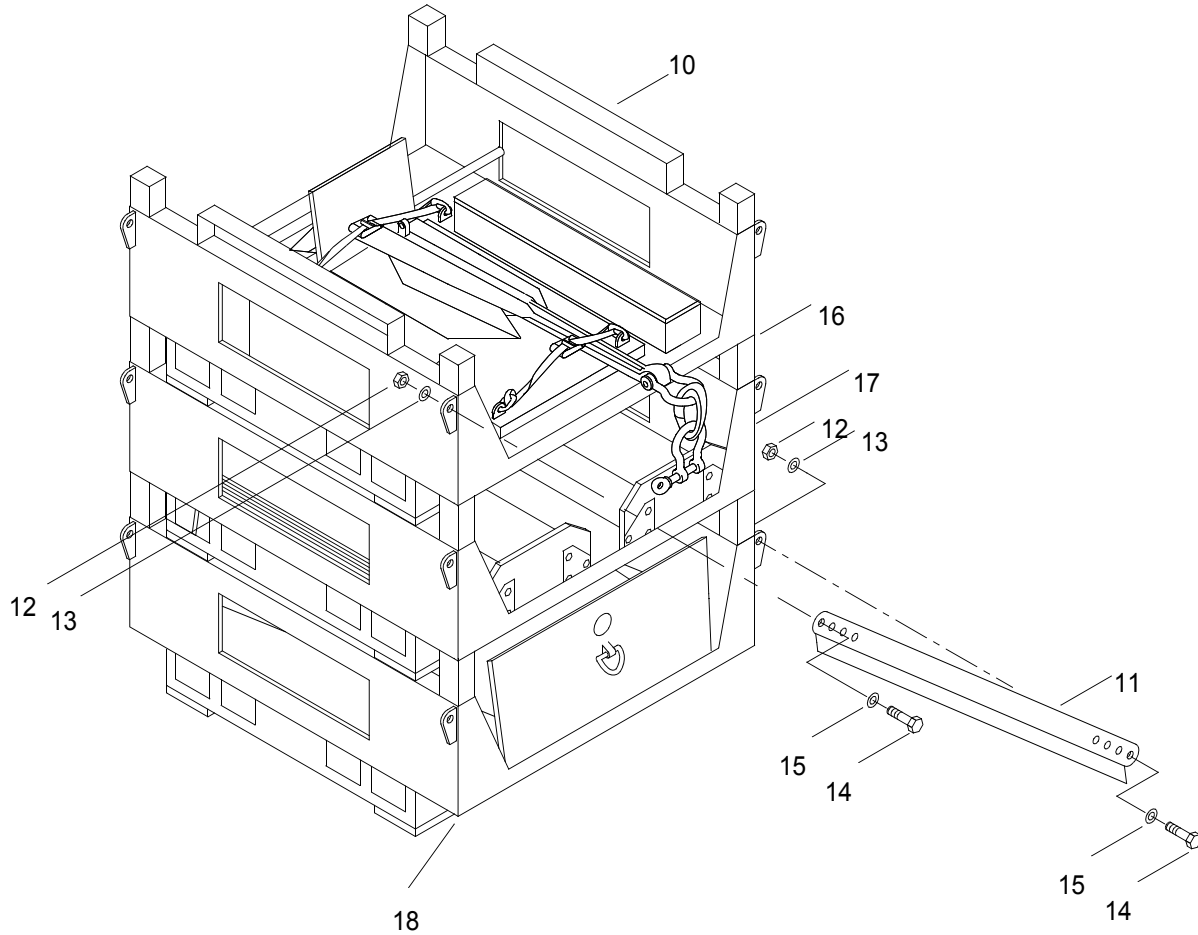
**HEAVY PARTS**

- Using a forklift, remove bottom pallet (9).
- Loosen ratchet straps securing pallet stack (10) to ISO container.

WARNING

**HEAVY PARTS**

- Using a forklift, remove pallet stack (10) from ISO container.



10. Remove pallet tie bar (11).
 - a. Remove two nuts (12) and washers (13).
 - b. Remove two bolts (14) and washers (15).
 - c. Remove tie bar (11).
11. Repeat steps to remove tie bar from opposite side of pallet stack (10).

WARNING



HEAVY PARTS

12. Using a forklift, remove top pallet (16) from ISO container.

WARNING

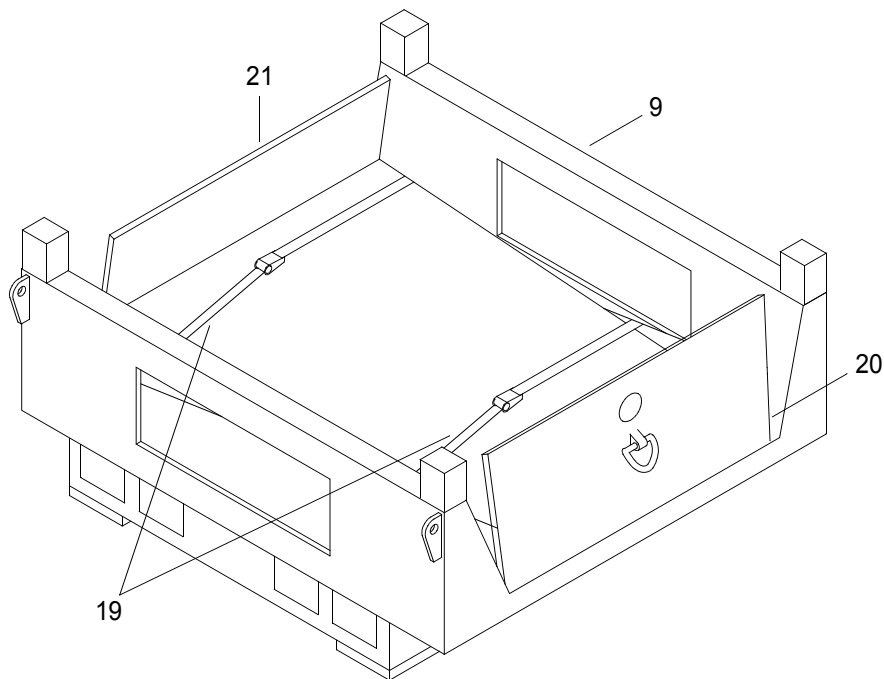
**HEAVY PARTS**

13. Using a forklift, remove center pallet (17).

REMOVE WARPING TUG STABILIZERS**NOTE**

This procedure is typical for removing stabilizers from either pallet.

1. Remove two ratchet straps (19) securing stabilizers to pallet.



WARNING

**HEAVY PARTS**

2. Using crane, sling and shackle, remove first anchor stabilizer (20) from pallet (9).
3. Remove slings and shackles.

WARNING

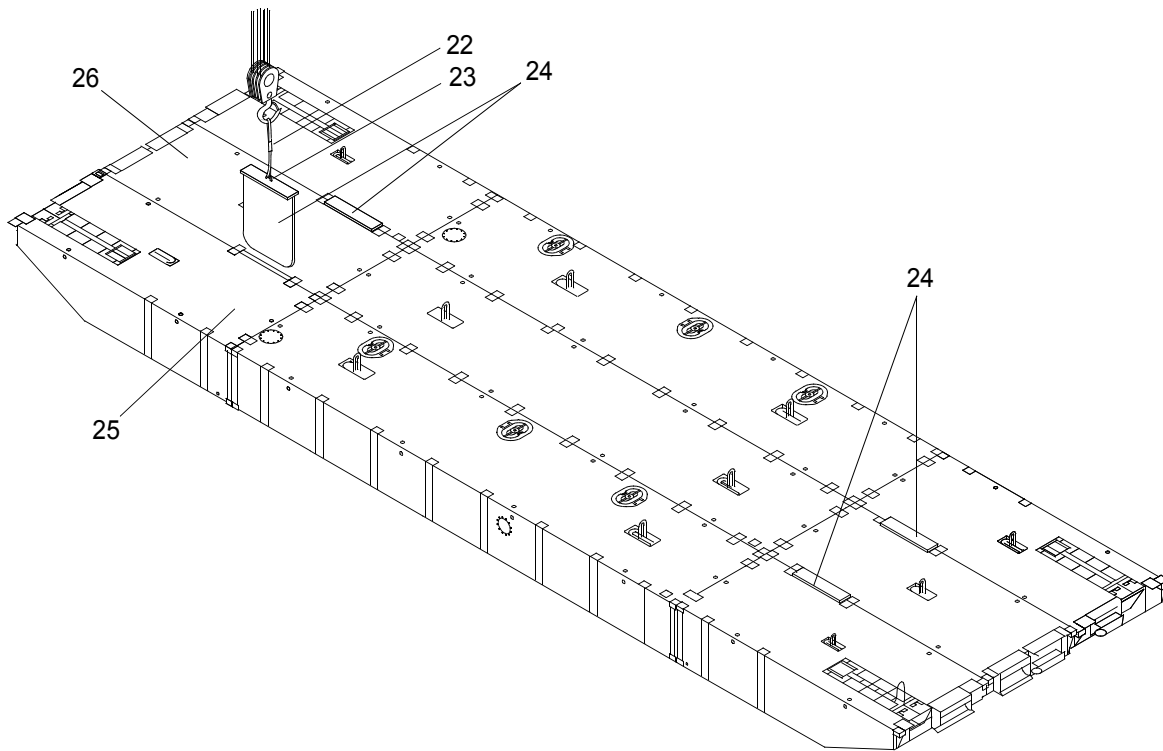
**HEAVY PARTS**

4. Using crane, sling and shackle, remove second anchor stabilizer (21) from pallet (9).
5. Remove slings and shackles.

INSTALL STABILIZERS ON WARPING TUG**NOTE**

This procedure is typical for installation of all stabilizers.

1. Attach ships sling (22) and shackle to lifting eye (23) of stabilizer (24).



WARNING

**HEAVY PARTS**

2. Using crane, lower stabilizer (24) into space between outboard end rake (25) and center end rake (26).
3. Remove slings and shackles.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
WINCH
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Sling, Lifting, 8400 lbs (Yellow) (Item 72, WP 0108 00)
 Qty 4
 4 ¾ Ton ¾ in. Shackle (Item 5, WP 0108 00)
 Qty 4

Personnel Required

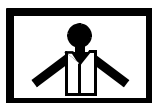
Seaman 88K (2)

Equipment Condition

Module ISOPAK Disassembled. (WP 0007 00)
 Operation Of Male And Female Guillotine Connectors. (WP 0008 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Installed. (WP 0009 00)
 Module String Assembled. (WP 0010 00)
 Warping Tug Assembled. (WP 0011 00)

PREPARATION FOR USE - INSTALL WINCH

WARNING



VEST



HELMET PROTECTION



HEAVY PARTS



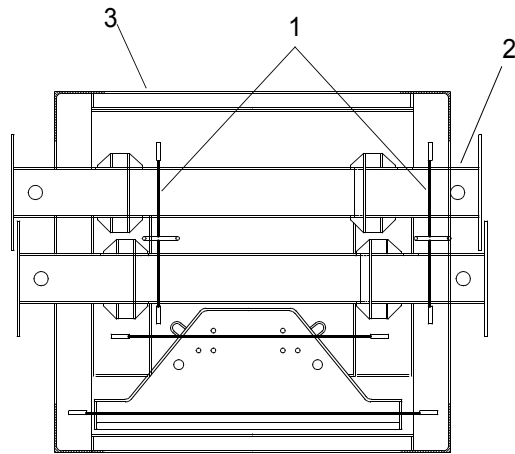
MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

NOTE

All attaching hardware is stowed in the storage box of the stern anchor pallet.

1. Remove two ratchet straps (1) securing transverse beams (2) to stowage pallet (3).



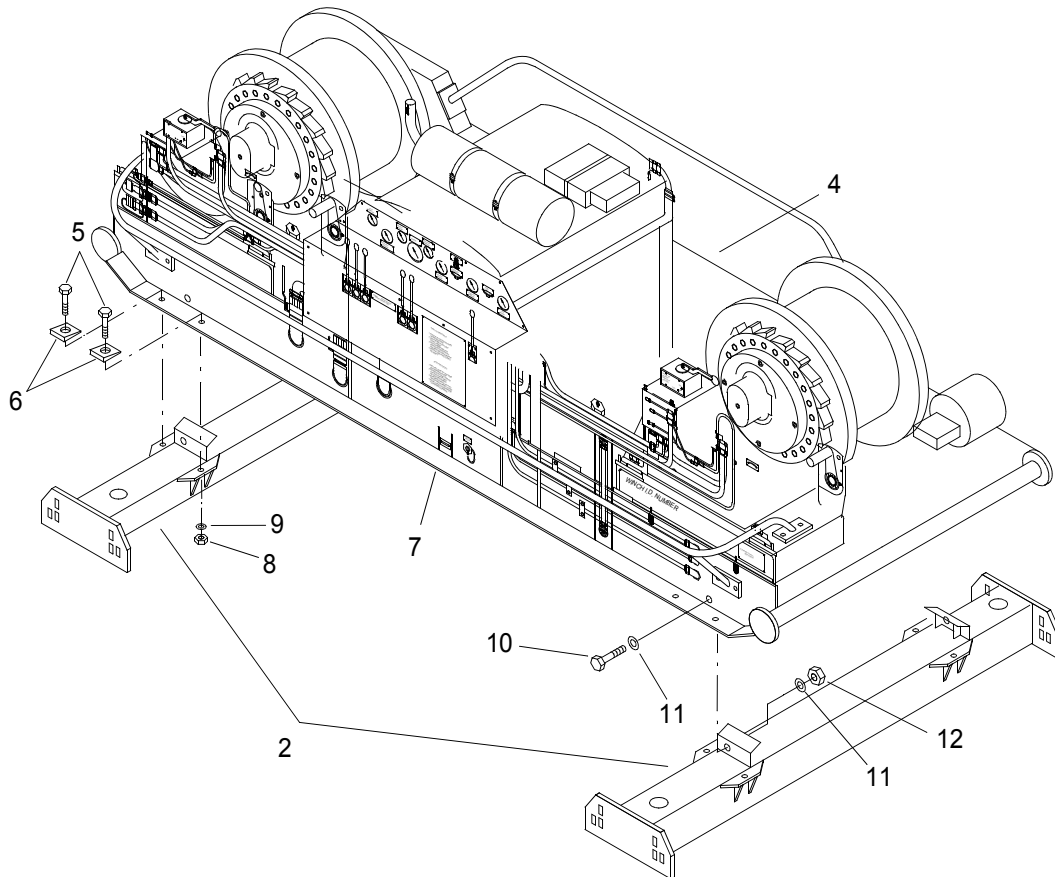
WARNING

**HEAVY PARTS**

2. Using crane, sling and shackles, remove winch foundation transverse beams (2) from stowage pallet (3) and place on deck dunnage.

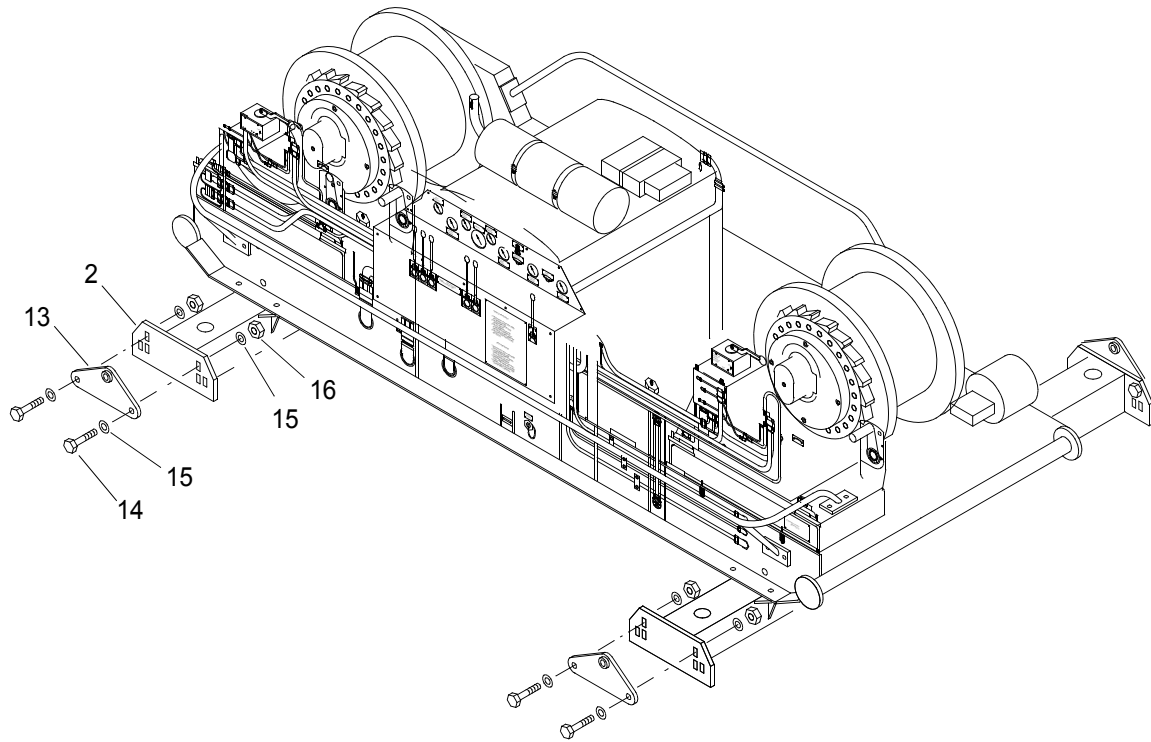
WARNING**HEAVY PARTS**

3. Using crane and sling, lift and lower the diesel-hydraulic winch (4) onto the transverse beams (2) and align the bolt holes between winch frame and beams.



4. Remove slings and shackles.
5. Install the winch to the transverse beams.
 - a. Install eight vertical bolts (5) with tapered washer plates (6) through winch frame (7) and transverse beams (2).
 - b. Install eight nuts (8) with washers (9) and hand tighten.
 - c. Install four horizontal bolts (10) with washers (11) through winch frame (7) and transverse beams (2).
 - d. Install four washers (11) and nuts (12), and hand tighten.
 - e. Tighten all nuts, then tighten an additional 1/3 of a revolution (120°).

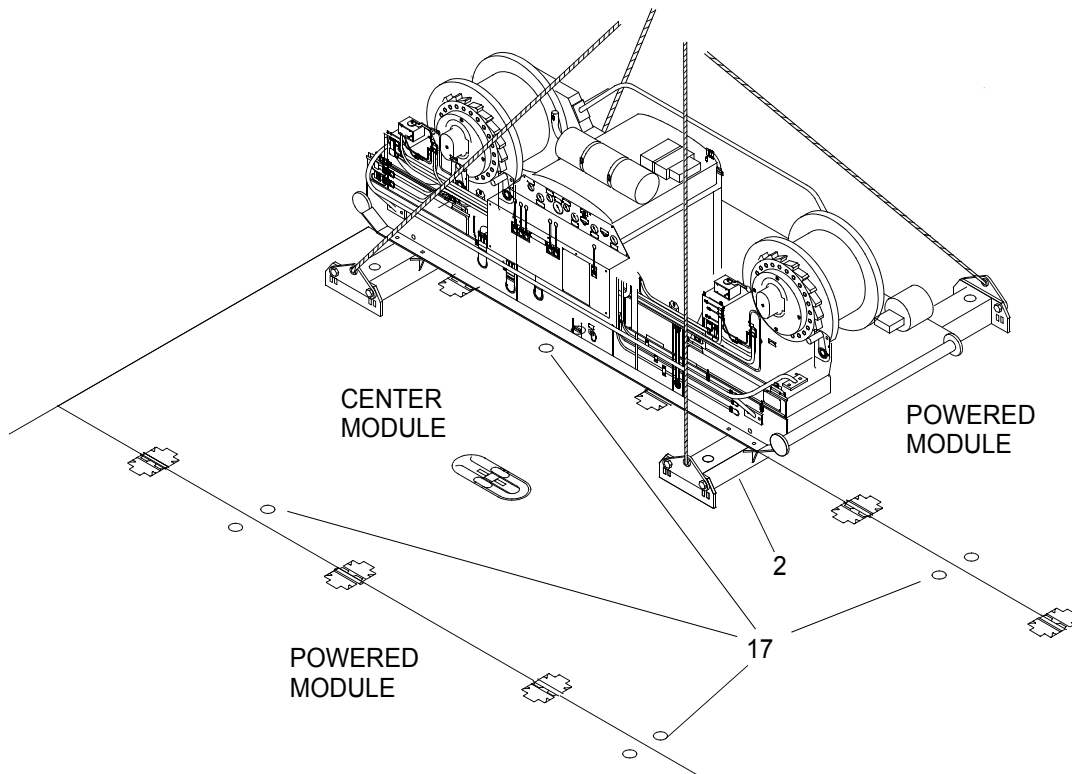
6. Install four lifting brackets (13) to each end of the transverse beams (2).



- a. Align holes of lifting brackets (13) with holes in ends of transverse beam (2).
- b. Install two bolts (14) with washers (15).
- c. Install two nuts (16) with washers (15) and tighten.

WARNING**HEAVY PARTS**

- Using crane, slings and shackles, lift and lower the diesel-hydraulic winch (4), positioning transverse beams (2) bottom locator pins into WT center module deck holes (17).



- Remove slings and shackles.
- Remove four lifting brackets (13) from the ends of the transverse beams (2) by removing eight bolts (14), 16 flat washers (15) and eight nuts (16).

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
WINCH MOUNTING PLATES
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Crowbar (Item 15, WP 0108 00)

Personnel Required

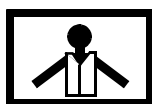
Seaman 88K

Equipment Condition

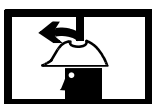
Module ISOPAK Disassembled. (WP 0007 00)
 Operation Of Male And Female Guillotine Connectors. (WP 0008 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Installed. (WP 0009 00)
 Module String Assembled. (WP 0010 00)
 Warping Tug Assembled. (WP 0011 00)
 Winch Installed. (WP 0013 00)

PREPARATION FOR USE - INSTALL WINCH MOUNTING PLATES

WARNING



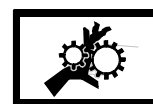
VEST



HELMET PROTECTION



HEAVY PARTS



MOVING PARTS

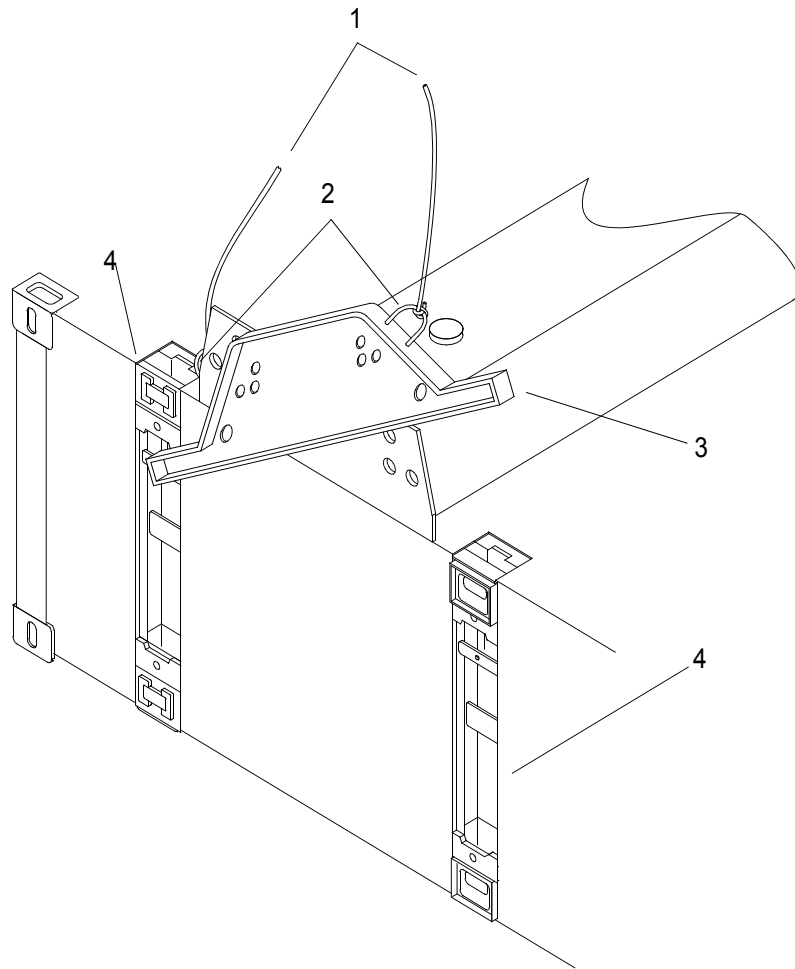
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

NOTE

The four mounting plate assemblies are installed between the center module and the powered modules. The mounting plate fits under the lock castings of the module side connector assembly.

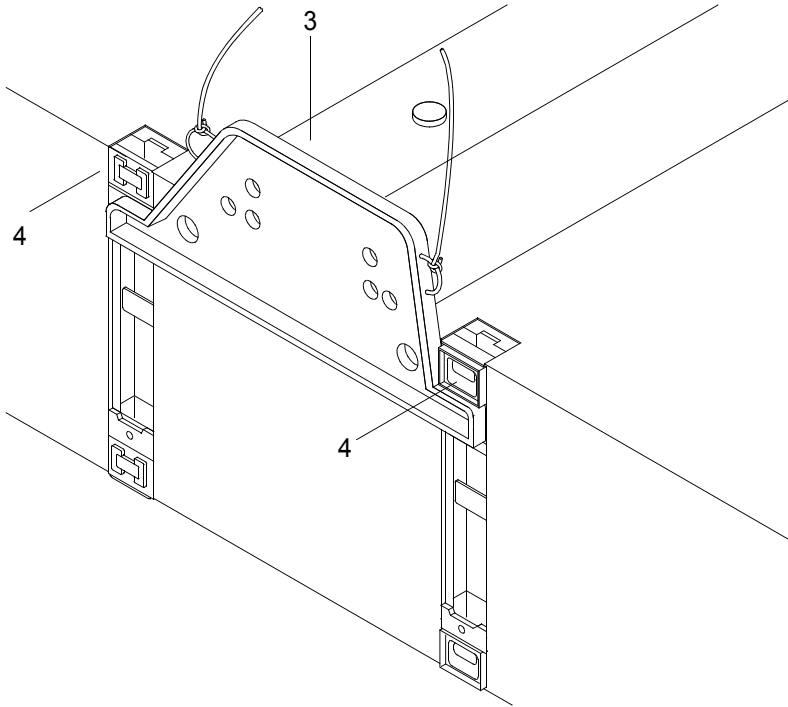
The following procedure is typical for installation of the four mounting plates.

1. Attach lifting line (1) to mounting plate lifting eyes (2).

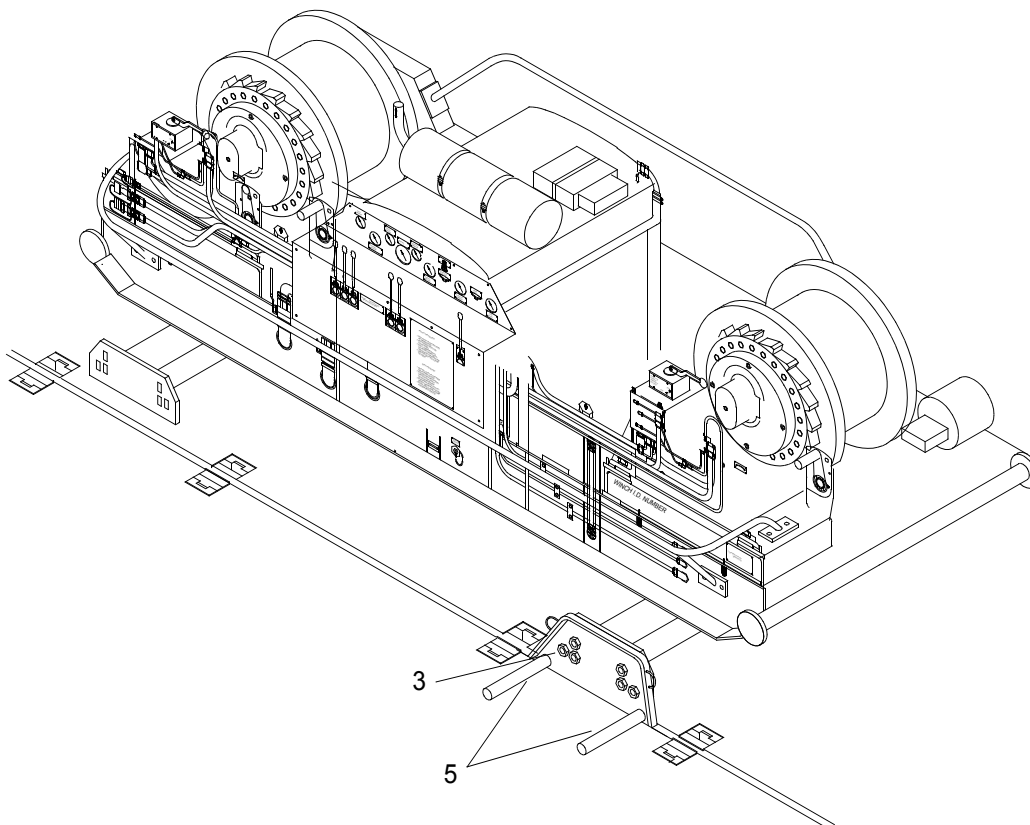


2. Lift and install the mounting plate (3) by allowing one end of the mounting plate to dip downward between the appropriate lock castings (4) far enough so mounting plate can be rotated to a horizontal position under the two adjoining lock castings.

3. Lift the mounting plate (3) until it contacts the bottom surface of the two lock castings (4).



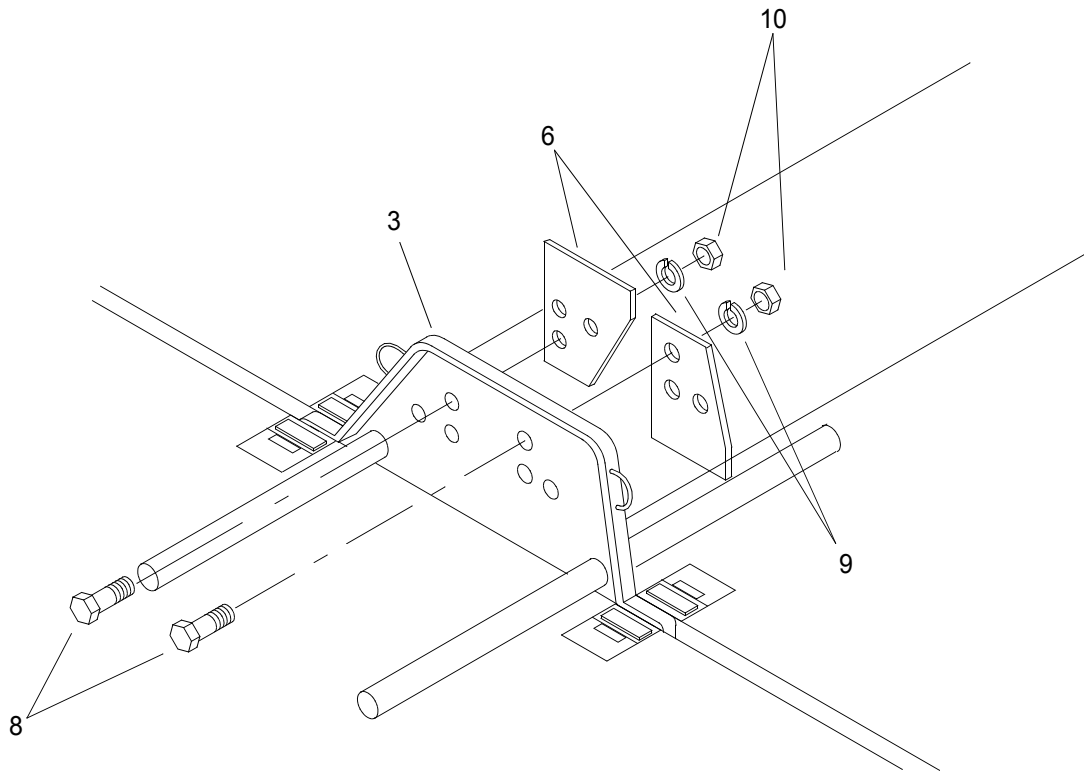
4. Insert pieces of round bar or pipe (5) through the 2 in. diameter holes in the mounting plate (3) to hold it in position while installing the mounting plate hardware.



WARNING**HEAVY PARTS****NOTE**

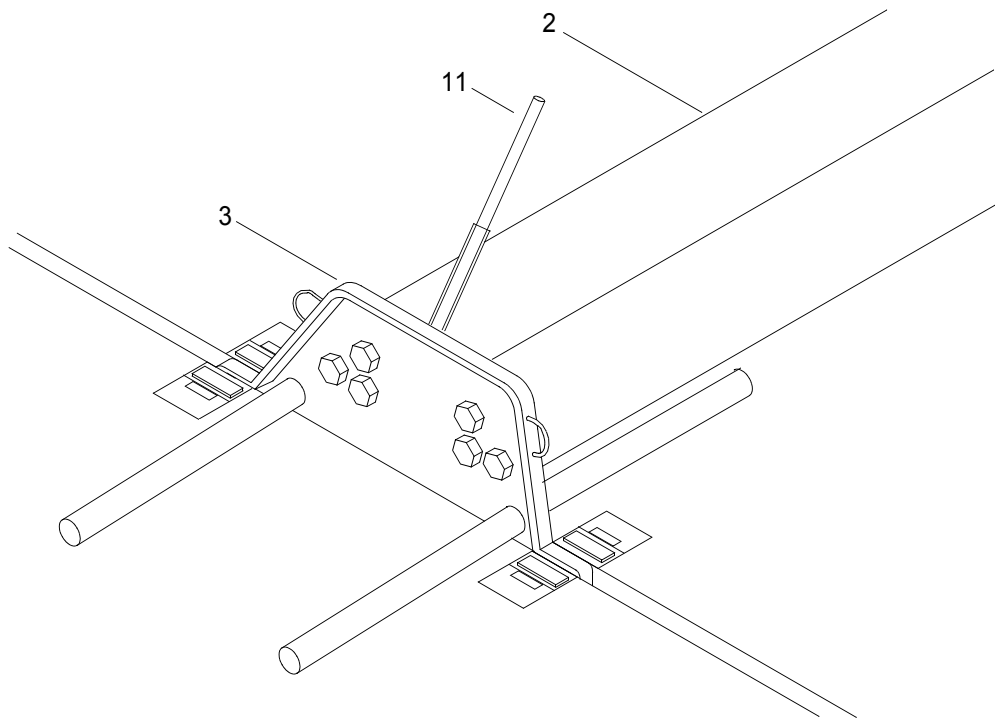
The following steps are typical for installing eight triangular washer plates. During installation, holding triangular washer plate upside down and installing top bolt will prevent dropping plate between modules.

5. Hold bottom of triangular washer plate (6) and install top of plate between mounting plate (3) and transverse beam (7).



6. Install top bolt (8) into mounting plate (3), triangular washer plate (6) and transverse beam (7).
7. Install lock washer (9) and nut (10) finger tight.
8. Release triangular washer plate (6), allowing it to fall in place.
9. Install two bottom bolts (8) through the mounting plate (3), triangular washer plates (6) and transverse beam (7).
10. Install lock washer (9) and nut (10) and hand tighten.

11. After all bolts (8) are installed in mounting plate (3), tighten nuts (10) by inserting a crowbar (11) into the space between the top flange of each mounting plate (3) and the top of the transverse beam (2), and pull mounting plate upward.



12. While holding tension on the crowbar (11), tighten the nuts (10) until snug, then tighten an additional 1/3 turn (120°).
13. Remove pieces of round bar or pipe (5).

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
A-FRAME
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Sling, Lifting 5300 lbs (Green) (Item 70, WP 0108 00)
 Qty 2
 4 ¾ Ton ¾ in. Shackle (Item 5, WP 0108 00)
 Qty 2
 Rope, Fibrous (Item 61, WP 0108 00)

Personnel Required

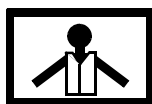
Seaman 88K (4)

Equipment Condition

Module ISOPAK Disassembled. (WP 0007 00)
 Operation Of Male And Female Guillotine Connectors. (WP 0008 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Installed. (WP 0009 00)
 Module String Assembled. (WP 0010 00)
 Warping Tug Assembled. (WP 0011 00)
 Winch Installed. (WP 0013 00)
 Winch Mounting Plates Installed. (WP 0014 00)

PREPARATION FOR USE - INSTALL A-FRAME

WARNING



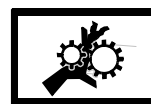
VEST



HELMET PROTECTION



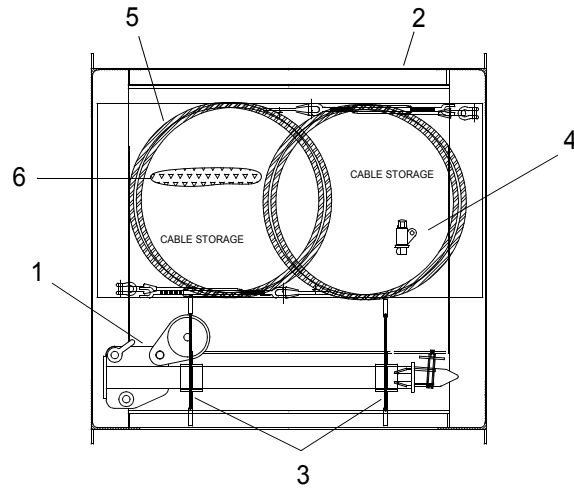
HEAVY PARTS



MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Remove A-frame elevating pole (1) from stowage pallet (2).



- a. Remove two ratchet straps (3) securing A-frame elevating pole (1) in storage pallet (2).

WARNING



HEAVY PARTS

- b. Using crane, sling and shackle, remove elevating pole (1) and place on WT deck.
 - c. Remove slings and shackles.
2. Remove two A-frame corner fittings (4) from storage pallet storage box (6).

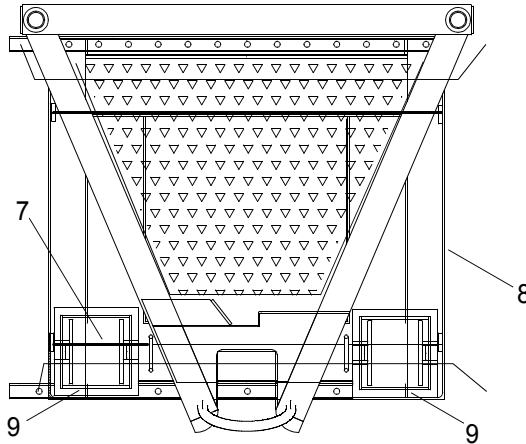
WARNING



HEAVY PARTS

3. Using crane and sling, remove four A-frame cables (5) from storage pallet storage box (6).

4. Remove A-frame foot assemblies (7) from stowage pallet (8).



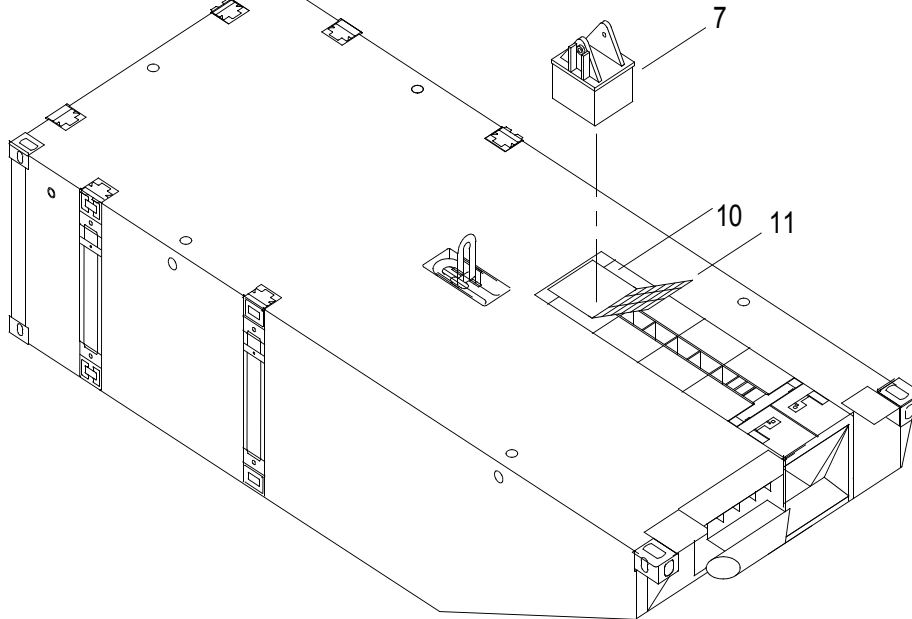
- a. Remove two ratchet straps (9) securing A-frame foot assemblies (7) in stowage pallet (8).

WARNING



HEAVY PARTS

- b. Using crane, sling and shackle, remove two A-frame foot assemblies (7) from stowage pallet (8) and install in forward flexor wells (10).



- {1} Lift the grate coverings (11) over the forward outboard flexor wells (10).

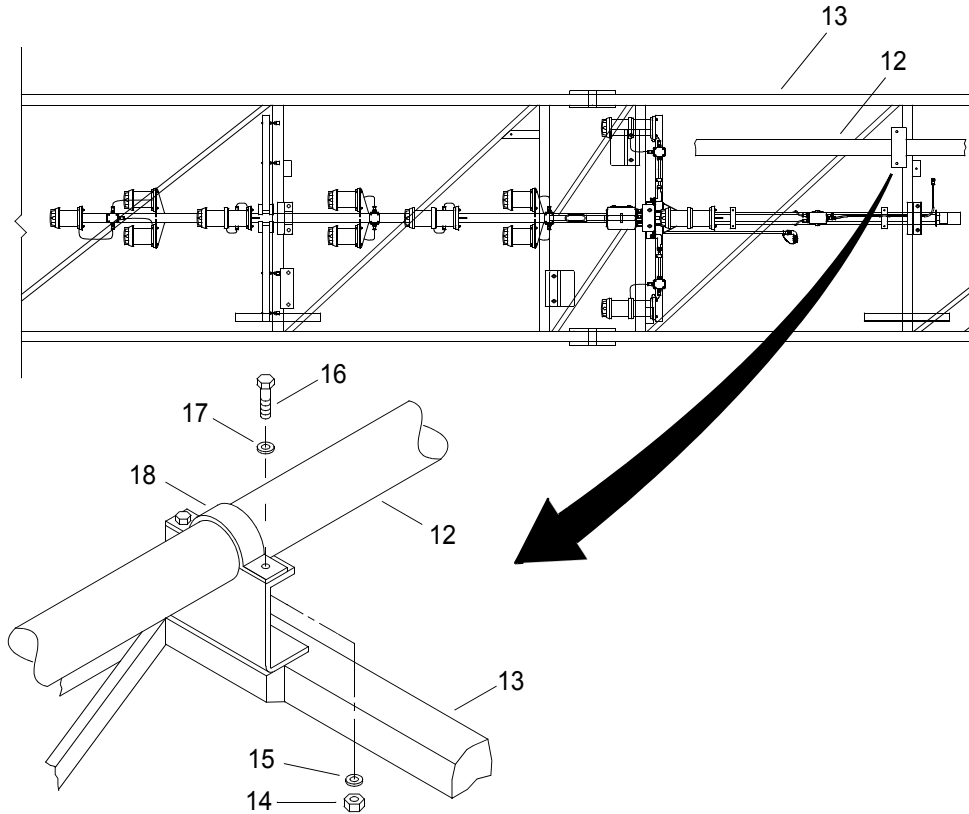
{2} Install foot assembly (7) into flexor well (10).

{3} Remove slings and shackles.

NOTE

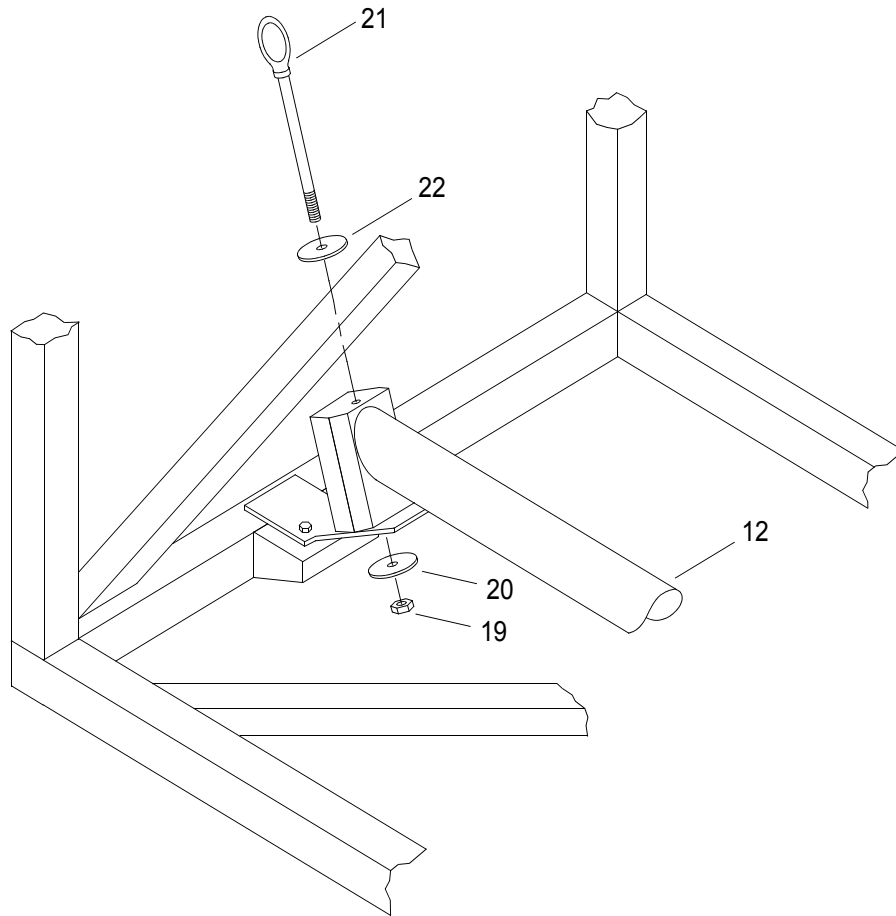
The following procedure is typical for installation of both A-frame legs.

5. Remove A-frame leg (12) from shipping frame (13).



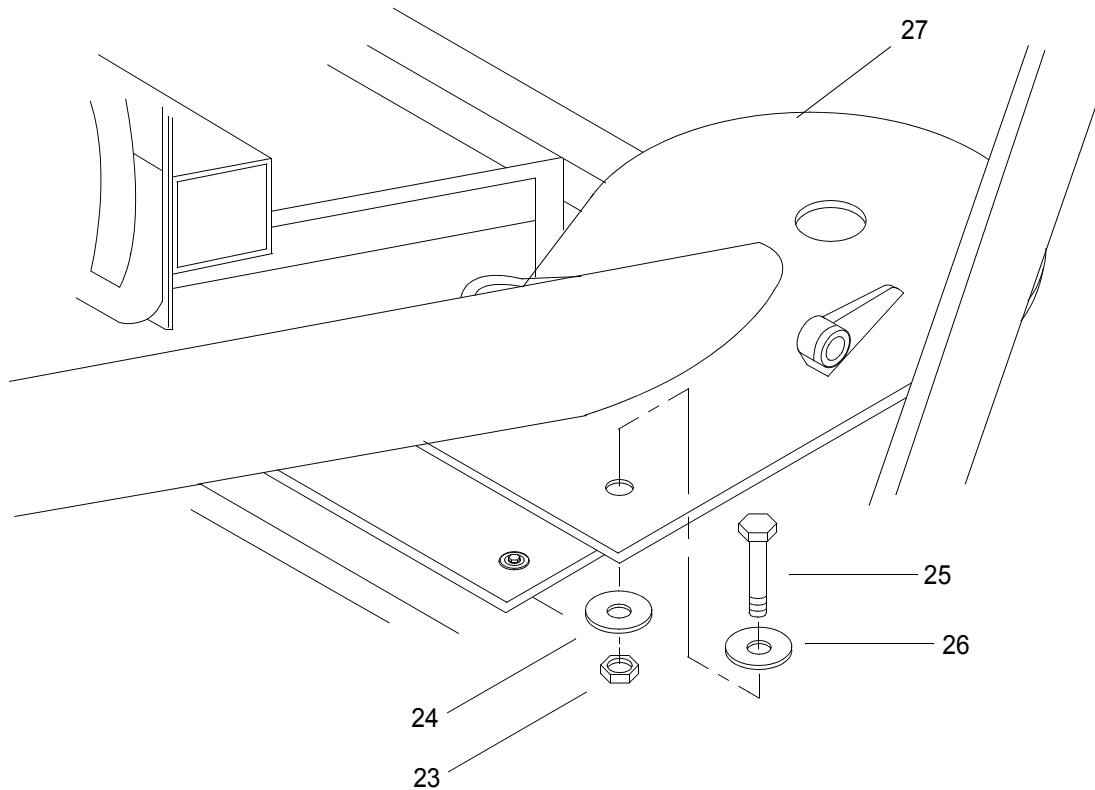
- a. Attach crane, slings and shackles to A-frame leg (12).
- b. Remove two self locking nuts (14) and washers (15).
- c. Remove two bolts (16) with washers (17) from clamps (18).
- d. Remove clamp (18).

- e. Remove nut (19) and washer (20) from eyebolt (21).



- f. Remove eyebolt (21) and washer (22) from A-frame leg (12).

- g. Remove two self-locking nuts (23) and washers (24).



- h. Remove two bolts (25) with washers (26) from A-frame sheave plate (27).

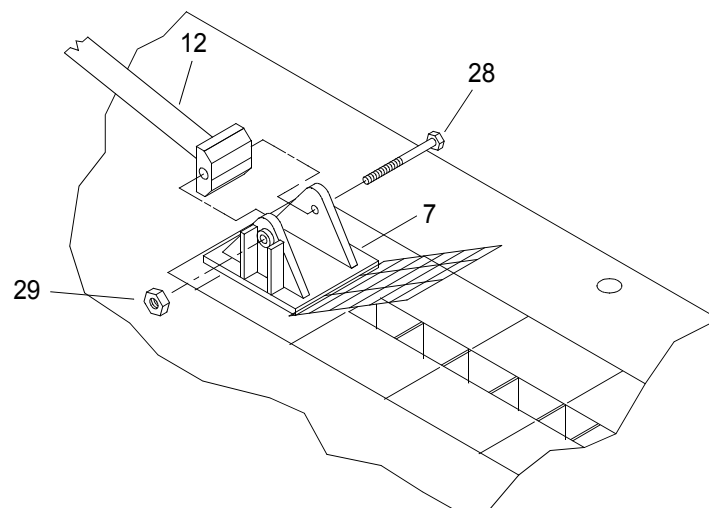
WARNING



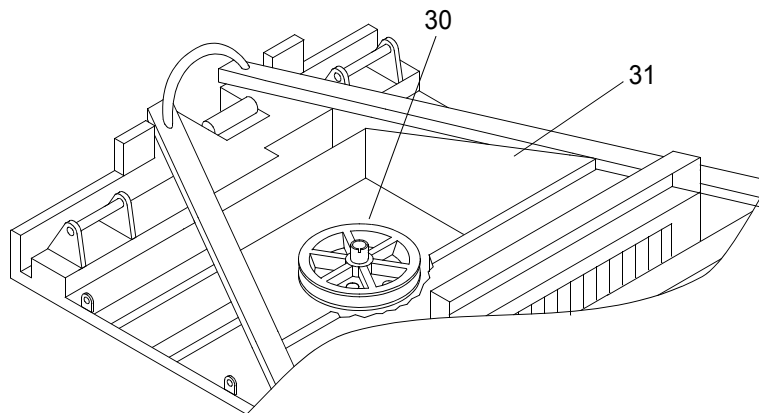
HEAVY PARTS

- i. Using crane, slings and shackles, remove A-frame leg (12) from shipping frame (13) and place on WT deck, supporting top end of A-frame leg on a 12 x 12 in. dunnage.

- j. Position A-frame leg (12) into A-frame foot assembly (7) and align holes.



- k. Install bolt (28) into foot assembly (7) and leg (12).
- l. Install nut (29) and tighten until bolt (28) threads are just exposed.
- m. Remove slings and shackles.
6. Remove A-frame sheave (30) from stowage pallet stowage box (31).



- a. Remove sheave attaching hardware from stowage box (31).

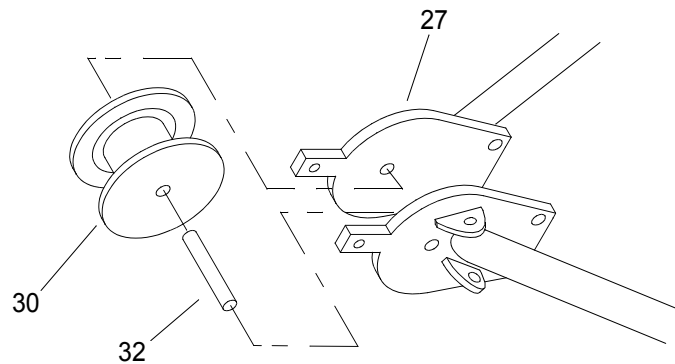
WARNING



HEAVY PARTS

- b. Using crane and sling, remove A-frame sheave (30) from stowage box (31) and place on WT deck, do not remove sling.
7. Install sheave (30) into sheave plate (27).

- a. Install bushing (32) into sheave (30).

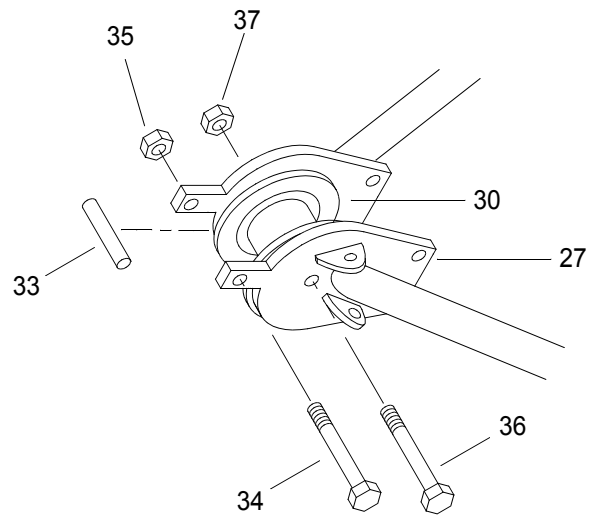


WARNING



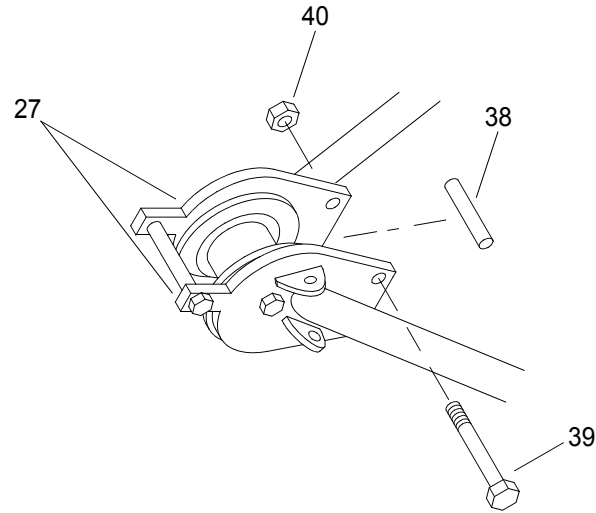
HEAVY PARTS

- b. Using crane and sling, position A-frame sheave (30) between the sheave plates (27).
 c. Install and hold upper spacer (33) between sheave plates (27).



- d. Install bolt (34), draw sheave plates (27) together and install nut (35) finger tight.
 e. Install bolt (36) into sheave plate (27) and sheave (30).
 f. Install nut (37) finger tight.

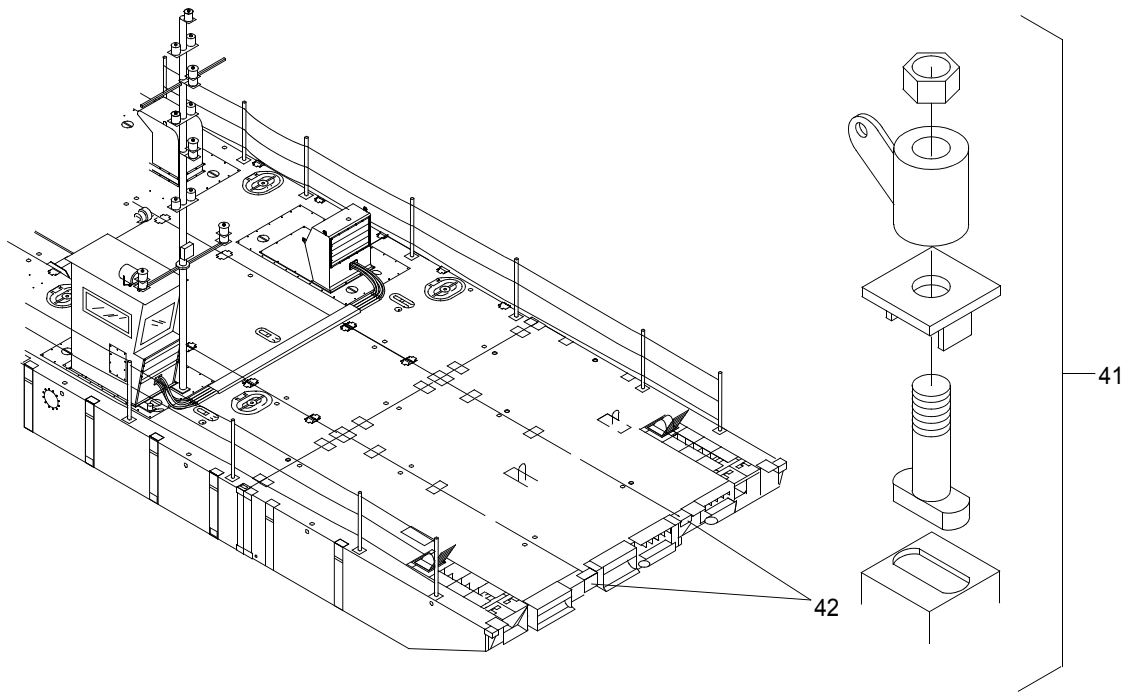
- g. Install the two lower spacers (38) and hold in place.



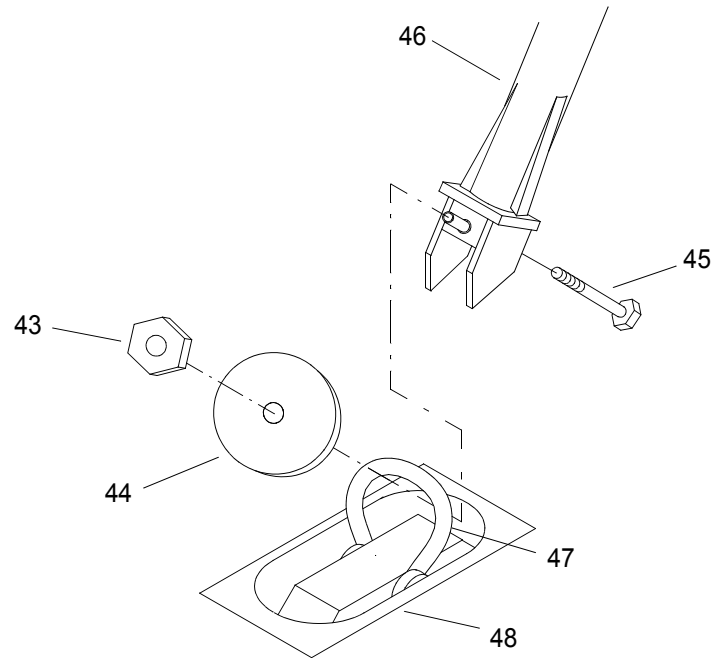
- h. Install two bolts (39) into sheave plates (27) and spacer (38).
- i. Install two nuts (40) finger tight.
- j. Tighten the A-frame leg nuts (29), sheave plate nuts (37) and (40) and sheave nut (35) until snug, then tighten each an additional 1/3 turn (120°).
- k. Remove sling.

INSTALL THE A-FRAME ELEVATING POLE

- 1. Install a corner fitting lug assembly (41) in each of the two forward outboard rake module corner fittings (42).



- Remove the nut (43) and large washer plate (44) and bolt (45) from the foot of the elevating pole (46).

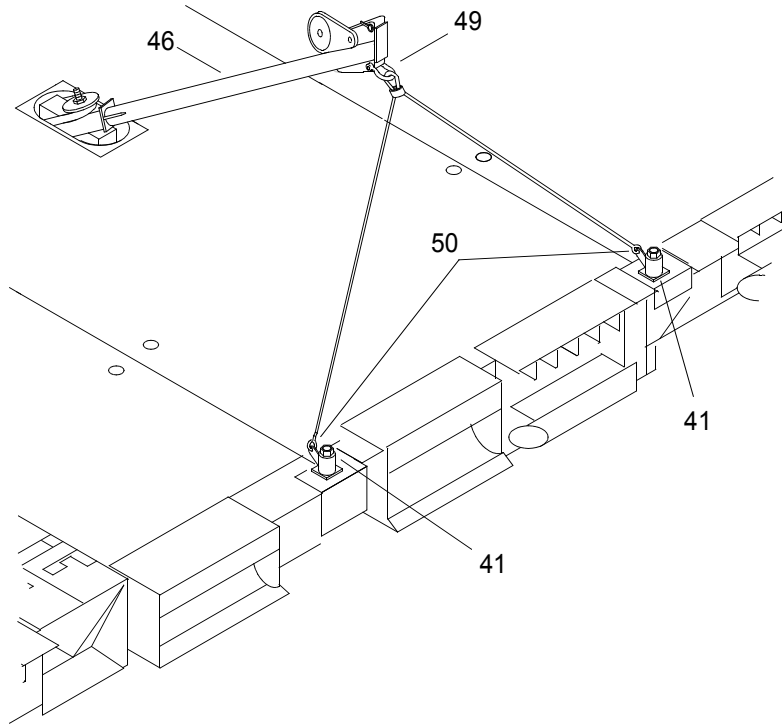


WARNING

**HEAVY PARTS**

- Lift center rake modules lifting shackle (47) and insert the elevating pole foot (46) into lifting lug casting (48).
- Install bolt (45) through elevating pole foot (46) and lifting shackle (47).
- Install washer plate (44) and nut (43).

6. Attach the elevating pole guy wire center shackle (49) to top lower mount on elevating pole (46).

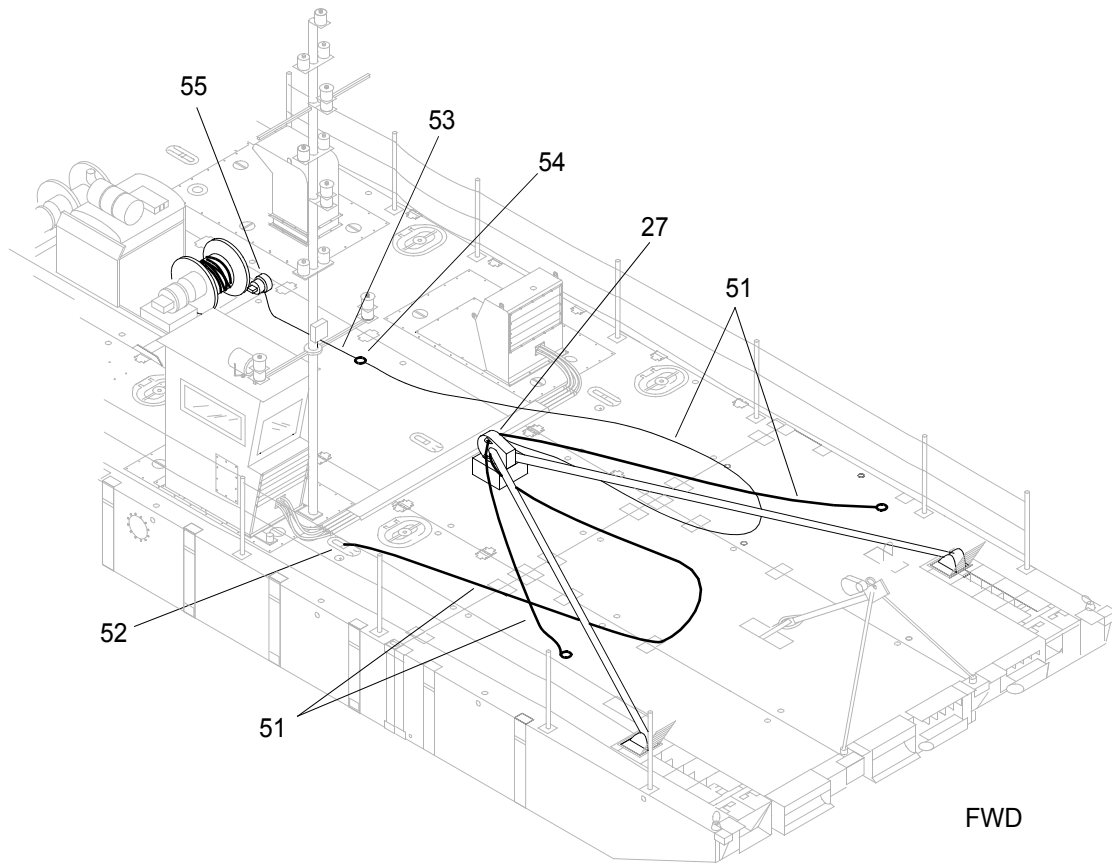


7. Install guy wire end shackles (50) to two center rake module corner fittings (41).

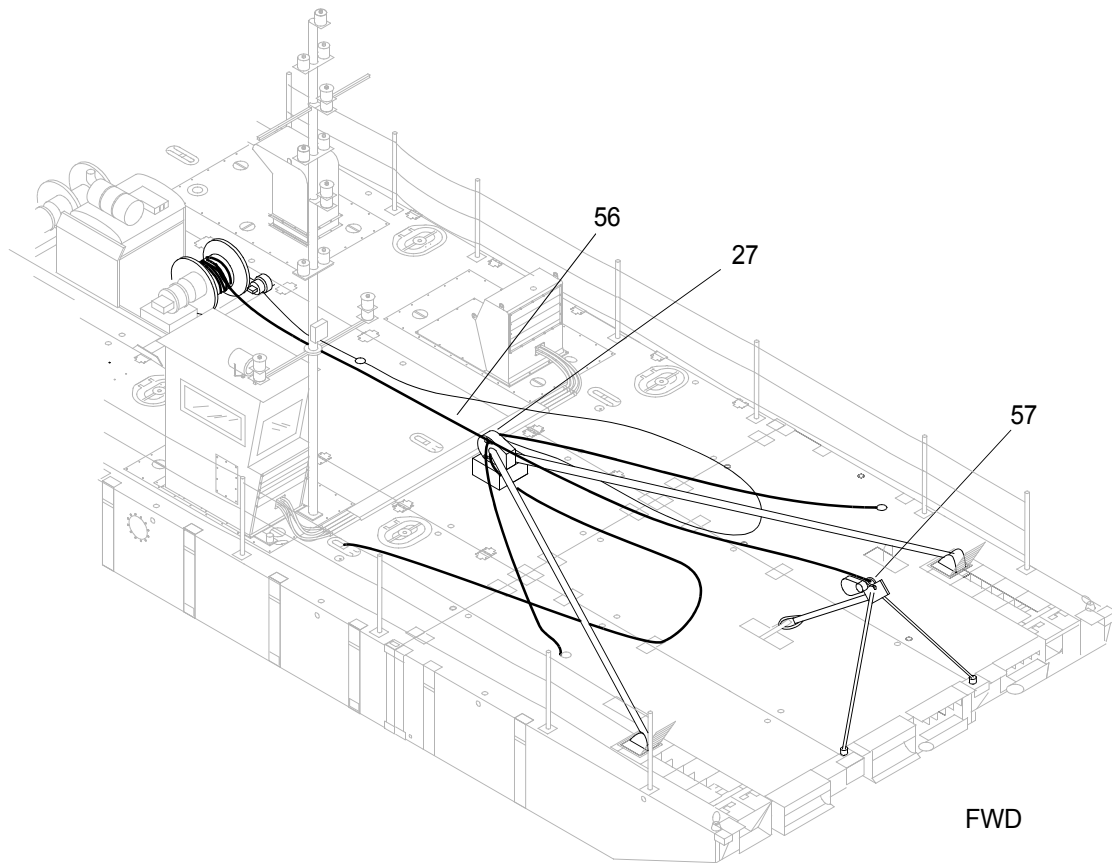
ELEVATE THE A-FRAME

1. Secure the four guy assembly shackles (51) to the A-frame sheave plates (27).
2. Secure starboard aft guy assembly (51) to the starboard propulsion module forward lifting lug (52).

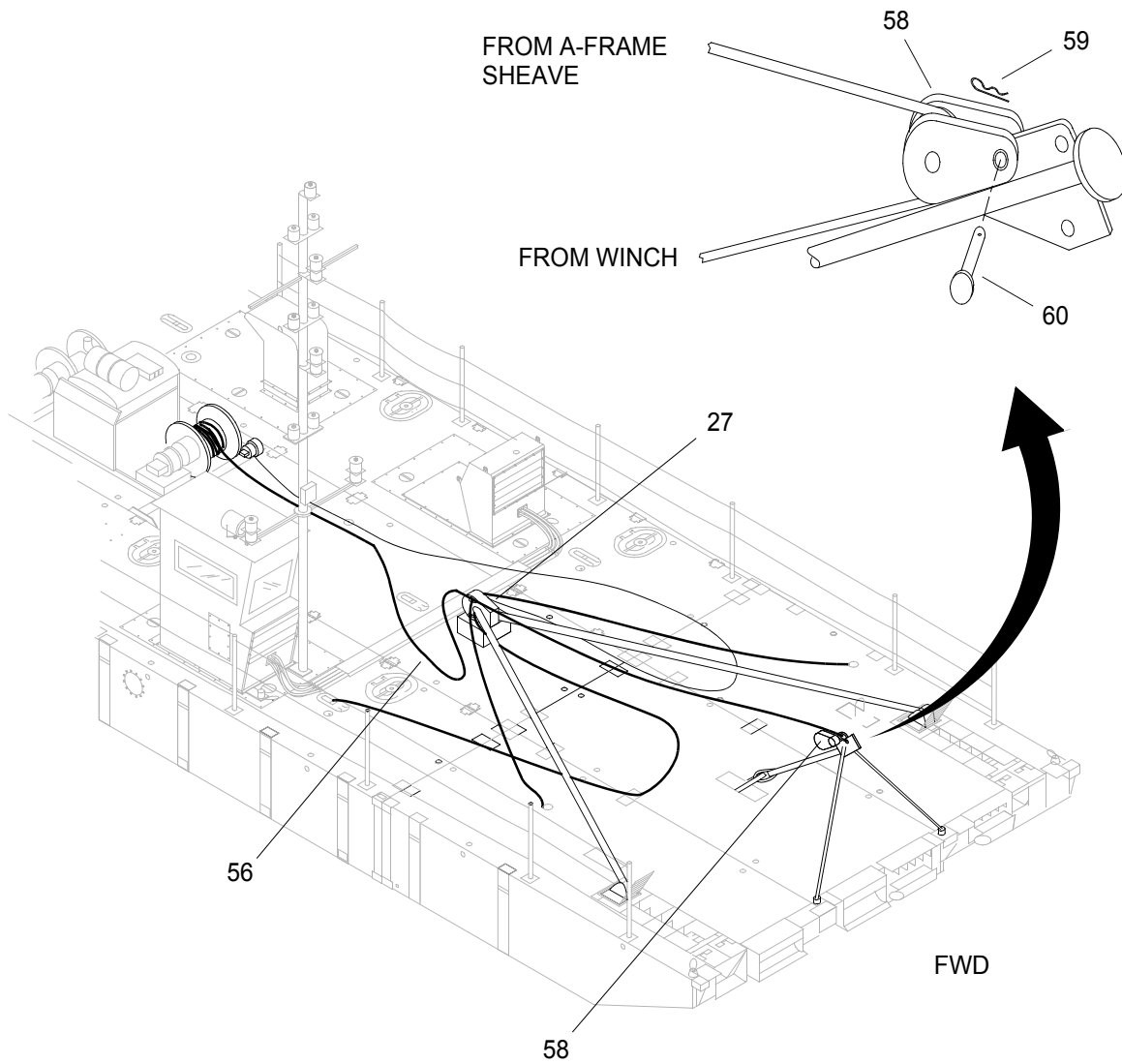
3. Secure a 1 in. diameter nylon line (53) to the turnbuckle (54) of the port after guy assembly (51) and route to gypsy winch (55) to be tended as a preventer line while elevating the A-frame.



4. Lead forward winch drum cable (A-wire) (56) over the A-frame sheave (27) to elevating pole upper eye (57) and secure it.

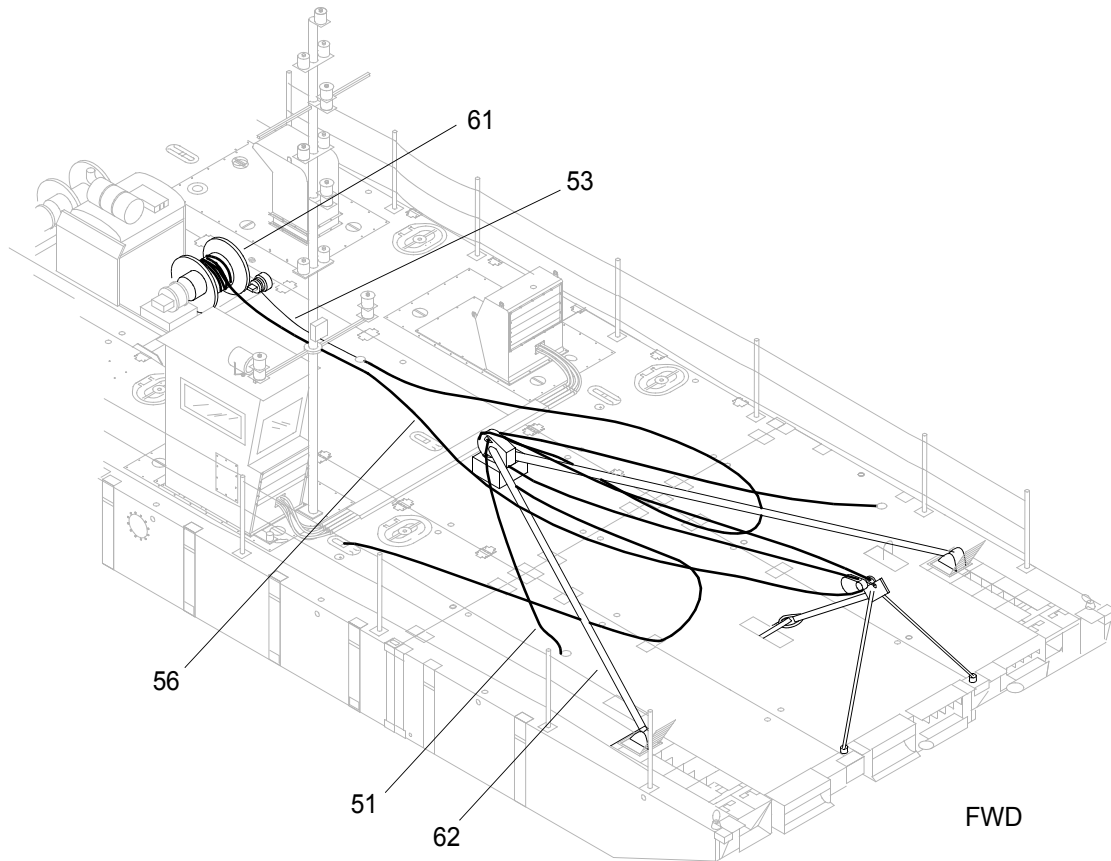


5. Take a bight of winch drum A-wire (56) under the A-frame sheave (27) and capture it in the 8 in. elevating pole snatch block (58).

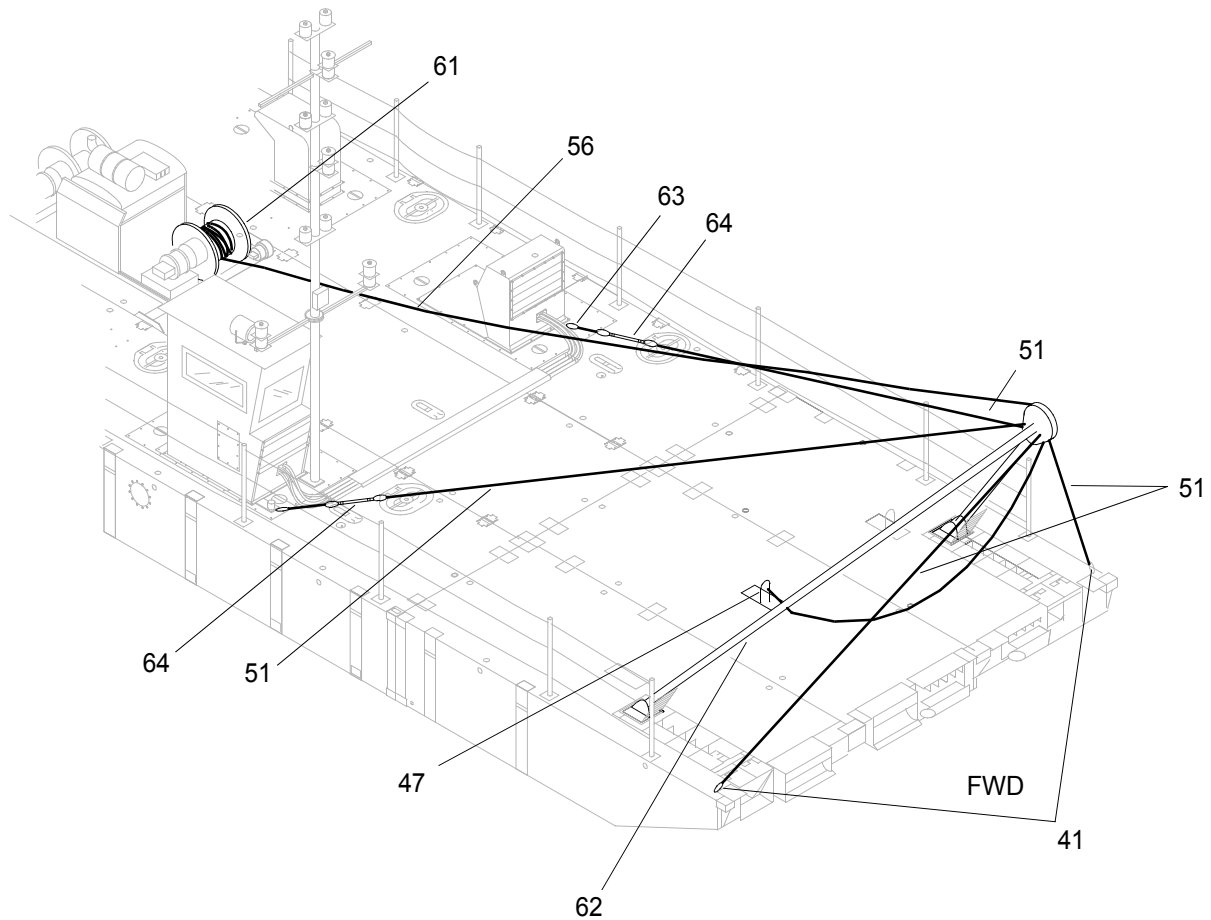


- a. Remove cotter pin (59).
- b. Holding snatch block (58), remove pin (60).
- c. Loop A-wire (56) on snatch block (58) with end from winch drum entering the snatch block from the bottom.
- d. Position snatch block (58) in place and install pin (60).
- e. Install cotter pin (59).

6. Ensure all shackles are secure before raising A-frame.



7. Using winch (61), haul on the A-wire (56) to raise the A-frame (62).
8. Tend the preventer line (53) on the gypsy as the A-frame (62) is raised and passes through the vertical position.
9. Using the preventer line (53) lower the A-frame (62) into operating position (approximately 60° past vertical) until it is supported by the starboard after guy assembly (51).



10. Remove the preventer line (53) from the port after guy assembly (51).
11. Attach port guy assembly (51) to the port propulsion module forward lifting lug (63).
12. Remove the A-wire (56) from the elevating pole snatch block (58).
13. Remove A-wire (56) from elevating pole upper eye (57).
14. Attach A-wire (56) to end rake center module lifting shackle (47).
15. Using winch (61) remove slack on A-wire (56) and make taut.
16. Remove the guy wire shackles (50) from corner fitting lugs (41).
17. Remove corner fitting lugs (41) and install in the left and right end rake modules outboard corners.
18. Secure the A-frame forward guy wires (51) to the corner fitting lugs (41).
19. Remove slack from A-frame guy wires (51) by tightening the after guy wire turnbuckles (64) until taut. Balance the tension between port and starboard, until no slack is present.
20. Remove the elevating pole (46) and stow it.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
ABOVE DECK EQUIPMENT
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)
Gloves, Chemical (Item 29, WP 0108 00)
Goggles, Industrial (Chipping, Chemical) (Item 32, WP 0108 00)
Ladder (Item 43, WP 0108 00)
Sling, 5300 lbs (Green) (Item 69, WP 0108 00)
Qty 2
4 3/4 Ton 3/4 in. Shackle (Item 5, WP 0108 00)
Qty 2

Materials/Parts

Adhesive (Item 1, WP 0109 00)

Personnel Required

Seaman 88K

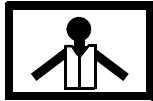
References

TM 11-5820-890-10-8

Equipment Condition

Module ISOPAK Disassembled. (WP 0007 00)
Operation Of Male And Female Guillotine Connectors. (WP 0008 00)
D-Ring/Cloverleaf And Deck Cleat Fittings Installed. (WP 0009 00)
Module String Assembled. (WP 0010 00)
Warping Tug Assembled. (WP 0011 00)
Winch Installed. (WP 0013 00)
Winch Mounting Plates Installed. (WP 0014 00)
Winch A-Frame Installed. (WP 0015 00)

PREPARATION FOR USE - INSTALLATION OF WARPING TUG ABOVE DECK EQUIPMENT**INSTALL OPERATORS CAB**

WARNING

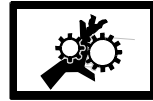
VEST



HELMET PROTECTION



HEAVY PARTS



MOVING PARTS



VAPOR

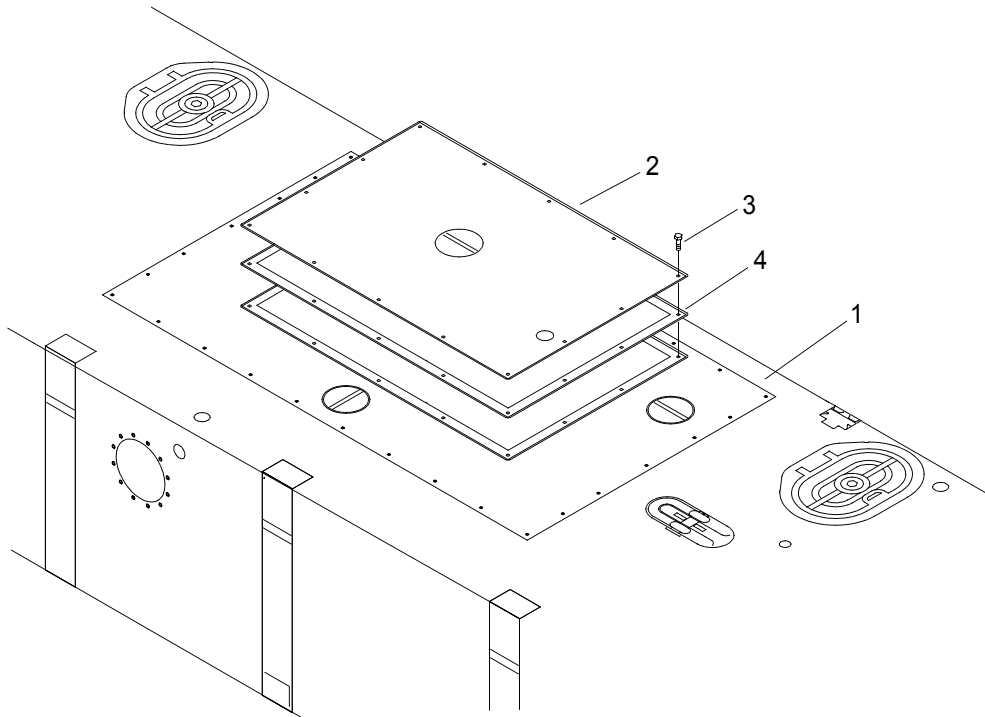
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

Attempting to assemble Warping Tug in higher sea conditions than Sea State 0 could cause injury or possible death to personnel and/or damage the equipment.

NOTE

The operators cab is normally installed on the starboard side. If required, the operators cab may be installed on the port side. This procedure is typical for installation on the starboard side, unless otherwise noted.

1. Remove starboard propulsion module engine hatch (1) shipping plate (2).



- a. Remove 14 bolts (3) securing shipping plate (2) to starboard propulsion module engine hatch (1). Bolts will be reused for installation of operators cab.

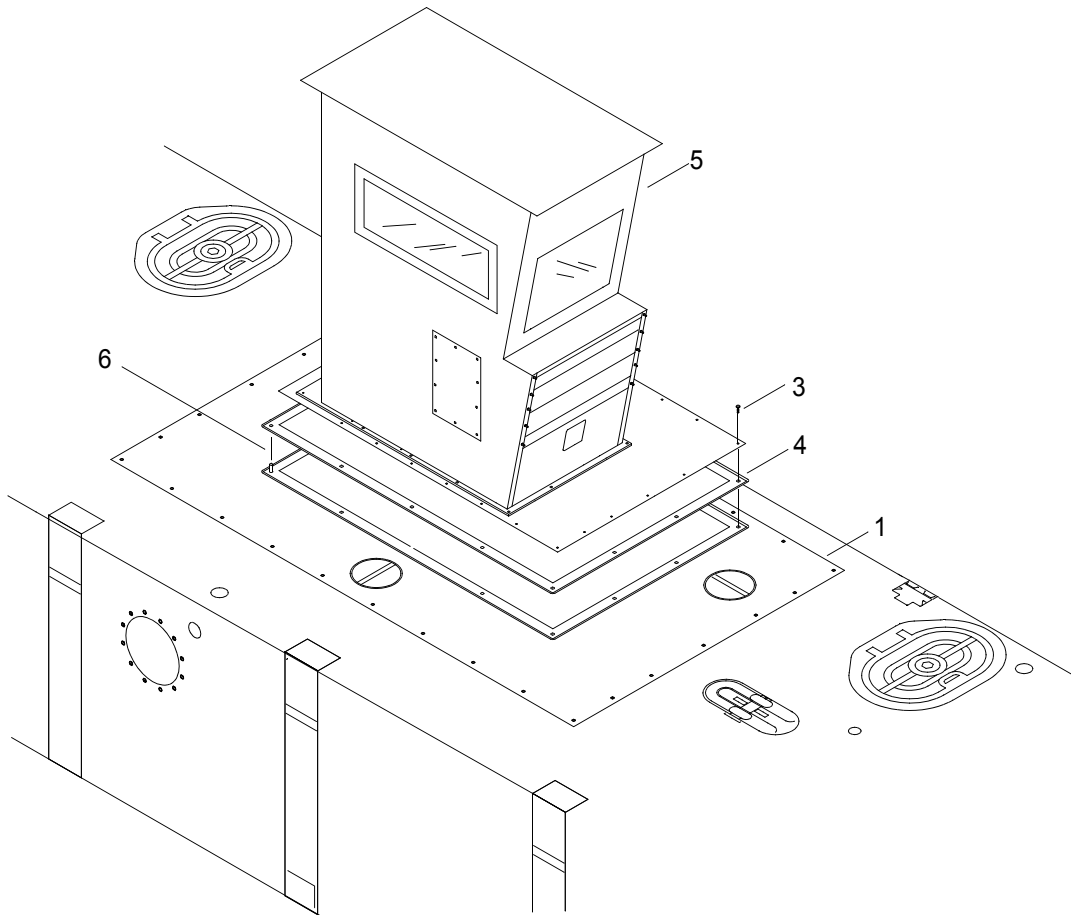
WARNING**HEAVY PARTS**

- b. Using crane, slings and shackles, remove starboard engine hatch plate (2).

NOTE

When removing engine hatch plate the gasket will remain on engine hatch.

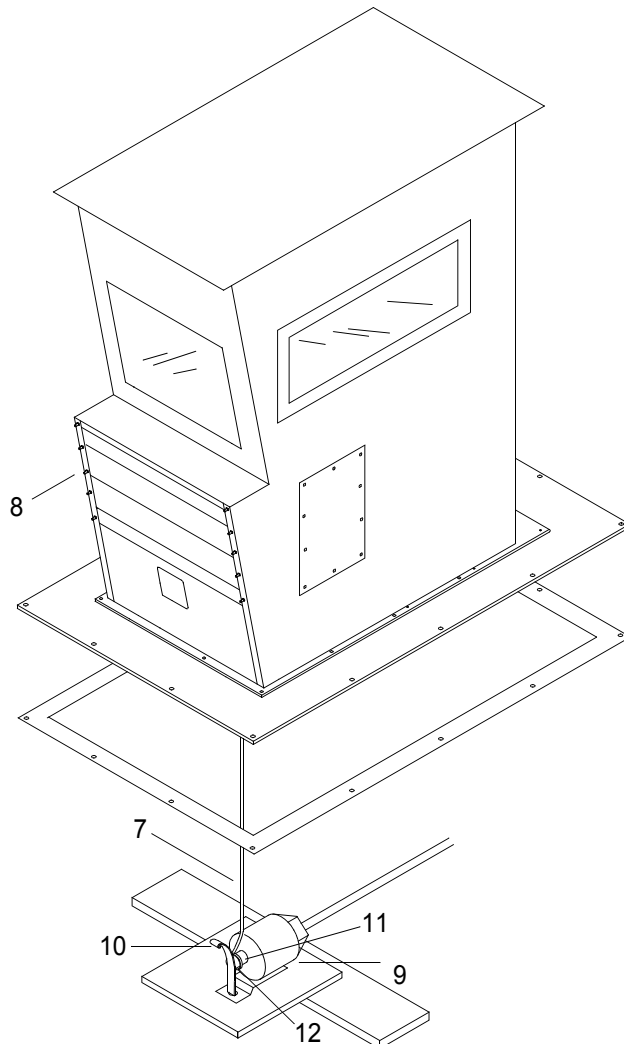
- c. Remove gasket (4), if damaged.
 - d. Remove sling and shackle.
 - e. Stow shipping plate (2).
2. Install operators cab (5) on starboard propulsion module engine hatch (1).



- a. Install four guide pins (6) on corners to align and install operators cab.
- b. Install new gasket (4), if removed.

WARNING**HEAVY PARTS**

- c. Using crane, slings and shackles, align operators cab mounting holes and guide pins (6), lower cab on engine hatch.
- d. Remove guide pins (6).
- e. Install 14 bolts (3), removed from shipping plates (2), securing operators cab (5) into propulsion module (1) until snug.
- f. Tighten bolts (3) using cross method.
- g. Remove slings and shackles.
- h. Connect wire rope (7) in operators cab intake plenum (8) to fire suppression trip mechanism (9).

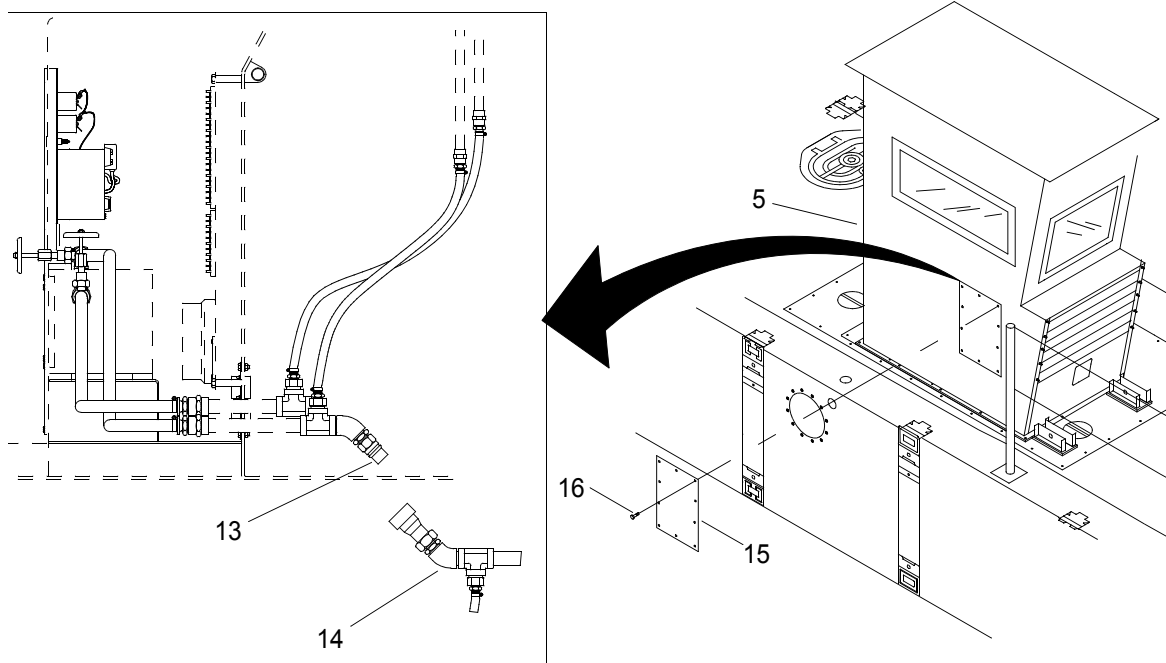


{1} Move fire suppression solenoid spring flange (10) away from solenoid shaft (11).

{2} Install wire rope ring (12) on the fire suppression solenoid shaft (11).

{3} Release flange (10).

i. Connect heating system male (13) and female (14) quick disconnect water hoses.



{1} Remove operators cab (5) side access panel (15).

(a) Remove 10 bolts (16).

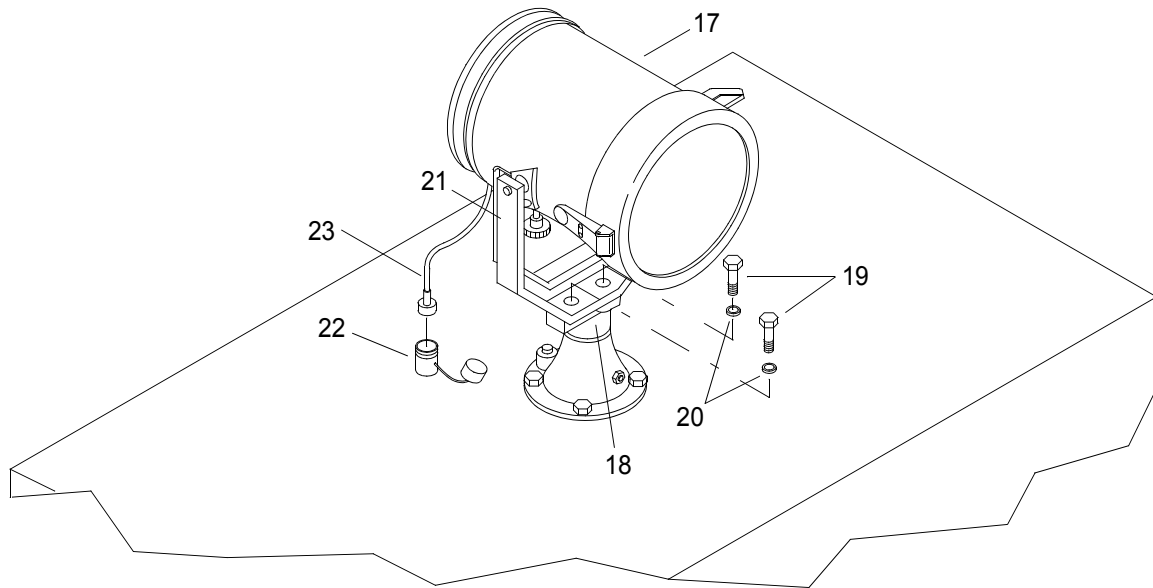
(b) Remove access panel (15).

{2} Connect heating system water hoses (13, 14).

j. Using ladder, gain access to top of operators cab.

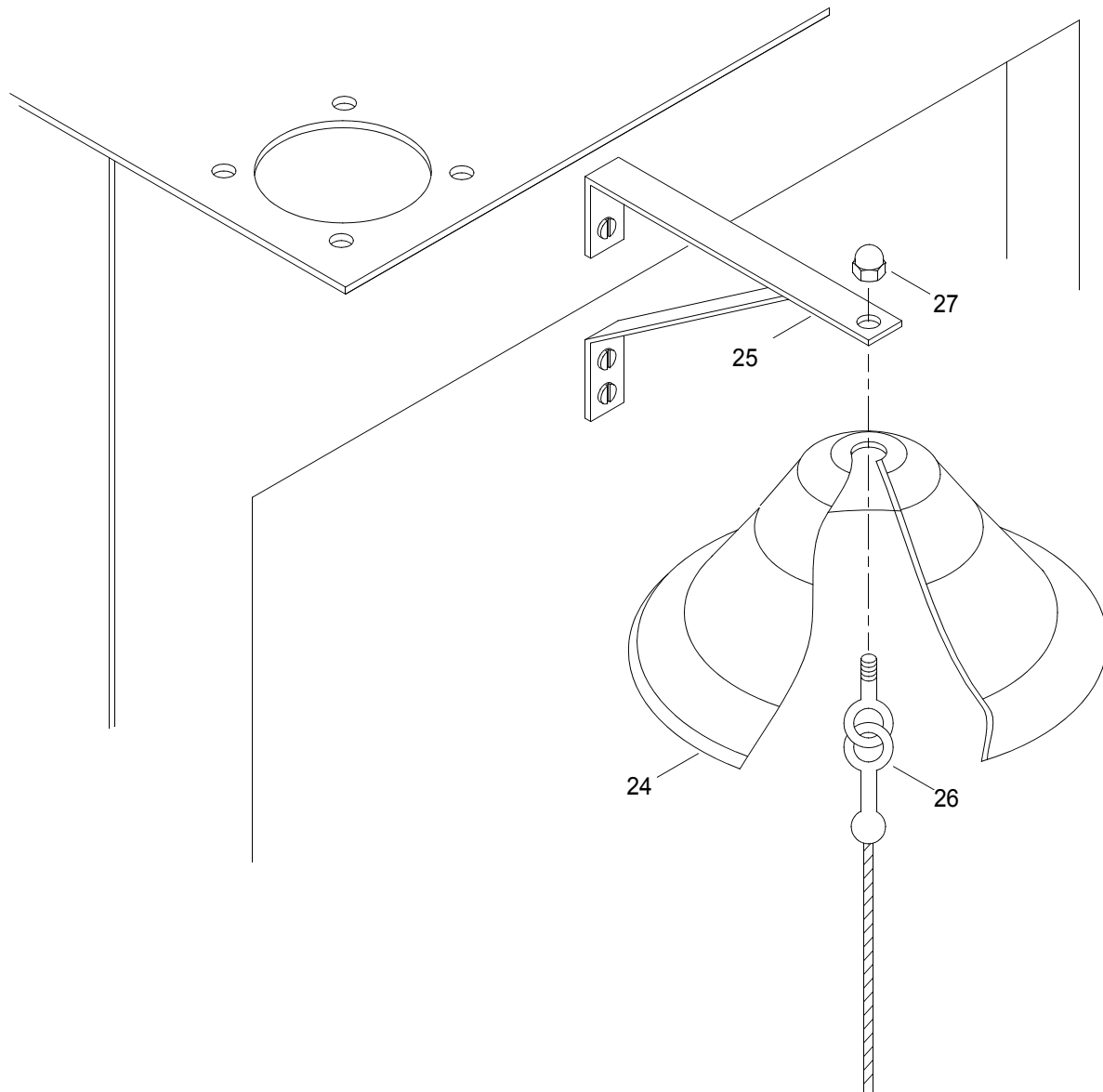
k. Install SINGARS antenna. Refer to TM 11-5820-890-10-8.

1. Install operators cab spotlight (17).



- {1} Using ladder, gain access to top of operators cab.
- {2} Using crane, sling and shackle, position spotlight (17) on spotlight flange tube (18).
- {3} Install two bolts (19) with washers (20) through spotlight harp (21) to spotlight flange tube (18).
- {4} Tighten bolts (19).
- {5} Remove sling and shackle.
- {6} Remove dust cap from the receptacle (22) and connect spotlight electrical connector (23).

m. Install navigation bell (24).



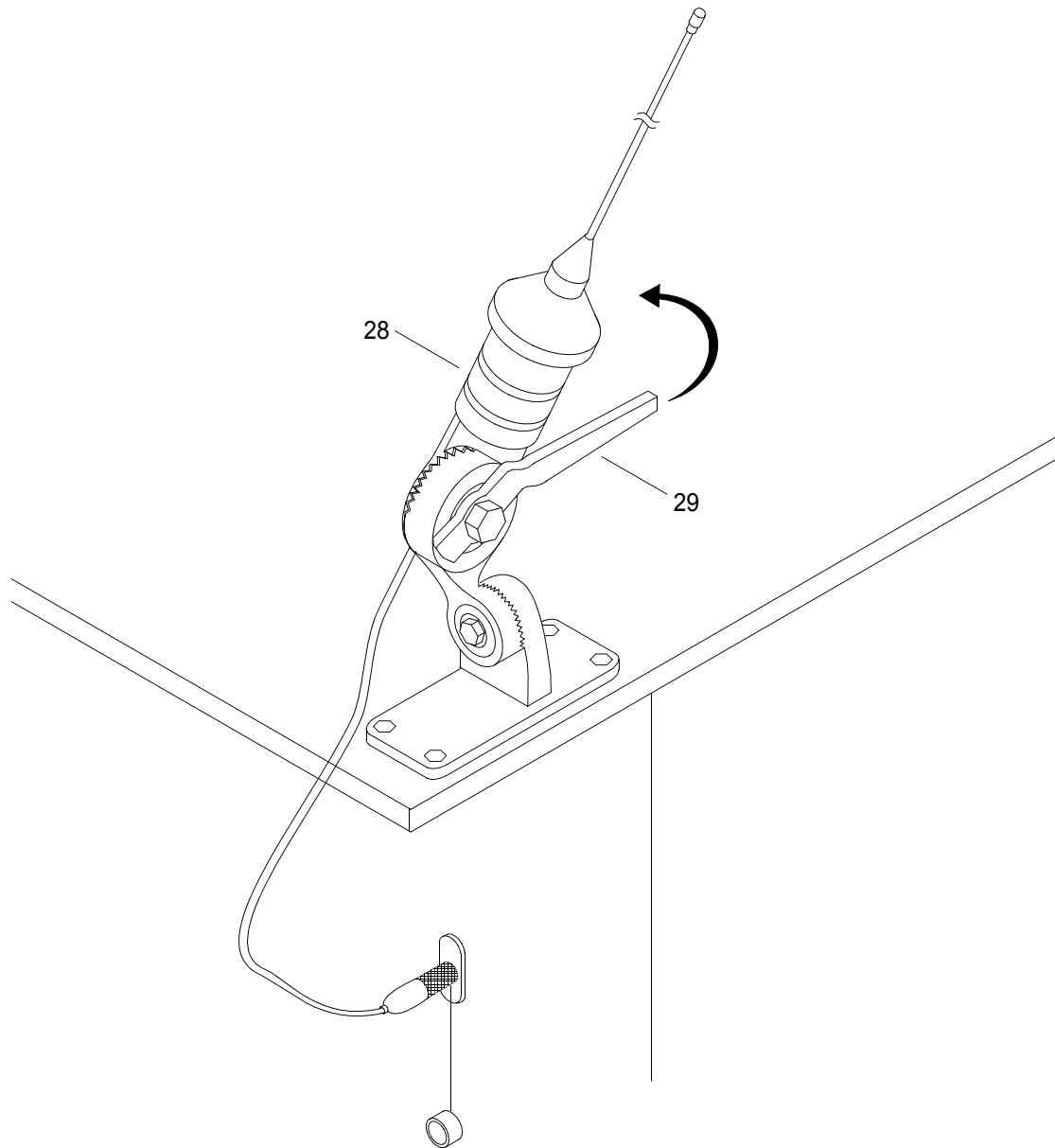
{1} Using ladder, gain access to top of operators cab.

{2} Align hole in top of navigation bell (24) with hole in mounting bracket (25).

{3} Install clapper bolt (26) through bell and mounting bracket.

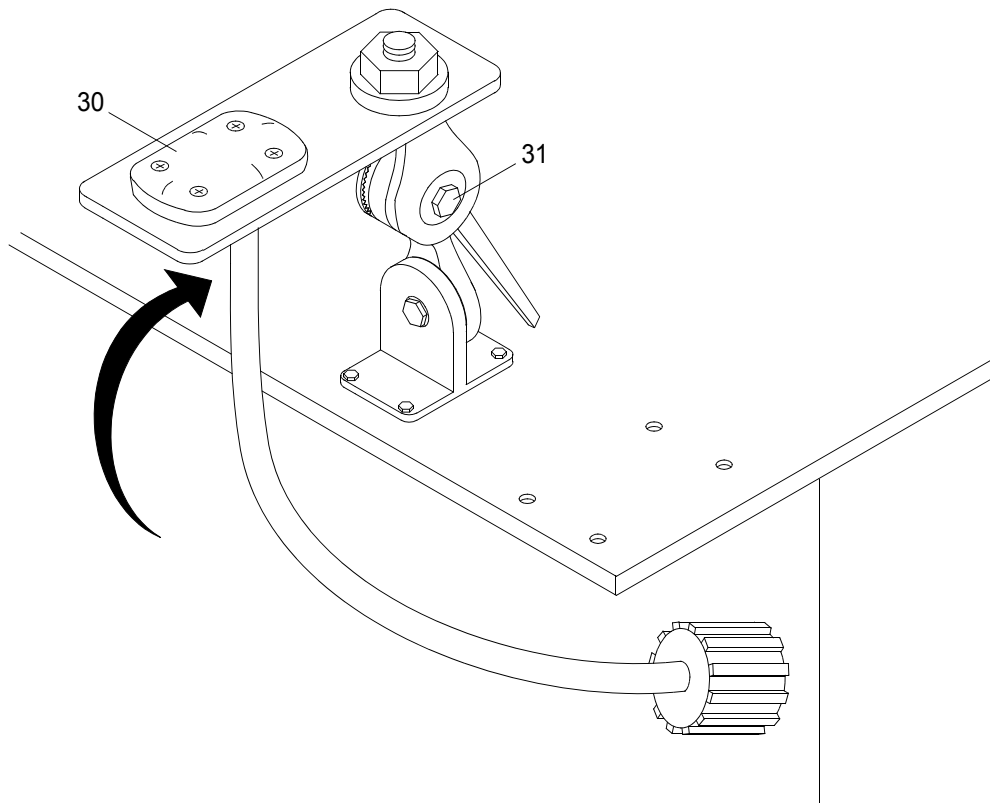
{4} Install nut (27) and tighten.

- n. Reposition VHF/FM DSC transceiver antenna (28).



- {1} Using ladder, gain access to top of operators cab.
- {2} Rotate handle (29) on VHF/FM DSC transceiver antenna ratchet mount counterclockwise to rotate antenna to vertical position.
- {3} Rotate handle (29) on VHF/FM DSC transceiver antenna ratchet mount clockwise to secure mount.

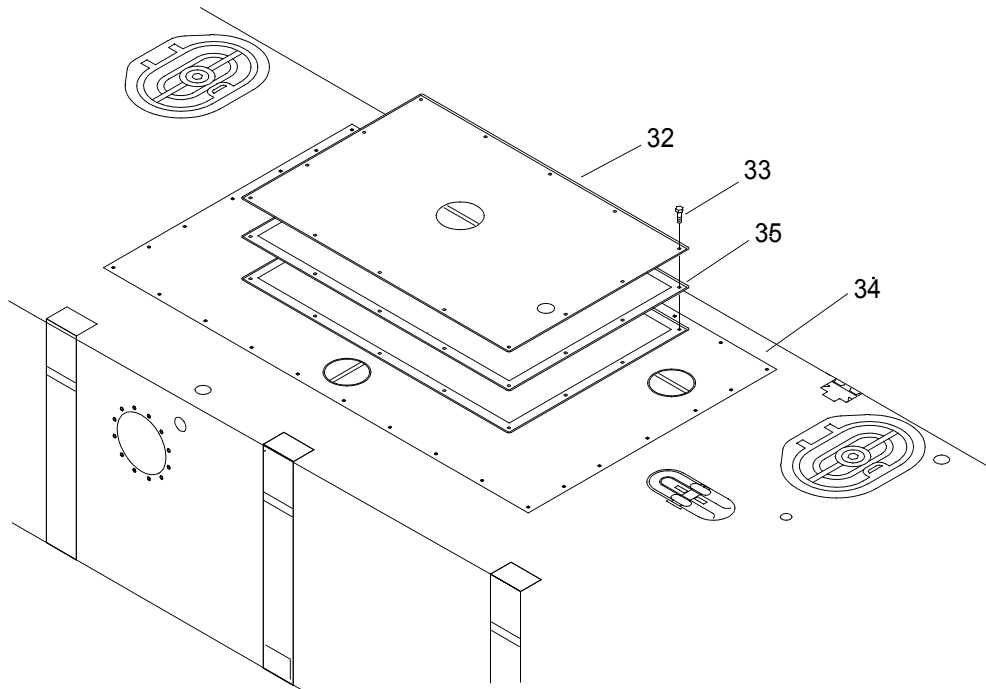
- o. Reposition GPS antenna (30).



- {1} Using ladder, gain access to top of operators cab.
- {2} Rotate handle (31) on GPS antenna ratchet mount counterclockwise to rotate antenna mount plate to horizontal position.
- {3} Rotate handle (31) on GPS antenna ratchet mount clockwise to secure mount.

INSTALL AIR INTAKE PLENUM

1. Remove port propulsion module engine hatch shipping plate (32).



- a. Remove 14 bolts (33) securing shipping plate (32) to port propulsion module engine hatch (34). Bolts will be reused for installation of the intake plenum.

WARNING

**HEAVY PARTS**

- b. Using crane, sling and shackle, remove port engine hatch plate (32).

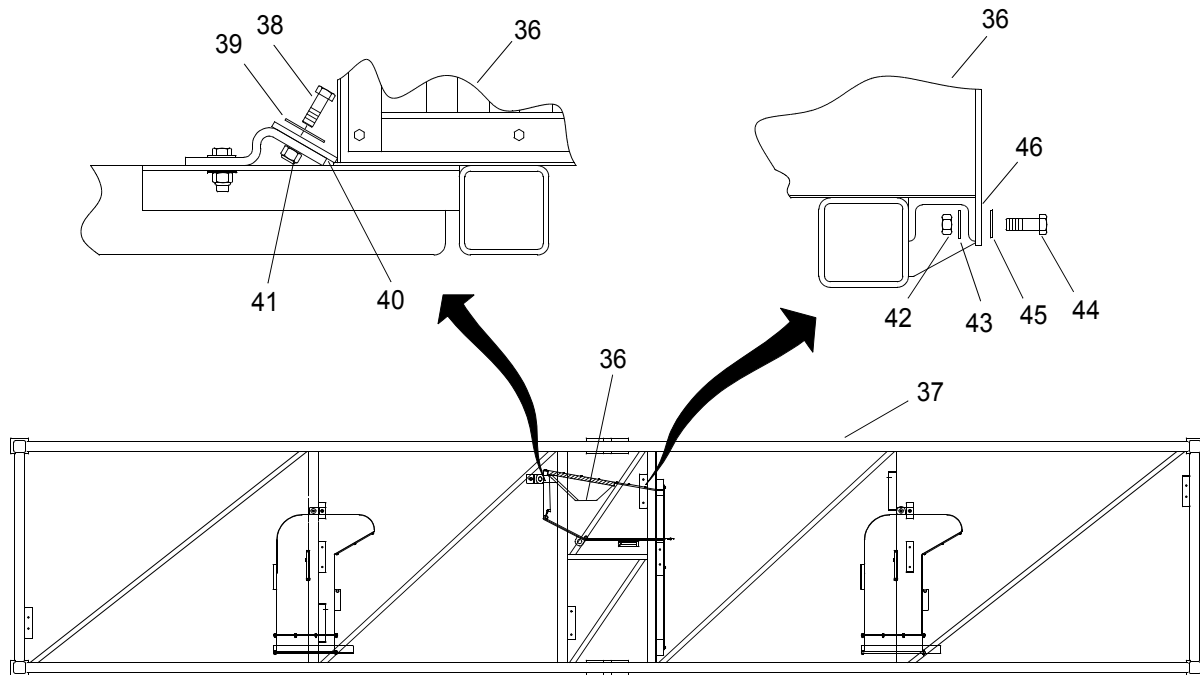
NOTE

When removing engine hatch plate the gasket will remain on engine hatch.

- c. Remove gasket (35), if damaged.
- d. Remove sling and shackle.
- e. Stow shipping plate (32).

WARNING**HEAVY PARTS**

2. Remove intake plenum (36) from shipping frame (37).

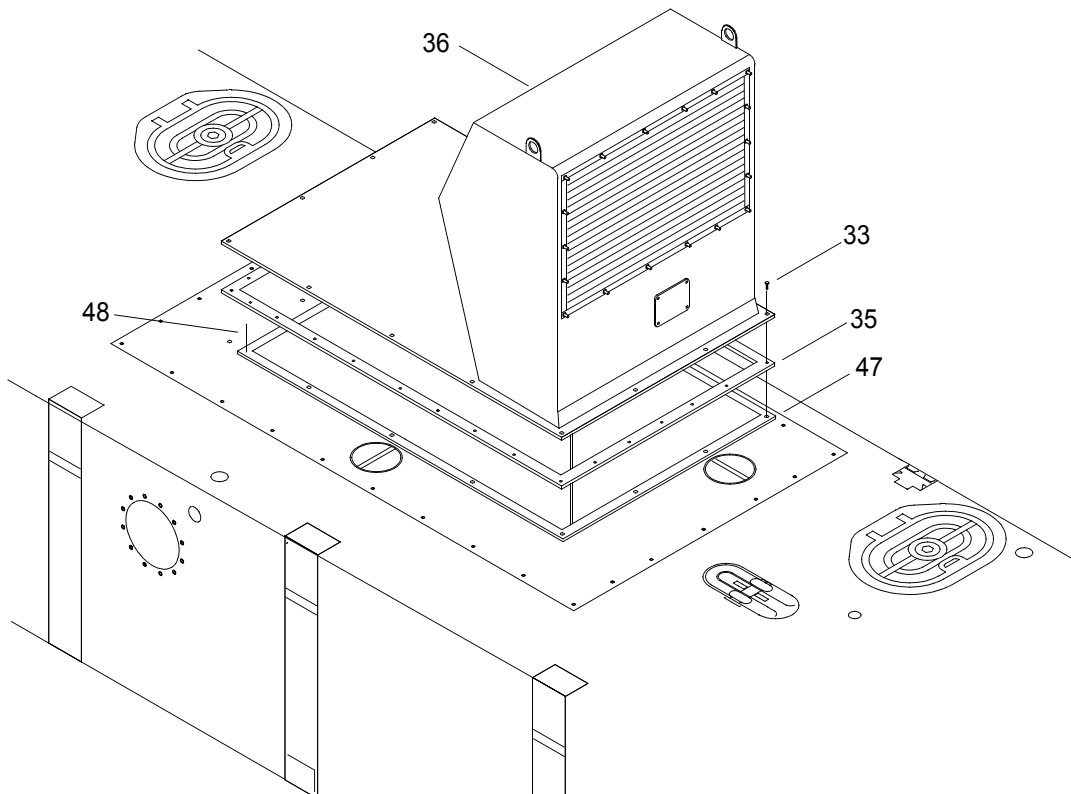
**WARNING****HEAVY PARTS**

- a. Using crane, slings and shackles, support intake plenum (36) in preparation of removal from shipping rack (37).
- b. Remove bolt (38) and washer (39), securing top of plenum to stowage frame bracket (40), from welded nut (41).
- c. Remove two nuts (42), washers (43) and bolts (44) with washer (45) securing base of intake plenum stowage frame bracket (46).

WARNING

**HEAVY PARTS**

- d. Using crane, remove plenum (36) from shipping frame (37).
 - e. Install plenum mounting hardware (38), (39), (42), (43), (44) and (45) into shipping frame (37).
3. Install intake plenum (36) on port propulsion module engine hatch (47).



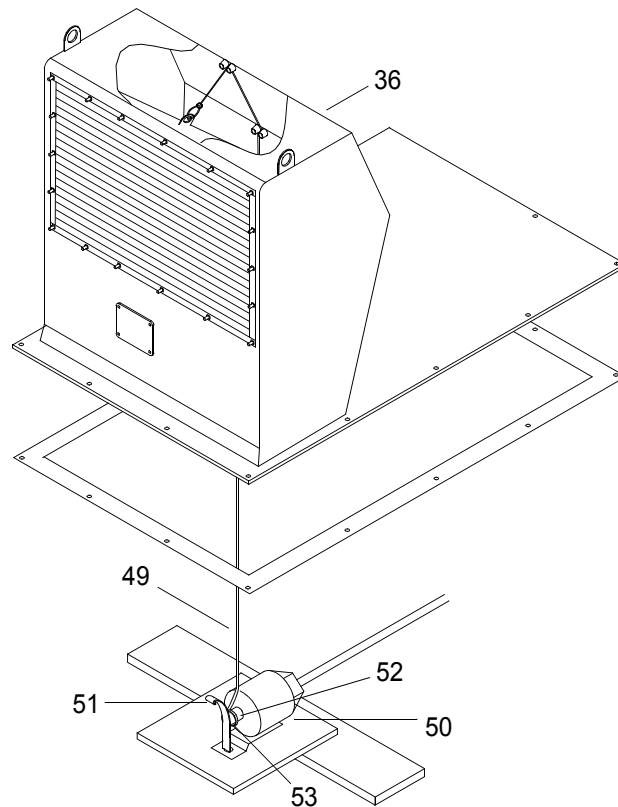
- a. Install four guide pins (48) on corners to align and install intake plenum (36).
- b. Install new gasket (35), if removed.

WARNING

**HEAVY PARTS**

- c. Using crane, slings and shackles, align intake plenum mounting holes and guide pins (48), lower intake plenum on engine hatch (47).
- d. Remove guide pins (48).

- e. Install 14 bolts (33), removed from shipping plate 33, securing plenum (37) into propulsion module (47) until snug.
- f. Tighten bolts (33) using cross method.
- g. Remove slings and shackles.
- h. Connect wire rope (49) in the intake plenum (36) to the fire suppression trip mechanism (50).



- {1} Move fire suppression solenoid spring flange (51) away from solenoid shaft (52).
- {2} Install wire rope ring (53) on the fire suppression solenoid shaft (52).
- {3} Release flange (51).

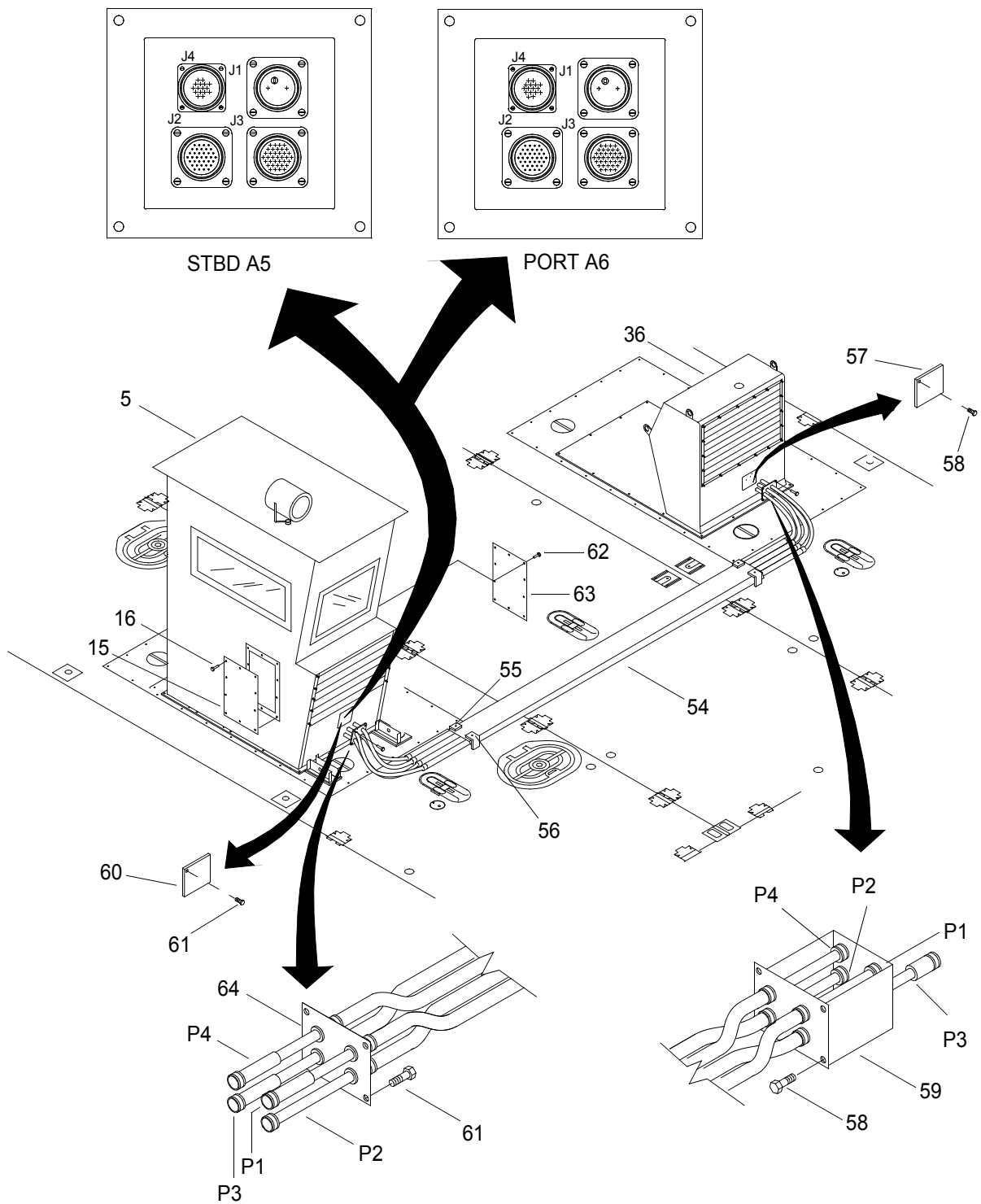
INSTALL MODULE ELECTRICAL INTERCONNECT ASSEMBLY

WARNING



HEAVY PARTS

1. Using crane, slings and shackles, lower the interconnect assembly (54) onto the WT, between the operators cab (5) and the intake plenum (36).



2. Remove slings and shackles.
3. Rotate four hold down clamps (55) into position over interconnect assembly and tighten four allen head bolts (56).

CAUTION

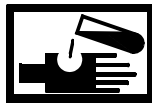
When installing the operators cab on the starboard side, the interconnect cable must be connected to the operators cab port receptacle (A6) to ensure operators control of the port engine. Failure to make proper connection could result in damage to equipment.

When connecting interconnect cables, do not use excessive force, as damage to equipment could occur.

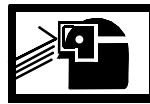
4. Connect interconnect cables to intake plenum receptacles.
 - a. Remove intake plenum front access panel (57).
 - {1} Remove bolts (58) securing front access panel (57) to intake plenum (36).
 - {2} Remove access panel (57).
 - b. Insert cables into intake plenum (36) front access.
 - c. From below deck, connect power module cables to interconnect cable receptacles.
 - {1} Connect power module junction box A3, P2 to interconnect cable, P2.
 - {2} Connect power module junction box A3, P4 to interconnect cable, P4.
 - {3} Connect power module junction box A3, P3 to interconnect cable, P3.
 - {4} Connect power module A6, P1 to interconnect cable, P1.
 - d. Install conduit entry plate (59) to air intake plenum (36).
 - {1} Align entry plate holes with holes in intake plenum (36).
 - {2} Install four bolts (58) through plate (59) into intake plenum (36).
 - {3} Tighten bolts (58).
5. Connect interconnect cables to operators cab receptacle.
 - a. Remove operators cab front access panel (60).
 - {1} Remove bolts (61) securing front access panel (60) to operators cab (5).
 - {2} Remove access panel (60).
 - b. Remove portside operators cab side access panel (63).
 - {1} Remove 10 screws (62) securing side access panel (63) to operators cab (5).
 - {2} Remove access panel (63).
 - c. Insert cables through operators cab (5) front access.
 - d. Connect interconnect cables to operators cab PORT receptacle A6.

-
- {1} Connect P2 to PORT A6, J2.
 - {2} Connect P4 to PORT A6, J4.
 - {3} Connect P3 to PORT A6, J3.
 - {4} Connect P1 to PORT A6, J1.
- e. From below deck, bring the power module A6, cable P1 and power module junction box A3, cables P2, P3, and P4 up through the bottom of the operators cab intake plenum area.
- f. Connect the power module cables to STBD receptacle A5.
- {1} Connect power module A6, P2 to STBD A5, J2.
 - {2} Connect power module A6, P4 to STBD A5, J4.
 - {3} Connect power module A6, P3 to STBD A5, J3.
 - {4} Connect power module A3, P1 to STBD A5, J1.
- g. Secure conduit entry plate (64) to the operators cab (5).
- {1} Align entry plate holes with holes in operators cab (5).

WARNING



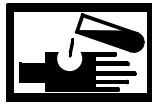
CHEMICAL



EYE PROTECTION

- {2} Apply adhesive to threads of bolts (16).
 - {3} Install four bolts (16) through entry plate (64) into operators cab (5).
 - {4} Tighten bolts (16).
- h. Install both operators cab side access panels (15) and (63).
- {1} Align panel (63) holes with holes in operators cab (5).

WARNING



CHEMICAL



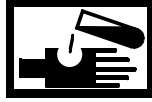
EYE PROTECTION

- {2} Apply adhesive to threads of bolts (62).
- {3} Install ten bolts (62) through side access panel into operators cab.

{4} Tighten bolts (62).

{5} Align panel (15) holes with holes in operators cab (5).

WARNING



CHEMICAL



EYE PROTECTION

{6} Apply adhesive to threads of bolts (16).

{7} Install ten bolts (16) through side access panel into operators cab (5).

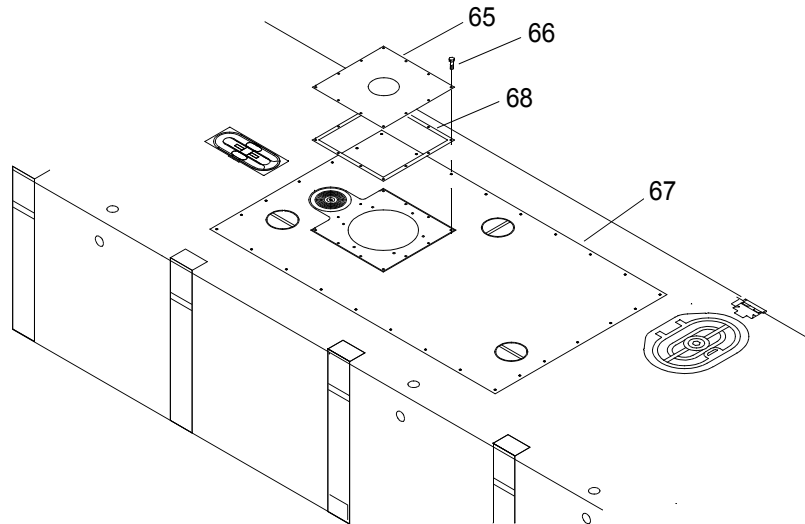
{8} Tighten bolts (16).

INSTALL PORT AND STARBOARD EXHAUST PLENUMS

NOTE

These procedures are typical for both port and starboard exhaust plenums.

1. Remove propulsion module pump-jet thruster hatch shipping plate (65).



- a. Remove 12 bolts (66) securing shipping plate (65) to propulsion module pump-jet thruster hatch (67).

WARNING

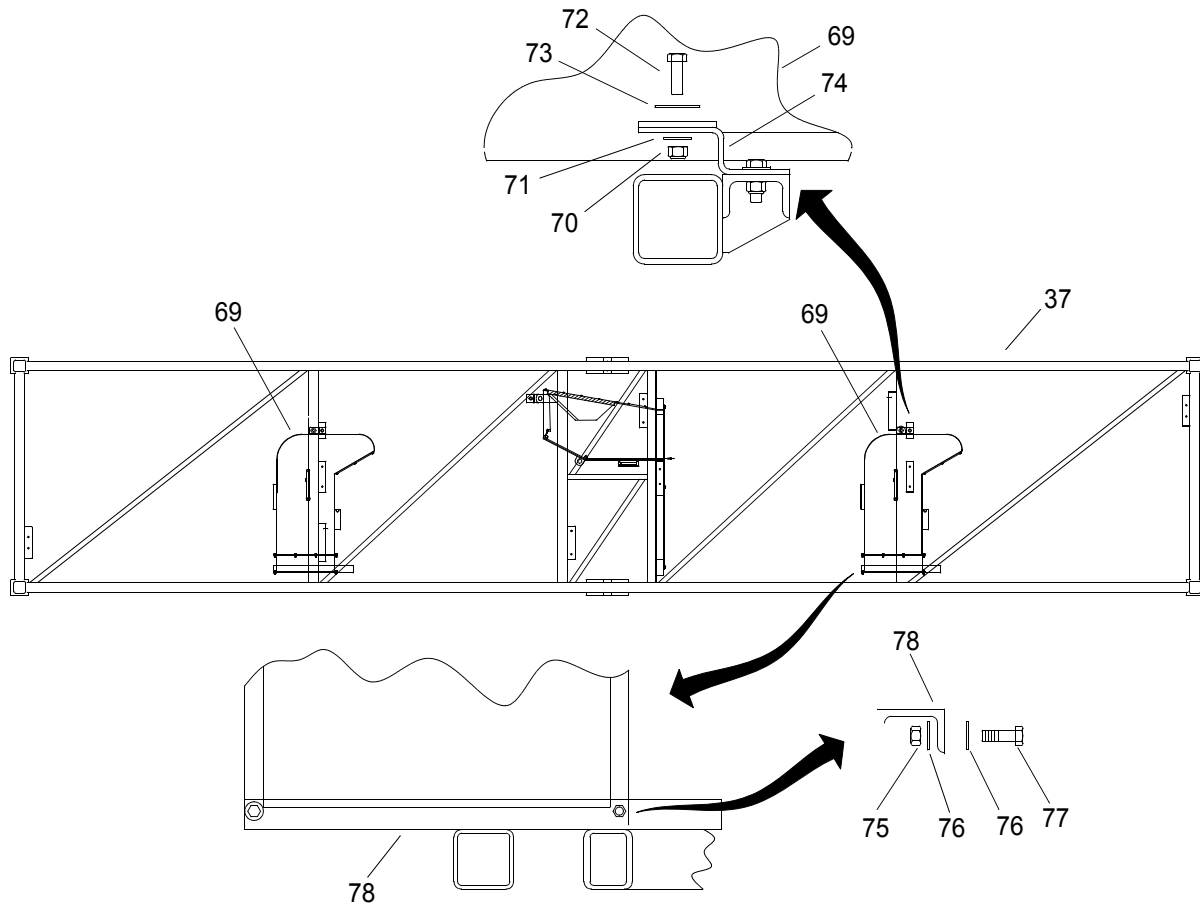


HEAVY OBJECTS

- b. Remove port pump-jet thruster hatch shipping plate (65).
- c. Remove gasket (68), if damaged.

d. Stow shipping plate (65).

2. Remove propulsion module exhaust plenum (69) from shipping frame (37).



WARNING



HEAVY PARTS

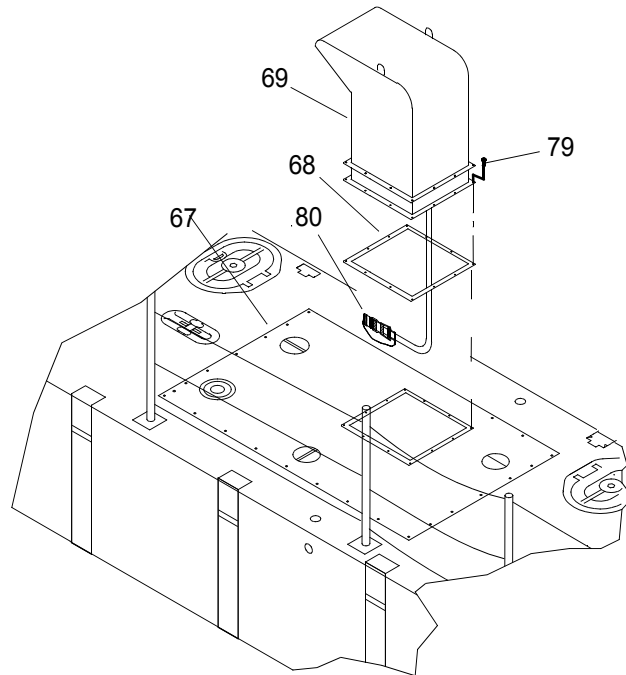
- a. Using crane, slings and shackles, support propulsion module exhaust plenum (69) in preparation of removal from shipping rack (37).
- b. Remove nut (70), washer (71), bolt (72) and fender washer (73) securing top of plenum (69) to stowage frame bracket (74).
- c. Remove two nuts (75), washers (76), bolts (77) and washers (78) securing bottom of plenum (69) to stowage frame bracket (78).

WARNING**HEAVY PARTS**

- d. Using crane remove propulsion module exhaust plenum (69) from shipping rack (37).
- e. Install plenum mounting hardware (70), (71), (72), (73), (75), (76) and (77) into shipping frame (37)

WARNING**HEAVY PARTS**

3. Position exhaust plenum (69), with the grating facing aft, over pump-jet thruster hatch (67).

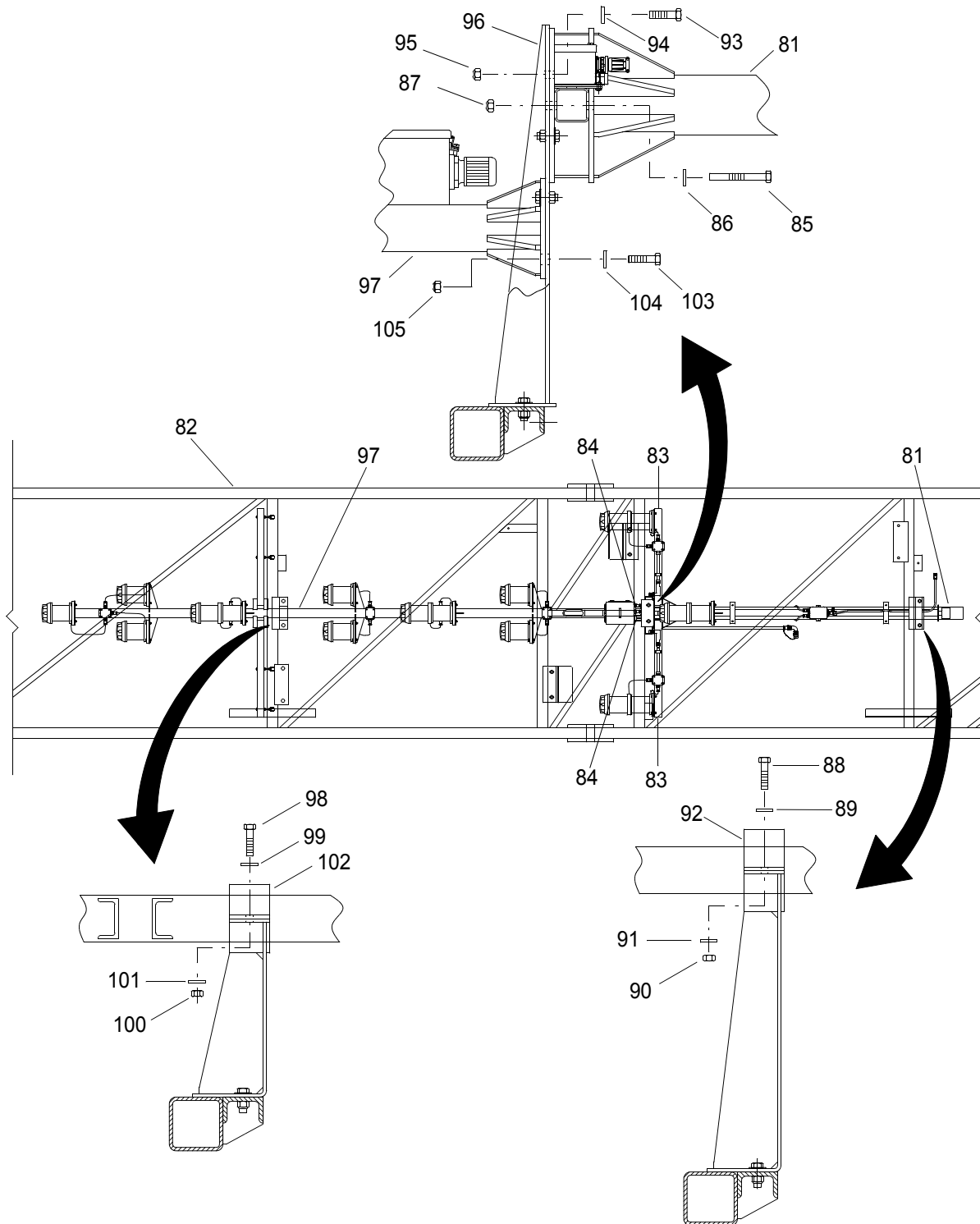


4. Install exhaust plenum (69) on pump-jet thruster hatch (67).
 - a. Align holes in base of exhaust plenum (69) with holes in pump-jet thruster hatch (67).
 - b. Install new gasket (68).
 - c. Install 12 bolts (79) through exhaust plenum (69) into holes in pump-jet thruster hatch (67).
 - d. Tighten bolts (79).
 - e. Remove slings and shackles.

5. Connect exhaust plenum fan cable (80) to vent fan relay enclosure A8.

INSTALL MAIN MAST

1. Remove lower main mast (81) from shipping frame (82).



NOTE

This step is typical for both the port and starboard yardarms.

- a. Remove lower main mast yardarm (83).
 - {1} Remove yardarm electrical cable connector (84).
 - {2} Remove two bolts (85) with washers (86) and nuts (87) securing yardarm to lower main mast (81). Retain hardware for installation of yardarms during assembly.
 - {3} Remove yardarm (83).
- b. Remove two bolts (88) with washers (89), nuts (90) and washers (91) securing upper end of lower main mast (81).
- c. Remove upper clamp half (92).

WARNING

**HEAVY PARTS**

- d. Using crane, slings and shackles to support the lower main mast (81), remove four bolts (93) with washers (94) and nuts (95) securing lower main mast base to stowage frame bracket (96).

WARNING

**HEAVY PARTS**

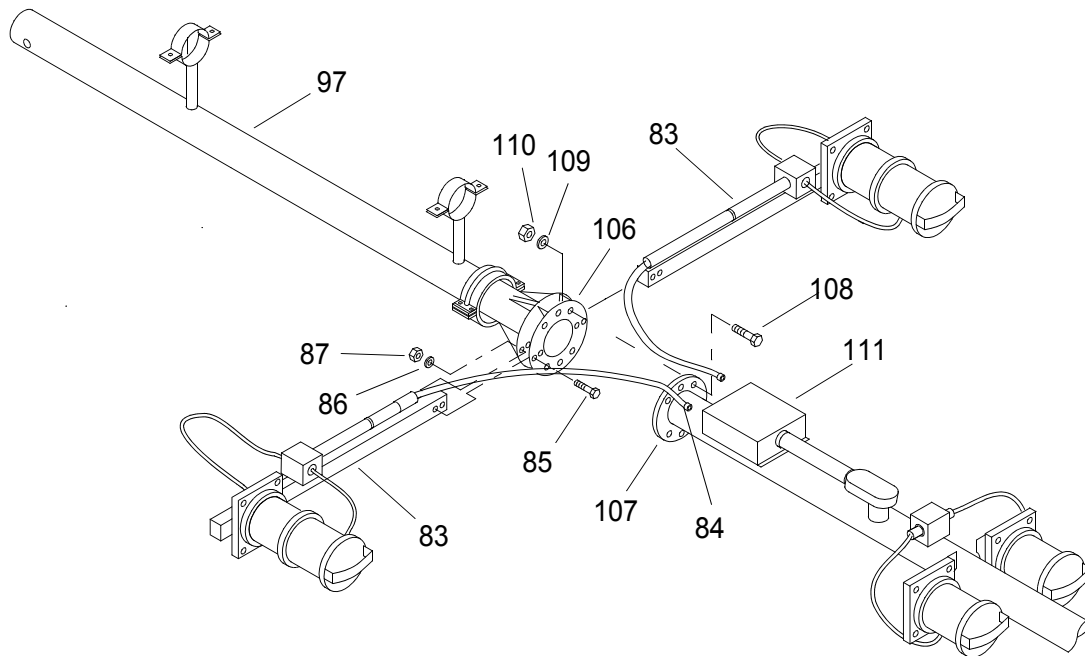
- e. Remove lower main mast (81) from shipping frame (82) and place mast on dunnage.
 - f. Remove slings and shackles.
2. Remove upper main mast (97) from shipping frame (82).
 - a. Remove two bolts (98) with washers (99), nuts (100) and washers (101) securing upper end of upper main mast (97).
 - b. Remove upper clamp half (102).

WARNING

**HEAVY PARTS**

- c. Using crane, slings and shackles to support the upper main mast (97), remove four bolts (103) with washers (104) and nuts (105) securing upper main mast (97).

- d. Remove upper main mast (97) from shipping frame (82) and place on dunnage.
 - e. Remove slings and shackles.
 - f. Install upper clamp (92) on to shipping frame (82), using bolt (88) with washer (89), nut (90) with washer (91).
 - g. Install upper clamp (102) on to shipping frame (82), using bolt (98) with washer (99), nut (100) with washer (101).
3. Assemble main navigation mast assembly.
 - a. Align holes in lower main mast weldment (106) with holes in upper main mast weldment (107).



- b. Install six bolts (108), washers (109) and nuts (110) through upper main mast weldment (106) and lower main mast weldment (107). Do not tighten nuts.

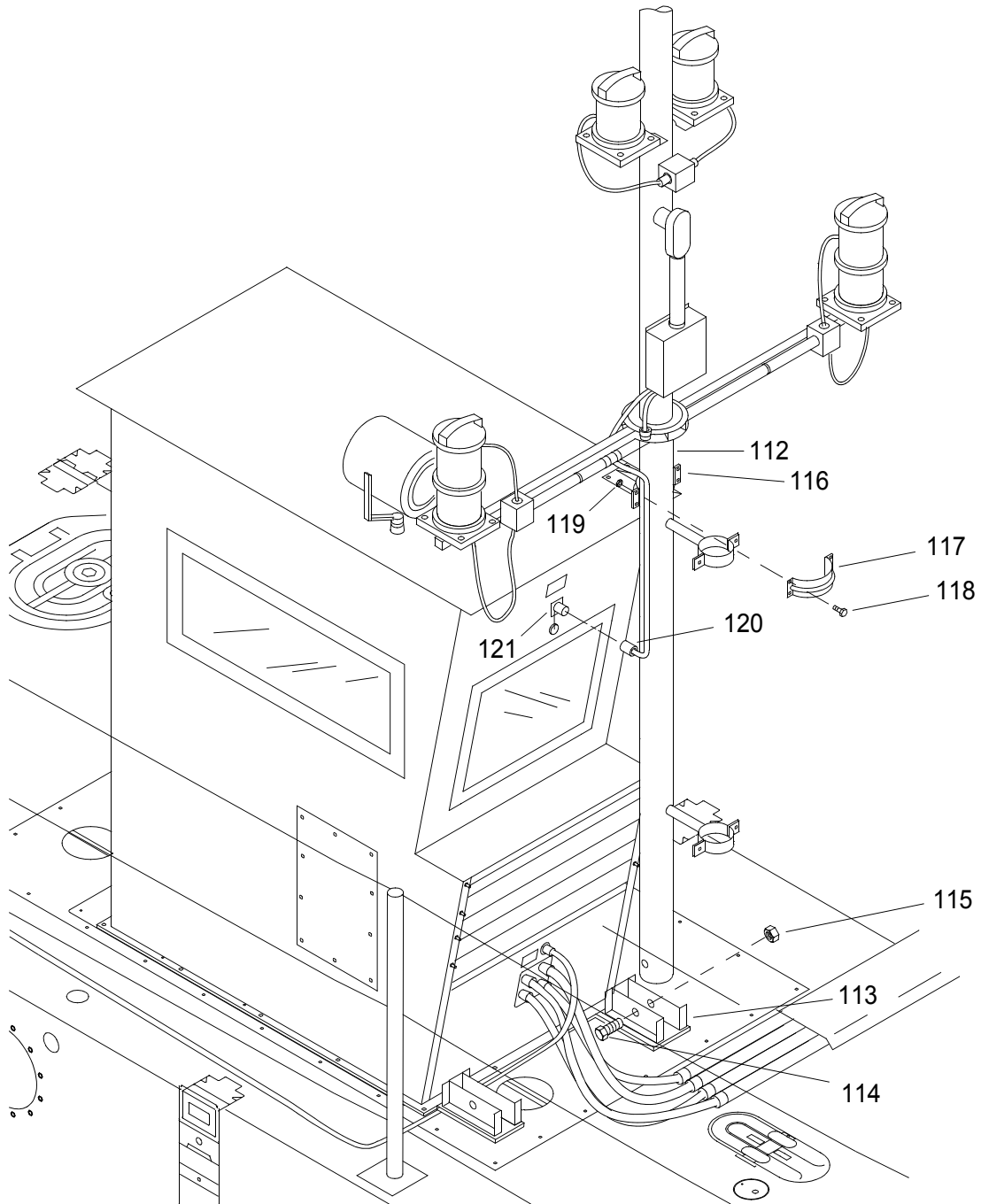
NOTE

This step is typical for both port and starboard yardarms.

- c. Install lower main mast yardarm (83).
 - {1} Install yardarm (83) into lower main mast weldment (106).
 - {2} Align holes and install two bolts (85), washers (86) and nuts (87) through lower main mast weldment (106) and yardarm (83).
 - {3} Tighten nuts (87) and (110).
 - {4} Attach yardarm electrical cable connector (84) to mast junction box (111).
4. Install main navigation mast assembly (112).

WARNING**HEAVY PARTS**

- a. Using crane, sling and shackle, lift mast (112) to position base into deck holder (113).



- b. Align holes in base of main mast (112) with holes in deck holder (113).

- c. Install bolt (114) and hex nut (115), do not tighten nut.
- d. Raise main mast (112) until mast contacts operators cab mast clamp (116).
- e. Using ladder, gain access to top of operators cab.
- f. Install clamp outer half (117) using four cap screws (118) and hex nuts (119), tighten nuts.
- g. Tighten nut (115).
- h. Remove sling and shackle.
- i. Connect electrical connector (120) to operators cab connector (121).
- j. Descend from operators cab and remove ladder.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
STERN ANCHOR FRAME
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Sling, 5300 lbs (Green) (Item 70, WP 0108 00)
 Qty 2
 4 ¾ Ton ¾ in. Shackle (Item 5, WP 0108 00)
 Qty 2

Personnel Required

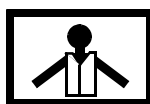
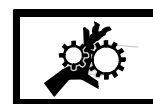
Seaman 88K (2)

Equipment Condition

Module ISOPAK Disassembled. (WP 0007 00)
 Operation Of Male And Female Guillotine Connectors. (WP 0008 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Installed. (WP 0009 00)
 Module String Assembled. (WP 0010 00)
 Warping Tug Assembled. (WP 0011 00)
 Winch Installed. (WP 0013 00)
 Winch Mounting Plates Installed. (WP 0014 00)
 Winch A-Frame Installed. (WP 0015 00)
 Warping Tug Above Deck Equipment Installed. (WP 0016 00)

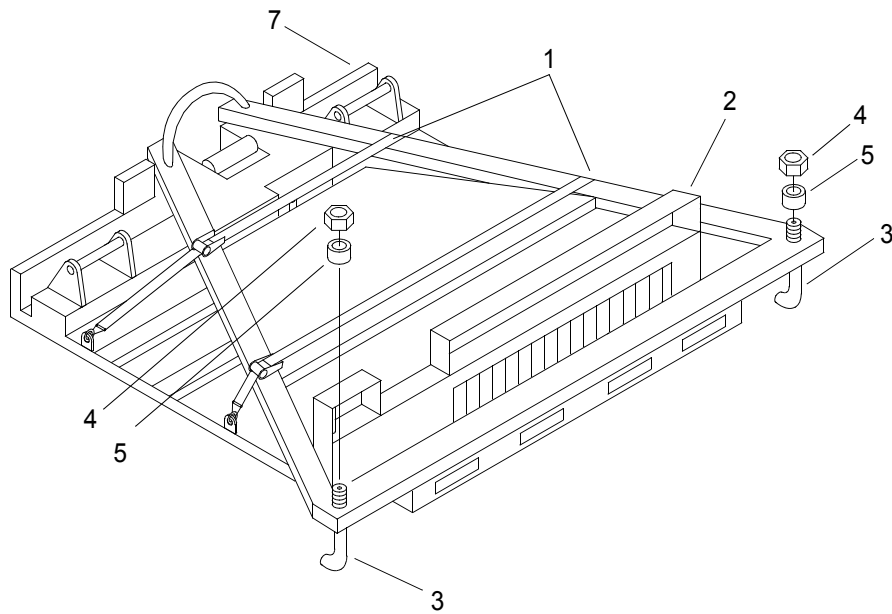
PREPARATION FOR USE - INSTALL STERN ANCHOR FRAME

WARNING

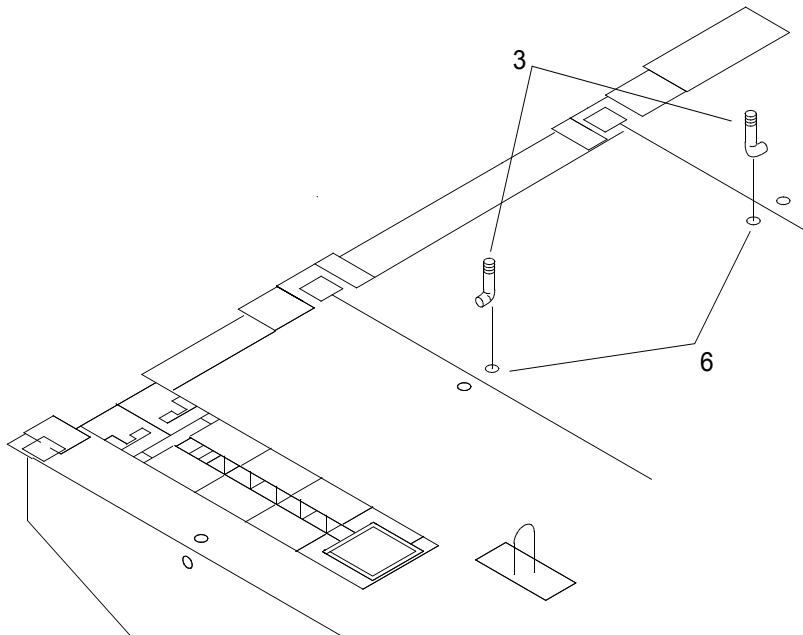
**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Loosen and remove two straps (1) from stern anchor frame (2).

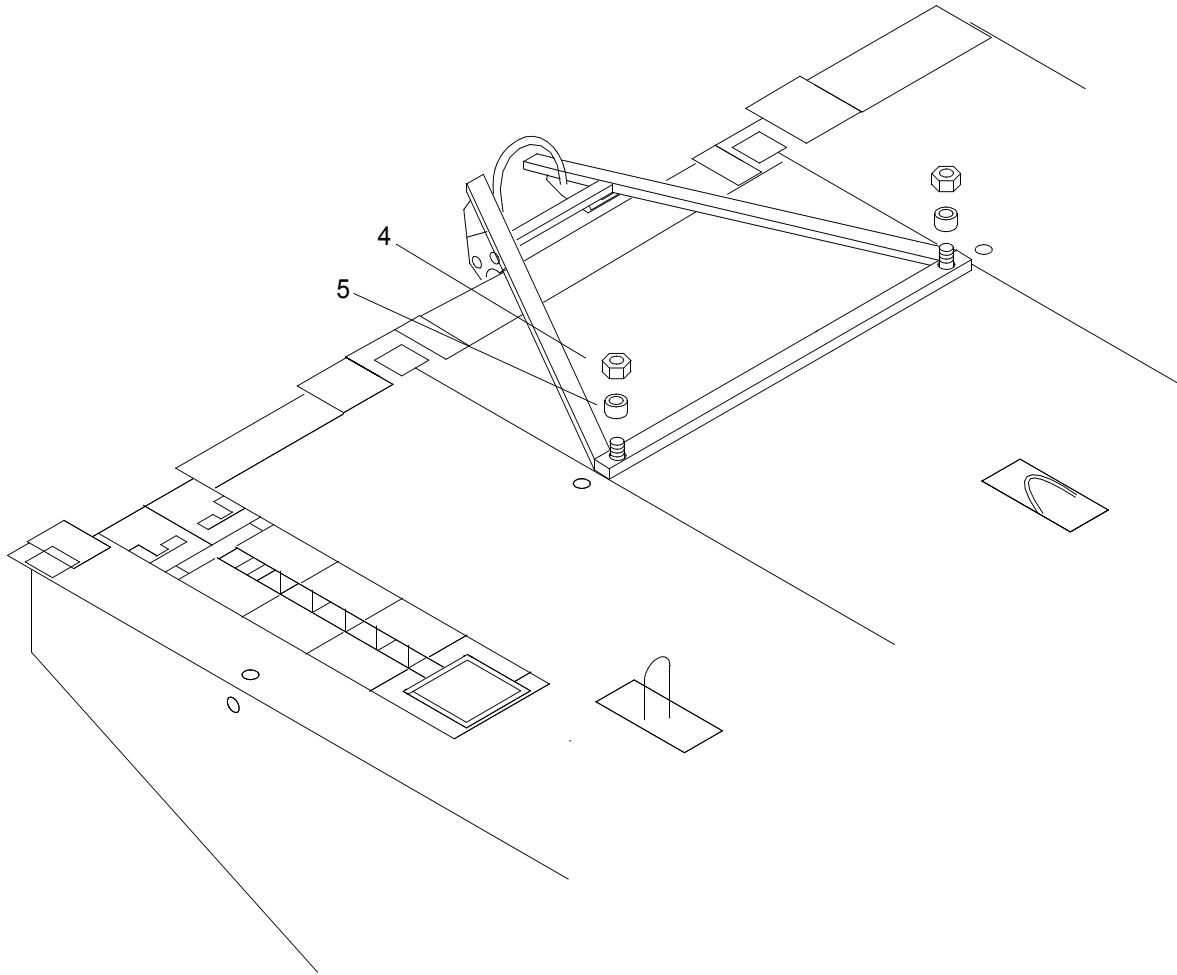


2. Remove two J-bolts (3) from stern anchor frame (2).
 - a. Remove nut (4) and bushing (5).
 - b. Remove J-bolt (3).
3. Install two J-bolts (3) into side turn tube deck holes (6) on WT aft center rake module.



4. Using crane, slings and shackles, remove stern anchor frame (2) from stowage pallet (7) and position onto WT aft center end rake J-bolts.

5. Install the J-bolt bushings (5) and nuts (4) and tighten until snug, then tighten 1/3 turn (120°).



6. Remove slings and shackles.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
STERN ANCHOR
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Sling, 5300 lbs (Green) (Item 70, WP 0108 00)
 4 ¾ Ton ¾ in. Shackle (Item 5, WP 0108 00)

Personnel Required

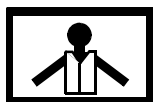
Seaman 88K (2)

Equipment Condition

Module ISOPAK Disassembled. (WP 0007 00)
 Operation Of Male And Female Guillotine Connectors. (WP 0008 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Installed. (WP 0009 00)
 Module String Assembled. (WP 0010 00)
 Warping Tug Assembled. (WP 0011 00)
 Winch Installed. (WP 0013 00)
 Winch Mounting Plates Installed. (WP 0014 00)
 Winch A-Frame Installed. (WP 0015 00)
 Warping Tug Above Deck Equipment Installed. (WP 0016 00)
 Stern Anchor Frame Installed. (WP 0017 00)

PREPARATION FOR USE - INSTALL STERN ANCHOR

WARNING

**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS****HEAVY PARTS**

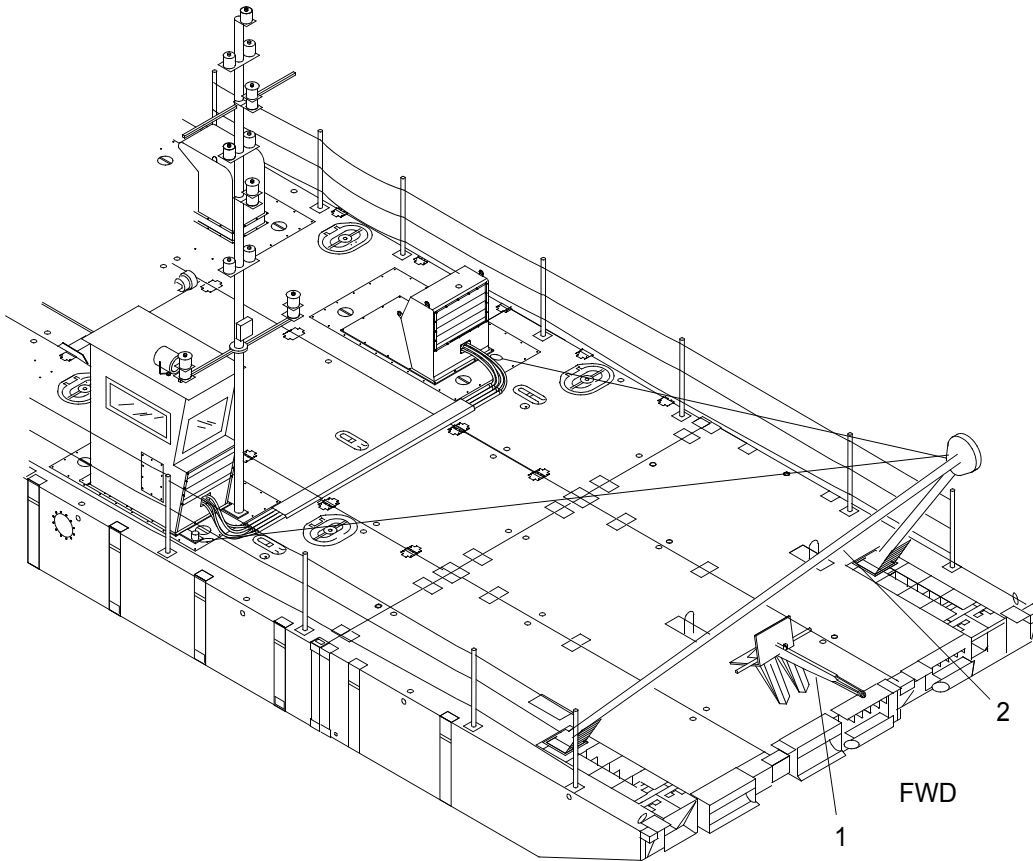
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

NOTE

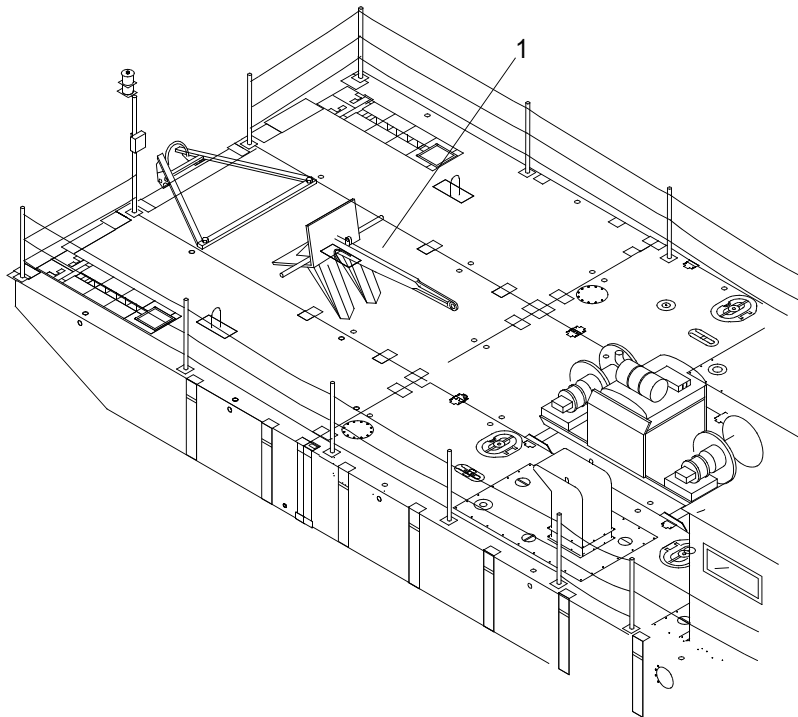
The stern anchor may be installed from the forward or aft end of the WT. The following steps are for both procedures.

1. Using crane, sling and shackle, lower the 1,000 lb NAVMOOR anchor (1) onto WT forward or aft deck.

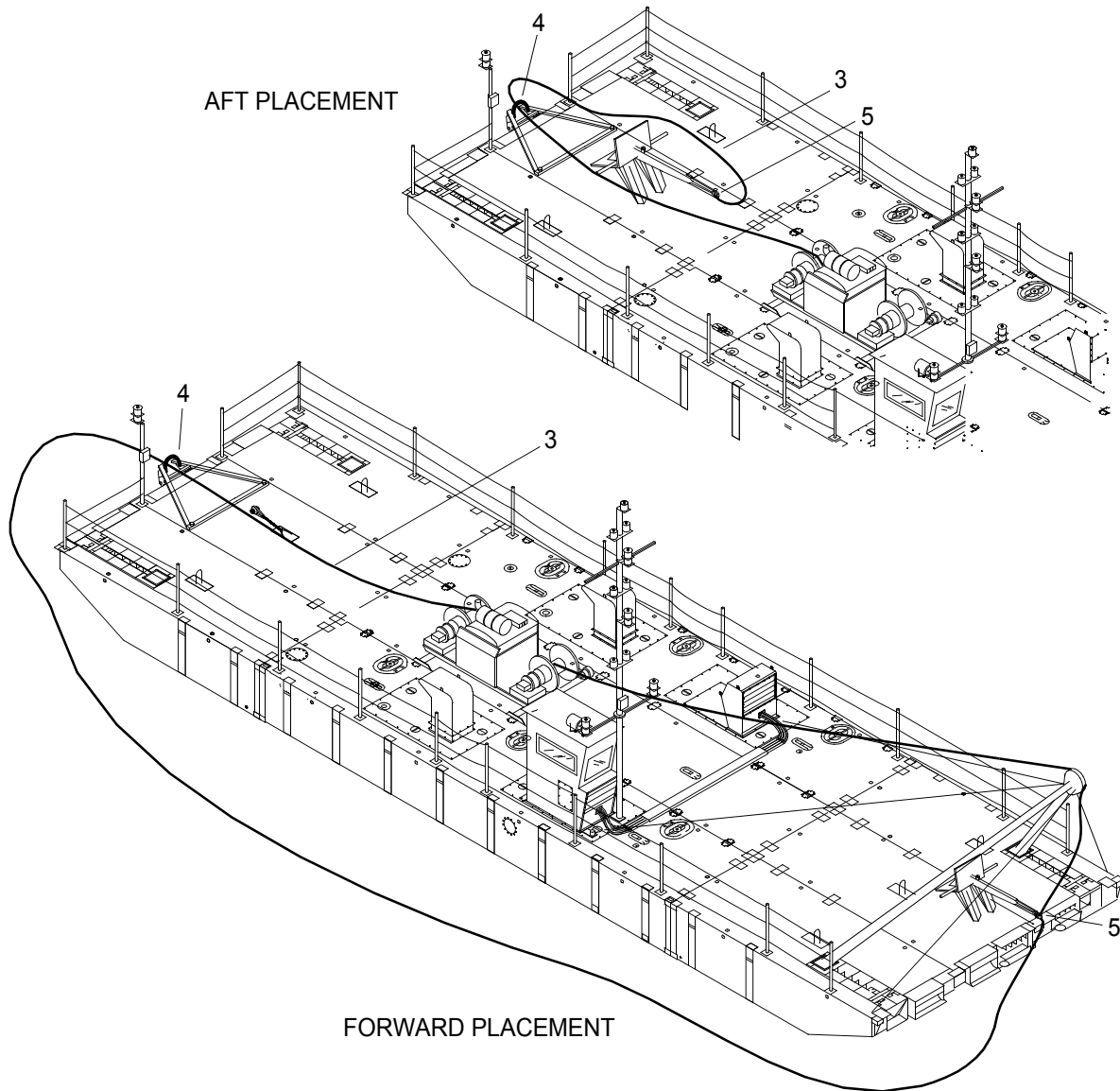
- a. Spot the anchor (1) forward so that it can be placed overboard using the WT A-frame (2).



- b. Spot the anchor (1) aft where crane will be required to place it over the side.



- c. Remove sling and shackle.
2. Lead the after winch drum wire (3) through the anchor frame guide bow (4) and then to the connecting link (5) on the anchor (1) and secure it.

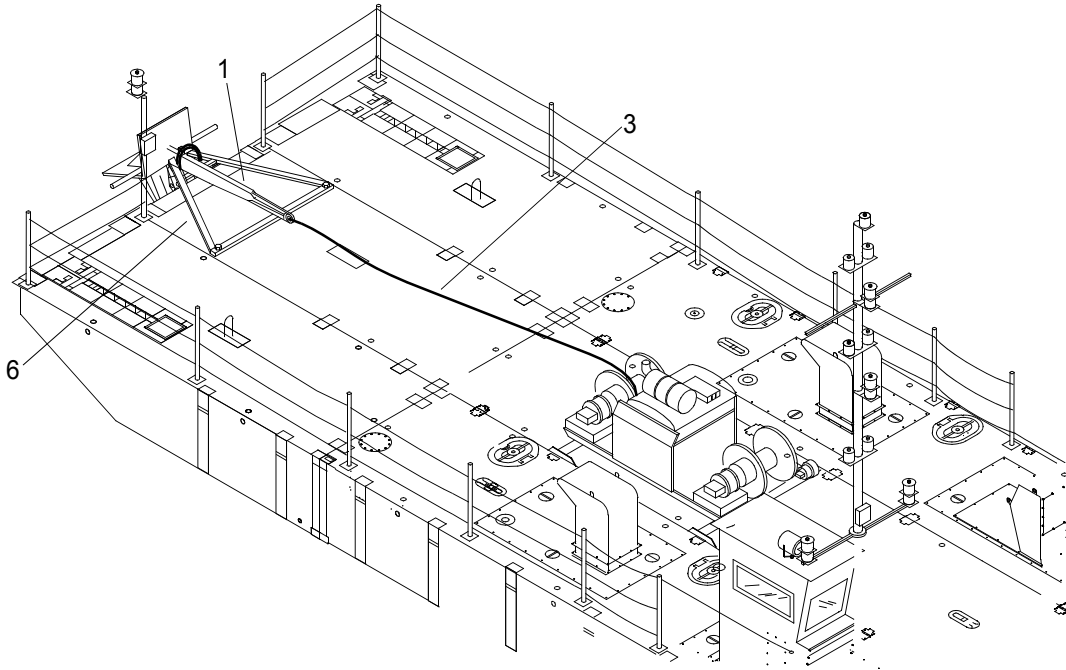


WARNING

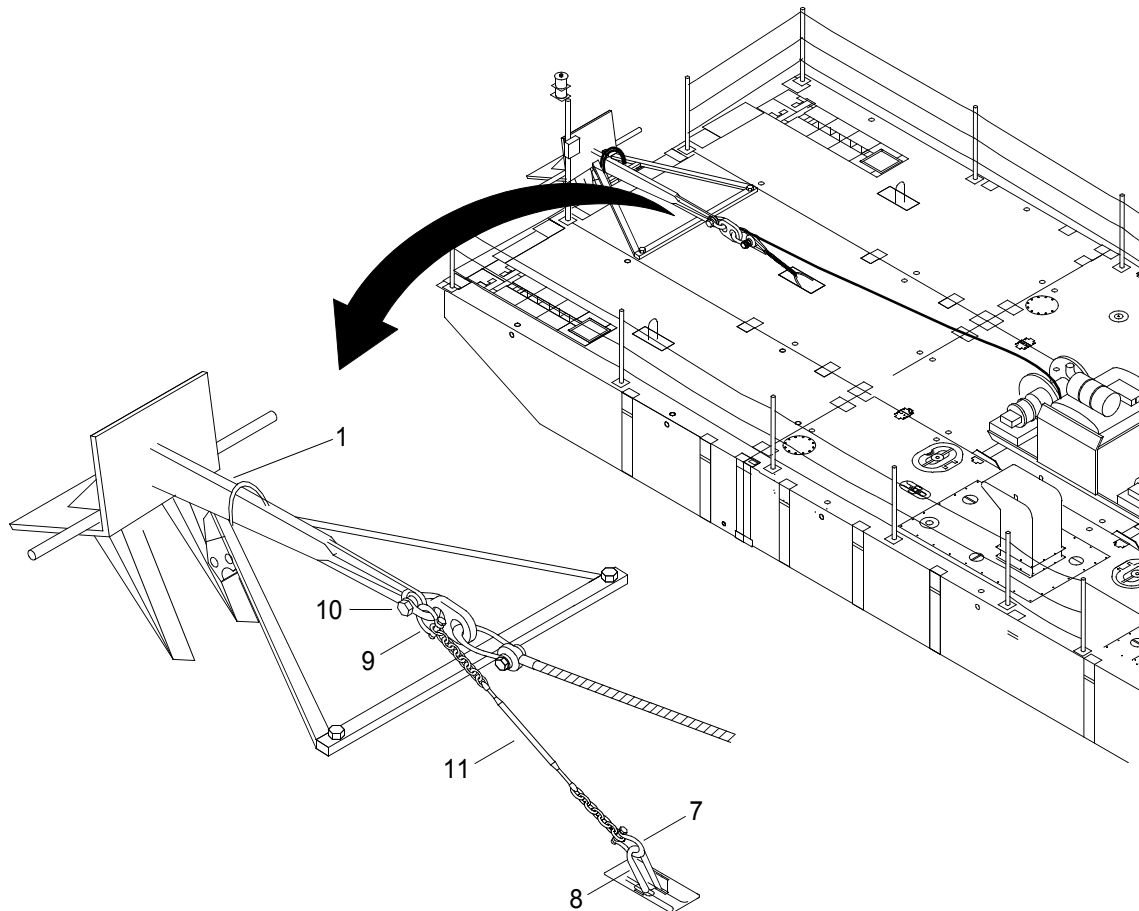
**HEAVY PARTS**

3. Use the A-frame (2) or crane to place the anchor (1) overboard.

4. Using the aft winch drum wire (3) haul the anchor (1) up onto the stern anchor frame (6).



5. Attach the large shackle (7) of the retaining assembly to the lifting lug (8) of the center rake module.



-
6. Attach the retaining assembly shackle (9) to the anchor shank shackle (10).
 7. Tighten the retaining assembly turnbuckle (11) to secure the anchor (1) in place.
 8. Remove aft drum wire (3) from anchor (1).

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
STUB NAVIGATION MAST
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

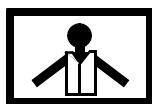
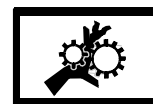
Seaman 88K

Equipment Condition

Module ISOPAK Disassembled. (WP 0007 00)
 Operation Of Male And Female Guillotine Connectors. (WP 0008 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Installed. (WP 0009 00)
 Module String Assembled. (WP 0010 00)
 Warping Tug Assembled. (WP 0011 00)
 Winch Installed. (WP 0013 00)
 Winch Mounting Plates Installed. (WP 0014 00)
 Winch A-Frame Installed. (WP 0015 00)
 Warping Tug Above Deck Equipment Installed. (WP 0016 00)
 Stern Anchor Frame Installed. (WP 0017 00)
 Stern Anchor Installed. (WP 0018 00)

PREPARATION FOR USE - INSTALLATION OF STUB NAVIGATION MAST

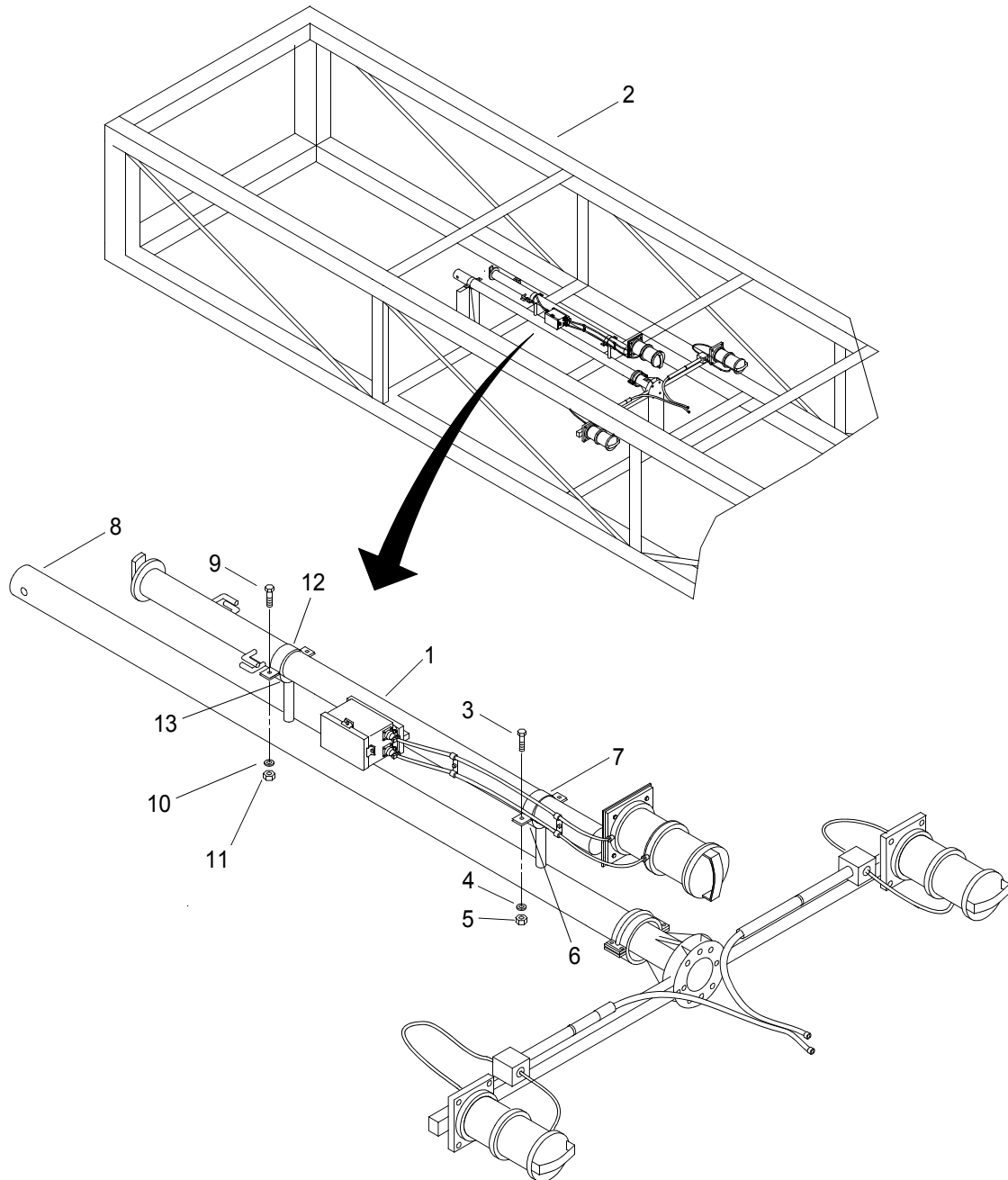
WARNING

**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

INSTALL STUB MAST

1. Remove stub mast (1) from shipping frame (2).

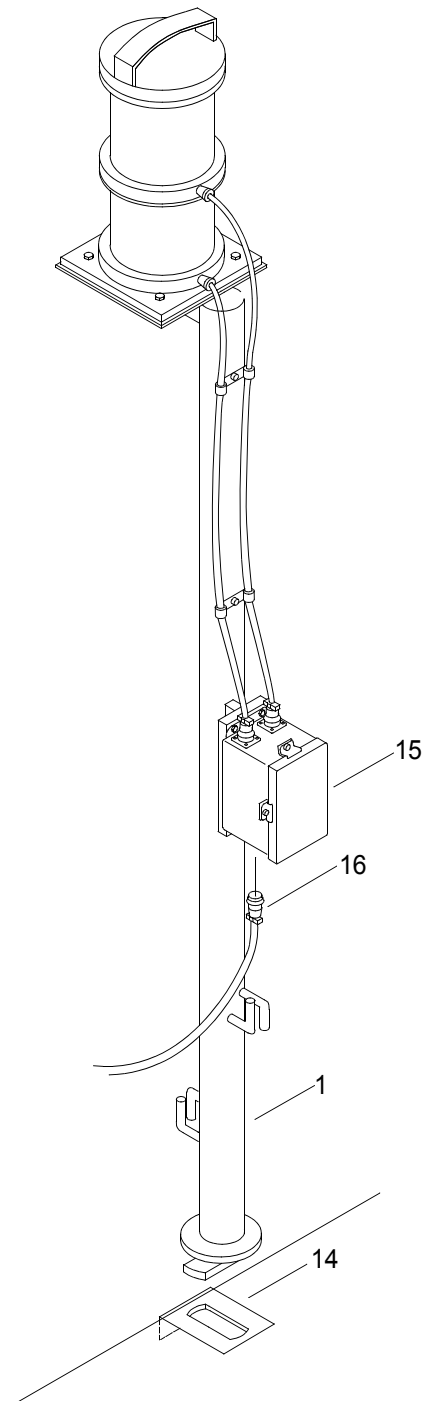


- a. Remove two bolts (3), washers (4) and nuts (5) through clamp halves (6 and 7) attaching upper end of stub mast (1) to lower main mast (8).
- b. Remove two bolts (9), washers (10) and nuts (11) through clamp halves (12 and 13) attaching lower end of stub mast (1) to lower main mast (8).
- c. Remove stub mast (1) from shipping frame (2).
- d. Install clamp half (7) on clamp half (6) on lower main mast shipping fixture.

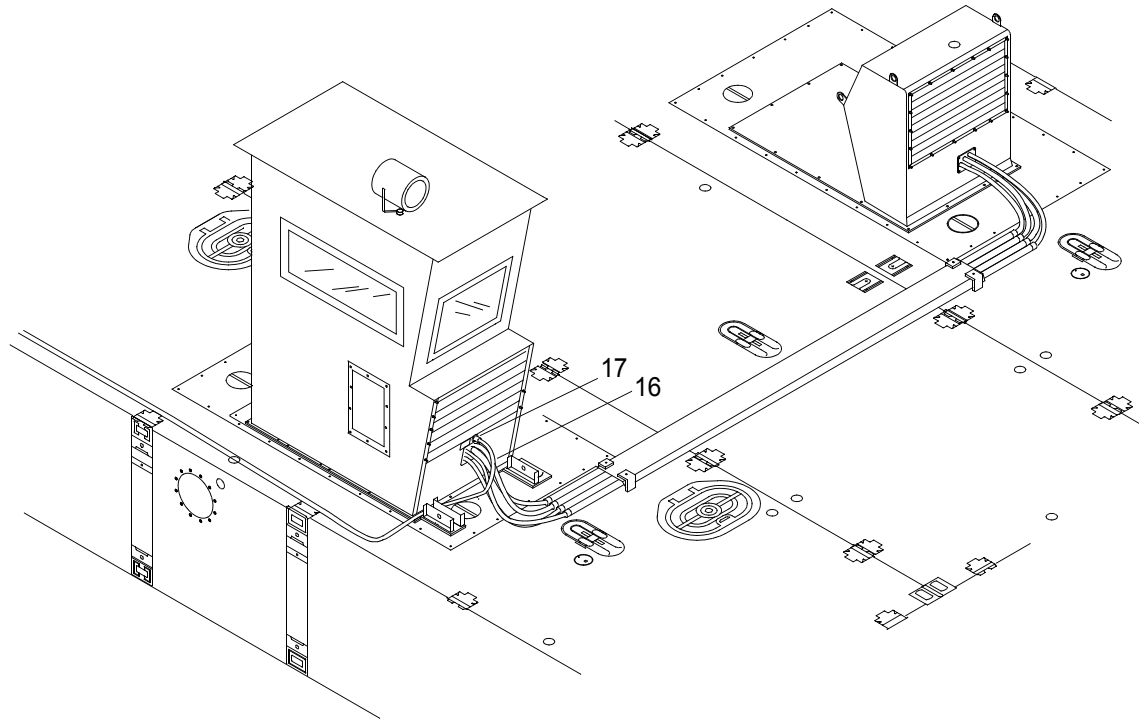
{1} Align removable clamp half holes with fixed clamp half holes.

{2} Install two bolts (3), washers (4) and nuts (5).

-
- {3} Tighten nuts (5).
- e. Install clamp half (12) on clamp half (13) on lower main mast shipping fixture.
- {1} Align removable clamp half holes with fixed clamp half holes.
- {2} Install two bolts (9), washers (10) and nuts (11).
- {3} Tighten nuts (11).
2. Position stub mast (1) at mounting location on the starboard side of the left end rake ISO fitting (14).



3. Insert the base of the stub mast (1) into the corner ISO fitting (14).
4. Rotate the stub mast 90° to lock into place in the ISO fitting (14), with the electrical junction box (15) facing inboard.
5. Connect the stub mast electrical cable (16) to the stub mast electrical junction box (15).
6. Run the electrical cable (16) along the outer edge of propulsion module and connect at receptacle (17) below intake louver vent on front of operators cab.



END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
FENDERS
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Sling, Lifting 5300 lbs (Green) (Item 70, WP 0108 00)
 4 ¾ Ton ¾ in. Shackle (Item 5, WP 0108 00)

Personnel Required

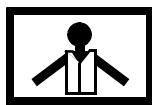
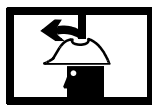
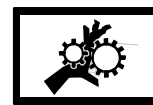
Seaman 88K

Equipment Condition

Module ISOPAK Disassembled. (WP 0007 00)
 Operation Of Male And Female Guillotine Connectors. (WP 0008 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Installed. (WP 0009 00)
 Module String Assembled. (WP 0010 00)
 Warping Tug Assembled. (WP 0011 00)
 Winch Installed. (WP 0013 00)
 Winch Mounting Plates Installed. (WP 0014 00)
 Winch A-Frame Installed. (WP 0015 00)
 Warping Tug Above Deck Equipment Installed. (WP 0016 00)
 Stern Anchor Frame Installed. (WP 0017 00)
 Stern Anchor Installed. (WP 0018 00)
 Stub Navigation Mast Installed. (WP 0019 00)

PREPARATION FOR USE - INSTALLATION OF FENDERS

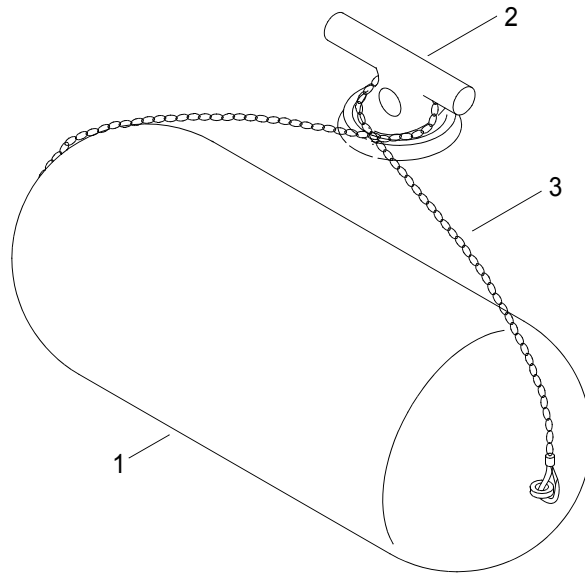
WARNING

**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Using crane, sling and shackle, remove fender (1) from box and place on deck.
2. Attach fender to deck cleat fittings (2) with the wire rope assembly (3).
3. Remove sling and shackle.

4. Roll fender over side.



END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
SAFETY EQUIPMENT
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

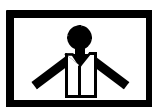
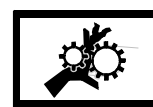
Seaman 88K

Equipment Condition

Module ISOPAK Disassembled. (WP 0007 00)
 Operation Of Male And Female Guillotine Connectors. (WP 0008 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Installed. (WP 0009 00)
 Module String Assembled. (WP 0010 00)
 Warping Tug Assembled. (WP 0011 00)
 Winch Installed. (WP 0013 00)
 Winch Mounting Plates Installed. (WP 0014 00)
 Winch A-Frame Installed. (WP 0015 00)
 Warping Tug Above Deck Equipment Installed. (WP 0016 00)
 Stern Anchor Frame Installed. (WP 0017 00)
 Stern Anchor Installed. (WP 0018 00)
 Stub Navigation Mast Installed. (WP 0019 00)
 Fenders Installed. (WP 0020 00)

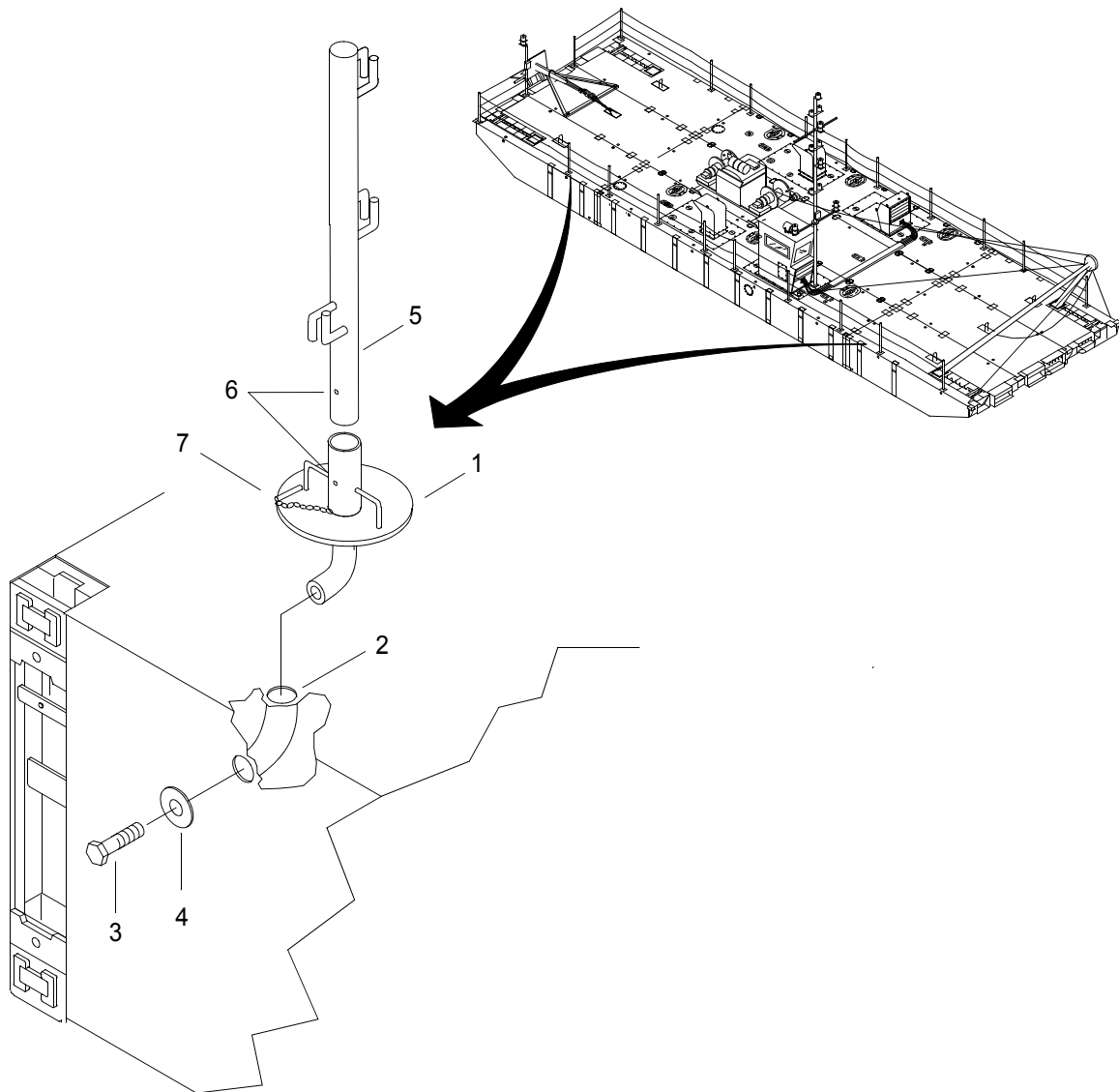
PREPARATION FOR USE - INSTALLATION OF SAFETY EQUIPMENT
INSTALLATION OF STANCHIONS

WARNING

**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Install end rake side stanchion deck fitting (1) into the module turn tube (2).

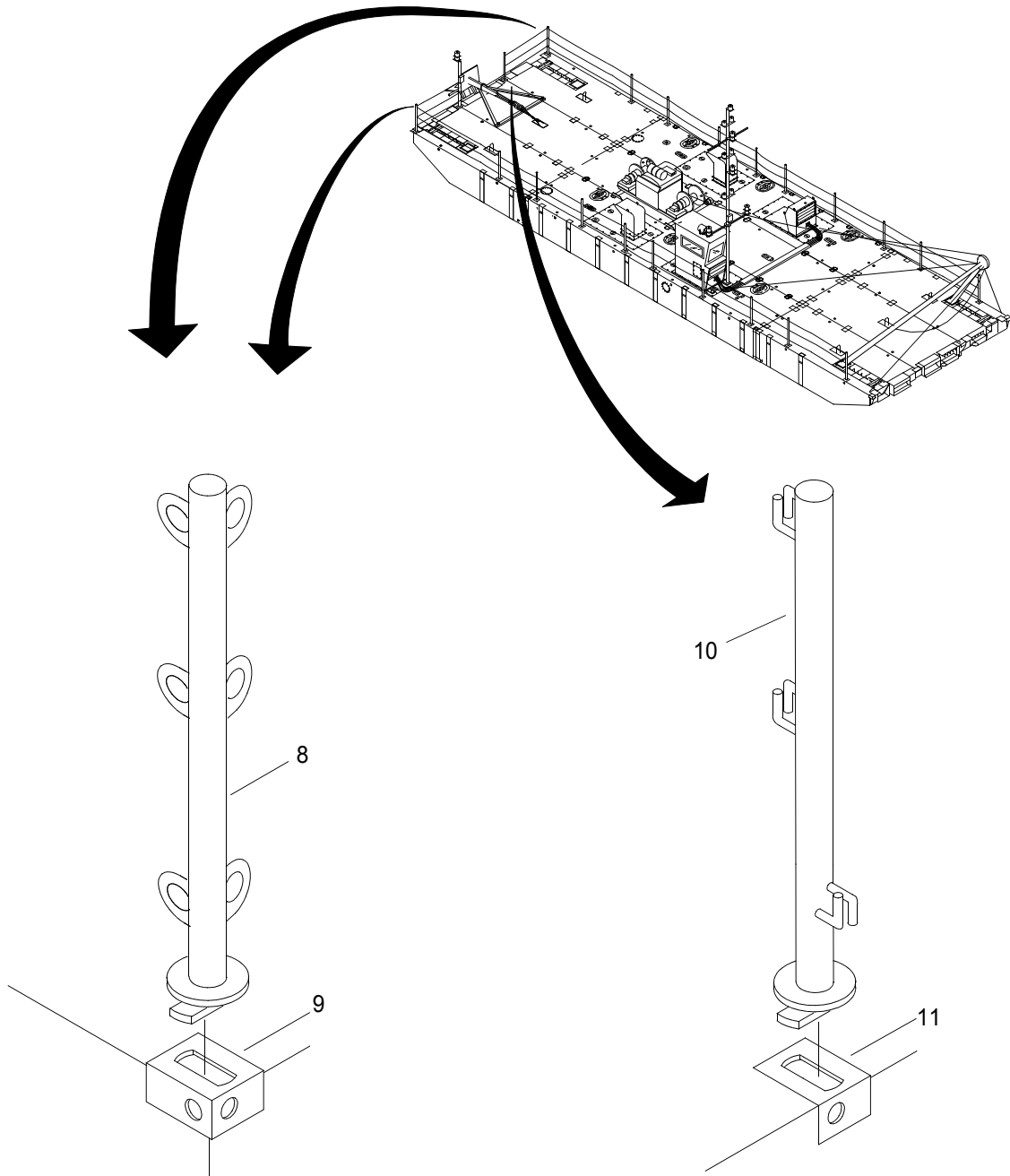


WARNING

Beware of other craft or objects coming alongside while working outboard installing the keeper plate and bolt on deck fittings, as the possibility exists of falling overboard. Failure to observe these precautions could result in death or injury to personnel.

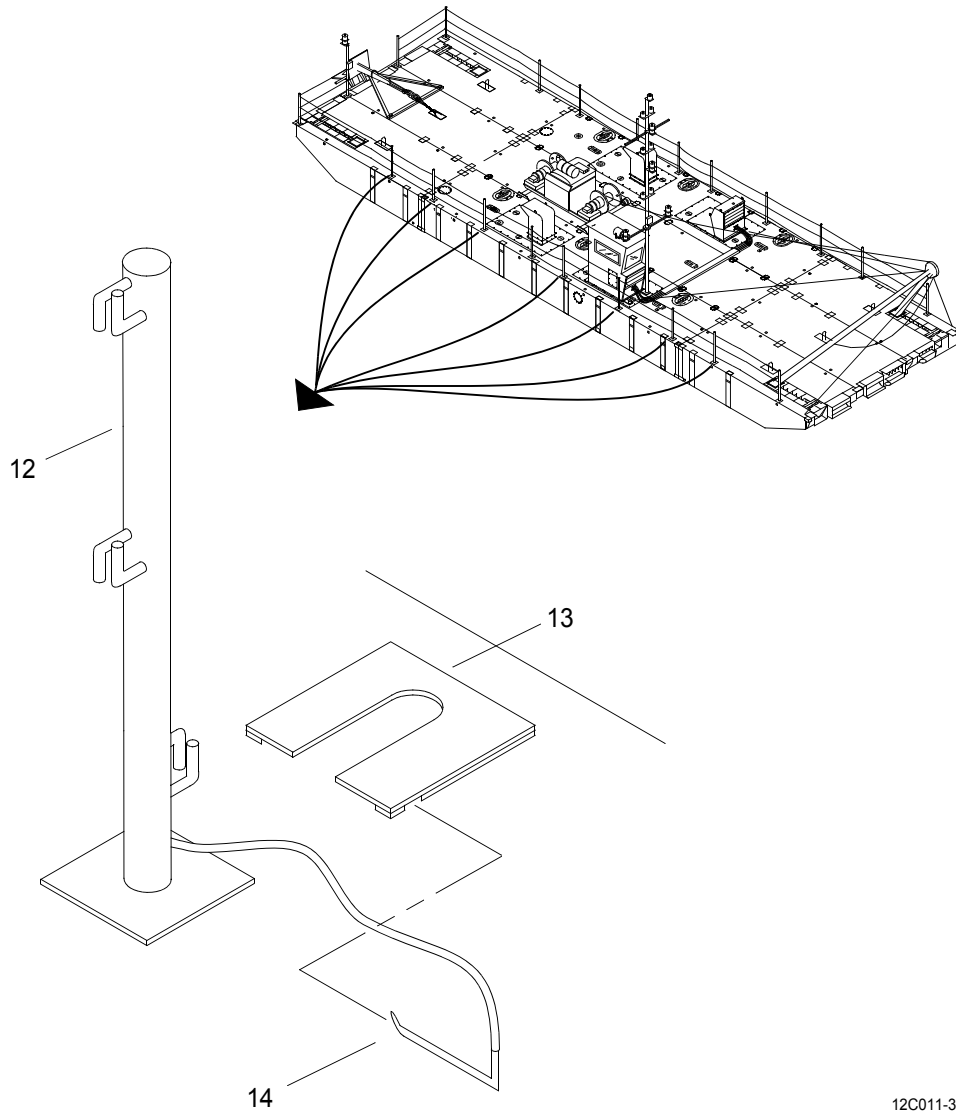
2. Install bolt (3) with keeper plate (4) into stanchion deck fitting (1) and tighten.
3. Install end rake side stanchion (5) in deck fitting (1) and align holes (6).
4. Install attached toggle pin (7) through holes (6).
5. Repeat steps 1 through 4 for WT port side.

6. Install two end stanchions (8) into aft outboard end rake corner ISO fittings (9) and turn 90° to lock in place.



7. Install stanchion (10) into aft center end rake ISO fitting (11) turn 90° to lock in place.

8. Install 12 propulsion module side stanchions (12) by sliding it into each deck fitting (13) on propulsion module.

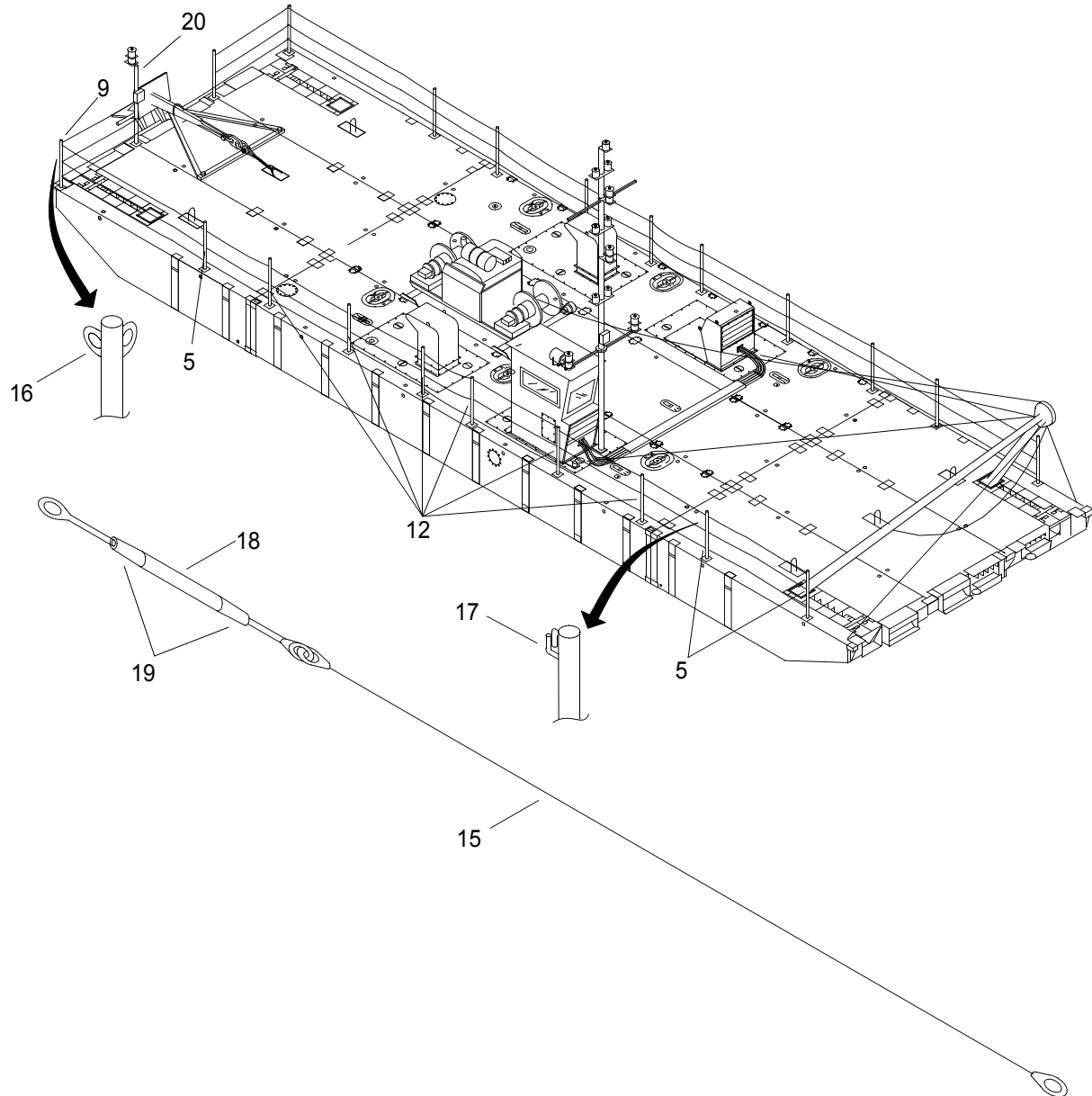


9. Secure propulsion module side stanchion (12) by inserting the locking pin (14) through the plate base (13).

INSTALLATION OF LIFELINES
NOTE

The following steps are typical for the installation of all lifelines.

1. Lay out lifelines (15) on the deck.

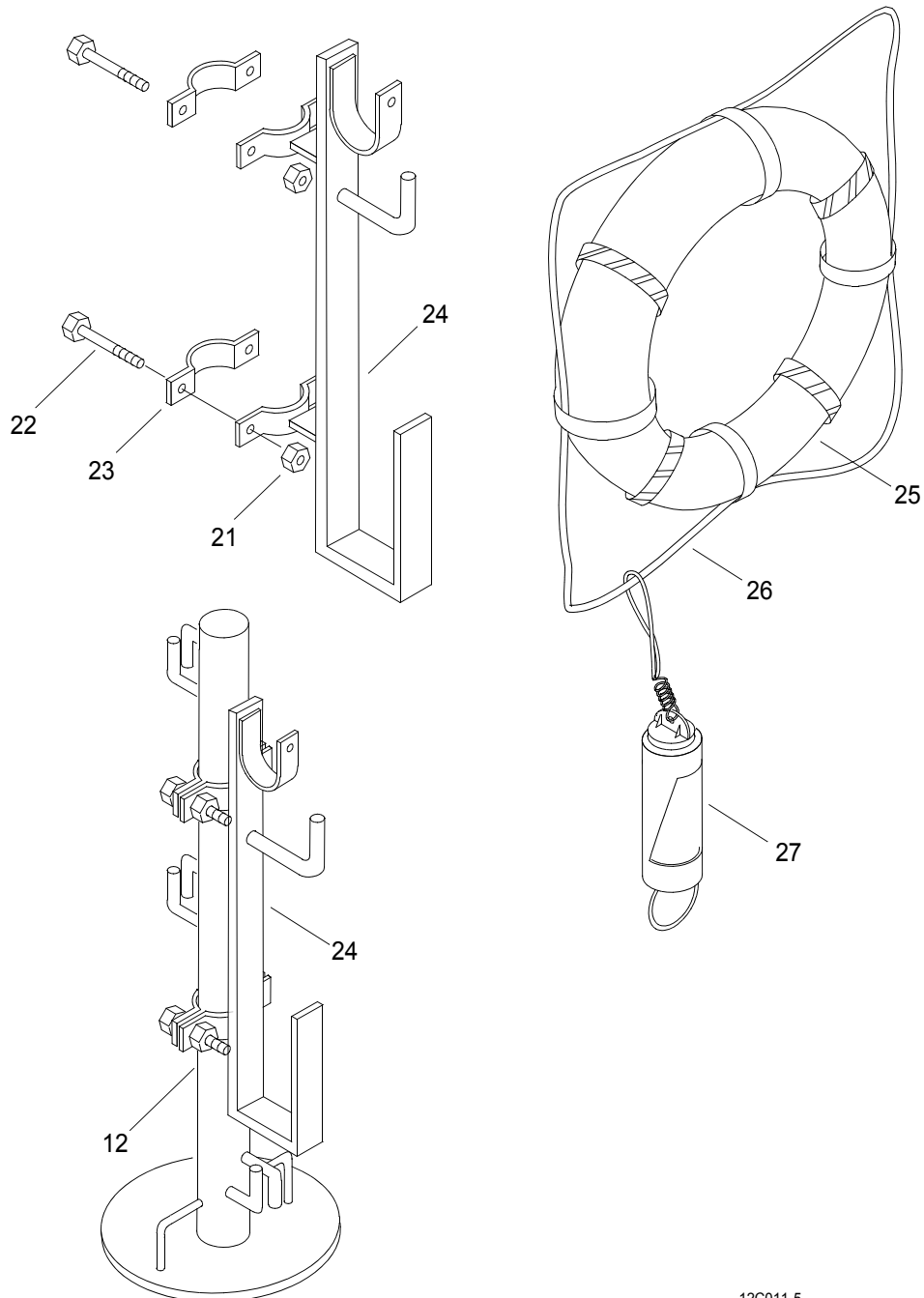


2. Install lifelines (15) to staple fittings (16) on end rake corner stanchions (9).
3. Run lifelines (15) through the pigtail fairleads (17) on the side and end stanchions (5 and 12).
4. Install turnbuckle (18) to forward outboard end rake stanchion (5).
5. Take up slack with turnbuckle (18) until taut and set turnbuckle locknuts (19).

6. Install lifeline (15) to staple fittings (16) on starboard end rake corner stanchion (9) and to stub navigation mast (20).
7. Take up slack with turnbuckle (18) until taut and set turnbuckle locknuts (19).
8. Install lifeline (15) to staple fittings (16) on port end rake corner stanchion (9) and to aft center end rake stanchion (10).
9. Take up slack with turnbuckle (18) until taut and set turnbuckle locknuts (19).

INSTALLATION OF LIFE RINGS

1. Remove nuts (21) from bolts (22) and separate life ring bracket retaining clamp half (23).

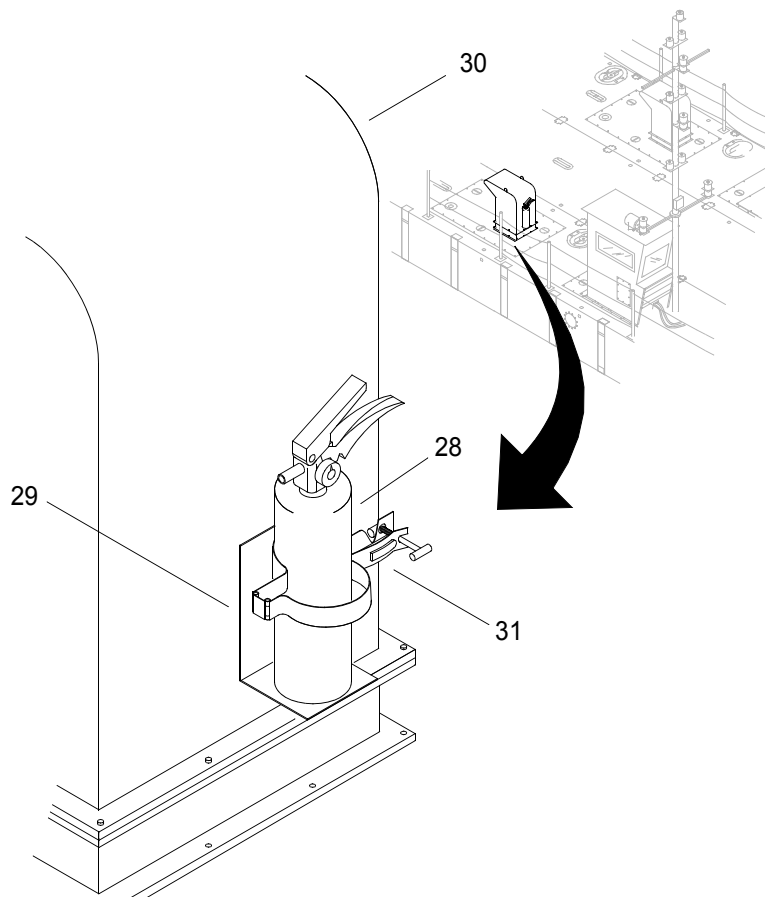


12C011-5

2. Position life ring bracket (24) on a propulsion module stanchion (12) opposite side of operators cab.
3. Position clamp half (23) and install bolt (22) and tighten nut (21).
4. Position life ring (25) and rope (26) in life ring bracket (24) and secure strobe light (27) to rope (26).

INSTALLATION OF PORTABLE FIRE EXTINGUISHER

1. Install the portable CO2 fire extinguisher (28) onto the bracket (29) on the exhaust plenum (30) located aft of the operators cab.



2. Secure extinguisher (28) in place with clamp (31).

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
OPERATION UNDER USUAL CONDITIONS**

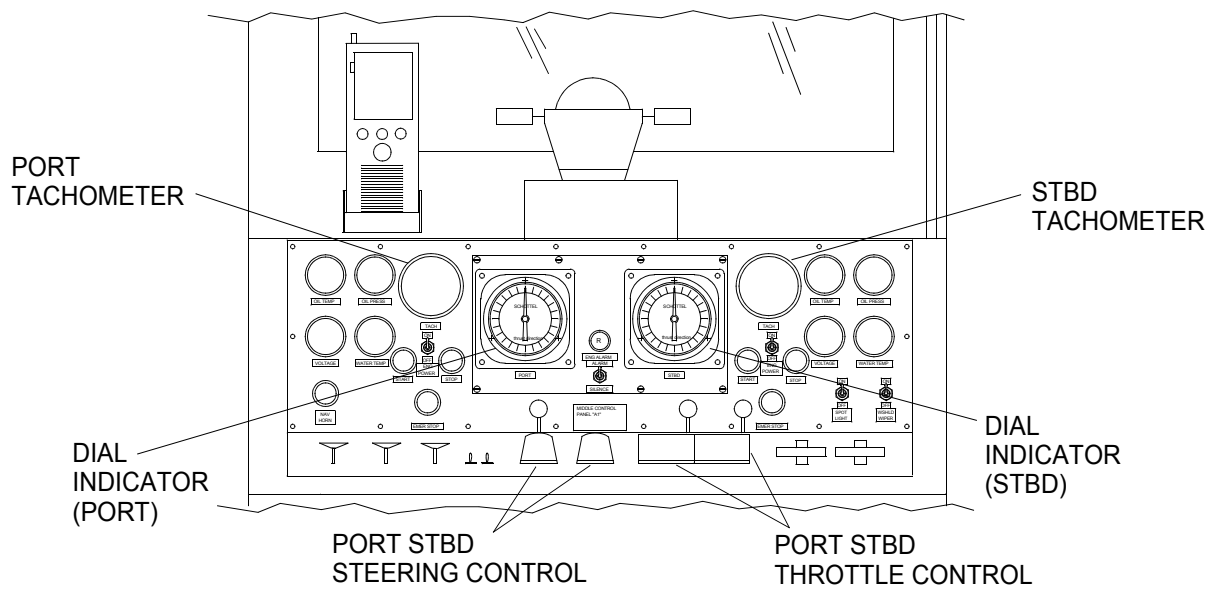
INITIAL SETUP:**Personnel Required**

Seaman 88K

Engineer 88L

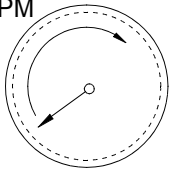
OPERATING PROCEDURES FOR WARPING TUG**CONDUCT STARTING CHECKS IN THE WT OPERATOR CHECKLIST****Table 1. WT Operator Starting Checklist.**

| ITEM NO. | PROCEDURE | INITIAL WHEN COMPLETED |
|----------|--|------------------------|
| 1 | Verify the MAIN circuit breaker switches on the Port and Stbd Propulsion Module Circuit Breaker Panels (A6) are in the up (ON) position. Verify all circuit breaker switches except the ENGINE circuit breaker switch are in the up (ON) position. | |
| 2 | Turn on the propulsion module vent fan. Wait five minutes to clear engine room of fumes (Port and Stbd). | |
| 3 | Turn off the propulsion module vent fan (Port and Stbd). | |
| 4 | Perform before operation PMCS. | |
| 5 | Verify that fire suppression systems are in working order. | |
| 6 | Verify that bilge pump oily waste 3-way ball valves are in line for the oil waste containment system (Port and Stbd). | |
| 7 | Ensure that emergency air shutoff, located on the blower inlet, is set Port and Stbd. Reset if necessary. | |
| 8 | Place the ENGINE circuit breaker switch on the Port and Stbd Propulsion Module Circuit Breaker Panels (A6) in the up (ON) position. Ensure that no personnel are below deck before starting the engines. | |
| 9 | Verify that exhaust flappers are unlatched (Port and Stbd). | |
| 10 | Ensure that all ventilation doors are locked in the open position Port and Stbd). | |
| 11 | Verify ENG ALARM toggle switches are set to ALARM (Port and Stbd). | |
| 12 | Verify FIRE warning alarm toggle switches are set to ALARM (Port and Stbd). | |
| 13 | Verify FLOODING warning alarm toggle switch is set to ALARM. | |
| 14 | Switch ENG POWER toggle switches to the ON position (Port and Stbd). | |
| 15 | Verify that the THROTTLE CONTROL levers are in the idle (all the way back) position (Port and Stbd). | |

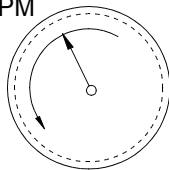


TACHOMETERS

INCREASE RPM

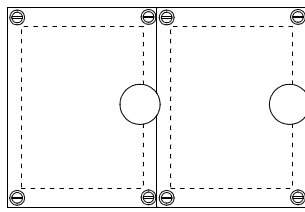


DECREASE RPM



THROTTLE CONTROLS

PUSH



PULL

STEERING CONTROL LEVERS

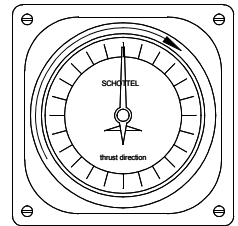
PUSH



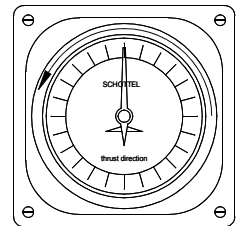
PULL

DIAL INDICATORS

CW

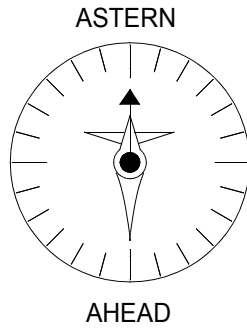
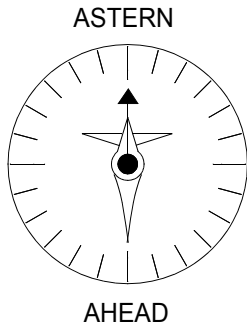


CCW

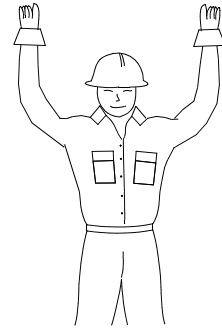


1. Engage clutches.
 - a. Push the clutch toggle switches forward to move forward.
 - b. Center the clutch toggle switches to return to neutral.
 - c. Pull the clutch toggle switches aft to backflush.
2. To move the WT, push throttle control levers for the port and starboard propulsion modules forward to increase engine RPM.
3. Pulling throttle control levers back towards the operator will decrease the engine RPM.
4. Position steering nozzles to desired direction of thrust using port and stbd steering control joystick levers.
 - a. If the dial indicators are pointing forward, the warping tug will move forward.
 - b. If the dial indicators are pointing aft, the warping tug will move aft.
 - c. Push the control levers forward to rotate the steering nozzle in counterclockwise direction to move the warping tug to the right.
 - d. Pull the control levers aft to rotate the steering nozzle in clockwise direction to move the warping tug to the left.
5. Perform during operation PMCS. (WP 0103 00)

6. Use hand signals to communicate instructions to the pilot of the warping tug.

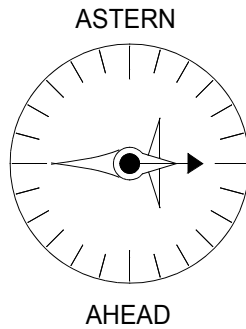
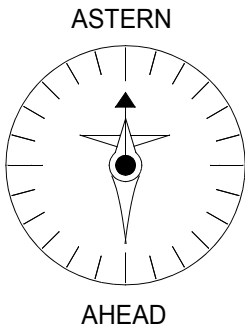


STRAIGHT
BACK



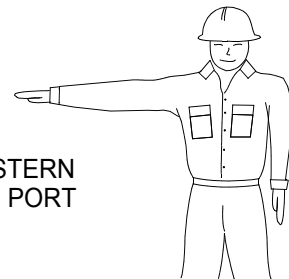
STRAIGHT BACK

< PORT SIDE INDICATORS >

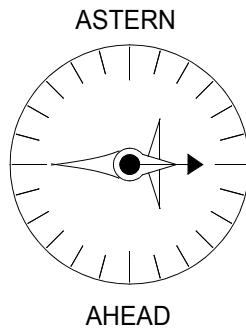
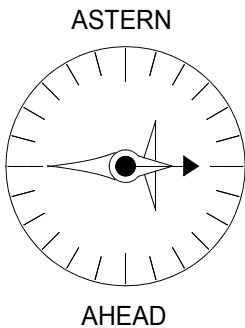


< STARBOARD SIDE INDICATORS >

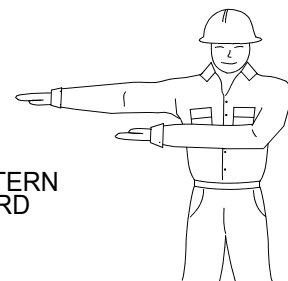
SWING STERN
TO FULL PORT



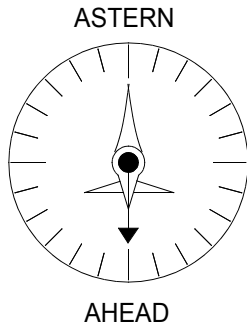
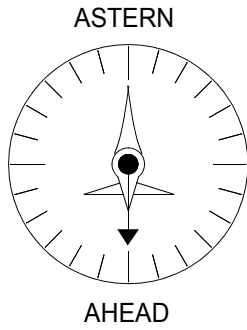
SWING STERN
PORT FULL



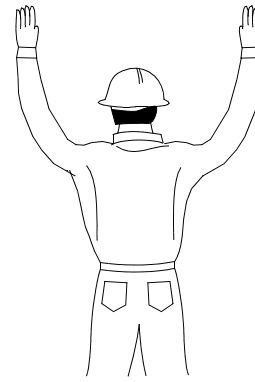
SWING STERN
PORT HARD



SWING STERN
PORT HARD

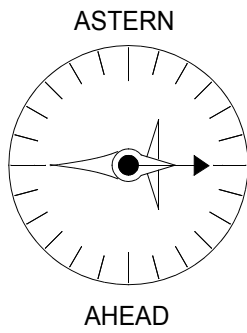
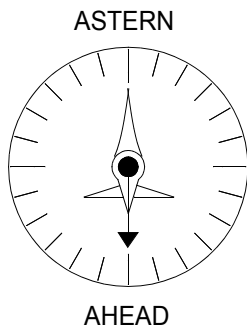


STRAIGHT
AHEAD



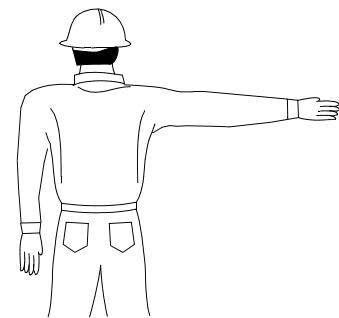
STRAIGHT AHEAD

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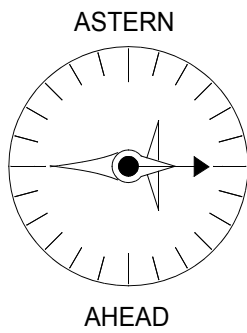
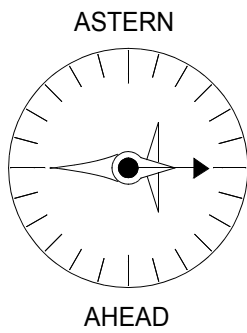


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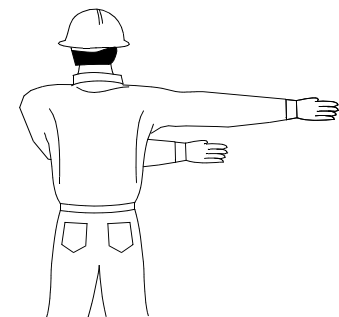
RIGHT
FULL
TURN



STARBOARD FULL

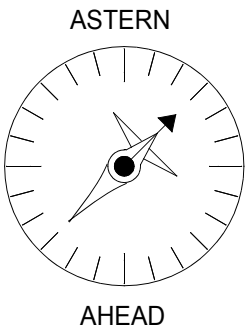
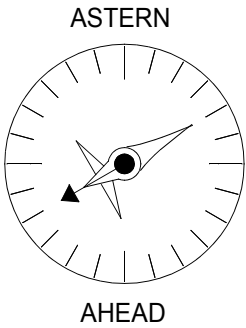
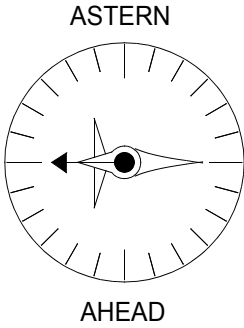
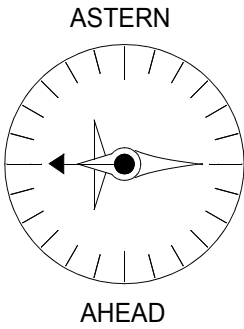


RIGHT
HARD
TURN

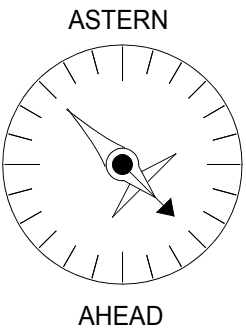
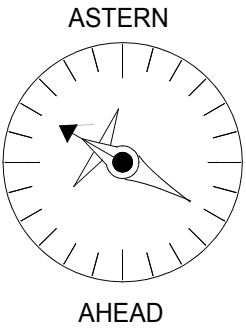
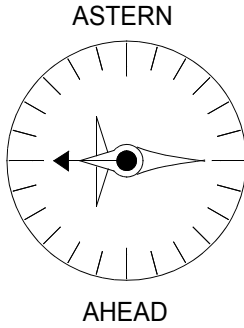
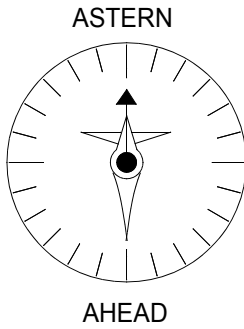


STARBOARD HARD

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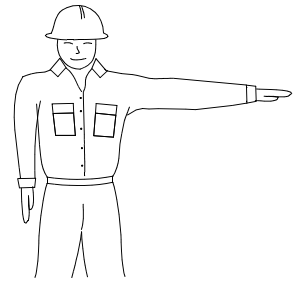


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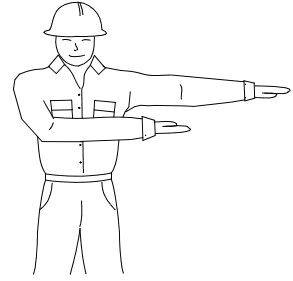
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SWING STERN TO STARBOARD FULL



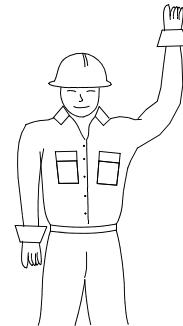
SWING STERN TO STARBOARD FULL

SWING STERN TO STARBOARD HARD



SWING STERN STARBOARD HARD

WALK STARBOARD

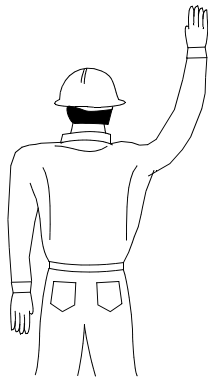


SWING STERN STARBOARD EASY

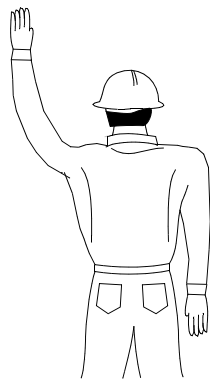
WALK PORT



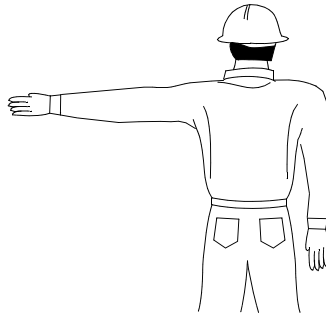
SWING STERN PORT EASY



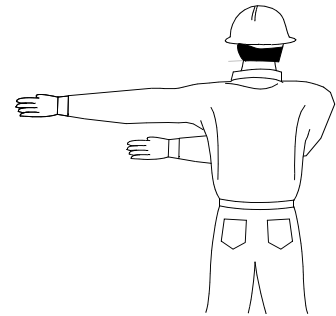
STARBOARD



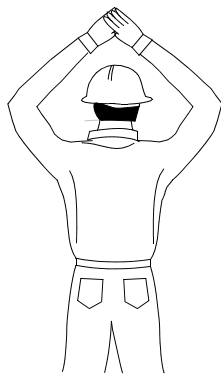
PORT EASY



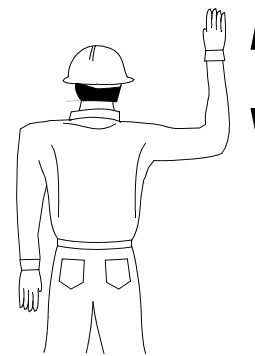
PORT FULL



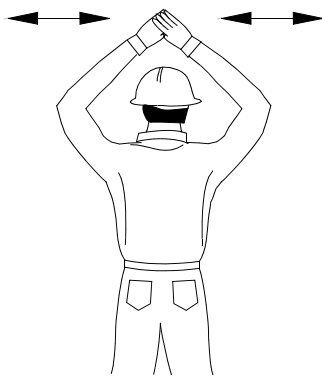
PORT HARD



DISENGAGE ENGINES

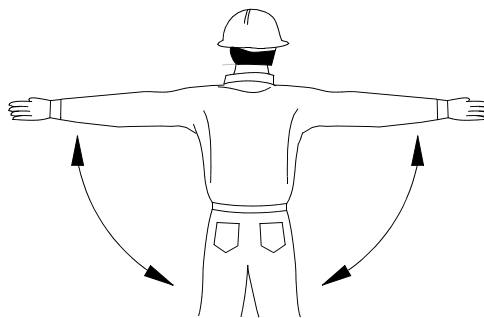


APPROPRIATE WHISTLE SIGNAL

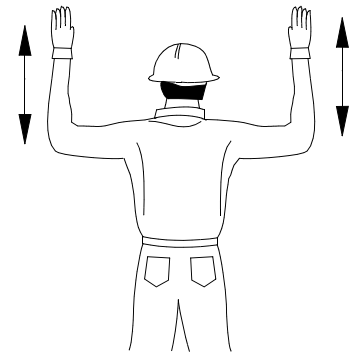


STOP HEADWAY

STOP HEADWAY



SLOW DOWN



SPEED UP

CONDUCT ENGINE SHUTDOWN CHECKS IN THE WT OPERATOR CHECKLIST

Table 2. WT Operator Engine Shutdown Checklist.

| ITEM NO. | PROCEDURE | INITIAL WHEN COMPLETED | | | |
|---|---|------------------------|-----------------------|------------|-------|
| 1 | Position the throttle control levers in the idle position (Port and Stbd). | | | | |
| 2 | Disengage clutch controls (Port and Stbd). | | | | |
| 3 | Run engines at idle (790 - 800 RPM) for five minutes before engine shutdown. | | | | |
| 4 | Depress STOP push button to shut down each engine. | | | | |
| 5 | Switch ENGINE POWER toggle switch to the OFF position for each engine. | | | | |
| 6 | Switch VENT FAN toggle switch for each propulsion module to the OFF position. | | | | |
| 7 | Perform after operation PMCS. | | | | |
| 8 | Latch exhaust flappers (Port and Stbd). | | | | |
| 9 | Place all circuit breaker switches on Port and Stbd Propulsion Module Circuit Breaker Panels (A6) in the down (OFF) position. | | | | |
| 10 | Place all circuit breaker switches on Operators Cab Circuit Breaker Panel (A3) to the down (OFF) position. | | | | |
| 11 | Check below decks to ensure no personnel are present below decks. | | | | |
| 12 | Close and dog all propulsion module access hatches. | | | | |
| 13 | Remove communications equipment from operators cab, as necessary. | | | | |
| 14 | Remove or secure all tools and crew equipment. | | | | |
| 15 | Secure and lock operators cab windows and door. | | | | |
| <table border="0" style="width: 100%;"> <tr> <td style="width: 33%;">NAME and RANK (Print)</td> <td style="width: 33%;">SIGNATURE:</td> <td style="width: 33%;">DATE:</td> </tr> </table> | | | NAME and RANK (Print) | SIGNATURE: | DATE: |
| NAME and RANK (Print) | SIGNATURE: | DATE: | | | |
| <p>CHEIF ENGINEER</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 33%;">NAME and RANK (Print)</td> <td style="width: 33%;">SIGNATURE:</td> <td style="width: 33%;">DATE:</td> </tr> </table> | | | NAME and RANK (Print) | SIGNATURE: | DATE: |
| NAME and RANK (Print) | SIGNATURE: | DATE: | | | |
| <p>VESSEL MASTER</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 33%;">NAME and RANK (Print)</td> <td style="width: 33%;">SIGNATURE:</td> <td style="width: 33%;">DATE:</td> </tr> </table> | | | NAME and RANK (Print) | SIGNATURE: | DATE: |
| NAME and RANK (Print) | SIGNATURE: | DATE: | | | |

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
VHF/FM HANDHELD TRANSCEIVER
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

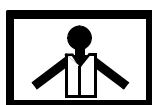
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

OPERATING PROCEDURES - OPERATE THE VHF/FM HANDHELD TRANSCEIVER**INITIAL SETUP OF VHF/FM HANDHELD TRANSCEIVER**

WARNING



VEST



HELMET PROTECTION



HEAVY PARTS

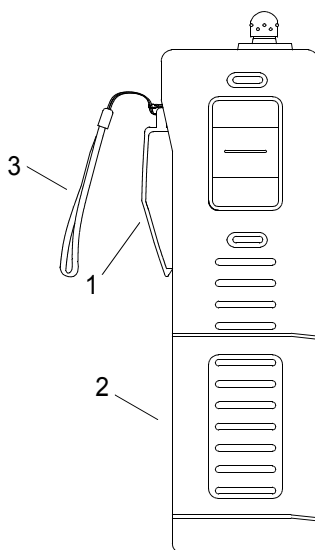


MOVING PARTS

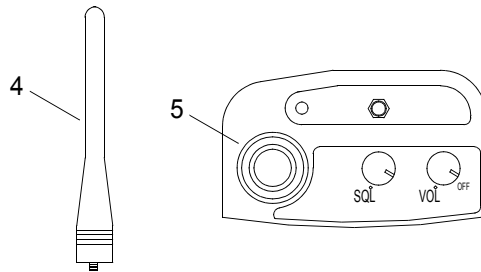
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

To avoid the risk of explosion, do not operate radio where explosive vapors may be present. Failure to observe these precautions could result in serious injury or death.

1. Install the belt clip (1) on the transceiver (2), if desired.



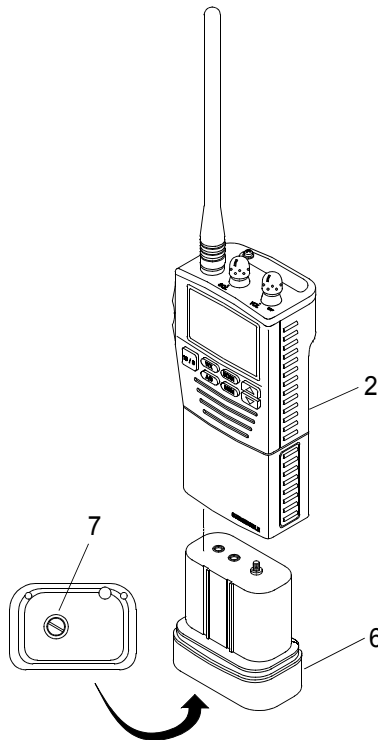
2. Install the nylon strap (3) on the belt clip (1), if desired.
3. Install the antenna (4) in the transceiver antenna receptacle (5).



WARNING

A metal object shorting the terminals may cause the battery to explode. Failure to observe this precaution could result in serious injury or death.

4. Install the CNB350 nickel cadmium battery pack (6) in the transceiver (2).



- a. Slide the battery pack (6) into the battery cavity.
- b. Rotate the battery lock screw (7) counterclockwise two revolutions prior to tightening.
- c. Turn the battery lock screw (7) clockwise until hand tight.

BATTERY CHARGING**WARNING**

Shorting the battery terminals that charge the transceiver can cause sparks, severe overheating, burns and battery damage. Do not place an uninstalled battery pack in the vicinity of metal objects that may short the terminals. Failure to observe this precaution could result in serious injury or death.

To avoid risk of explosion and injury, do not operate radio where explosive vapors may be present. Failure to observe these precautions could result in serious injury or death.

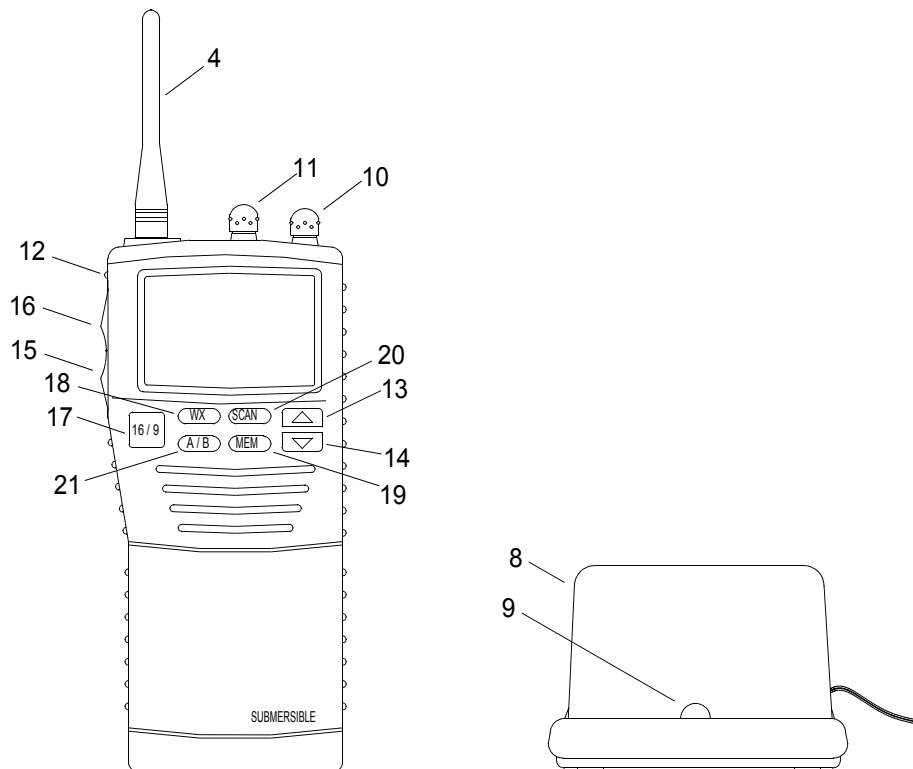
NiCad batteries must be disposed of properly. Battery may explode if incinerated, causing injury or death. Contact unit supply for proper disposal instructions.

CAUTION

Never plug the power supply to the CCA250 charge adaptor except with a CAW240, CWC230 or CWC232 adaptor. Damage to power supply could occur.

Charging the transceiver battery for more than 16 hours with the battery charge system can shorten battery life and cause other components to fail. Battery packs may be left in the CSA280 chargers without harm to either the battery pack or charger.

1. Turn the POWER/VOLUME knob (10) counterclockwise to turn the transceiver off.
2. Insert the transceiver (2) into the charger (8) to light charge indicator (9) and to begin charging.



3. Remove the transceiver (2) from the charger (8) when battery charge time has elapsed.

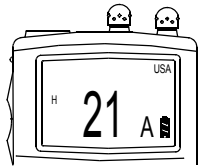
TURNING RADIO ON

NOTE

Water resistance of the transceiver is assured only when the battery pack and antenna are attached to the transceiver.

Never key the transceiver without the antenna attached. Damage to the transceiver will occur.

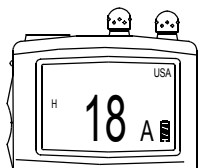
1. Turn the POWER/VOLUME knob (10) clockwise to turn the transceiver on.



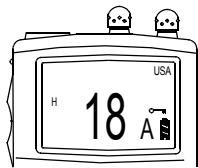
2. Rotate the SQUELCH CONTROL knob (11) fully counterclockwise to the SQUELCH OFF position.
3. Rotate the POWER/VOLUME CONTROL knob (10) until the noise or audio from the speaker can be heard.
4. Select a channel that has no voice transmissions occurring.
5. To find the squelch threshold, rotate the SQUELCH CONTROL knob (2) clockwise until the noise stops.
6. To turn on the radio light for 5 seconds, press the LAMP key (12)
7. To turn off the light sooner than 5 seconds, press the LAMP key (12).

RECEIVING RADIO TRANSMISSIONS

1. Press the UP ARROW key (13) or DOWN ARROW key (14) to change channels.

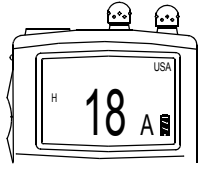


2. Press the LAMP/KEY LOCK key (12) for 1 second to lock the channel in the operating mode.
3. Ensure that the key lock symbol (12) appears on the display to indicate that the channel is locked.



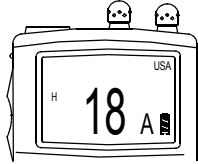
4. To unlock the channel, press the LAMP/KEY LOCK key (12) for 1 second.

5. Ensure that the key lock symbol disappears from the display to indicate that the channel is unlocked.

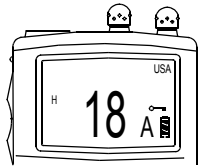


TRANSMITTING

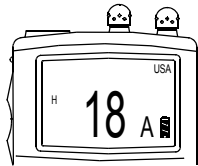
1. Press the UP ARROW key (13) or DOWN ARROW key (14) to change channels.



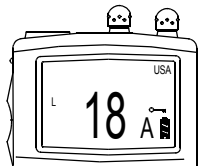
2. Adjust squelch as required.
3. Press the LAMP/KEY LOCK key (12) for 1 second to lock the channel in the operating mode.



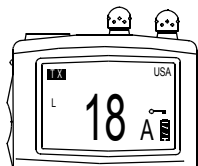
4. To unlock the channel, press the LAMP/KEY LOCK key (12) for 1 second.



5. Press the H/L key (15) until L is displayed for transmissions over a short distance.



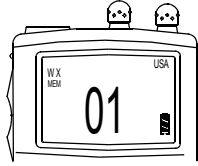
6. If low power is not effective, press the H/L key (15) until H is displayed.
7. Press the PTT switch (16) to transmit.



8. Release the PTT switch (16) when transmission is completed.

OPERATING MODES

1. To access the USA operating mode, hold down the 16/9 key (17) and press the WX key (18) to change the mode of the receiver to USA.



2. To access the INTERNATIONAL operating mode, hold down the 16/9 key (17) and press the WX key (18) to change the mode of the receiver to INTL.

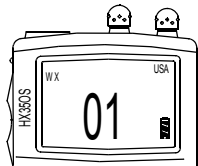


3. To access the CANADIAN operating mode, hold down the 16/9 key (17) and press the WX key (18) to change the mode of the receiver to CAN.

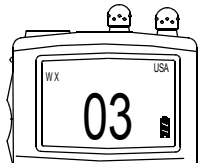


NOAA WEATHER CHANNELS

1. Press the WX key (18) to receive a weather channel.



2. Press the UP ARROW key (13) or DOWN ARROW key (14) to change to other weather channels.

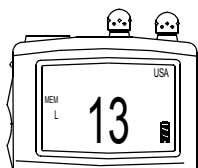


3. Press the WX key (18) to exit from the weather channels and return to the previous non-weather channel.



SCANNING

1. Select the desired channel to be scanned using the UP ARROW key (13) or DOWN ARROW key (14).
2. Press the MEM key (19) to store the channel into the transceiver's memory.



3. Repeat steps one and two until all channels to be scanned are stored in the transceiver's memory.
4. Press the SCAN key (20) to start scan.
5. Press the SCAN key (20) to stop the scan.

DELETE SCAN MEMORY

1. To delete a channel from the transceiver's scan memory, select the desired channel using the UP ARROW key (13) or DOWN ARROW key (14).
2. Press the MEM key (19) while the channel number to be deleted from the scan memory is displayed.
3. Delete the complete scan memory by resetting the transceiver's microprocessor.
 - a. Turn the transceiver off using the POWER/VOLUME CONTROL knob (10).
 - b. To return to the factory default settings, press the SCAN key (20) and the WX key (18) while turning on the transceiver.

PRIORITY SCAN

1. To change from channel 16 to channel 09 and set the priority channel, hold down the 16/9 key (17) and press the MEM key (19).
2. Press MEM key (19) to change to channel number programmed as A channel.
3. Press MEM key (19) to change to channel number programmed as B channel.
4. Press the SCAN key (20) at least 1 second for priority scanning during normal scanning.

WEATHER ALERT**NOTE**

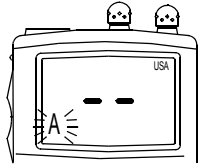
A loud tone will indicate that the transceiver is in the weather alert mode. When a weather alert is received, scanning stops and the transceiver enters the weather alert mode.

1. Press the SCAN key (20) to start scanning the memorized weather channels along with the other regularly scanned channels.
2. Press the WX key (18) to stop the alert tone and receive the voice information on the weather channel.

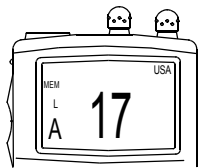
CHANNEL A/B INSTANT ACCESS**NOTE**

Ensure that a blinking letter A and dashes appear on the display to indicate that no channel has been selected for A.

1. Press the A/B key (21) and turn the transceiver on.



2. Using the UP ARROW key (13) and DOWN ARROW key (14), enter the desired channel.
3. Press the MEM key (19) to stop displayed A blinking and display the A channel.



4. Turn the radio off and back on using the POWER/VOLUME knob (10) to return to normal radio mode.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
AN/PSN-11 INTERFACE AND SWITCHBOX
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

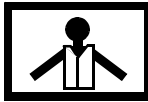
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

OPERATING PROCEDURE - OPERATE THE AN/PSN-11 INTERFACE AND SWITCHBOX

WARNING



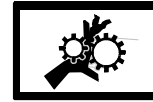
VEST



HELMET PROTECTION



HEAVY PARTS



MOVING PARTS

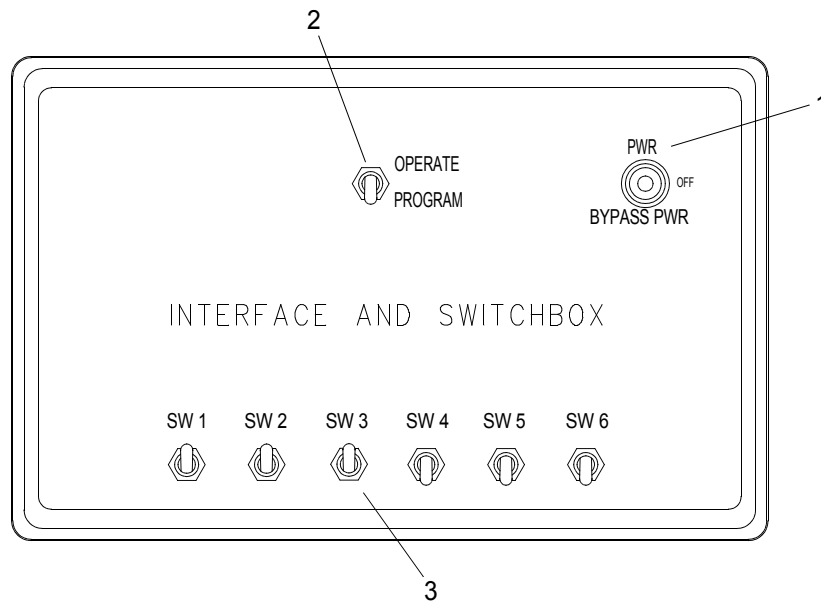
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

During tactical operations, switch SW3 should remain in the off position and used only as necessary. Failure to comply could result in unwanted interrogation of position. Enemy knowledge of position in wartime could result in injury or death to personnel.

NOTE

The interface and switchbox will not transmit the current position to any interfaced devices with the OPERATE/PROGRAM switch in the program position or the power switch in BYPASS PWR position.

1. Place the power switch (1) in the PWR position.



2. Place the power switch (1) in the OFF position to turn the power to the PLGR off.
3. Place the OPERATE/PROGRAM switch (2) in the OPERATE position.
4. Place the OPERATE/PROGRAM switch (2) in the PROGRAM position to provide a direct programming link between the PLGR and a data terminal.
5. Place SW3 (3) in the on (up) position to turn the GPS signal on from the PLGR.
6. Place SW3 (3) in the off (down) position to turn the GPS signal off from the PLGR.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PUBLIC ADDRESS SET (LOUDHAILER)
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

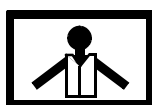
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

OPERATING PROCEDURES - OPERATE THE PUBLIC ADDRESS SET (LOUDHAILER)**LCD DISPLAY AND CONTROL KNOBS**

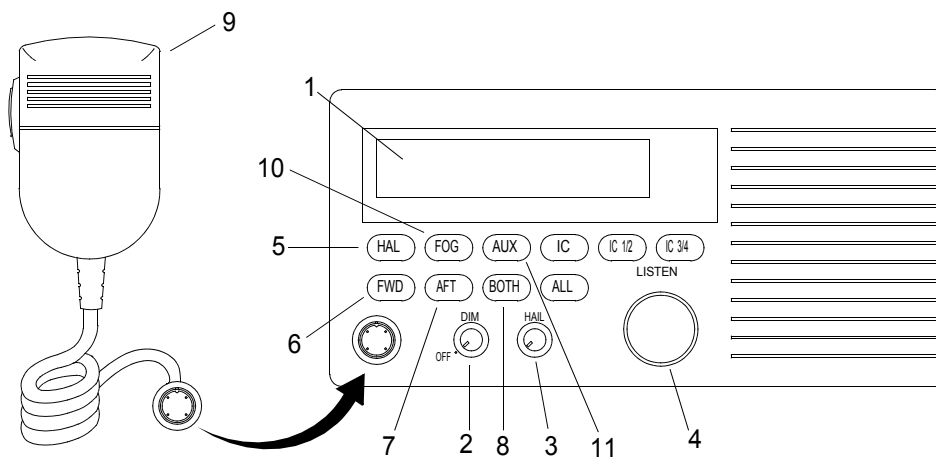
WARNING

**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

NOTE

The LCD display (1) shows the operation status of the loudhailer in bright bold letters. The display is illuminated in a blue green color with adjustable backlighting for optimal viewing in all light conditions.

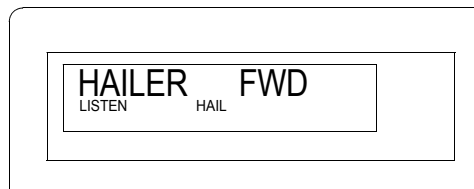


1. Turn power on and off and control the display lighting level.
 - a. Rotate the ON/OFF/DIM control knob (2) clockwise to turn the loudhailer on. Adjust the knob to adjust the display lighting level.

- b. Rotate the ON/OFF/DIM control knob (2) counterclockwise to turn the loudhailer off.
 2. Adjust the volume level to the hailer horns.
 - a. Turn the HAIL volume control knob (3) clockwise to increase the volume to the hailer horns.
 - b. Turn the HAIL volume control knob (3) counterclockwise to reduce the volume to the hailer horns.
 3. Adjust the listening volume.
 - a. Turn the LISTEN volume control knob (4) clockwise to increase the volume.
 - b. Turn the LISTEN volume control knob (4) counterclockwise to decrease the volume.

OPERATING IN THE LOUDHAILER MODE

1. Press the HAIL key (5). The loudhailer is now in the HAIL mode. HAILER appears in the LCD display operating mode window.



2. Press the FWD speaker key (6), AFT speaker key (7) or BOTH (8) to select the forward speaker, aft speaker or both. FWD, AFT or BOTH will appear in the LCD display speaker station window.
3. Press the microphone PUSH TO TALK switch (9). TALK will appear in the LCD display speaker station window.
4. Adjust the HAIL volume knob (3) to the desired sound level.

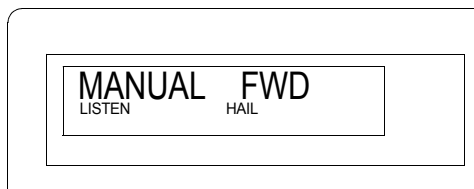
OPERATING IN THE FOG MODE

1. Press the FOG key (10) to select the type of fog signal to be transmitted. Repeatedly pressing the key will allow access to nine different fog signals. The type of fog alarm will appear in the LCD display.

NOTE

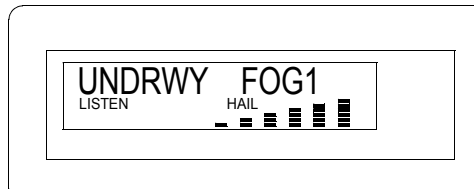
The manual type of fog signal is a manually controlled signal used as a horn signal for passing, etc. as described in 'Rules of the Road' - Section 35.

2. Select manual type of fog signal. In this mode, the horn sounds when the microphone is pressed. The length and timing of the horn blasts are controlled with the PUSH TO TALK switch (9).



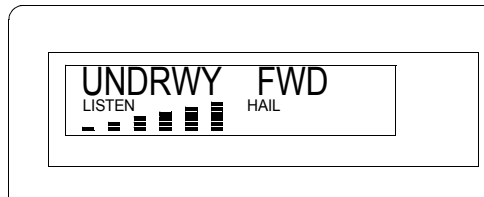
- a. Press the PUSH TO TALK switch (9) to sound the horn. MANUAL will appear in the LCD display.
 - b. Control the length and timing of the horn blasts by pushing and releasing the PUSH TO TALK switch (9).

3. Select UNDERWAY FOG for a programmed automatic fog signal used to signal when a powered vessel is underway. UNDRWY and FOG 1 will appear in the display when selected.

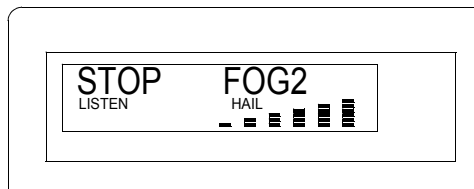


NOTE

After one second FOG 1 will disappear and UNDRWY and FWD will appear. The FOG 1 alarm pattern is one 5 second blast at 2 minute intervals.

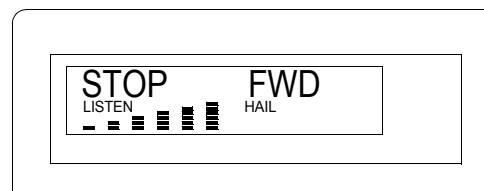


4. Select STOP FOG 2 for a programmed automatic fog signal used to signal that a vessel is not moving. STOP and FOG 2 will appear in the display when selected.

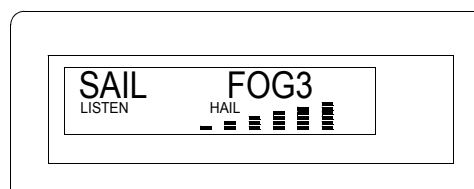


NOTE

After one second FOG 2 will disappear and STOP and FWD will appear. The FOG 2 alarm pattern is: Two 5 second blasts, with a 2 second interval between each blast repeated every 2 minutes.

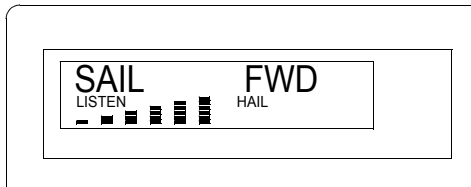


5. Select SAIL FOG 3 for a programmed automatic fog signal for sailboats, fish boats or towboats. SAIL and FOG 3 will appear in the display when selected.

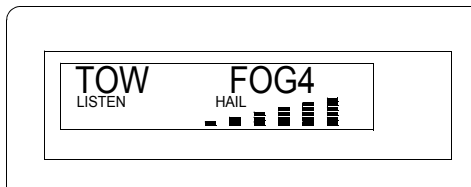


NOTE

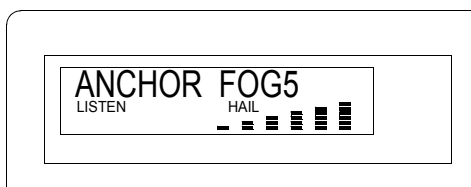
After one second FOG 3 will disappear and SAIL and FWD will appear. The FOG 3 alarm pattern is: One 5 second blast followed by two 1 second blasts, at 2 second intervals, repeated every 2 minutes.



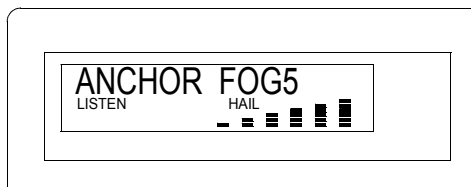
6. Select TOW FOG 4 for a programmed automatic fog signal used to signal that a vessel is under tow. TOW and FOG 4 will appear in the display when selected.

**NOTE**

After one second FOG 4 will disappear and TOW and FWD will appear. The FOG 4 alarm pattern is: One 5 second blast followed by three 1 second blasts, at 2 second intervals, repeated every 2 minutes.

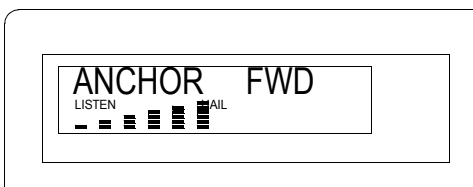


7. Select ANCHOR FOG 5 for a programmed automatic fog signal for a vessel at anchor. ANCHOR and FOG 5 will appear in the display when selected.

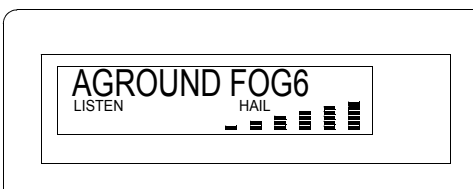


NOTE

After one second FOG 5 will disappear and ANCHOR and FWD will appear. The FOG 5 alarm pattern is: A rapidly ringing bell tone will sound for a duration of at least 5 seconds, with a repetition interval not to exceed 1 minute.

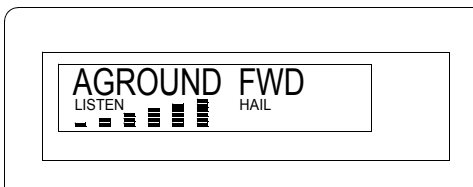


8. Select AGROUND FOG 6 for a programmed automatic fog signal for a vessel aground. AGROUND and FOG 6 will appear in the display when selected.

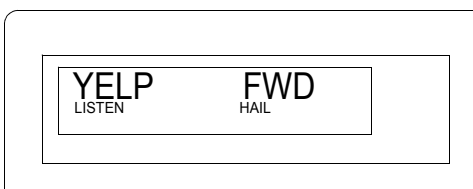


NOTE

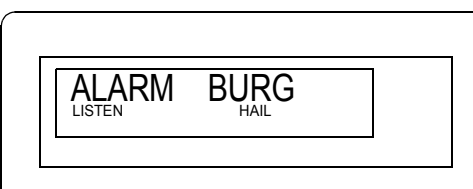
After one second FOG 6 will disappear and AGROUND and FWD will appear. The FOG 6 alarm pattern is: Three bell tone sounds, at 1 second intervals, followed by a rapidly ringing bell for a duration of 5 seconds, followed again by three bell tone sounds, at 1 second intervals. This signal is repeated once every minute.



9. Select YELP for a manually activated signal for regulatory vessels such as: Police, Fish and Game, US Coast Guard, etc. YELP will appear in the display when selected. Press the PUSH TO TALK switch (9) on the microphone to create the YELP sound.

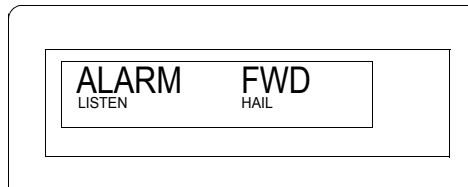


10. Select ALARM for an automatic signal used as a burglar alarm when activated. ALARM will appear in the display when selected.

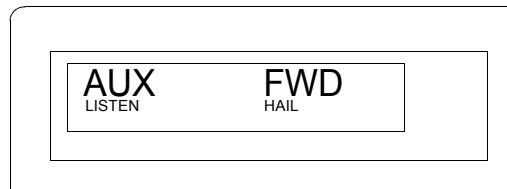


NOTE

After one second ALARM will disappear and ALARM and FWD will appear. An external, normally open type, sensor is required to operate this feature. This feature is not used on the mobile causeway.

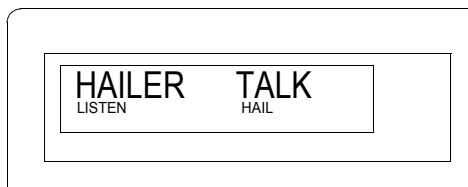


11. Select AUX to allow the crew to monitor the VHF/FM DSC transceiver when not in the operators cab. VHF/FM radio transmissions received are broadcast through the hailer horns.

**NOTE**

The speaker station display indicates which speaker station has been selected; FWD, AFT, BOTH or ALL (not used). In the FOG mode the speaker station display will temporarily indicate which FOG mode number has been selected when the FOG key is pushed. One second later, the normal speaker station selection will reappear.

12. Press the microphone PUSH TO TALK key (9) in the HAIL or INTERCOM modes and ensure that TALK appears in the speaker station display confirming that voice transmission is possible by speaking into the microphone.

**OPERATING IN THE AUXILIARY MODE**

1. Press the PUSH TO TALK switch (9) on the microphone to control manual operation. Manual operation is used for MANUAL and YELP modes only.
2. Press the FWD speaker key (6) to select the forward speaker, AFT speaker key (7) to select the aft speaker or BOTH (8) to select both forward and aft speakers. FWD, AFT or BOTH will appear in the LCD display speaker station window.
3. Adjust the HAIL volume knob (3) to the desired sound level.
4. Press the AUX key (11). The loudhailer is now in the AUX mode. AUX appears in the LCD display operating mode window.

-
5. Press the FWD speaker key (6) to select the forward speaker, AFT speaker key (7) to select the aft speaker or BOTH (8) to select both forward and aft speakers. FWD, AFT or BOTH will appear in the LCD display speaker station window.
 6. Adjust the HAIL volume knob (3) to the desired sound level.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
AN/VRC-88D SINGARS RADIO
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

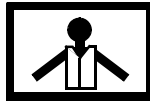
Seaman 88K

References

TM 11-5820-890-10-8

OPERATING PROCEDURES - OPERATE THE AN/VRC-88D SINGARS RADIO

WARNING



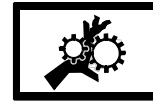
VEST



HELMET PROTECTION



HEAVY PARTS



MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

Refer to the AN/VRC-88D SINGARS Radio Operators Manual, TM 11-5820-890-10-8, for operating procedures.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
VHF/FM DSC TRANSCEIVER
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

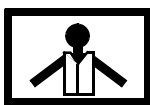
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

OPERATING PROCEDURES - PERFORM INITIAL SETUP OF THE VHF/FM DSC TRANSCEIVER**ENTER USER DIGITAL SELECTIVE CALL (DSC) ID NUMBER**

WARNING



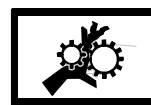
VEST



HELMET PROTECTION



HEAVY PARTS



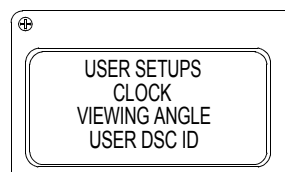
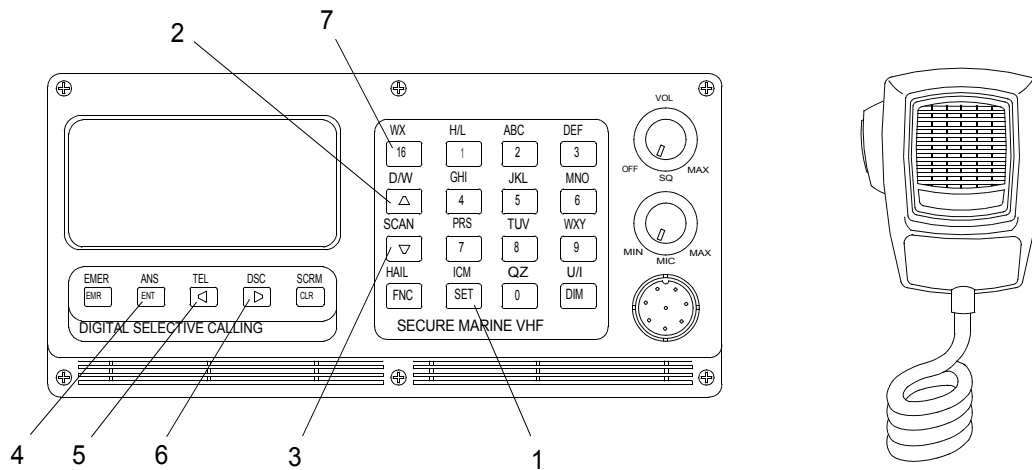
MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

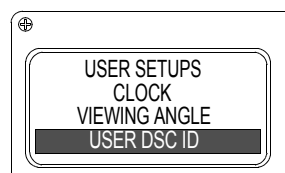
NOTE

A Ship Station Identity number may be entered or changed only one time. Any further attempts to change the number will cause USER DSC ID CAN NO LONGER BE CHANGED to appear in the display and the last ID number entered will become permanent. The transceiver must be returned to the factory or authorized dealer to clear this condition.

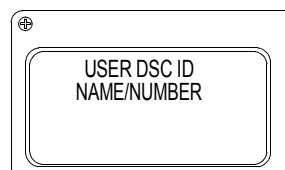
1. To enter your Ship Station Identity number, press the SET key (1). The USER SETUPS menu will appear.



2. Press the UP ARROW KEY (2) or DOWN ARROW key (3) to select USER DSC ID with the selection bar.

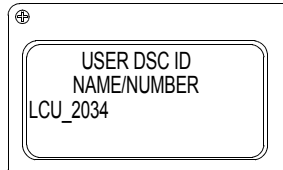


3. Press the ENT key (4). Ensure that the DSC ID, NAME/NUMBER page appears with the lower two lines of the display showing dashes unless a name and number have been previously entered.

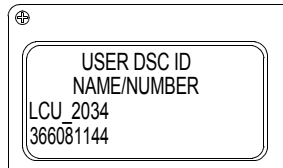


4. Enter a letter into the name line of the display.
 - a. Press the appropriate number key repeatedly until the desired letter or the number appears in the character position.
 - b. Press the next key to be entered and the entry point will move to the next position automatically.
 - c. Press the RIGHT ARROW key (6) to move the entry point to the next character position if more than one letter from the same key must be entered in succession.
 - d. Press the LEFT ARROW key (5) to backspace and correct an entry if necessary.

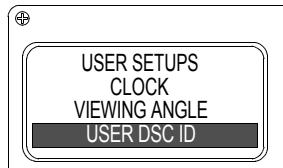
- e. Press the DOWN ARROW key (3) to move the entry point to the ID number line when the name is complete.



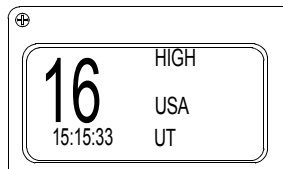
5. Press the appropriate number keys to enter the Ship Station Identification number. To correct an entry, press the LEFT ARROW key (5) to backspace. To skip a digit, press the RIGHT ARROW key (6).



6. When all information is displayed correctly, press the ENT key (4) to complete the operation and return to the USER SETUPS menu.



7. Press the WX key (7) to return to normal operation.



8. Perform user setups. (WP 0029 00)

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
VHF/FM DSC TRANSCEIVER
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

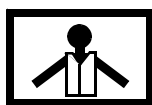
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

OPERATING PROCEDURES - OPERATE THE VHF/FM DSC TRANSCEIVER**MODEL IDENTIFICATION**

WARNING



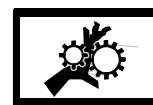
VEST



HELMET PROTECTION



HEAVY PARTS

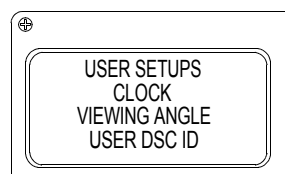
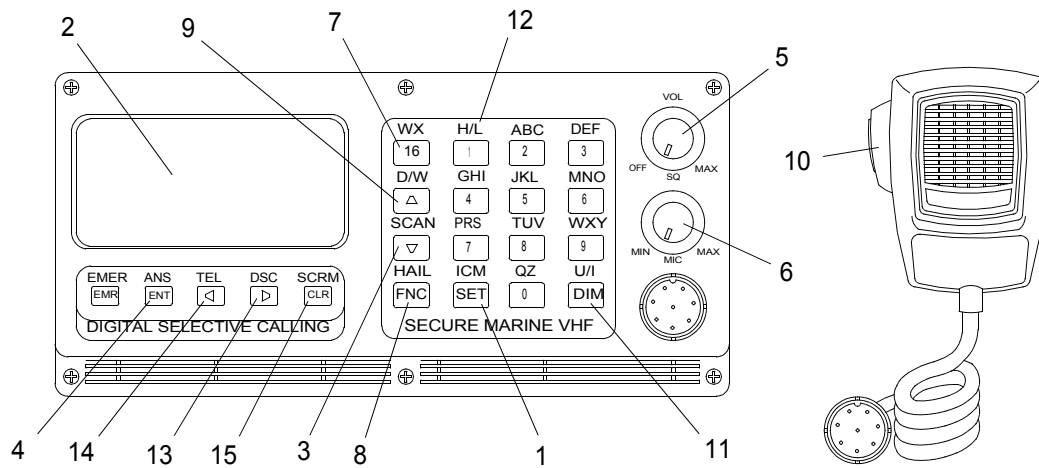


MOVING PARTS

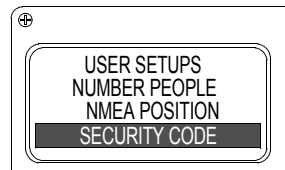
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

During tactical operations, any vessel can request position through the VHF/FM DSC transceiver. There is no request authorization required nor can this request be seen by the vessel operator. During tactical operations, switch SW3 on the AN/PSN-11 Interface and switchbox should remain in the OFF position and used only as necessary to prevent unwanted interrogation of position for vessels equipped with a DSC transceiver not manufactured to military specification. Vessels operating with a DSC transceiver manufactured to military specification may leave switch SW3 on the AN/PSN-11 Interface and switchbox in the on position, but must operate with the covert mode enabled. Failure to comply during tactical operations could result in injury or death to personnel.

1. To determine the type of transceiver installed, military specification or non-military specification, press the SET key (1). The USER SETUPS menu will appear in the LCD display (2).



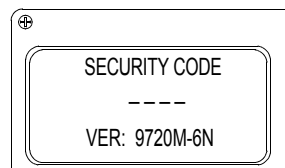
2. Press the DOWN ARROW key (3) until SECURITY CODE is highlighted.



NOTE

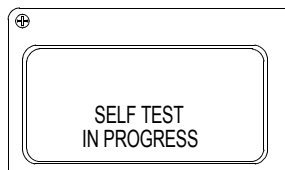
A software version number appears on the bottom line of the display. The letter “M” after the four numerical digits denotes that the transceiver has been manufactured to military specification. Absence of the letter “M” denotes that the transceiver has not been manufactured to military specification.

3. Press the ENT key (4).



POWER ON AND VOLUME

1. Rotate the VOLUME KNOB (5) clockwise to turn the power on.



2. Rotate the knob further clockwise to adjust the audio output level. If a self-test fails, a message describing the failure will be displayed.

POWER OFF

1. Rotate the knob further counterclockwise to decrease the audio output level.
2. Rotate the VOLUME KNOB (5) counterclockwise until it clicks to turn the power off. The display becomes blank and the transceiver does not receive any calls.

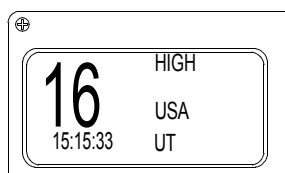
SQUELCH

1. Rotate the SQUELCH KNOB (6) counterclockwise until background noise is heard.
2. Adjust the knob clockwise until slightly beyond the point where noise is muted.

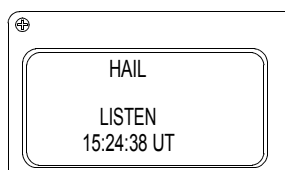
PRIMARY MODE**NOTE**

The PRIMARY mode is the basic communication mode of the transceiver. In voice contacts, both calling and routine communications 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.

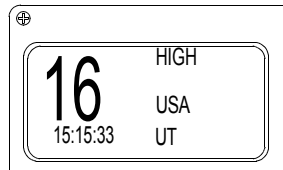
1. Press the 16 key (7), and any function, active or pending, is canceled and the PRIMARY mode display appears with channel 16 selected.



2. Press two channel number keys, and 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.
3. Press the function keys for the current active mode again. For example, to select the HAIL mode, press the FNC/HAIL key (8) twice. The HAIL display appears.

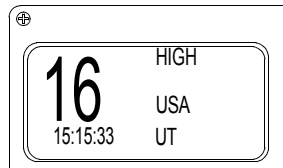


- To cancel the HAIL mode, press the FNC/HAIL key (8) twice again and the PRIMARY mode display will appear.



CHANGING CHANNELS

- To select the calling and safety channel, press the 16 key (7). The PRIMARY mode display appears with channel 16 selected as the working channel.

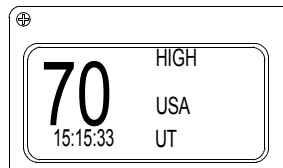


- To select a working channel, press the UP ARROW key (9) or DOWN ARROW key (3) or two number keys for the desired channel when the PRIMARY mode is active.

NOTE

If the transceiver has another mode active, the scan menu for example, two options are available to select a new channel.

- Pressing the functions keys for the active mode returns to the PRIMARY mode with the current working channel active. Press the arrow keys or two number keys to select the desired channel.



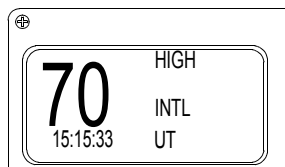
TRANSMITTING

- To transmit, hold the microphone near your lips and press the PUSH TO TALK button (10) on the microphone.
- 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.

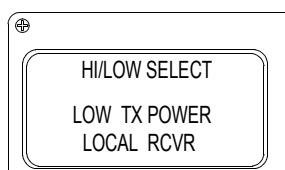
USA OR INTERNATIONAL FREQUENCIES
NOTE

The DSC may be operated on either the USA or INTERNATIONAL frequencies. The current selection appears in the PRIMARY mode display.

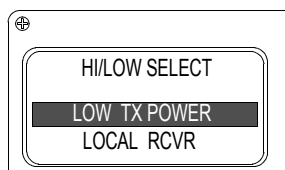
- To change the current frequency set, press the FNC key (8) and U/I key (11) while the PRIMARY mode is active. The annunciator toggles between USA and INTL each time the keys are pressed.

**TRANSMITTER POWER SETTING**

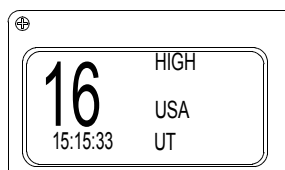
- To change the current power setting, select the PRIMARY mode. Press the FNC key (8) and H/L key (12). The HI/LOW SELECT menu appears in the display.



- Press the UP ARROW key (9) or DOWN ARROW key (3) 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 (4).

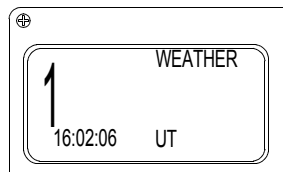
**NOTE**

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.

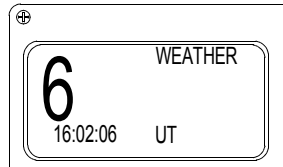
- To transmit on high power, the FNC key (8) and H/L (12) keys must be pressed and held while the microphone's PUSH TO TALK button (10) is pressed. The HIGH annunciator appears in the display while transmitting at 25 watts.

WEATHER

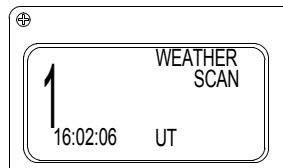
1. Press the FNC key (8) and WX key (7) to receive recorded weather broadcasts. The WEATHER display will appear and the last used channel will be selected.



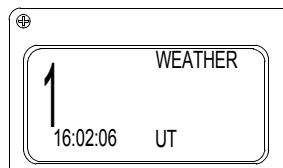
2. Press the UP ARROW key (9), DOWN ARROW key (3) or a number key to select a different weather channel.



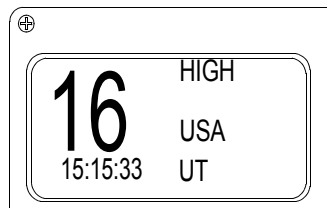
3. Press the FNC key (8) and SCAN key (3) to scan all weather channels.



4. Press the UP ARROW key (9) to force scanning to resume. To stop scanning and return to a weather channel, press the FNC key (8) and SCAN key (3) again.

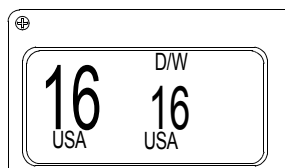


5. To return to the PRIMARY mode, press the FNC key (8) and WX key (7). To select any other mode, press the function key(s) for that mode.



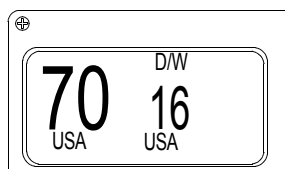
DUAL WATCH

1. Press the FNC key (8) and D/W key (9). The current working channel and last used priority channel numbers appear in the display.

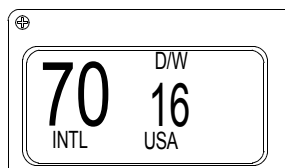
**NOTE**

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.

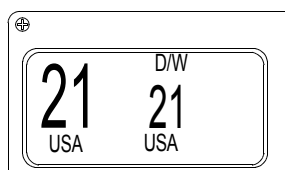
2. Pressing the PUSH TO TALK button (10) will cancel the DUAL WATCH mode.
3. To change the working channel, press the UP ARROW key (9) or DOWN ARROW key (3) or appropriate number keys to select a working channel. A three beep tone will sound if an invalid channel is selected.



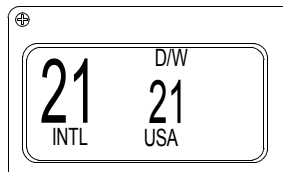
4. Press the FNC key (8) and U/I key (11) to change between USA and INTL frequencies.



5. To select or change the priority channel, press the RIGHT ARROW key (13). The smaller priority channel digits will begin flashing. The scan is halted while the digits are flashing. Press the UP ARROW key (9) or DOWN ARROW key (3) or appropriate number keys to select a priority channel.



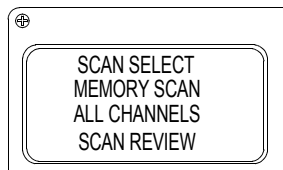
- Press the FNC key (8) and U/I key (11) to change between USA and INTL frequencies for the priority channels. Press the LEFT ARROW key (14) or RIGHT ARROW key (13) to complete the priority channel selection.



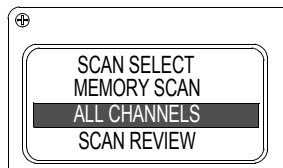
- Pressing the PUSH TO TALK button (10) on either channel will cancel the DUAL WATCH mode.
- Press the 16 key (7) to return to the PRIMARY mode.

ALL CHANNEL SCAN

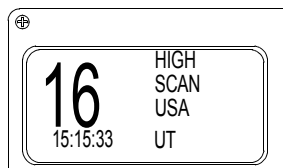
- Press the FNC key (8) and SCAN key (3). The SCAN SELECT display will appear.



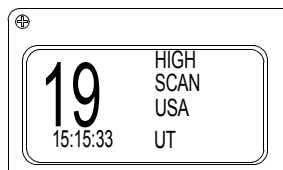
- Press the UP ARROW key (9) or DOWN ARROW key (3) to select ALL CHANNELS with selection bar.



- Press the ENT key (4) to initiate channel scanning. All channels will be scanned in sequence.



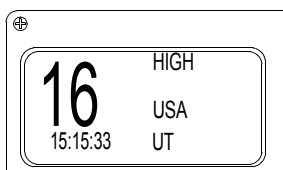
- Press the UP ARROW key (9) to override the active channel and resume scanning.



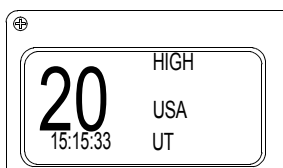
- Pressing the PUSH TO TALK button (10) or entering a channel number will cancel the ALL CHANNEL SCAN mode and select the PRIMARY mode.

SCAN MEMORY

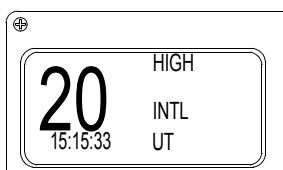
1. Press the 16 key (7) to select the calling channel. The PRIMARY mode display will appear.



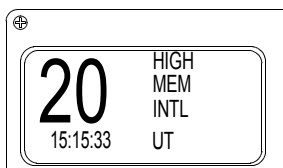
2. Press the UP ARROW key (9) or DOWN ARROW key (3) or appropriate number keys to select a desired channel.



3. Press the FNC key (8) and U/I key (11) to change between USA and INTL frequencies, if necessary.



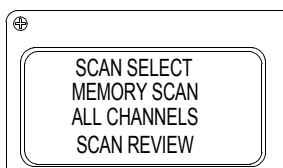
4. Press the ENT key (4) to enter the selected channel into Scan Memory. MEM will appear in the display.



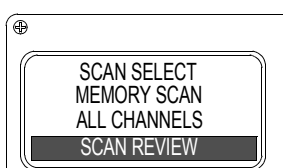
5. Press the CLR key (15) to remove a previously selected channel from SCAN MEMORY. MEM will not appear in display.

SCAN REVIEW

1. Press the FNC key (8) and SCAN key (3). The SCAN SELECT display will appear.



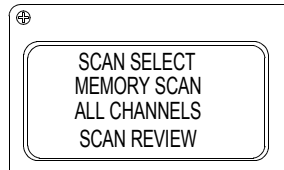
2. Press the UP ARROW key (9) or DOWN ARROW key (3) to select SCAN REVIEW with selection bar.



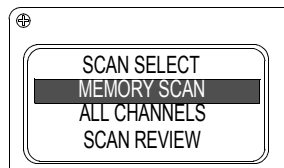
3. Press the ENT key (4) to initiate SCAN REVIEW. Each channel in SCAN MEMORY will be displayed for 1 second. Two beeps will sound at the end of the list.

MEMORY SCAN

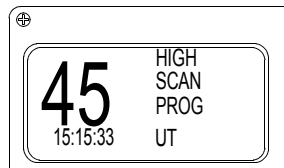
1. Press the FNC key (8) and SCAN key (3). The SCAN SELECT display will appear.



2. Press the UP ARROW key (9) or DOWN ARROW key (3) to select MEMORY SCAN with selection bar.



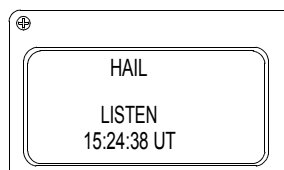
3. Press the ENT key (4) to initiate scanning. Only channels previously assigned to SCAN MEMORY will be scanned. Press the UP ARROW key (9) to override an active channel and resume scanning.



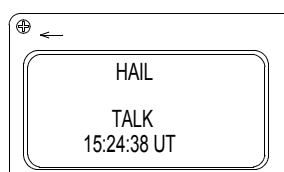
4. Press the CLR key (15) while the scan is stopped on the channel this will remove an excessively active channel from SCAN MEMORY.
5. Pressing the PUSH TO TALK button (10) or entering a channel number will cancel the MEMORY SCAN mode and select the PRIMARY mode. If the channel number is valid, the channel entered will be selected. If not valid, the channel being scanned at the first number key entry will become active.

HAIL

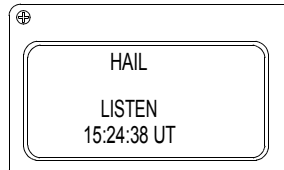
1. Press FNC/HAIL key (8) to select the HAIL mode.



2. Press the PUSH TO TALK button (10) to speak through the hail speaker. TALK will appear in the display.



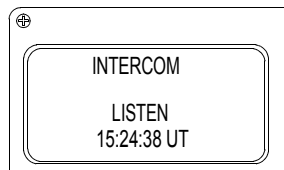
3. Release the PUSH TO TALK button (10) to listen through hail speaker. LISTEN will appear in the display.



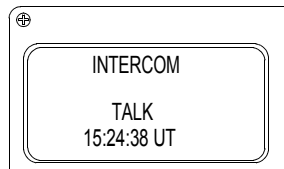
4. Use the VOLUME KNOB (5) to adjust the talk and listen levels. Press the FNC/HAIL key (8) again or enter a valid channel number to exit the HAIL mode and resume PRIMARY mode operation.

INTERCOM

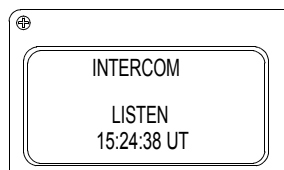
1. Press the FNC key (8) and ICM key (1) to select the INTERCOM mode. The INTERCOM display will appear.



2. Press the PUSH TO TALK button (10) to speak through the intercom speaker. TALK will appear in the display.



3. Release the PUSH TO TALK button (10) to listen through intercom speaker. LISTEN will appear in the display.



4. Use the VOLUME KNOB (5) to adjust the talk and listen levels. Press the FNC key (8) and ICM key (1) again or enter a valid channel number to exit the INTERCOM mode and resume PRIMARY mode operation.

Table 1. VHF Marine Channels and Frequencies.

| CHAN NUMB | SIMP USA | DUP INTL | USA CHANNEL ASSIGNMENT | INTL CHANNEL ASSIGNMENT | RECEIVE (USA) FREQ. MHZ | RECEIVE (INTL) FREQ. MHZ | TRANSMIT FREQ. MHZ |
|-----------|----------|----------|--|-------------------------------|-------------------------|--------------------------|--------------------|
| 01 | S | D | Port Operations | Port Operations | 156.050 | 160.650 | 156.050 |
| 02 | S | D | Port Operations | Port Operations | 156.100 | 160.700 | 156.100 |
| 03 | S | D | Intership & Coast-Coast | Public Correspondence | 156.150 | 160.750 | 156.150 |
| 04 | S | D | Port Operations | Port Operations | 156.200 | 160.800 | 156.200 |
| 05 | S | D | Port Ops. (Intership/Ship-Coast) | Port Operations | 156.250 | 160.850 | 156.250 |
| 06 | S | S | Ship-Ship Safety Only | Intership Safety | 156.300 | 156.300 | 156.300 |
| 07 | S | D | Commercial (Intership/Ship-Coast) | Public Correspondence | 156.350 | 160.950 | 156.350 |
| 08 | S | S | Commercial (Intership) | Commercial | 156.400 | 156.400 | 156.400 |
| 09 | S | S | Comm./Non Comm. (Intership/Ship-Coast) | Port Operations | 156.450 | 156.450 | 156.450 |
| 10 | S | S | Commercial (Intership/Ship-Coast) | Port Operations | 156.500 | 156.500 | 156.500 |
| 11 | S | S | Commercial (Intership/Ship-Coast) | Port Operations | 156.550 | 156.550 | 156.550 |
| 12 | S | S | Port Operations (Intership/Ship-Coast) | Port Operations | 156.600 | 156.600 | 156.600 |
| 13 | S | S | Navigation (Ship-Ship) | Port Operations | 156.650 | 156.650 | 156.650 |
| 14 | S | S | Port. Ops. (Intership/Ship-Coast) | Port Operations | 156.700 | 156.700 | 156.700 |
| 15 | S | S | Environmental | On-Board Communications | 156.750 | 156.750 | 156.750 |
| 16 | S | S | Distress, Safety, and Calling | Distress, Safety, and Calling | 156.800 | 156.800 | 156.800 |
| 17 | S | S | State Control | On-Board Communications | 156.850 | 156.850 | 156.850 |

Table 1. VHF Marine Channels and Frequencies. (Continued)

| CHAN NUMB | SIMP USA | DUP INTL | USA CHANNEL ASSIGNMENT | INTL CHANNEL ASSIGNMENT | RECEIVE (USA) FREQ. MHZ | RECEIVE (INTL) FREQ. MHZ | TRANSMIT FREQ. MHZ |
|-----------|----------|----------|------------------------------------|-------------------------|-------------------------|--------------------------|--------------------|
| 18 | S | D | Commercial (Intership/ Ship-Coast) | Port Operations | 156.900 | 161.500 | 156.900 |
| 19 | S | D | Commercial (Intership/ Ship-Coast) | Port Operations | 156.950 | 161.550 | 156.950 |
| 20 | D | D | Port Ops. (Intership/ Ship-Coast) | Port Operations | 161.600 | 161.600 | 157.000 |
| 21 | S | D | U. S. Government Only | Port Operations | 157.050 | 161.650 | 157.050 |
| 22 | S | D | Coast Guard Only | Port Operations | 157.100 | 161.700 | 157.100 |
| 23 | S | D | U. S. Government Only | Public Correspondence | 157.150 | 161.750 | 157.150 |
| 24 | D | D | Public Correspondence (Ship-Coast) | Public Correspondence | 161.800 | 161.800 | 157.200 |
| 224 | D | D | - | - | 161.8125 | 161.8125 | 157.2125 |
| 25 | D | D | Public Correspondence (Ship-Coast) | Public Correspondence | 161.850 | 161.850 | 157.250 |
| 225 | D | D | - | - | 161.8625 | 161.8625 | 157.2625 |
| 26 | D | D | Public Correspondence (Ship-Coast) | Public Correspondence | 161.900 | 161.900 | 157.300 |
| 226 | D | D | - | - | 161.9125 | 161.9125 | 157.3025 |
| 27 | D | D | Public Correspondence (Ship-Coast) | Public Correspondence | 161.950 | 161.950 | 157.350 |
| 227 | D | D | - | - | 161.9625 | 161.9625 | 157.3625 |
| 28 | D | D | Public Correspondence (Ship-Coast) | Public Correspondence | 162.000 | 162.000 | 157.400 |
| 228 | D | D | - | - | 162.0125 | 162.0125 | 157.4125 |
| 60 | D | D | - | Port Operations | 160.625 | 160.625 | 156.025 |
| 61 | D | D | - | Port Operations | 160.675 | 160.675 | 156.075 |

Table 1. VHF Marine Channels and Frequencies. (Continued)

| CHAN NUMB | SIMP USA | DUP INTL | USA CHANNEL ASSIGNMENT | INTL CHANNEL ASSIGNMENT | RECEIVE (USA) FREQ. MHZ | RECEIVE (INTL) FREQ. MHZ | TRANSMIT FREQ. MHZ |
|-----------|----------|----------|-----------------------------------|-------------------------|-------------------------|--------------------------|--------------------|
| 62 | D | D | Public Correspondence | Public Correspondence | 160.725 | 160.725 | 156.125 |
| 63 | S | D | Port Operations | Port Operations | 156.175 | 160.775 | 156.175 |
| 64 | D | D | - | - | 160.825 | 160.825 | 156.225 |
| 65 | D | D | Port Ops. (Intership/ Ship-Coast) | Special Emergency | 156.275 | 160.875 | 156.275 |
| 66 | S | D | Port Ops. (Intership/ Ship-Coast) | - | 156.325 | 160.875 | 156.325 |
| 67 | S | S | Commercial Miss. River | Port Operations | 156.375 | 157.375 | 157.375 |
| 68 | S | S | Non-Commercial | Port Operations | 156.425 | 156.425 | 156.425 |
| 69 | S | S | Non-Commercial | Port Operations | 156.475 | 156.475 | 156.475 |
| 70 | S | S | Digital Selective Calling | Commercial | 156.525 | 156.525 | 156.525 |
| 71 | S | S | Non-Commercial | Port Operations | 156.575 | 156.575 | 156.575 |
| 72 | S | S | Non-Commercial | Commercial | 156.625 | 156.625 | 156.625 |
| 73 | S | S | Port Ops. (Intership/ Ship-Coast) | Port Operations | 156.675 | 156.675 | 156.675 |
| 74 | S | S | Port Ops. (Intership/ Ship-Coast) | Port Operations | 156.725 | 156.725 | 156.725 |
| 75 | S | S | Guard Channel | - | 156.775 | 156.775 | 156.775 |
| 76 | S | S | Guard Channel | - | 156.825 | 156.825 | 156.825 |
| 77 | S | S | Port Ops. (Intership) | Commercial | 156.875 | 156.875 | 156.875 |
| 78 | S | D | Non. Commercial | Port Operations | 156.925 | 161.525 | 156.925 |
| 79 | S | D | Commercial | Port Operations | 156.975 | 161.575 | 156.975 |
| 80 | S | D | Commercial | Port Operations | 157.025 | 161.625 | 157.025 |
| 81 | S | D | U. S. Government Only | Port Operations | 157.075 | 161.675 | 157.075 |
| 82 | S | D | U. S. Government Only | Port Operations | 157.125 | 161.725 | 157.125 |

Table 1. VHF Marine Channels and Frequencies. (Continued)

| CHAN NUMB | SIMP USA | DUP INTL | USA CHANNEL ASSIGNMENT | INTL CHANNEL ASSIGNMENT | RECEIVE (USA) FREQ. MHZ | RECEIVE (INTL) FREQ. MHZ | TRANSMIT FREQ. MHZ |
|-----------|----------|----------|------------------------------------|-------------------------|-------------------------|--------------------------|--------------------|
| 83 | S | D | U. S. Government Only | Public Correspondence | 157.175 | 161.775 | 157.175 |
| 283 | D | D | - | - | 161.7875 | 161.7875 | 157.1875 |
| 84 | S | D | U. S. Government Only | Public Correspondence | 157.275 | 161.825 | 157.225 |
| 284 | D | D | - | - | 161.8375 | 161.8375 | 157.2375 |
| 85 | D | D | Public Correspondence (Ship-Coast) | Public Correspondence | 161.875 | 161.875 | 157.275 |
| 285 | D | D | - | - | 161.8875 | 161.8875 | 157.2875 |
| 86 | D | D | Public Correspondence (Ship-Coast) | Public Correspondence | 161.925 | 161.925 | 157.325 |
| 286 | D | D | - | - | 161.9375 | 161.9375 | 157.3375 |
| 87 | D | D | Public Correspondence (Ship-Coast) | Public Correspondence | 161.975 | 161.975 | 157.375 |
| 287 | D | D | - | - | 161.9875 | 161.9875 | 157.3875 |
| 88 | S | D | Commercial (Intership) | Public Correspondence | 157.425 | 162.025 | 157.425 |

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
VHF/FM DSC TRANSCEIVER
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

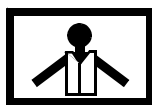
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

OPERATING PROCEDURES - PERFORM USER SETUPS FOR THE VHF/FM DSC TRANSCEIVER

WARNING

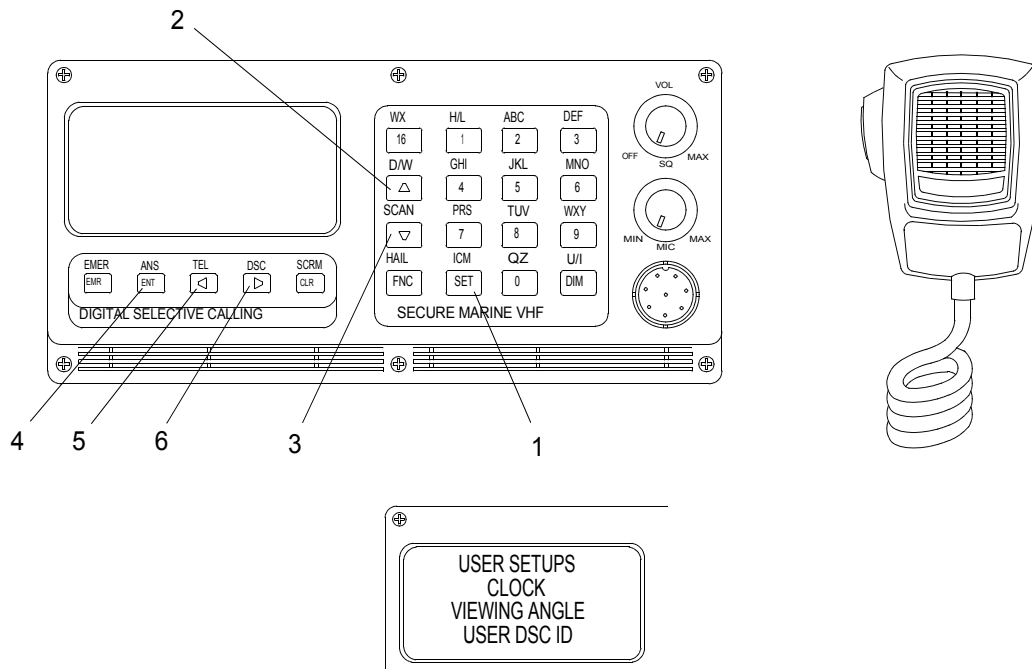
**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

NOTE

USER SETUPS allow certain characteristics of the DSC to be set or changed according to the user's preference. Once the preferences have been set, they will be retained in memory until again changed by the user.

1. Press the SET key (1). The USER SETUPS menu will appear.



2. Press the UP ARROW key (2) or DOWN ARROW key (3) to position the selection bar on the desired selection.
3. Press the ENT key (4) to complete the selection. The appropriate setup page will appear.
4. Press LEFT ARROW key (5) or RIGHT ARROW key (6) to select the character to be changed.
5. Press the UP ARROW key (2), DOWN ARROW key (3) or a NUMBER KEY to change a value.

NOTE

If the ENT key is not pressed to complete an operation, the new setup information will not be remembered.

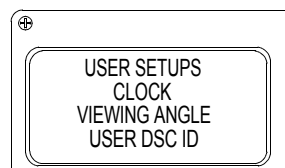
6. Press the ENT key (4) to complete the operation and return to the USER SETUPS menu.

CLOCK SETUP

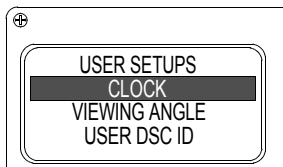
NOTE

The CLOCK SETUP page allows the user to choose how the time of day will appear in certain displays. The time may be displayed as either local time or UTC time. Local time may be displayed in AM/PM or 24 hour format. UTC time is always displayed in 24 hour format.

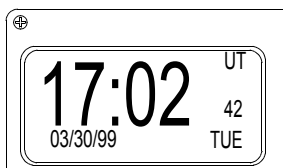
1. Press the SET key (1). The USER SETUPS menu will appear.



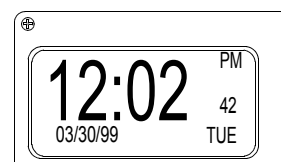
2. Press the UP ARROW key (2) to highlight CLOCK.



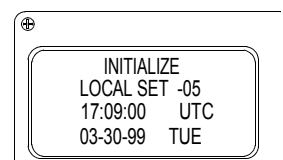
3. Press the ENT key (4). The CLOCK display will appear. The date and day of the week appear in the lower line of the display. The large digits display the hours and the minutes. Seconds are displayed to the lower right. The two letters in the upper right hand corner of the display indicate how the time is displayed. AM or PM indicates 12 hour format, MT indicates 24 hour military format and UT indicates Universal Coordinated Time. Universal Coordinated Time (UTC) has been known as Greenwich Mean Time (GMT) or Zulu time.



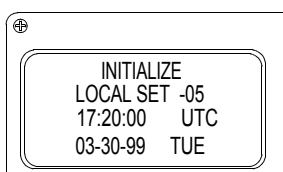
4. Press either the UP ARROW key (2), DOWN ARROW key (3), LEFT ARROW key (5) or RIGHT ARROW key (6) to change between AM/PM or MT or UT.



5. Press the CLR key (7). The INITIALIZE page will appear to change the time, date, day of week, or local offset from UTC,. The UTC time, date and day of the week appear in the lower two lines of the display. The LOCAL SET line in the display show the offset from UTC to local time as + or D the number of hours from your location to the Greenwich meridian. The + or D sign will be flashing.



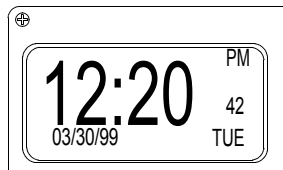
6. Press the UP ARROW key (2) to change the sign.
7. Press the RIGHT ARROW key (6) to select the next digit in the offset field. Enter the correct number of hours. As each digit is entered, the flashing digit will move to the next position.



NOTE

If this is the first time you have set the clock, you may want to set the time several minutes ahead to allow for following the instructions.

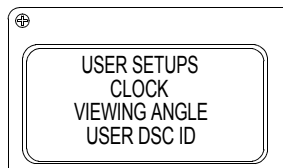
8. To correct an entry, press the LEFT ARROW key (5) to backspace.
9. To skip a digit, press the RIGHT ARROW key (6). Enter the correct UTC time in hours and minutes. As each digit is entered, the flashing digit will move to the next position.
10. After the time is set, the flashing digit will move to the first digit on the lower line of the display. Press the appropriate number keys to enter the date.
11. When the date is complete, press the UP ARROW key (2) repeatedly to select the day of the week.
12. When all information is displayed correctly, press the ENT key (4).



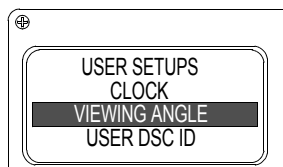
13. The UTC time will be corrected by the AN/PSN-11(V)1 PLGR if the system is operational.
14. Press the 16 key to return to the PRIMARY mode.

VIEWING ANGLE

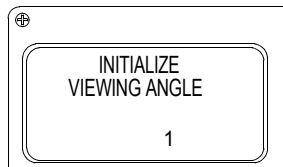
1. Press the SET key (1). The USER SETUPS menu will appear.



2. Press the UP ARROW key (2) or DOWN ARROW key (3) to select VIEWING ANGLE with the selection bar.



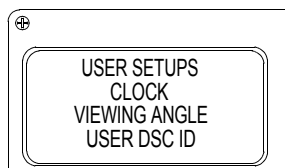
3. Press the ENT key (4). The INITIALIZE VIEWING ANGLE page will appear.



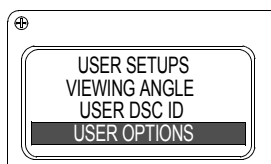
4. Press the UP ARROW key (2) or DOWN ARROW key (3) or an appropriate number key (0-7) to change the contrast between the background and the displayed character.
5. Press the ENT key (4) to complete the operation and return to the USER SETUPS menu.
6. Press the 16 key to return to the PRIMARY mode.

USER OPTIONS

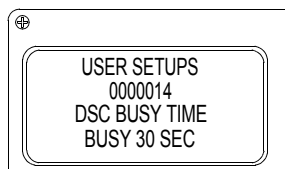
1. Press the SET key (1). The USER SETUPS menu will appear.



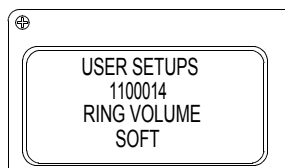
2. Press the UP ARROW key (2) or DOWN ARROW key (3) to select USER OPTIONS with the selection bar.



3. Press the ENT KEY (4), the USER OPTIONS page will appear with a seven digit number in the second line of the display.
4. Press the LEFT ARROW key (5) or RIGHT ARROW key (6) to select a digit position. The active digit position will flash.
5. Press the UP ARROW key (2) or DOWN ARROW key (3) repeatedly to change to the desired value.
6. Press the ENT key (4) to complete the operation and return to the USER SETUPS menu.
7. Press the RIGHT ARROW key (6) to select the first digit position.
8. Press the UP ARROW key (2) or DOWN ARROW key (3) repeatedly to change to the desired DSC BUSY TIME: The amount of time, after the release of the PUSH TO TALK button (8), that the transceiver will respond to a DSC call with a busy signal.



9. Press the RIGHT ARROW key (6) to select the second digit position.

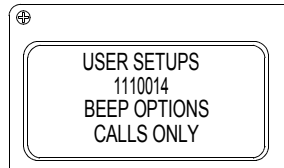


10. Press the UP ARROW key (2) or DOWN ARROW key (3) repeatedly to change to the desired ring volume.

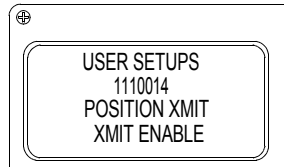
11. Press the RIGHT ARROW key (6) to select the third digit position. Press the UP ARROW key (2) or DOWN ARROW key (3) repeatedly to change to ALL ON, CALLS ONLY or ALL OFF. The distress signal will sound with any option.

NOTE

If a distress signal is sent, position coordinates will be transmitted with either option selected, provided the AN/PSN-11(V)1 PLGR is operational.



12. Press the RIGHT ARROW key (6) to select the fourth digit position.

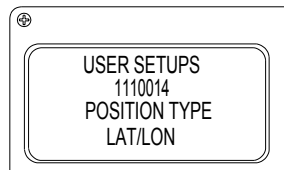


13. Press the UP ARROW key (2) or DOWN ARROW key (3) repeatedly to select POSITION XMIT or XMIT ENABLE.

NOTE

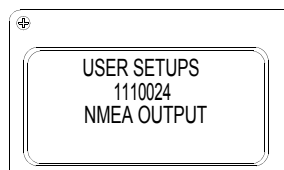
LATITUDE/LONGITUDE should always be selected in the fifth position of the USER SETUP menu.

14. Press the RIGHT ARROW key (6) to select the fifth digit position.



12C033-16

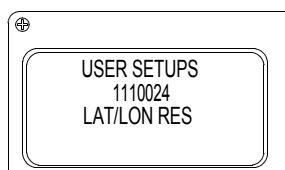
15. Press the UP ARROW key (2) or DOWN ARROW key (3) repeatedly to select POSITION XMIT or XMIT ENABLE
16. Press the RIGHT ARROW key (6) to select the sixth digit position.
17. Press the UP ARROW key (2) or DOWN ARROW key (3) repeatedly to select NMEA output sentences available from the data interface.



NOTE

Each selection provides one or more sentences to facilitate connection to plotters, displays, or personal computers. OPTION 0: Outputs the \$LCGLL sentence for any LAT/LON position received from another vessel. OPTION 1: Outputs \$CDWPL and \$CDBWC sentences for LAT/LON positions received from another vessel. OPTION 2: Repeats every 5 seconds a \$CDGLL sentence for any LAT/LON position received through the NMEA data input to the DSC. Also outputs \$CDWPL and \$CDBWC sentences each time a LAT/LON position received through the NMEA data input to the DSC. Also outputs \$CDWPL and \$CDBWC sentences each time a LAT/LON position is received from another vessel. OPTION 3: Proprietary. OPTION 4: Repeats character \$GPGGA, \$xxVTG, and \$GPGSV sentences received through the NMEA data input.

18. Press the RIGHT ARROW key (6) to select the seventh digit position.

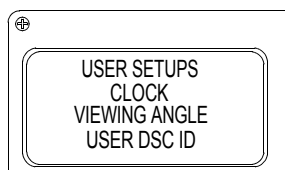


19. Press the UP ARROW key (2) or DOWN ARROW key (3) repeatedly to select LAT/LON RESOLUTION to set the number of decimal places in LAT/LON position.
20. Press the 16 key to return to the PRIMARY mode.

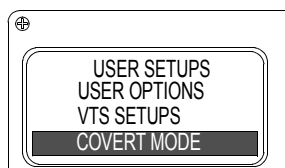
COVERT MODE
NOTE

Only military specification transceivers are equipped with the COVERT mode option.

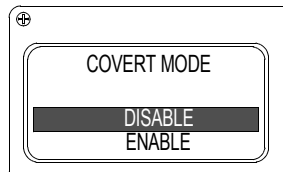
- The COVERT mode, when enabled, prevents the DSC transceiver from being interrogated by another vessel requesting position.
- Press the SET key (1). The USER SETUPS menu will appear.



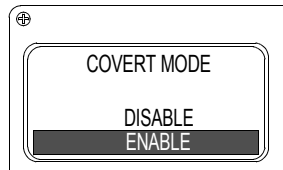
- Press the DOWN ARROW key (3) to select COVERT mode with the selection bar.



- Press the ENT key (4), the COVERT mode page will appear.



- Press the DOWN ARROW key (3) to select ENABLE.



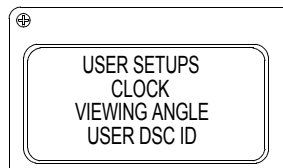
- Press the ENT key (4). The display returns to the USER SETUPS menu.
- Press the 16 key to return to the PRIMARY mode.

WATCH 16

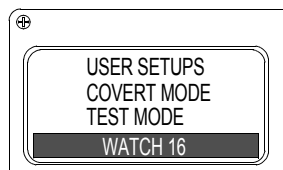
NOTE

The WATCH 16 mode, when enabled, allows the operator to select a working channel other than channel 16 while monitoring channel 16. Any activity on channel 16 will cause the transceiver to change to channel 16 until the activity ceases. The transceiver then changes back to the operator assigned working channel

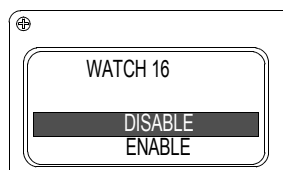
- Press the SET key (1). The USER SETUPS menu will appear.



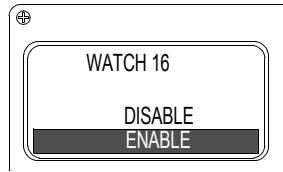
- Press the DOWN ARROW key (3) to select WATCH 16 with the selection bar.



- Press the ENT key (4), the WATCH 16 page will appear.



- Press the DOWN ARROW key (3) to select ENABLE.



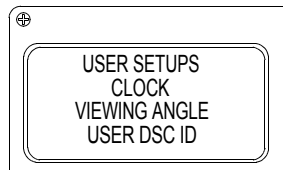
- Press the ENT key (4). The display returns to the USER SETUPS menu.
- Press the 16 key to return to the PRIMARY mode.

STATION NUMBER

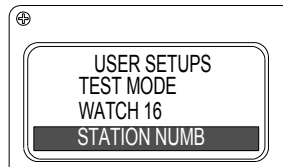
NOTE

Only transceivers manufactured to military specification have the STATION NUMBER mode.

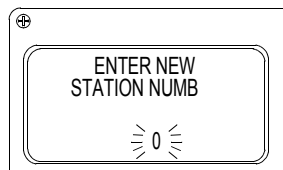
- Press the SET key (1). The USER SETUPS menu will appear.



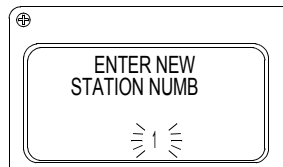
- Press the DOWN ARROW key (3) to select STATION NUMB with the selection bar.



- Press the ENT key (4), the STATION NUMB page will appear.



- Enter the preferred STATION NUMBER.

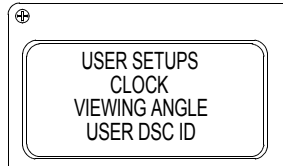


- Press the ENT key (4). The display returns to the USER SETUPS menu.
- Press the 16 key to return to the PRIMARY mode.

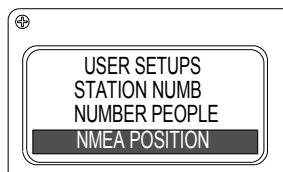
NMEA POSITION**NOTE**

The NMEA POSITION function displays the position coordinates from the AN/PSN-11(V)1 PLGR.

1. Press the SET key (1). The USER SETUPS menu will appear.

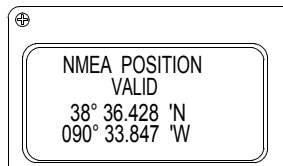


2. Press the UP ARROW key (2) or DOWN ARROW key (3) to select NMEA POSITION with the selection bar.

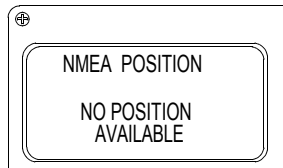
**NOTE**

The DSC protocol specifies LAT./LON coordinates for reporting. The DSC is capable of using both TD and LAT./LON coordinates, depending upon the POSITION TYPE setting on the USER OPTIONS page. Ensure that POSITION TYPE is set up for LAT./LON.

3. Press the ENT key (4). The NMEA POSITION page will appear. If position information is available from the AN/PSN-11(V)1 PLGR, the coordinates will appear.



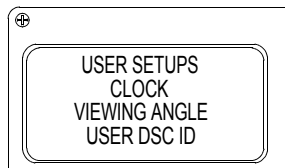
4. If position information is not available from AN/PSN-11(V)1 PLGR, NO POSITION AVAILABLE will appear in the lower two lines of the display.



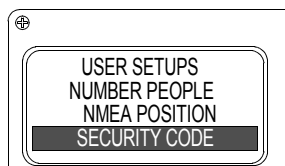
5. Press the 16 key to return to the PRIMARY mode.

SECURITY CODE

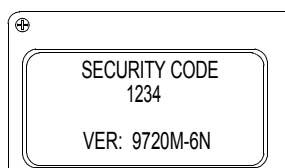
1. Press the SET key (1). The USER SETUPS menu will appear.



2. Press the UP ARROW key (2) or DOWN ARROW key (3) to select SECURITY CODE with the selection bar.

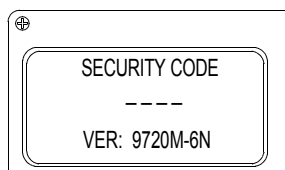


3. Press the ENT key (4). The SECURITY page will appear.

**NOTE**

Four dashes appear on the second line of the display if no code has been entered. The software version number, VER: #-#, appears in the lower line of the display. If a four digit number appears in the second line, it may be changed or deleted or left as is.

4. Press the CLR key (7) twice to clear an existing entry. Four dashes will appear in the display. To change an existing code or enter a new one, press the desired number keys. Four digits without spaces must be entered.



5. To correct an entry, press the LEFT ARROW key (5) to backspace. To skip a digit, press the RIGHT ARROW key (6).

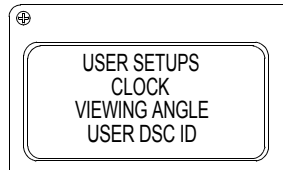
NOTE

When all information is displayed correctly, record the code number in a safe place. The next time the transceiver is turned on, you must know the code. If a security code is entered and not remembered, the transceiver's advanced features will not function. Contact a Ross Dealer or Ross Engineering Co. to restore the unit to full operation.

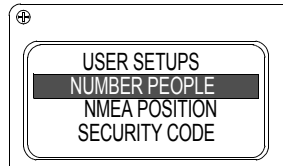
6. Press the ENT key (4) to complete the operation and return to the USER SETUPS menu.
7. Press the 16 key to return to the PRIMARY mode.

NUMBER OF PEOPLE

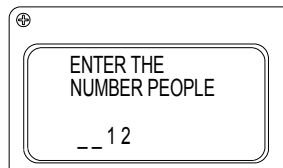
1. Press the SET key (1). The USER SETUPS menu will appear.



2. Press the UP ARROW key (2) or DOWN ARROW key (3) to select NUMBER PEOPLE with the selection bar and press the ENT key (4).



3. Enter the number of people using the digit keys on the keypad, press the ENT key (4) to save the information. This option is saved when the unit is turned off as with all USER SETUPS options.



4. Press the 16 key to return to the PRIMARY mode.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
VHF/FM DSC TRANSCEIVER
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:

Tools

- Gloves, Men’s and Women’s (Leather Palm) (Item 31, WP 0108 00)
- Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
- Life Preserver, Vest (Item 45, WP 0108 00)
- Helmet, Safety (Brown) (Item 40, WP 0108 00)

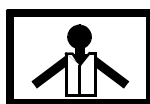
Personnel Required

Seaman 88K

**OPERATING PROCEDURES - OPERATE THE DSC FUNCTIONS FOR THE
VHF/FM DSC TRANSCEIVER**

DSC MODE MENU ARRANGEMENT

WARNING



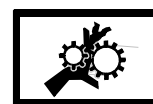
VEST



HELMET PROTECTION



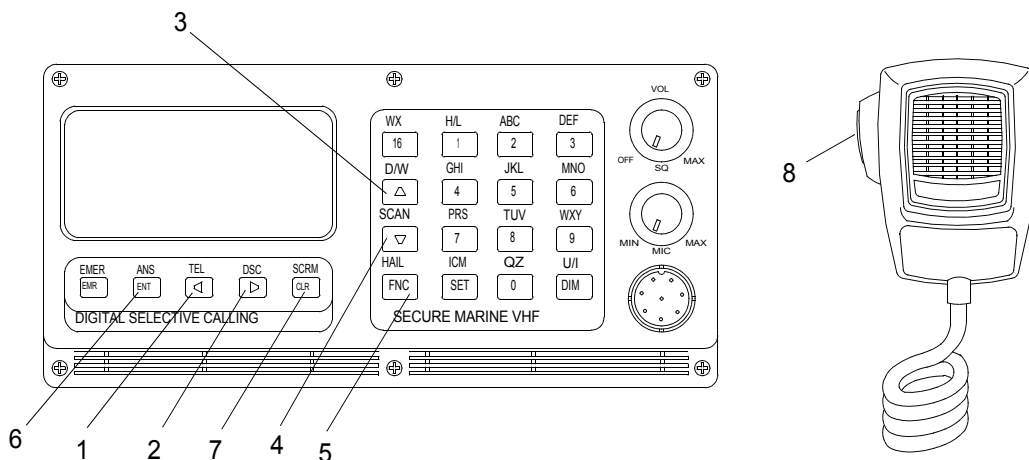
HEAVY PARTS



MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Access the DSC mode.



2. Press the LEFT ARROW key (1) to access the desired menu; DSC CALLING, DSC STANDBY, ALL SHIPS, DISTRESS DATA, GROUP POSITION, GROUP CALLING, REQUEST POSITION, and SEND POSITION.
3. Press the RIGHT ARROW key (2) to scroll through the menus and their data pages.

4. Press the LEFT ARROW key (1) to scrolls through the DSC functions menu.

NOTE

When certain selections are activated, another page will appear which either presents more information or allows the user to enter information into the page.

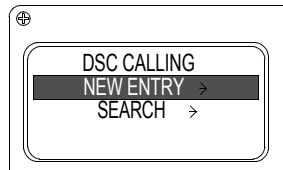
5. Press the UP and DOWN ARROW keys (3 and 4) to highlight the desired selection with the menu bar.

DSC CALLING DIRECTORY

NOTE

The basic procedure for entering names and numbers into directories is the same for all directories except CALL WAITING and DISTRESS DATA. These two directories automatically receive DSC calls and do not accept user entries from the keypad. However, logged entries may be cleared as desired from the CALL WAITING directory. The contents of all directories are protected from loss by an internal memory battery.

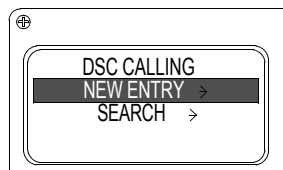
1. Press the FNC key (5) and DSC (2) keys to access the DSC CALLING directory. The DSC CALLING menu will appear in the display.



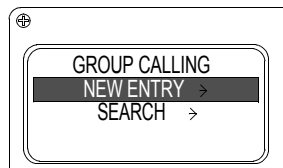
2. Select NEW ENTRY or SEARCH.

DSC GROUP CALLING DIRECTORY

1. Press the FNC key (5) and DSC (2) keys to access the DSC GROUP CALLING directory. The DSC CALLING menu will appear in the display.



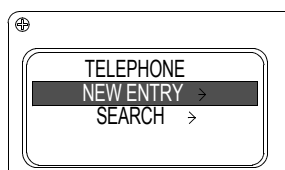
2. Press the RIGHT ARROW key (2) repeatedly until the GROUP CALLING menu is displayed.



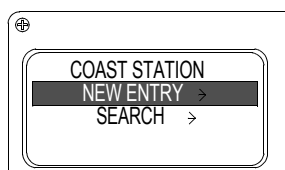
DSC COAST STATION DIRECTORY**NOTE**

The DSC COAST STATION directory will accept 50 entries of station names and their ID numbers. The name may be one to ten characters and the ID number must be nine digits. Letters, numbers and spaces may be used in the name but at least one character must be entered. An ID number without a name will not be accepted.

1. To access the DSC COAST STATION directory, press the FNC key (5) and TEL key (1). The TELEPHONE menu will appear in the display.

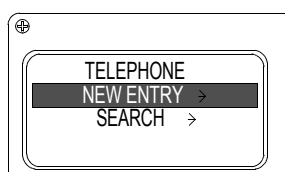


2. Press the RIGHT ARROW key (2). The COAST STATION menu will appear in the display.

**DSC TELEPHONE DIRECTORY****NOTE**

The DSC TELEPHONE directory will accept 200 entries of individual names and their telephone numbers. The telephone number may be up to 16 digits long, while the name may not exceed 10 characters. Letters, numbers and spaces may be used in the name but at least one character must be entered. A telephone number without a name will not be accepted. Letters are not accepted in telephone numbers.

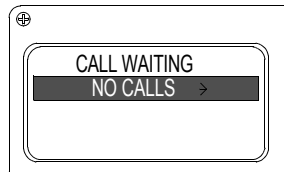
1. Press the FNC key (5) and TEL key (1) to access the DSC TELEPHONE directory. The TELEPHONE menu will appear in the display.



2. Select NEW ENTRY or SEARCH.

DSC CALL WAITING DIRECTORY

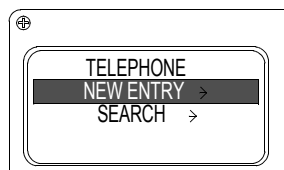
1. Press the FNC key (5) and ANS key (6) to access the DSC CALL WAITING directory. The CALL WAITING menu will appear in the display.



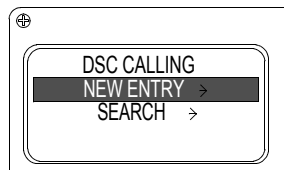
2. Select the call to be returned.

BUILDING DIRECTORIES

1. Press the FNC key (5) and TEL key (1) to select the TELEPHONE mode.



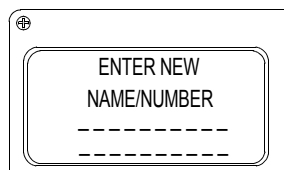
2. Access the DSC calling or group calling directories by entering the DSC mode.



3. Press the FNC key (5) and DSC key (2). When the desired mode is active, press the RIGHT ARROW key (2) to select the desired entry.

NOTE

The ENTER NEW NAME/NUMBER page will appear. Dashes will appear in the lower two lines of the display.

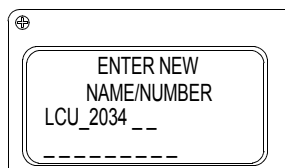


4. Press the UP ARROW key (3) or DOWN ARROW key (4) to position the selection bar on NEW ENTRY. Press the ENT key (6).

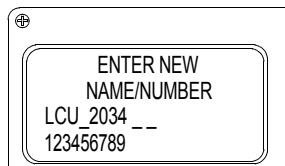
NOTE

A name must be entered on the second line from the bottom of the display and the ID number must be entered on the lower line. A name may be one or more alphanumeric characters but the ID number must be nine digits. Alphabetic entries are allowed only on certain pages for entering names into directories. At other times, pressing a number key will enter a numeric value only.

- To enter a letter into the name line of the display, press the appropriate number key until the desired letter or the number appears in the character position.



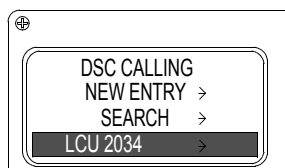
- Press the next key to be entered and the entry point will move to the next position automatically.
- Press the RIGHT ARROW key (2) to move the entry point to the next character position if more than one letter from the same key must be entered in succession.
- Press the LEFT ARROW key (1) to backspace and correct an entry if necessary.
- Press the DOWN ARROW key (4) to move the entry point to the ID number line when the name is complete.
- Press the appropriate number keys to enter the Ship Station Identification number. To correct an entry, press the LEFT ARROW key (1) to backspace. To skip a digit, press the RIGHT ARROW key (2).



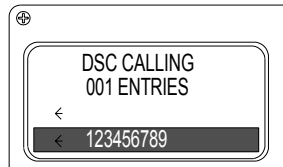
- When all information is displayed correctly, press the ENT key (6) to complete the operation.

NOTE

The DSC CALLING menu will appear and the newest entry name will appear with the selection bar in the lower line of the display.



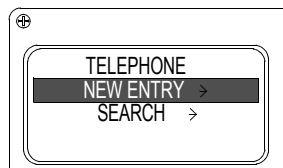
- To check the ID number for the name, press the RIGHT ARROW key (2). The corresponding ID number will appear with the selection bar in the lower line of the display. To return to the name, press the LEFT ARROW key (1).



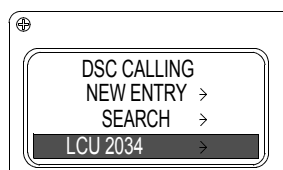
13. Use the LEFT ARROW (1) and RIGHT ARROW (2) keys to switch back and forth between a name page and a number page.
14. Press the UP ARROW key (3) and DOWN ARROW key (4) as appropriate to recall other names and numbers in the directory.
15. Press and hold down the appropriate ARROW key to scroll through the directory list.
16. Select NEW ENTRY from the menu and repeat the above entry procedure to add more entries to the directory.
17. Press the appropriate function keys again or enter a valid channel number to exit the directory and return to the PRIMARY mode.
18. Press the function keys for the desired mode to exit the directory and select another mode.

CHANGE OR REMOVE AN EXISTING DIRECTORY ENTRY

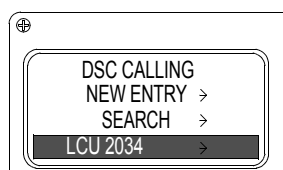
1. To access a directory, first select the appropriate mode. To access the TELEPHONE and COAST STATION directories, enter the TELEPHONE mode. Press the FNC key (5) and TEL key (1).



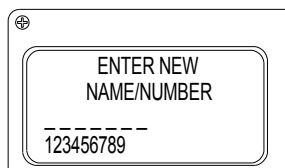
2. To access the DSC CALLING or GROUP CALLING directories, enter the DSC mode.



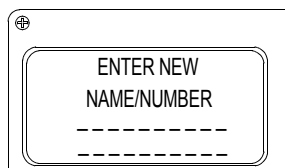
3. Press the FNC key (5) and DSC key (2).
4. Press the RIGHT ARROW key (2) as necessary to select the desired directory.
5. Press the UP ARROW key (3) or DOWN ARROW key (4) to position the selection bar on the entry you want to change or remove.



6. Press the CLR key (7). The ENTER NEW page will appear with the selected entry information displayed. The first character in the name will be flashing.
7. To remove the selection from the directory, press the CLR key (7) twice. Dashes will appear in the name line of the display.



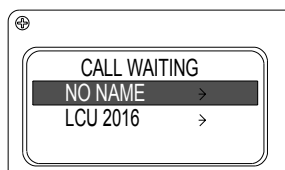
8. Press the ENT key (6). Both the name and ID number have been cleared from the directory.



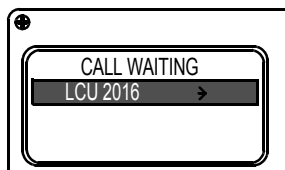
9. Change the name or ID number.
 - a. Press the UP ARROW key (3), DOWN ARROW key (4), LEFT ARROW key (1) or RIGHT ARROW key (2) to move the flashing entry point to the character to be changed.
 - b. Press the appropriate number keys to make the desired changes.
 - c. When all information is displayed correctly, press the ENT key (6) to complete the operation and enter the changes into the directory.

TRANSFER OR CLEAR FROM CALL WAITING

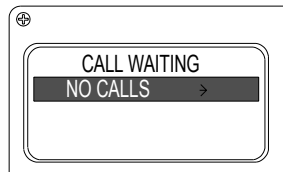
1. Press the FNC key (5) and ANS key (6) to access the DSC CALL WAITING directory. The CALL WAITING menu will appear in the display.



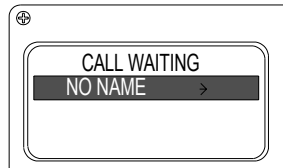
2. Press the UP ARROW key (3) or DOWN ARROW key (4) to position the selection bar on the entry you want to transfer or clear. If the selection has a name and you want to remove it from the directory, press and hold the CLR key (7) for two seconds. The selection will be cleared and the next entry in the directory will appear with the selection bar.



3. If no more entries exist in the directory, NO CALLS will appear in the display.

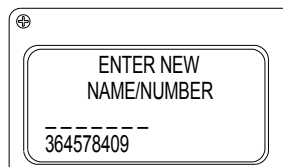


4. If the selection is NO NAME, press and hold the CLR key (7) for two seconds.



NOTE

The ENTER NEW NAME/NUMBER page will appear. The ID number will appear in the lower line of the display and dashes will appear in the line above the ID number. The first dash will be flashing.

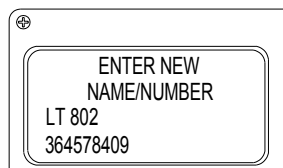


5. Press the ENT key (6) to clear the entry. The entry is cleared.

NOTE

A name must be entered in order to transfer the selected entry. A name may be one or more letters or numbers and may include spaces. At least one character must be entered. Names are entered by pressing the number key that is associated with the letters of the alphabet printed above them. The number for that key may be used as part of the name also.

6. Press the appropriate number keys to enter a name. When all information is displayed correctly, press the ENT key (6). The new name and its corresponding ID number have been added to the DSC calling directory also.

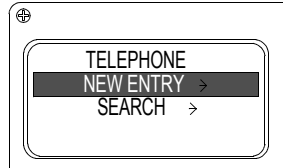


SEARCHING DIRECTORIES

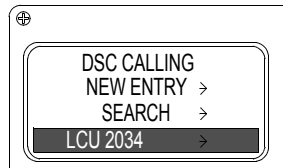
NOTE

To search a directory, first select the appropriate mode.

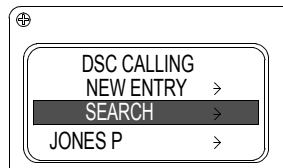
1. Press the FNC key (5) and TEL key (1) to access the TELEPHONE and COAST STATION directories.



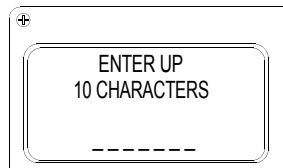
2. Press the FNC key (5) and DSC key (2) to access the DSC CALLING and GROUP CALLING directories.



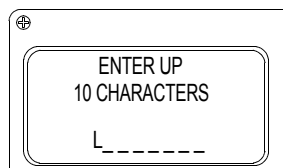
3. Press the RIGHT ARROW key (2) as necessary to select the desired directory.



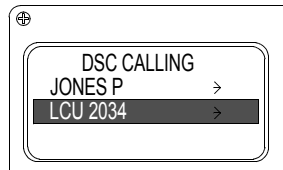
4. Press the UP ARROW key (3) or DOWN ARROW key (4) to position the selection bar on SEARCH in the DIRECTORY menu.
5. Press the ENT key (6).



6. Press the appropriate key to enter one or more characters of the name to be found.



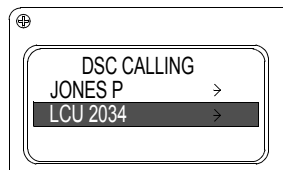
- Press the ENT key (6) to complete the operation. The name alphabetically nearest to the search character(s) will appear in the display with the selection bar.



- Press the UP ARROW key (3) or DOWN ARROW key (4) to position the selection bar on another entry if necessary. Once the desired entry is found, any appropriate function may be activated using the entry.

PLACING A DSC INDIVIDUAL CALL

- Select the PRIMARY mode by exiting any other active function. Press the appropriate number keys to select the desired working channel. A three beep tone will sound if an invalid channel number is entered. Press the FNC key (5) and DSC key (2). The DSC calling menu will appear in the display.



NOTE

One of four status messages will appear when placing a call. These status messages are:

ANSWERED. Contact with the called vessel was established. After several seconds, the transceiver will switch to the PRIMARY mode and the selected working channel will be active. Normal communications may begin immediately. The called party's name will appear in the lower line of the display. The time of day will return to the lower line of the display after 1 minute.

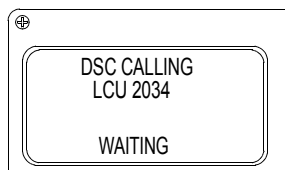
NO RESPONSE. Contact with the other vessel could not be established. After several seconds, the DSC calling directory will reappear with the called party's name at the top of the list. You may call again later or select another party to call.

BUSY. Contact was established but the transceiver was busy. Your call will be logged into the other transceiver's call waiting directory. After several seconds, the DSC calling directory will reappear with the called party's name at the top of the list. You may call again later or select another party to call.

UNATTENDED. Contact was established with the other vessel. The other vessel's transceiver is set to reply with the unattended message. For some reason an operator is not available to respond. Your call will be logged into the other transceiver's call waiting directory. After several seconds, your DSC calling directory will reappear with the called party's name at the top of the list. You may call again later or select another party to call.

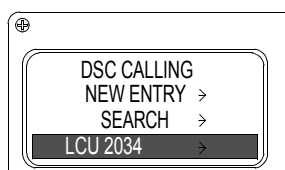
- Press the UP ARROW key (3) or DOWN ARROW key (4) to select the desired party from the directory. A three or four beep tone will sound and a status message will appear in the display.

3. Press the ENT key (6) to initiate the call. The called party's name and WAITING will appear in the display.

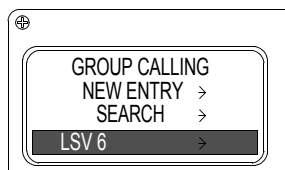


PLACING A DSC GROUP CALL

1. Select the PRIMARY mode by exiting any other active function. Press the appropriate number keys to select the desired working channel. A three beep tone will sound if an invalid channel number is entered.
2. Press the FNC (5) and DSC (2) keys. The DSC CALLING menu will appear in the display.



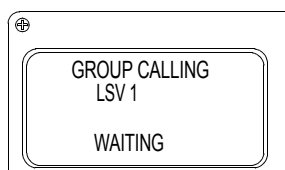
3. Press the RIGHT ARROW key (2) repeatedly until the GROUP CALLING menu appears. Press the DOWN ARROW key (4) to highlight the desired group name.



NOTE

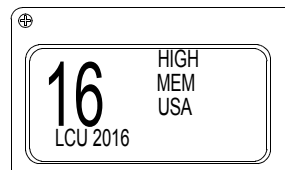
On group calls, there is no acknowledgement from the called vessels. After several seconds, the transceiver switches to the PRIMARY mode and the selected working channel is active. The group name will appear in the lower line of the display. Normal communication may begin immediately and a voice poll or roll call should be made to confirm which group members are present. The time of day will return to the lower line of the display after 1 minute.

4. Press the ENT key (6) to initiate the call. The called group's name and WAITING will appear in the display.



DSC ANSWERING AND CALL WAITING
NOTE

Calls received while idle are signaled by short Hi/Lo beeps. RECEIVED DSC CALL FROM with the caller's name or DSC call sign will appear in the display for 5 seconds. The PRIMARY mode display will appear with the caller's name or DSC call sign in the lower line. The channel number displayed will be the caller's working channel. The sound will repeat every 8 seconds until the call is answered or until the call is logged into the CALL WAITING directory after 60 seconds.

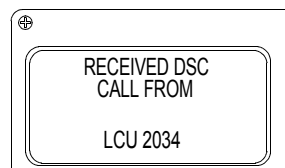


1. Press the PUSH TO TALK button (8) on the microphone and acknowledge the call verbally. To silence the beeps without answering the call, press the CLR key (7). The call will not be logged.

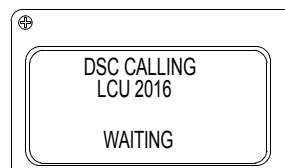
NOTE

Calls received while busy or unattended are signaled by short Hi/Lo beeps that will sound only once. The call will be logged into the CALL WAITING directory if the call is not answered within 60 seconds. The vessel that called will appear flashing in the lower line of the PRIMARY mode display. When you are able to return the call, press the appropriate number keys to select the desired working channel. A three beep tone will sound if an invalid channel number is entered.

2. Press the UP ARROW key (3) or DOWN ARROW key (4) to select the desired caller from the directory.

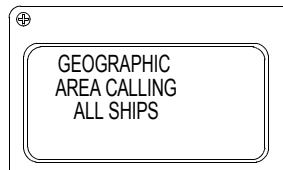


3. Press the ENT key (6) to answer the call on the current working channel of your radio. The called party's name and WAITING will appear in the display.

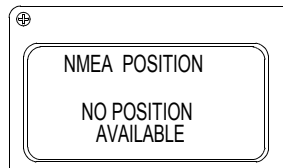


GEOGRAPHIC AREA CALLING

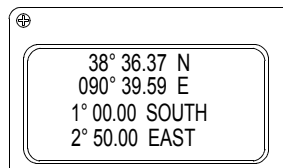
1. Access the DSC directory. Press the LEFT ARROW key (2) until the title GEOGRAPHIC AREA CALLING ALL SHIPS is displayed.



2. Press the ENT key (6) to open the edit to make a geographic area call.



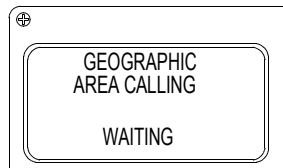
3. Enter the latitude of the reference point on line one and the longitude reference point on line two. Enter the number of ° and minutes of the North-to-South side on line three and the West-to-East side on line four.



NOTE

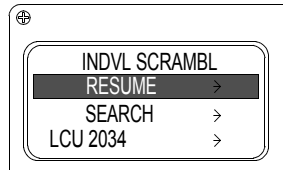
The geographical area call will switch all vessels within the defined area to the calling radio's working channel just like a DSC GROUP CALL.

4. Press the ENT key (6) to activate the DSC call.

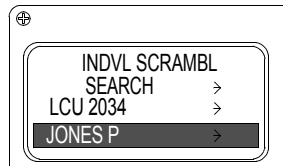

SCRAMBLER MODE

1. Place an individual scrambled call.
 - a. Select the PRIMARY mode by exiting any other active function.
 - b. Press the appropriate number keys to select the desired working channel. A three beep tone will sound if an invalid channel is selected.

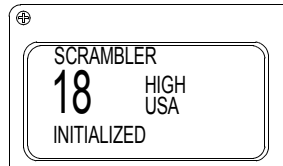
- c. Press the FNC key (5) and SCRM key (7). The INDIVIDUAL SCRAMBLER menu will appear in the display.



- d. Press the UP ARROW key (3) or DOWN ARROW key (4) to select the desired party from the directory.

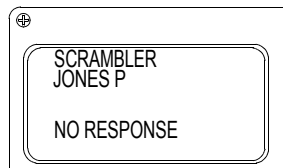


- e. Press the ENT key (6) to initiate the call. SCRAMBLER will appear in the upper line of the display and INITIALIZED will appear in the lower line. Working channel information will also be displayed.



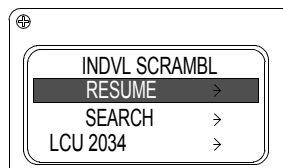
NOTE

A three or four beep tone will sound and either the called party's name or a status message will appear in the display. If the called party's name appears, the call was completed and scrambled voice communication may proceed.

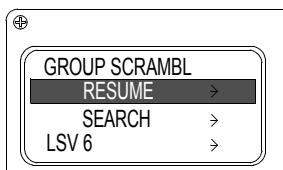


2. Place a scrambled group call.

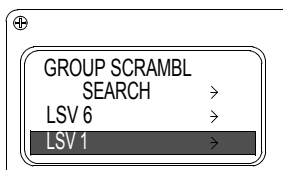
- a. Select the PRIMARY mode by exiting any other active function.
- b. Press the appropriate number keys to select the desired working channel. A three beep tone will sound if an invalid channel is selected.
- c. Press the FNC key (5) and SCRM key (7). The INDIVIDUAL SCRAMBLE menu will appear in the display.



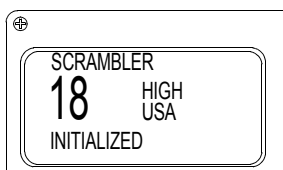
- d. Press the RIGHT ARROW key (2). The SCRAMBLER GROUP menu will appear in the display.



- e. Press the UP ARROW key (3) or DOWN ARROW key (4) to select the desired party from the directory.



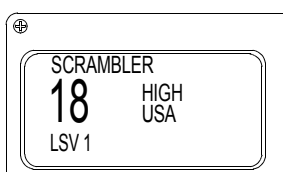
- f. Press the ENT key (6) to initiate the call. SCRAMBLER will appear in the upper line of the display and INITIALIZED will appear in the lower line. Working channel information will also be displayed.



NOTE

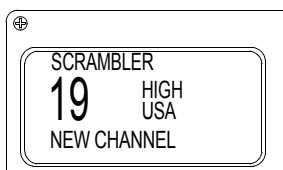
In group calls there is no acknowledgement from the called vessels. A voice poll or role call should be made to confirm which group members are present.

When the group name appears in the lower line of the display, voice contact may be initiated.

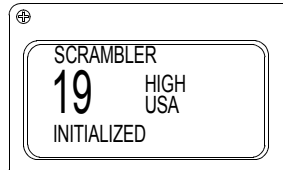


3. Change scrambler channels.

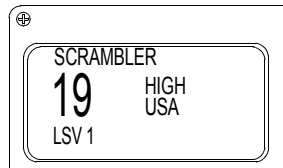
- a. Press the UP ARROW key (3) or DOWN ARROW key (4) or press the appropriate number keys to select a different working channel. A three beep tone will sound if an invalid channel is selected. NEW CHANNEL will appear in the lower line of the display.



- b. Press the ENT key (6) to complete the operation. INITIALIZED will appear in the lower line of the display.



- c. When the called party's name returns to the lower line of the display, the channel change is complete and scrambled voice contact may resume.



- d. Ensure that the PUSH TO TALK button (8) is not pressed before pressing the ENT key (6) or the SCRAMBLER mode will be cancelled and the PRIMARY mode will become active.
4. Cancel SCRAMBLE mode.
- a. Press the FNC key (5) and SCRM key (7) again or change channels and press the PUSH TO TALK button (8) instead of the ENT key (6).
- b. The SCRAMBLE mode may also be cancelled by pressing the appropriate function keys to activate another mode.

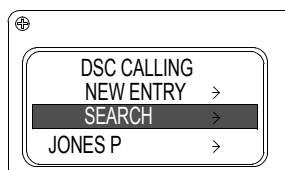
NOTE

The resume feature allows the user to interrupt scrambled conversation to use the transceiver for other communication and return to the scrambled conversation without having to initialize. The working channel and scramble codes are memorized by the transceiver. The resume feature may be used in both individual and group scramble communication.

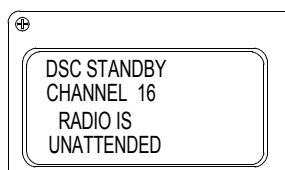
5. Resume SCRAMBLE mode.
- a. Press the FNC key (5) and SCRM key (7) to resume a scrambled call. The scramble menu will appear.
- b. Press the RIGHT ARROW key (2) to select GROUP.
- c. Press the UP ARROW key (3) to select RESUME.
- d. Press the ENT key (6). The SCRAMBLER display will appear showing the working channel and the other vessel's name.

DSC STANDBY

1. Press the appropriate number keys to select the desired channel to monitor. A three beep tone will sound if an invalid channel is selected. Press the FNC key (5) and DSC key (2). The DSC CALLING menu will appear in the display.



2. Press the LEFT ARROW key (1) two times until the DSC STANDBY menu appears. DSC STANDBY, CHANNEL number and RADIO IS UNATTENDED will appear in the display with the selected monitor channel number.

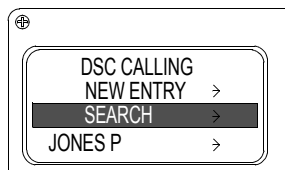
**NOTE**

When a DSC call is received, the radio will respond with the unattended message informing the caller that an operator is not available to answer the call. Calls received will be logged into the CALL WAITING directory.

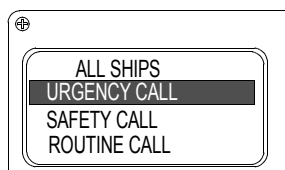
3. Enter a valid channel number or press the PUSH TO TALK button (8) to cancel the DSC STANDBY mode and switch to the PRIMARY mode.

ALL SHIPS CALL

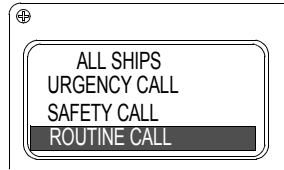
1. Press the appropriate number keys to select the desired working channel. A three beep tone will sound if an invalid channel is selected. Press the FNC key (5) and DSC key (2). The DSC CALLING menu will appear in the display.



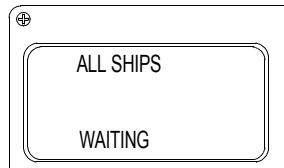
2. Press the RIGHT ARROW key (2) repeatedly until ALL SHIPS menu appears.



- Press the UP ARROW key (3) or DOWN ARROW key (4) to select the priority for the call.



- Press the ENT key (6) to initiate the ALL SHIPS call. DSC transceivers aboard vessels receiving the call will ring and ALL SHIPS will appear in their display.



- The vessel initiating an all ships call should make a voice call to alert the other vessels.

SENDING POSITION

WARNING

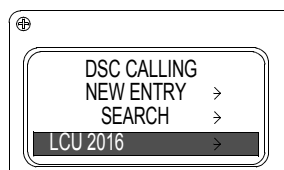
During tactical operations, any vessel can request position through the VHF/FM DSC transceiver. There is no request authorization required nor can this request be seen by the vessel operator. During tactical operations, switches SW1, SW2, SW3 on the AN/PSN-11 interface and switchbox should remain in the OFF position and used only as necessary to prevent unwanted interrogation of position for vessels equipped with a DSC transceiver not manufactured to military specification. Vessels operating with a DSC transceiver manufactured to military specification may leave switch SW3 on the AN/PSN-11 interface and switchbox in the on position but must operate with the COVERT mode enabled. Failure to comply during tactical operations could result in injury or death to personnel.

NOTE

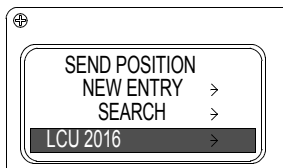
The send position function will override the POSITION XMIT DISABLE.

The type of position coordinates sent, either Lat./Lon or Loran TD's is determined by the POSITION TYPE USER OPTION in the USER SETUPS mode.

- To send the current position, press the FNC (5) and DSC (2) keys. The DSC CALLING menu will appear in the display.



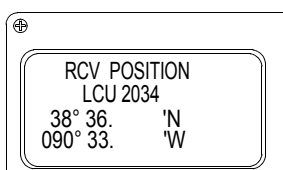
2. Press the RIGHT ARROW key (2) repeatedly until the END POSITION menu appears.



3. Press the UP ARROW key (3) or DOWN ARROW key (4) to select the desired name from the directory. Press the ENT key (6) to initiate the call. There is no acknowledgement from the other vessel that the position was received.

RECEIVE A POSITION

1. Be alert for four beeps that will sound when a SEND POSITION call is received from another vessel. RCV POSITION will appear in the upper line of the display.



NOTE

The calling vessel's name or Ship Station Identity number will appear in the second line and the calling vessel's coordinates will appear in the lower two lines of the display. At the same time as the position coordinates are displayed, the position information is output through the data interface. The interface may be connected to any device capable of receiving the information.

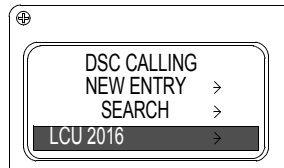
2. Press the ENT key (6) if the receiving device was not ready to accept the data. Each time the key is pressed, the position coordinated will be output to the data interface.
3. The display will remain until a valid channel number is entered or the PUSH TO TALK button (8) is pressed or another function is selected.

REQUEST POSITION

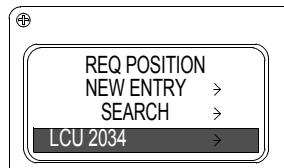
WARNING

During tactical operations, any vessel can request position through the VHF/FM DSC transceiver. There is no request authorization required nor can this request be seen by the vessel operator. During tactical operations, switches SW1, SW2, SW3 on the AN/PSN-11 interface and switchbox should remain in the OFF position and used only as necessary to prevent unwanted interrogation of position for vessels equipped with a DSC transceiver not manufactured to military specification. Vessels operating with a DSC transceiver manufactured to military specification may leave switch SW3 on the AN/PSN-11 interface and switchbox in the on position but must operate with the COVERT mode enabled. Failure to comply during tactical operations could result in injury or death to personnel.

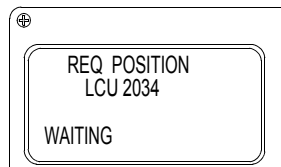
1. Press the FNC key (5) and DSC (2) key to request the position of another vessel. The DSC CALLING menu will appear in the display.



2. Press the RIGHT ARROW key (2) repeatedly until the REQ POSITION menu appears.



3. Press the UP ARROW key (3) or DOWN ARROW key (4) to select the desired name from the directory.

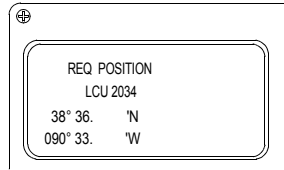


12C034-51

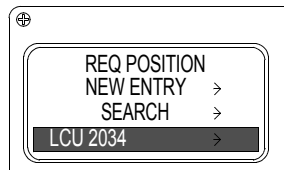
4. Press the ENT (6) key to initiate the call. The called vessel's name and WAITING will appear in the display.

NOTE

Three or four beeps will sound and either the called vessel's coordinates or a status message will appear in the display.



5. Press the ENT key (6) if the receiving device was not ready to accept the data. Each time the key is pressed, the position coordinates will be output to the data interface.
6. To return to the REQUEST POSITION menu, press the CLR key (7).



7. To return to the PRIMARY mode, enter a valid channel number, press the PUSH TO TALK button (8) or select another mode by pressing the appropriate function keys.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR)
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

References

TM 11-5825-291-13

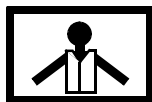
Equipment Condition

Interface And Switchbox Power On. (WP 0024 00)

OPERATING PROCEDURES - PERFORM INITIAL SETUP OF THE PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR)

SETUP PLGR

WARNING



VEST



HELMET PROTECTION



HEAVY PARTS

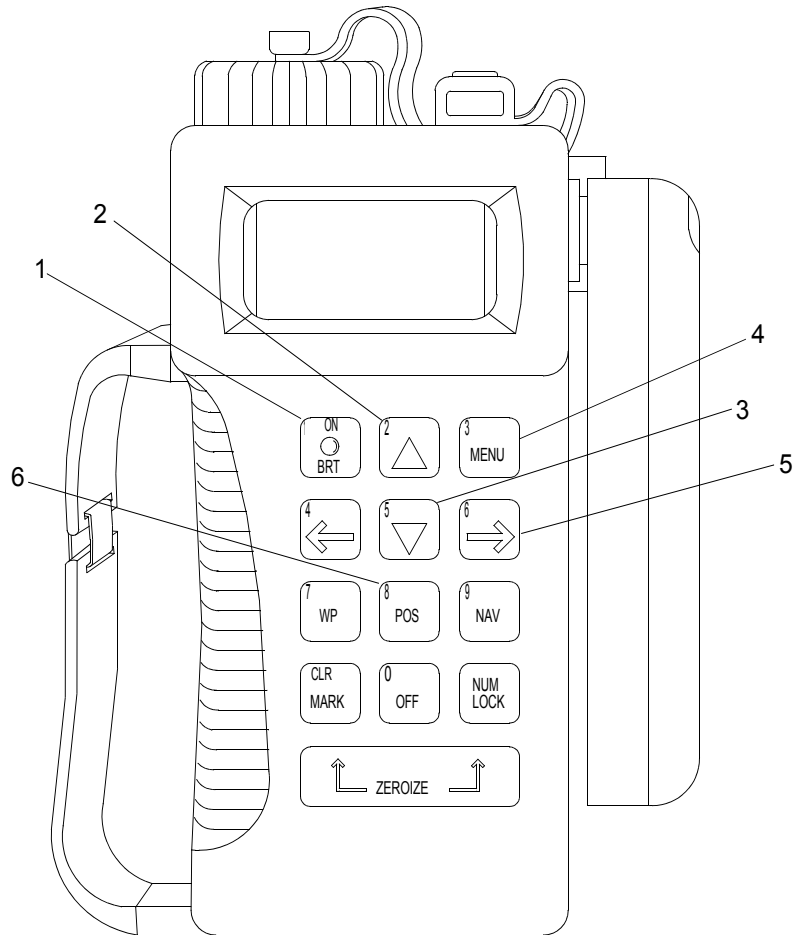


MOVING PARTS

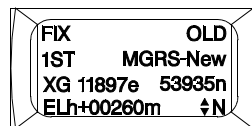
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

To prevent personal injury and equipment damage, remove BA-5800 battery before applying external power.

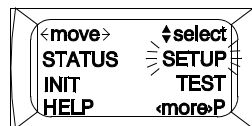
1. Press the ON key (1) to turn the PLGR on.



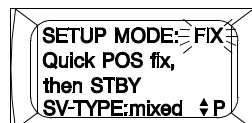
- Adjust the display backlighting by simultaneously pressing the ON/BRT key (1) and the UP ARROW key (2) to increase lighting or the DOWN ARROW key (3) to decrease lighting.



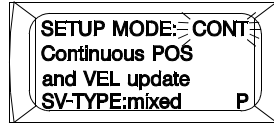
- Press the MENU key (4).
- Ensure SETUP is flashing. If STATUS is flashing, press the RIGHT ARROW key (5).



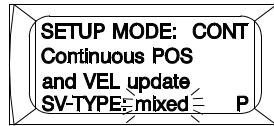
- Press the DOWN ARROW key (3).
- Press the RIGHT ARROW key (5). Ensure that FIX is flashing in SETUP mode.



- Press the UP ARROW key (2) or DOWN ARROW key (3) until CONT is flashing in SETUP mode.



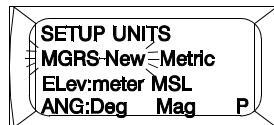
- Press the RIGHT ARROW key (5) to save CONT and move to next selection.
- Press the UP ARROW key (2) or DOWN ARROW key (3) until MIXED is flashing in SV-TYPE.



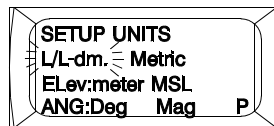
- Press the RIGHT ARROW key (5) to save MIXED.

SETUP UNITS

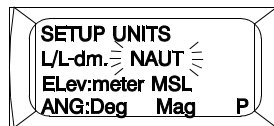
- Press the DOWN ARROW key (3) to advance to SETUP UNITS.
- Press the RIGHT ARROW key (5) to start selection flashing.



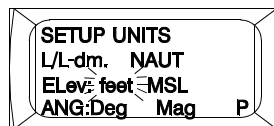
- Press the UP ARROW key (2) or DOWN ARROW key (3) until L/L-DM. is flashing.



- Press the RIGHT ARROW key (5) to save L/L-DM. and move to next selection.
- Press the UP ARROW key (2) or DOWN ARROW key (3) until NAUT is flashing.

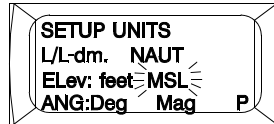


- Press the RIGHT ARROW key (5) to save NAUT and move to next selection.
- Press the UP ARROW key (2) or DOWN ARROW key (3) until FEET is flashing for Elev.



- Press the RIGHT ARROW key (5) to save FEET and move to next selection.

9. Press the UP ARROW key (2) or DOWN ARROW key (3) until MSL is flashing.



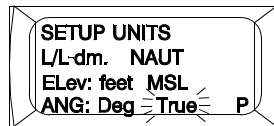
10. Press the RIGHT ARROW key (5) to save MSL and move to next selection.

11. Press the UP ARROW key (2) or DOWN ARROW key (3) until DEG is flashing for ANG.



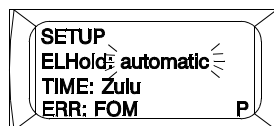
12. Press the RIGHT ARROW key (5) to save DEG and move to next selection.

13. Press the UP ARROW key (2) or DOWN ARROW key (3) until TRUE is flashing for vessels with a gyro compass. For vessels without a gyro compass, select MAG.

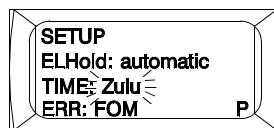


SETUP ELHOLD, TIME AND ERR

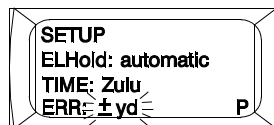
1. Press the DOWN ARROW key (3) twice to advance to SETUP.
2. Press the RIGHT ARROW key (5) to start selection flashing.
3. Press the UP ARROW key (2) or DOWN ARROW key (3) until automatic is flashing for ELHold.



4. Press the RIGHT ARROW key (5) to save AUTOMATIC and move to next selection.
5. Press the UP ARROW key (2) or DOWN ARROW key (3) until ZULU is flashing for TIME.



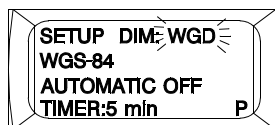
6. Press the UP ARROW key (2) or DOWN ARROW key (3) to save ZULU and move to next selection.
7. Press the UP ARROW key (2) or DOWN ARROW key (3) until ± YD is flashing for ERR.



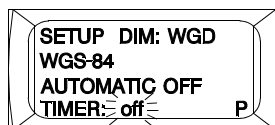
- Press the RIGHT ARROW key (5) to save \pm YD and end selection flashing.

SETUP DTM AND AUTOMATIC OFF TIMER

- Press the DOWN ARROW key (3) to advance to SETUP.
- Press the RIGHT ARROW key (5) to start selection flashing.
- Press the UP ARROW key (2) or DOWN ARROW key (3) until WGD is flashing.



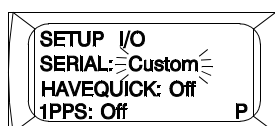
- Press the RIGHT ARROW key (5) to save WGD WGS-84 and move to next selection.
- Press the UP ARROW key (2) or DOWN ARROW key (3) until OFF is flashing for TIMER.



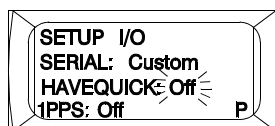
- Press the RIGHT ARROW key (5) to save OFF and end selection flashing.

SETUP I/O SERIAL, HAVEQUICK AND 1PPS

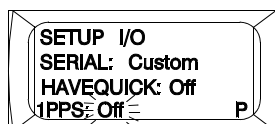
- Press the DOWN ARROW key (3) to advance to SETUP I/O.
- Press the RIGHT ARROW key (5) to start selection flashing.
- Press the UP ARROW key (2) or DOWN ARROW key (3) until CUSTOM is flashing for SERIAL.



- Press the RIGHT ARROW key (5) to save CUSTOM and move next selection.
- Press the UP ARROW key (2) or DOWN ARROW key (3) until OFF is flashing for HAVEQUICK.



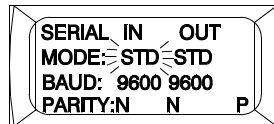
- Press the RIGHT ARROW key (5) to save OFF and move to next selection.
- Press the UP ARROW key (2) or DOWN ARROW key (3) until OFF is flashing for 1PPS.



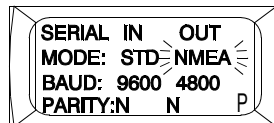
8. Press the RIGHT ARROW key (5) to save OFF and end selection flashing.

SERIAL IN OUT SETUP

1. Press the DOWN ARROW key (3) to advance to SERIAL IN OUT.
2. Press the RIGHT ARROW key (5) to start selection flashing.
3. Press the UP ARROW key (2) or DOWN ARROW key (3) until STD is flashing for SERIAL IN mode.



4. Press the RIGHT ARROW key (5) to save STD and move to next selection.
5. Press the UP ARROW key (2) or DOWN ARROW key (3) until NMEA is flashing for SERIAL OUT mode.



6. Press the RIGHT ARROW key (5) to save NMEA and end selection flashing.

SETUP NMEA SENTENCE STRING

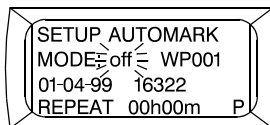
1. Press the DOWN ARROW key (3) to advance to SETUP.
2. Press the RIGHT ARROW key (5) to start selection flashing.
3. Enter the seven required NMEA sentence strings.
 - a. Press the UP ARROW key (2) or DOWN ARROW key (3) to change the sentence string.
 - b. After entering each 3 letter group sentence string, press the RIGHT ARROW key (5) to advance to the next string.
 - c. Continue until all letter groups are entered.
 - d. Ensure that sentence string is [RMC] [GGA] [GSA] [RMB] [XTE] [VTG].



SETUP AUTO MARK MODE

1. Press the DOWN ARROW key (3) to advance to SETUP AUTOMARK.
2. Press the RIGHT ARROW key (5) to start selection flashing.

3. Press the UP ARROW key (2) or DOWN ARROW key (3) until OFF is flashing for MODE.



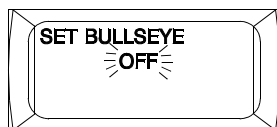
4. Press the RIGHT ARROW key (5) four times to save OFF and end selection flashing.

SET BULLSEYE

NOTE

The bull's-eye menu will only activate when waypoint data is entered.

1. Press the DOWN ARROW key (3) to advance to SET BULLSEYE.
2. Press the RIGHT ARROW key (5) to start selection flashing.



3. Press the UP ARROW key (2) or DOWN ARROW key (3) to select flashing OFF.
4. Press the RIGHT ARROW key (5) to save OFF and end selection flashing.

SETUP OPERATOR ID

1. Press the DOWN ARROW key (3) to advance to SETUP OPERATOR ID.
2. Press the RIGHT ARROW key (5) to start selection flashing.
3. Press the UP ARROW key (2) or DOWN ARROW key (3) to enter the operator ID.
4. After each letter/number is entered, press the RIGHT ARROW key (5) to advance to the next letter/number position.
5. Press the UP ARROW key (2) or DOWN ARROW key (3) to change the letter/number.
6. Continue until the complete operator ID is entered.
7. Press the RIGHT ARROW key (5) until the double arrow symbol appears in the right lower corner of the display to the left of P.

SETUP APPROACH

1. Press the DOWN ARROW key (3) to advance to SETUP APPROACH.
2. Verify default settings.
3. Press the POS key (6) to end setup and return to POSITION SCREEN.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR)
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)

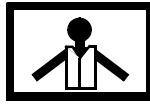
Personnel Required

Seaman 88K

**OPERATING PROCEDURES - SETUP WAYPOINTS USING THE PRECISION LIGHTWEIGHT
GLOBAL POSITIONING RECEIVER (PLGR)**

ENTERING WAYPOINTS

WARNING



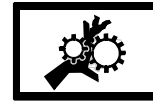
VEST



HELMET PROTECTION



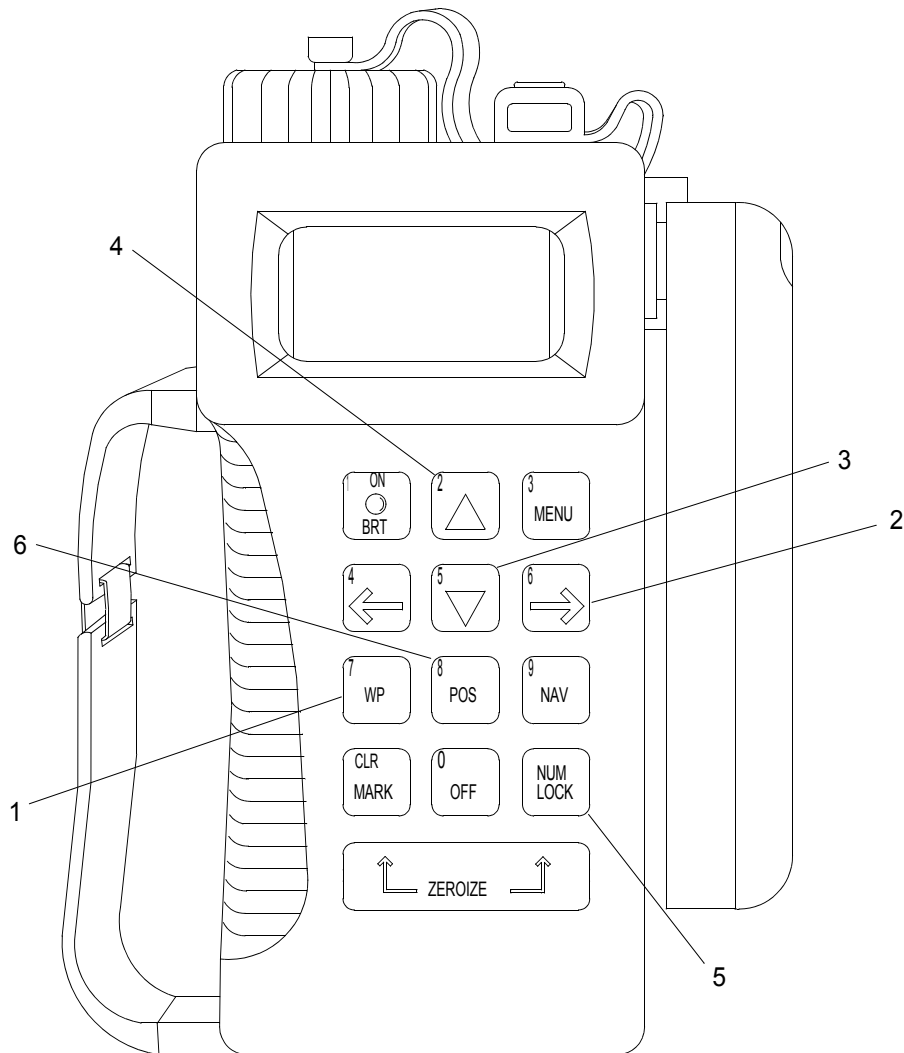
HEAVY PARTS



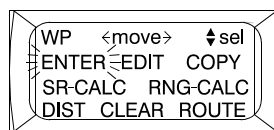
MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

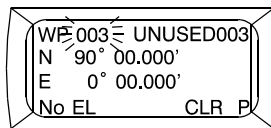
1. Press the WP key (1) to access the WAYPOINTS OPTIONS menu.



2. Press the RIGHT ARROW key (2) until ENTER is flashing.



3. Press the DOWN ARROW key (3).
4. Press the RIGHT ARROW key (2) to start the waypoint number field in the upper left corner flashing.

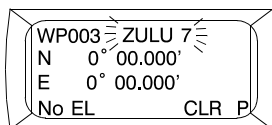


NOTE

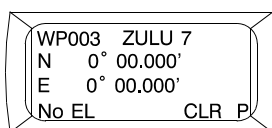
Waypoint numbers range from 000 to 999. Present position is always waypoint 000.
Waypoint 000 cannot be edited.

5. Change the waypoint number as desired using the UP ARROW key (4) or DOWN ARROW key (3).

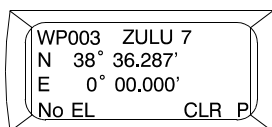
6. Press the RIGHT ARROW key (2) twice to start the waypoint label field flashing.



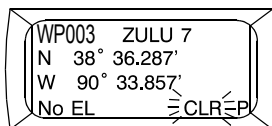
7. Press the DOWN ARROW key (3) to start the first letter/number position flashing.
8. Use the UP ARROW key (4) or DOWN ARROW key (3) to change the first letter/number in the waypoint label.
9. Press the RIGHT ARROW key (2) to advance to the next letter/number position.
10. Use the UP ARROW key (4) or DOWN ARROW key (3) to change the letter/number. Continue until the complete waypoint name is entered. Waypoint names may not exceed ten characters.
11. Press the RIGHT ARROW key (2) as necessary to move to the latitude field.



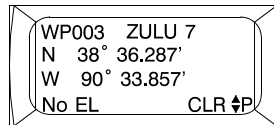
12. Toggle between N or S using the UP ARROW key (4).
13. Press the RIGHT ARROW key (2) to move to the first numeric latitude number.
14. Use the UP ARROW key (4) or DOWN ARROW key (3) to change the number.
15. Progress to each number using the RIGHT ARROW key (2) until the complete latitude of the waypoint is entered.
16. Press the RIGHT ARROW key (2) to move to the longitude field. Toggle between W or E using the UP ARROW key (4). Press the RIGHT ARROW key (2) to move to the first numeric longitude number. Use the UP ARROW key (4) or DOWN ARROW key (3) to change the number. Progress to each number using the RIGHT ARROW key (2) until the complete longitude of the waypoint is entered.



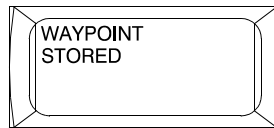
17. Toggle between W or E using the UP ARROW key (4).
18. Press the RIGHT ARROW key (2) to move to the first numeric longitude number.
19. Use the UP ARROW key (4) or DOWN ARROW key (3) to change the number. Progress to each number using the RIGHT ARROW key (2) until the complete longitude of the waypoint is entered.
20. Press the RIGHT ARROW key (2) twice. CLR will be flashing.



21. Press the NUM LOCK key (5) to change the PLGR to the CONTROL mode. A P will be displayed in the lower right hand corner of the display. Press the RIGHT ARROW key (2) to move the cursor next to the P. An UP and DOWN ARROW symbol will appear next to the letter P.



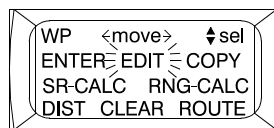
22. Press the DOWN ARROW key (3) and observe the display. WAYPOINT STORED will appear and the PLGR will automatically default to page 2 of waypoints.



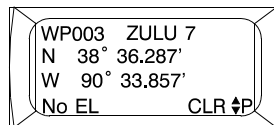
23. For vessels without a gyro compass, press the RIGHT ARROW key (2) until NO MAGVAR is flashing. Enter the magnetic variation from the chart used for the waypoint. Press the RIGHT ARROW key (2) three times.
24. Press the DOWN ARROW key (3) to enter another waypoint or exit by pressing the POS key (6).

EDITING A WAYPOINT

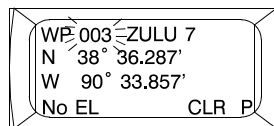
1. Press the WP key (1).
2. Press the RIGHT ARROW key (2) until EDIT is flashing.



3. Press the UP ARROW key (4). A waypoint will appear on the display.



4. Press the RIGHT ARROW key (2). The waypoints number field will be flashing. Use the UP ARROW key (4) or DOWN ARROW key (3) to change the waypoint number or press the NUM LOCK key (5) and enter the number of the waypoint.

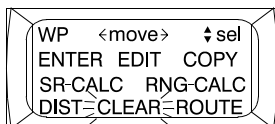


5. Change the waypoint data using the procedures for entering a waypoint.

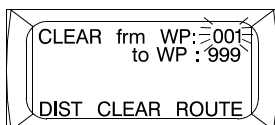
CLEARING A WAYPOINT**NOTE**

Clearing a waypoint will also clear any routes that contain this waypoint.

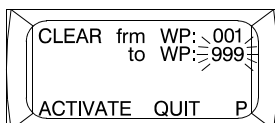
1. Press the WP key (1).
2. Press the RIGHT ARROW key (2) until CLEAR is flashing.



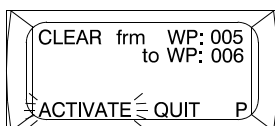
3. Press the UP ARROW key (4).
4. Press the RIGHT ARROW key (2) until FRM: WP number is flashing.



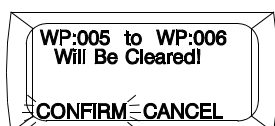
5. Press the UP ARROW key (4) to start the first number position of the waypoint number flashing.
6. Press the RIGHT ARROW key (2) to enter the next digit of the waypoint to be deleted. Continue until the complete waypoint number is entered.
7. Press the RIGHT ARROW key (2) until TO: WP number is flashing.



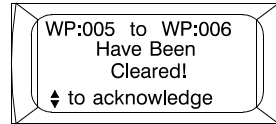
8. Press the UP ARROW key (4) to start the first number position of the waypoint number flashing.
9. Press the RIGHT ARROW key (2) to enter the next digit of the waypoint to be deleted. Continue until the complete waypoint number is entered.
10. Press the RIGHT ARROW key (3) until ACTIVATE is flashing.



11. Press the UP ARROW key (1).
12. Press the RIGHT ARROW key (3) until CONFIRM is flashing.



13. Press the UP ARROW key (4). The display will advise the operator of the waypoints that will be deleted.



14. Press the POS key (6) to return to the POS display.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR)
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

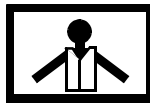
References

TM 11-5825-291-13

OPERATING PROCEDURES - SETUP ROUTE NAVIGATION USING THE PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR)

PLANNING A ROUTE

WARNING



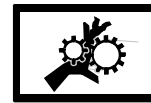
VEST



HELMET PROTECTION



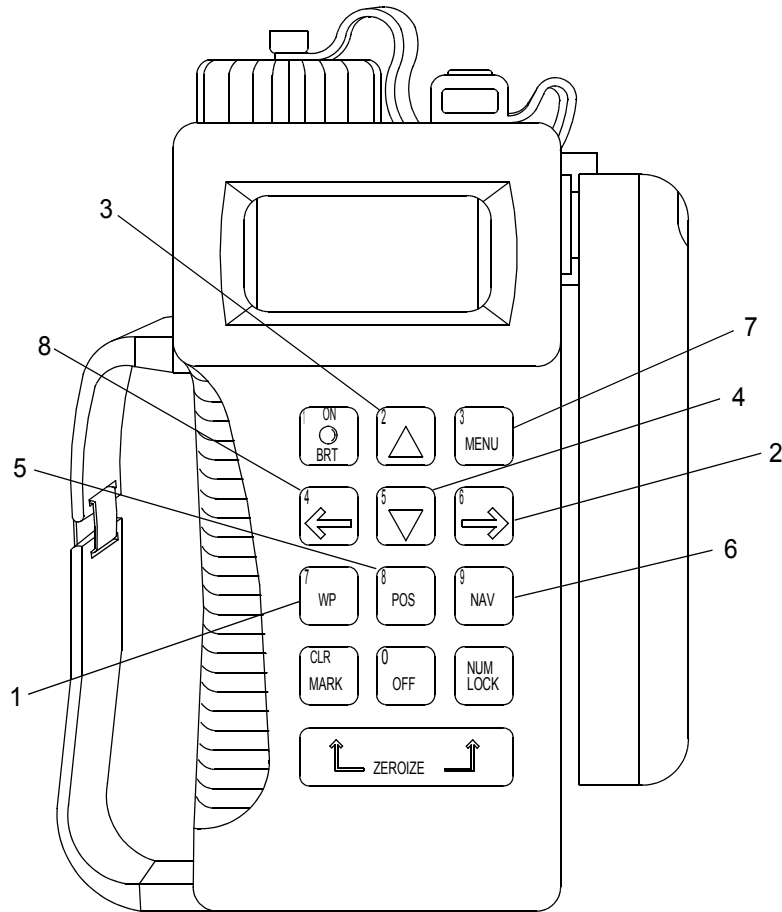
HEAVY PARTS



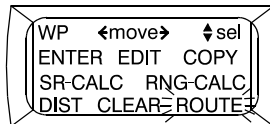
MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

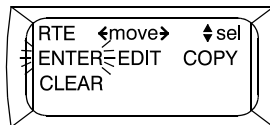
1. Press the WP key (1).



2. Press the RIGHT ARROW key (2) until ROUTE is flashing.

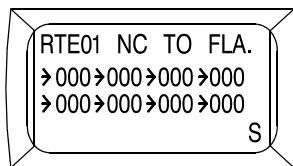


3. Press the UP ARROW key (3) to select ROUTE.
4. ENTER will be flashing. Press the UP ARROW key (3) to select ENTER.

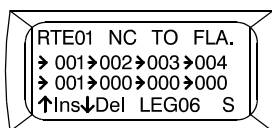


5. Using the UP ARROW key (3) or DOWN ARROW key (4), assign a route number to the new route.

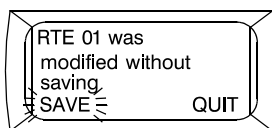
6. Press the RIGHT ARROW key (2) to highlight the route name field. Press the UP ARROW key (3) to select the first letter of the route name. Use the UP ARROW key (3) or DOWN ARROW key (4) to change to the desired letter. Press the RIGHT ARROW key (2) to advance to the next letter position. Repeat until the route name is entered.



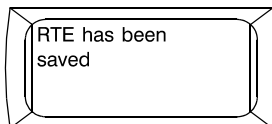
7. Press the RIGHT ARROW key (2) until the arrow left of the first group of three digits is flashing.
8. Press the UP ARROW key (3) or DOWN ARROW key (4) to change to the desired letter.
9. Press the RIGHT ARROW key (2) to advance to the next letter position. Repeat until the route name is entered.
10. Press the RIGHT ARROW key (2) until the arrow left of the first group of three digits is flashing.
11. Press the RIGHT ARROW key (2) to start the first group of three digits flashing.
12. Press the UP ARROW key (3) to select the first waypoint number.
13. Press the RIGHT ARROW key (2). Press the UP ARROW key (3) to enter the next waypoint. Continue to add waypoints until all waypoints have been entered.



14. After all waypoints have been entered, exit the display by pressing the WP key (1), POS key (5), NAV key (6) or MENU key (7). The display informs the user that the route has not been saved. SAVE will be flashing.

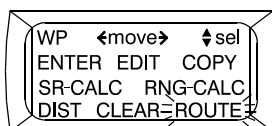


15. Press the UP ARROW key (3) to save the route.

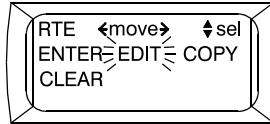


EDITING A ROUTE

1. Press the WP key (1). Press the RIGHT ARROW key (2) until ROUTE is flashing.



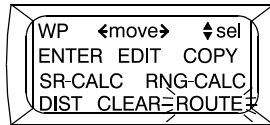
2. Press the UP ARROW key (3) to select ROUTE. Press the RIGHT ARROW key (2) until EDIT is flashing.



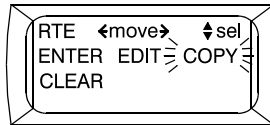
3. Press the UP ARROW key (3) to select EDIT.
4. Using the UP ARROW key (3) or DOWN ARROW key (4), select the route number to be edited. Follow the procedures for planning a route to edit the route as required.

COPYING A ROUTE

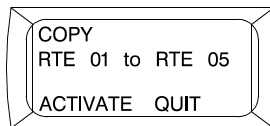
1. Press the WP key (1).
2. Press the RIGHT ARROW key (2) until ROUTE is flashing.



3. Press the UP ARROW key (3).
4. Press the RIGHT ARROW key (2) until COPY is flashing.



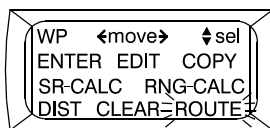
5. Press the UP ARROW key (3).
6. Enter the route numbers for copying to/from using the RIGHT ARROW key (2) or LEFT ARROW key (8) to select to/from and the UP ARROW key (3) or DOWN ARROW key (4) to change the route numbers.
7. Press the RIGHT ARROW key (2) until ACTIVATE is flashing.



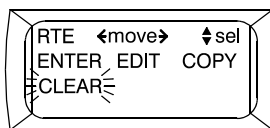
8. Press the UP ARROW key (2).
9. Press the POS key (6) to exit the WP menu.

CLEARING A ROUTE

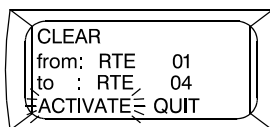
1. Press the WP key (1).
2. Press the RIGHT ARROW key (2) until ROUTE is flashing.



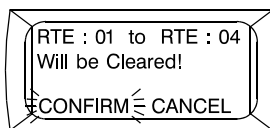
3. Press the UP ARROW key (3).
4. Press the RIGHT ARROW key (2) until CLEAR is flashing.



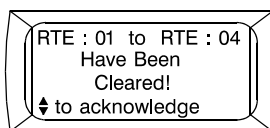
5. Press the UP ARROW key (3).
6. Press the RIGHT ARROW key (2) until the FROM: RTE number is flashing. Enter the starting route number to be deleted using the UP ARROW key (3).
7. Press the RIGHT ARROW key (2) until the TO: RTE number is flashing. Enter the ending route number to be deleted using the UP ARROW key (3).
8. Press the RIGHT ARROW key (2) until ACTIVATE flashes.



9. Press the UP ARROW key (3).
10. Press the RIGHT ARROW key (2) until CONFIRM flashes.



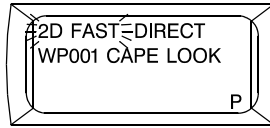
11. Press the UP ARROW key (3).



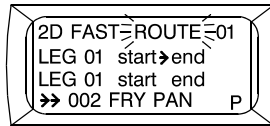
12. Press the POS key (5) to return to POS display.

NAVIGATING A COURSE

1. Press the NAV key (6). Press the RIGHT ARROW key (2) to start the type of navigation flashing.
2. Press the UP ARROW key (3) to start 2D FAST flashing.



3. Press the RIGHT ARROW key (2) to advance to the next field. Press the DOWN ARROW key (4) until ROUTE is flashing.



4. Press the RIGHT ARROW key (2) to advance to the route number field. Use the UP ARROW key (3) or DOWN ARROW key (4) to change the route number to the desired route.
5. Press the RIGHT ARROW key (2) to advance to the leg number field. Use the UP ARROW key (3) or DOWN ARROW key (4) to change the leg number.
6. Press the RIGHT ARROW key (2) to advance to the START - END/END - START field. Use the UP ARROW key (3) or DOWN ARROW key (4) to change START - END or END - START.
7. Press the RIGHT ARROW key (2) to complete programming the route.

NOTE

Pages 2 and 4 display information on destination, slant range, track, ground speed, azimuth and north reference, elevation angle and cross track error. Page 3 displays information on range, time to go, elevation difference and minimum miss distance.

8. Refer to page 2, 3 or 4 if more navigational information is necessary.
9. Press the POS key (5) to exit the NAV display.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR)
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

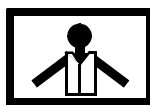
References

TM 11-5825-291-13

**OPERATING PROCEDURES - PERFORM CRYPTO VARIABLE OPERATIONS - PRECISION
LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR)**

CRYPTO KEY ENTRY USING THE KYK-13

WARNING



VEST



HELMET PROTECTION



HEAVY PARTS



MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

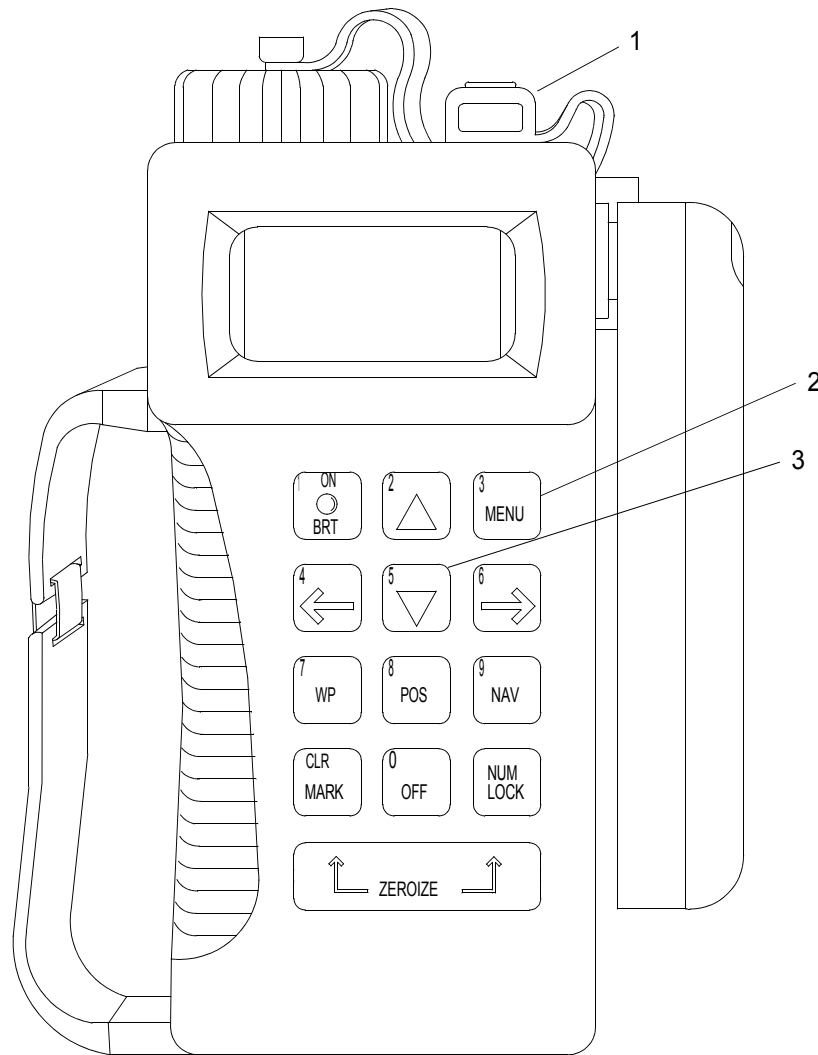
All shipboard PLGRs must be keyed using the correct crypto key prior to combat operations. Failure to observe these precautions could result in loss of life.

NOTE

The PLGR has a national security agency (NSA) module that stores the crypto keys. Since the crypto keys are stored in this tamper proof module (called a Precise Positioning Service Security Module, or PPS-SM), the PLGR is not classified when crypto keys are installed.

The PPS-SM does not protect classified waypoints. When classified waypoints are stored in the PLGR, the PLGR is classified at the same level as the waypoints.

1. Connect the KYK-13 to the J1 port (1) on the PLGR. Ensure that the PLGR is turned on and not performing a self-test.



2. Set the KYK-13 selector switch to the position that contains the crypto key.
3. Set the KYK-13 mode switch to ON. The light on the KYK-13 flashes showing a successful crypto load.

CRYPTO KEY ENTRY USING KOI-18

1. Connect the KOI-18 to the J1 port (1) on the PLGR. Ensure that the PLGR is turned on and not performing a self-test.
2. Press the MENU key (2) until the menu display with KOI-18 appears. Select and activate the KOI-18.
3. Select and activate LOAD. Immediately pull the paper tape through the KOI-18.
4. After loading, select and activate QUIT.
5. Bring up the CRYPTO pages from the system menu.

-
6. Verify the crypto key status.
 - a. Select menu second page.
 - b. Ensure that crypto is displayed on line 4 or crypto keys are not installed or are not valid.
 7. Remove the KOI-18 from the PLGR.

CRYPTO KEY ENTRY USING AN/CYZ-10 (SPECIAL ANCD)

1. Turn on the ANCD, read RADIO/SOI/SUPERVISOR.
2. Enter RADIO, read SEND/RECEIVE/DATABASE/SETUP/COMSEC/TIME.
3. Enter COMSEC, read VG/LD/RV/AK/MK/VU.
4. Enter LD, read SELECT TEK/KEK.
5. Enter TEK.
6. Select the desired GPS key, then press ENTER.
7. Enter QUIT, read CONNECT ANCD TO RT - DO NOT COMPLY.
8. Press the DOWN ARROW key (3), read Press LOAD ON RT- DO NOT COMPLY.
9. Turn the PLGR on, wait for self-test to complete.
10. Connect ANCD to the J1 port (1) on the PLGR. GPS key transfers automatically.
11. The ANCD reports: 1 KEYS TRANSFERRED. The PLGR reports KEY LOADED.
12. Disconnect ANCD from the J1 port (1) on the PLGR.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DC TO DC CONVERTER
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

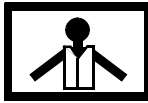
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

OPERATING PROCEDURES - OPERATE THE DC TO DC CONVERTER

WARNING



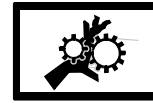
VEST



HELMET PROTECTION



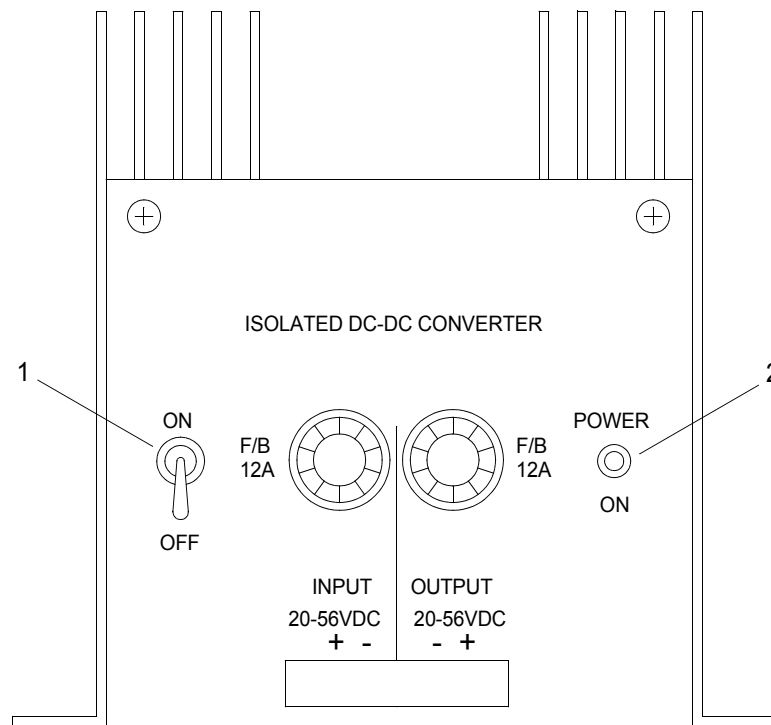
HEAVY PARTS



MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Move power switch (1) to ON position.



DC TO DC CONVERTER

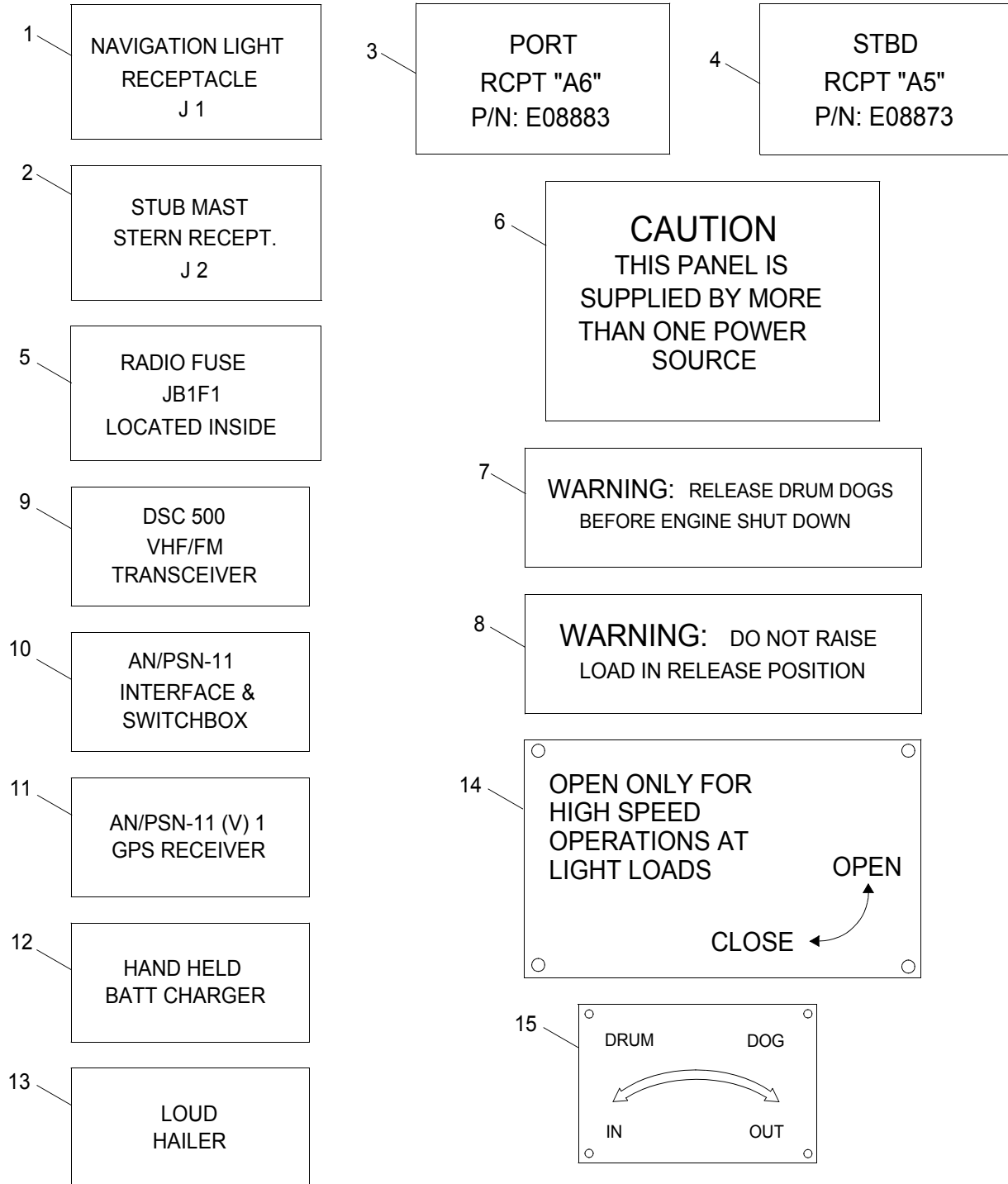
2. Ensure that power indicator light (2) is lit, indicating that the converter is producing power.

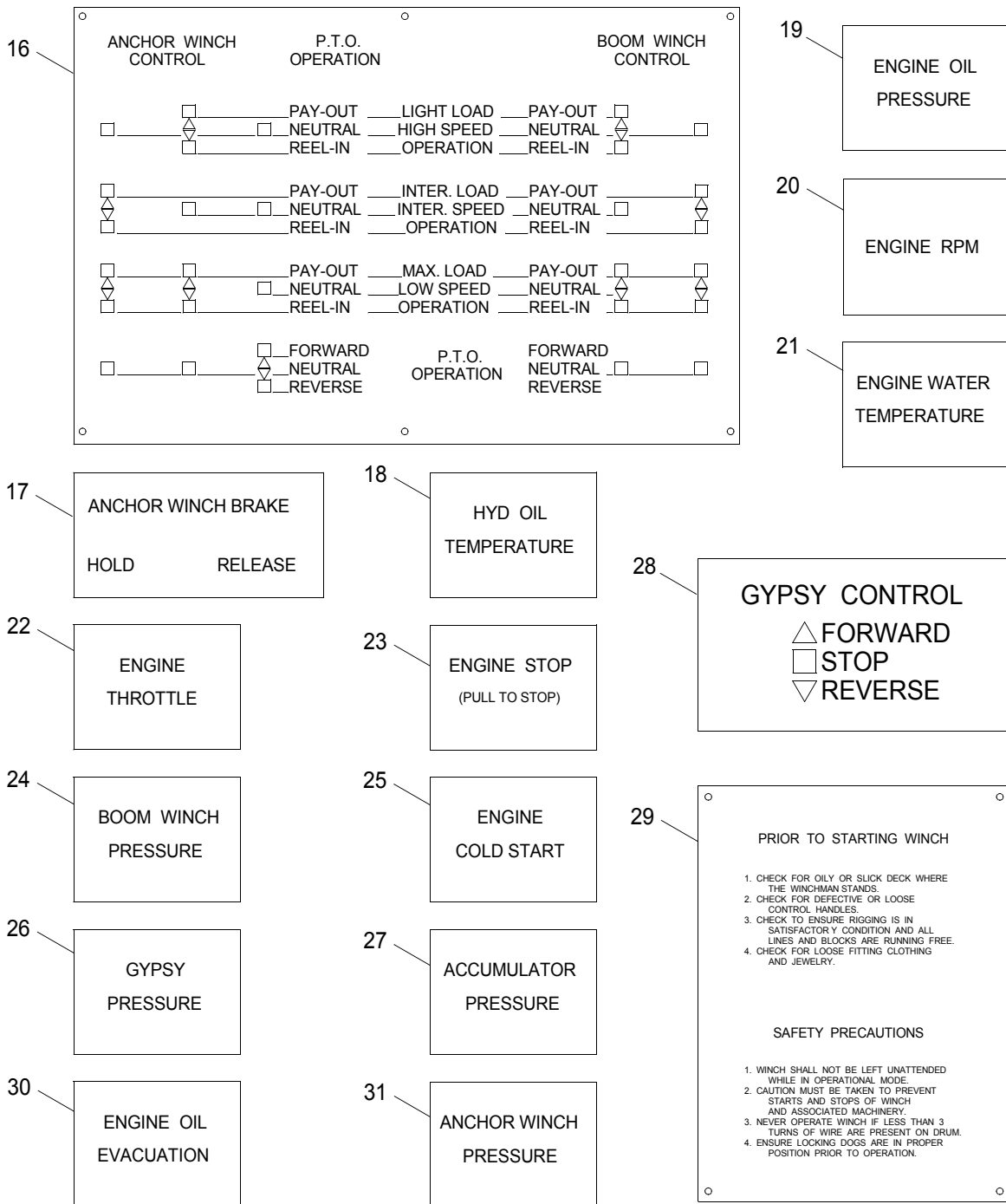
END OF WORK PACKAGE

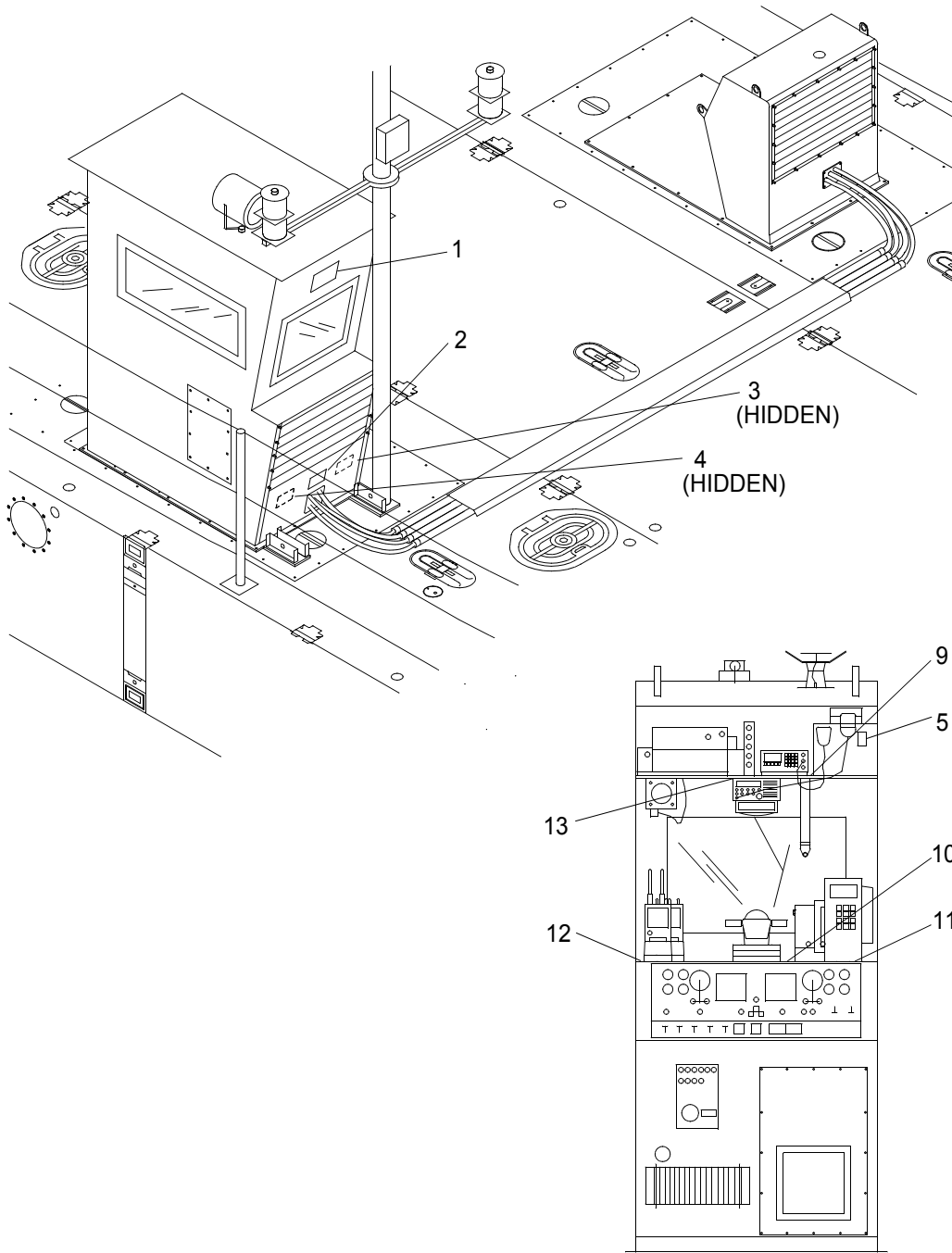
**OPERATOR MAINTENANCE
WARPING TUG
DECALS AND INSTRUCTION PLATES
OPERATION UNDER USUAL CONDITIONS**

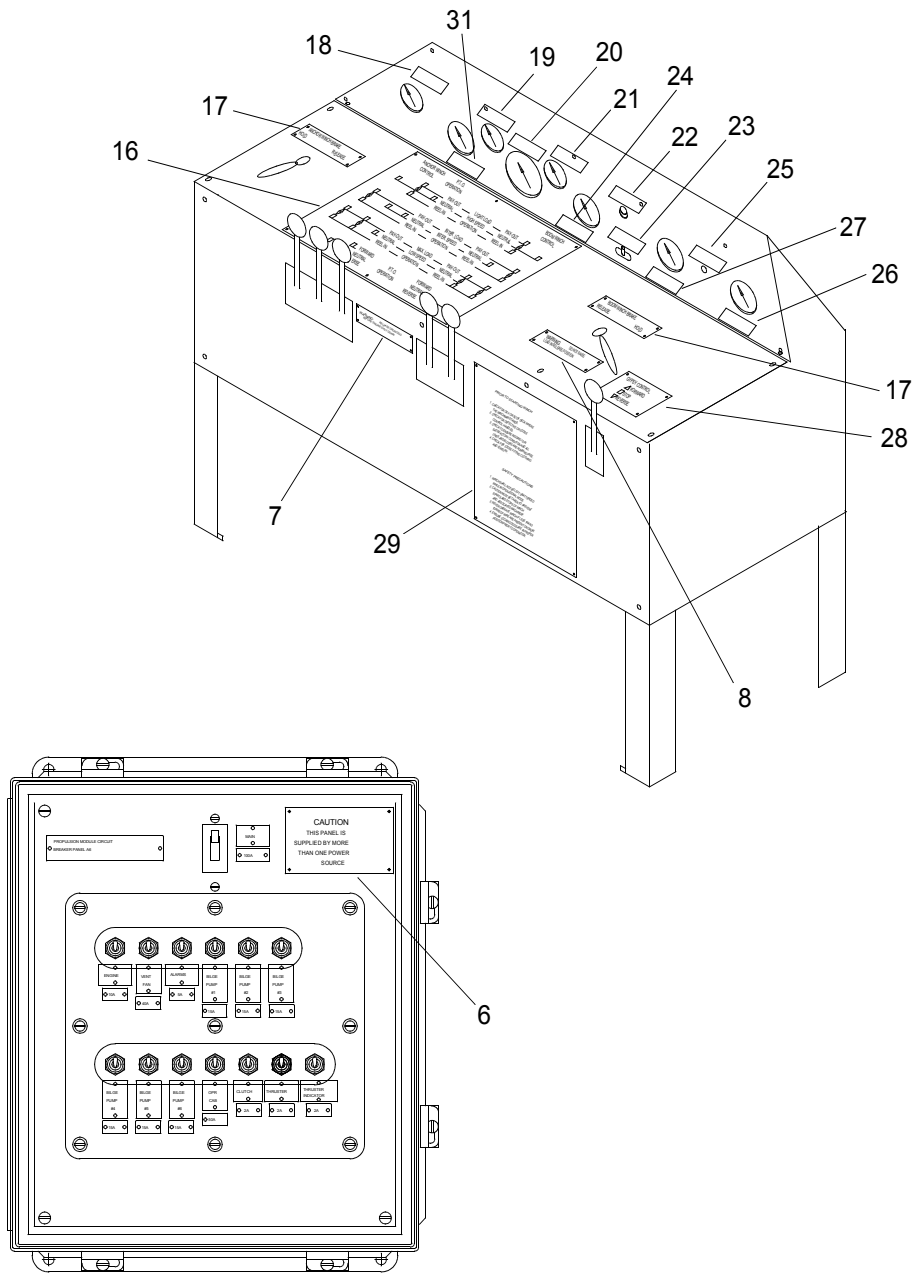
DECALS AND INSTRUCTION PLATE LOCATIONS FOR WARPING TUG

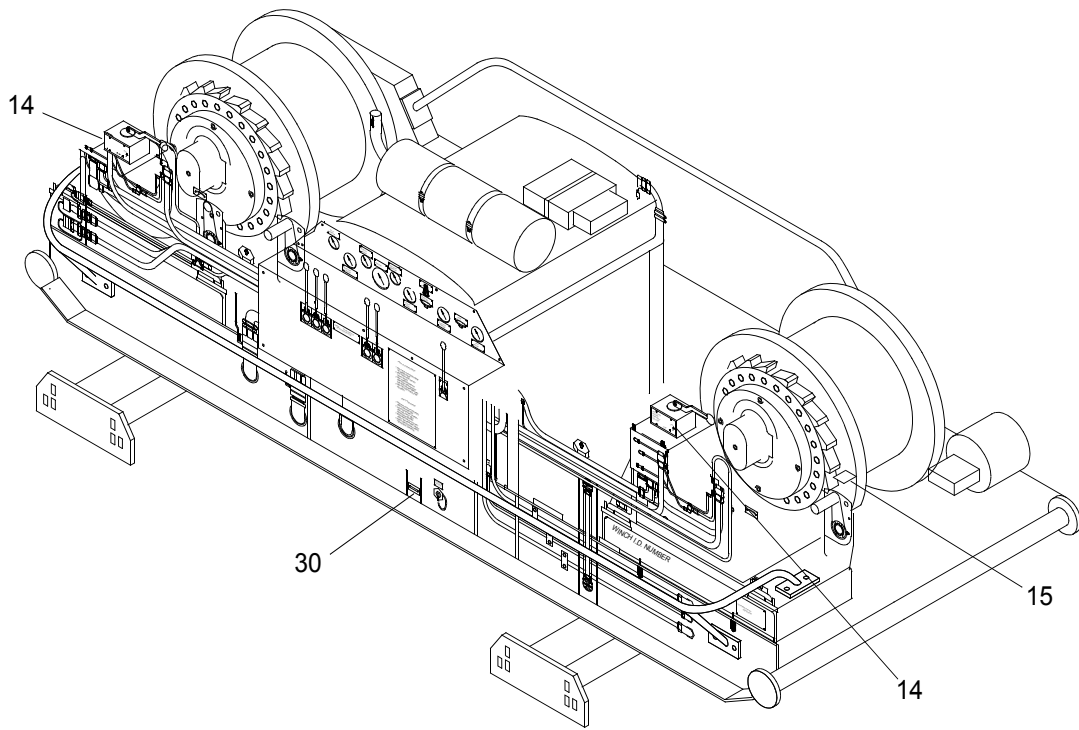
This work package is provided to inform operator of the location and description of decals and instruction plates.











**OPERATOR MAINTENANCE
WARPING TUG
SAFETY EQUIPMENT
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:

Tools

- Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
- Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
- Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
- Life Preserver, Vest (Item 45, WP 0108 00)
- Helmet, Safety (Brown) (Item 40, WP 0108 00)

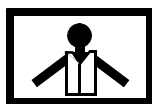
Personnel Required

Seaman 88K

PREPARATION FOR MOVEMENT - REMOVAL OF SAFETY EQUIPMENT

REMOVAL OF PORTABLE FIRE EXTINGUISHER

WARNING



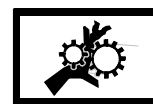
VEST



HELMET PROTECTION



HEAVY PARTS



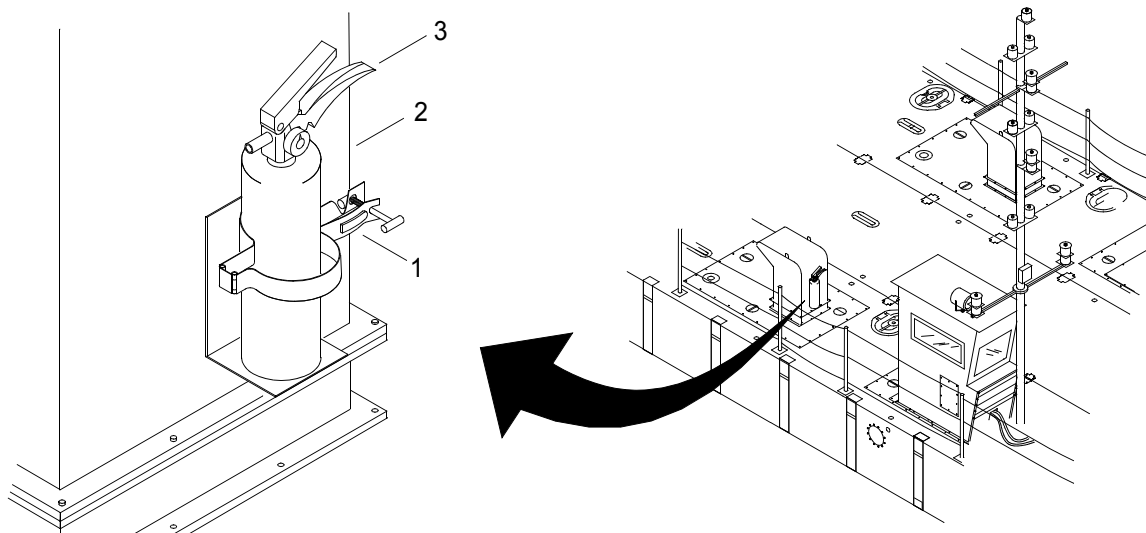
MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

NOTE

All removed equipment will be stowed in the BII ISO Container.

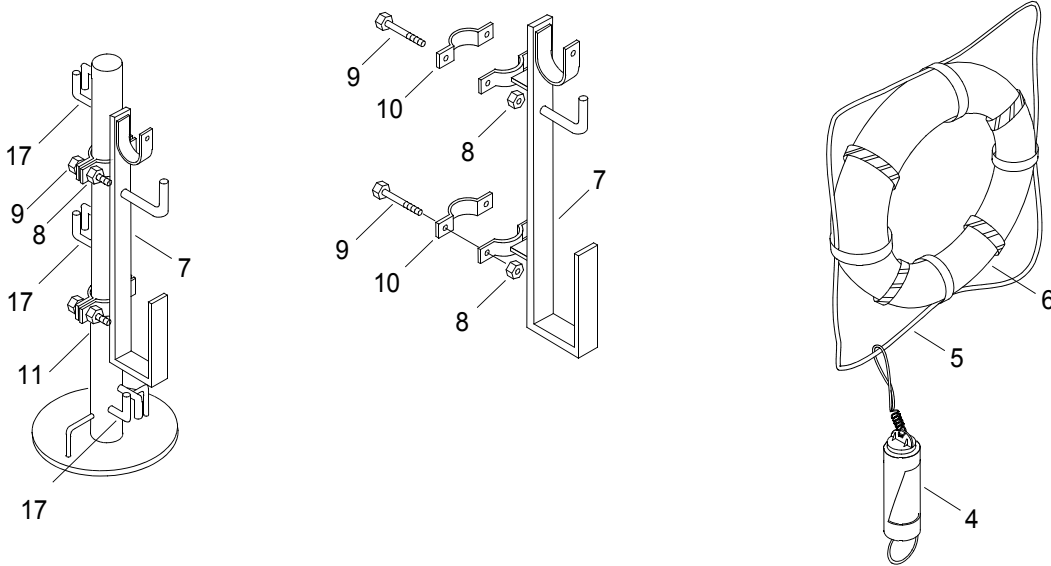
1. Unclamp portable fire extinguisher clamp (1) from exhaust plenum (2).



2. Remove extinguisher (3).

REMOVAL OF LIFE RINGS

1. Remove strobe light (4) from rope (5).



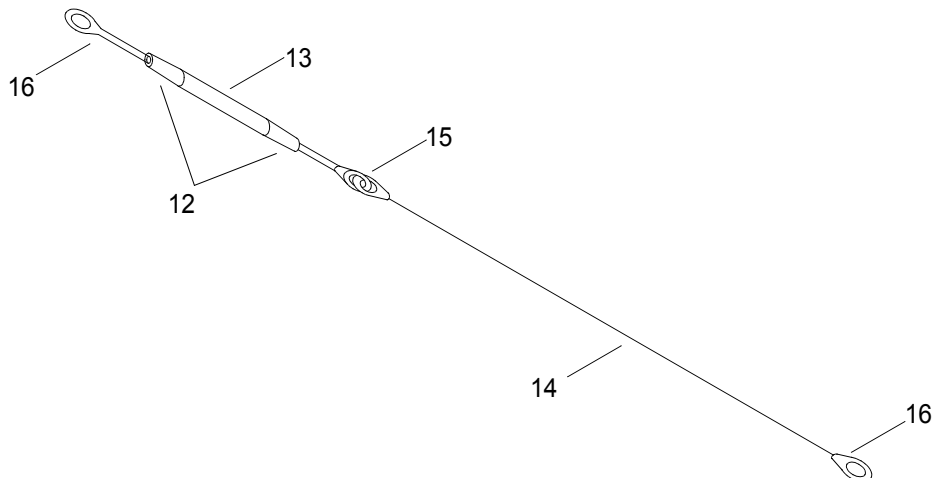
2. Remove life ring (6) and rope (5) from life ring bracket (7).
3. Remove nuts (8) from bolts (9).
4. Remove clamp halves (10) from stanchion (11).
5. Remove bracket (7).

REMOVAL OF LIFELINES

NOTE

This task is typical for all lifelines.

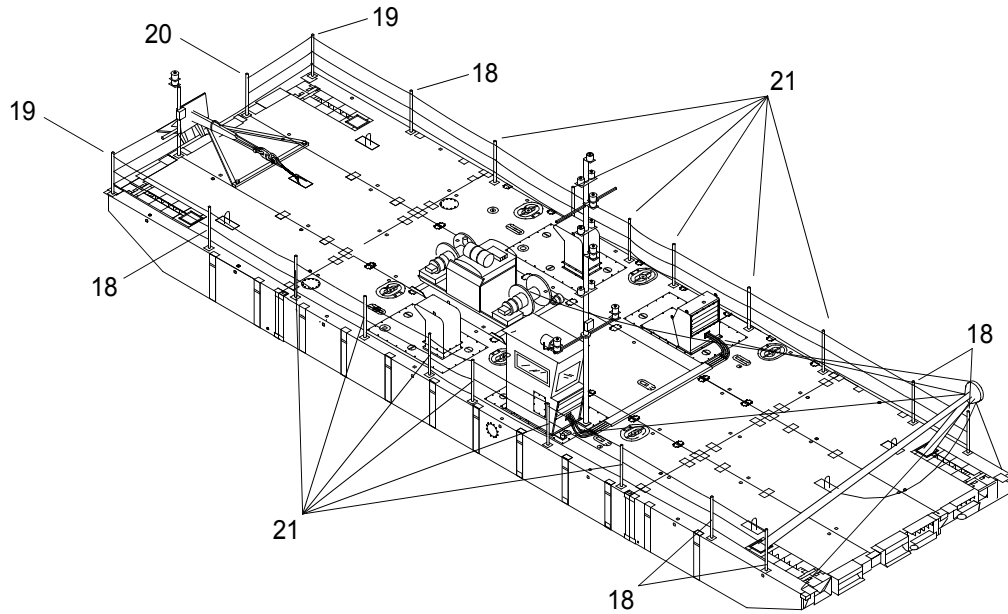
1. Loosen turnbuckle locknuts (12) and loosen turnbuckles (13) to put slack in the lines (14).



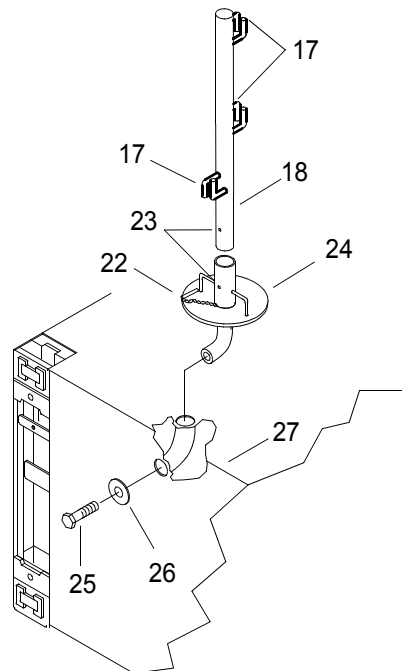
2. Remove the end clevises (16) on the staple fittings and remove lifelines (14) from pigtail fairheads (17) on each end and side stanchion (18, 20 and 21).
3. Remove the lifelines (14).

REMOVAL OF STANCHIONS

1. Remove stanchions (18, 19, 20, and 21) from warping tug.



2. Remove toggle pin (22) from holes (23).

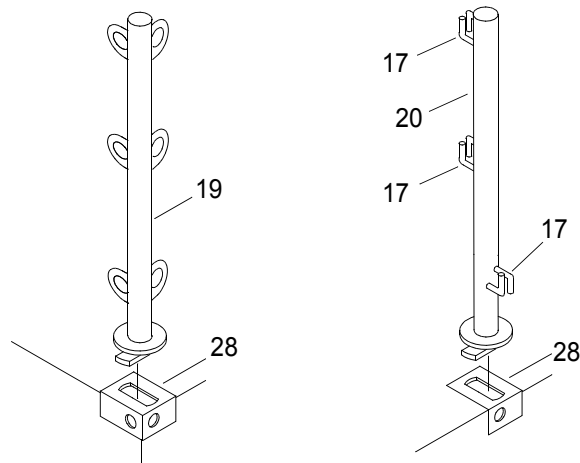


3. Remove end rake side stanchion (18) from deck fitting (24).

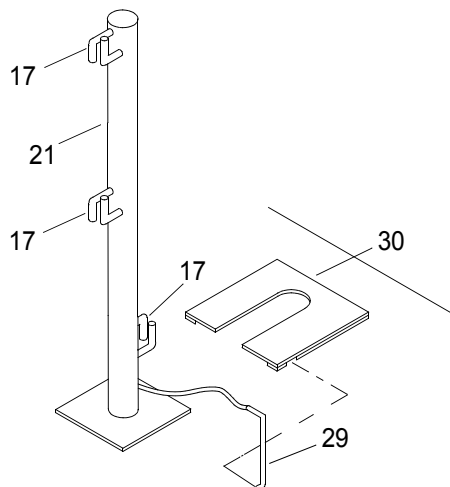
WARNING

Beware of other craft or objects coming alongside while working outboard installing the keeper plate and bolt on deck fittings, as the possibility exists of falling overboard. Failure to observe these precautions could result in death or injury to personnel.

4. Carefully loosen bolt (25) and remove both the bolt and keeper plate (26).
5. Remove the end rake side stanchion (24) deck fitting from turn tube on module (27).
6. Turn end rake corner (19) and end stanchions (20) 90° in ISO fitting (28) to unlock.



7. Remove stanchions (19 and 20).
8. Remove locking pin (29) from plate base (30).



9. Slide propulsion module side stanchion (21) out of the deck fitting (30) to remove.
10. Stow safety equipment in BII ISO container. (WP 0063 00)

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
FENDERS
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Sling, Lifting 5300 lbs (Green) (Item 70, WP 0108 00)
 4 ¾ Ton ¾ in. Shackle (Item 5, WP 0108 00)

Personnel Required

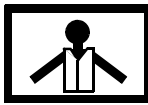
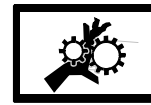
Seaman 88K

Equipment Condition

Safety Equipment Removed. (WP 0037 00)

PREPARATION FOR MOVEMENT - REMOVAL OF FENDERS**REMOVE FENDERS**

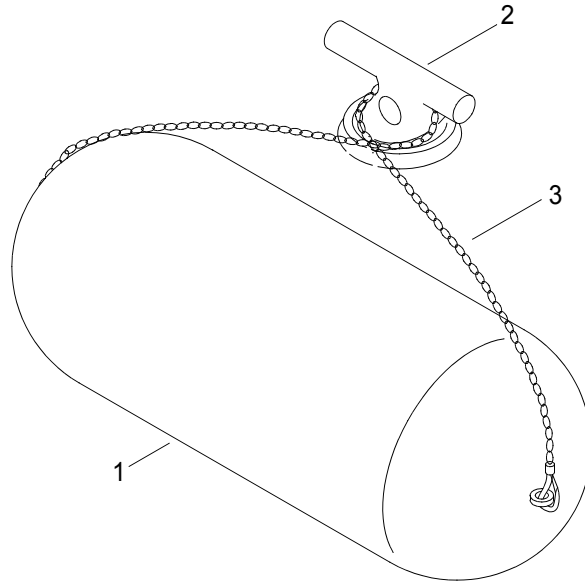
WARNING

**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Using warping tug, pull fender (1) up to deck.
2. Remove wire rope assembly (3) from the deck cleat fitting (2).

-
3. Using crane, sling and shackle, remove fender (1) for stowage.



4. Remove sling and shackle.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
D-RING/CLOVERLEAF AND DECK CLEAT FITTINGS
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

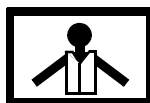
Equipment Condition

Safety Equipment Removed. (WP 0037 00)
 Fenders Removed. (WP 0038 00)

**PREPARATION FOR MOVEMENT - REMOVAL OF D-RING/CLOVERLEAF AND DECK
CLEATS FITTINGS**

REMOVE D-RING/CLOVERLEAF FITTINGS

WARNING



VEST



HELMET PROTECTION



HEAVY PARTS



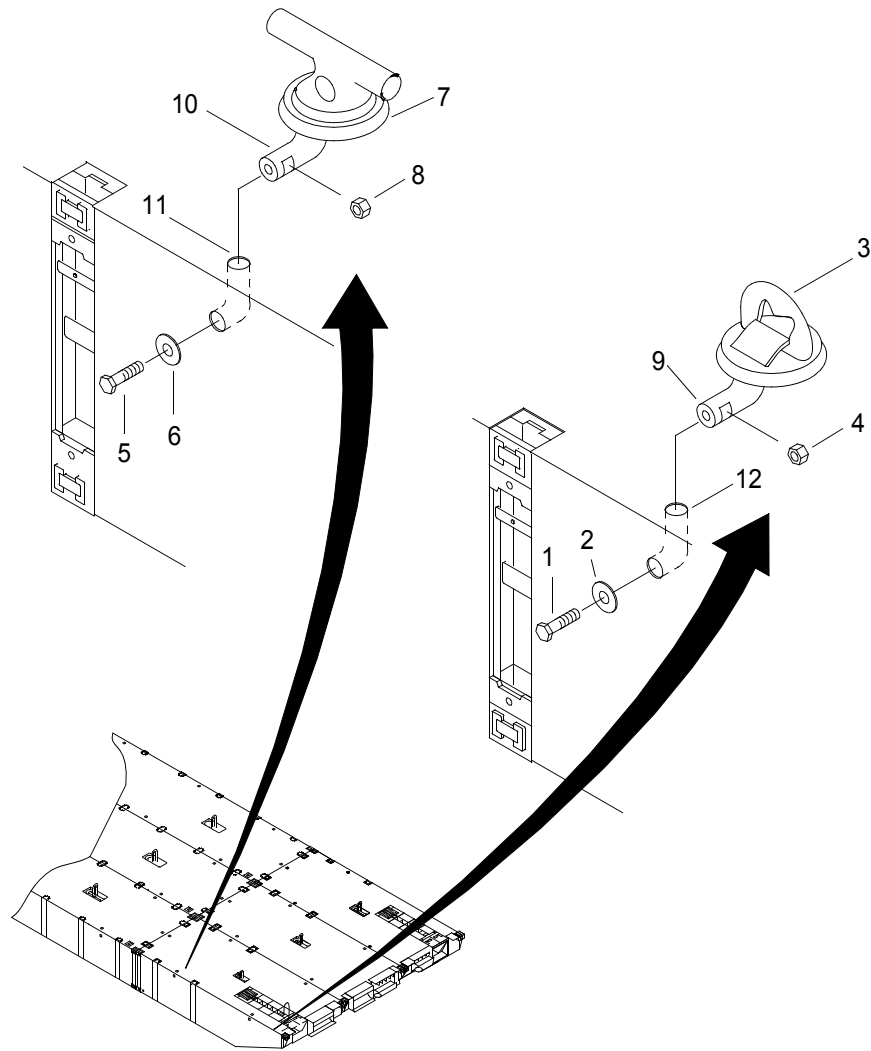
MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

Beware of other craft or objects coming alongside while working outboard installing the bolt and washer. Serious injury may result if body parts are crushed between module and other craft or objects.

Use extreme caution while working outboard and lifting heavy objects as the possibility of falling overboard exists, which could cause serious injury or death.

1. Loosen bolt (1).



2. Remove bolt (1) and keeper plate (2) from nut (4) and tailpiece (9).
3. Remove D-ring/cloverleaf (3) with nut (4) from module turn tube (12).
4. Install bolt (1) through keeper plate (2) and thread it into nut (4) in tailpiece (9).
5. Stow D-ring/cloverleaf (3) assemblies in BII ISO container. (WP 0108 00)

REMOVE DECK CLEAT FITTINGS

WARNING

Beware of other craft or objects coming alongside while working outboard installing the bolt and washer. Serious injury may result if body parts are crushed between module and other craft or objects.

Use extreme caution while working outboard and lifting heavy objects as the possibility of falling overboard exists, which could cause serious injury or death.

1. Loosen bolt (5) from nut (8).
2. Remove bolt (5) and keeper plate (6) from nut (8) and tailpiece (10).
3. Remove deck cleat (7) with nut (8) from module turn tube (11).
4. Install bolt (5) through keeper plate (6) and thread it into nut (8) and tailpiece (10).
5. Stow deck cleat (7) assemblies in BII ISO container. (WP 0108 00)

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
STUB NAVIGATION MAST
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

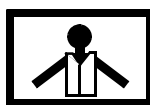
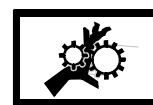
Seaman 88K

Equipment Condition

Safety Equipment Removed. (WP 0037 00)
 Fenders Removed. (WP 0038 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Removed. (WP 0039 00)

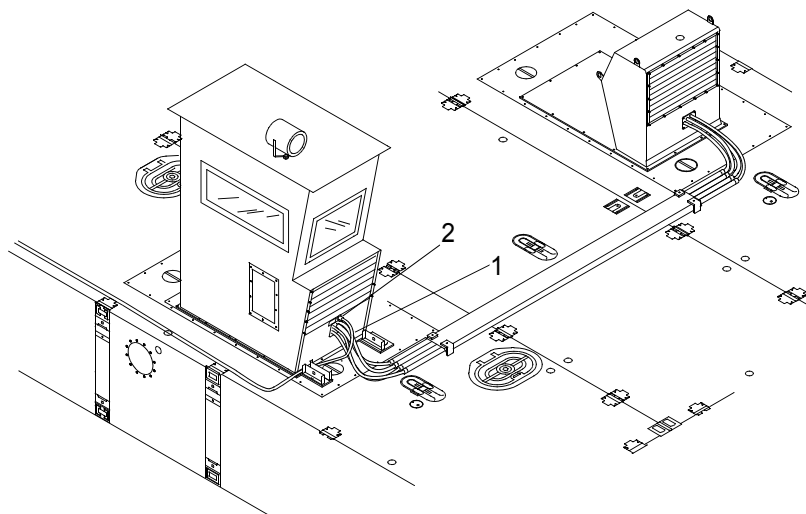
PREPARATION FOR MOVEMENT - REMOVAL OF STUB NAVIGATION MAST**REMOVE STUB MAST**

WARNING

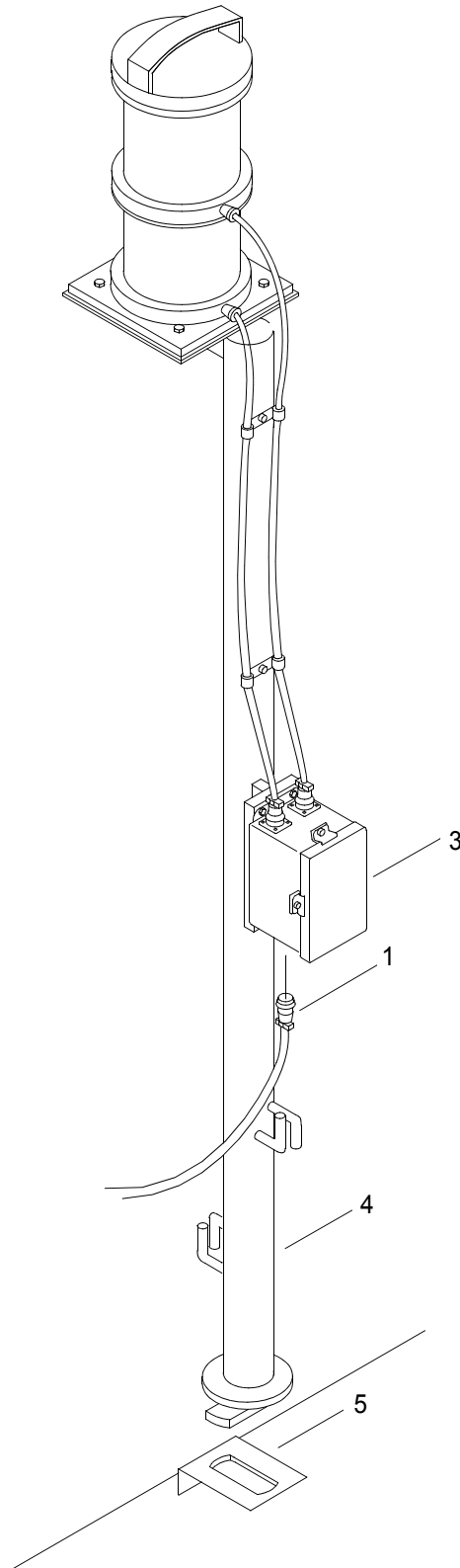
**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Disconnect electrical cable (1) at receptacle (2) found below intake louver vent on front of operators cab. (WP 0006 00)

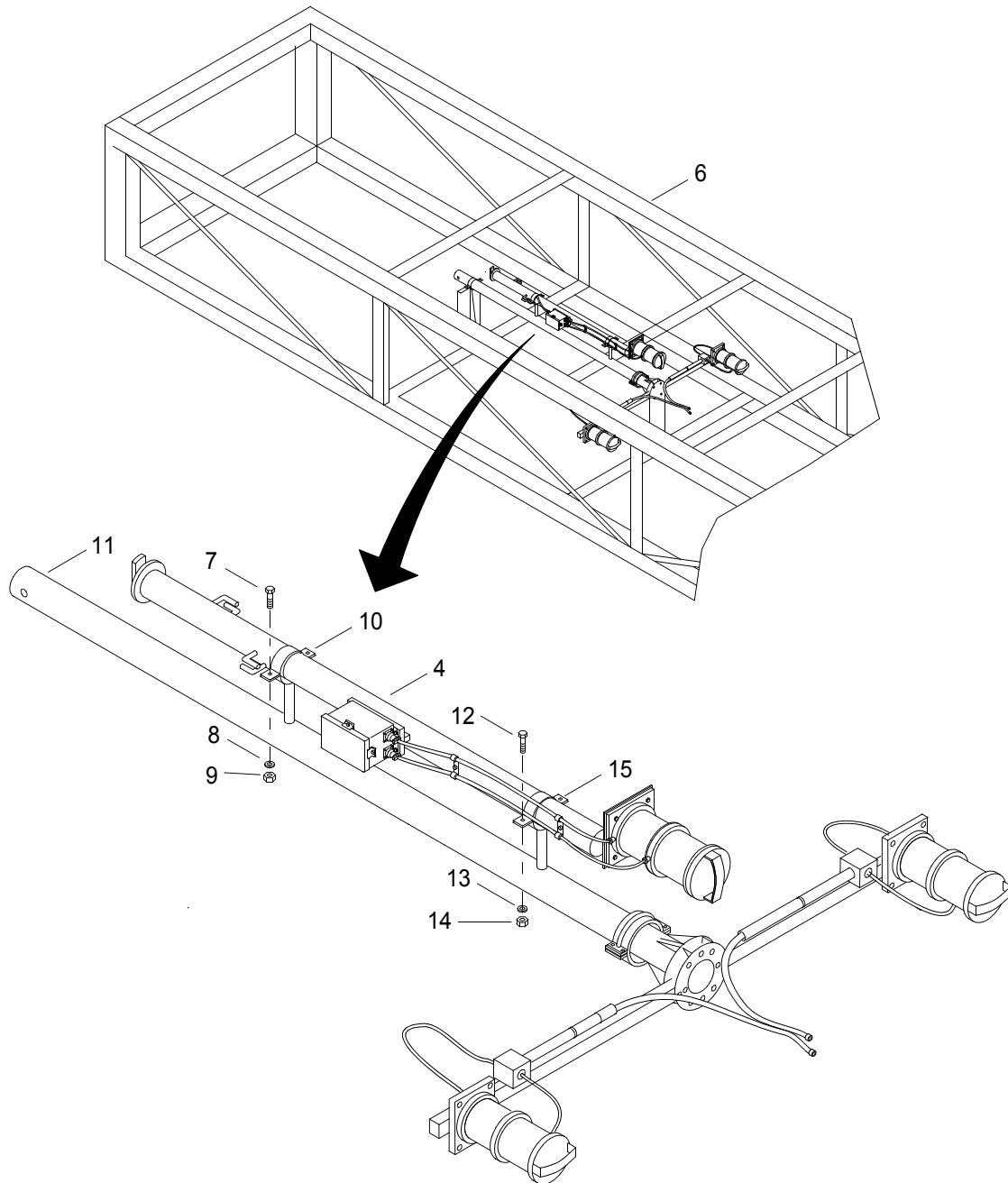


2. Disconnect the stub mast electrical cable (1) from the stub mast electrical junction box (3).



3. Rotate the stub mast (4) 90° to unlock.
4. Remove the stub mast (4) from the corner ISO fitting (5).

5. Install stub mast (4) in shipping frame (6).



- a. Position stub mast (4) in shipping frame (6).
- b. Install two bolts (7), washers (8) and nuts (9) through clamp (10) attaching lower end of stub mast (4) to lower main mast (11).
- c. Install two bolts (12), washers (13) and nuts (14) through clamp (15) attaching upper end of stub mast (4) to lower main mast (11).

6. Tighten nuts (9 and 14).

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
STERN ANCHOR
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Sling, Lifting 5300 lbs (Green) (Item 70, WP 0108 00)
 4 ¾ Ton ¾ in. Shackle (Item 5, WP 0108 00)

Personnel Required

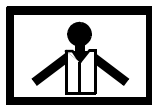
Seaman 88K (2)

Equipment Condition

Safety Equipment Removed. (WP 0037 00)
 Fenders Removed. (WP 0038 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Removed. (WP 0039 00)
 Stub Navigation Mast Removed. (WP 0040 00)

PREPARATION FOR MOVEMENT - REMOVAL OF STERN ANCHOR**REMOVE STERN ANCHOR**

WARNING



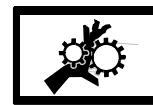
VEST



HELMET PROTECTION



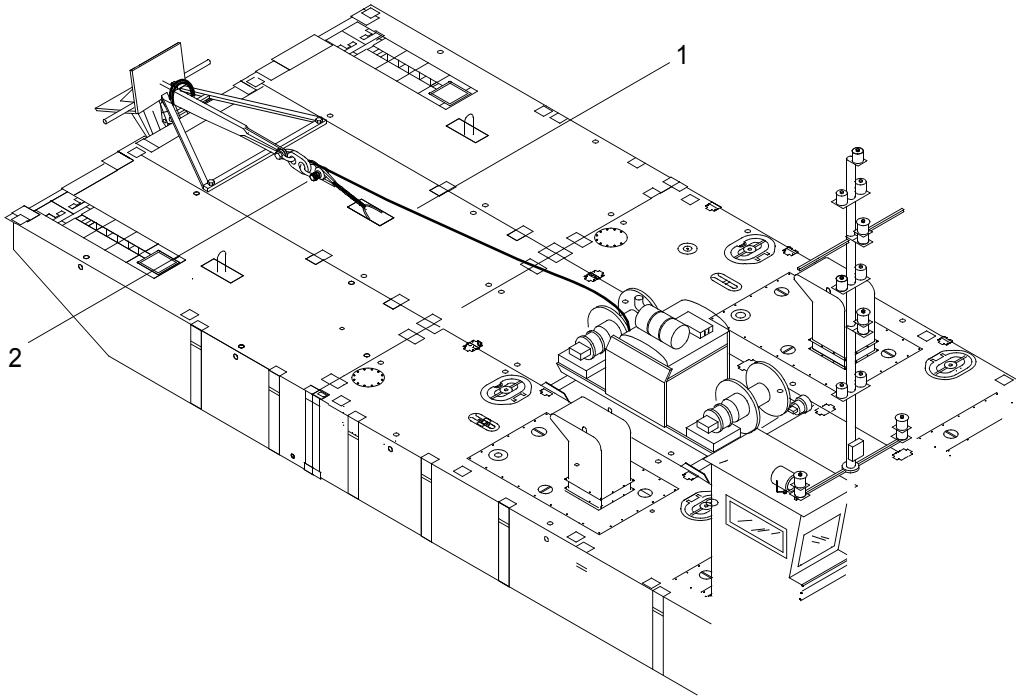
HEAVY PARTS



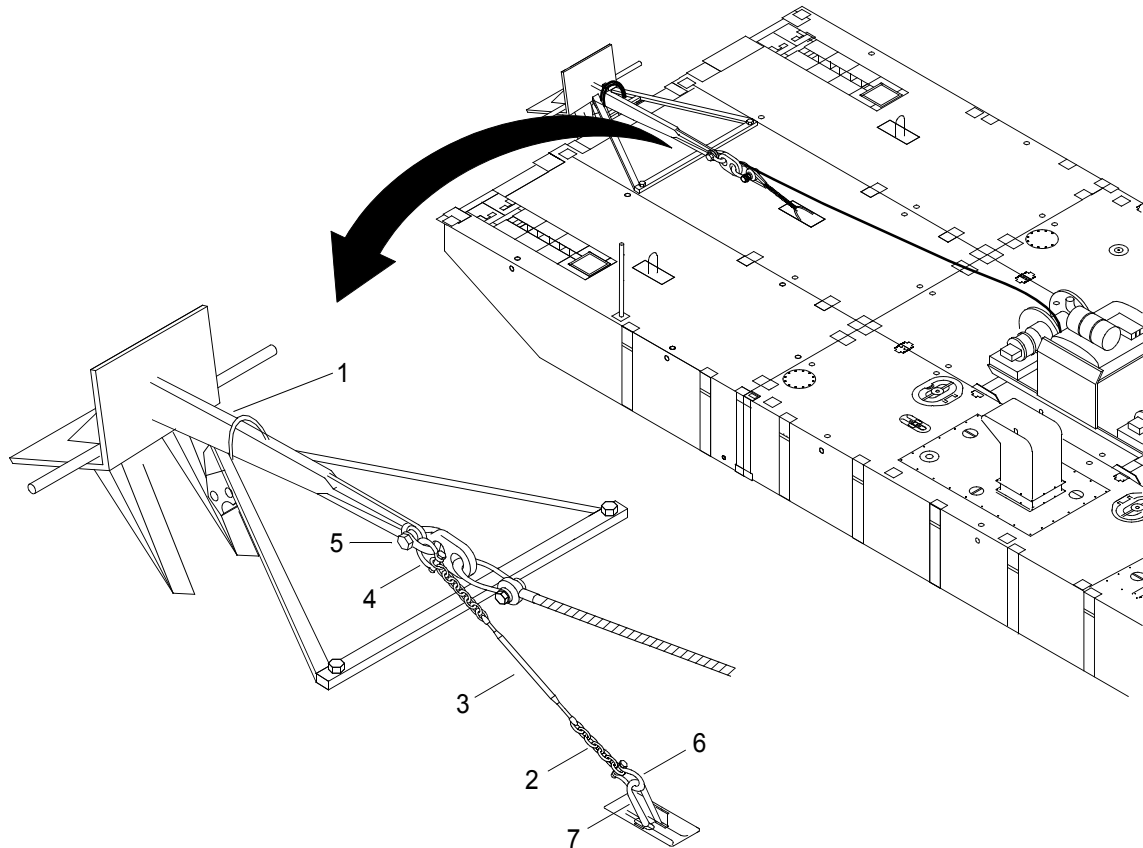
MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Using deck winch, allow after drum wire (1) to pay out and connect to stern anchor.



2. Using the deck winch, take up tension on the after drum wire (1).
3. Remove retaining assembly (2).

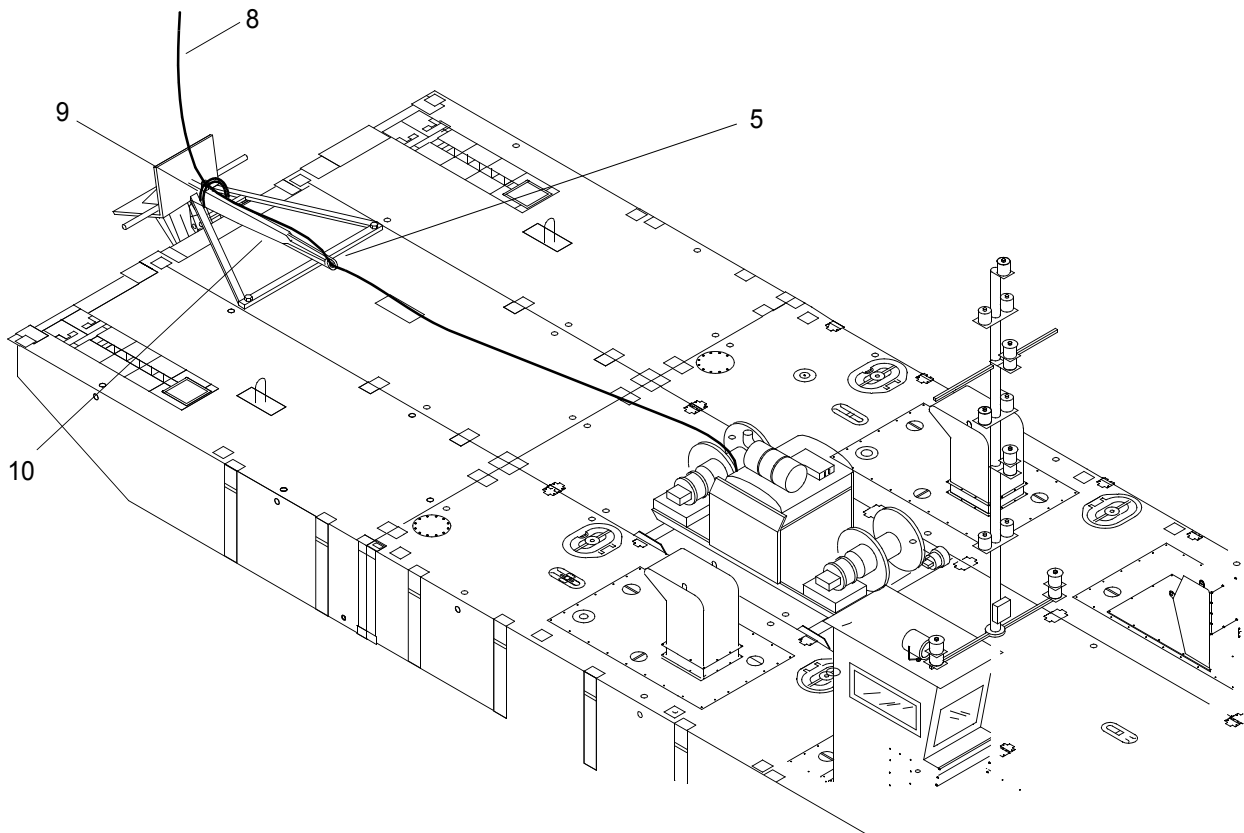


- a. Loosen the retaining assembly turnbuckle (3).
- b. Remove the retaining assembly shackle (4) from the anchor shank shackle (5).
- c. Remove the large shackle (6) from the center rake module lifting lug (7).

WARNING

**HEAVY PARTS**

4. Using the crane, sling and shackle, lower the cable (8) and run it through the anchor frame bow (9), to connecting link (5).

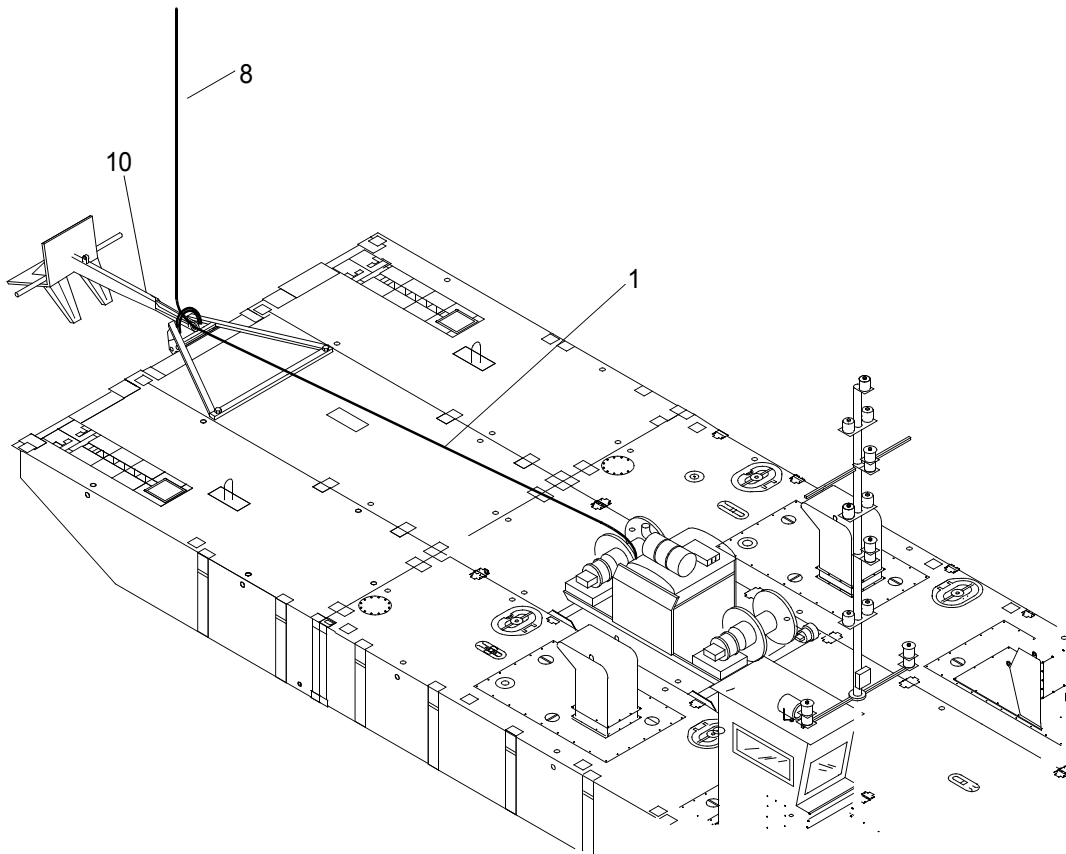


5. Attach the cable (8) to the connecting link (5)

WARNING

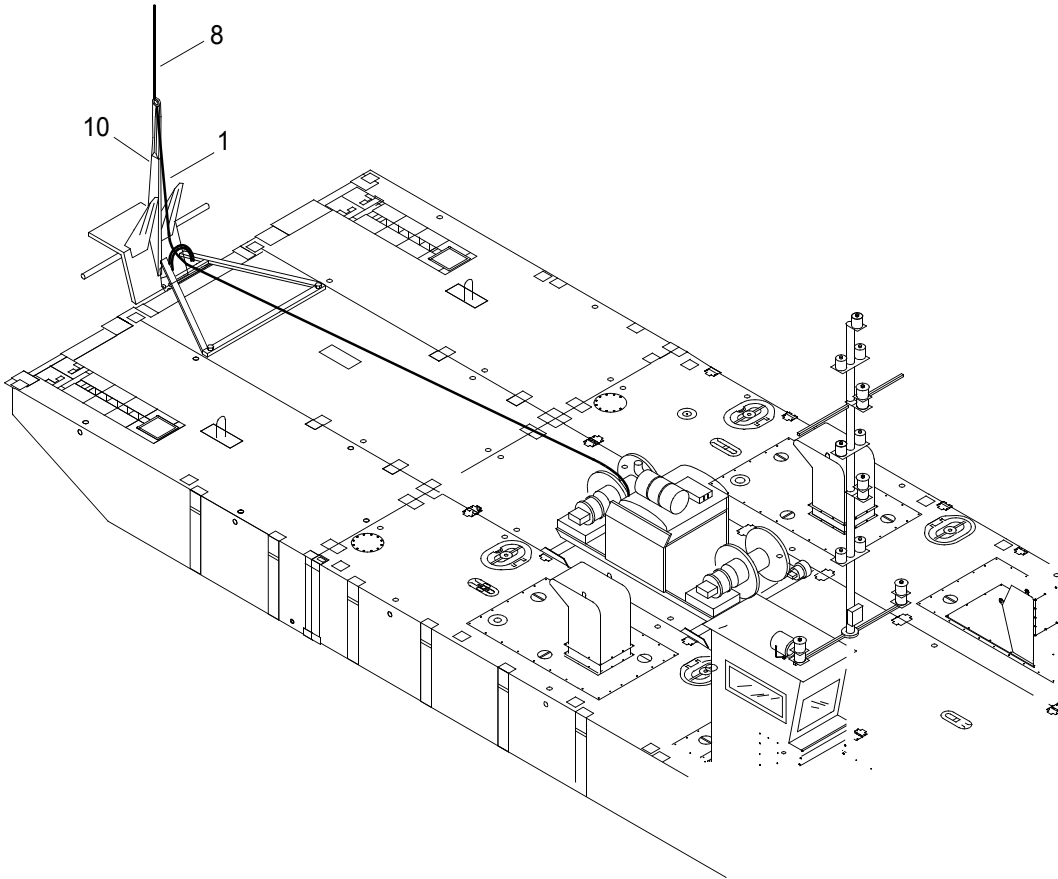
**HEAVY PARTS**

6. Using the deck winch, allow the after drum wire (1) to pay out until retaining shackle (4) clears anchor frame bow (9).



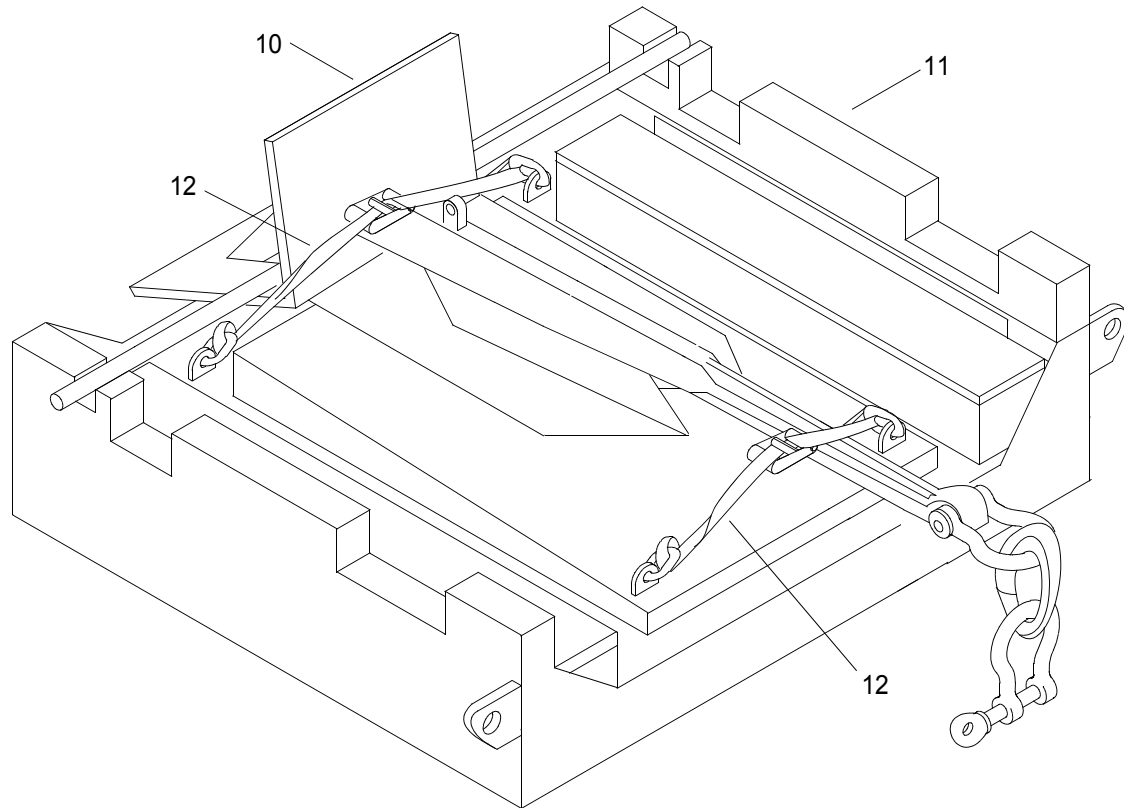
WARNING**HEAVY PARTS**

7. Using crane cable (8) raise anchor (10) enough to release the deck winch after drum wire (1) from the anchor (10).



WARNING**HEAVY PARTS**

- Using crane, slings and shackles, raise the 1,000 lb NAVMOOR anchor (10) and position in shipping pallet (11).



- Remove slings and shackles.
- Secure anchor (10) to shipping pallet (11) with ratchet straps (12).
- Tighten ratchet straps (12).

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
STERN ANCHOR FRAME
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Sling, Lifting 5300 lbs (Green) (Item 70, WP 0108 00)
 4 ¾ Ton ¾ in. Shackle (Item 5, WP 0108 00)

Personnel Required

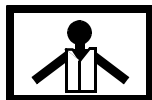
Seaman 88K (2)

Equipment Condition

Safety Equipment Removed. (WP 0037 00)
 Fenders Removed. (WP 0038 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Removed. (WP 0039 00)
 Stub Navigation Mast Removed. (WP 0040 00)
 Stern Anchor Removed. (WP 0041 00)

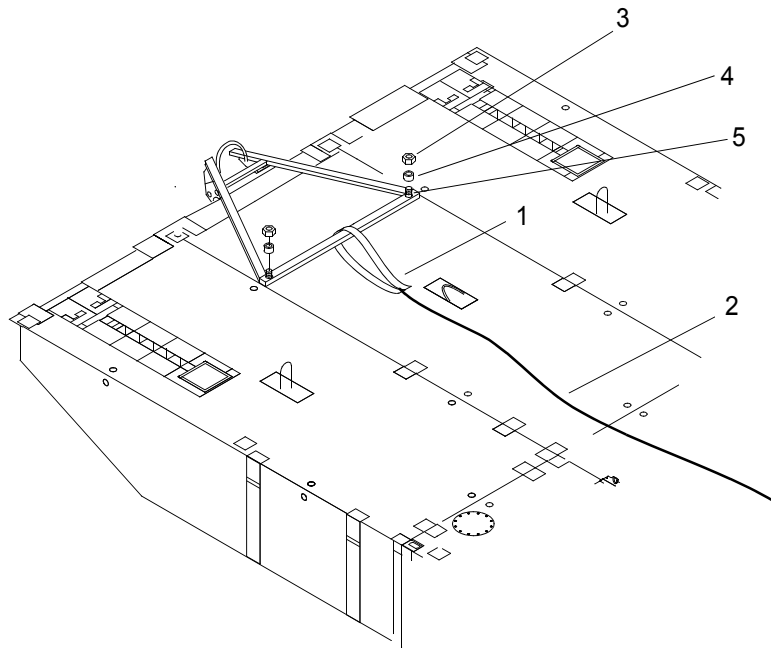
PREPARATION FOR MOVEMENT - REMOVAL OF STERN ANCHOR FRAME**REMOVE STERN ANCHOR FRAME**

WARNING

**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Attach sling (1) to the after drum winch wire (2) and take up tension.



2. Remove nuts (3) and bushings (4) from J-bolts (5).

WARNING

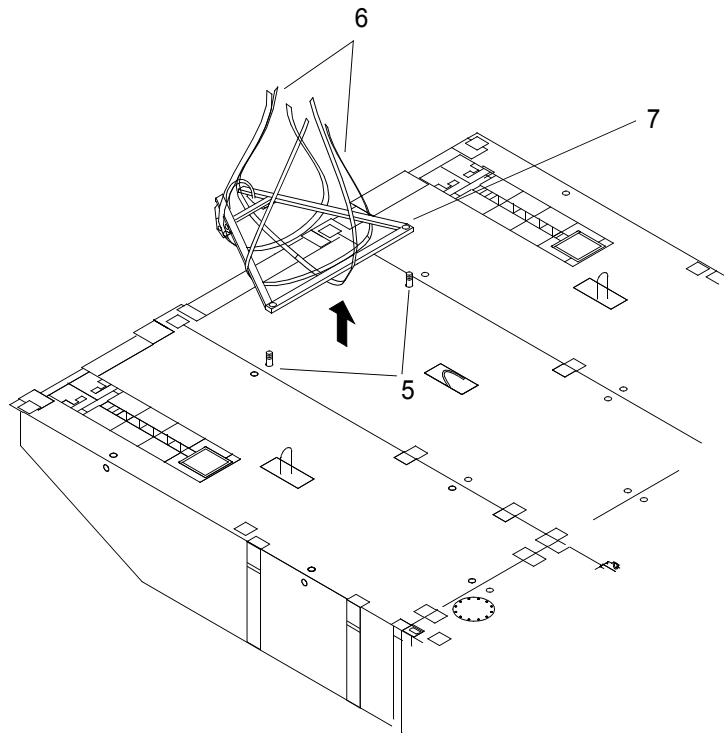
**HEAVY PARTS**

3. Attach slings (6) and shackles to the stern anchor frame (7) and apply tension with crane.
4. Release tension from the after drum winch wire (2) and remove sling (1).

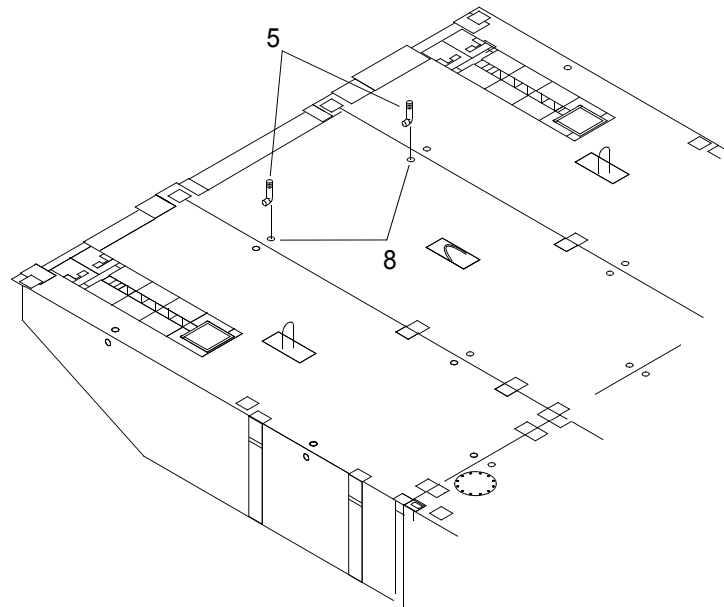
WARNING

**HEAVY PARTS**

5. Using the crane, raise the frame off the J-bolts (5).

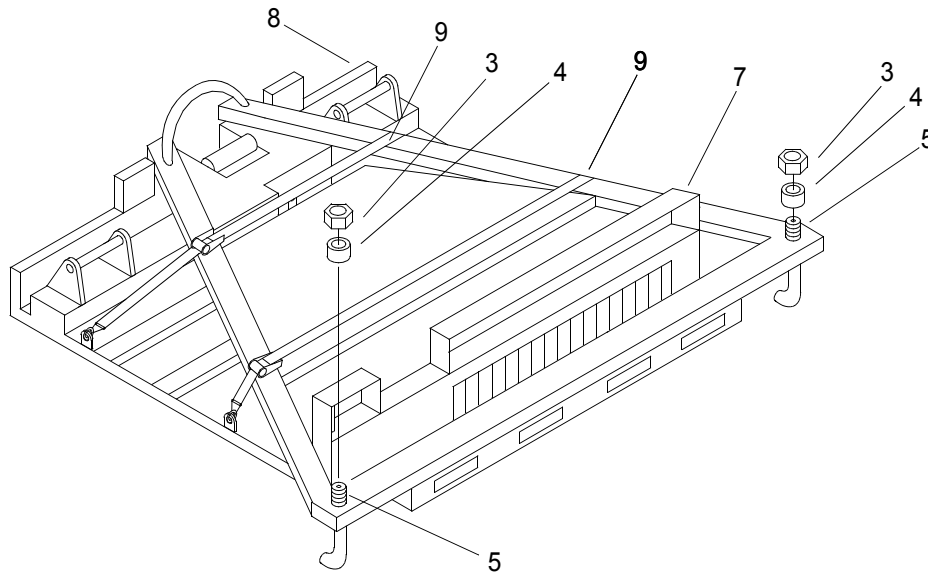


6. Remove the two J-bolts (5) from the side turn tube deck holes (8) on the WT center rake module.



STOW STERN ANCHOR FRAME

1. Install stern anchor frame (7) on stowage pallet (8).



WARNING


HEAVY PARTS

- a. Using crane, slings and shackles, lift stern anchor frame (7) and place on stowage pallet (8).
 - b. Secure stern anchor frame (7) to stowage pallet (8) with ratchet straps (9).
 - c. Remove slings and shackles.
 - d. Tighten ratchet straps (9).
2. Install J-bolts (5) in stern anchor frame (7).
 - a. Install J-bolts (5) through holes in stern anchor frame (7).
 - b. Install bushings (4) and nuts (3) on J-bolts (5)
 - c. Tighten nuts (3).

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
A-FRAME
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Sling, Lifting 5300 lbs (Green) (Item 70, WP 0108 00)
 Qty 2
 4 ¾ Ton ¾ in. Shackle (Item 5, WP 0108 00)
 Qty 2
 Rope, Fibrous (Item 61, WP 0108 00)

Personnel Required

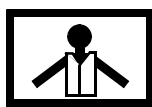
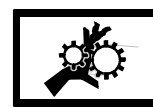
Seaman 88K (4)

Equipment Condition

Safety Equipment Removed. (WP 0037 00)
 Fenders Removed. (WP 0038 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Removed. (WP 0039 00)
 Stub Navigation Mast Removed. (WP 0040 00)
 Stern Anchor Removed. (WP 0041 00)
 Stern Anchor Mount Removed. (WP 0042 00)

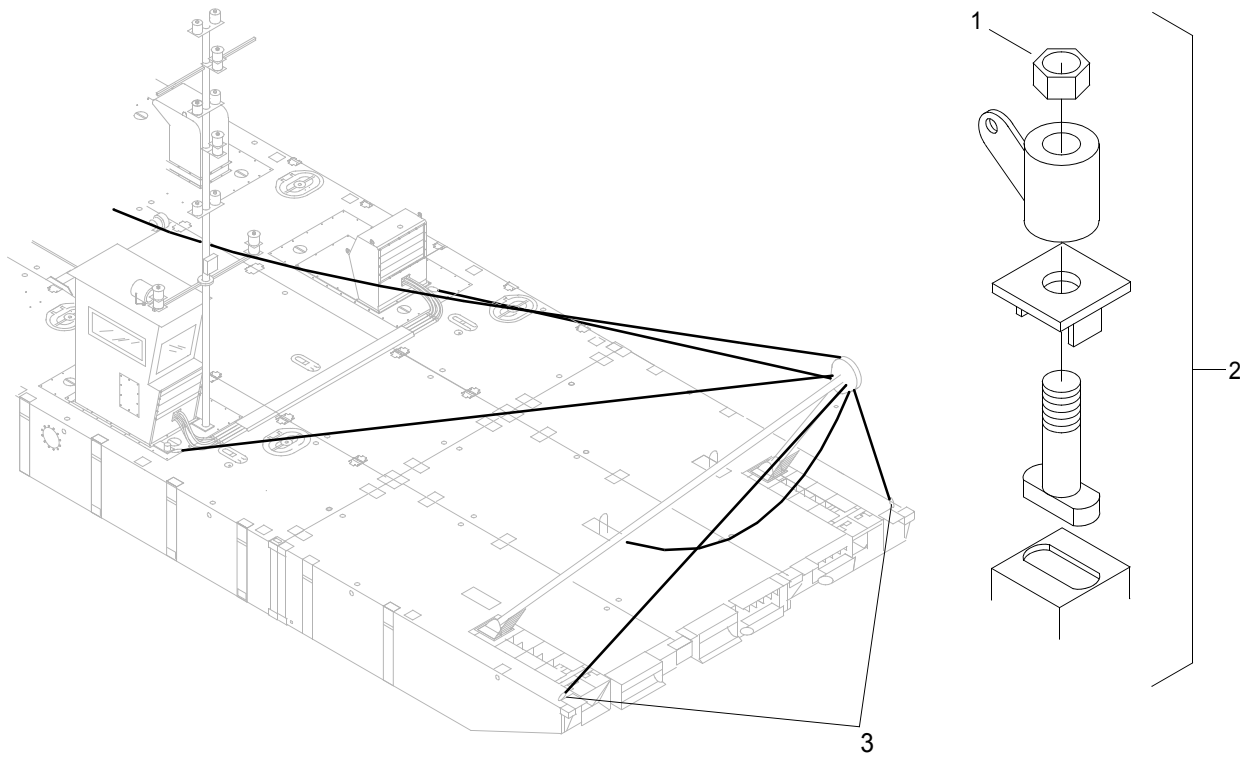
PREPARATION FOR MOVEMENT - REMOVAL OF A-FRAME**INSTALL THE A-FRAME ELEVATING POLE**

WARNING

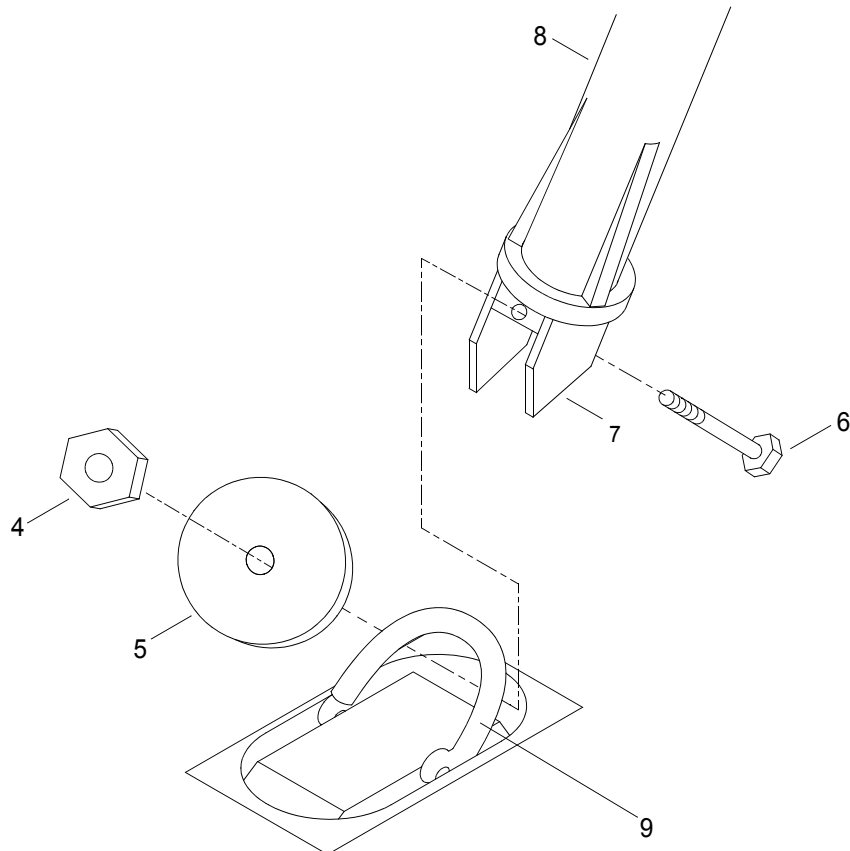
**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

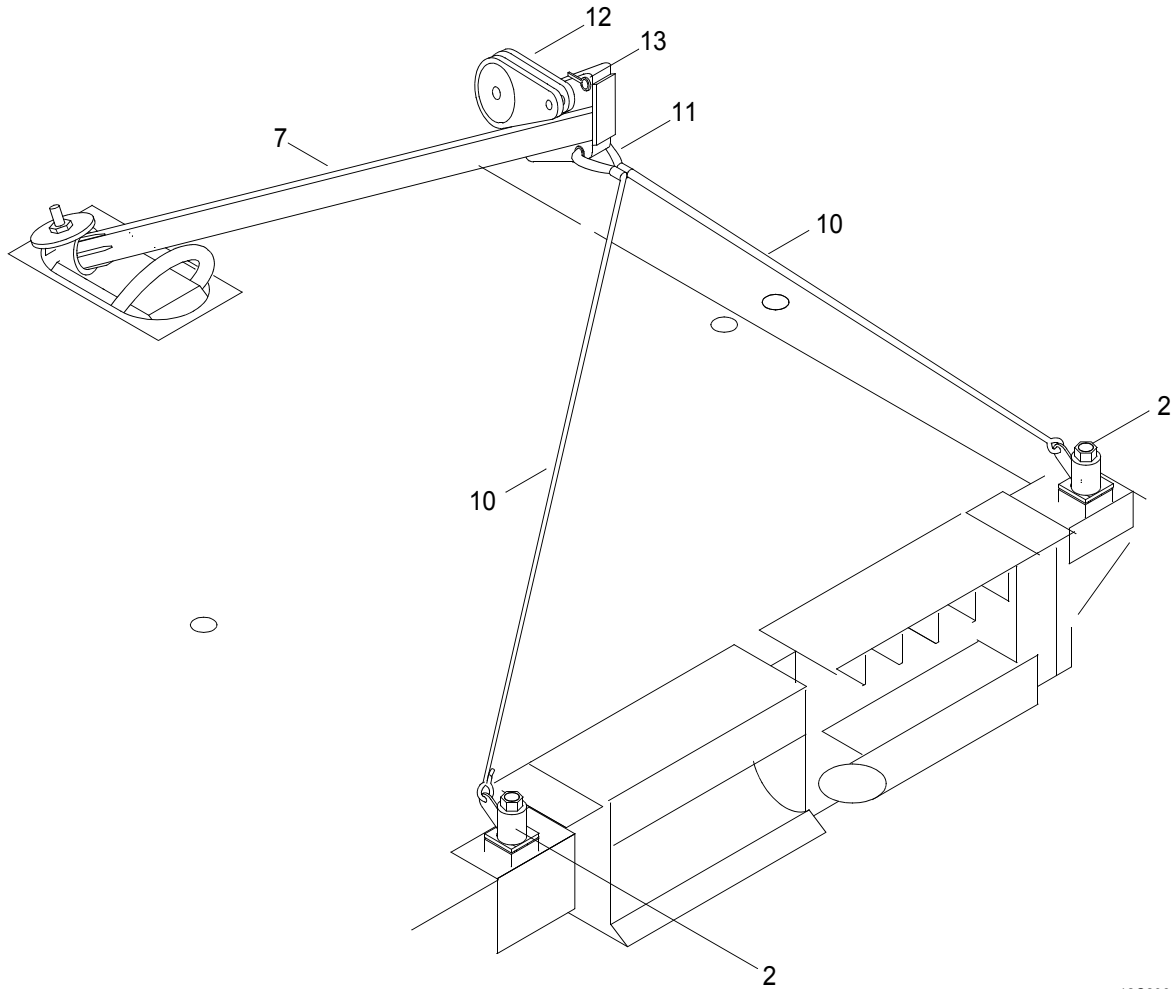
1. Loosen nut (1) and install a corner fitting lug assembly (2) in each of two forward center rake module corner ISO fittings (3).



2. Rotate corner fitting lug assembly (2) in the ISO fitting (3) to lock it in place. Tighten nut (1).
3. Remove nut (4), large washer plate (5) and bolt (6) from foot (7) of elevating pole (8).



4. Position elevating pole (8) into center rake module's lifting lug shackle (9).
5. Install bolt (6) through elevating pole foot (7) and shackle (9) and secure with washer plate (5) and nut (4).
6. Attach elevating pole guy wire assembly (10) to forward shackle hole (11) of elevating pole (7) and at two corner fitting lug assemblies (2).

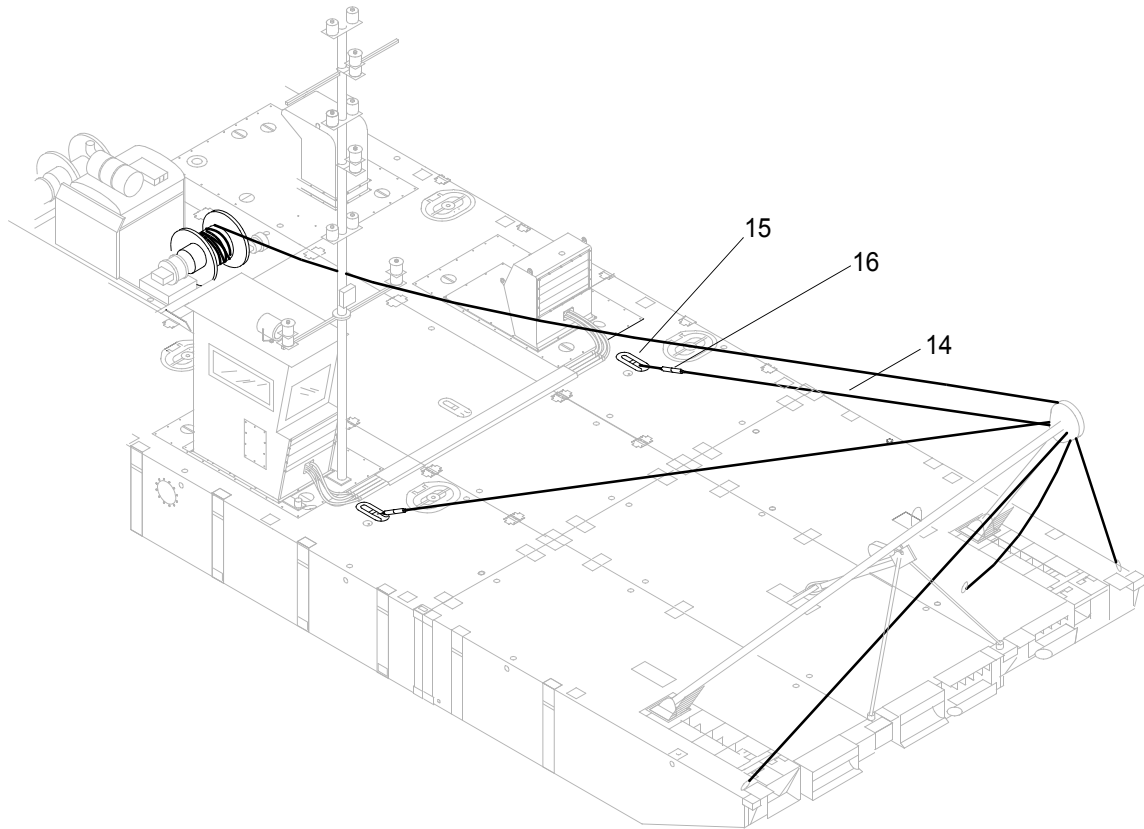


12C206-5

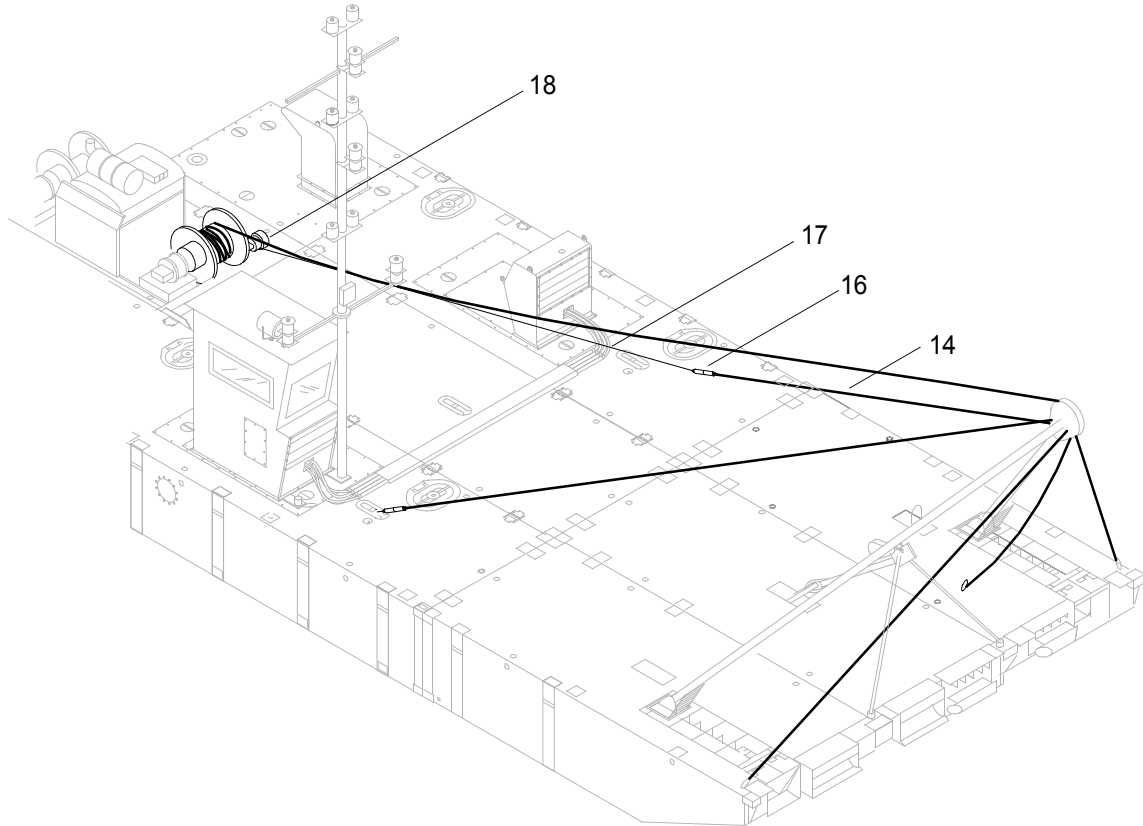
7. Install 8 in. snatch block (12) in lower after hole (13) of elevating pole head.

LOWER THE A-FRAME

1. Remove port after guy assembly (14) from forward lifting lug (15) of port propulsion module by turning turnbuckle (16) to release tension.



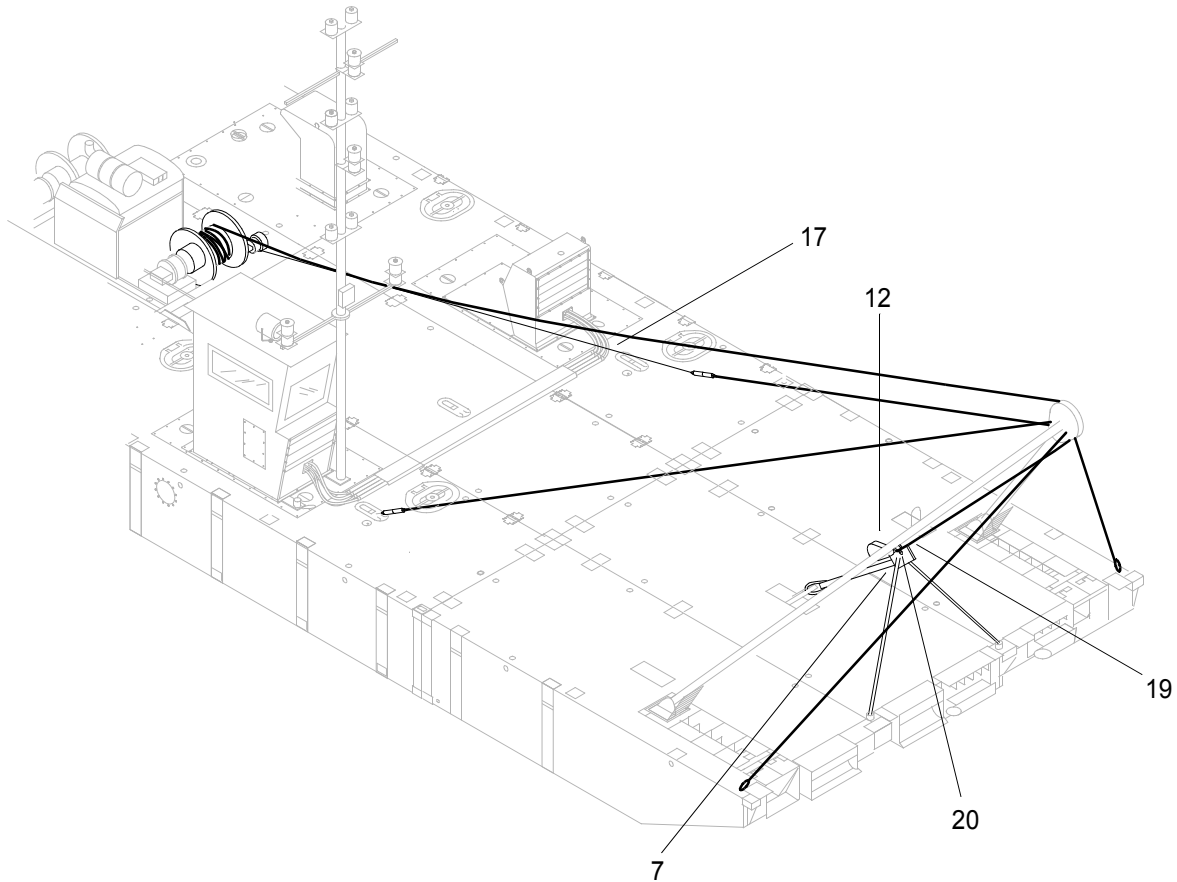
- Secure a 1 in. diameter rope (17) to turnbuckle (16) of port after guy assembly (14).

**NOTE**

The rope is used to pull the A-frame back past top dead center during lowering.

- Take rope (17) to gypsy winch (18).

4. Run forward winch drum wire (19) out and secure end to the upper eye (20) on top of elevating pole (7).



5. With slack in forward winch drum wire (19), capture it in 8 in. snatch block (12) on elevating pole (7), entering snatch block (12) from bottom.
6. Draw up on both forward winch drum wire (19) and rope (17) until both wire and rope are tight.

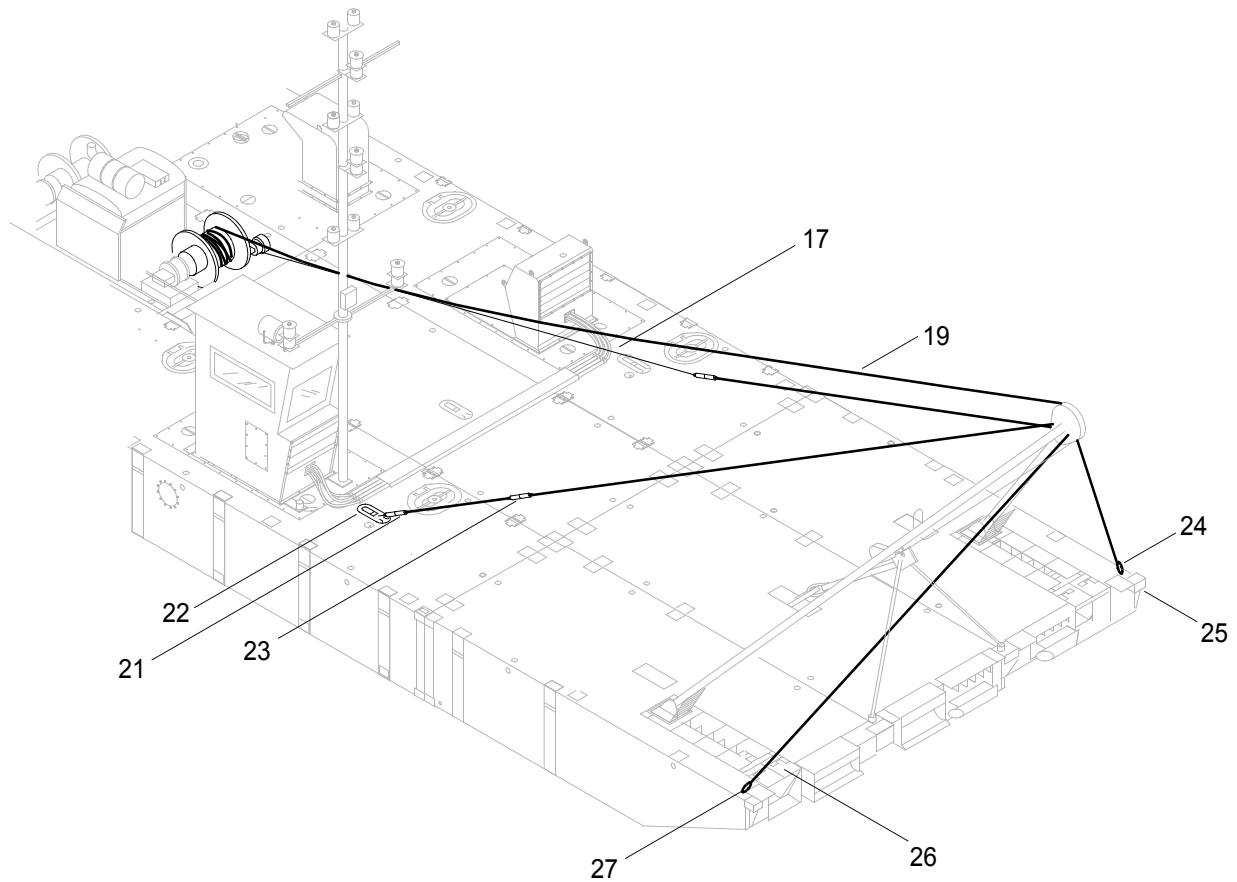
WARNING



HEAVY PARTS

Tension must be maintained on both the gypsy winch rope and forward drum winch wire to prevent A-frame from falling forward. Failure to comply will result in personnel injury and damage to equipment.

7. Remove starboard after guy assembly (21) from forward lifting lug (22) of starboard propulsion module by turning turnbuckle (23) to release tension.



8. Easing off slightly on both forward drum and gypsy winches, remove port forward guy assembly (24) from corner fitting lug assembly (25).
9. Remove starboard forward guy assembly (26) from corner fitting lug assembly (27).

WARNING



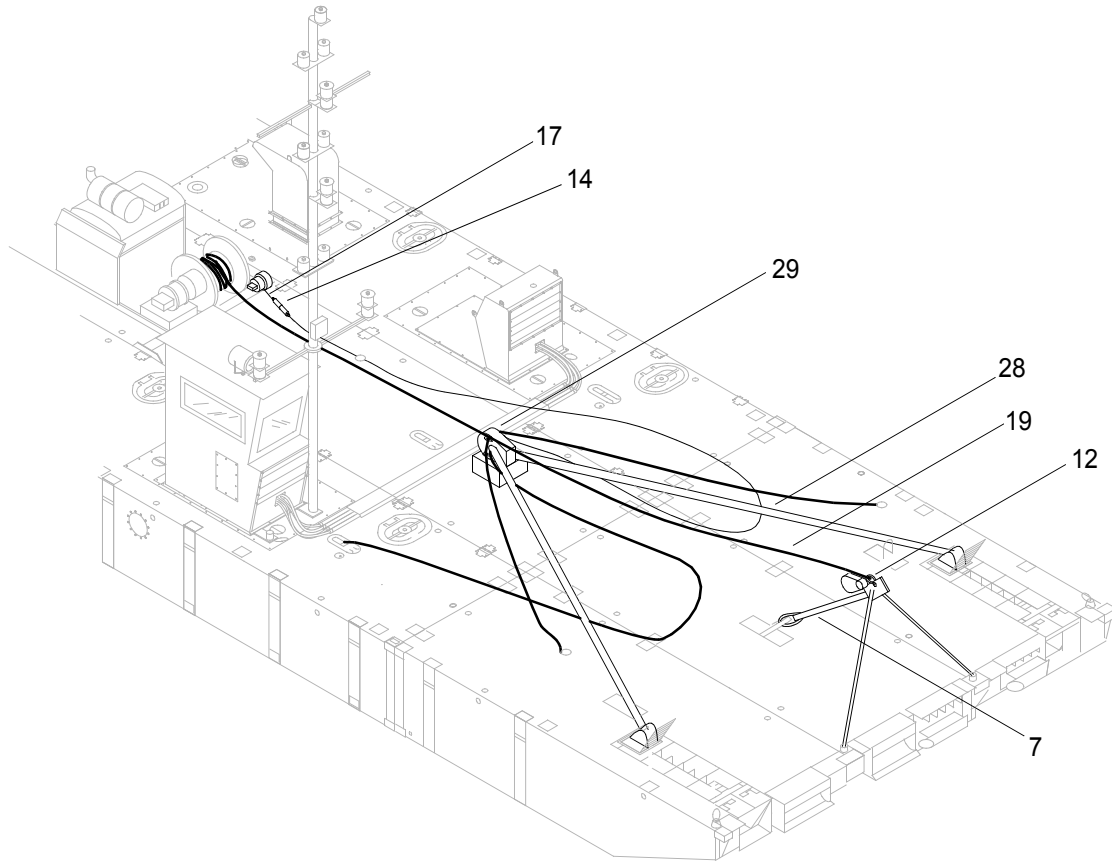
HEAVY PARTS

NOTE

The rope attached to gypsy winch is used to pull the A-frame back past vertical. Once achieved, the forward winch wire looped through elevating pole supports weight of A-frame until it is lowered to deck.

10. Using both winches, slowly take in rope (17) while letting out winch drum wire (19) until A-frame (28) is levered backwards and lowered towards deck.

11. Place a suitable large wooden block beneath A-frame (28) to protect sheave (29).



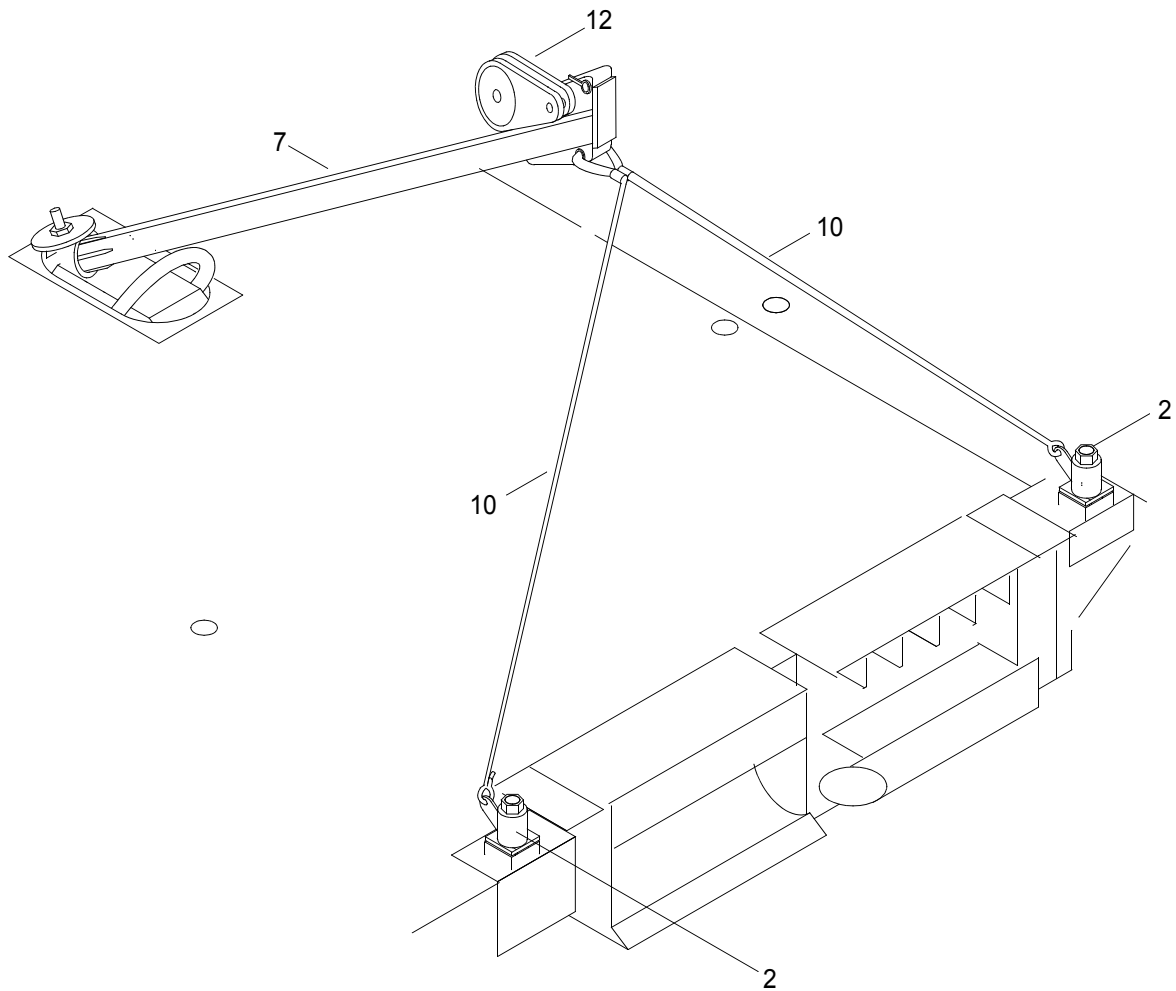
12. Finish lowering A-frame (28) until sheave (29) rests on a wooden block.

13. Slacken drum wire (19).

14. Remove rope (17) from port after guy assembly (14).

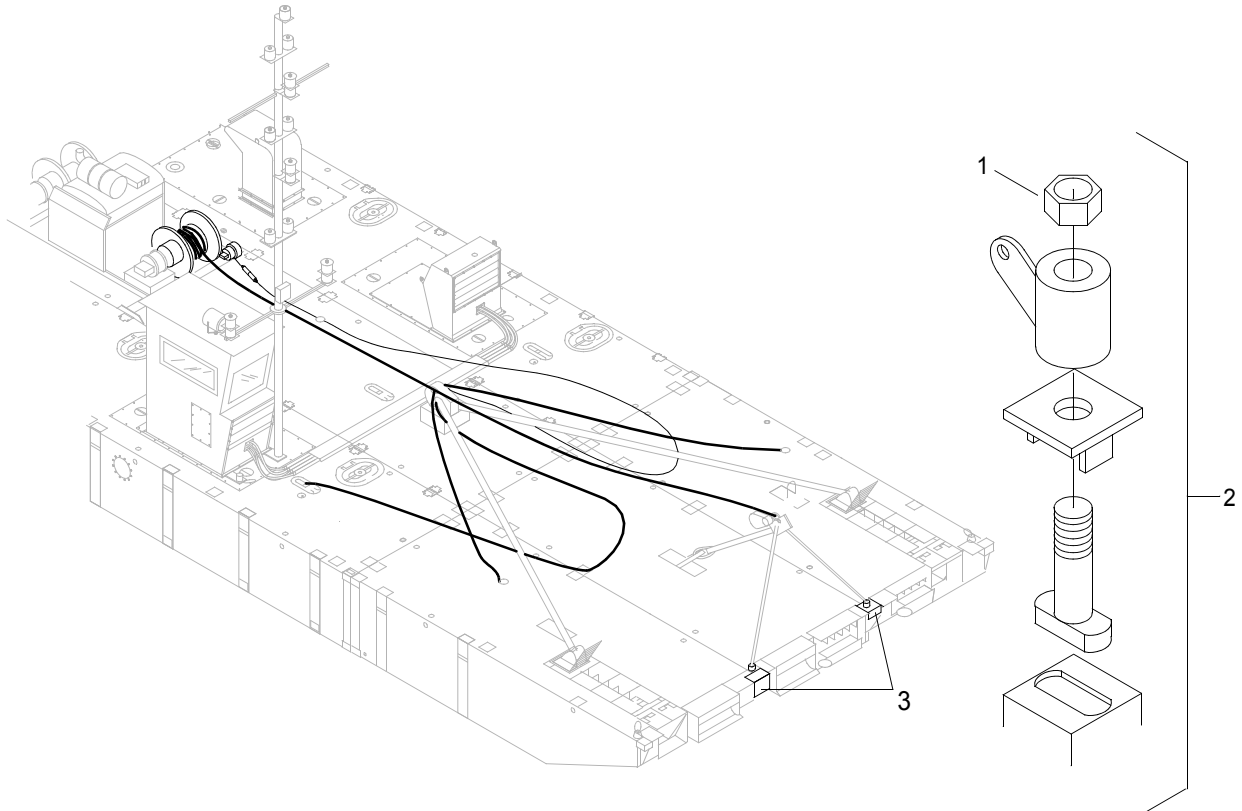
15. Remove forward winch drum wire (19) from snatch block (12) on elevating pole (7).

16. Remove the 8 in. snatch block (12) from elevating pole (7).



17. Remove guy wire assembly (10) from elevating pole (7) and corner fitting lug assemblies (2).

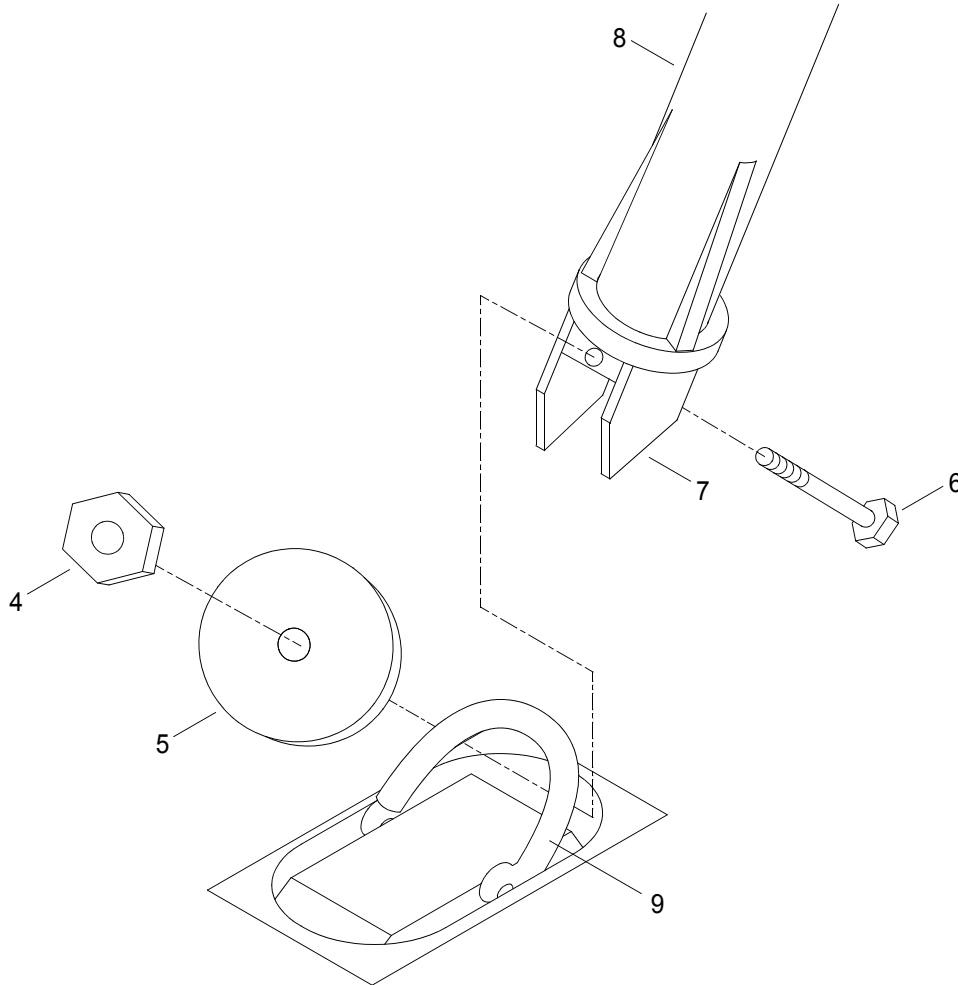
18. Loosen two nuts (1) on corner fitting lug assemblies (2) in 2 forward center rake module corner ISO fittings (3).



19. Rotate corner lug fittings (2) in ISO fittings (3) to unlock it.

20. Remove corner lug fittings (2).

21. Remove nut (4), large washer plate (5) and bolt (6) from foot (7) of elevating pole (8).



22. Remove elevating pole (8) from center rake module's lifting lug shackle (9).

23. Install bolt (6), washer plate (5) and nut (4) into elevating pole foot (7).

24. Remove elevating pole (8).

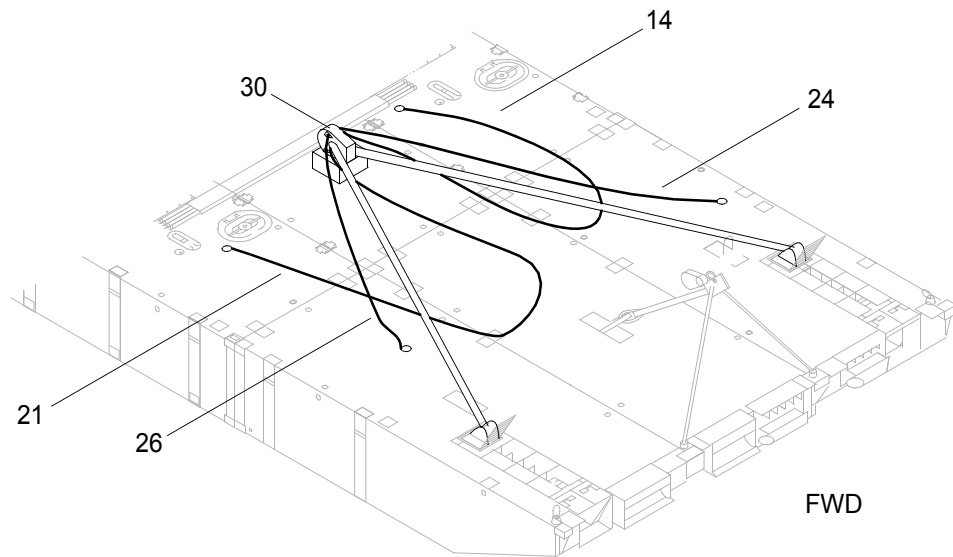
DISASSEMBLE THE A-FRAME

WARNING

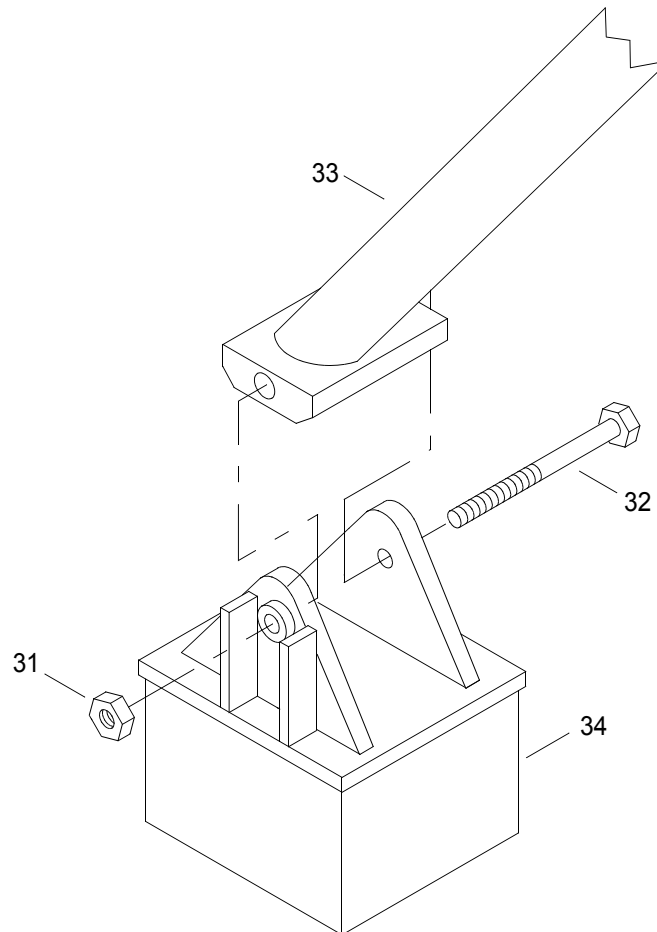


HEAVY PARTS

1. Remove four guy assemblies (14), (21), (24) and (26) from eyes on A-frame heads (30).



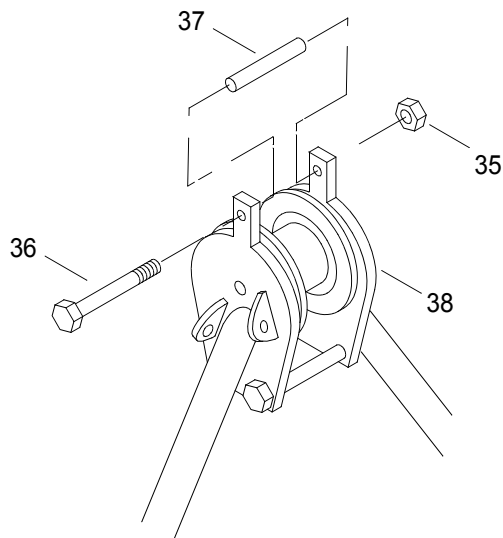
2. Remove two nuts (31) and bolts (32) securing A-frame legs (33) to foot assemblies (34).



WARNING

**HEAVY PARTS**

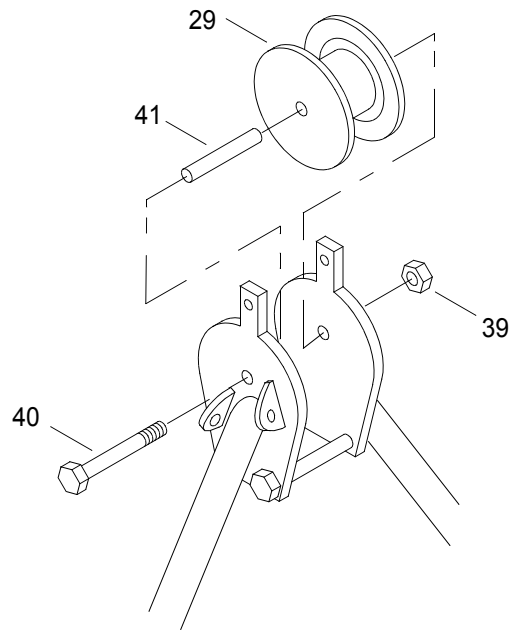
- Using crane, sling and shackle, separately remove foot assemblies (34).
- Remove sling and shackle.
- Remove nut (35), bolt (36) and upper spacer (37) from A-frame heads (38).



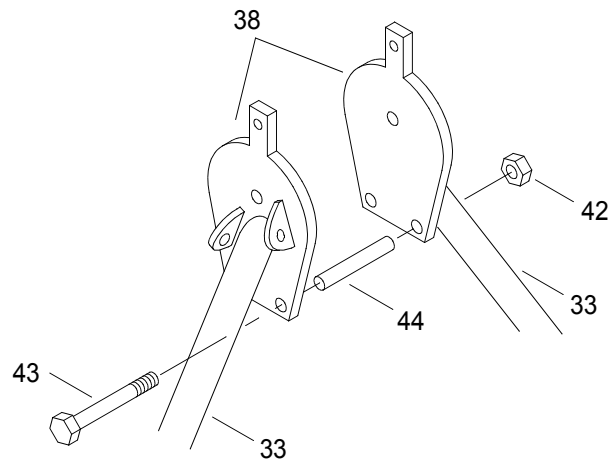
WARNING

**HEAVY PARTS**

- Supporting weight of sheave (29) with crane, sling and shackles, remove nut (39), bolt (40) and bushing (41).



7. Remove sheave (29).
8. Remove sling from sheave (29).
9. Remove two nuts (42), bolts (43) and lower spacers (44) from A-frame heads (38).



WARNING

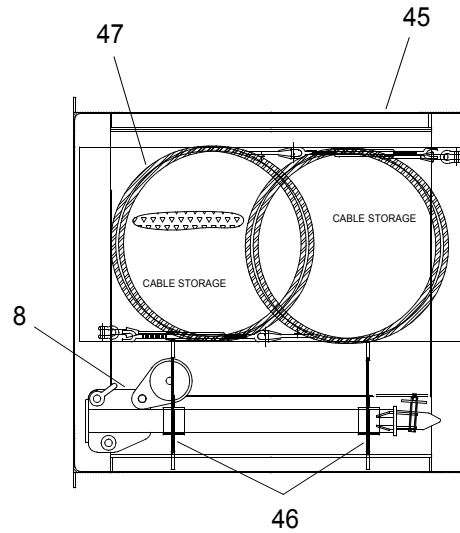


HEAVY PARTS

10. Using crane, slings and shackles, separately remove two A-frame legs (33).
11. Remove slings and shackles.

STOW A-FRAME COMPONENTS ON STOWAGE PALLETS

1. Stow A-frame elevating pole (8) on stowage pallet (45).



2. Secure A-frame elevating pole (8) to stowage pallet (45) with two ratchet straps (46).
3. Tighten ratchet straps (46).

WARNING

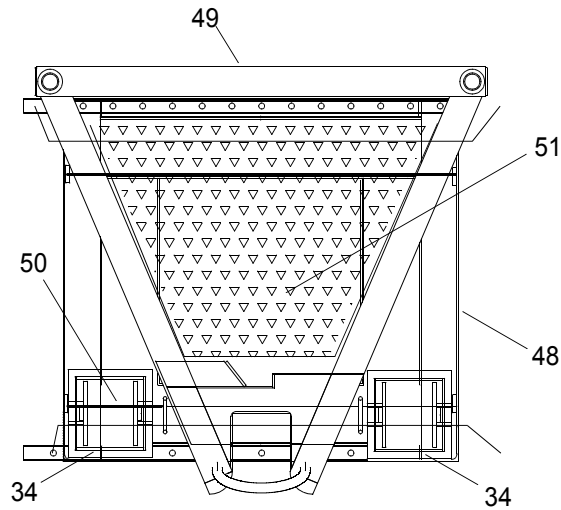

HEAVY PARTS

4. Using crane and sling, stow A-frame cables (14), (21), (24) and (26) in storage box (47) of stowage pallet (45).
5. Remove sling.
6. Stow A-frame corner fitting lug assemblies (2) in storage box (47) of stowage pallet (45).

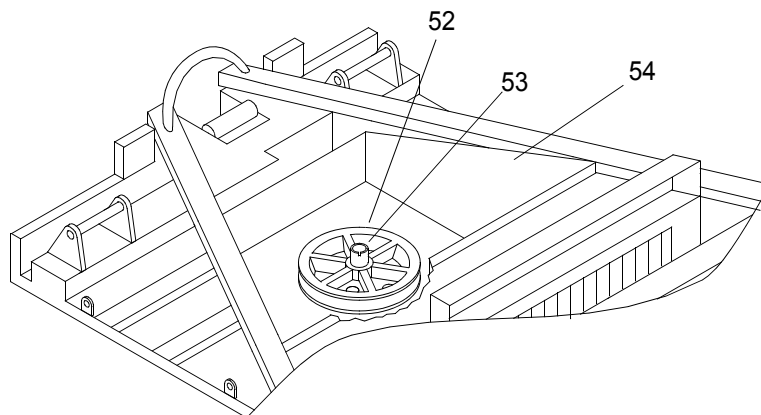
WARNING

**HEAVY PARTS**

7. Using crane, sling and shackles, stow A-frame foot assemblies (34) on stowage pallet (48) with stern anchor frame (49).



8. Remove sling and shackle.
9. Secure A-frame foot assemblies (34) to stowage pallet (48) with ratchet straps (50).
10. Tighten ratchet straps (50).
11. Stow A-frame sheave (52).



- a. Open anchor frame stowage pallet toolbox door (51).

WARNING

**HEAVY PARTS**

- b. Using crane and sling, place sheave (52) on stowage rod (53).
- c. Remove sling.
- d. Place sheave attachment hardware in toolbox (54).
- e. Close toolbox door (51).

STOW A-FRAME LEGS IN SHIPPING RACK

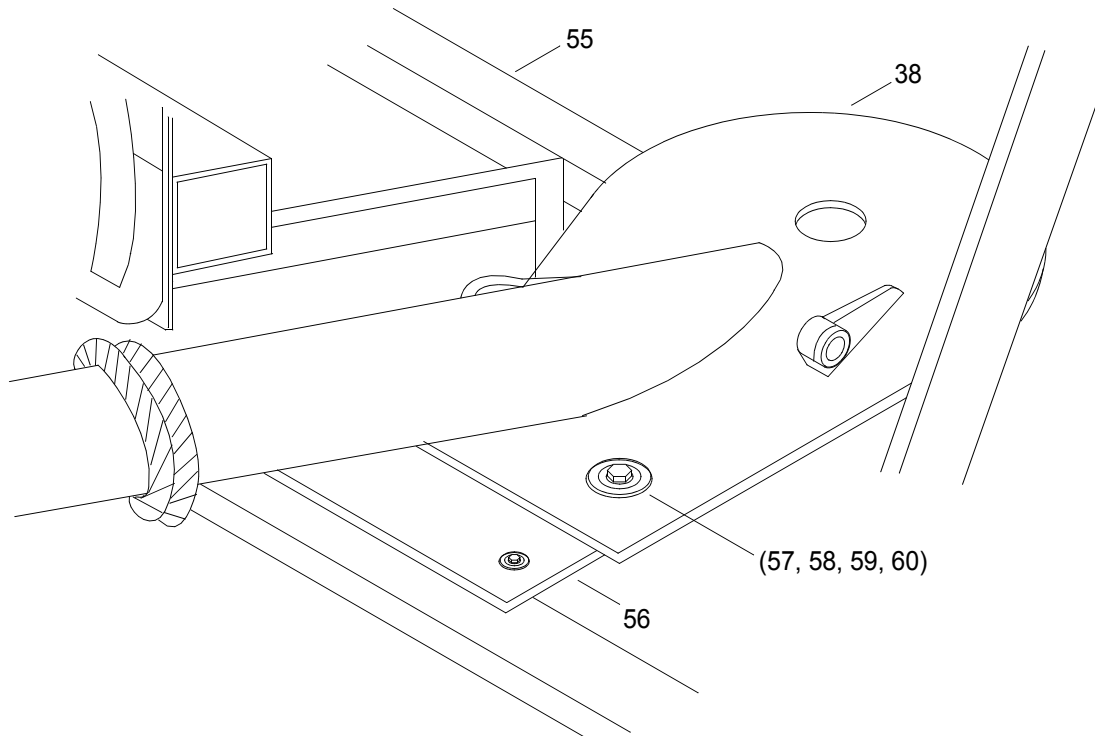
WARNING

**HEAVY PARTS****NOTE**

This procedure is typical for installation of both A-frame legs in the shipping rack.

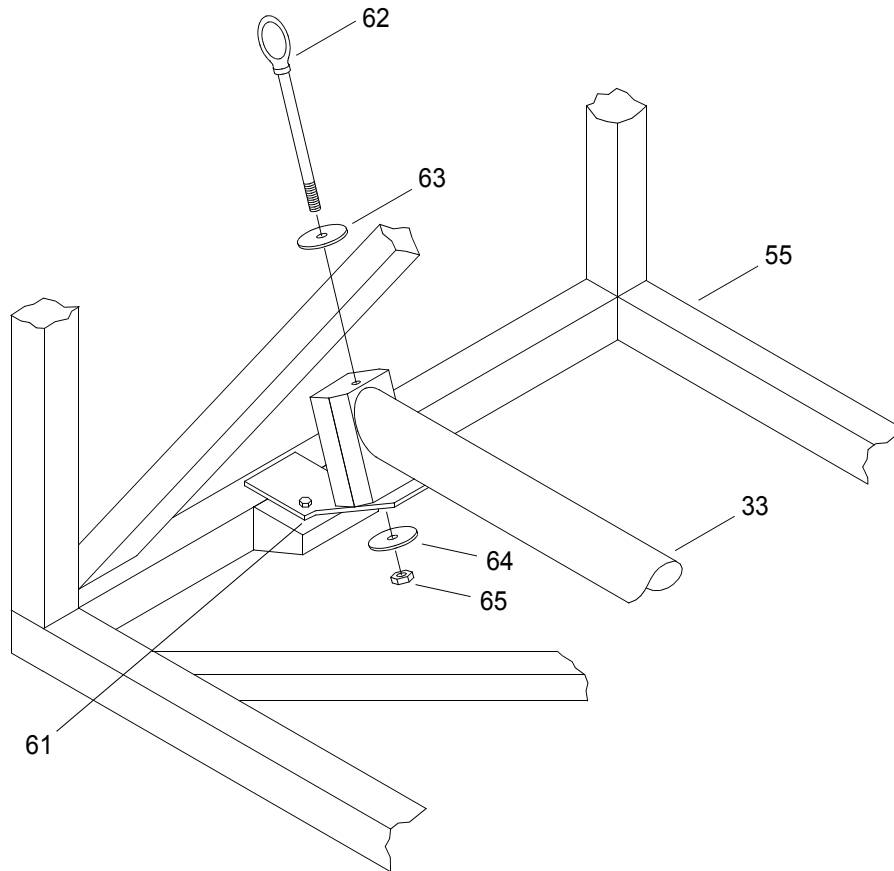
1. Using crane, slings and shackles, lower A-frame leg (33) into shipping frame (55).

2. Attach A-frame sheave plate (38) to shipping frame (55).



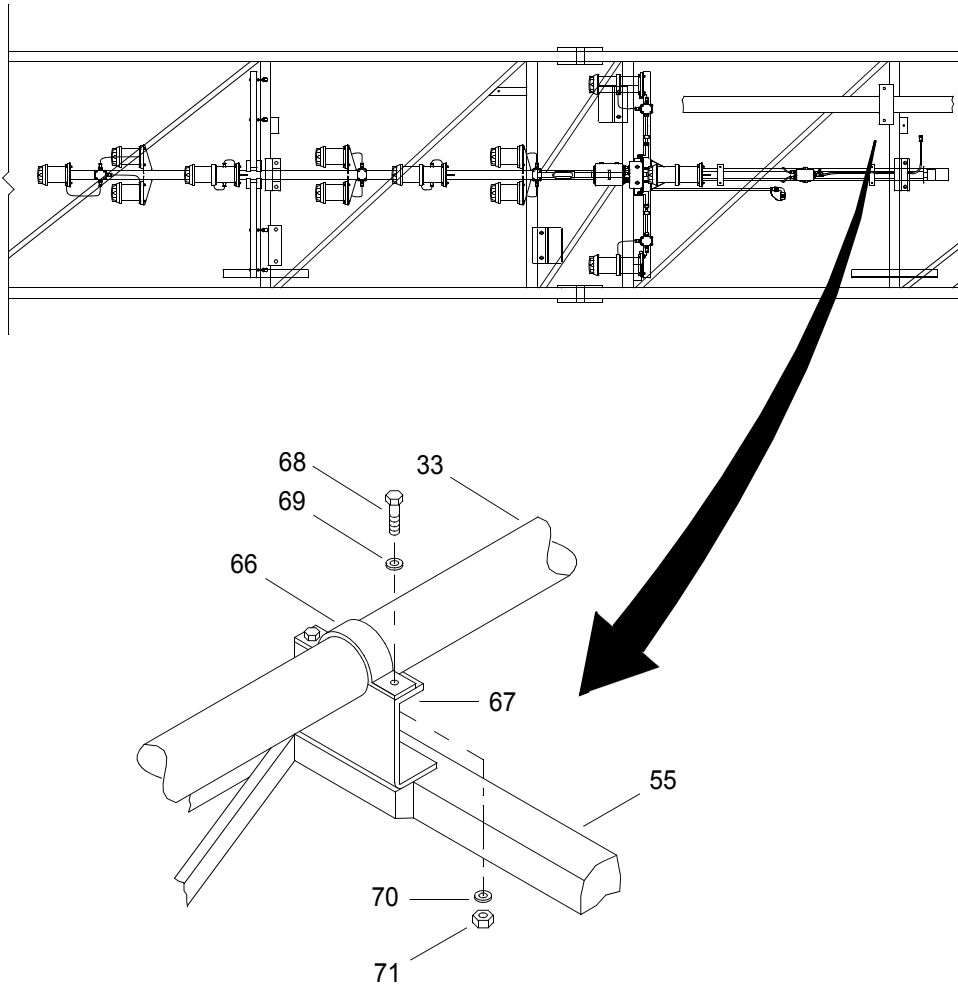
- a. Align holes in sheave plate (38) with holes in shipping bracket (56).
- b. Install two bolts (57) and washers (58) through sheave plate (38) and shipping bracket (56).
- c. Install two washers (59) and self-locking nuts (60).
- d. Tighten nuts (60).

3. Attach lower end of A-frame leg (33) to shipping frame (55).



- a. Align hole in lower end of A-frame leg (33) with hole in shipping bracket (61).
- b. Install eyebolt (62) and washer (63) through lower A-frame leg (33) and shipping bracket (61).
- c. Install washer (64) and nut (65) on eyebolt (62).
- d. Tighten nut (65).
- e. Remove slings and shackles.

4. Clamp A-frame leg (33) in shipping frame (55).



- a. Position upper half of clamp (66) over A-frame leg (33).
- b. Align holes in upper clamp half (66) with holes in lower clamp half (67).
- c. Install two bolts (68) and washers (69) through holes in upper (66) and lower (67) clamp halves.
- d. Install two washers (70) and self-locking nuts (71) on bolts (68).
- e. Tighten nuts (71).

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
WINCH MOUNTING PLATES
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Crowbar (Item 15, WP 0108 00)

Personnel Required

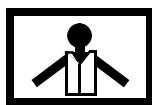
Seaman 88K

Equipment Condition

Safety Equipment Removed. (WP 0037 00)
 Fenders Removed. (WP 0038 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Removed. (WP 0039 00)
 Stub Navigation Mast Removed. (WP 0040 00)
 Stern Anchor Removed. (WP 0041 00)
 Stern Anchor Mount Removed. (WP 0042 00)
 A-Frame Removed. (WP 0043 00)

PREPARATION FOR MOVEMENT - REMOVAL OF WINCH MOUNTING PLATES**REMOVE WINCH MOUNTING PLATES**

WARNING



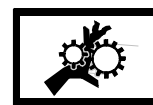
VEST



HELMET PROTECTION



HEAVY PARTS



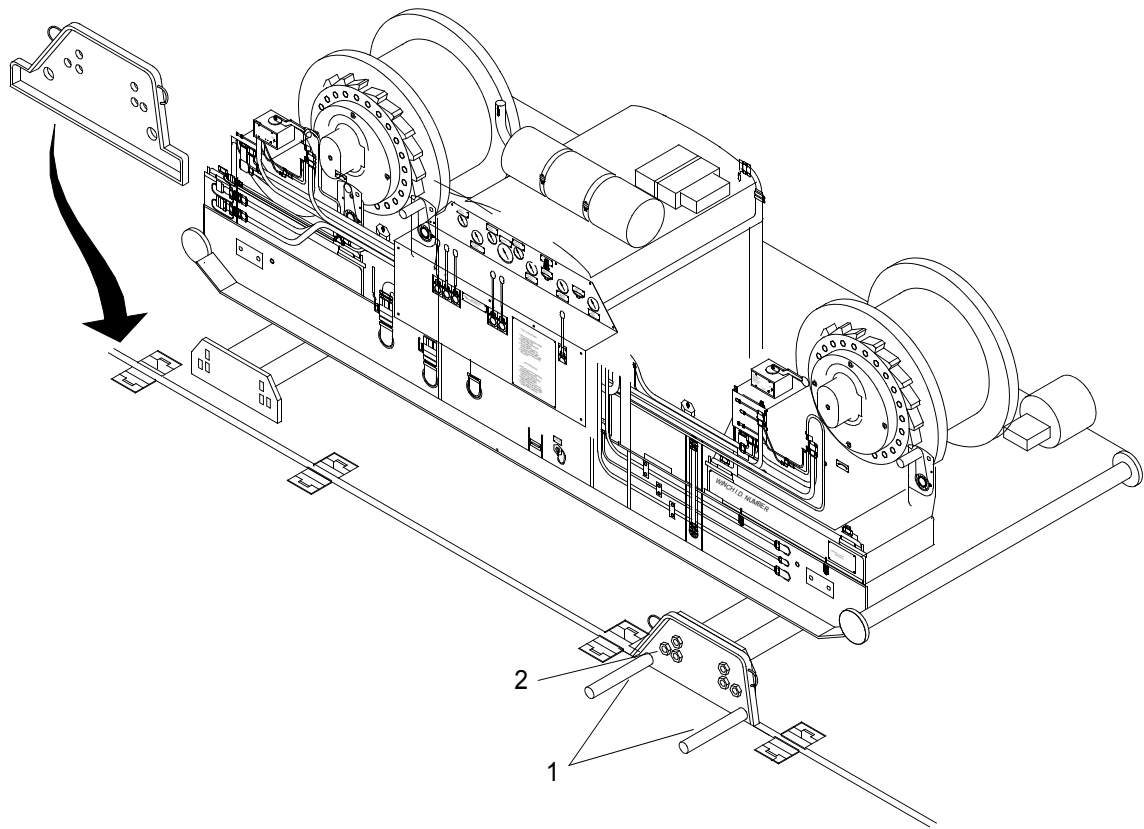
MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

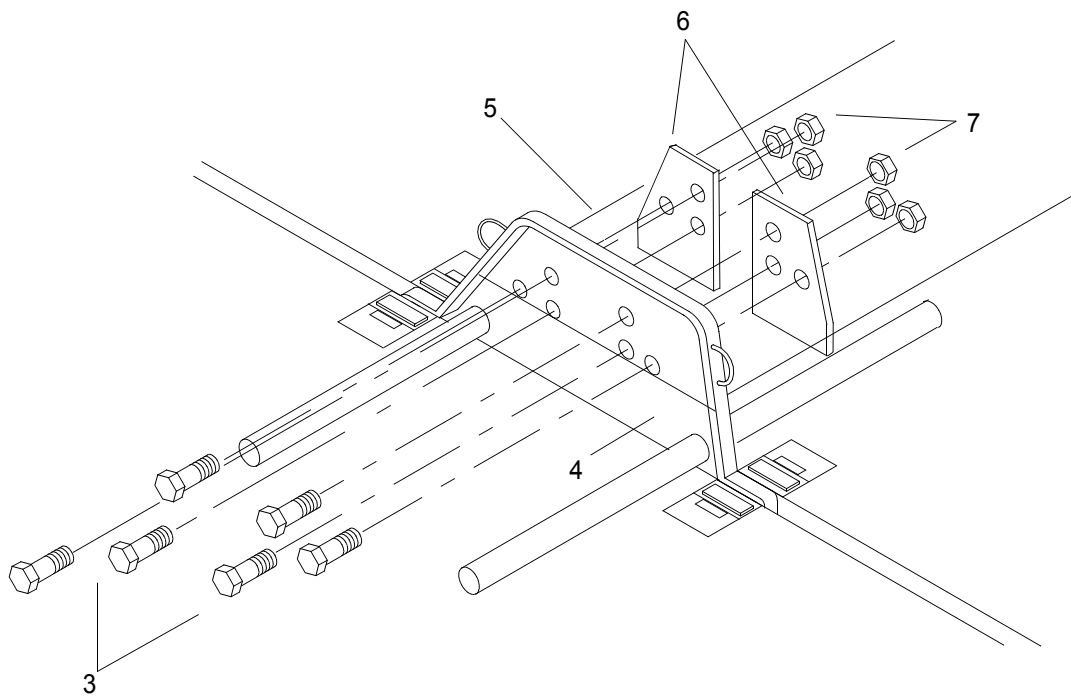
NOTE

The four mounting plate assemblies are installed between the center module and the outer modules. The mounting plate fits under the lock castings of the side connector assembly of the modules. The removal procedures are shown below.

1. Insert pieces of round bar or pipe (1) through the 2 in. diameter holes in the mounting plate (2) to hold it in position while removing the mounting plate bolting hardware.



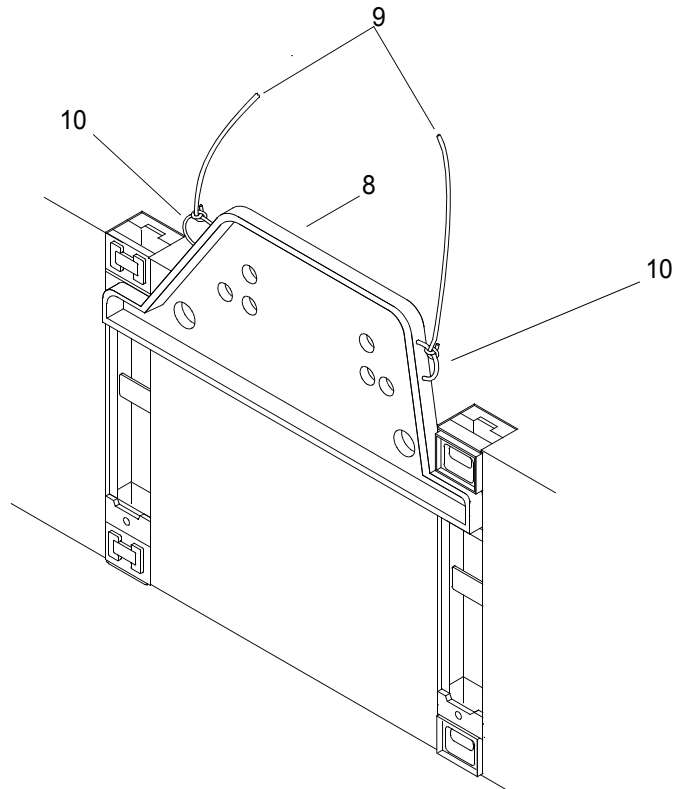
2. Remove 6 high-strength bolts (3) from the mounting plate (4), transverse beam (5), triangular washer plates (6) and 6 nuts (7).



WARNING

**HEAVY OBJECTS**

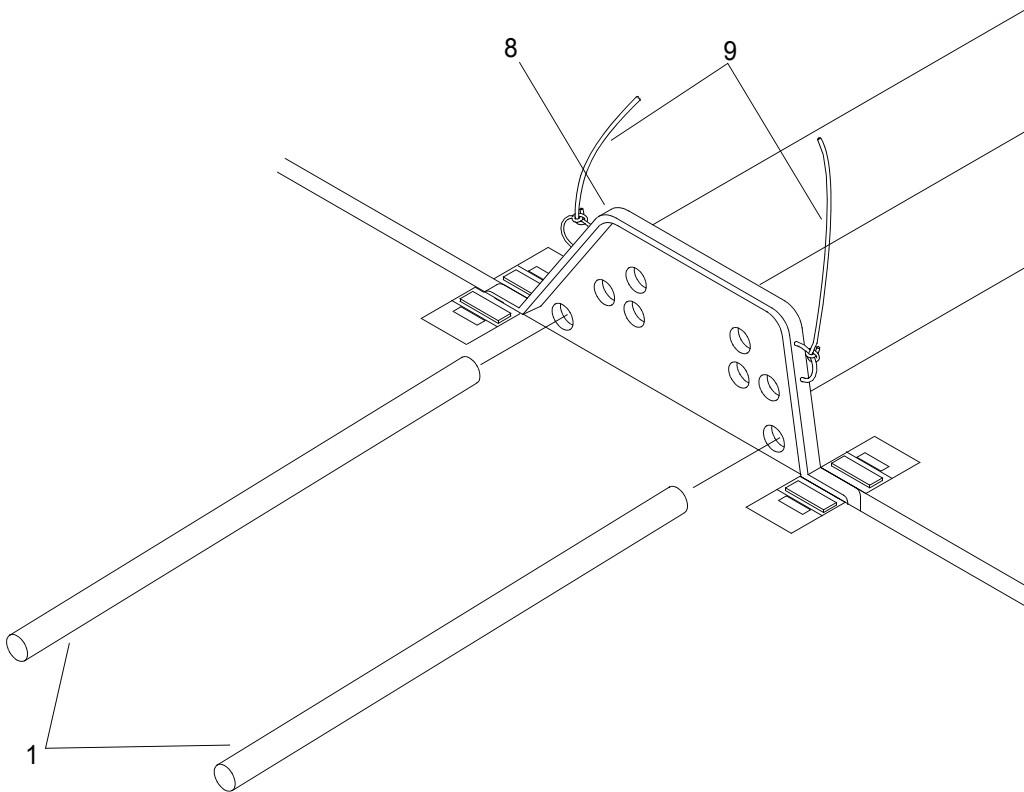
3. Hold the mounting plate (8) by using two lengths of line (9), one tied through each of the lifting eyes (10) of the mounting plate (8).



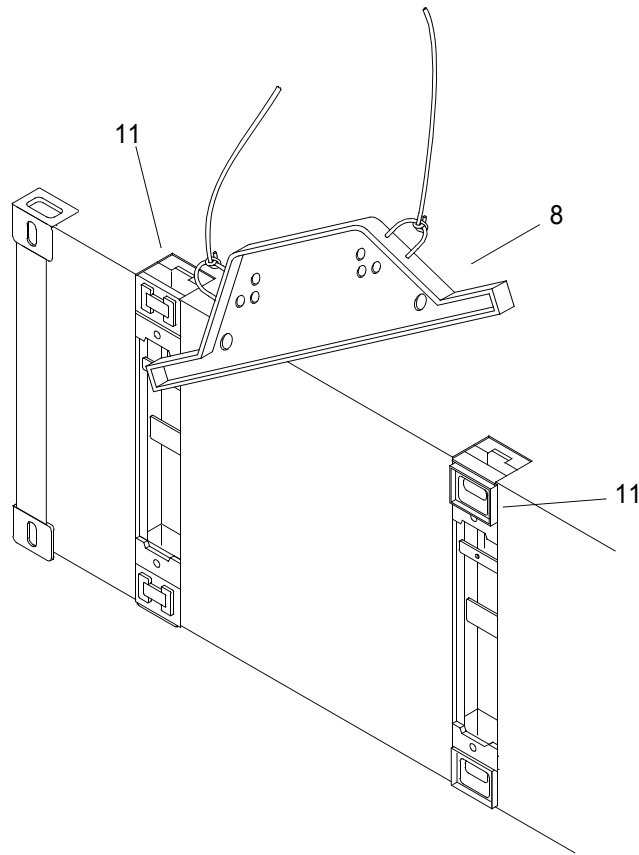
WARNING

**HEAVY OBJECTS**

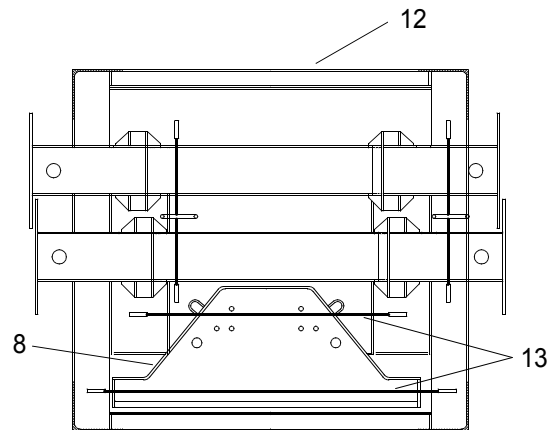
4. Hold the mounting plates (8) in position with line (9) and remove pieces of round bar or pipe (1) from the 2 in. diameter holes in the mounting plate.



5. Remove the mounting plate (8) by allowing one end of the mounting plate to dip downward between the appropriate lock castings (11) far enough so that the plate (8) can be rotated to a vertical attitude and removed from the adjoining lock castings.



6. Repeat the steps for the three remaining mounting plates.
7. Place mounting plates (8) in storage pallet (12).



8. Secure mounting plates (8) to pallet (12) with two ratchet straps (13).
9. Tighten ratchet straps (13).

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
WINCH
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Sling, Lifting 8400 lbs (Yellow) (Item 72, WP 0108 00)
 Qty 4
 4 ¾ Ton ¾ in. Shackle (Item 5, WP 0108 00)
 Qty 4

Personnel Required

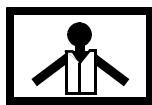
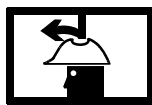
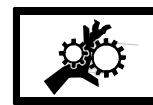
Seaman 88K (2)

Equipment Condition

Safety Equipment Removed. (WP 0037 00)
 Fenders Removed. (WP 0038 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Removed. (WP 0039 00)
 Stub Navigation Mast Removed. (WP 0040 00)
 Stern Anchor Removed. (WP 0041 00)
 Stern Anchor Mount Removed. (WP 0042 00)
 A-Frame Removed. (WP 0043 00)
 Winch Mounting Plates Removed. (WP 0044 00)

PREPARATION FOR MOVEMENT - REMOVAL OF WINCH**REMOVE WINCH**

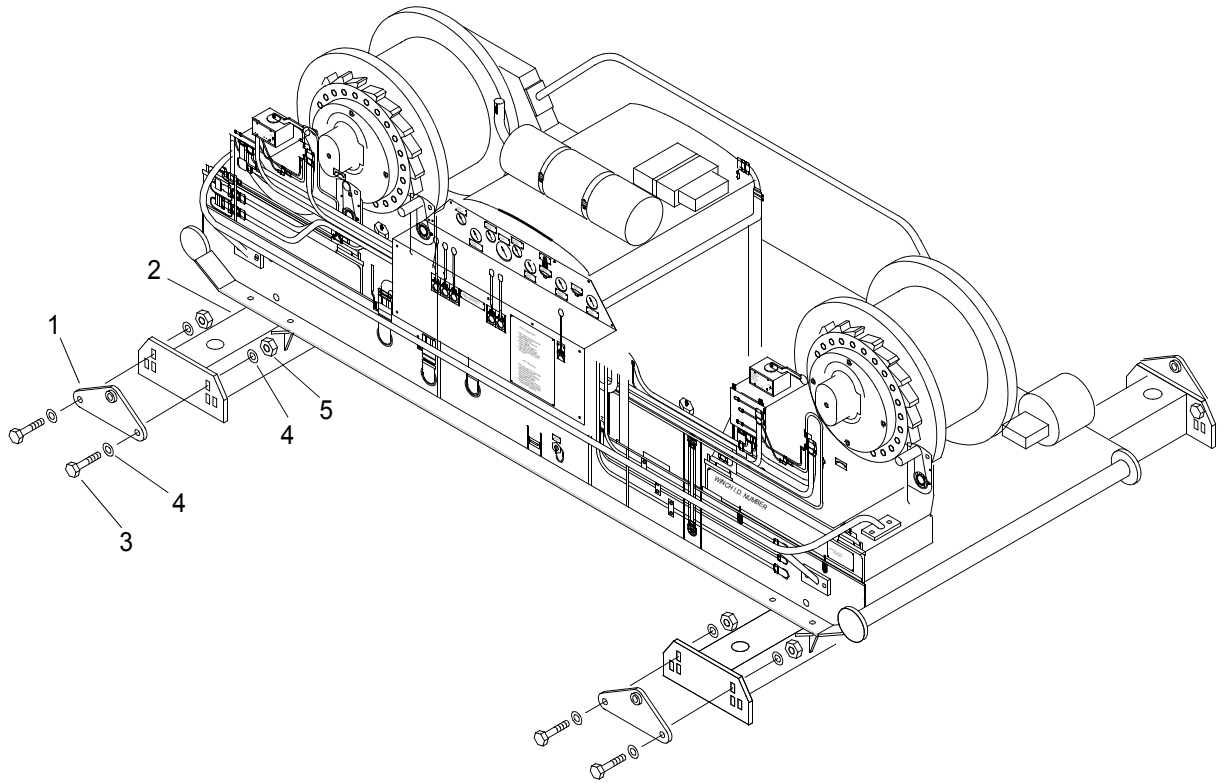
WARNING

**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

The deck winch weighs approximately 10,000 lbs. Use proper hoisting and lifting equipment to prevent possible injury to personnel and/or damage to equipment.

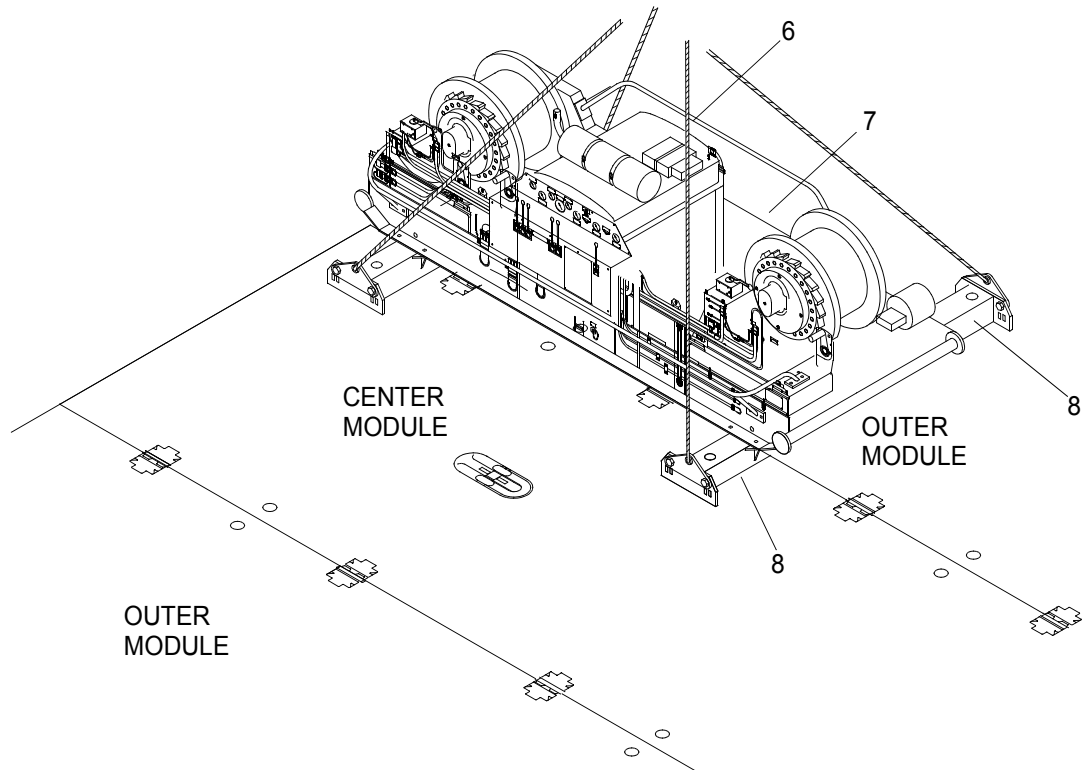
1. Attach lifting brackets (1) to the ends of the transverse beams (2) using 8 high strength bolts (3), 16 flat washers (4) and 8 nuts (5).



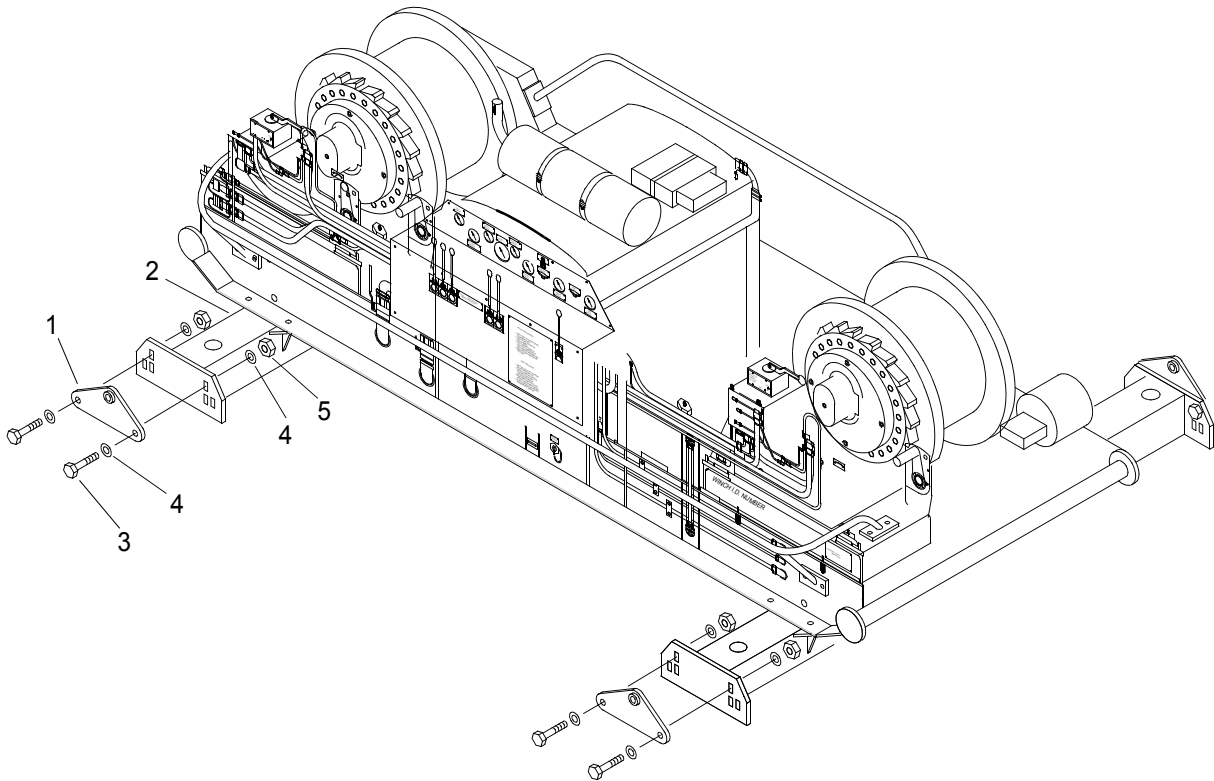
WARNING

**HEAVY PARTS**

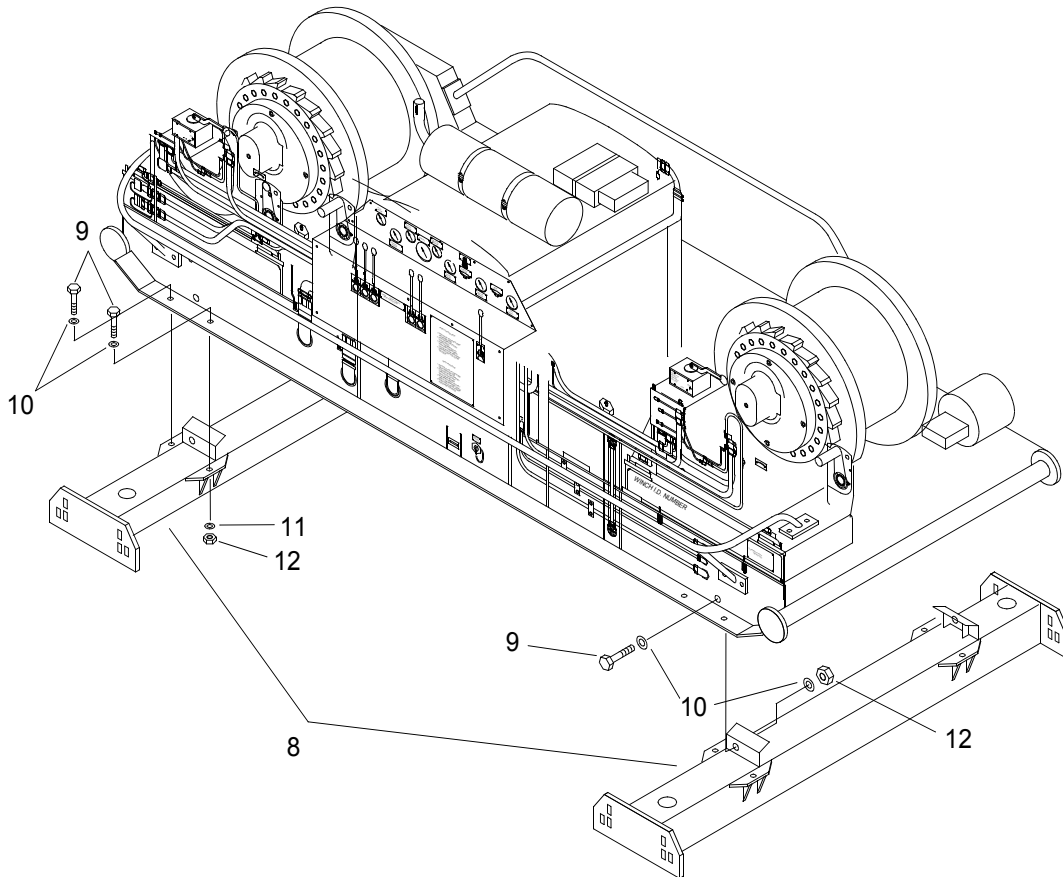
2. Using crane, attach slings (6) and shackles to the lifting brackets (1) and raise the deck winch (7), with the transverse beams (8) attached, onto the ship.



3. Remove slings and shackles from the deck winch lifting brackets and remove lifting brackets (1) from the ends of the transverse beams (2) by removing 8 high strength bolts (3), 16 flat washers (4) and 8 nuts (5).



4. Remove the winch frame (7) from the transverse beams (8) by removing 12 high-strength bolts (9), 8 flat washers (10), 4 beveled washers (11) and 12 nuts (12).

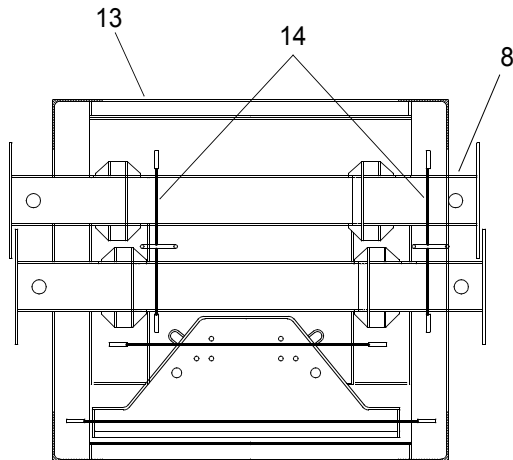
**WARNING****HEAVY PARTS**

5. Using the crane, slings and shackles, lift the winch off the transverse beams (8).
6. Remove slings and shackles.

WARNING

**HEAVY PARTS**

- Using the crane, slings and shackles, stow winch foundation transverse beams (8) on stowage pallet (13).



- Remove slings and shackles.
- Attach and tighten two ratchet straps (14) to secure beams to pallet (13).

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
ABOVE DECK EQUIPMENT
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)
Sling, Lifting 5300 lbs (Green) (Item 69, WP 0108 00)
Qty 2
4 ³/₄ Ton ³/₄ in. Shackle (Item 5, WP 0108 00)
Qty 2

Materials/Parts

Adhesive (Item 1, WP 0109 00)

Personnel Required

Seaman 88K

References

TM 11-5820-890-10-8

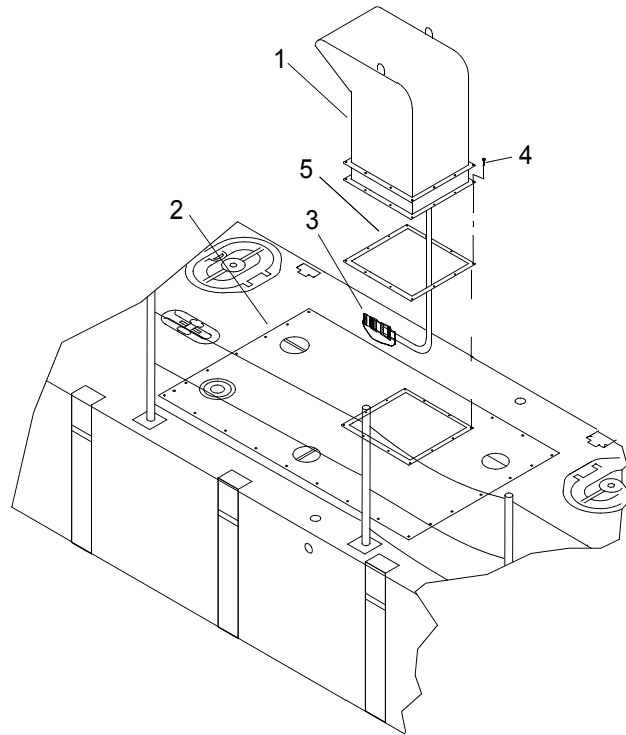
Equipment Condition

Safety Equipment Removed. (WP 0037 00)
Fenders Removed. (WP 0038 00)
D-Ring/Cloverleaf And Deck Cleat Fittings Removed. (WP 0039 00)
Stub Navigation Mast Removed. (WP 0040 00)
Stern Anchor Removed. (WP 0041 00)
Stern Anchor Mount Removed. (WP 0042 00)
A-Frame Removed. (WP 0043 00)
Winch Mounting Plates Removed. (WP 0044 00)
Winch Removed. (WP 0045 00)

PREPARATION FOR MOVEMENT - REMOVAL OF WARPING TUG ABOVE DECK EQUIPMENT**REMOVE PORT AND STARBOARD PROPULSION MODULE EXHAUST PLENUMS****NOTE**

The following procedure is typical for both port and starboard exhaust plenums.

1. Remove propulsion module exhaust plenum (1) from pump-jet thruster hatch (2).



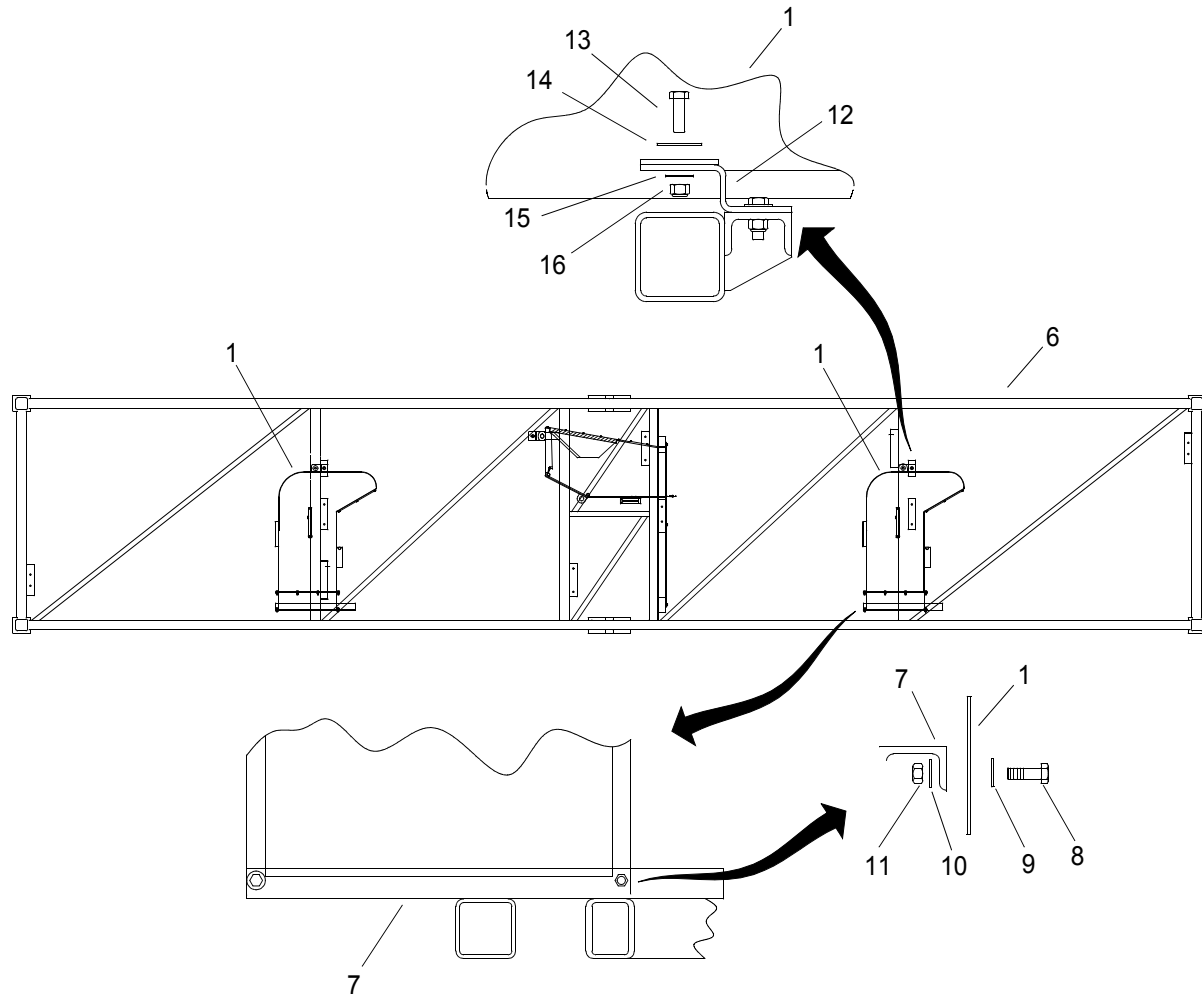
- a. Remove exhaust plenum fan cable (3) to vent fan relay panel A8.
- b. Remove 12 bolts (4) attaching exhaust plenum (1) to pump-jet thruster hatch (2).
- c. Remove plenum gasket (5), if damaged.
- d. Secure exhaust plenum fan cable (3) inside of exhaust plenum (1).

WARNING

**HEAVY PARTS**

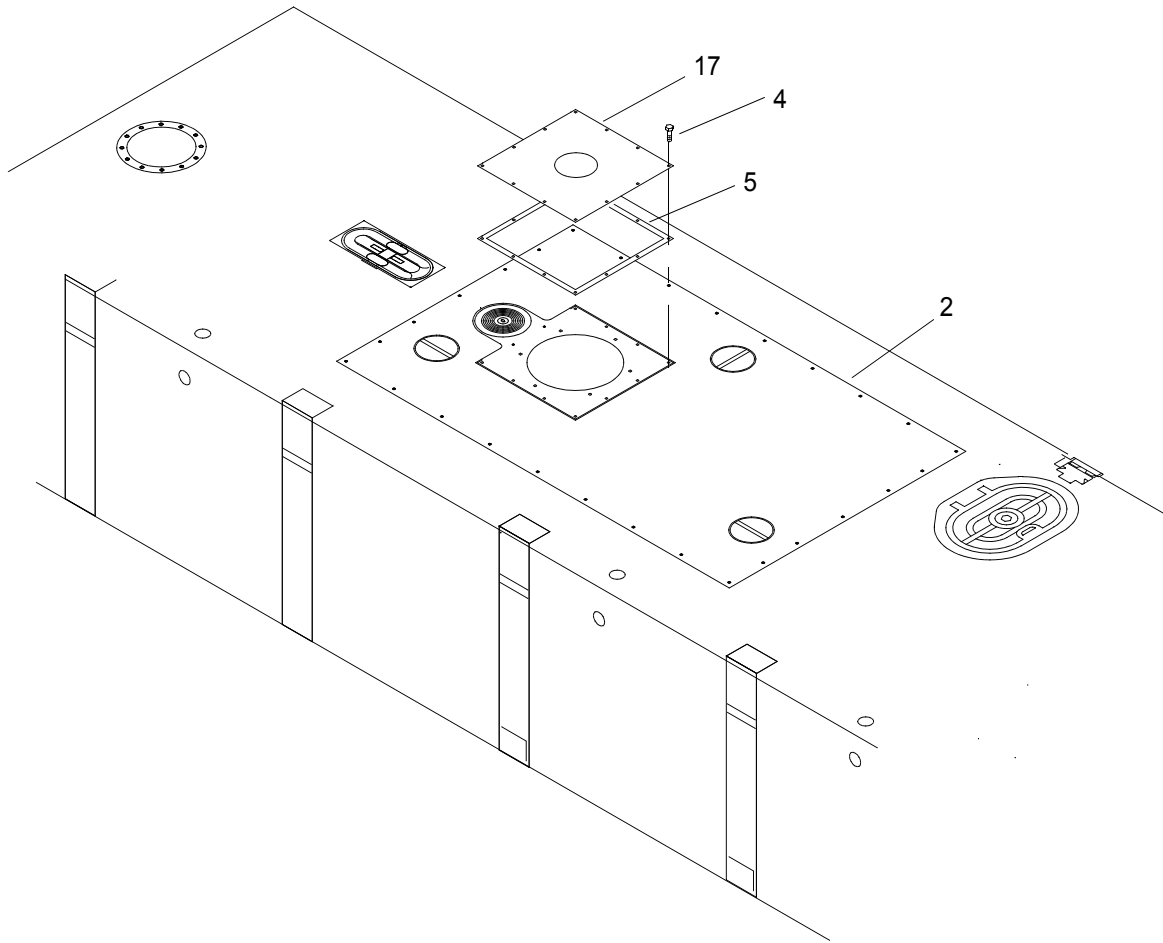
- e. Using crane, slings and shackles, lift exhaust plenum (1) from pump-jet thruster hatch (2).

2. Stow exhaust plenum (1) in shipping frame (6).



- a. Align holes in base of exhaust plenum (1) with holes in shipping frame bracket (7).
- b. Install two bolts (8) and washers (9) through base of exhaust plenum (1) and shipping frame bracket (7).
- c. Install four washers (10) and two nuts (11) on bolts (8).
- d. Align hole in top of exhaust plenum (1) with hole in shipping frame bracket (12).
- e. Install bolt (13) and fender washer (14) through top of plenum (1) and shipping frame bracket (12).
- f. Install washer (15) and nut (16) on bolt (13).
- g. Tighten nuts (11 and 16).
- h. Remove slings and shackles.

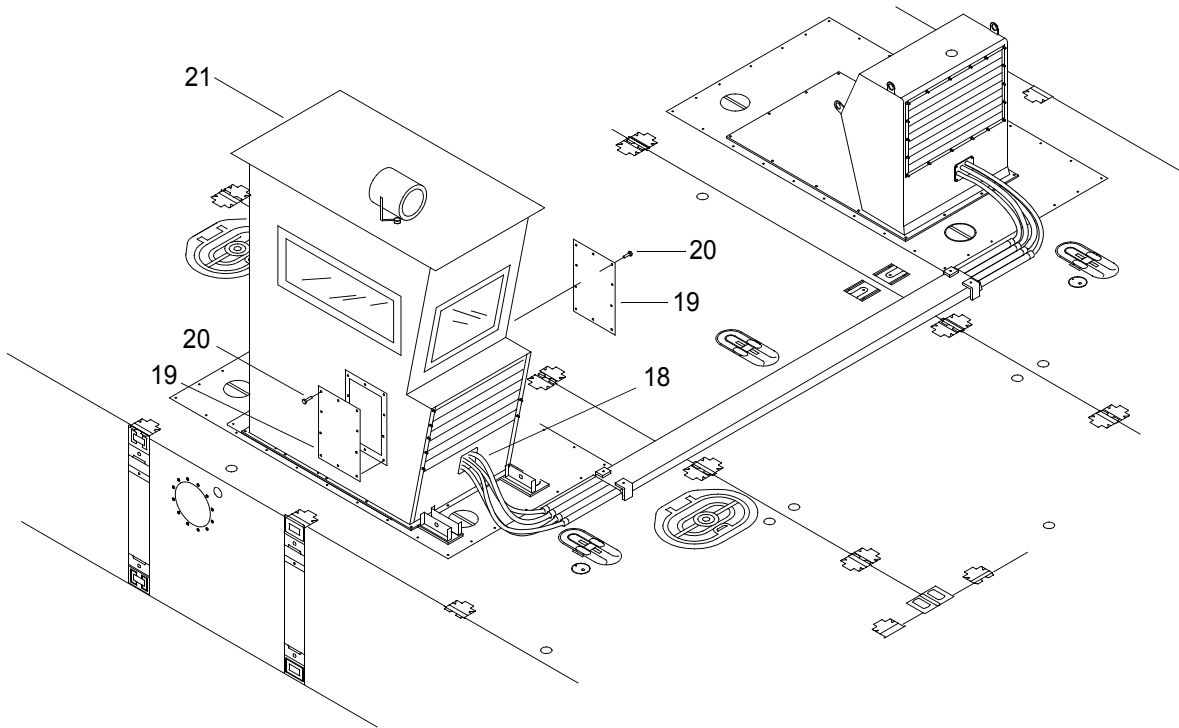
3. Install propulsion module pump-jet thruster hatch shipping plate (17).



- a. Install new gasket (5), if damaged.
- b. Align holes in shipping plate (17) with holes in port pump-jet thruster hatch (2).
- c. Install 12 bolts (4) to secure shipping plate (17) to port propulsion module pump-jet thruster hatch (2).

REMOVE MODULE ELECTRICAL INTERCONNECT ASSEMBLY

1. Remove electrical interconnect assembly (18).

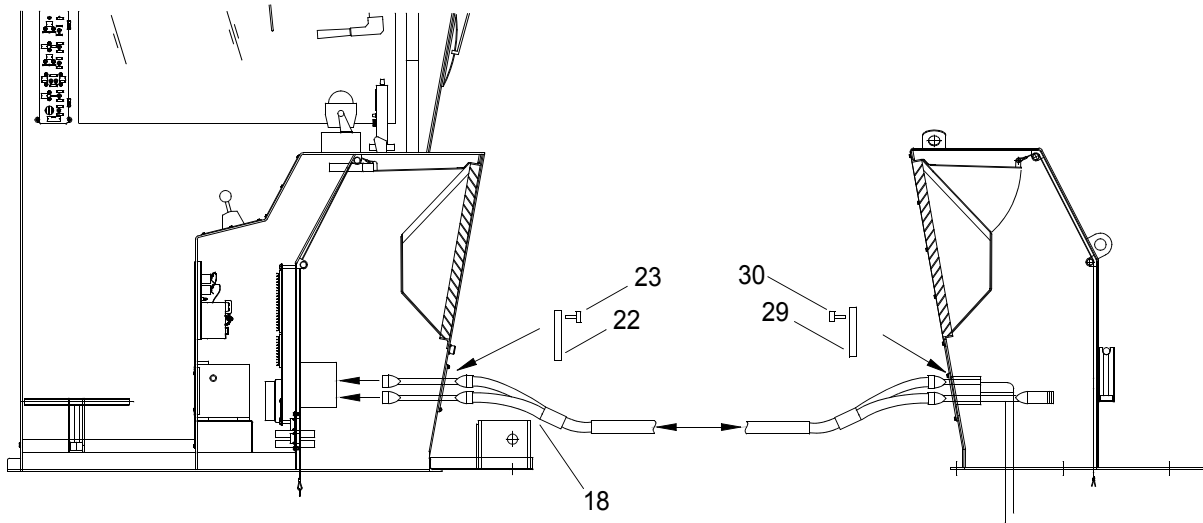


a. Remove both operators cab side access panels (19).

{1} Remove bolts (20) attaching each side access panel (19) to operators cab (21).

{2} Remove side access panels (19).

b. Remove operators cab conduit entry plate (22).



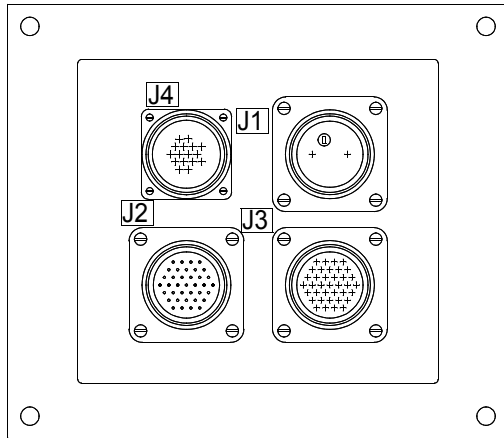
{1} Remove four bolts (23) attaching conduit entry plate (22) to operators cab (21).

{2} Remove entry plate (22).

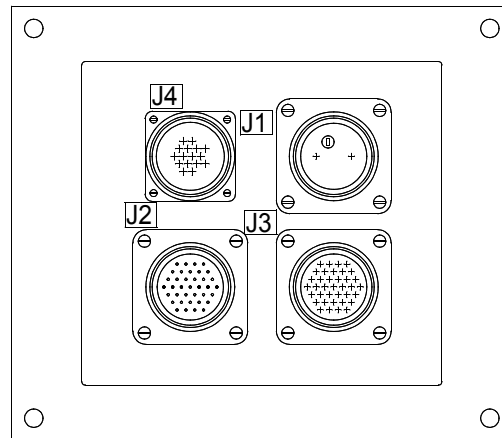
NOTE

The following steps provide removal of interconnect assembly when the operators cab is installed on the starboard side. When installed on the port side the STBD and PORT receptacles will be reversed.

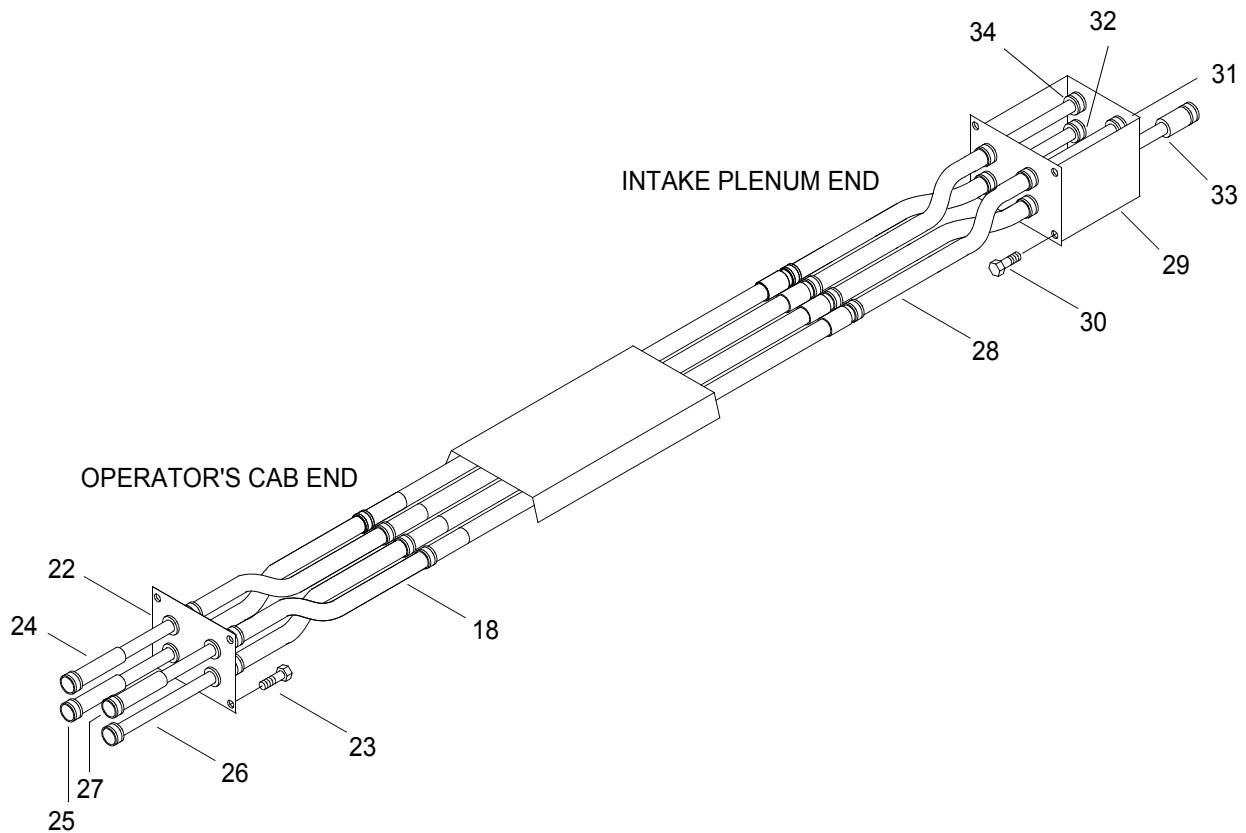
- c. Remove power module cables from STBD receptacle A5.

IN OPERATORS CAB

STBD A5



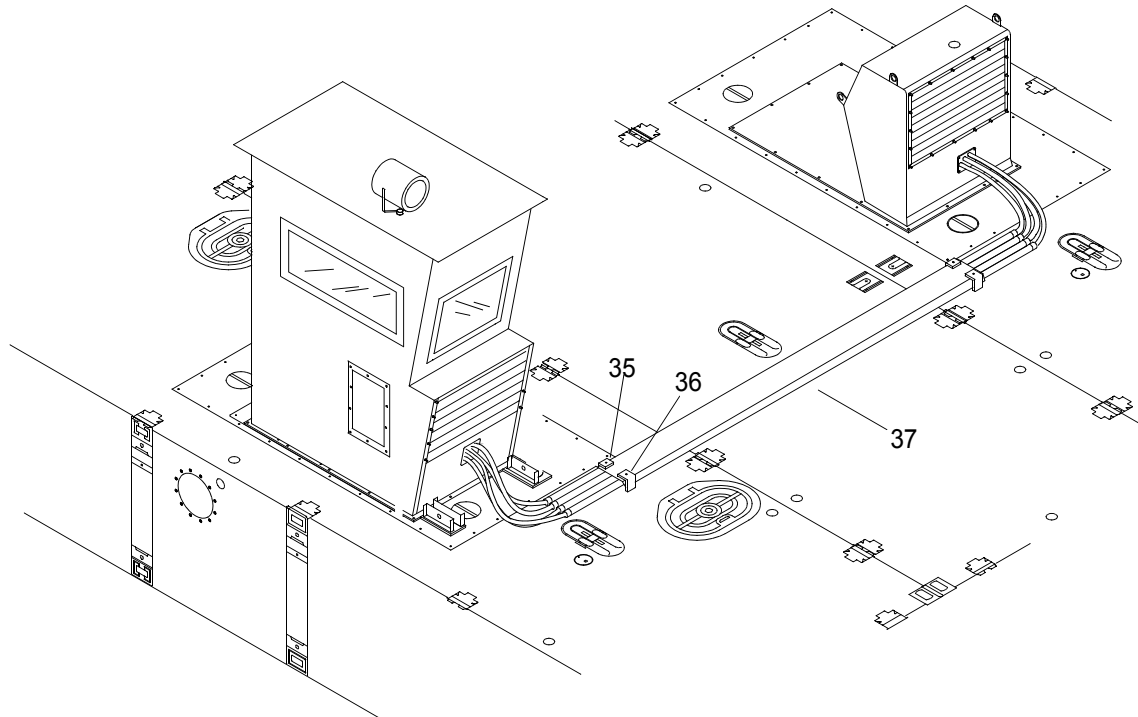
PORT A6



{1} Remove power module A3, P1 from STBD A5, P1.

-
- {2} Remove power module A6, P3 from STBD A5, P3.
 - {3} Remove power module A6, P4 from STBD A5, P4.
 - {4} Remove power module A6, P2 from STBD A5, P21.
 - d. Remove interconnect cables from PORT receptacle A6.
 - {1} Remove P4 (24) from PORT receptacle A5, J4.
 - {2} Remove P3 (25) from PORT receptacle A5, J3.
 - {3} Remove P2 (26) from PORT receptacle A5, J2.
 - {4} Remove P1 (27) from PORT receptacle A5, J1.
 - 2. Remove interconnect cables (28) from intake plenum receptacles.
 - a. Remove the intake plenum conduit entry panel (29).
 - {1} Remove four bolts (30).
 - {2} Remove access panel (29).
 - b. From below deck, remove power module cable from interconnect cable receptacles.
 - {1} Remove power module A6, P1 from interconnect cable, P1 (31).
 - {2} Remove power module junction box A3, P2 from interconnect cable, P2 (32).
 - {3} Remove power module junction box A3, P3 from interconnect cable, P3 (33).
 - {4} Remove power module junction box A3, P4 from interconnect cable, P4 (34).
 - c. Feed the cables (28) from inside the intake plenum through the front panel access.

3. Remove interconnect assembly (37).



- a. Loosen four allen head bolts (35) and rotate hold down clamps (36) from interconnect assembly (37).

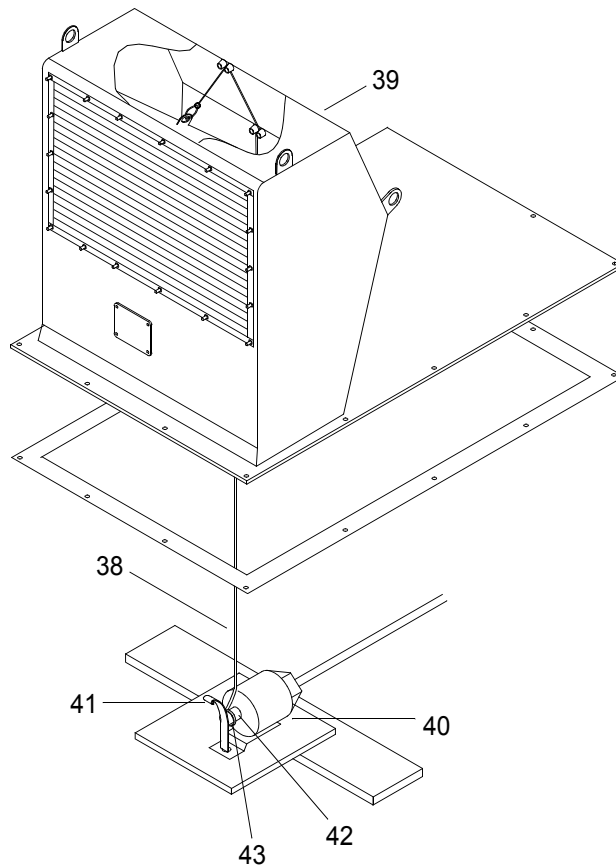
WARNING

**HEAVY PARTS**

- b. Using crane, slings and shackles, remove interconnect assembly (37) from deck.
- c. Remove slings and shackles.

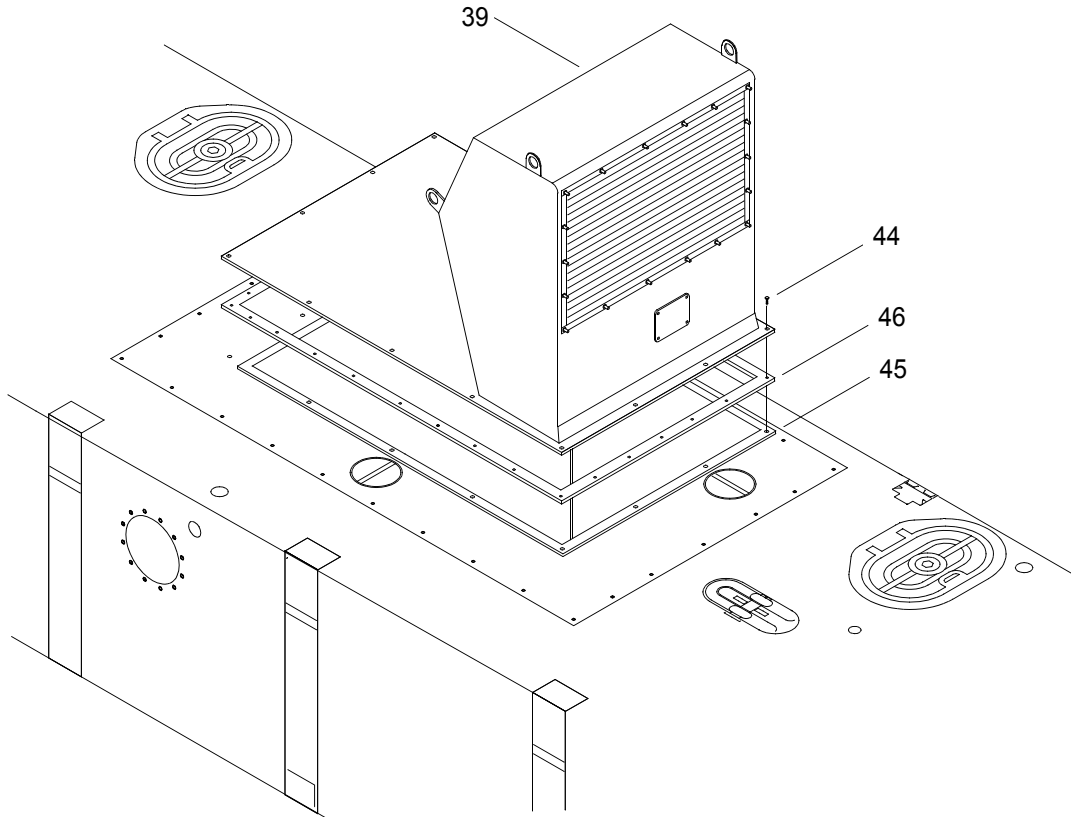
REMOVE AIR INTAKE PLENUM

1. Remove wire rope (38) in the intake plenum (39) from the fire suppression trip mechanism (40).



- a. Move fire suppression solenoid spring flange (41) away from solenoid shaft (42).
- b. Remove wire rope ring (43) from the fire suppression solenoid shaft (42).
- c. Release flange (41).

- Remove 12 bolts (44) attaching intake plenum (39) to propulsion module hatch (45).



- Remove air intake plenum gasket (46), if damaged.

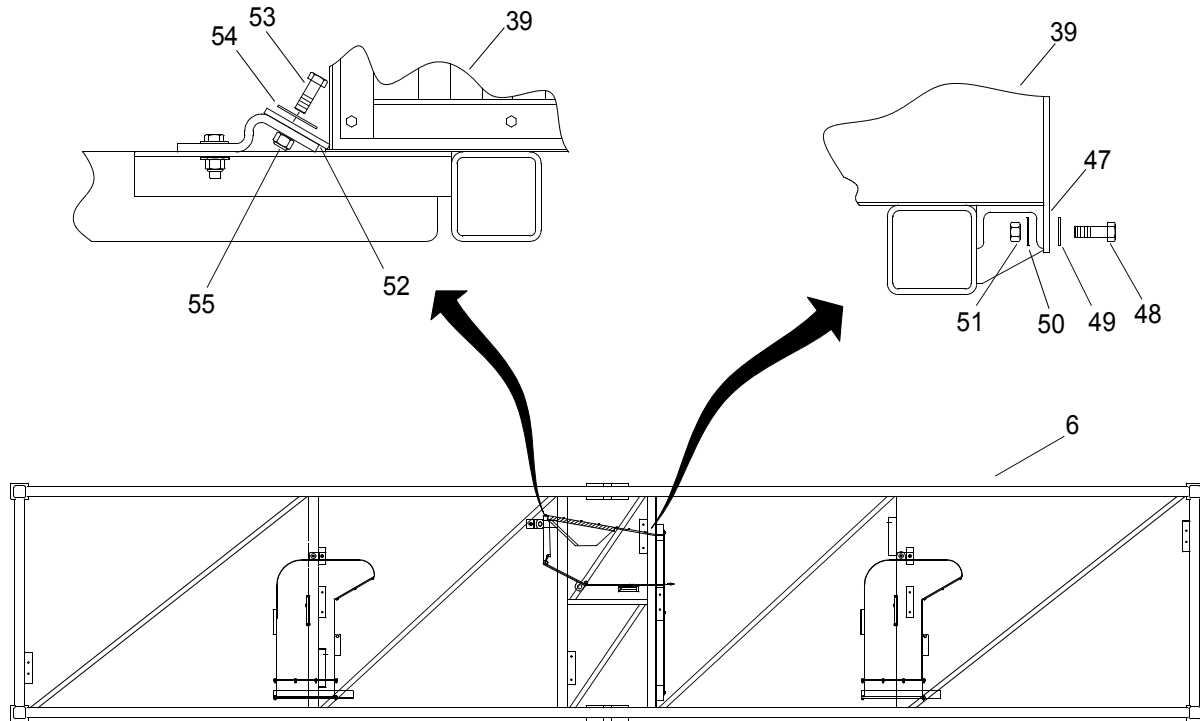
WARNING

**HEAVY PARTS**

- Using crane, slings and shackles, remove intake plenum (39) from port propulsion module hatch (45).

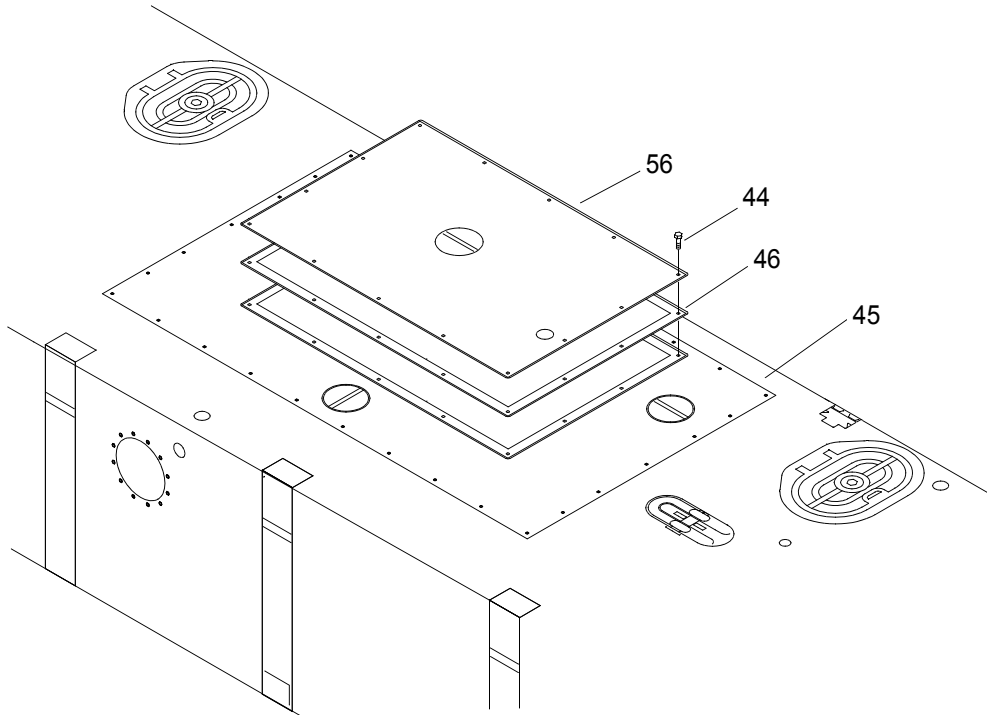
WARNING**HEAVY PARTS**

5. Install intake plenum (39) in shipping frame (6).



- a. Align two holes in the base of the intake plenum (39) with holes in shipping frame bracket (47).
- b. Install two bolts (48) and washers (49) through holes in base of intake plenum (39) through shipping frame bracket (47).
- c. Install two washers (50) and nuts (51).
- d. Tighten nuts (51).
- e. Align hole in top of intake plenum (39) with hole in shipping frame bracket (52).
- f. Install bolt (53) and washer (54) through intake plenum (39) and shipping frame bracket (52) into welded nut (55).
- g. Tighten bolt (53).
- h. Remove slings and shackles.

6. Install port propulsion module engine hatch shipping plate (56).



- a. Install new gasket (46), if damaged.

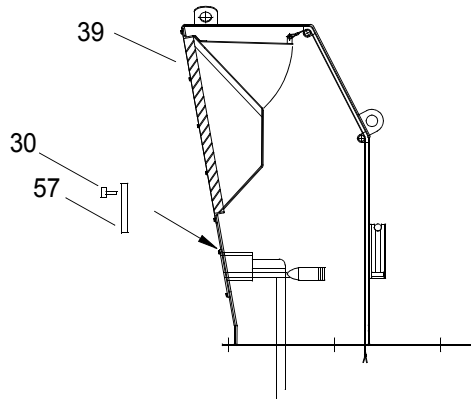
WARNING



HEAVY PARTS

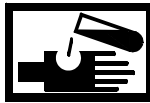
- b. Using crane, slings and shackles, lower shipping plate (56) onto propulsion module hatch (45).
- c. Install bolts (44) securing shipping plate (56) to hatch (45).
- d. Tighten bolts (44).
- e. Remove slings and shackles.

7. Install electrical interconnect shipping plate (57) on intake plenum (39).

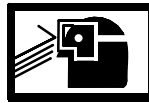


- a. Align holes in shipping plate (57) with holes in intake plenum (39).

WARNING



CHEMICAL



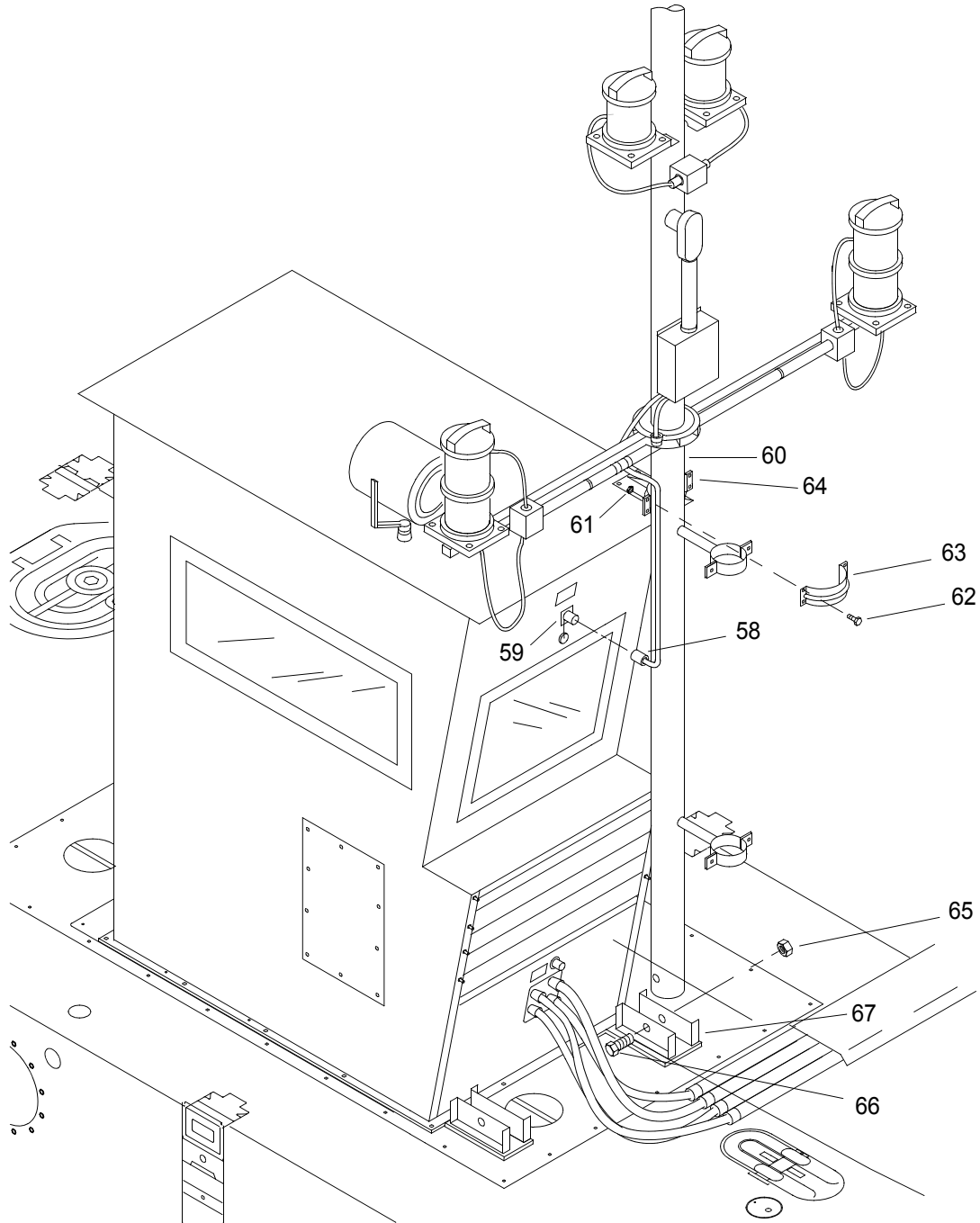
EYE PROTECTION

- b. Apply adhesive to threads of bolts (30).
- c. Install bolts (30) securing plate (57) to plenum (39).
- d. Tighten bolts (30).

REMOVE MAIN MAST

1. Using ladder, gain access to top of operators cab.

2. Remove mast electrical connector (58) from operators cab connector (59).



3. Attach crane, sling and shackle to upper main mast (60) and make taut.
4. Remove four nuts (61) from bolts (62).
5. Remove clamp half (63) from clamp half (64).
6. Loosen nut (65) on bolt (66).

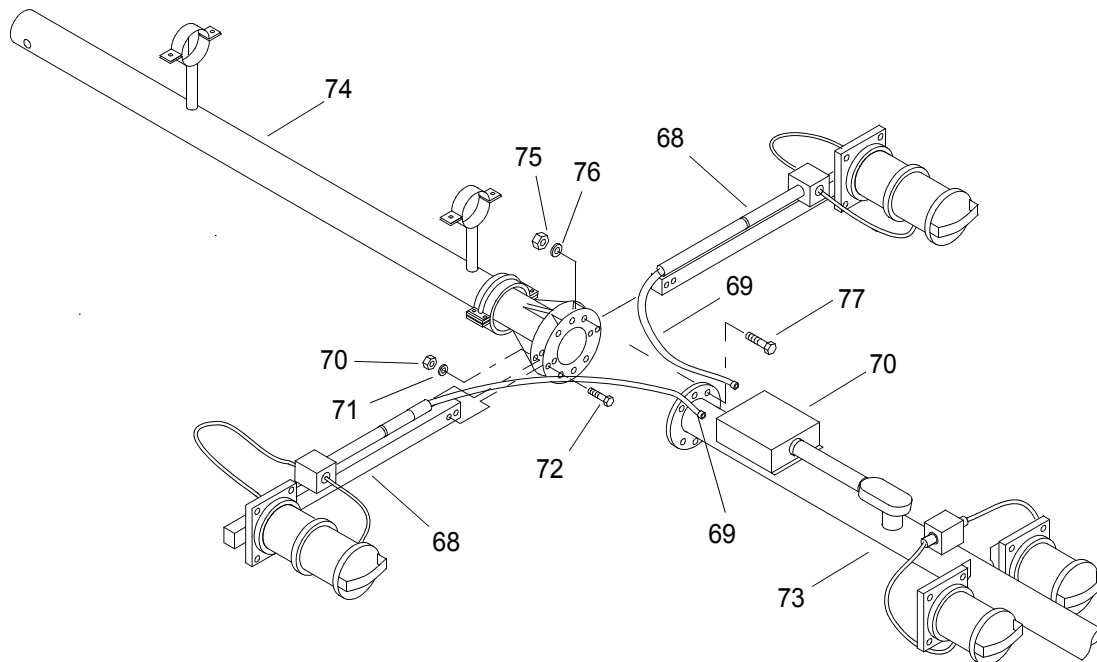
WARNING**HEAVY PARTS**

7. Lower main navigation mast assembly (60) onto a wooden block on the deck.
8. Remove nut (65).
9. Remove bolt (66) from mast (60) and deck holder (67).
10. Remove sling and shackle.

NOTE

This step is typical for both port and starboard yardarms.

11. Remove lower main mast yardarm (68).



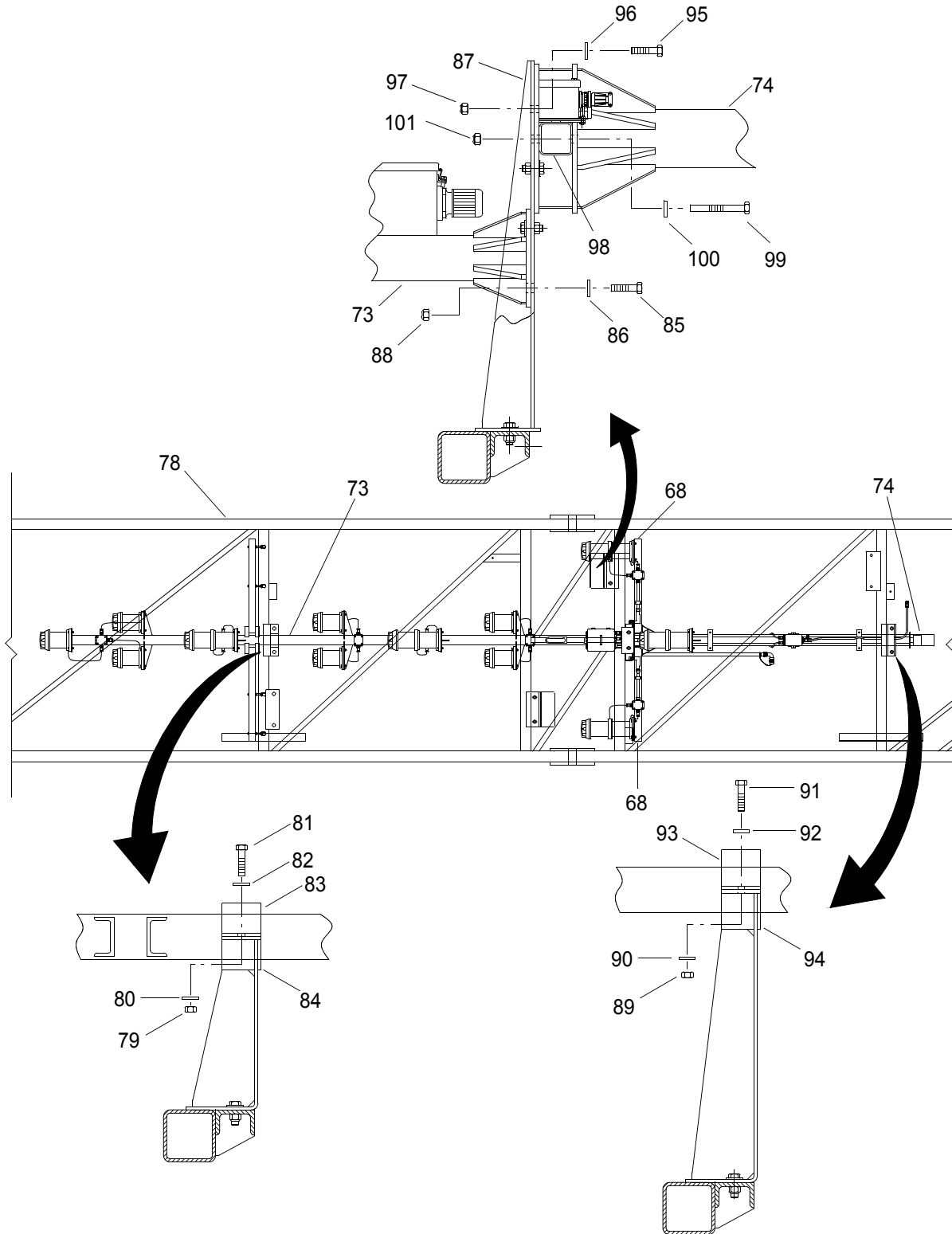
- a. Remove yardarm electrical cable connector (69) from mast junction box (70).
- b. Remove two nuts (70), washers (71) and bolts (72) from yardarm (68).
- c. Remove yardarm (68).

WARNING

**HEAVY PARTS**

12. Remove upper mast (73) from lower mast (74).
 - a. Place dunnage under lower mast (74) for support.
 - b. Remove six nuts (75) and washers (76) from bolts (77).
 - c. Holding upper mast, remove bolts (77).

13. Install upper main mast (73) in shipping frame (78).



- a. Remove two nuts (79), washers (80), bolts (81) and washers (82) securing clamp halves (83 and 84).

WARNING

**HEAVY PARTS**

- b. Using crane, sling and shackle, remove upper main mast (73) from deck and lower mast into shipping frame (81).
 - c. Install four bolts (85), washers (86) through stowage frame bracket (87) and upper main mast (73) base.
 - d. Install four nuts (88) on bolts (85).
 - e. Tighten nuts (88).
 - f. Install upper clamp half (83) over lower clamp half (84).
 - g. Install two bolts (81) with washers (82) into clamp halves (83) and (84).
 - h. Install two washers (80) and nuts (79) on bolts (81).
 - i. Tighten nuts (79).
 - j. Remove sling and shackle.
14. Install lower main mast (74) in shipping frame (78).
- a. Remove two nuts (89), washers (90), bolts (91) and washers (92) securing clamp halves (93) and (94).

WARNING

**HEAVY PARTS**

- b. Using crane, sling and shackle, remove lower main mast (74) from deck and lower mast into shipping frame (81).
- c. Install four bolts (95), with washers (96) through lower main mast (74) base and stowage frame bracket (87).
- d. Install four nuts (97) on bolts (95).
- e. Tighten nuts (97).
- f. Remove slings and shackles.
- g. Install upper clamp half (93) over lower clamp half (94).
- h. Install two bolts (91) with washers (92) into clamp halves (93) and (94).
- i. Install two washers (90) and nuts (89) on bolts (91).

-
- j. Tighten nuts (91).

NOTE

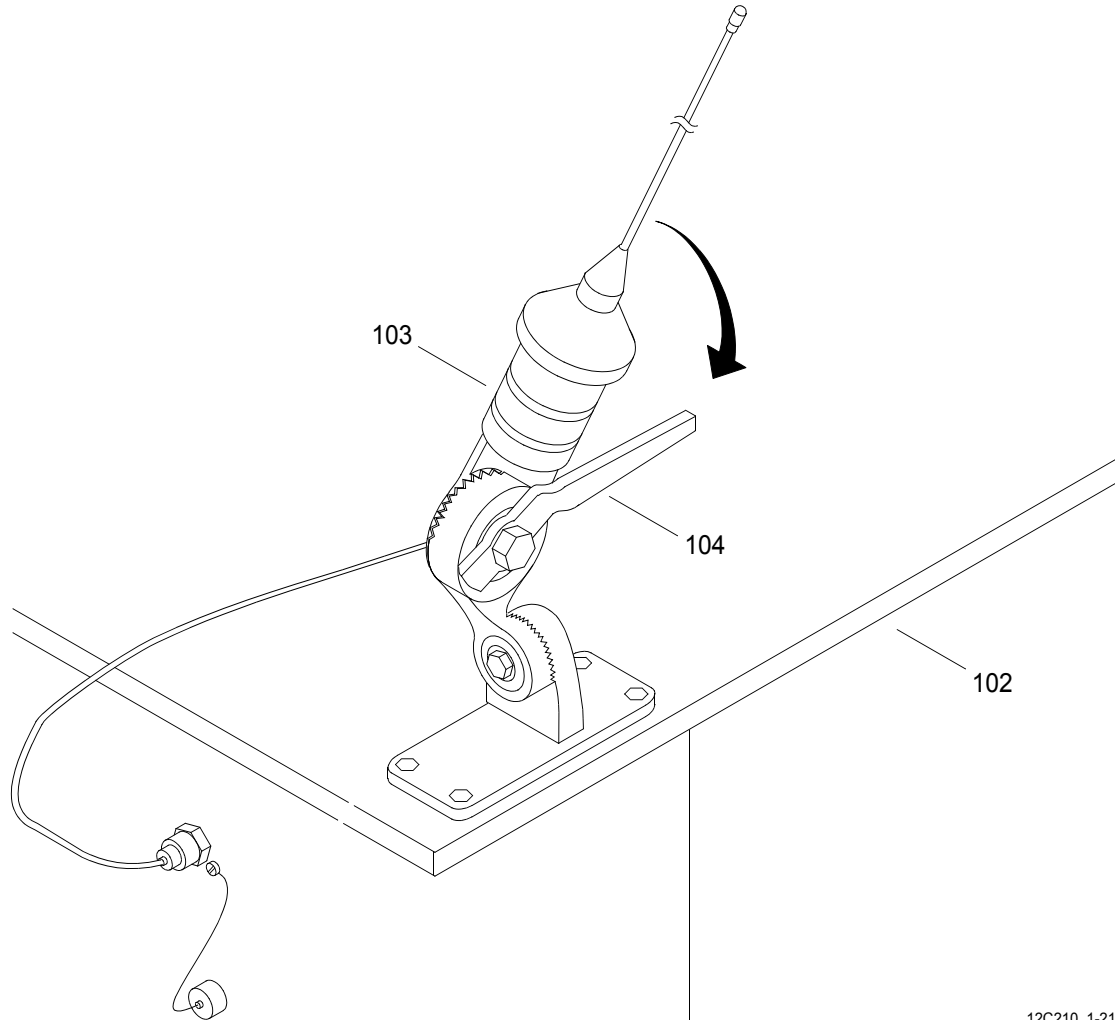
This step is typical for both port and starboard yardarms, except port yardarm must be installed facing toward bottom of lower main mast.

- k. Install lower main mast yardarms (68).
 - {1} Align holes in yardarm (68) with holes in mast base (98).
 - {2} Install two bolts (99) with washers (100) into lower main mast base (98) and yardarm (68).
 - {3} Install two nuts (101) on bolts (99).
 - {4} Tighten nuts (101).
- l. Connect yardarm electrical cable connector (69) to mast junction box (70).

REMOVE OPERATORS CAB

- 1. Remove equipment from operators cab (102).
 - a. Using ladder, gain access to top of operators cab.
 - b. Remove SINCGARS antenna. Refer to TM 11-5820-890-10-8.

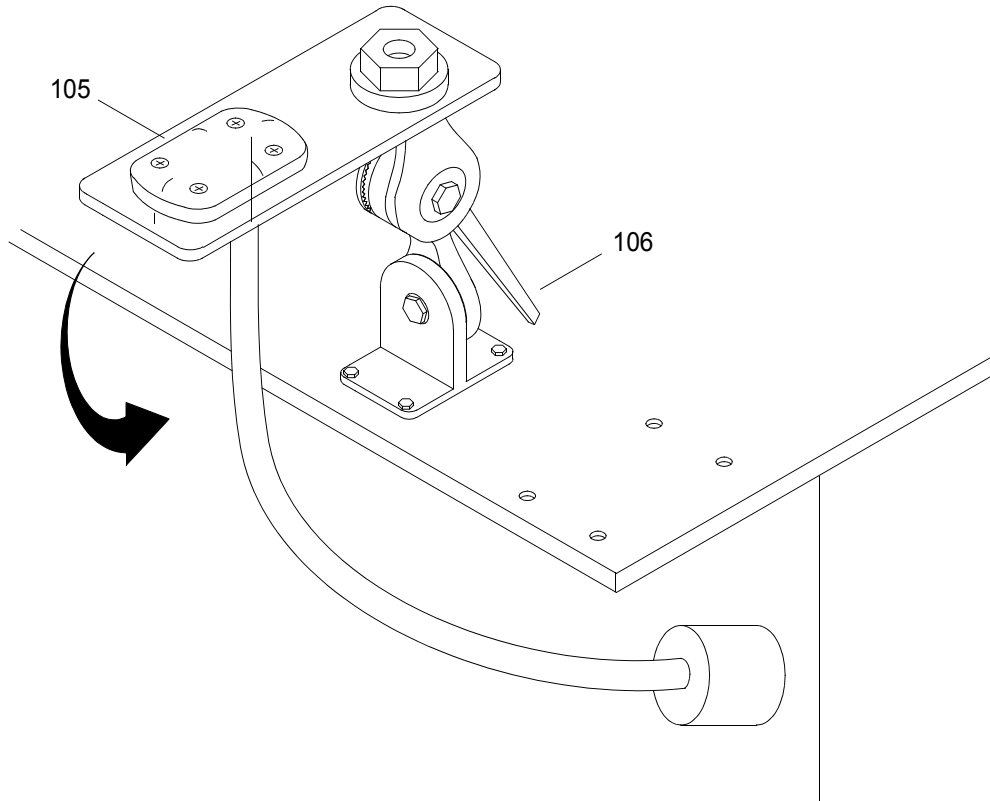
- c. Reposition VHF/FM DSC transceiver antenna (103).



12C210_1-21

- {1} Rotate handle (104) on VHF/FM DSC transceiver antenna ratchet mount counterclockwise to allow rotation of antenna (103) to horizontal position.
- {2} Rotate handle (104) on VHF/FM DSC transceiver antenna ratchet mount clockwise to secure antenna (103).

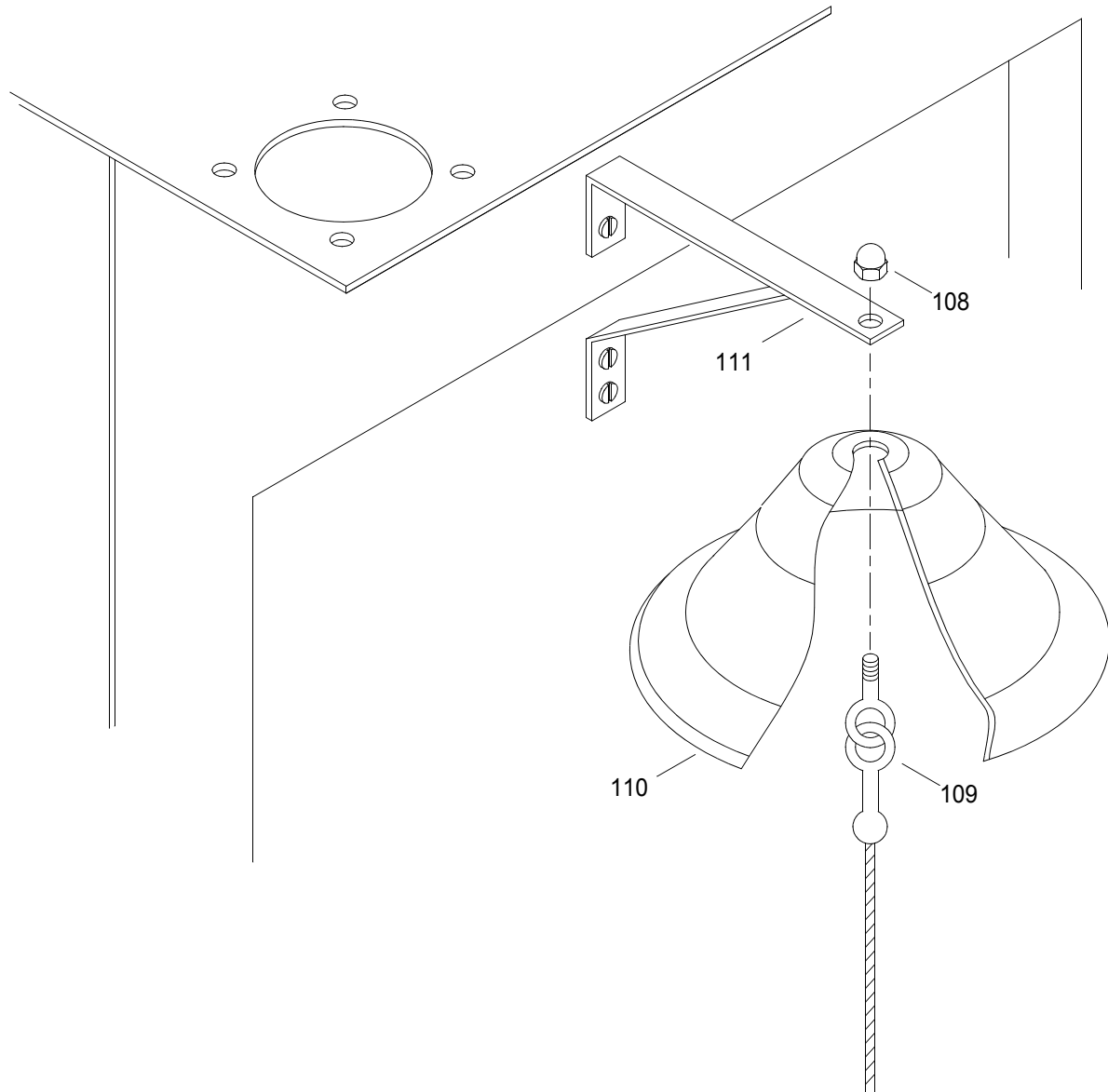
d. Reposition GPS antenna (105).



{1} Rotate handle (106) on GPS antenna ratchet mount counterclockwise to allow rotation of antenna mount plate downward to operators cab (102) roof.

{2} Rotate handle (106) on GPS antenna ratchet mount clockwise to secure mount.

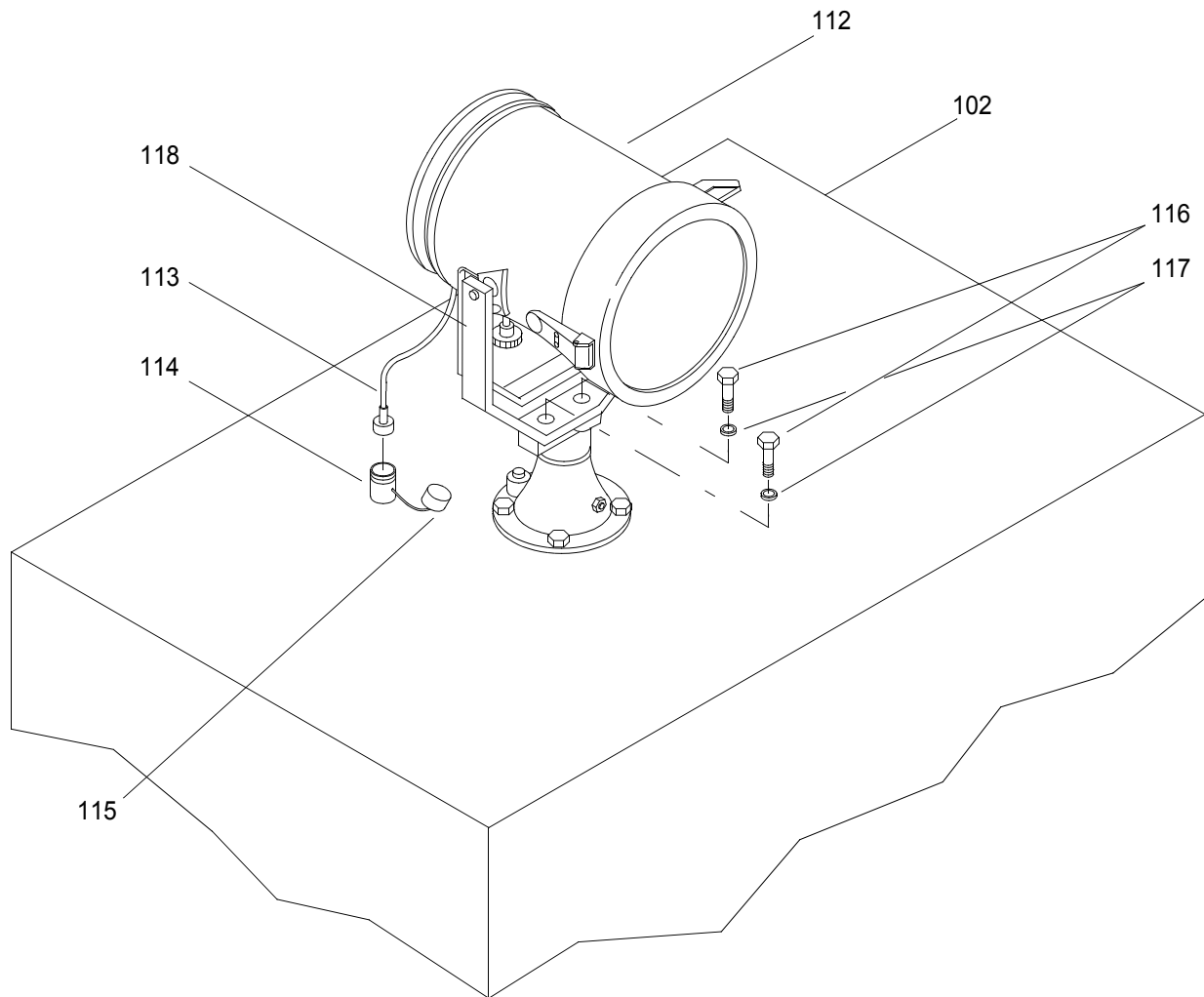
e. Remove navigation bell (107).



{1} Remove acorn nut (108).

{2} Remove eyebolt clapper assembly (109) and bell (110) from mount (111).

f. Remove operators cab spotlight (112).



{1} Remove spotlight electrical connector (113) from receptacle (114) on roof of operators cab (102).

{2} Install spotlight electrical receptacle dust cap (115).

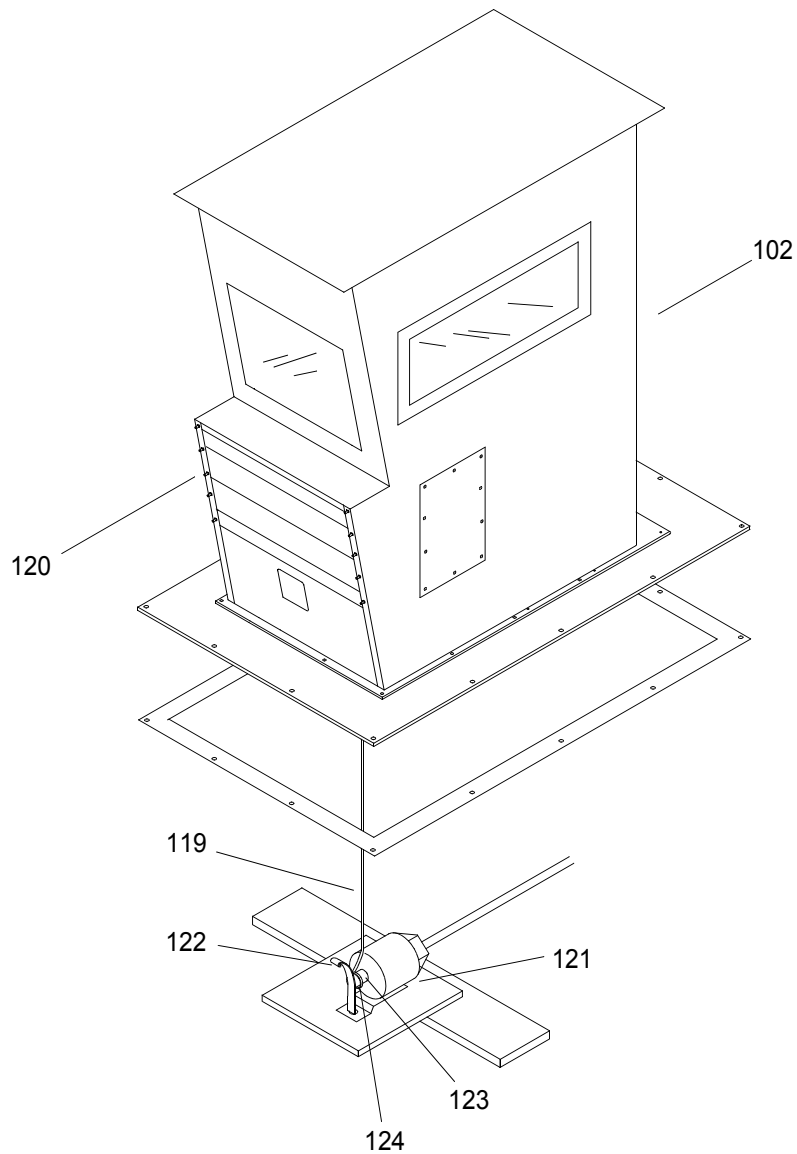
{3} Remove two bolts (116) and washers (117).

{4} Using crane, sling and shackle, remove spotlight (112) from spotlight harp (118).

{5} Stow spotlight (112) inside operators cab (102).

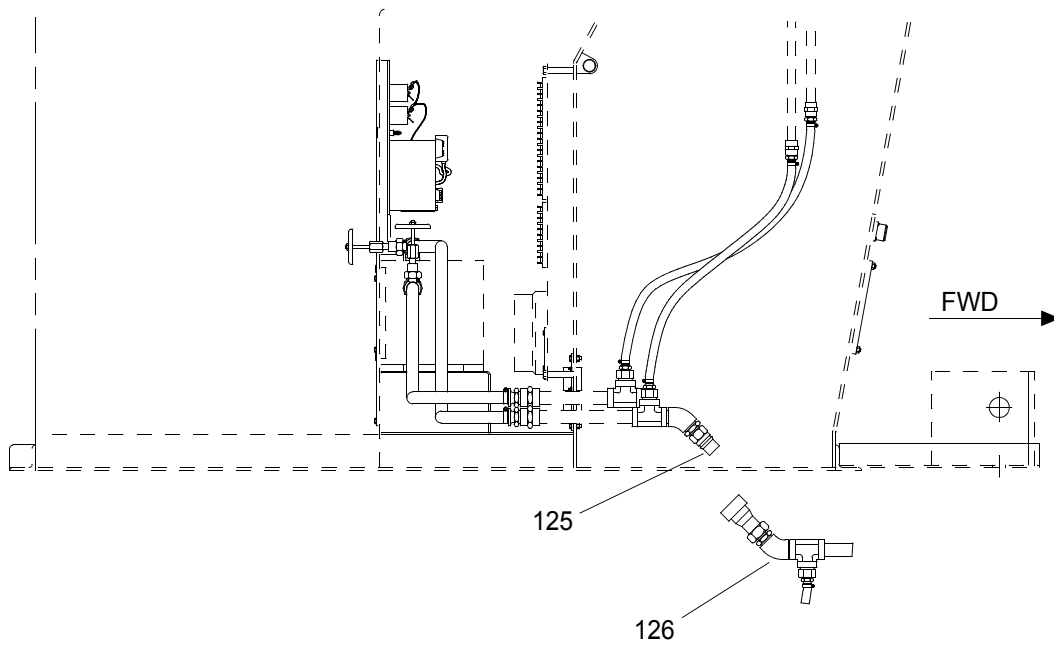
{6} Remove sling and shackle.

- g. Remove wire rope (119) in the operators cab intake plenum (120) from the fire suppression trip mechanism (121).

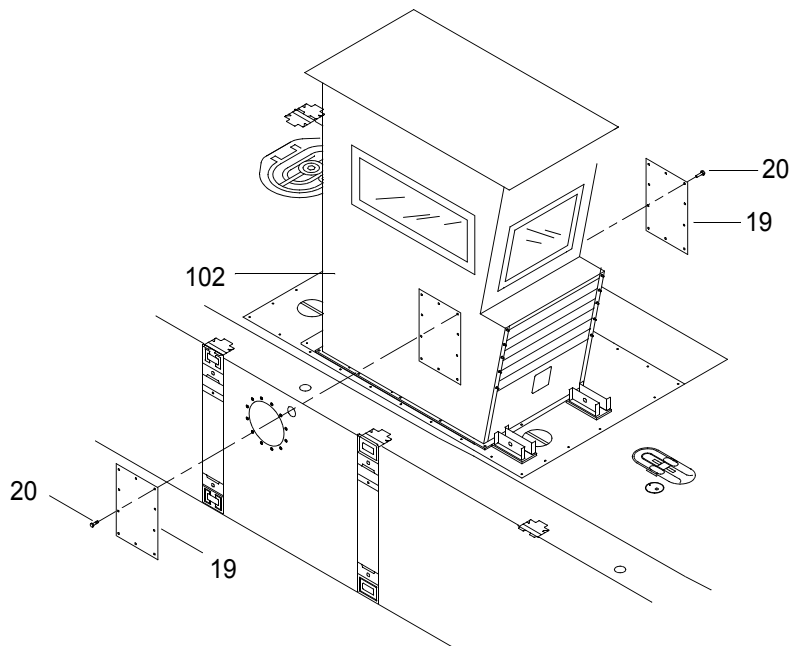


- {1} Move fire suppression solenoid spring flange (122) away from solenoid shaft (123).
- {2} Remove wire rope ring (124) from the fire suppression solenoid shaft (123).
- {3} Release flange (122).

- h. Through operators cab starboard access, disconnect heating system male (125) and female (126) quick disconnect water hoses.

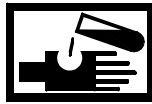
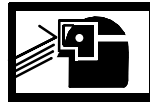


- i. Install both operators cab side access panels (19).

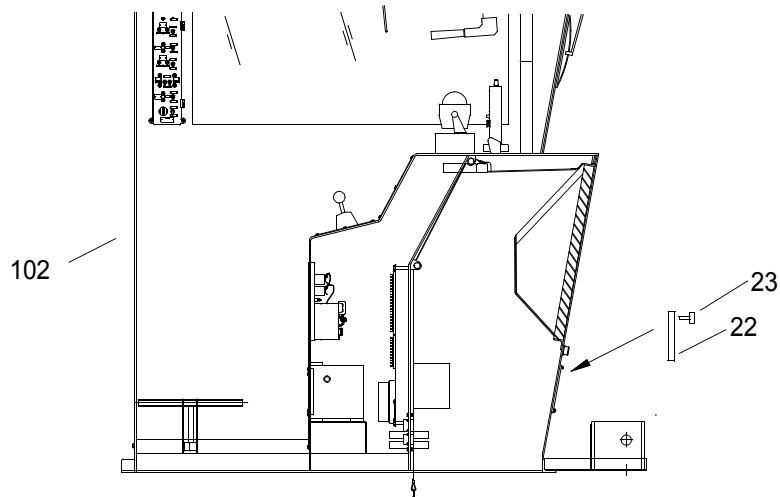


{1} Align holes in access panel (19) with holes in operators cab (102).

WARNING

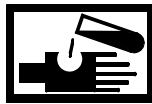
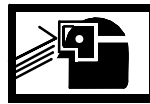
**CHEMICAL****EYE PROTECTION**

- {2} Apply adhesive to threads of bolts (20).
- {3} Install bolts (20) to secure side access panel (19).
- j. Install electrical interconnect shipping plate (22).



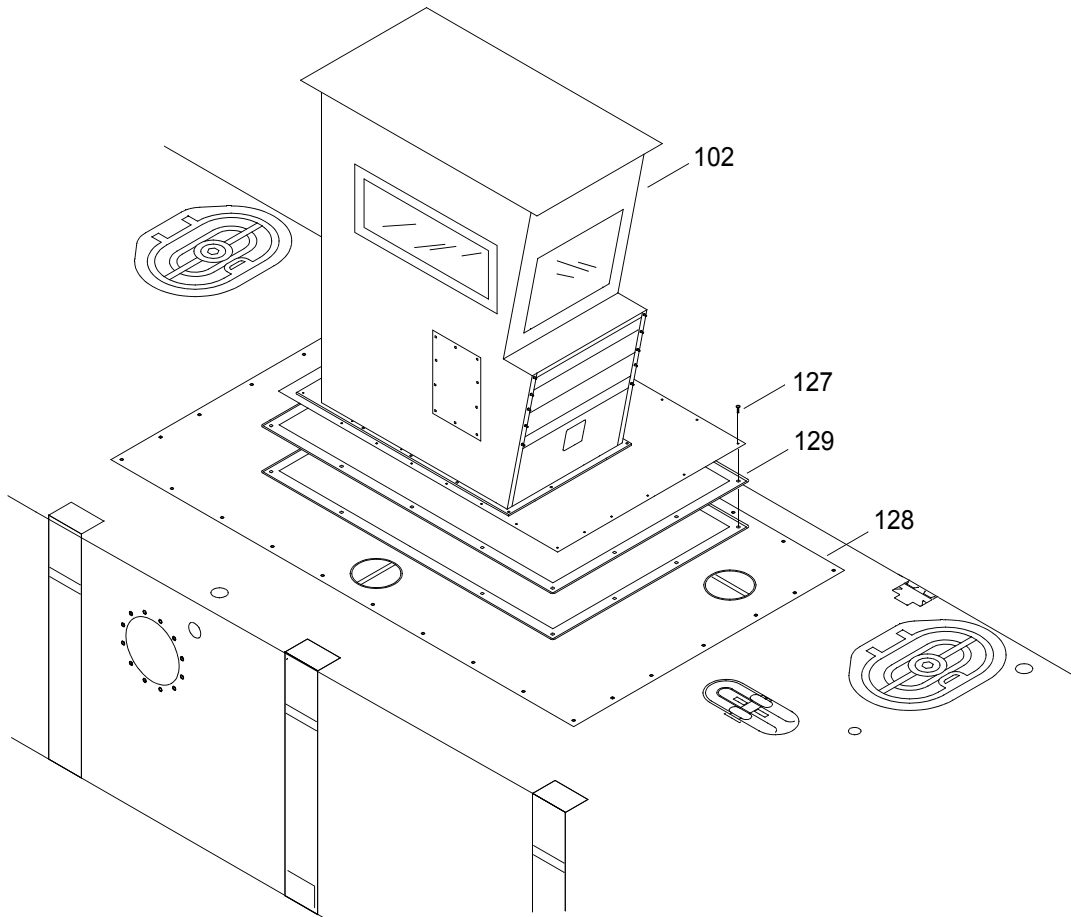
- {1} Align holes in shipping plate (22) with holes in operators cab (102).

WARNING

**CHEMICAL****EYE PROTECTION**

- {2} Apply adhesive to threads of bolts (23).
- {3} Install bolts (23) to secure shipping plate (22).

- k. Remove bolts (127) attaching operators cab (102) to propulsion module engine hatch (128).



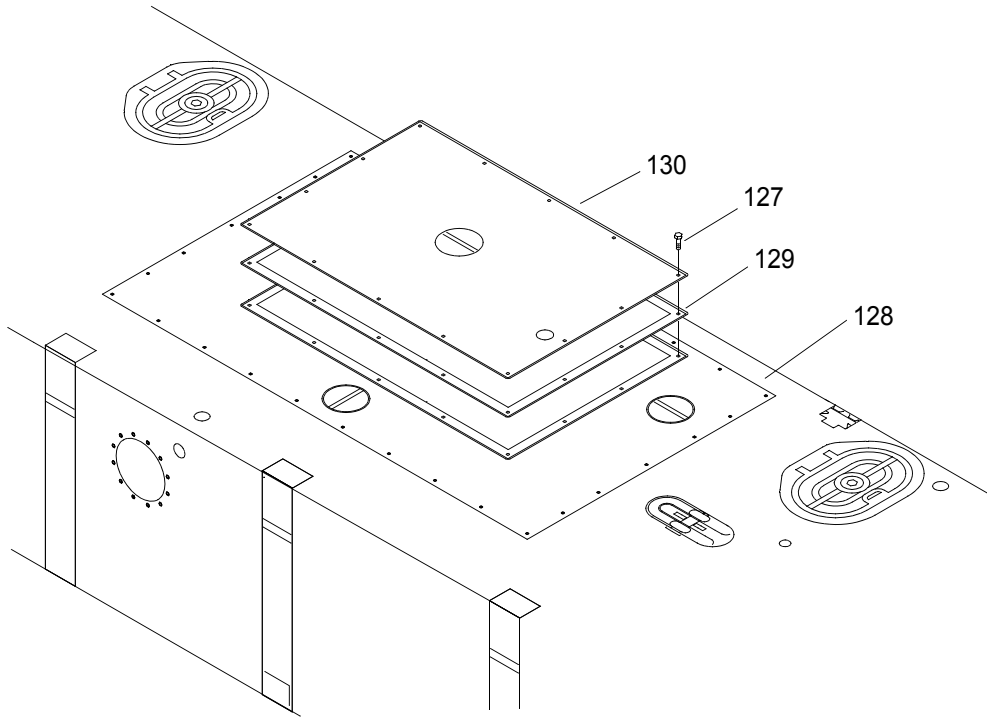
WARNING



HEAVY PARTS

- l. Using crane, slings and shackles, lift operators cab (102) from propulsion module engine hatch (128).
- m. Remove gasket (129), if damaged.
- n. Remove slings and shackles.

1. Install starboard propulsion module engine hatch shipping plate (130).



- a. Install new gasket (129), if damaged.

WARNING



HEAVY PARTS

- b. Using crane, slings and shackles, align bolt holes in shipping plate (130) with holes in propulsion module engine hatch (128).
- c. Install bolts (127) to secure shipping plate (130) to starboard propulsion module engine hatch (128).
- d. Tighten bolts (127).
- e. Remove slings and shackles.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
STABILIZERS
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)
Sling, Lifting 5300 lbs (Green) (Item 70, WP 0108 00)
4 ³/₄ Ton ³/₄ in. Shackle (Item 5, WP 0108 00)

Personnel Required

Seaman 88K

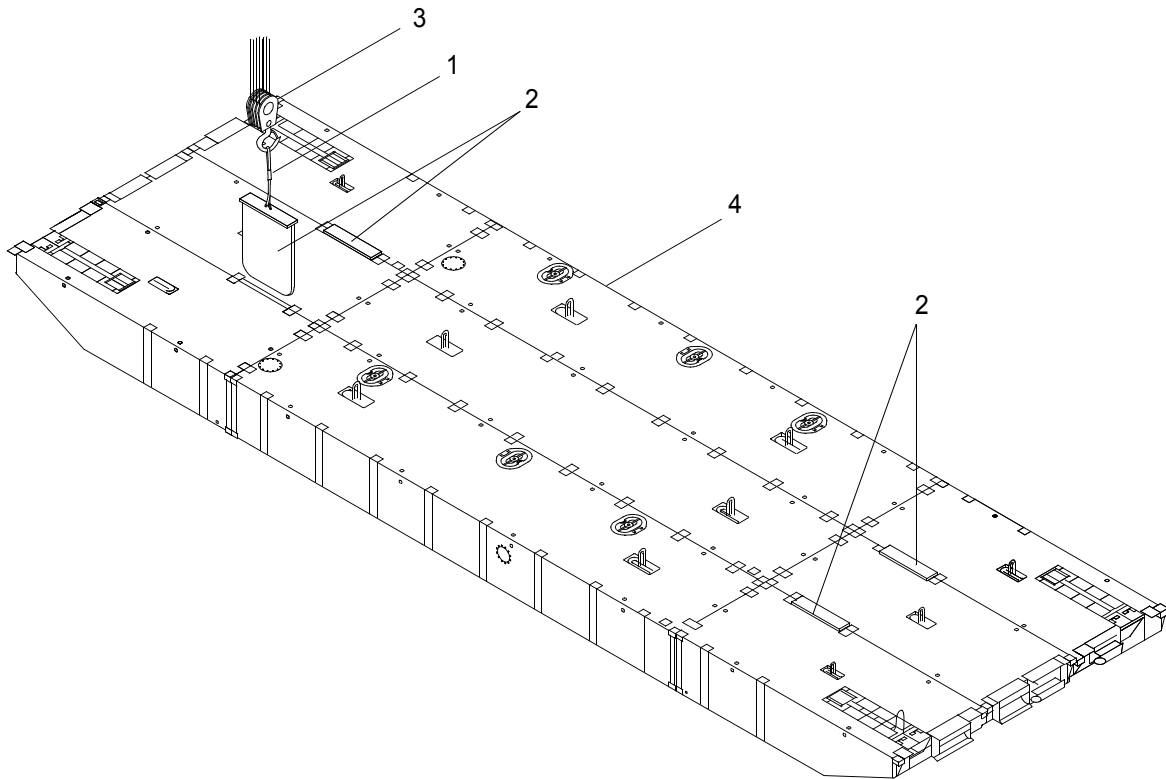
Equipment Condition

Safety Equipment Removed. (WP 0037 00)
Fenders Removed. (WP 0038 00)
D-Ring/Cloverleaf And Deck Cleat Fittings Removed. (WP 0039 00)
Stub Navigation Mast Removed. (WP 0040 00)
Stern Anchor Removed. (WP 0041 00)
Stern Anchor Mount Removed. (WP 0042 00)
A-Frame Removed. (WP 0043 00)
Winch Mounting Plates Removed. (WP 0044 00)
Winch Removed. (WP 0045 00)
Warping Tug Above Deck Equipment Removed. (WP 0046 00)

PREPARATION FOR MOVEMENT - REMOVAL OF WARPING TUG STABILIZERS**REMOVE STABILIZERS****NOTE**

This procedure is typical for removal of all stabilizers.

1. Attach sling and shackle (1) to stabilizer (2).



WARNING



HEAVY PARTS

- Using crane (3), lift stabilizer (2) from warping tug (4).

STOW WARPING TUG STABILIZERS

NOTE

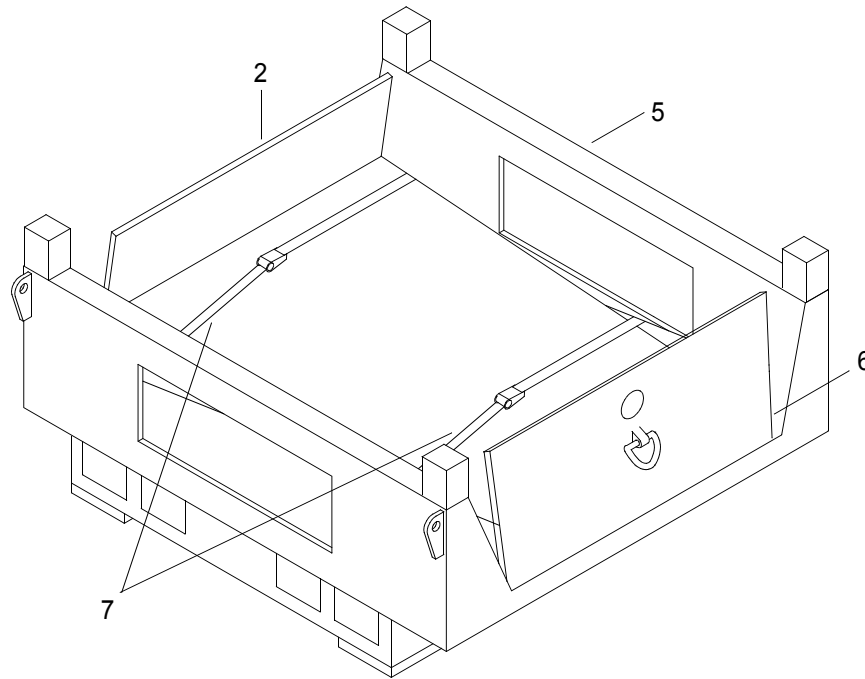
This procedure is typical for stowing stabilizers on either pallet.

WARNING



HEAVY PARTS

- Using crane and sling, place first anchor stabilizer (2) on pallet (5).



2. Remove sling and shackle.
3. Using crane and sling, place second anchor stabilizer (6) on pallet (5).
4. Remove sling and shackle.
5. Secure stabilizers (2 and 6) with two ratchet straps (7).
6. Tighten ratchet straps (7).
7. Repeat steps to install remaining two stabilizers on pallet.

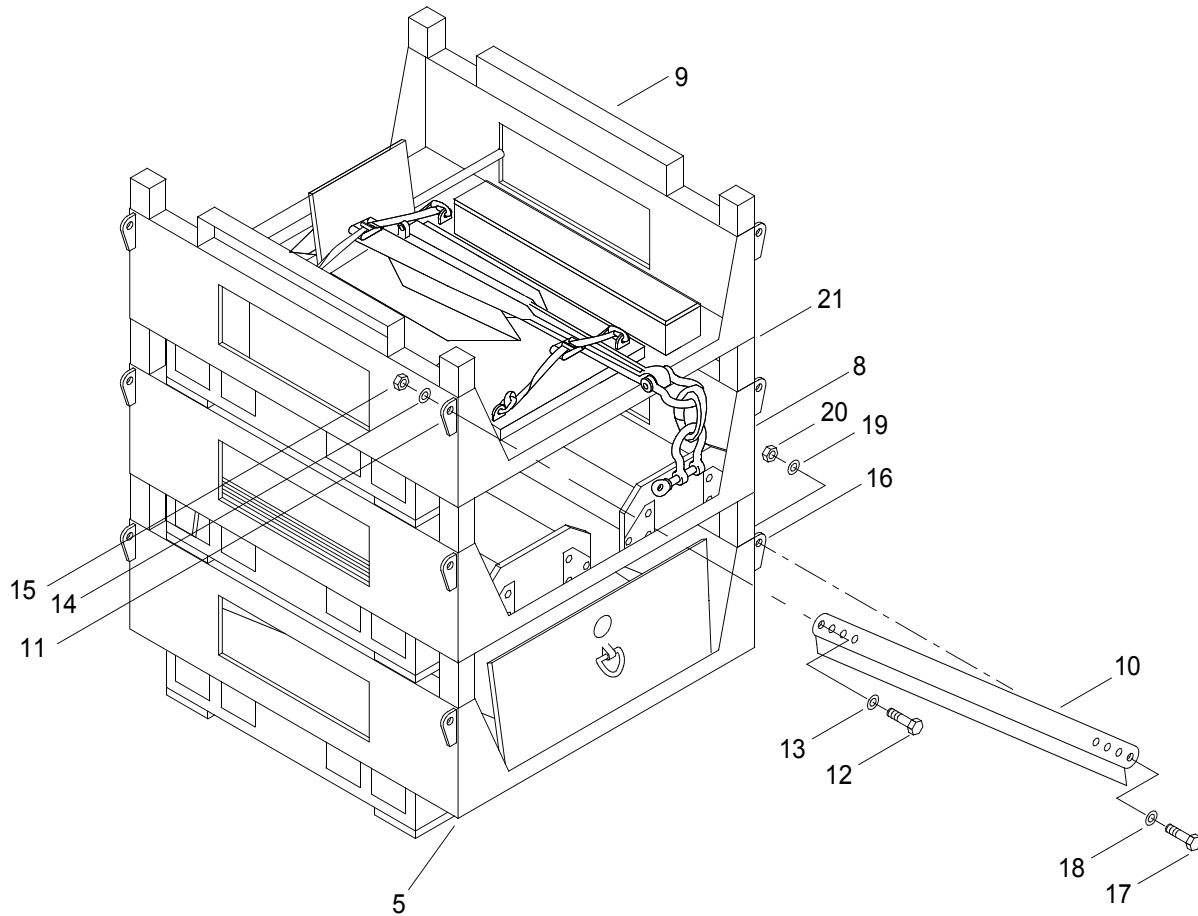
STOW PALLETS IN ISO CONTAINER

WARNING



HEAVY PARTS

1. Using a forklift, place the pallet (8) containing the winch foundation on top of the first stabilizer pallet (5).



WARNING



HEAVY PARTS

2. Using a forklift, place the pallet containing the anchor (9) on top of the winch foundation pallet (8).
3. Install the pallet tie bar (10).
 - a. Align the hole in the upper end of the tie bar (10) with the hole in the pallet tie bar bracket (11).
 - b. Install bolt (12) and washer (13) through tie bar (10) and bracket (11).
 - c. Install washer (14) and nut (15) on bolt (12).
 - d. Align the hole in the lower end of the tie bar (10) with the hole in the pallet tie bar bracket (16).
 - e. Install bolt (17) and washer (18) through tie bar (10) and bracket (16).
 - f. Install washer (19) and nut (20) on bolt (17).
 - g. Tighten both tie bar nuts (15 and 20).

- h. Repeat steps to install tie bar on opposite side of pallet stack.

WARNING



HEAVY PARTS

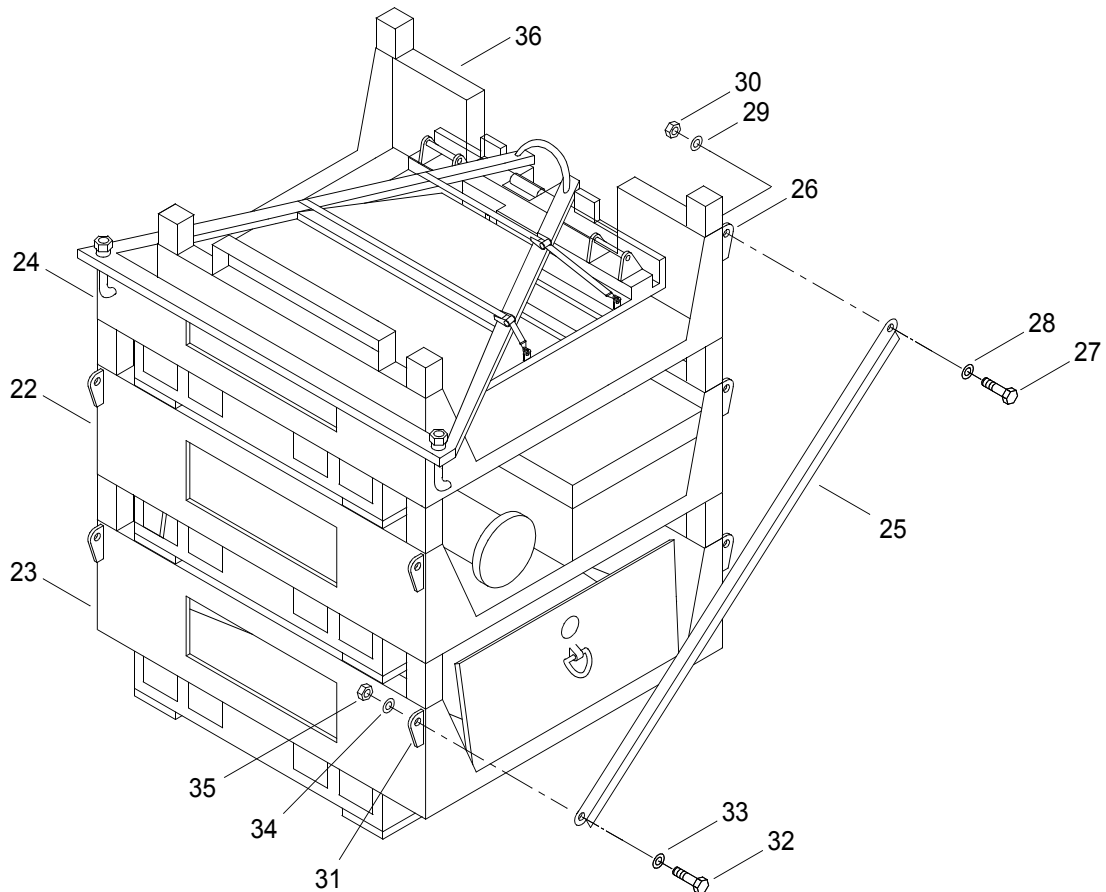
4. Using a forklift, place pallet stack (21) in ISO container.
5. Secure pallet stack (21) to container with ratchet straps.
6. Tighten ratchet straps.

WARNING



HEAVY PARTS

7. Using a forklift, place the pallet containing the A-Frame elevating pole pallet (22) on top of the second stabilizer pallet (23).



WARNING

**HEAVY PARTS**

8. Using a forklift, place the pallet containing the anchor frame (24) on top of the A-Frame elevating pole pallet (22).
9. Install the pallet tie bar (25).
 - a. Align the hole in the upper end of the tie bar (25) with the hole in the pallet tie bar bracket (26).
 - b. Install bolt (27) and washer (28) through tie bar (25) and bracket (26).
 - c. Install washer (29) and nut (30) on bolt (27).
 - d. Align the hole in the lower end of the tie bar (25) with the hole in the pallet tie bar bracket (31).
 - e. Install bolt (32) and washer (33) through tie bar (25) and bracket (31).
 - f. Install washer (34) and nut (35) on bolt (32).
 - g. Tighten both tie bar nuts (30 and 35).
 - h. Repeat steps to install tie bar on opposite side of pallet stack (36).

WARNING

**HEAVY PARTS**

10. Using a forklift, place pallet stack (36) in ISO container.
11. Secure pallet stack (36) to container with ratchet straps.
12. Tighten ratchet straps.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Crowbar (Item 15, WP 0108 00)

Personnel Required

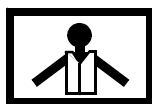
Seaman 88K

Equipment Condition

Safety Equipment Removed. (WP 0037 00)
 Fenders Removed. (WP 0038 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Removed. (WP 0039 00)
 Stub Navigation Mast Removed. (WP 0040 00)
 Stern Anchor Removed. (WP 0041 00)
 Stern Anchor Mount Removed. (WP 0042 00)
 A-Frame Removed. (WP 0043 00)
 Winch Mounting Plates Removed. (WP 0044 00)
 Winch Removed. (WP 0045 00)
 Warping Tug Above Deck Equipment Removed. (WP 0046 00)
 Warping Tug Stabilizers Removed. (WP 0047 00)

PREPARATION FOR MOVEMENT - DISASSEMBLY OF WARPING TUG**DISASSEMBLE WARPING TUG**

WARNING



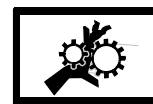
VEST



HELMET PROTECTION



HEAVY PARTS



MOVING PARTS

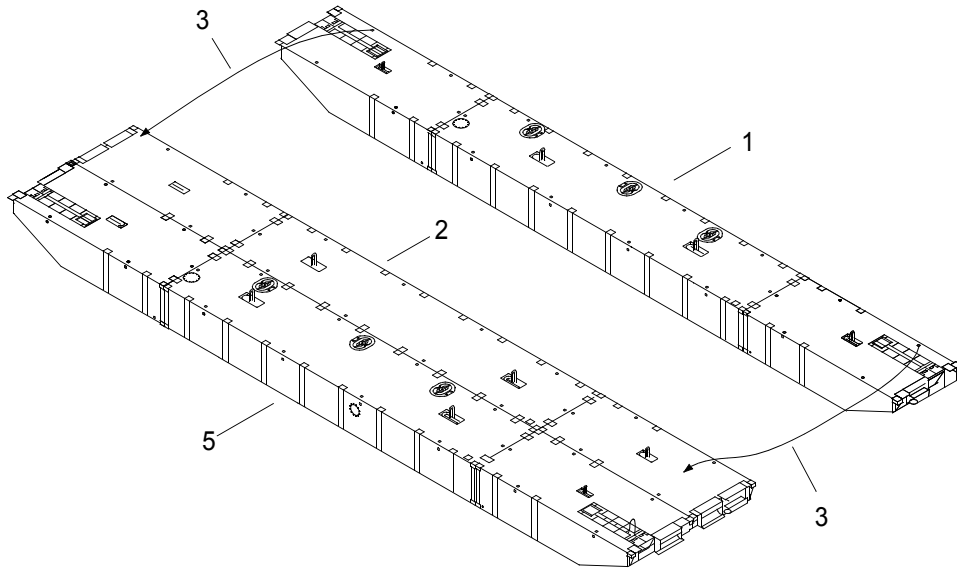
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

Do not handle ropes/lines by placing hands in bight of the line where it feeds into cleats, etc. Place the hands on top or on the outside so that in an emergency the lines can be released quickly to preclude being pulled into the equipment. Failure to observe these precautions could result in serious injury or death.

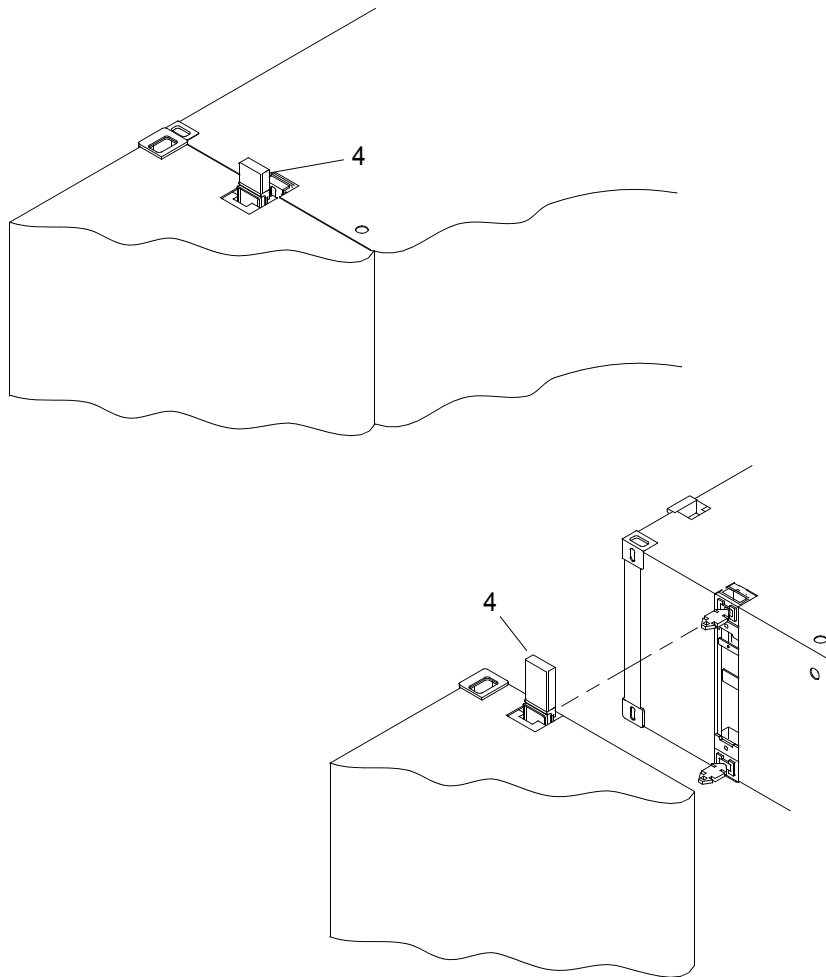
NOTE

Disassemble the warping tug into strings in the water. Lift strings onto deck of ship for disassembly.

1. Secure the outer string (1) to the center string (2) with line (3).



2. Using a crowbar, raise the side female guillotine connectors (4) to release one outboard string (1).



3. Separate the outboard string (1) from the center string (2).

-
4. Repeat steps to separate outboard string (5) from the center string (2).
 5. Stow the male and female connector guillotines. (WP 0056 00)

WARNING

**HEAVY PARTS**

6. Using crane and slings, lift string out of the water for disassembly.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
MODULE STRINGS
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Crowbar (Item 15, WP 0108 00)

Personnel Required

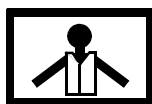
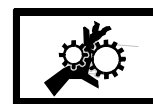
Seaman 88K

Equipment Condition

Safety Equipment Removed. (WP 0037 00)
 Fenders Removed. (WP 0038 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Removed. (WP 0039 00)
 Stub Navigation Mast Removed. (WP 0040 00)
 Stern Anchor Removed. (WP 0041 00)
 Stern Anchor Mount Removed. (WP 0042 00)
 A-Frame Removed. (WP 0043 00)
 Winch Mounting Plates Removed. (WP 0044 00)
 Winch Removed. (WP 0045 00)
 Warping Tug Above Deck Equipment Removed. (WP 0046 00)
 Warping Tug Stabilizers Removed. (WP 0047 00)
 Warping Tug Disassembled. (WP 0048 00)

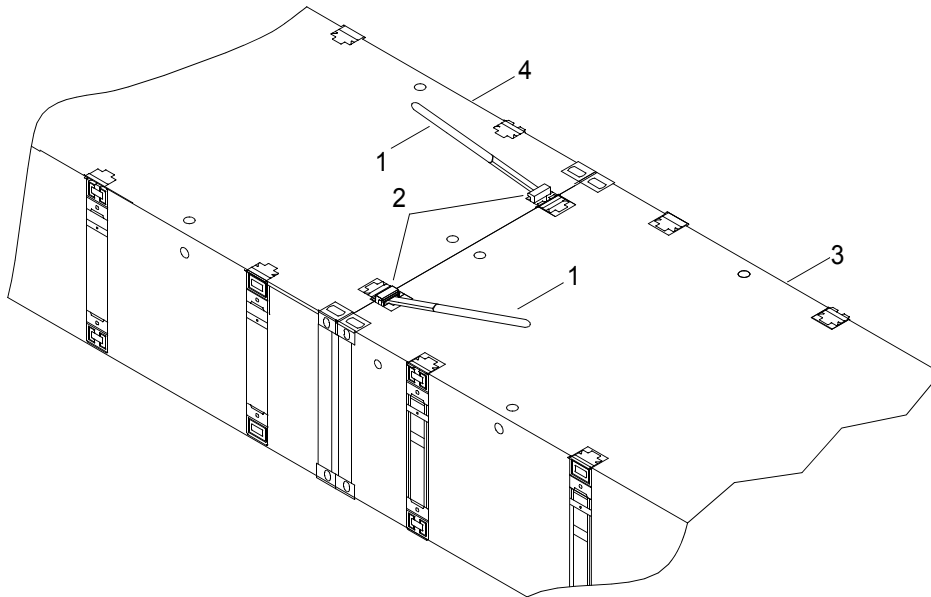
PREPARATION FOR MOVEMENT - DISASSEMBLY OF MODULE STRINGS**DISASSEMBLE MODULE STRINGS**

WARNING

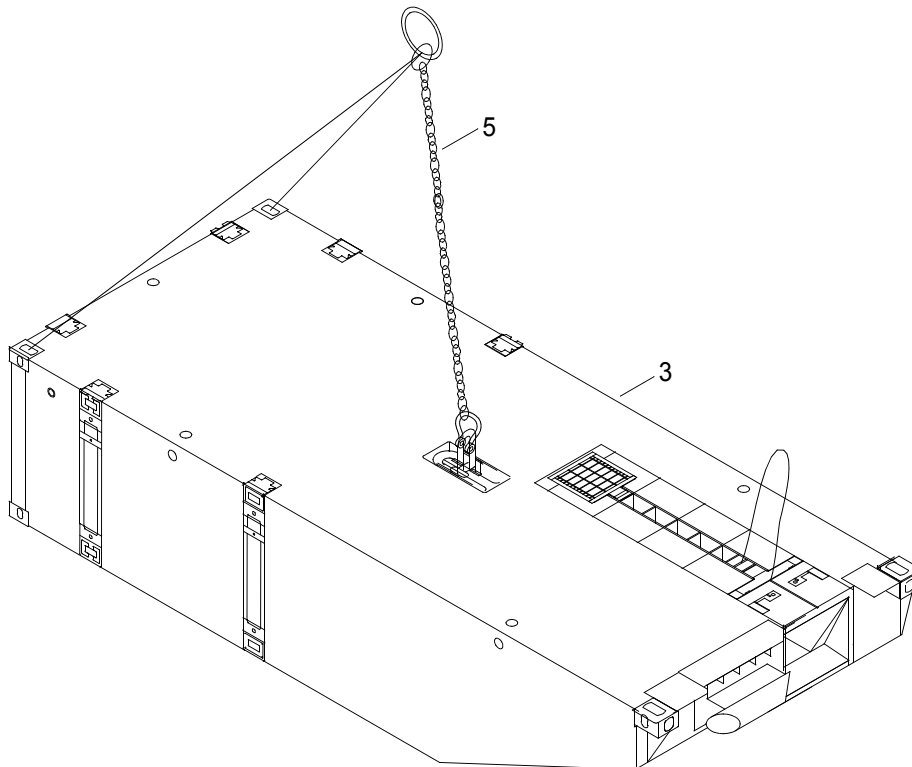
**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Using a crowbar (1), lift the female guillotine connectors (2) to release the end rake module (3) from the center module (4).

**WARNING****HEAVY PARTS**

2. Separate the end rake module (3) from the center module (4) using a three leg sling (5).



-
3. Repeat steps for end rake on opposite end of center module.
 4. Stow the male and female connector guillotines and pins. (WP 0050 00)

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
MALE AND FEMALE GUILLOTINE CONNECTORS
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Hammer, Hand (10 lb Sledge) (Item 36, WP 0108 00)

Personnel Required

Seaman 88K

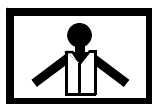
Equipment Condition

Safety Equipment Removed. (WP 0037 00)
 Fenders Removed. (WP 0038 00)
 D-Ring/Cloverleaf And Deck Cleat Fittings Removed. (WP 0039 00)
 Stub Navigation Mast Removed. (WP 0040 00)
 Stern Anchor Removed. (WP 0041 00)
 Stern Anchor Mount Removed. (WP 0042 00)
 A-frame Removed. (WP 0043 00)
 Winch Mounting Plates Removed. (WP 0044 00)
 Winch Removed. (WP 0045 00)
 Warping Tug Above Deck Equipment Removed. (WP 0046 00)
 Warping Tug Stabilizers Removed. (WP 0047 00)
 Warping Tug Disassembled. (WP 0048 00)
 Module Strings Disassembled. (WP 0049 00)

**PREPARATION FOR MOVEMENT - STOWAGE OF MALE AND FEMALE
GUILLOTINE CONNECTORS**

STOW MALE CONNECTORS

WARNING



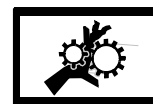
VEST



HELMET PROTECTION



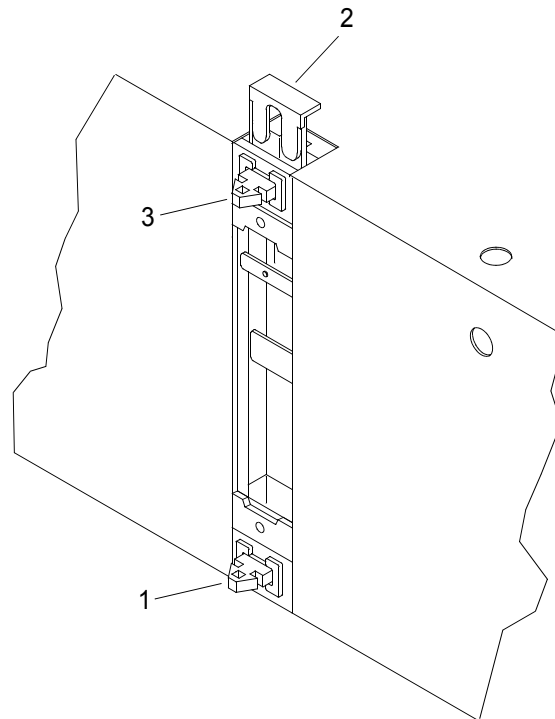
HEAVY PARTS



MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

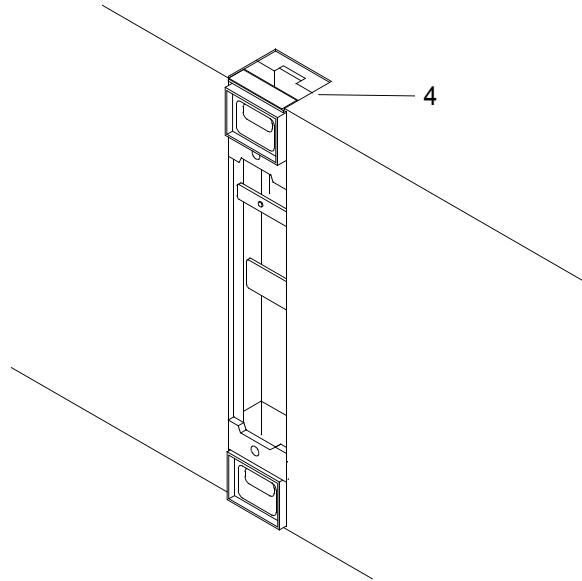
1. Depress the lower male lock pin (1) against its deployment spring into the lower male housing.



2. Hold the lower male lock pin (1) fully inward while lowering the guillotine connector (2) slightly with sledgehammer to engage and restrain the lower pin without coming in physical contact with any other connector parts.
3. Depress the upper male lock pin (3) against its deployment spring into the upper male housing.
4. Hold the upper lock pin (3) fully inward while lowering the guillotine connector (2) completely down with sledgehammer to engage and restrain the upper pin.

STOW FEMALE CONNECTORS

1. Using the sledgehammer, strike the guillotine (4) of the female connectors until completely flush with the deck.



2. Connectors are properly stowed when guillotines are flush with module deck.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
MODULE ISOPAK
OPERATION UNDER USUAL CONDITIONS**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
 Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
 Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
 Life Preserver, Vest (Item 45, WP 0108 00)
 Helmet, Safety (Brown) (Item 40, WP 0108 00)
 Ladder (Item 43, WP 0108 00)

Personnel Required

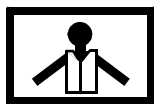
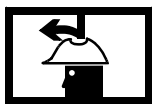
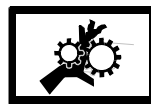
Seaman 88K

Equipment Condition

Safety Equipment Removed. (WP 0037 00)
 Fenders Removed. (WP 0038 00)
 D-Ring/Cloverleaf and Deck Cleat Fittings Removed. (WP 0039 00)
 Stub Navigation Mast Removed. (WP 0040 00)
 Stern Anchor Removed. (WP 0041 00)
 Stern Anchor Mount Removed. (WP 0042 00)
 A-Frame Removed. (WP 0043 00)
 Winch Mounting Plates Removed. (WP 0044 00)
 Winch Removed. (WP 0045 00)
 Warping Tug Above Deck Equipment Removed. (WP 0046 00)
 Warping Tug Stabilizers Removed. (WP 0047 00)
 Warping Tug Disassembled. (WP 0048 00)
 Module Strings Disassembled. (WP 0049 00)
 Male and Female Connectors Stowed. (WP 0050 00)

PREPARATION FOR MOVEMENT - ASSEMBLY OF MODULE ISOPAK**ASSEMBLE CENTER MODULE ISOPAK**

WARNING

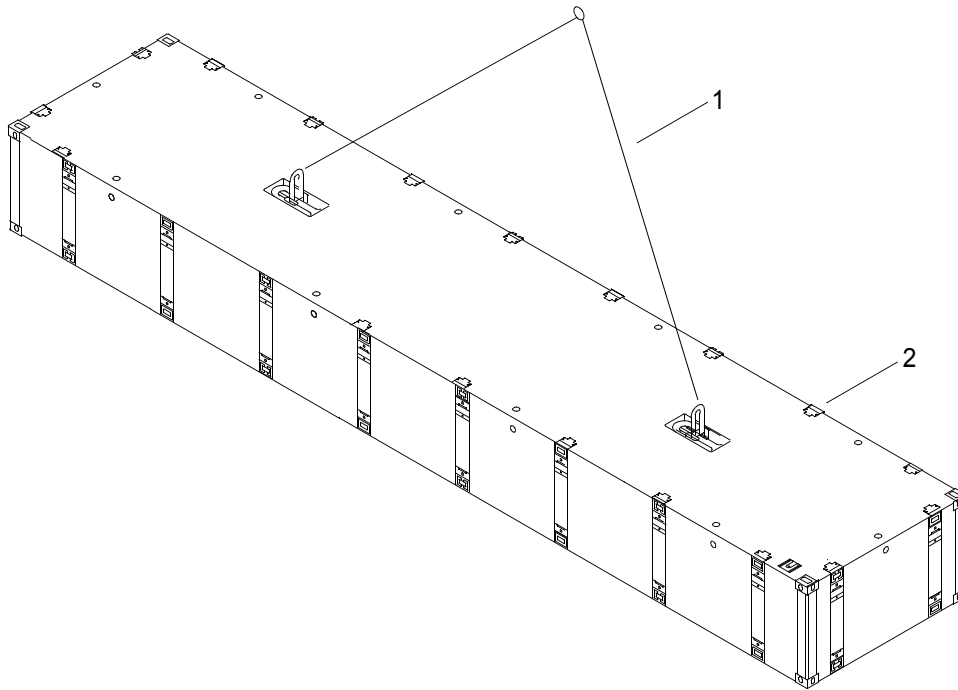
**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS****HEAVY PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

NOTE

Modules must remain level when lifting with slings.

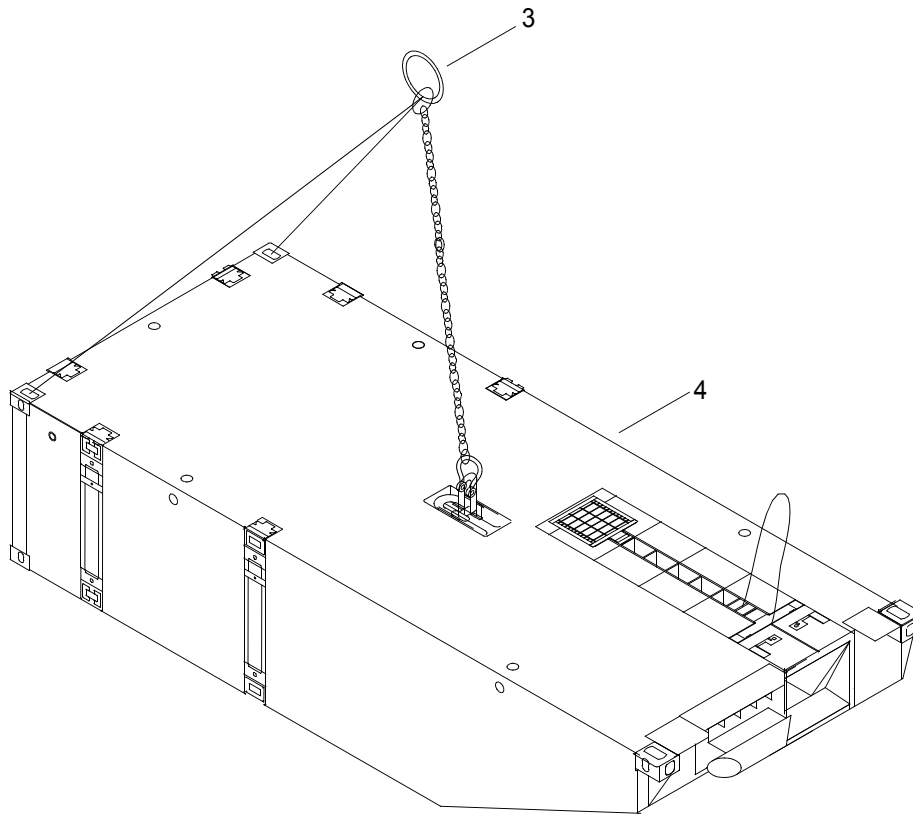
1. Using a two leg sling (1) with a 22 ton eye hook on each leg and crane, lift and position the center module (2) so that ISOPAK can be assembled.



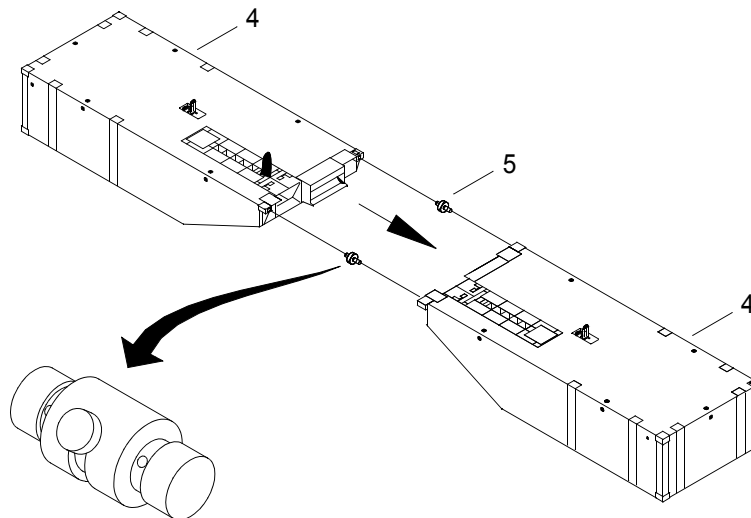
WARNING

**HEAVY PARTS**

2. Using a three leg bridle sling (3), lift the end rakes (4).



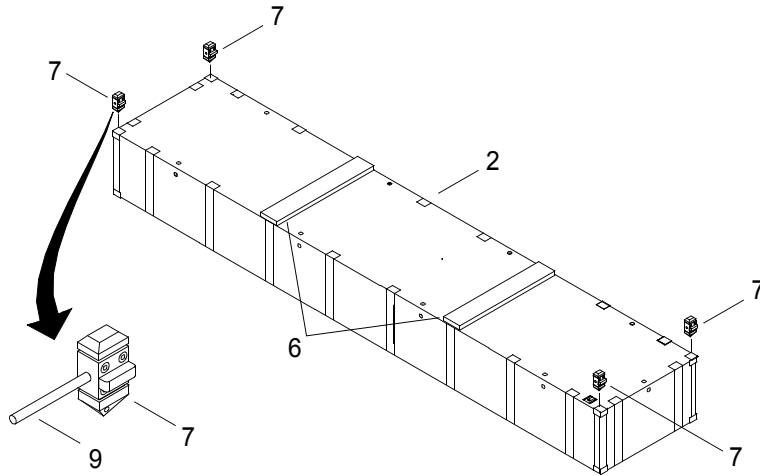
3. Position two end rake modules (4) nose to nose.
4. Connect end rake modules (4) nose to nose with two horizontal ISOPAK connectors (5).



NOTE

Ensure dunnage is properly placed.

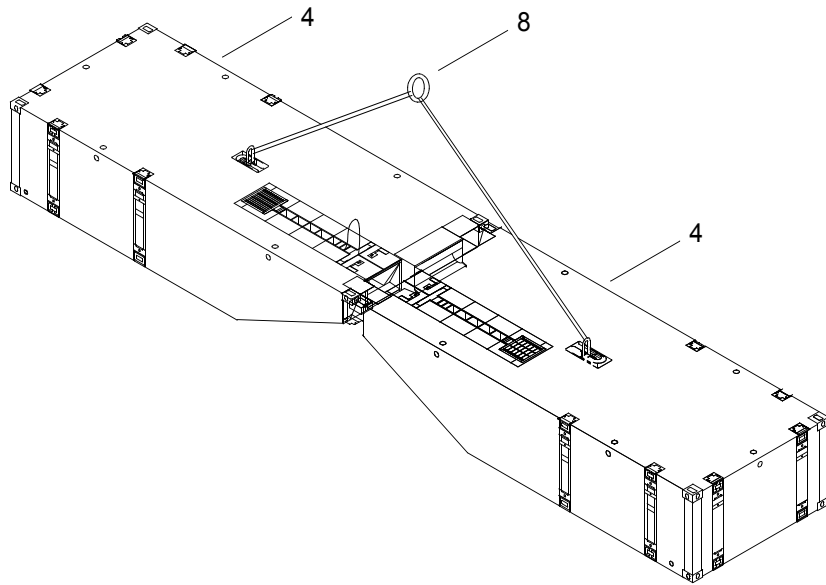
- Place two 2 in. X 6 in. dunnage boards (6) on the center module (2).



- Install four vertical ISO connectors (7) on center module (2), one on each corner.

WARNING**HEAVY PARTS**

- Lift connected end rake modules (4) with the two leg sling (8).



WARNING

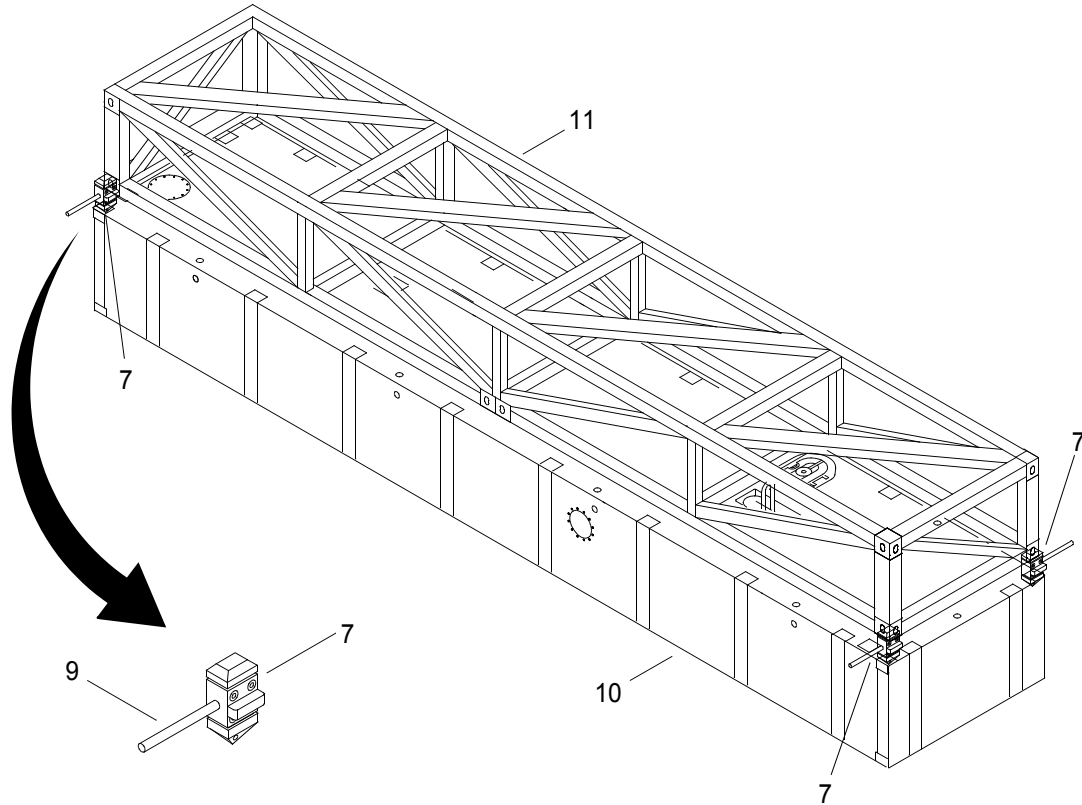
**HEAVY PARTS**

8. Using crane, position and place end rake modules (4) on top of center module (2).
9. Align all four corners, repositioning connectors if necessary, to get a metal-to-metal fit.
10. Obtain ISO ladder from BII container.
11. Using ISO ladder, climb to top of module ISOPAK and remove sling (8) from end rake modules (4).
12. Descend from module ISOPAK using ladder.
13. Remove ladder from ISOPAK.
14. Lock four ISOPAK vertical connectors (7), one at each corner, by moving the levers (9).

INSTALL SHIPPING FRAME ON POWERED MODULE
NOTE

This procedure is typical for both powered modules.

1. Install four ISOPAK vertical connectors (7) on corners of powered module (10).



2. Using ISOPAK ladder, attach crane and sling to shipping frame (11).
3. Descend from top of shipping frame.

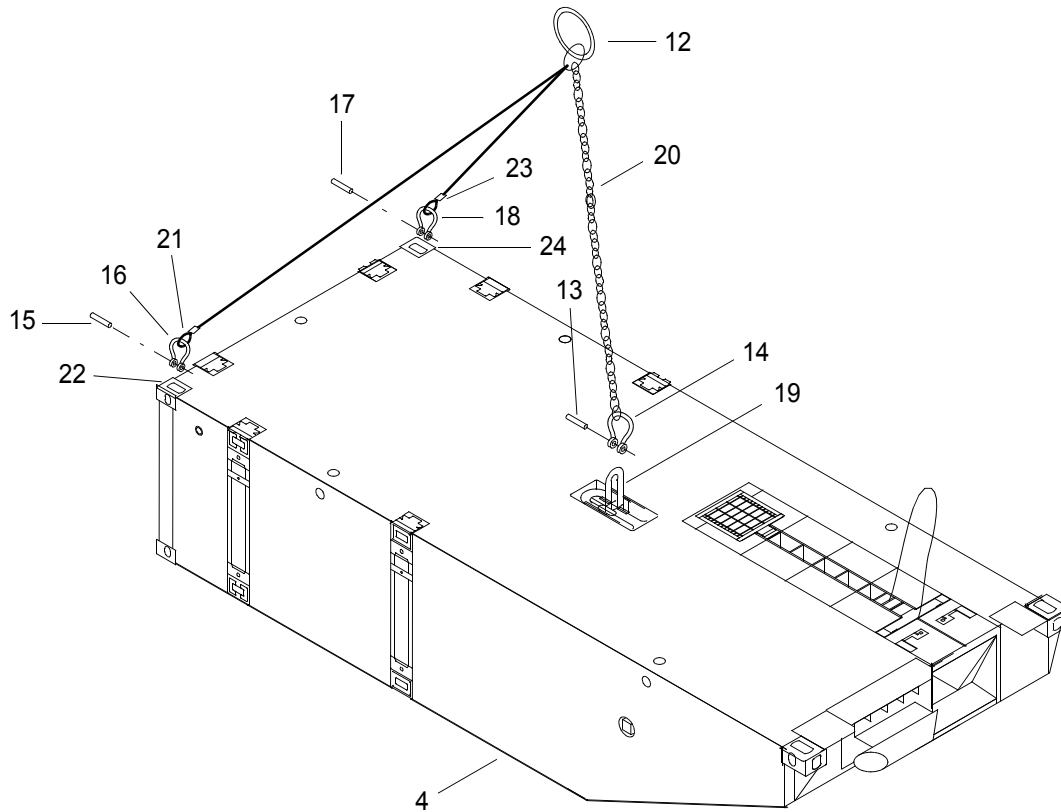
WARNING

**HEAVY PARTS**

4. Using crane and sling, lift shipping frame (11) and place on top of powered module (10).
5. Lock four ISOPAK vertical connectors (7), one at each corner, by moving the lever (9).
6. Remove crane and sling.

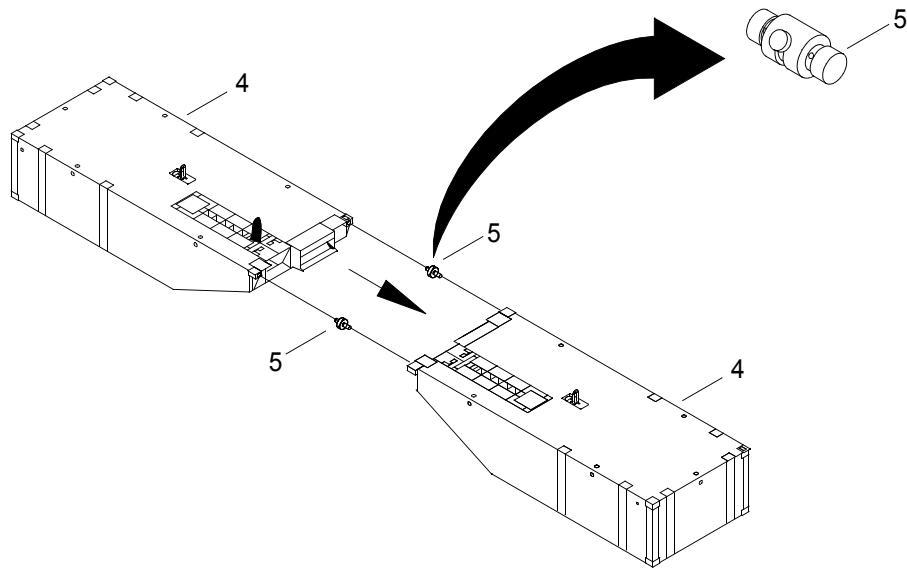
INSTALL MAIN MAST FRAME ON END RAKE MODULES

1. Install three leg sling (12) on end rake module (4).

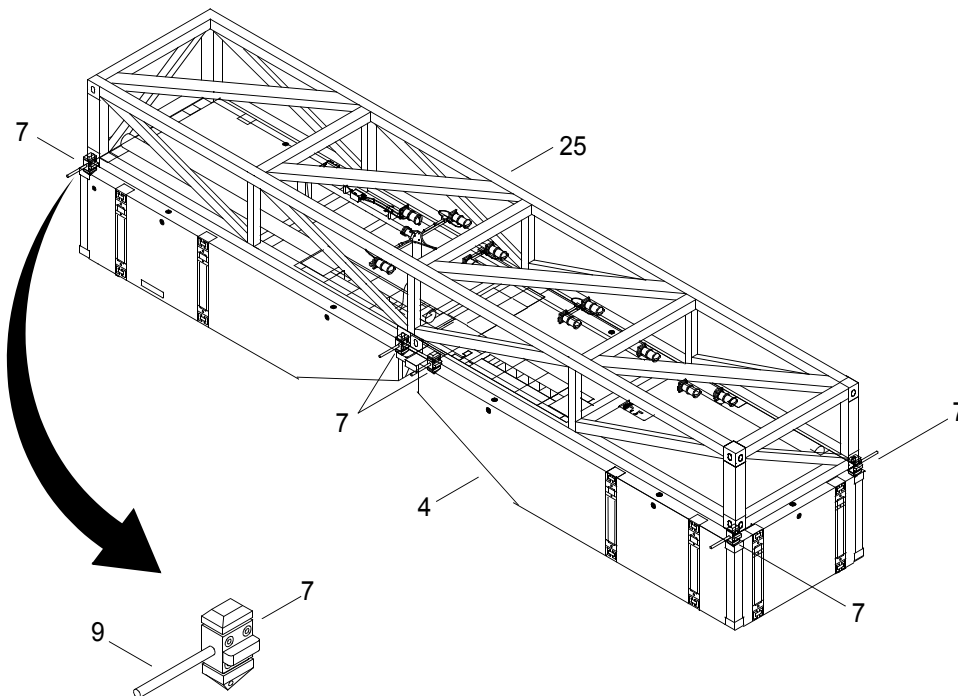


- a. Remove shackle pin (13) from shackle (14).
 - b. Remove shackle pin (15) from shackle (16).
 - c. Remove shackle pin (17) from shackle (18).
 - d. Insert shackle (14) through module lifting shackle (19) and chain (20).
 - e. Install shackle pins (13) in shackle (14).
 - f. Insert shackle (16) through sling eye (21) and module ISO fitting (22).
 - g. Install shackle pin (15) in shackle (16).
 - h. Insert shackle (18) through sling eye (23) and module ISO fitting (24).
 - i. Install shackle pin (17) in shackle (18).
2. Using crane and sling, position two end rake modules (4) nose to nose.

3. Connect end rake modules (4) nose to nose with two horizontal ISOPAK connectors (5).



4. Using ISOPAK ladder, attach crane and slings to shipping frame (25).



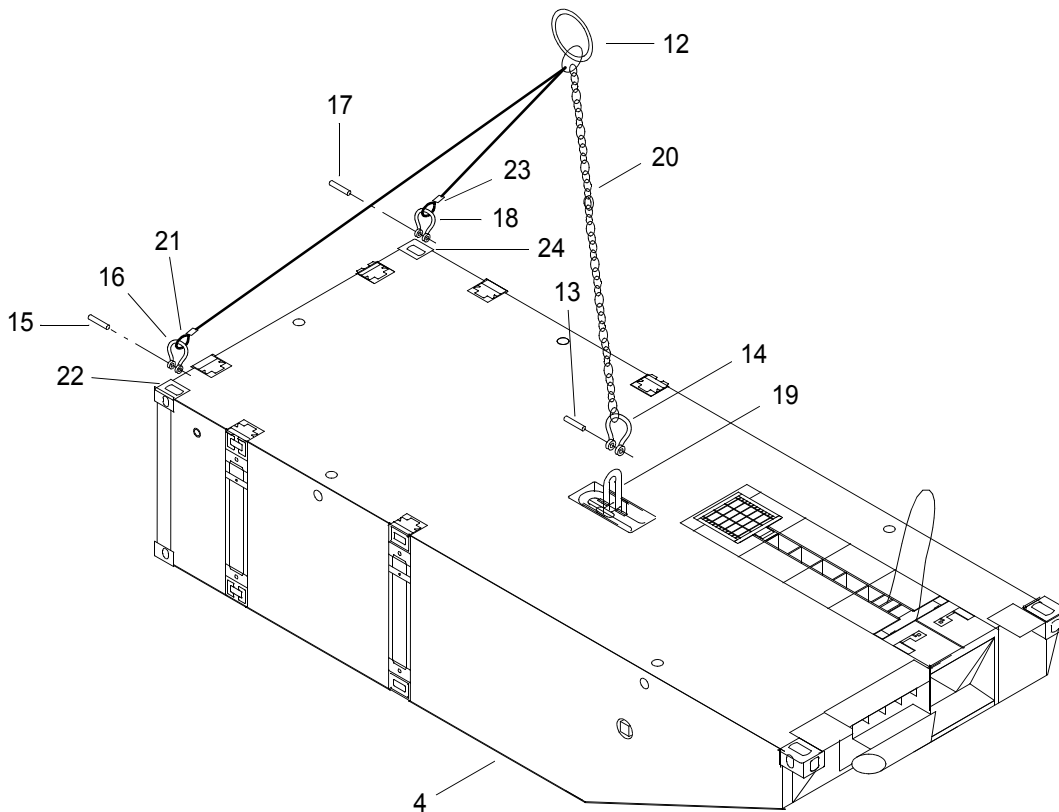
5. Descend from top of shipping frame (25) and remove ladder.

WARNING**HEAVY PARTS**

6. Lift shipping frame (25) and place on top of connected end rakes (4).
7. Lock eight ISOPAK vertical connectors (7) attaching shipping frame (25) to end rake modules (4) by moving the lever (9).
8. Remove crane and sling.

INSTALL PLENUM SHIPPING FRAME ON END RAKE MODULES

1. Install three leg sling (12) on end rake module (4).



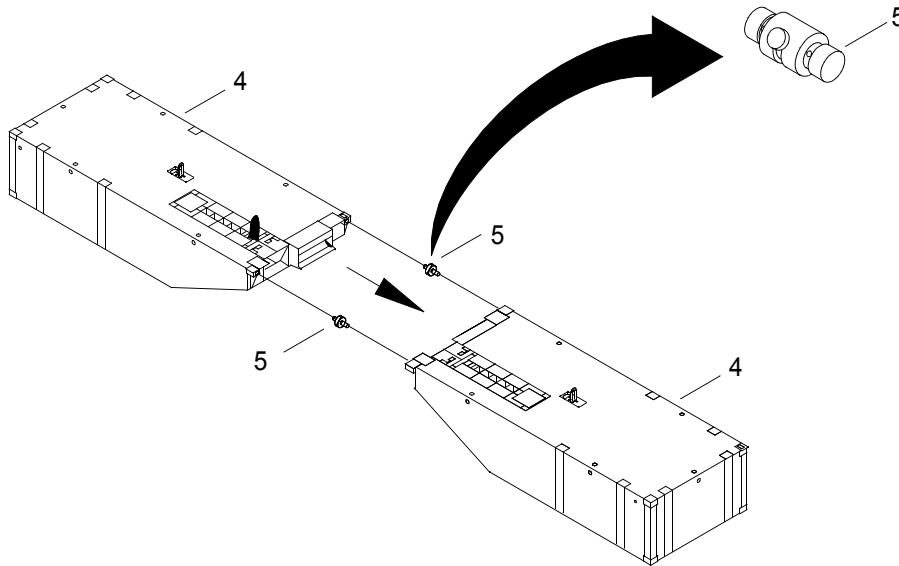
- a. Remove shackle pin (13) from shackle (14).
- b. Remove shackle pin (15) from shackle (16).
- c. Remove shackle pin (17) from shackle (18).
- d. Insert shackle (14) through module lifting shackle (19) and chain (20).
- e. Install shackle pins (13) in shackle (14).

- f. Insert shackle (16) through sling eye (21) and module ISO fitting (22).
- g. Install shackle pin (15) in shackle (16).
- h. Insert shackle (18) through sling eye (23) and module ISO fitting (24).
- i. Install shackle pin (17) in shackle (18).

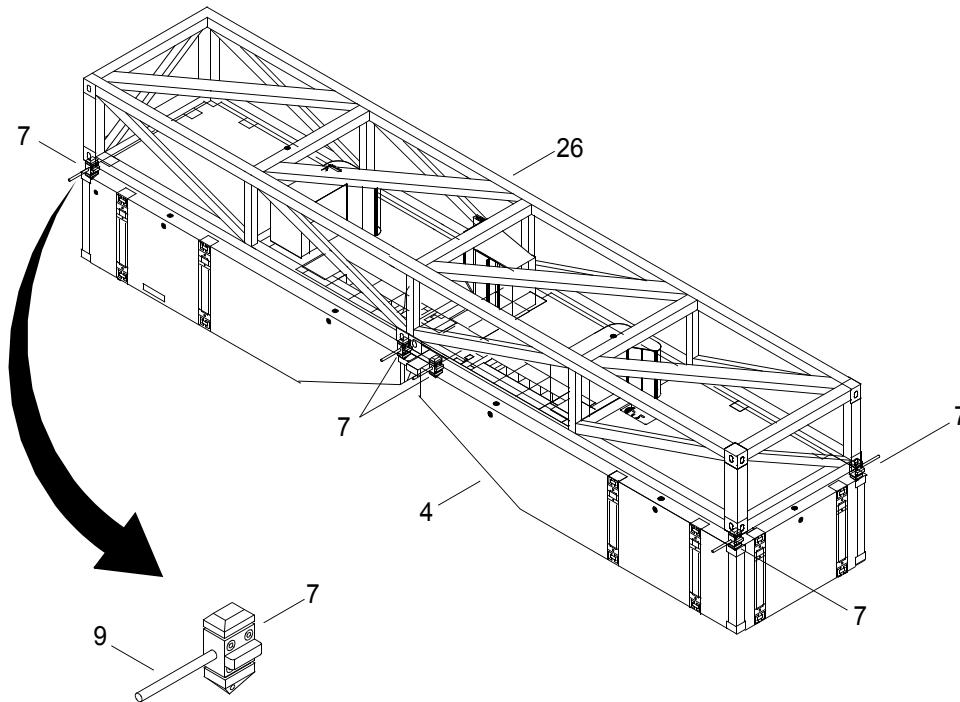
WARNING

**HEAVY PARTS**

2. Using crane and sling, position two end rake modules (4) nose to nose.
3. Connect end rake modules (4) nose to nose with two horizontal ISOPAK connectors (5).



4. Using ISOPAK ladder, attach crane and slings to shipping frame (26).



5. Descend from top of shipping frame (26) and stow ladder in BII container.

WARNING



HEAVY PARTS

6. Lift shipping frame (26) and place on top of connected end rakes (4).
7. Lock eight ISOPAK vertical connectors (7) attaching shipping frame (26) to end rake modules (4) by moving the lever (9).
8. Remove crane and sling.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
OPERATION UNDER UNUSUAL CONDITIONS**

INITIAL SETUP:**Personnel Required**Seaman 88K

UNUSUAL ENVIRONMENT/WEATHER

WARNING

It is critical for safety purposes to keep the engine hatch covers closed when engines are running, except when engine maintenance is being performed. Failure to do so can result in personal injury.

1. During extreme heat, perform the following steps.
 - a. Keep engine coolant at proper level.
 - b. Do not fill the fuel tank above full mark. Allow room for expansion of fuel.
 - c. Increase battery PMCS. Keep electrolytes to proper level.
 - d. Verify engine exhaust fans are on keeping engine room compartment temperature from rising 20°F above ambient temperature.

CAUTION

Follow drainage procedures for raw water system, as required, in daily PMCS during below freezing weather conditions 32°F. Failure to do so will result in severe damage to the system.

2. During extreme cold, perform the following steps.
 - a. Inspect water discharge outlets, connectors, deck, deck fittings, hatch latches and any other areas or components that may have operational or safety factors affected by ice buildup.
 - b. Check bilge pumps frequently for operation. If necessary, use hot air or hot water to thaw pumps.
 - c. Keep engine coolant mixture at proper mixture to prevent freeze up.
3. When operating the WT in salt water perform the following steps.
 - a. Always keep hatch covers closed.
 - b. Check frequently for signs of corrosion wherever surfaces are exposed to salt water and air exposure.

{1} Check above deck lights, portable fire extinguisher, topside equipment and electrical components/connections.

{2} Wipe items frequently to remove excess moisture accumulation.

4. In the event the WT must be operated with only one engine, perform the following steps.
 - a. Adjust steering procedures to prevent turning.
 - b. Report the problem and return to shore as soon as possible for repairs.
5. In the event the WT loses power to both engines, perform the following steps.
 - a. Deploy the anchor to avoid drifting.
 - b. Radio for emergency help.
6. In the event the weather conditions rise above Sea State condition 2, perform the following steps.
 - a. Proceed with caution to a safe harbor and deploy the anchor.
 - b. If movement is not possible, deploy stern anchor and abandon the WT until sea conditions improve.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DIESEL ENGINE
OPERATION UNDER UNUSUAL CONDITIONS**

INITIAL SETUP:**Personnel Required**

Seaman 88K

References

TM 55-1945-205-24-3-2

EMERGENCY PROCEDURE - EMERGENCY SHUTDOWN OF THE ENGINE

WARNING

It is critical for safety purposes to keep the engine hatch covers closed when engines are running, except when engine maintenance is being performed. Failure to do so can result in personal injury.

CAUTION

Emergency shutdown should be used only when the engine does not respond to the normal stopping procedure. Use of emergency shutdown can cause lubricating oil to be sucked past the oil seals and into the blower housing and/or cause damage to the turbocharger.

To ensure positive closure should another emergency shutdown be required, the shutdown must be checked and required repairs or adjustments made. Failure to comply may permit engine run-on when the emergency shutdown is activated.

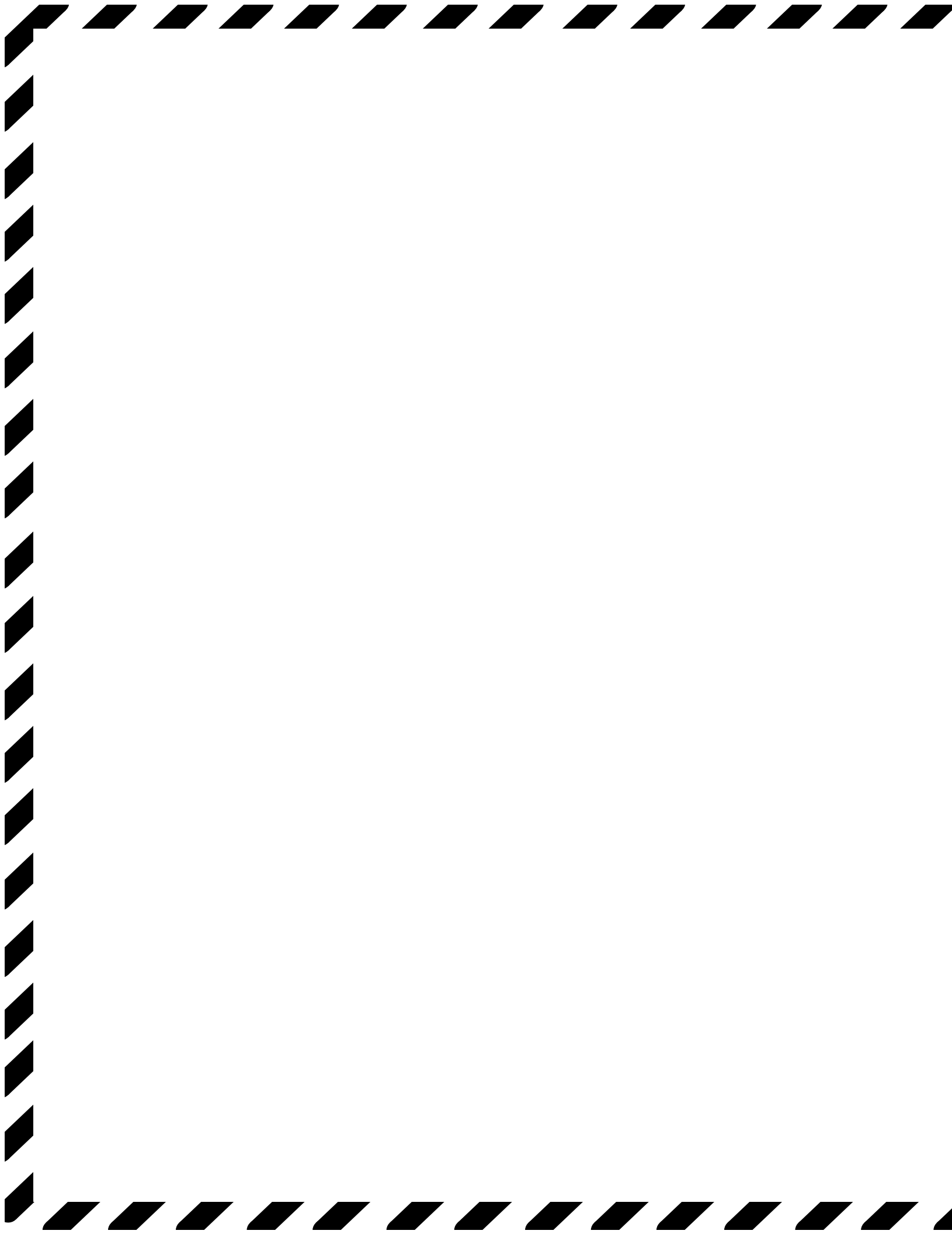
NOTE

The engine emergency stop is automatic when the fire suppression system is actuated or on an overspeed condition.

The air manifold intake flapper door must be manually reset by moving reset lever downward when normal conditions resume.

1. Press the EMERGENCY STOP button. (WP 0006 00)
2. After the emergency shutdown, check for engine damage and proper operation before the WT is returned to service. (TM 55-1945-205-24-3-2)
3. Reset the air shutdown, located in the air inlet housing. (WP 0006 00)

END OF WORK PACKAGE



**OPERATOR MAINTENANCE
WARPING TUG
FIRE SUPPRESSION SYSTEM
OPERATION UNDER UNUSUAL CONDITIONS**

INITIAL SETUP:**Tools**

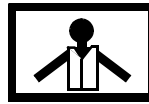
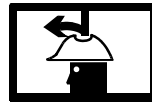
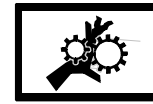
Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

EMERGENCY PROCEDURE - MANUALLY OPERATE THE FIRE SUPPRESSION SYSTEM**ACTIVATE FIRE SUPPRESSION FROM ABOVE DECK**

WARNING

**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

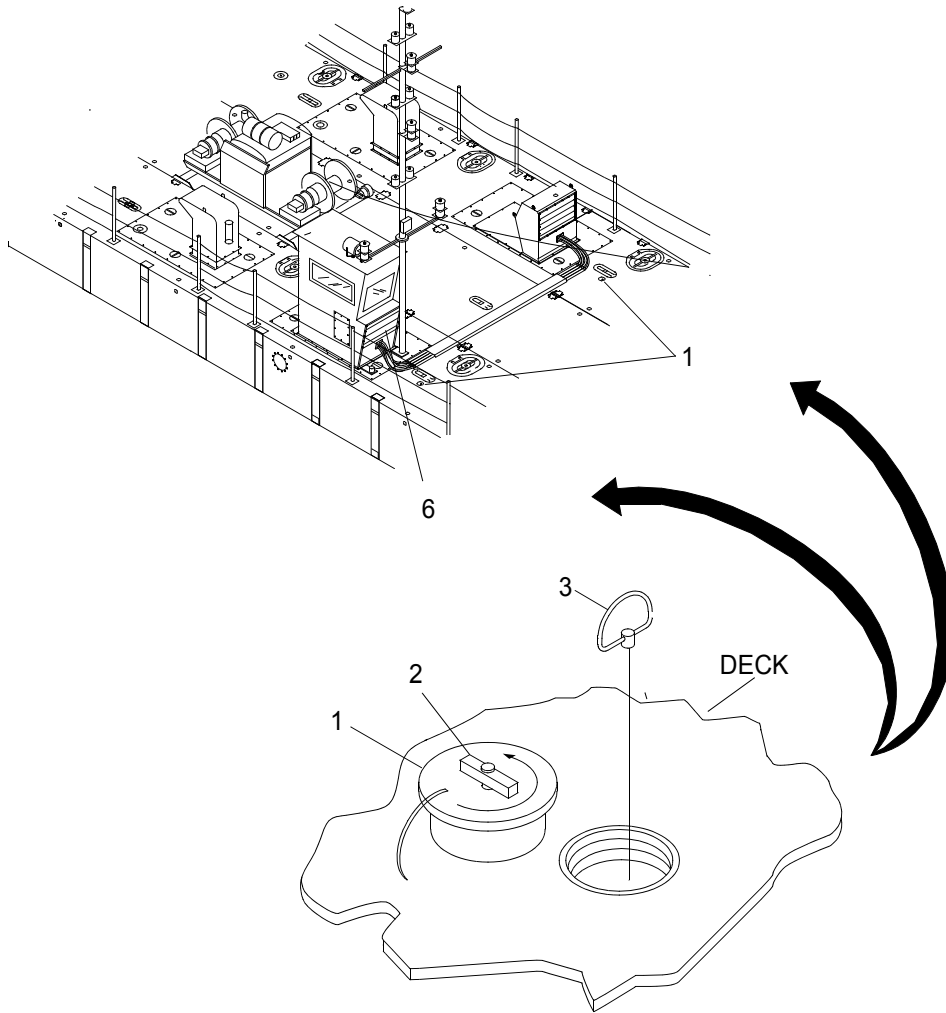
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

CO2 reduces the available oxygen in the atmosphere and will not support life. Accidental discharge of this agent can cause serious injury or death to personnel.

NOTE

In case of fire, activate the fire suppression system and/or use the hand operated fire extinguisher.

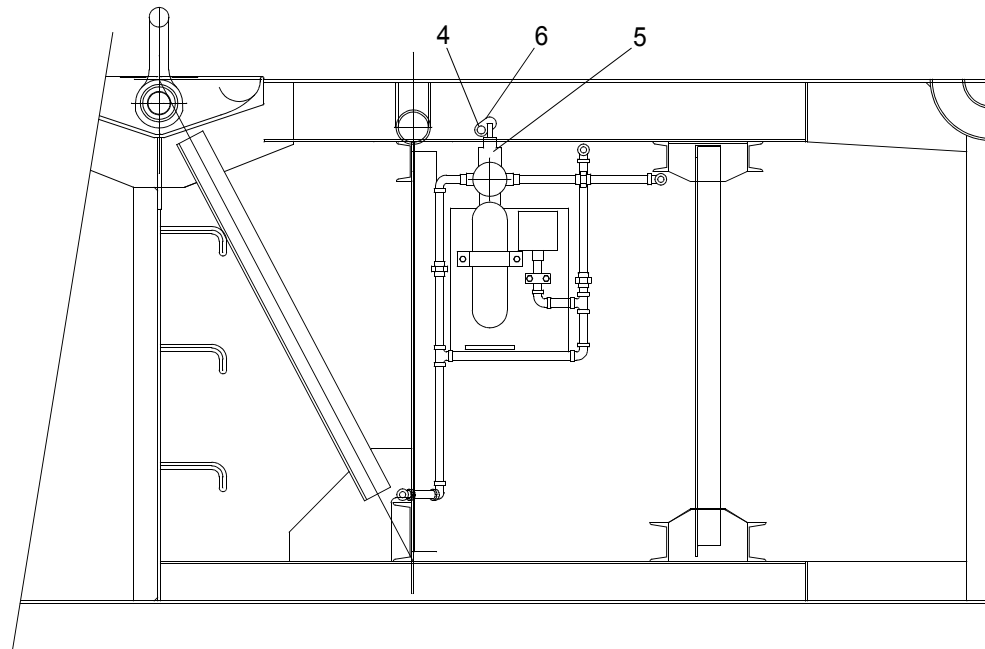
1. Remove deck soft plug (1).



- a. Turn T-bar (2) counterclockwise to loosen.
 - b. Pull deck soft plug (1) from deck.
2. Pull fire suppression handle (3) to activate fire suppression system.

ACTIVATE FIRE SUPPRESSION SYSTEM FROM TIME DELAY CYLINDER

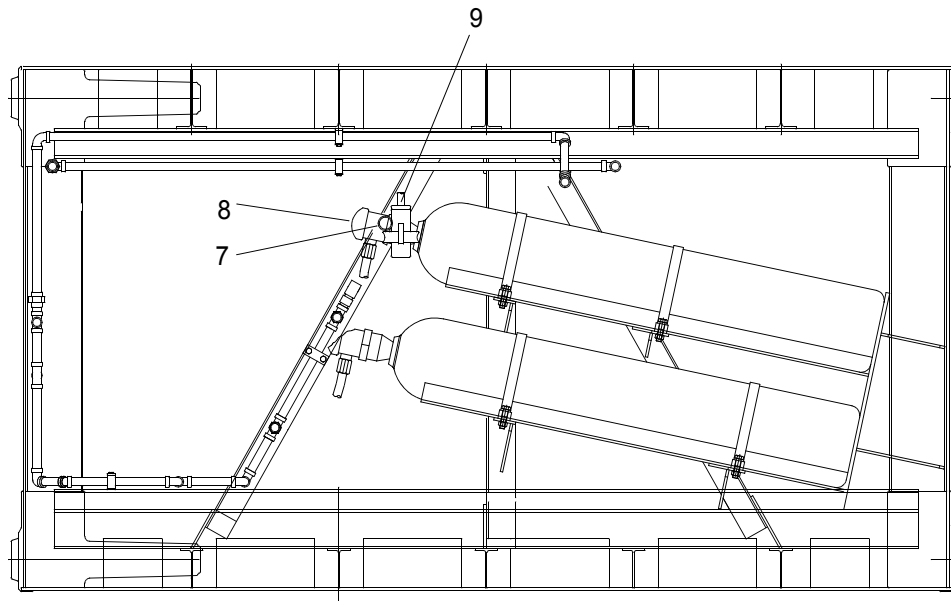
1. Pull pin (4) from time delay cylinder (5).



2. Pull lever (6) to actuate fire suppression system.

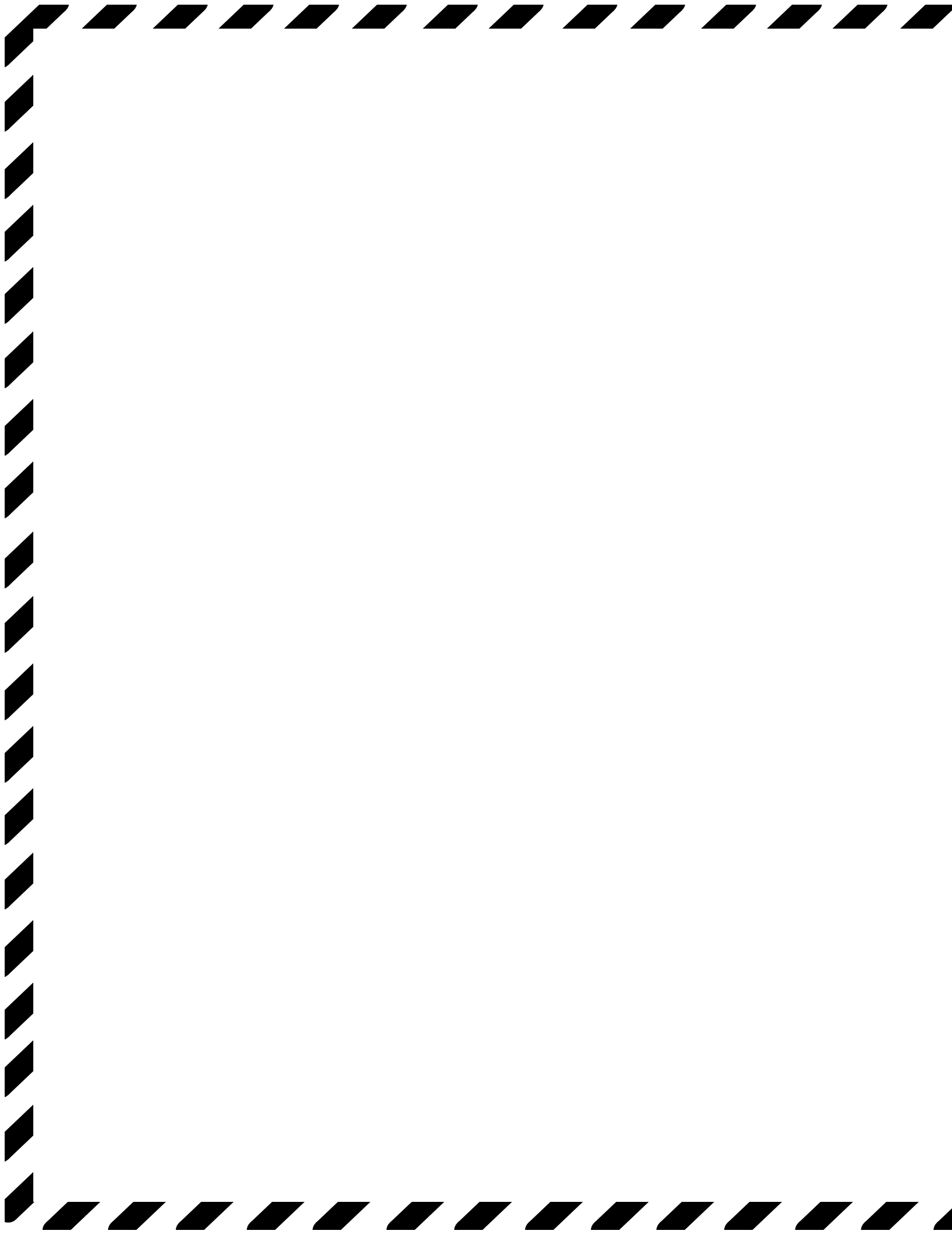
ACTIVATE FIRE SUPPRESSION SYSTEM FROM CO2 CYLINDER

1. Pull pin (7) from CO2 cylinder (8).



2. Pull lever (9) to actuate fire suppression system.

END OF WORK PACKAGE



**OPERATOR MAINTENANCE
WARPING TUG
STEERING SYSTEM
OPERATION UNDER UNUSUAL CONDITION**

INITIAL SETUP:**Tools**

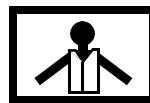
Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

EMERGENCY PROCEDURE - EMERGENCY STEERING

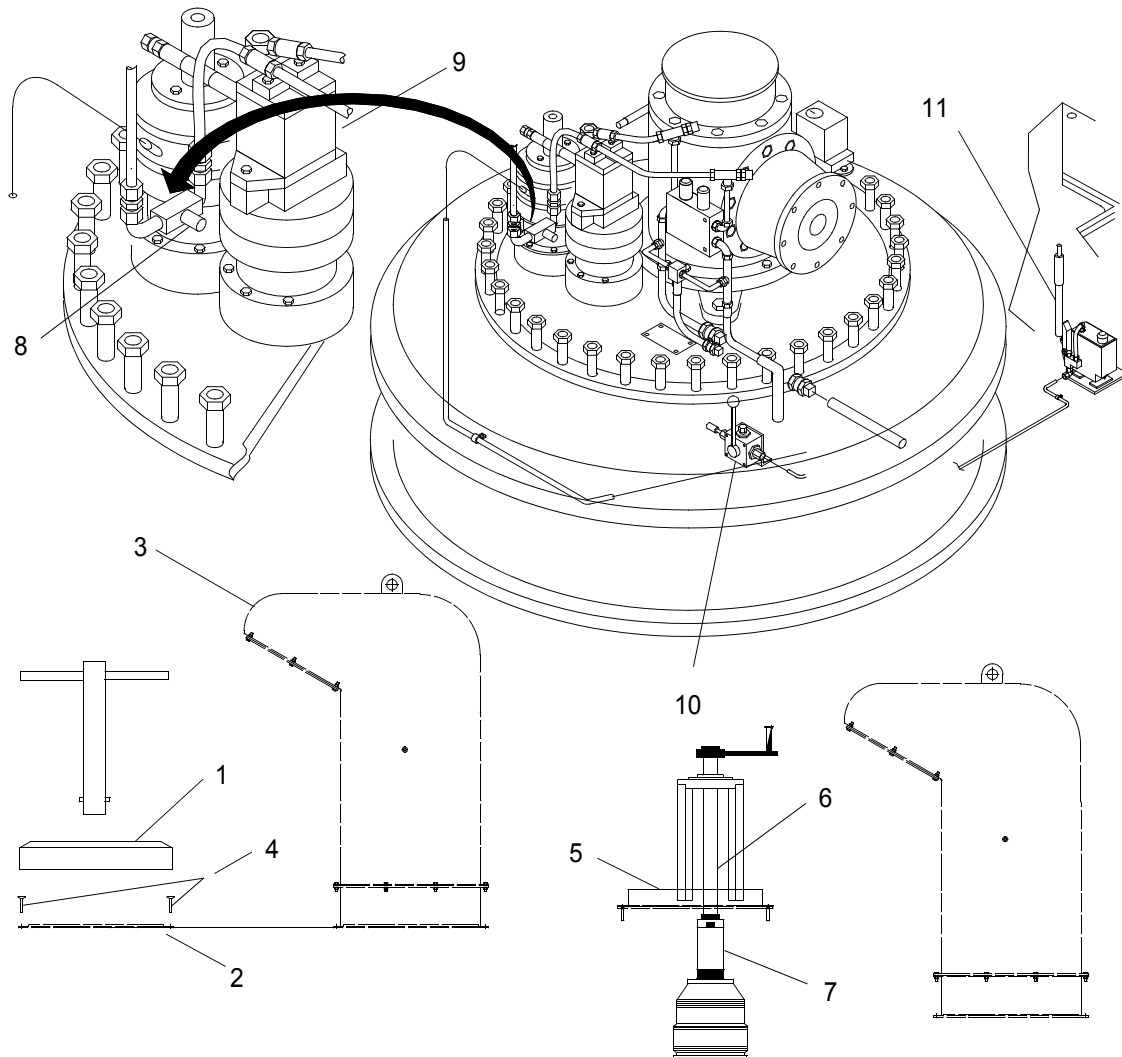
WARNING

**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Remove emergency steering unit from the lazaret compartment (forward machinery hatch of propulsion module).

2. Remove emergency steering hatch cover (1) on propulsion module pump-jet thruster hatch (2) located aft of the exhaust plenum (3).



3. Remove three flat head screws (4) from the pump-jet thruster hatch (2).
4. Set support (5) on pump-jet thruster hatch (2) and install three flat head screws (4) through the slotted holes in the support (5). Do not tighten.
5. Install drive shaft (6) on hydraulic steering motor shaft (7).
 - a. Align the drive shaft (6) with the steering motor shaft (7).

NOTE

Ensure that drive shaft (6) and steering motor shaft (7) are not binding.

- b. Check steering assembly for proper vertical alignment of the drive shaft (6) with the steering motor shaft (7).
6. Tighten three flat head screws (4) securing support (5) to pump-jet thruster hatch (2).

CAUTION

Do not attempt to operate steering hydraulically with needle valve closed and emergency steering shaft connected. Serious damage to gearbox, shaft or motor may result.

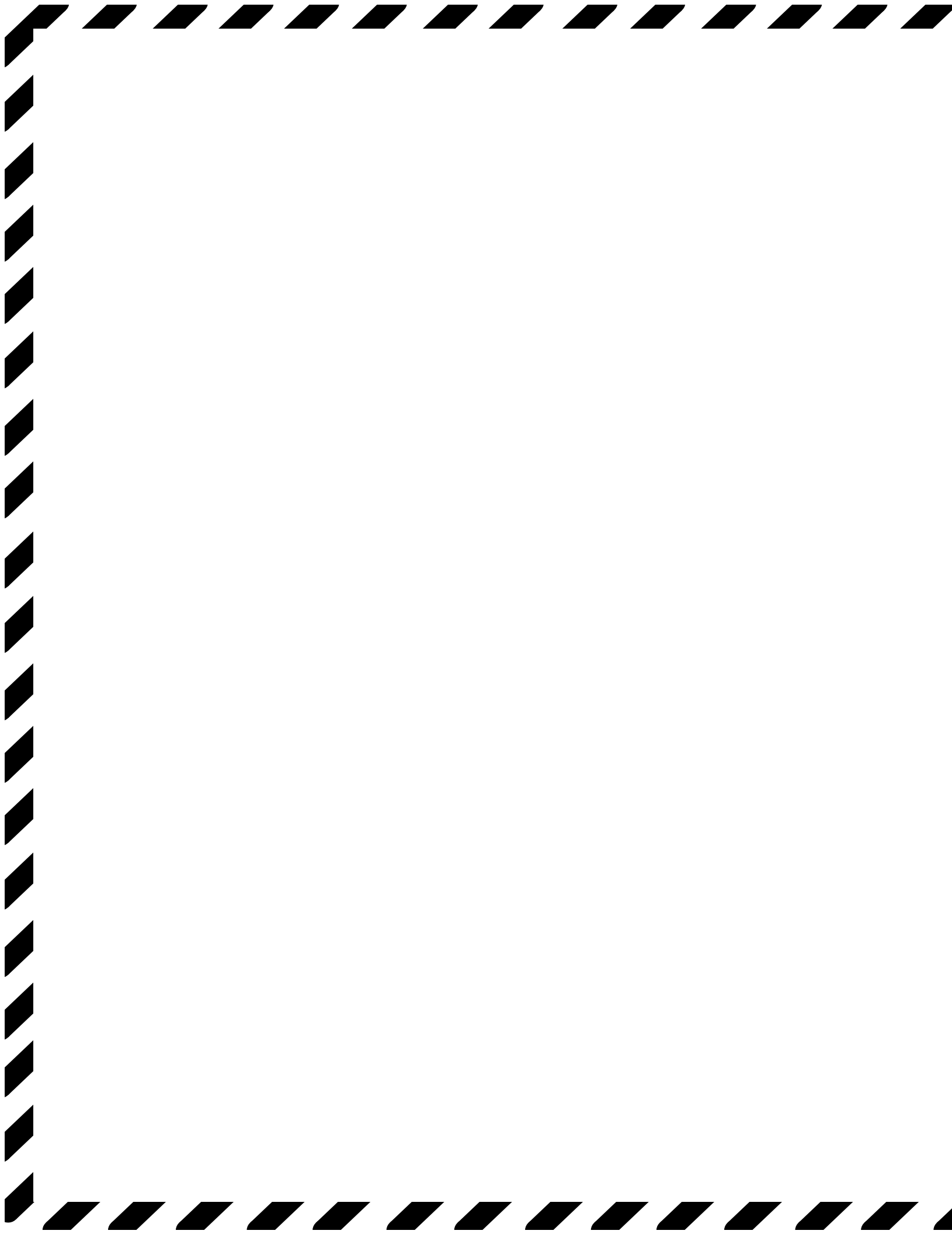
7. Open the emergency steering needle valve (8) on the hydraulic steering motor (9).
8. Turn 3/2 way-valve (10).
9. Release brake with hand pump (11).

NOTE

During emergency steering operation the operator in the operators cab will instruct the crewman operating the hand crank to turn the crank based on the thrust dial indicator reading.

10. Rotate the hand crank counterclockwise CCW to move the pump-jet thruster nozzle and move the warping tug to the right.
11. Rotate the hand crank clockwise CW to move the pump-jet thruster nozzle and move the warping tug to the left.

END OF WORK PACKAGE



**OPERATOR MAINTENANCE
WARPING TUG
STEERING SYSTEM
OPERATION UNDER UNUSUAL CONDITION**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanics Rail and Marine (Item 76, WP 0108 00)
Gloves, Chemical (Item 29, WP 0108 00)
Goggles, Industrial (Chipping, Chemical) (Item 32, WP 0108 00)

Personnel Required

Seaman 88K

Equipment Condition

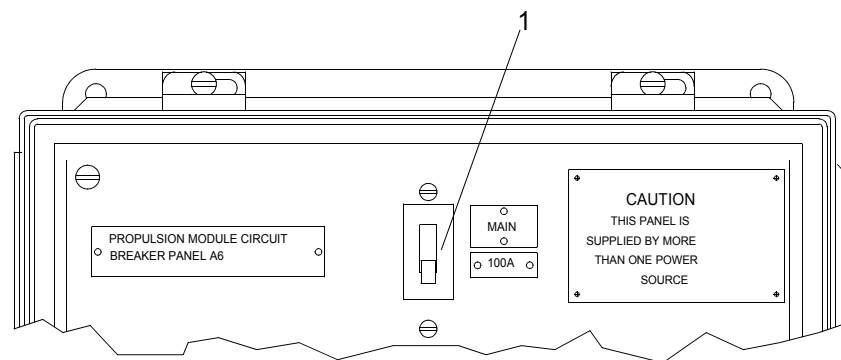
Engine Shut Down. (WP 0022 00)

EMERGENCY PROCEDURE - EMERGENCY ENGAGEMENT OF MARINE GEAR**NOTE**

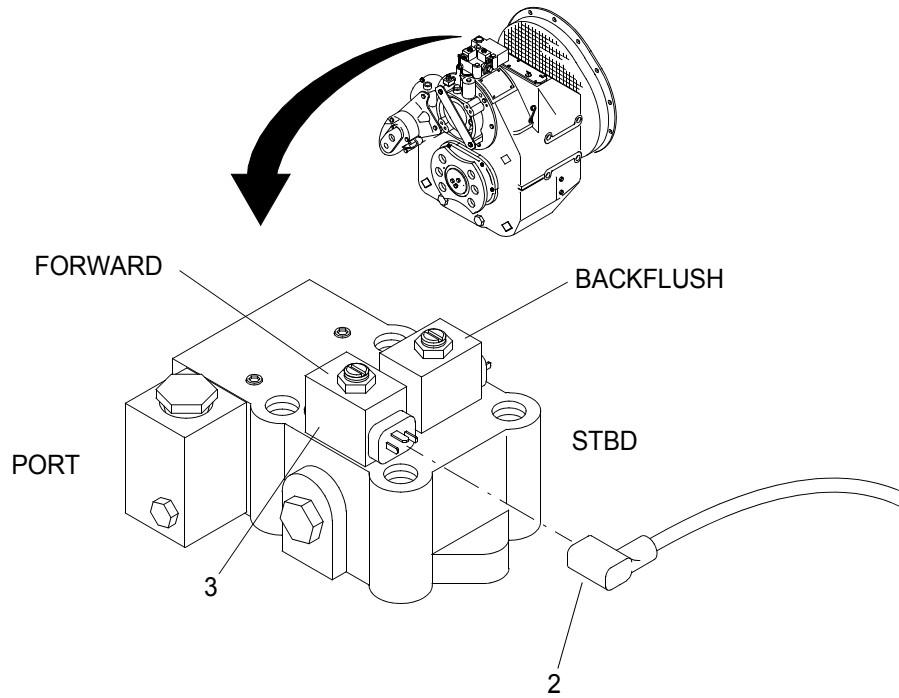
The following procedure is typical for the installation of the emergency lock-up plug used to lock the marine gear into the forward or backflush position.

After installation of the emergency lock-up plug, the lower control panel A2 PORT/STBD CLUTCH toggle switch will no longer control the marine gear. The marine gear will remain locked until the plug is removed.

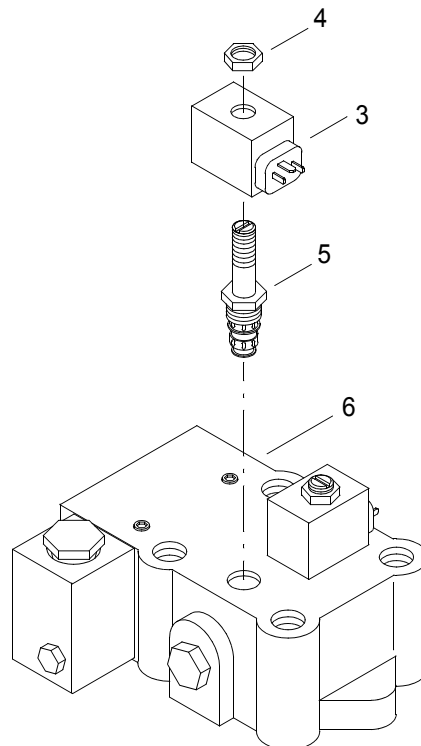
1. Verify MAIN circuit breaker (1) on propulsion module circuit breaker panel A6 is in off position.



2. Disconnect electrical plug-in connection (2) from forward control valve solenoid (3).

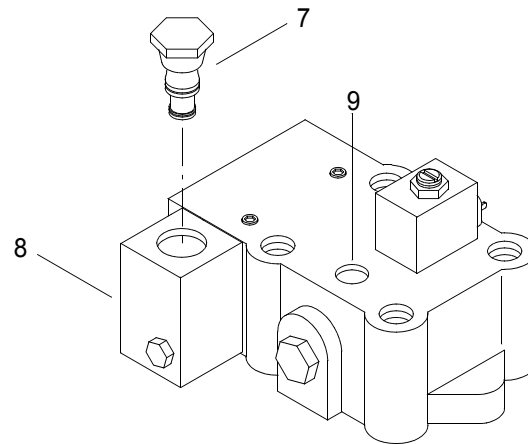


3. Remove nut (4) and control valve solenoid (3) from control valve (5).



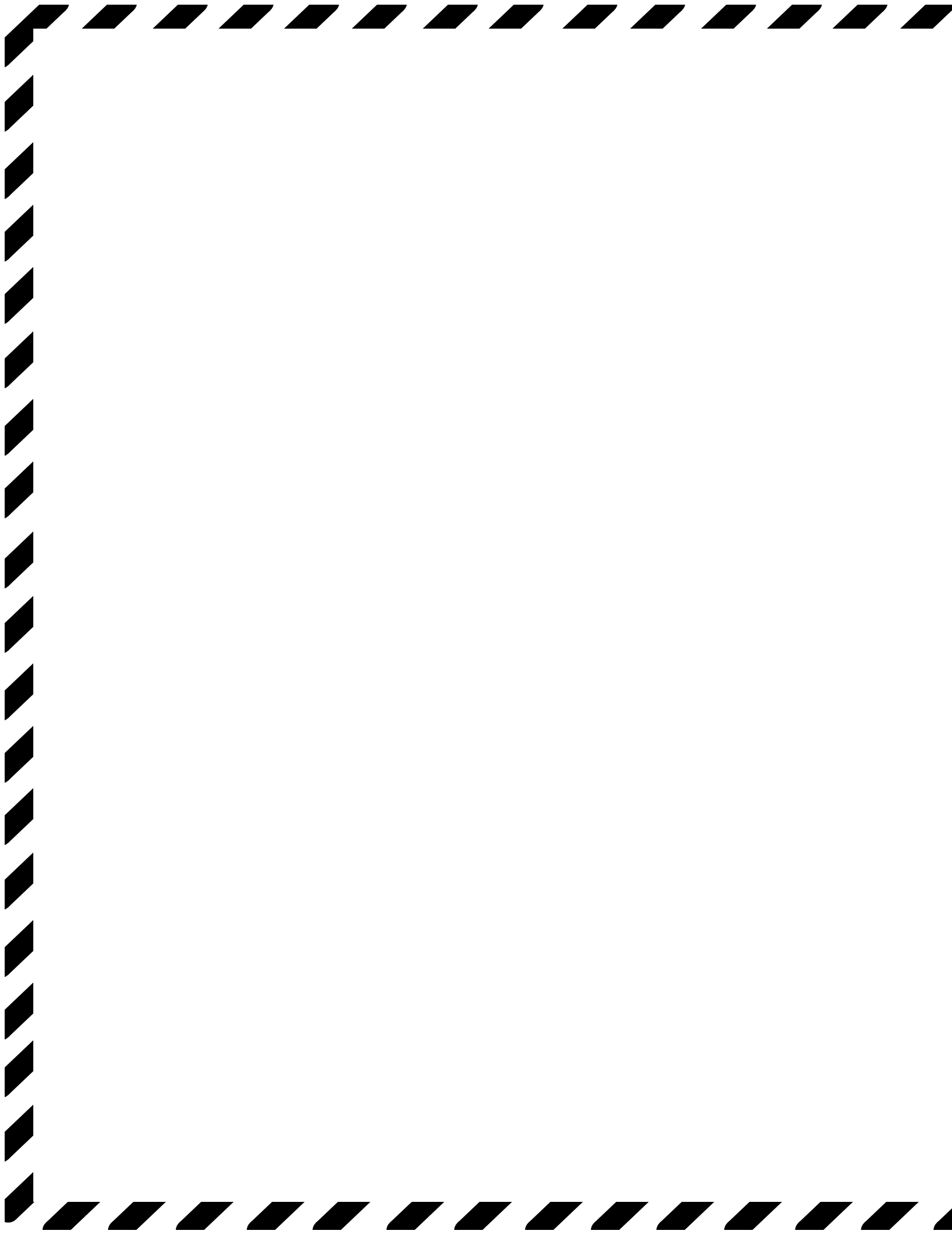
4. Remove the control valve assembly (5) from the control valve body (6).

-
5. Remove cavity plug (7) from plug carrier (8).



6. Install cavity plug (7) in port (9) vacated by control valve (5) and tighten plug (7).
7. Start engine. (WP 0022 00)
8. Upon completion of mission, contact unit maintenance for replacement/repair of marine forward control valve solenoid (3).

END OF WORK PACKAGE



**OPERATOR MAINTENANCE
WARPING TUG
PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER
OPERATION UNDER UNUSUAL CONDITION**

INITIAL SETUP:**Tools**

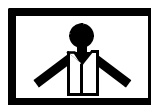
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

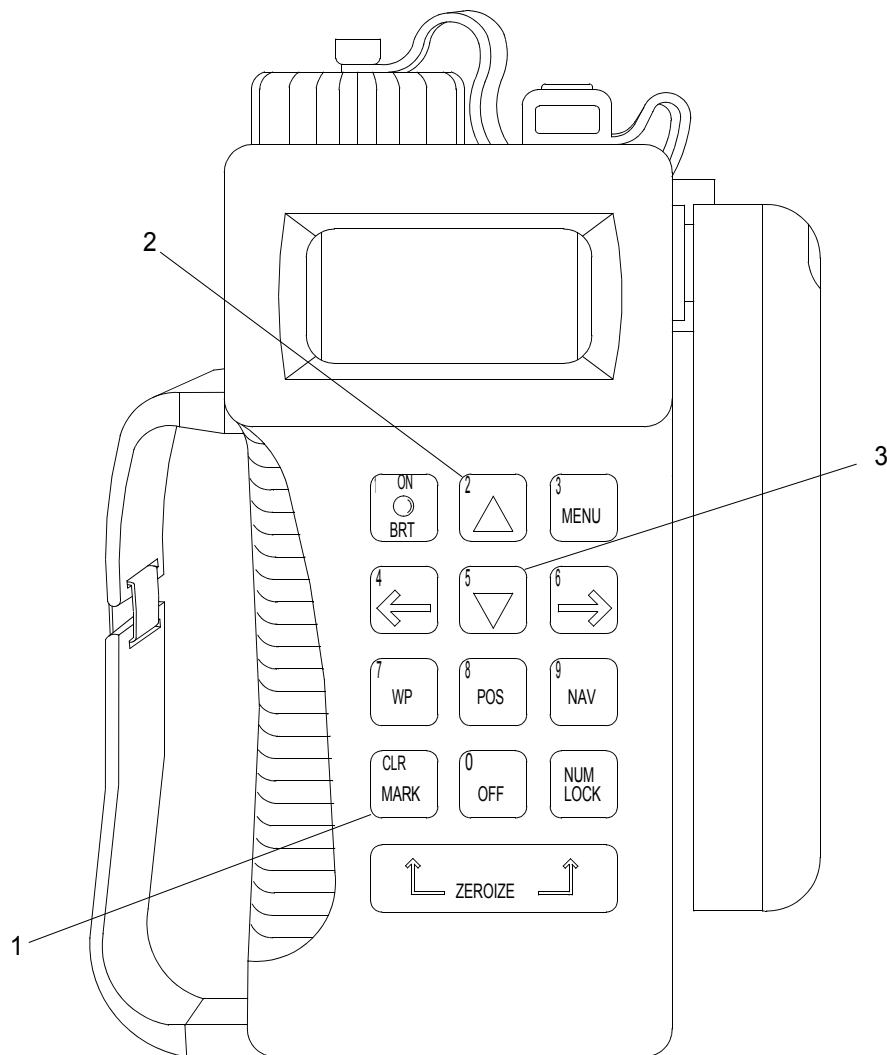
EMERGENCY PROCEDURE - MARK POSITION OF MAN OVERBOARD

WARNING

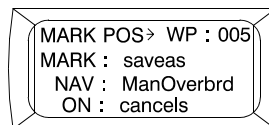
**VEST****HELMET PROTECTION****HEAVY PARTS****MOVING PARTS**

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

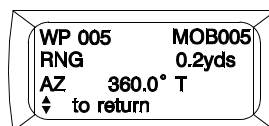
1. The man overboard selection is utilized using the MARK key (1). When notified that a man is overboard, immediately press the MARK key (1). Pressing the MARK key (1) freezes the current position.



2. When the MARK key (1) is pressed the first time, the MARK POS display will appear. The waypoints field will be flashing. You may keep this waypoint number or assign a different designation using the UP ARROW key (2) or DOWN ARROW key (3).



3. If a waypoint number is chosen that already exists, OVERWRITES will appear on the display.
4. To store the man overboard information, press the MARK key (1) again.
5. Navigate to the man overboard marked position to rescue the man overboard.



END OF WORK PACKAGE

**OPERATOR MAINTENANCE
 WARPING TUG
 VHF/FM DSC TRANSCEIVER
 OPERATION UNDER UNUSUAL CONDITIONS**

INITIAL SETUP:

Tools

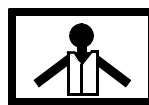
- Gloves, Men’s and Women’s (Leather Palm) (Item 31, WP 0108 00)
- Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
- Life Preserver, Vest (Item 45, WP 0108 00)
- Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

EMERGENCY PROCEDURE - SEND DISTRESS USING VHF/FM DSC TRANSCEIVER

WARNING



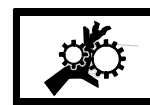
VEST



HELMET PROTECTION



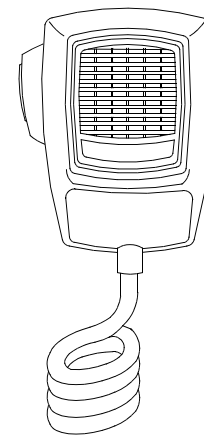
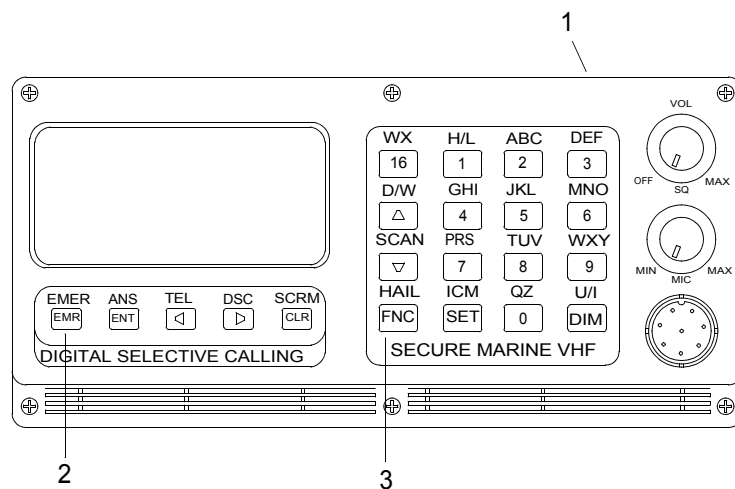
HEAVY PARTS



MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

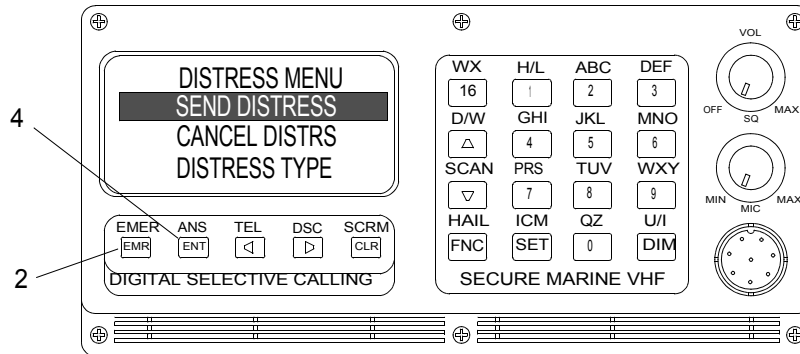
1. The EMERGENCY mode may be used to send a distress call. The distress call automatically includes the vessel’s DSC call sign and LAT/LON position. The vessel’s position can be sent only if the PLGR is operational.
2. To access the EMERGENCY functions of the transceiver (1), press the EMR key (2) or press the FNC key (3) and the EMR key (2).



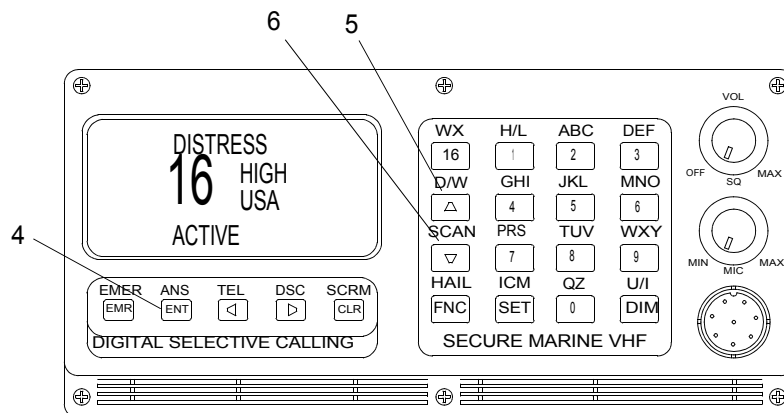
SEND DISTRESS**NOTE**

The menu selection by default is the “send distress” option.

- To access and send a distress call, first go to DISTRESS MENU by pressing the EMR key (2).



- From the DISTRESS MENU, press and hold the EMR key (2) or the ENT key (4). The display prompts the user to HOLD KEY TO SEND DISTRESS and has a countdown indicator on the bottom line displaying the number of seconds until transmission of the distress call. The EMR key (2) or the ENT key (4) must be held for 5 seconds before the distress call will be transmitted. If the key is released before the distress call is sent, the transmit timer will restart at 5 seconds.

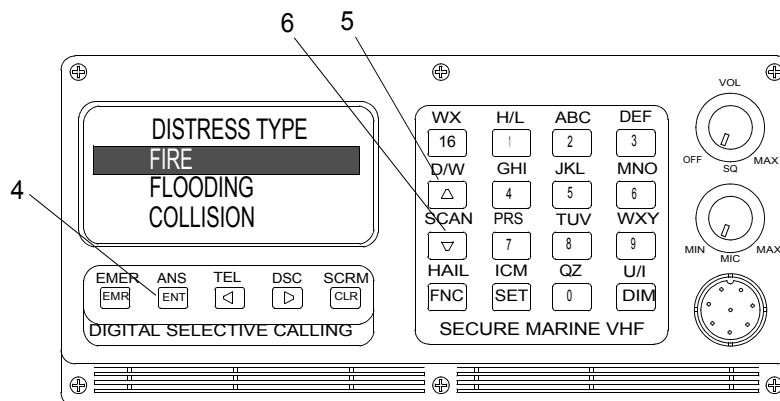


- To specify the type of distress, select the DISTRESS TYPE menu option with the UP ARROW key (5) or DOWN ARROW key (6) and press the ENT key (4). The menu options are:

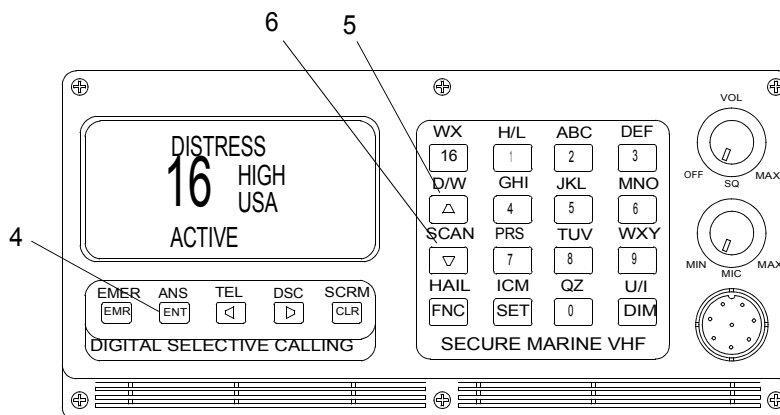
| |
|-----------|
| FIRE |
| FLOODING |
| COLLISION |
| GROUNDING |
| CAPSIZING |
| SINKING |
| ADRIFT |

| |
|---|
| UNDESIGNATED (default if none selected) |
| ABANDONING |
| PIRACY |
| MAN OVERBOARD |

4. Select the type of distress with UP ARROW key (5) or DOWN ARROW key (6) and press the ENT key (4). The selected distress type will remain active until the radio is turned off.

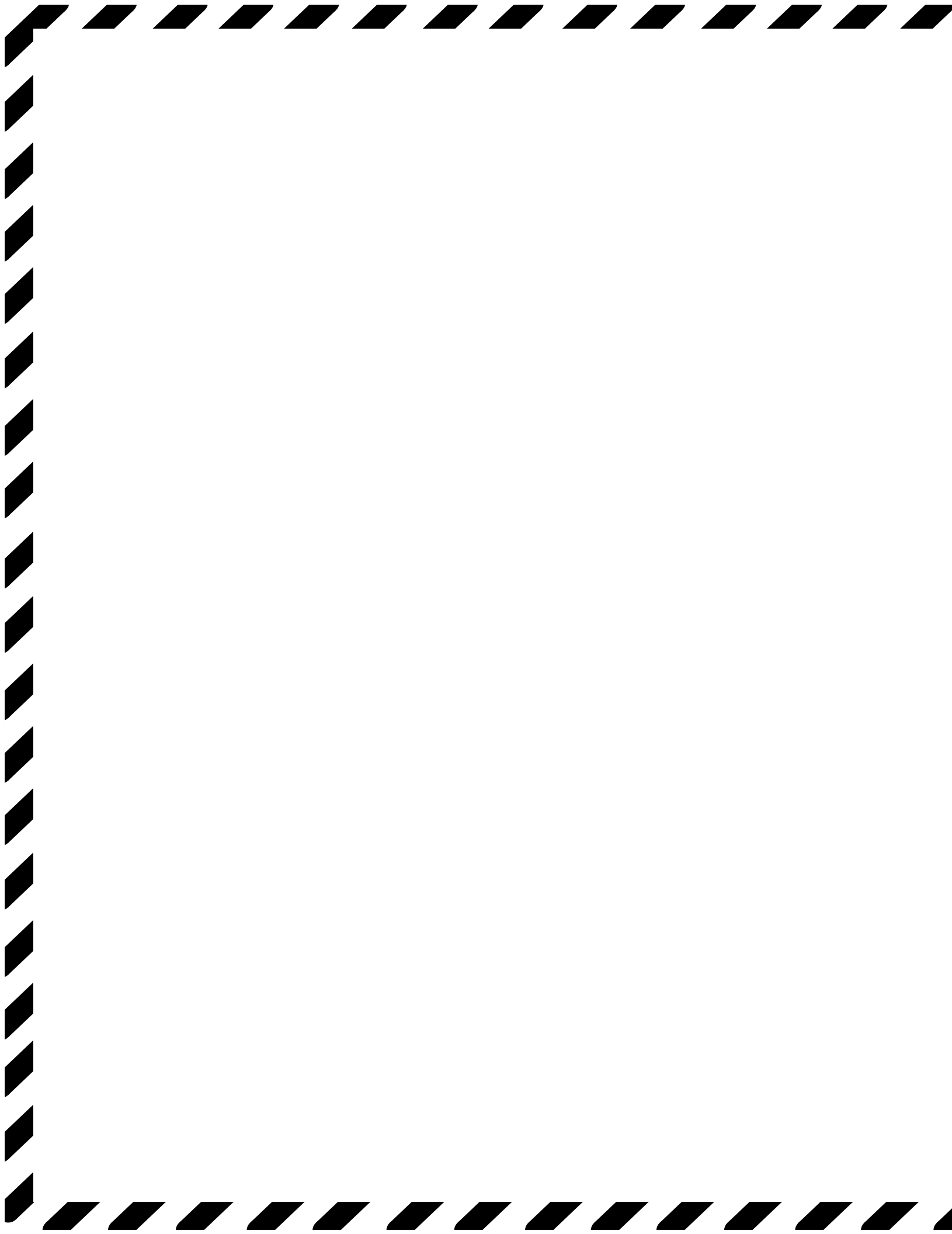


5. DISTRESS will appear in the upper line of the display and ACTIVE will appear in the lower line while waiting for an acknowledgement. If a DSC acknowledgement is not received from a shore station within two minutes, the distress call will be automatically repeated. If, after five minutes from the second call, a shore station has not acknowledged the distress call or cancelled by the sender, distress will be rebroadcast with an updated position. Distress will continue to be rebroadcast every five minutes until either acknowledged or cancelled. When acknowledgement is received, DISTRESS CALL ACKNOWLEDGEMENT PRESS ANY KEY will be displayed and the distress call will be automatically cancelled.



- a. Other functions of the transceiver may be used while the EMERGENCY mode is active.
 - b. As a reminder that the EMERGENCY mode is active, the distress tone will sound for five seconds every thirty seconds.
6. Select the LAT/LON ENTRY option from the MAIN DISTRESS MENU. Use the UP ARROW key (5) or DOWN ARROW key (6) and press the ENT key (4). If the transceiver has no position from the PLGR, the screen will be blank. Enter the latitude and longitude for the current position. To enter the hemisphere, press the corresponding key where the alpha character is located.

END OF WORK PACKAGE



**OPERATOR MAINTENANCE
WARPING TUG
VHF/FM DSC TRANSCEIVER
OPERATION UNDER UNUSUAL CONDITIONS**

INITIAL SETUP:

Tools

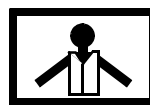
- Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
- Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
- Life Preserver, Vest (Item 45, WP 0108 00)
- Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

EMERGENCY PROCEDURE - RECEIVE DISTRESS USING THE VHF/FM DSC TRANSCEIVER

WARNING



VEST



HELMET PROTECTION



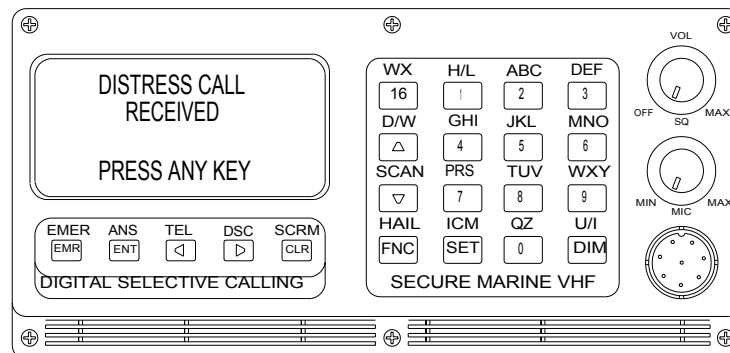
HEAVY PARTS



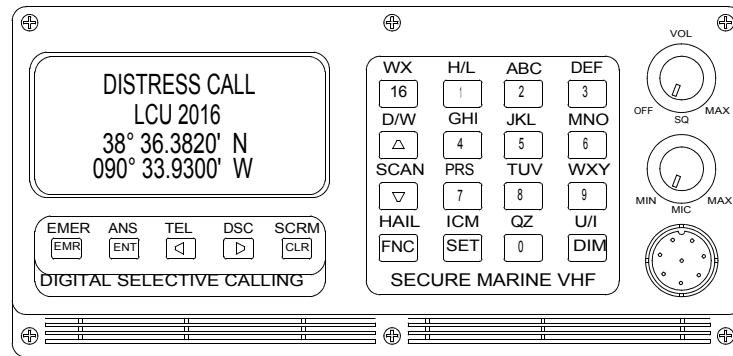
MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. When a distress is received, a distress tone will be heard on the radio. The VHF/FM DSC transceiver will default to the distress display. Press any key.



- The vessel position and identification will appear in the transceiver display.

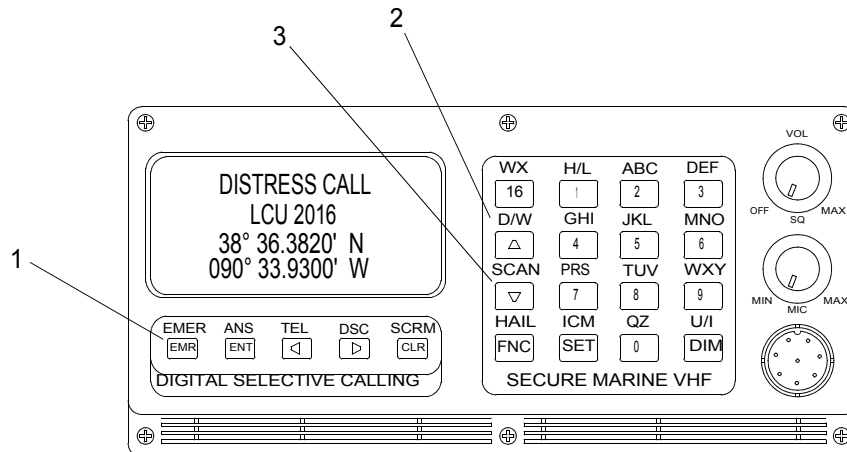


ACKNOWLEDGE DISTRESS

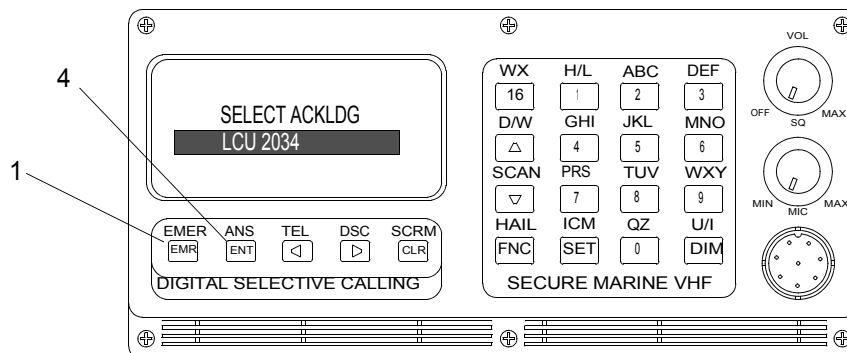
NOTE

A distress call cannot be acknowledged for the first 80 seconds after receiving the call. This allows time for shore base stations to respond to the distress call.

- Press the EMER key (1) to acknowledge a distress call that the transceiver has received. Select the DISTRESS ACK key option from the main distress menu with the UP ARROW key (2) or the DOWN ARROW key (3).

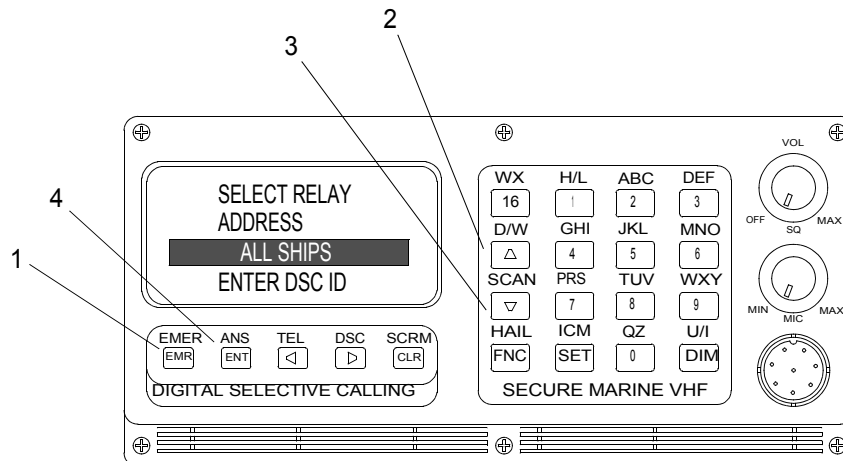


- Press the ENT key (4). The next display will be the DISTRESS LOG. Select the distress log entry which corresponds to the distress call that is to be acknowledged and press the ENT key (4).

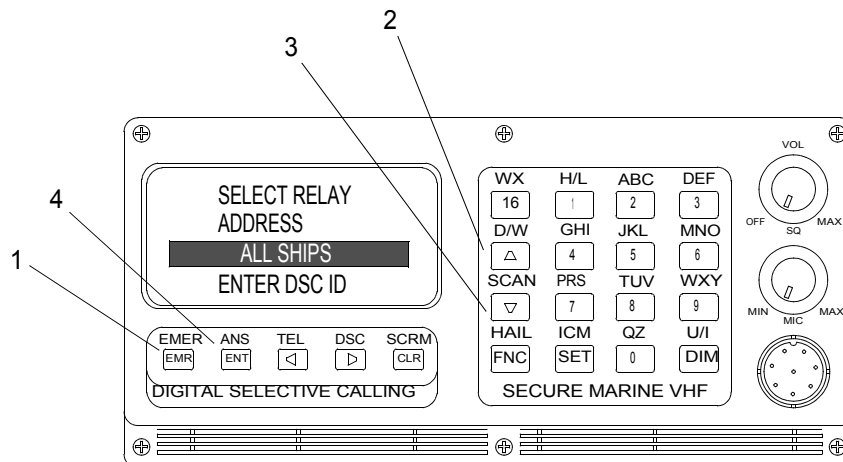


DISTRESS RELAY

1. Press the EMER key (1) to relay a distress call received by the transceiver. Select DISTRS RELAY from the main distress menu with the UP ARROW key (2) or the DOWN ARROW key (3) and press the ENT key (4). The distress log will be displayed. Select the distress log entry which corresponds to the distress call that is to be relayed. Press the ENT key (4).



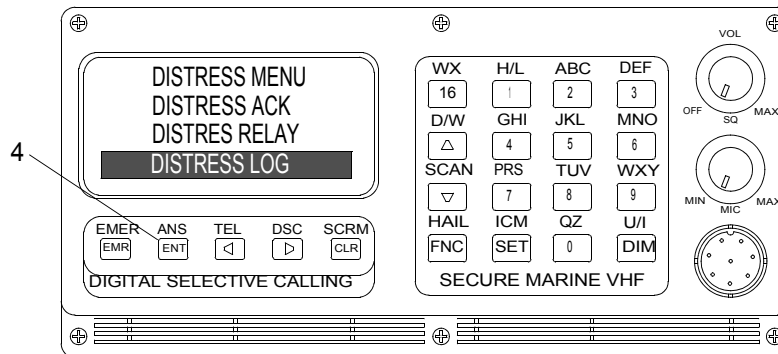
2. The next example is used to specify the destination of the relay distress call and contains the selection of either ALL SHIPS or DSC ID. The default is to ALL SHIPS and should be used if an official coast station's DSC ID is not known. With the ALL SHIPS option selected, press the ENT key (4) to send the distress relay.



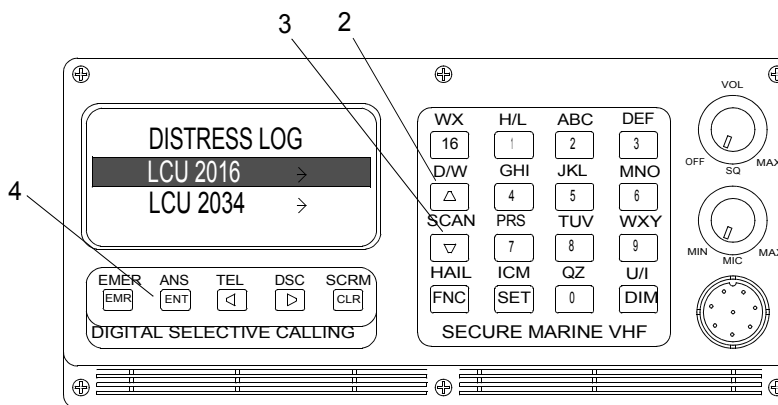
3. If the DSC ID of the coast station is known, select the DSC ID option. Press the ENT key (4). Enter the DSC ID key in the space provided. Press the ENT key (4) to send the distress relay.
4. The DISTRESS RELAY option is not available for distress calls that have already been acknowledged.

DISTRESS LOG

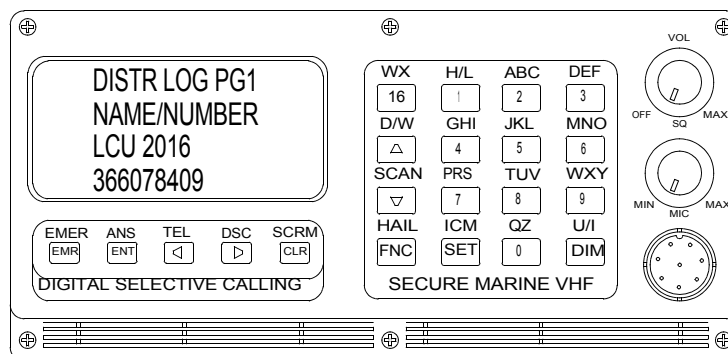
- The information and status of the last 20 distress calls received or generated is recorded in the distress log. The information is saved while the transceiver is turned off. To view the distress log, select the DISTRESS LOG from the main distress menu and press the ENT key (4).



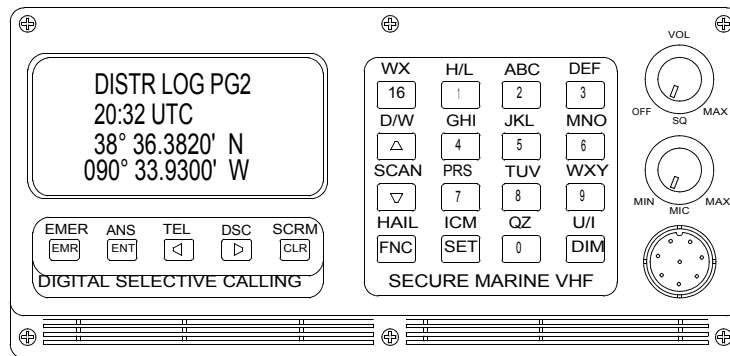
- The distress log directory displays a list of names or DSC number of the ENT key (4). Select a name or number from the log using the UP ARROW key (2) or the DOWN ARROW key (3). To select, press the ENT key (4). Once selected, use the RIGHT ARROW key (2) to move through the rest of the distress log pages.



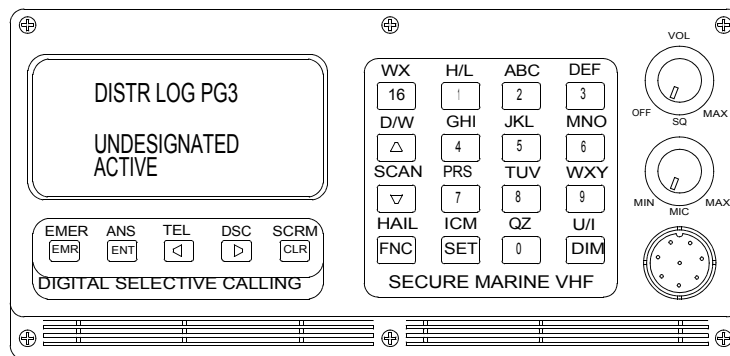
- Distress log page 1 displays the name and DSC ID number of the vessel that sent the distress call. If there is no name associated with the DSC ID (not in DSC directory), then this page is not available.



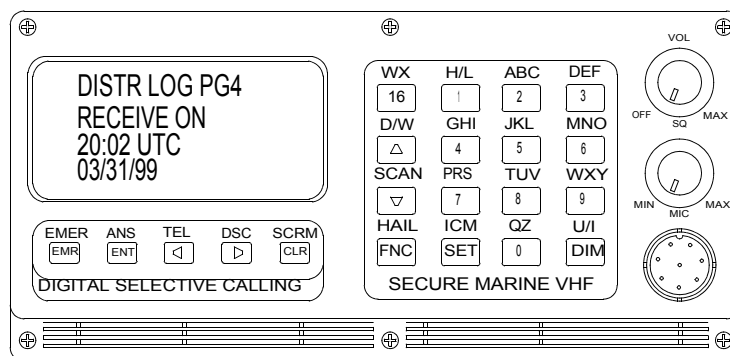
4. Distress log page 2 displays the latitude, longitude and time of position as received from the distress call.



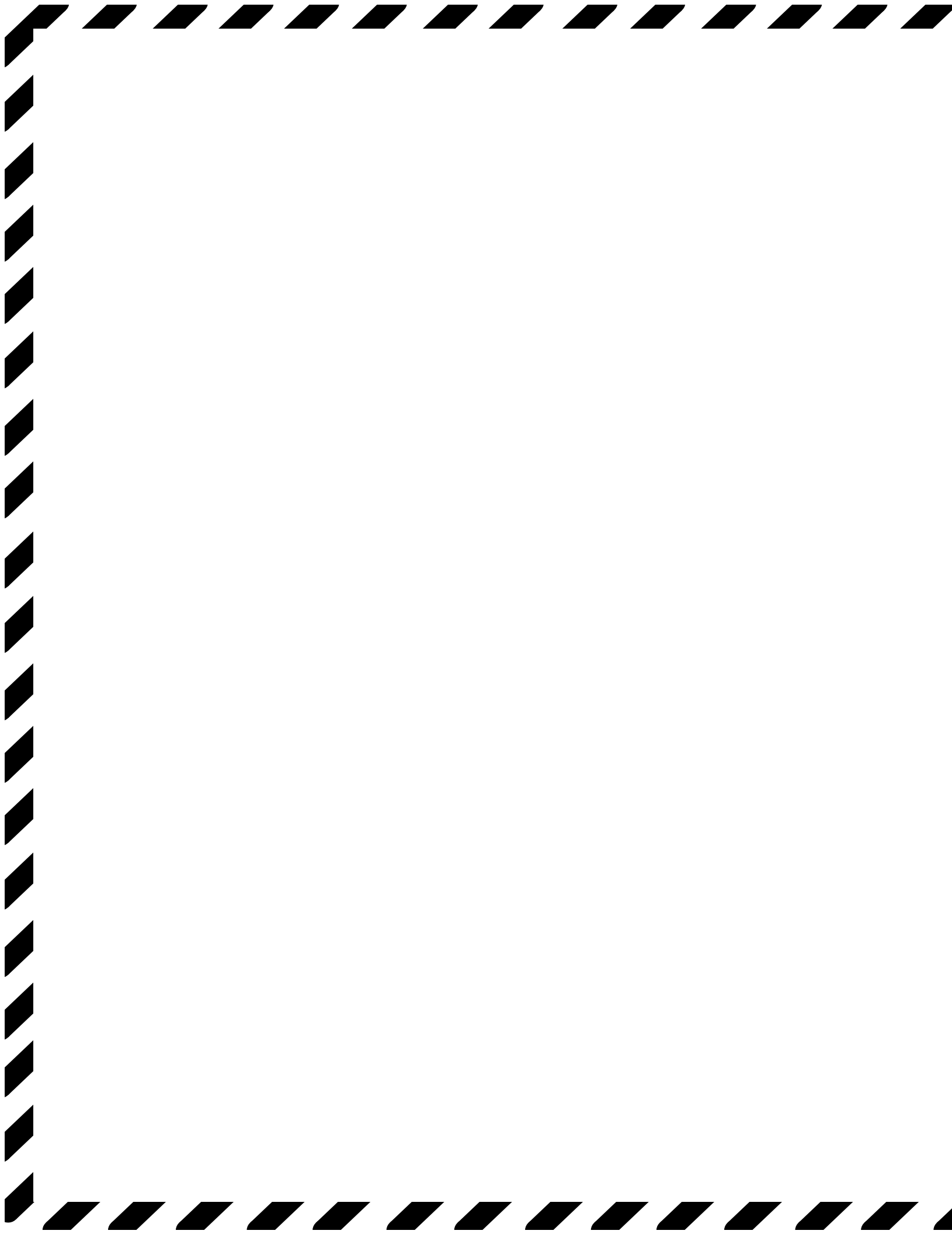
5. Distress log page 3 displays the status and other information about the distress call. If provided, the Number of People is displayed on line 2. The type of distress is displayed on line 3 and the status of the call is displayed on line 4. The status can be one of the following: Active, Relay, Acknowledged and Cancelled.



6. Distress log page 4 can only be accessed if the distress call has been acknowledged. This page displays the name and DSC ID number of the station that acknowledged the distress call.



END OF WORK PACKAGE



**OPERATOR MAINTENANCE
WARPING TUG
VHF/FM DSC TRANSCEIVER
OPERATION UNDER UNUSUAL CONDITIONS**

INITIAL SETUP:

Tools

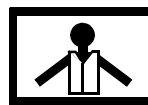
- Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
- Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
- Life Preserver, Vest (Item 45, WP 0108 00)
- Helmet, Safety (Brown) (Item 40, WP 0108 00)

Personnel Required

Seaman 88K

EMERGENCY PROCEDURE - CANCEL DISTRESS USING THE VHF/FM DSC TRANSCEIVER

WARNING



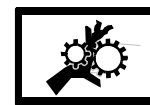
VEST



HELMET PROTECTION



HEAVY PARTS

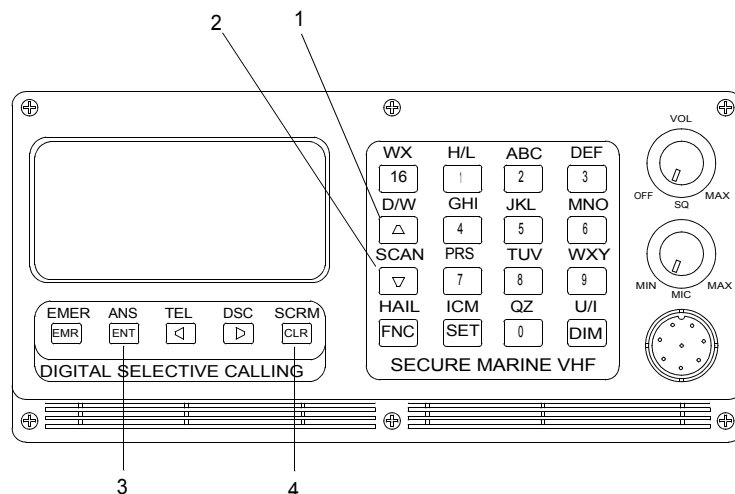


MOVING PARTS

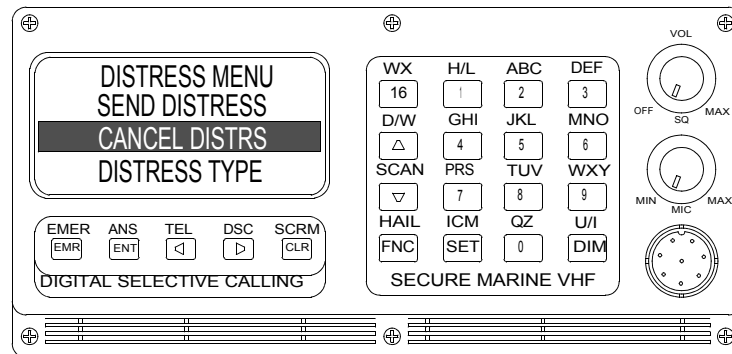
All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

NOTE

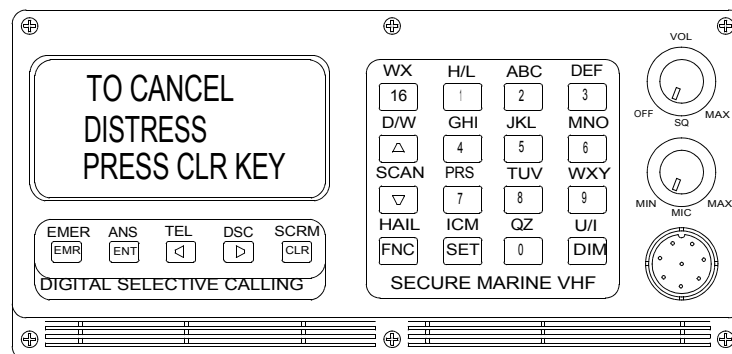
If a distress call is made by mistake, the CANCEL DISTRESS function can be used to cancel the active distress.



1. Use the UP ARROW key (1) or DOWN ARROW key (2) to select CANCEL DISTRS and press the ENT key (3).



2. Press the CLR key (4) to cancel the distress. This function is not available if there is not an active distress being transmitted. The CANCEL DISTRESS function sends out a DISTRESS ACKNOWLEDGEMENT with the DSC ID as the source and destination.



3. Tune the transceiver to the channel that the distress was transmitted on.
4. Broadcast cancellation message to ALL STATIONS with the required information.

VHF/FM message example:

All Stations, All Stations, All Stations
 This is NAME (vessel) CALL SIGN,
 DSC NUMBER, POSITION.
 Cancel my distress alert of
 DATE, TIME UTC,
 = Master NAME, CALL SIGN,
 DSC NUMBER, DATE, TIME UTC.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PUBLIC ADDRESS SET (LOUDHAILER)
OPERATION UNDER UNUSUAL CONDITIONS**

INITIAL SETUP:

Tools

- Gloves, Men’s and Women’s (Leather Palm) (Item 31, WP 0108 00)
- Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
- Life Preserver, Vest (Item 45, WP 0108 00)
- Helmet, Safety (Brown) (Item 40, WP 0108 00)

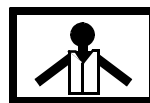
Personnel Required

Seaman 88K

EMERGENCY PROCEDURE - PUBLIC ADDRESS SET (LOUDHAILER) EMERGENCY OPERATION

OPERATE FOG HORN AFTER RUNNING AGROUND IN FOG

WARNING



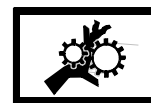
VEST



HELMET PROTECTION



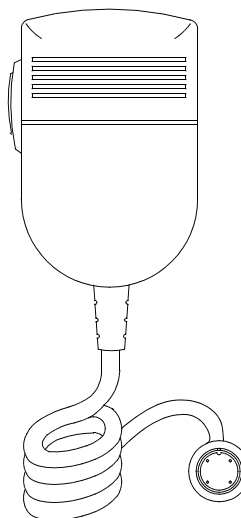
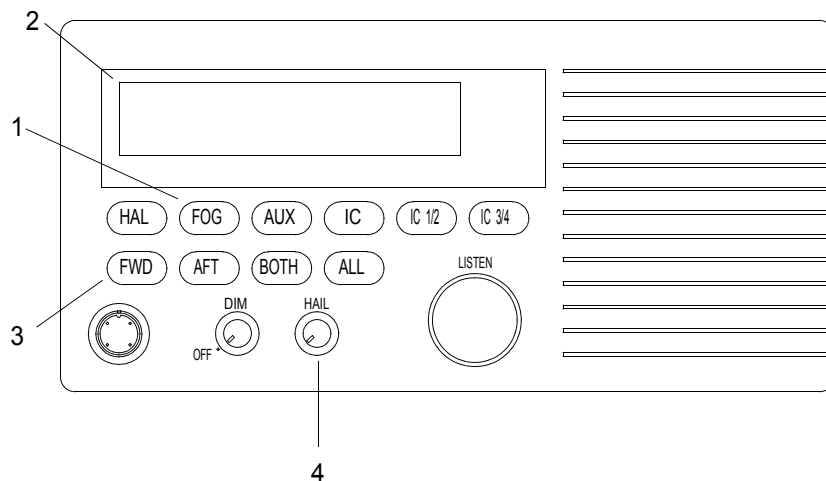
HEAVY PARTS



MOVING PARTS

All personnel must wear personal flotation device, hard hat, safety shoes and gloves during WT operations and maintenance. Failure to observe these precautions could result in serious injury or death.

1. Press FOG key (1) repeatedly until AGROUND FOG6 appears in the LCD display speaker station window (2).





2. Press the FWD speaker key (3) to select the forward speaker. FWD will appear in the LCD display speaker station window (2).



12C055-3

3. Adjust the HAIL volume knob (4) to the desired sound level.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
CONVERSION KIT
STOWAGE**

INTRODUCTION

Scope

This work package covers stowage of the conversion kit.

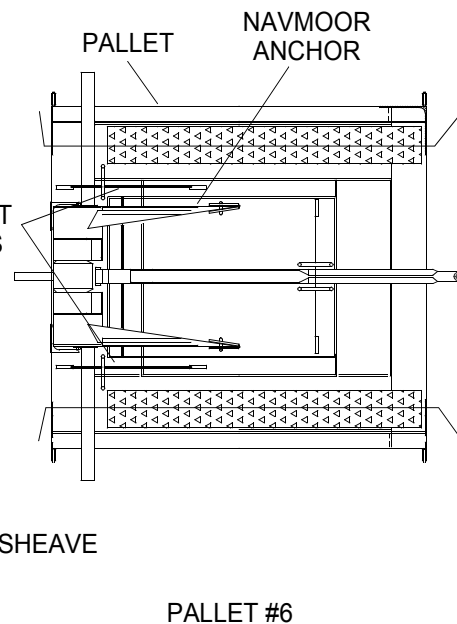
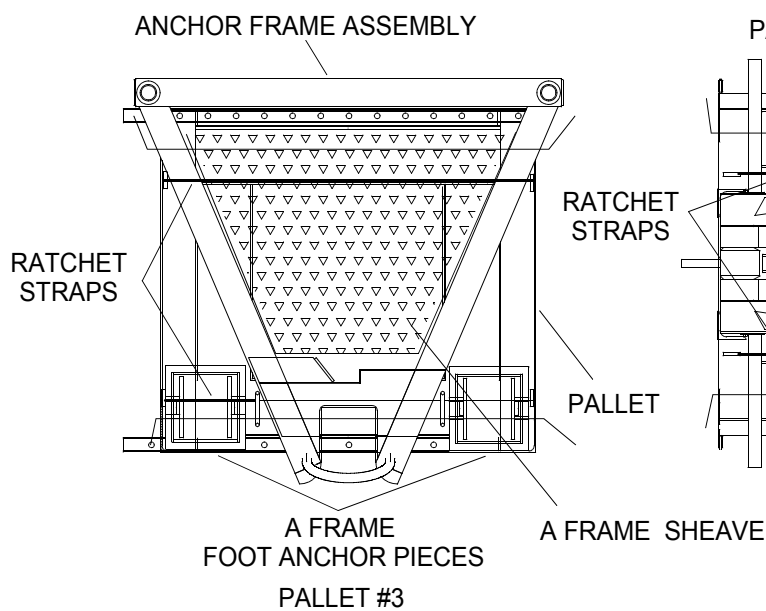
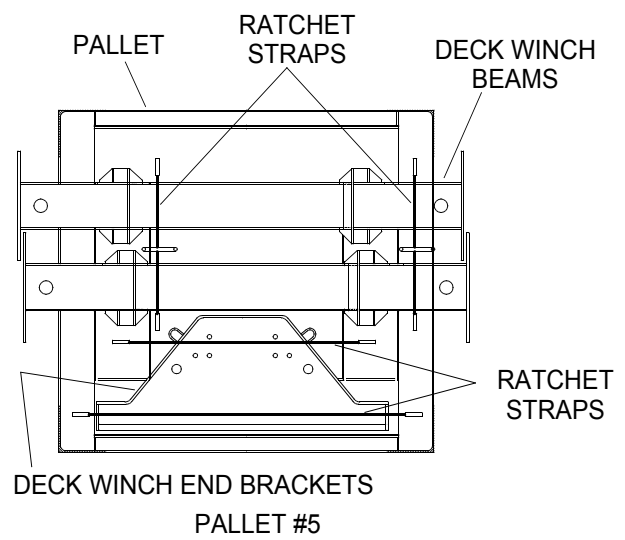
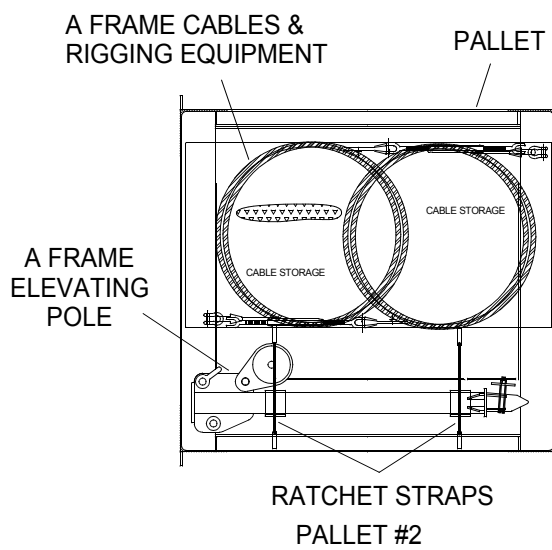
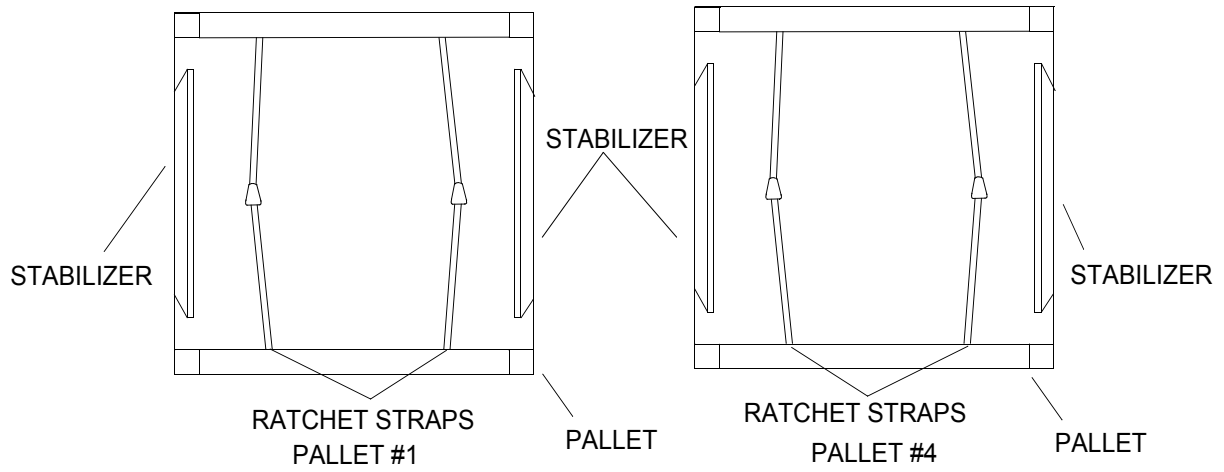
Stowage of Conversion Kit

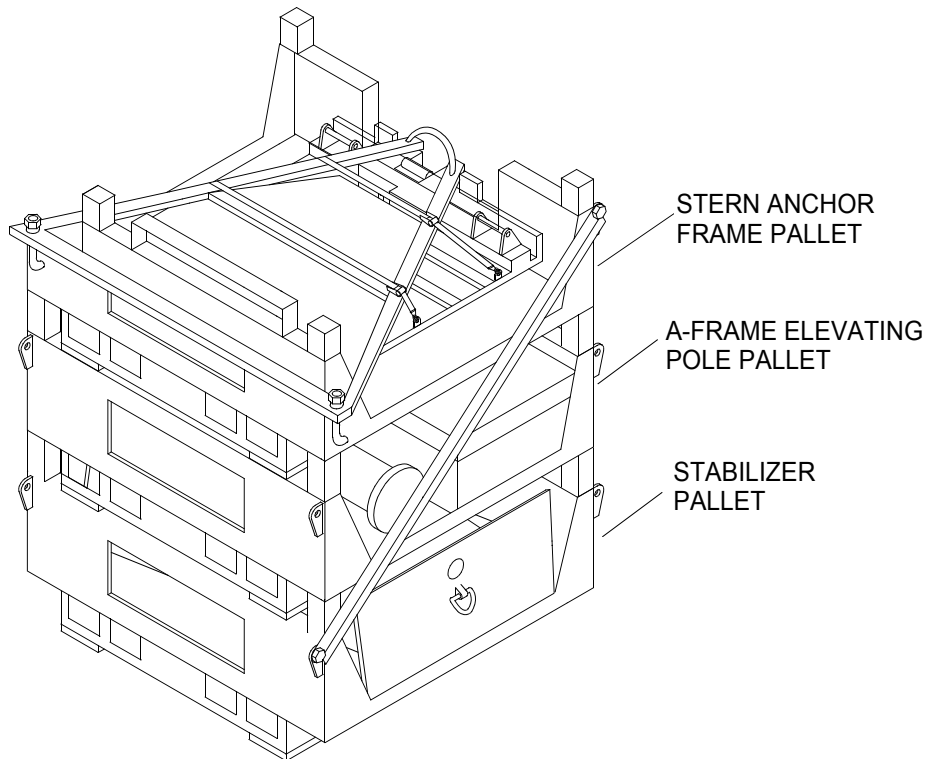
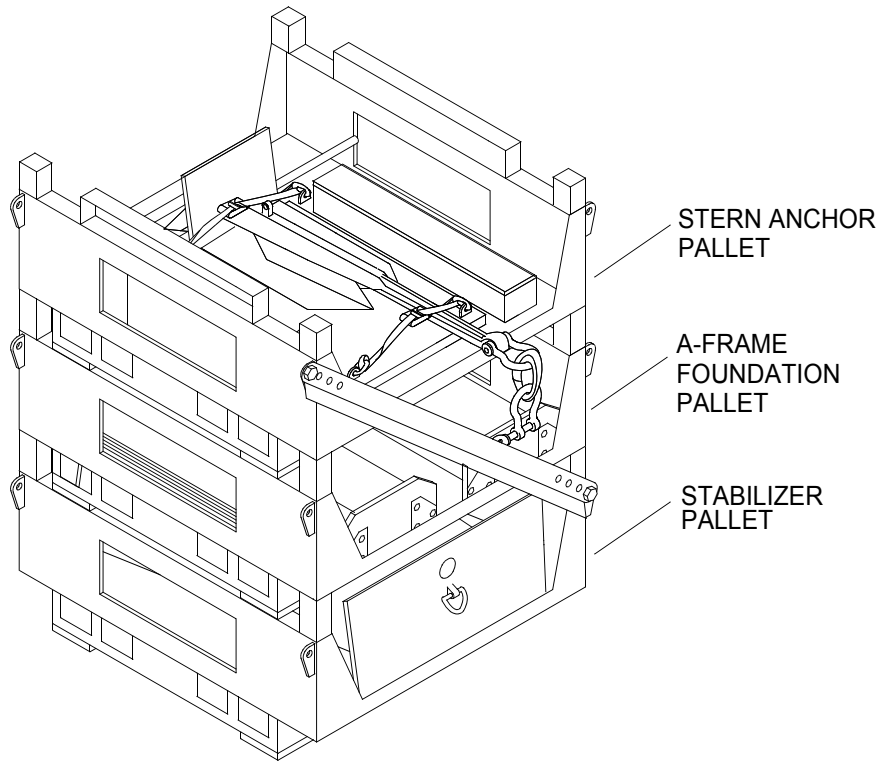
The following procedures are required prior to stowage of the conversion kit:

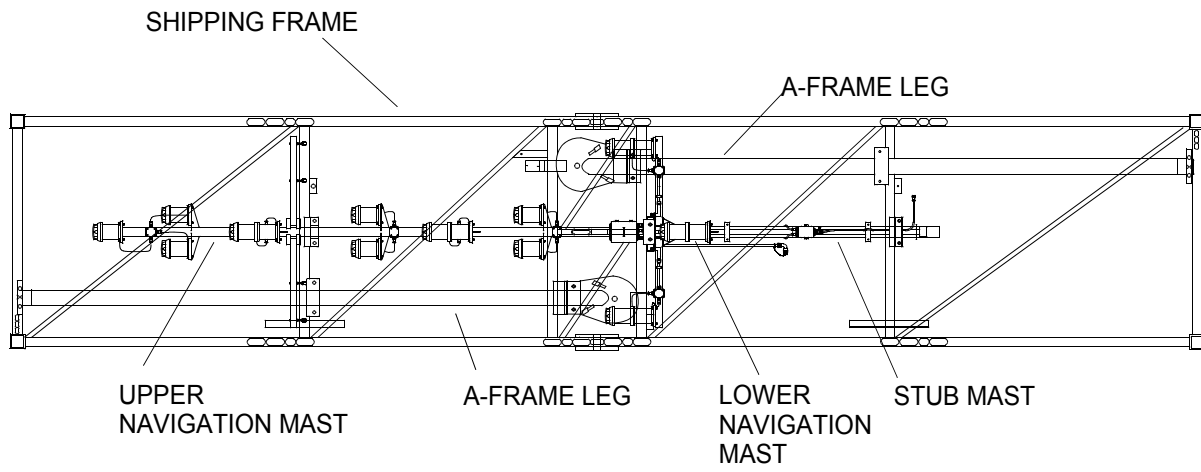
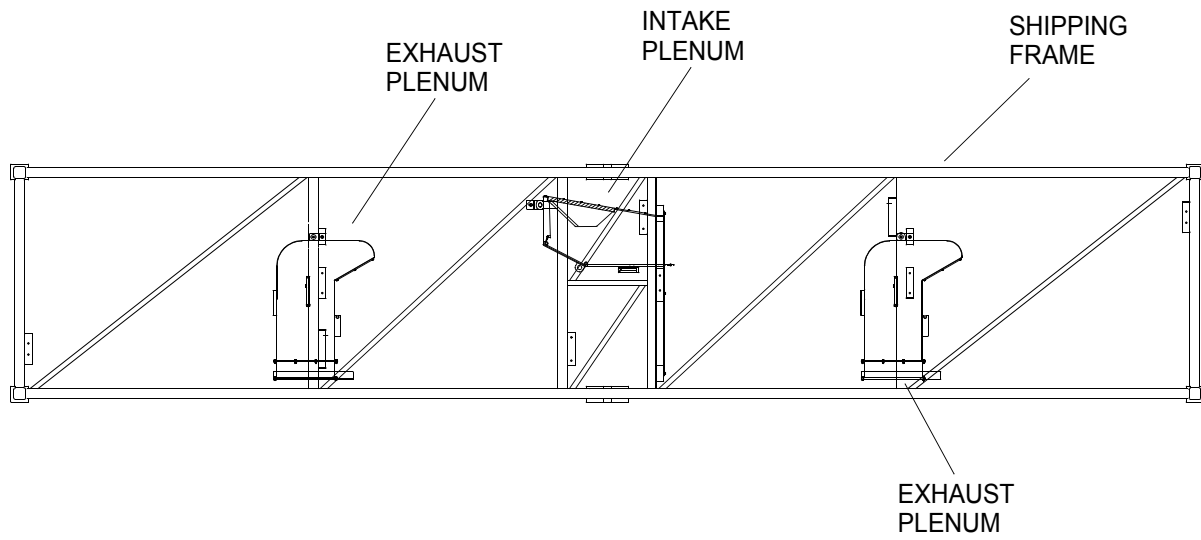
NOTE

This work package is incomplete, pending shipping information from VOLPE on the operators cab, BII container and other specific components.

The components of the warping tug are stowed for transport and storage on pallets and in shipping frames. One shipping frame containing the A-frame legs and mast assembly sections is shipped with two end rakes. A second shipping frame containing the air intake plenum and exhaust plenums is shipped with two end rakes. An empty shipping frame is shipped with each of the propulsion modules. The remainder of the warping tug components are stowed on pallets, as illustrated below.







**OPERATOR MAINTENANCE
WARPING TUG
BASIC ISSUE ITEMS (BII) AND EQUIPMENT
STOWAGE**

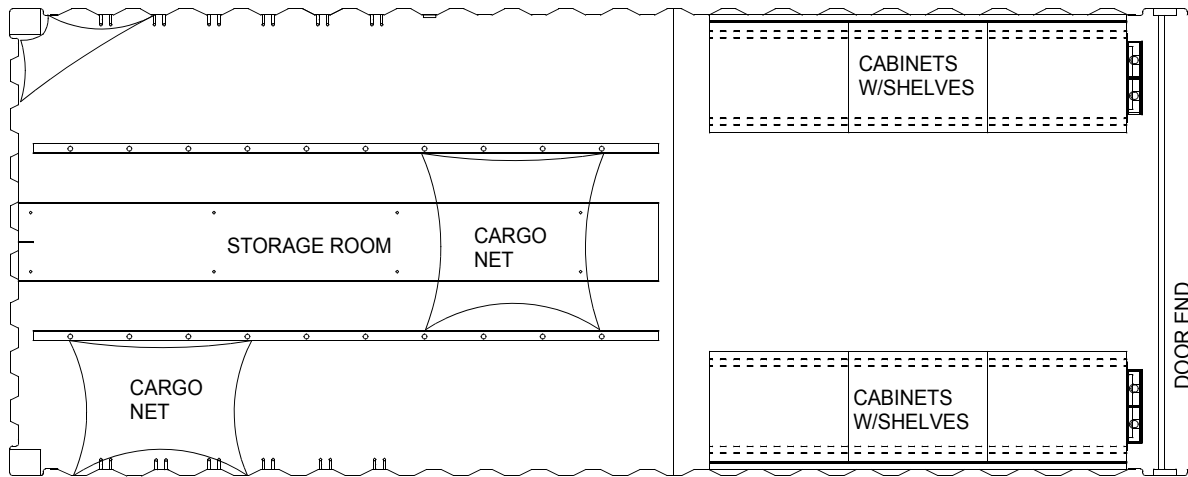
INTRODUCTION

Scope

This work package covers stowage of the BII.

Stowage of BII

The BII for the Warping Tug (WT) is stowed in the BII container. The BII is stowed in the cabinets, storage room and on the shelves. The packing list in the BII container may be consulted for additional information.



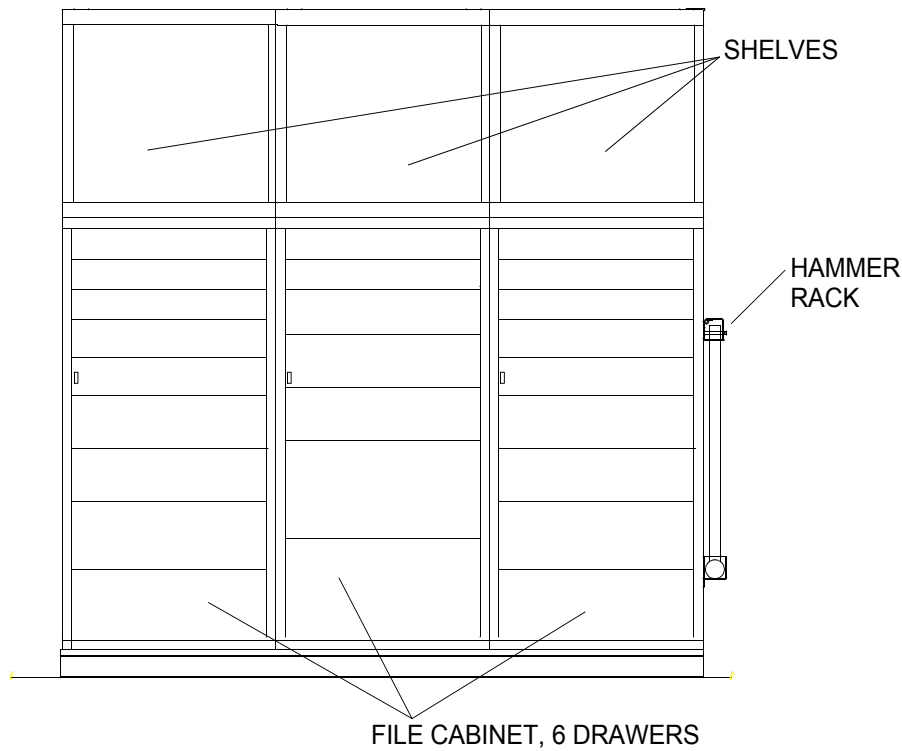


Table 1. BII Stowage Location.

| DESCRIPTION | QTY | LOCATION |
|--|-----|-----------------------|
| Apron, Utility | 2 | Cabinets |
| Ax, Pickhead | 1 | Storage Room on Hooks |
| Bar, Wrecking | 2 | Storage Room |
| Blanket, Fire (72 in. x 60 in.) | 1 | Storage Room |
| Block, Snatch (8 in. Diameter) | 4 | Storage Room |
| Body Assembly Lantern (Clear Lens) | 3 | Storage Room |
| Body Assembly Lantern (Red Lens) | 1 | Storage Room |
| Bracket, Lantern | 3 | Storage Room |
| Chain Sling, Adjustable, 36, 000 lbs | 4 | Storage Room |
| Crowbar | 2 | Storage Room |
| Extinguisher, Fire (15 lb) | 3 | Storage Room |
| Faceshield, Industrial | 6 | Cabinets |
| Fiber Rope Assembly, Single Leg (100 ft) | 2 | Storage Room |
| Fid (12 in.) | 2 | Storage Room |

Table 1. BII Stowage Location. (Continued)

| DESCRIPTION | QTY | LOCATION |
|--|------------|-----------------------|
| Flag, Signal (“A” INTL CODE SIZE 6) | 1 | Cabinets |
| Flag, Signal (“B” INTL CODE SIZE 6) | 1 | Cabinets |
| Flag, Signal (“O” INTL CODE SIZE 6) | 1 | Cabinets |
| Flag, Signal (“U” INTL CODE SIZE 6) | 1 | Cabinets |
| Flag, Signal (“V” INTL CODE SIZE 6) | 1 | Cabinets |
| Flag, Signal (“W” INTL CODE SIZE 6) | 1 | Cabinets |
| Flag, Signal (“Y” INTL CODE SIZE 6) | 1 | Cabinets |
| Flashlight | 2 | Cabinets |
| FLOCS with pump and hoses | 1 | Storage Room |
| Gloves, Antiflash | 6 | Cabinets |
| Gloves, Chemical | 2 | Cabinets |
| Gloves, Electric | 6 | Cabinets |
| Gloves, Men’s and Women’s (Leather Palm) | 6 | Cabinets |
| Goggles, Industrial (Chipping) | 6 | Cabinets |
| Goggles, Industrial (No Vents) | 2 | Cabinets |
| Goggles, Sun, Wind and Dust | 6 | Cabinets |
| Grip, Handle, Lantern | 3 | Storage Room |
| Hammer, Hand (Maul) | 1 | Storage Room on Hooks |
| Hammer, Hand (Sledge) | 2 | Hammer Rack |
| Harness, Safety, Industrial | 6 | Cabinets |
| Helmet, Safety (Blue) | 2 | Storage Room on Hooks |
| Helmet, Safety (Brown) | 4 | Storage Room on Hooks |
| Holder, Light | 3 | Storage Room |
| Hook, Boat | 2 | Storage Room |
| Kit, Burn | 1 | Cabinets |
| Kit, Tagout/Lockout | 1 | Storage Room |
| Ladder, ISOPAK | 1 | Storage Room |
| Lanyard, Safety Harness | 6 | Storage Room on Hooks |

Table 1. BII Stowage Location. (Continued)

| DESCRIPTION | QTY | LOCATION |
|---|-----|---------------------------|
| Life Lines with Stanchions (Set) | 1 | Storage Room |
| Life Preserver, Vest | 8 | Storage Room |
| Life Preserver, Vest (Stearns Work Vest) | 8 | Cabinets |
| Light, Distress, Personal Marker | 24 | Storage Room |
| Lights, Navigation (Set) | 1 | Storage Room |
| Plug, Ear (Box) | 1 | Storage Room |
| Plug, Wood (1 in. X 0 in. X 8 in.) | 5 | Storage Room |
| Plug, Wood (10 in. X 7 in. X 12 in.) | 5 | Storage Room |
| Plug, Wood (2 in. X 0 in. X 4 in.) | 5 | Storage Room |
| Plug, Wood (3 in. X 0 in. X 8 in.) | 5 | Storage Room |
| Plug, Wood (7 in. X 3 in. X 10 in.) | 5 | Storage Room |
| Plug, Wood (8 in. X 4 in. X 10 in.) | 5 | Storage Room |
| Protector, Hearing | 6 | Storage Room and Cabinets |
| Pump, Sampler | 1 | Storage Room |
| Receiver/Xmtr (VHF/FM Handheld Transceiver) | 2 | Cabinets |
| Repair (Repair Kit, Emergency Pipe) | 1 | Storage Room |
| Rope, Fibrous (¼ in. x 300 ft) (Spool) | 1 | Storage Room |
| Rope, Fibrous (Retrieving Line) (Roll) | 1 | Cabinets |
| Shackle, ½ in., 2 Ton | 8 | Cabinets |
| Shackle, ¾ in., 4.75 Ton | 8 | Cabinets |
| Shackle, 1½ in., 30 Ton | 4 | Cabinets |
| Shackle, 1¾ in., 40 Ton | 4 | Cabinets |
| Shackle, 5/8 in., 3.25 Ton | 8 | Cabinets |
| Shape, Day, Maritime (Black Diamond) | 1 | Storage Room |
| Shape, Day, Maritime (Black Round) | 2 | Storage Room |
| Shore, Damage (Adjustable Steel Shoring) | 4 | Storage Room |
| Signal, Smoke and Illumination | 12 | Cabinets |
| Sling, 20 ft, 8400 lbs (Yellow) | 4 | Cabinets |

Table 1. BII Stowage Location. (Continued)

| DESCRIPTION | QTY | LOCATION |
|---------------------------------------|------------|-----------------|
| Sling, 25 ft, 53,000 lbs (Green) | 4 | Storage Room |
| Sling, 30 ft, 66,000 lbs (Olive) | 4 | Storage Room |
| Sling, 4 ft, 5300 lbs (Green) | 4 | Cabinets |
| Sling, 5 ft, 5300 lbs (Green) | 4 | Cabinets |
| Sling, 6 ft, 5300 lbs (Green) | 4 | Cabinets |
| Snap, Hook (Box) | 2 | Cabinets |
| Tape, Reflective (Roll) | 1 | Shelves |
| Tester, Pneumatic | 1 | Storage Room |
| Tool Kit, General Mechanic's | 1 | Storage Room |
| Wedge, Wood (1½ in. X 2 in. X 12 in.) | 5 | Storage Room |
| Wedge, Wood (2 in. X 2 in. X 8 in.) | 5 | Storage Room |
| Whistle, Ball | 24 | Cabinets |
| Work Suit, Stearns | 8 | Cabinets |

CHAPTER 3

OPERATOR TROUBLESHOOTING PROCEDURES

FOR

MODULAR CAUSEWAY SYSTEM (MCS)

WARPING TUG (WT)

**OPERATOR MAINTENANCE
WARPING TUG
TROUBLESHOOTING PROCEDURES INDEX**

MALFUNCTION/SYMPTOM**TROUBLESHOOTING PROCEDURE****ABOVE DECK SYSTEMS**

Navigation Light(s) Will Not Function WP 0101 00

PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR)

Does Not Display A Valid Position WP 0098 00

Has Cleared Memory WP 0099 00

Has No Power WP 0097 00

DIESEL ENGINE

Fails To Start, Starts With Difficulty And Runs Badly WP 0068 00

Has Sudden Loss Of Power (Heavy Black Smoke) WP 0066 00

Has Sudden Loss Of Power (No Black Smoke) WP 0071 00

Starts With Difficulty And Runs Rough WP 0070 00

Turns Over, But Will Not Start WP 0067 00

Will Not Turn Over WP 0069 00

EXHAUST PLENUM

Vent Fan Will Not Operate WP 0065 00

HYDRAULIC SYSTEM

Hydraulic System Has No Pressure WP 0078 00

OPERATORS CAB

Accessories Do Not Function WP 0088 00

Ammeter Indicates Discharging Of System WP 0085 00

Clutch Status Light Not Operational WP 0077 00

Engine Audible Alarm Comes On (Normal Operation) WP 0072 00

Low Engine Oil Pressure (Engine Audible Alarm And Warning Light
Will Come On) (Normal Operation) WP 0073 00

Navigation Light Audible Pulse Beeper Sounds WP 0087 00

No Power To Control Panel WP 0101 00

No Steering Control WP 0083 00

No Steering Control Indication For The Pump-Jet WP 0084 00

Overheating (Engine Audible Alarm And Warning Light Will Come On) WP 0074 00

MALFUNCTION/SYMPTOMTROUBLESHOOTING PROCEDURE**PROPULSION MODULE**

| | |
|---|------------|
| Bilge Pumps Do Not Function | WP 0086 00 |
| Drive Train Does Not Operate Freely And Smoothly; Excessive Vibration Is Experienced During Operation | WP 0075 00 |
| Marine Gear Clutch Will Not Engage In Engage/backflush Directions | WP 0076 00 |
| No Propulsion From Pump-Jet | WP 0079 00 |
| No Steering Control Form The Pump-Jet | WP 0081 00 |
| Pump-Jet Can Only Develop A Small Amount Of Thrust (Not Enough Water Is Being Delivered) | WP 0080 00 |
| Steering Reacts Sluggishly | WP 0082 00 |

PUBLIC ADDRESS SET (LOUDHAILER)

| | |
|---|------------|
| Has No Power | WP 0089 00 |
| Will Not Transmit Fog Signal To Hailer Horn (Loudhailer External Speaker) | WP 0091 00 |
| Will Not Transmit Vhf/fm Dsc Transceiver Audio To Hailer Horn (Loudhailer External Speaker) | WP 0092 00 |
| Will Not Transmit Voice To Hailer Horn (Loudhailer External Speaker) | WP 0090 00 |

VHF/FM DSC TRANSCEIVER

| | |
|---------------------------------|------------|
| Does Not Display Valid Position | WP 0096 00 |
| Has No Power | WP 0093 00 |
| Will Not Receive | WP 0094 00 |
| Will Not Transmit | WP 0095 00 |

**OPERATOR MAINTENANCE
WARPING TUG
EXHAUST PLENUM VENTILATION FAN
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Engineer 88L

TROUBLESHOOTING PROCEDURE

EXHAUST PLENUM VENT FAN WILL NOT OPERATE

NOTE

This troubleshooting procedure is typical for both the starboard and port vent fans.

SYMPTOM

Ventilation fan does not operate.

MALFUNCTION

VENT FANS toggle switch on the lower control panel (A2) is OFF.

CORRECTIVE ACTION

Position VENT FANS toggle switch on the lower control panel (A2) to ON.

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

VENT FAN circuit breaker on the propulsion module circuit breaker panel (A6) is off.

CORRECTIVE ACTION

Position VENT FAN circuit breaker on the propulsion module circuit breaker panel (A6) to on.

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Loose or disconnected exhaust fan power cable on vent fan relay enclosure (A8).

CORRECTIVE ACTION

Tighten or connect exhaust fan power cable on vent fan relay enclosure (A8).

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Ventilation fan still does not operate.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DIESEL ENGINE
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE DIESEL ENGINE HAS A SUDDEN LOSS OF POWER (HEAVY BLACK SMOKE)

NOTE

This troubleshooting procedure is typical for both engines.

SYMPTOM

Power from the diesel engine is lost and heavy black smoke emitted from the exhaust plenum.

MALFUNCTION

The air inlet has a blockage.

CORRECTIVE ACTION

Remove the blockage from the air inlet or contact unit maintenance.

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

The return line fuel valve is not open.

CORRECTIVE ACTION

Open the return line fuel valve. (WP 0103 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

The air filter restriction indicator's red button is visible.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

Diesel engine still has power loss and heavy black smoke observed.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DIESEL ENGINE
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE DIESEL ENGINE WILL TURN OVER, BUT WILL NOT START

NOTE

This troubleshooting procedure is typical for both engines.

SYMPTOM

The diesel engine fails to start, but turns over.

MALFUNCTION

No fuel in the fuel tank.

CORRECTIVE ACTION

Fill the fuel tank with fuel. (WP 0103 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Fuel has drained back and/or leaked out of supply lines.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

During severe cold weather conditions, the cold pac starting aid may be out of ether.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

The emergency air shutdown was activated.

CORRECTIVE ACTION

Reset the emergency air shutdown solenoid valve. If engine still does not start, contact unit maintenance.

MALFUNCTION

The fuel shutoff valves are closed.

CORRECTIVE ACTION

Open the fuel shutoff valves. (WP 0103 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Water is discovered in the fuel in the fuel water separator.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

The engine is turning slowly.

CORRECTIVE ACTION

Ensure the marine gear is not engaged.

Perform operational check of WT. (WP 0022 00)

If the battery output is low or if the starter is faulty, contact unit maintenance.

MALFUNCTION

Diesel engine still will not start, but turns over.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DIESEL ENGINE
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE DIESEL ENGINE FAILS TO START, STARTS WITH DIFFICULTY AND RUNS BADLY

NOTE

This troubleshooting procedure is typical for both engines.

SYMPTOM

The diesel engine fails to start, starts with difficulty or runs badly.

MALFUNCTION

The fuel shutoff valves are closed.

CORRECTIVE ACTION

Open the fuel shutoff valves. (WP 0103 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Water is discovered in the fuel in the fuel water separator.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

The engine is not getting enough air.

CORRECTIVE ACTION

Check air cleaners for red buttons. If visible, contact unit maintenance.

Check that air flapper valve is open.

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

No indication of load on ammeter.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

Diesel engine still fails to start, starts with difficulty or runs badly.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DIESEL ENGINE
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE DIESEL ENGINE WILL NOT TURN OVER

NOTE

This troubleshooting procedure is typical for both engines.

SYMPTOM

The diesel engine fails to turn over.

MALFUNCTION

Electrical power to the starter controls are not on.

CORRECTIVE ACTION

Ensure the ENG POWER toggle switch on the middle control panel (A1) is in the ON position. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

The CLUTCH switch on the lower control panel (A2) is in the BACKFLUSH or FORWARD position.

CORRECTIVE ACTION

Return the CLUTCH switch to the DISENGAGE position. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

No power is being received from the batteries.

CORRECTIVE ACTION

Check battery terminals for loose connections.

Perform operational check of WT. (WP 0022 00)

If batteries are weak or appear to be dead, contact unit maintenance.

MALFUNCTION

Diesel engine still will not turn over.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DIESEL ENGINE
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE DIESEL ENGINE STARTS WITH DIFFICULTY AND RUNS ROUGH

NOTE

This troubleshooting procedure is typical for both engines.

SYMPTOM

The diesel engine starts with difficulty and runs rough.

MALFUNCTION

Fuel shutoff valves are not open.

CORRECTIVE ACTION

Open fuel shutoff valves. (WP 0103 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Water is discovered in the fuel in the fuel water separator.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

Diesel engine still starts with difficulty and runs rough.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DIESEL ENGINE
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE DIESEL ENGINE HAS A SUDDEN LOSS OF POWER (NO BLACK SMOKE)

NOTE

This troubleshooting procedure is typical for both engines.

SYMPTOM

Power from the diesel engine is lost, but no black smoke emitted from the exhaust plenum.

MALFUNCTION

Water is discovered in the fuel in the fuel water separator.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

Fuel shutoff valves are closed.

CORRECTIVE ACTION

Open the fuel shutoff valves. (WP 0103 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Fuel filter contains contamination.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

Diesel engine still has a sudden power loss, but no black smoke observed.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DIESEL ENGINE
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

ENGINE AUDIBLE ALARM AND WARNING LIGHT ON (NORMAL OPERATION)

NOTE

This troubleshooting procedure is typical for both starboard and port engines.

SYMPTOM

Audible engine alarm and warning light is on.

MALFUNCTION

OIL PRESSURE gauge on the middle control panel A1 reads below 32 PSI (2.2 kp/cm²).

CORRECTIVE ACTION

Stop engine, allow engine to cool down and add oil to the engine. (WP 0103 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

WATER TEMP gauge on the middle control panel A1 reads above 185°F (83°C).

CORRECTIVE ACTION

WARNING

**HOT AREA**

Cooling system is hot. Do not touch the cap with your bare hands. Never take off cap while engine is overheated. Failure to comply may result in serious personnel injury.

Stop engine, allow engine to cool down and add coolant. (WP 0103 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Audible engine alarm and warning light remains on.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DIESEL ENGINE
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

ENGINE OIL PRESSURE GAUGE READS ABOVE 70 PSI (NORMAL OPERATION)

NOTE

This troubleshooting procedure is typical for both starboard and port engines.

SYMPTOM

Engine oil pressure gauge reads above 70 PSI.

MALFUNCTION

Oil pressure gauge on the middle control panel A1 pressure reading above maximum pressure of 70 PSI indicating clogged oil filter or clogged lines.

CORRECTIVE ACTION

Stop engine and contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DIESEL ENGINE
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**

Seaman 88K

TROUBLESHOOTING PROCEDURE

ENGINE OVERHEATING (AUDIBLE ALARM AND WARNING LIGHT ON)

WARNING

**HOT AREA**

Cooling system is hot. Do not touch the cap with your bare hands. Never take off cap while engine is overheated. Contact unit maintenance. Failure to comply may result in serious personnel injury.

CAUTION

Do not use emergency stop to shut off engine. This action shuts off air to the engine. Failure to comply will result in serious damage to the engine.

NOTE

This troubleshooting procedure is typical for both starboard and port engines.

SYMPTOM

Audible engine alarm and engine warning light is on.

MALFUNCTION

The engine is overheating.

CORRECTIVE ACTION

Reduce engine speed to idle.

Turn off engine by means of the engine STOP push button on the middle control panel (A1) for affected engine.

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
DRIVE TRAIN
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Engineer 88L

TROUBLESHOOTING PROCEDURE

DRIVE TRAIN DOES NOT OPERATE FREELY AND SMOOTHLY; EXCESSIVE VIBRATION IS EXPERIENCED DURING OPERATION

NOTE

This troubleshooting procedure is typical for both the starboard and port marine transmissions.

SYMPTOM

Excessive vibration is experienced during operation of the drive train.

MALFUNCTION

Foreign objects in pump-jet water inlet.

CORRECTIVE ACTION

Perform backflush.

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Vibration still present after backflush.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
MARINE GEAR
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

MARINE GEAR CLUTCH WILL NOT ENGAGE IN ENGAGE/BACKFLUSH DIRECTIONS.

NOTE

This troubleshooting procedure is typical for both marine gears.

SYMPTOM

The marine gear clutch will not engage in the engage/backflush directions.

MALFUNCTION

The CLUTCH circuit breaker on the propulsion module circuit breaker panel (A6) is not in on position.

CORRECTIVE ACTION

Move the CLUTCH circuit breaker to the on position. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

The oil level in the marine gear is low.

CORRECTIVE ACTION

Add oil to the proper level on the dipstick. (WP 0103 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

The marine gear filter screen is clogged.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

The clutch solenoid is not functioning properly.

CORRECTIVE ACTION

Contact unit maintenance

MALFUNCTION

The marine gear clutch still will not engage in the engage/backflush directions.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
MARINE GEAR CLUTCH STATUS LIGHT
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

CLUTCH STATUS LIGHT NOT OPERATIONAL

NOTE

This troubleshooting procedure is typical for both marine gears.

SYMPTOM

Light for clutch status not operational.

MALFUNCTION

CLUTCH circuit breaker on propulsion module circuit breaker panel A6 is off.

CORRECTIVE ACTION

Position CLUTCH circuit breaker to on. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Indicator light bulb failed.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
HYDRAULIC SYSTEM
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE HYDRAULIC SYSTEM HAS NO PRESSURE

NOTE

This troubleshooting procedure is typical for both hydraulic systems.

SYMPTOM

No hydraulic steering system pressure.

MALFUNCTION

The hydraulic fluid level is low.

CORRECTIVE ACTION

Add hydraulic fluid to the proper level. (WP 0103 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

The hydraulic steering system still has no pressure.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PUMP-JET
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

NO PROPULSION FROM PUMP-JET

NOTE

This troubleshooting procedure is typical for both the starboard and port pump-jets.

SYMPTOM

Pump-jet has no propulsion.

MALFUNCTION

Diesel engine is not running.

CORRECTIVE ACTION

Start diesel engine. (WP 0022 00)

MALFUNCTION

Marine gear is not engaged.

CORRECTIVE ACTION

Engage marine gear. (WP 0022 00)

MALFUNCTION

The clutch is not engaged.

CORRECTIVE ACTION

Check to ensure the CLUTCH switch on the lower control panel A2 is in either the FORWARD or BACKFLUSH position. (WP 0022 00)

MALFUNCTION

The pump-jet intake is clogged with foreign objects.

CORRECTIVE ACTION

Backflush the pump-jet to clear the intake.

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Pump-jet still not delivering propulsion.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PUMP-JET
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Engineer 88L

TROUBLESHOOTING PROCEDURE

PUMP-JET CAN ONLY DEVELOP A SMALL AMOUNT OF THRUST (NOT ENOUGH WATER IS BEING DELIVERED)

NOTE

This troubleshooting procedure is typical for both the starboard and port pump-jets.

SYMPTOM

Only a small amount of thrust from the pump-jet.

MALFUNCTION

Diesel engine is not operating at required speed.

CORRECTIVE ACTION

Increase the speed of the diesel engine. (WP 0022 00)

MALFUNCTION

Pump-jet intake or impeller is clogged with foreign objects.

CORRECTIVE ACTION

Disengage pump-jet and backflush to clear debris. (WP 0022 00)

MALFUNCTION

Pump-jet still delivers only a small a small amount of thrust.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PUMP-JET
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE**NO STEERING CONTROL FROM THE PUMP-JET****NOTE**

This troubleshooting procedure is typical for pump-jet in both the starboard and port powered modules.

SYMPTOM

The pump-jet has no steering control.

MALFUNCTION

The THRUSTER circuit breaker on propulsion module circuit breaker panel (A6) is not on.

CORRECTIVE ACTION

Position THRUSTER circuit breaker on propulsion module circuit breaker panel to the on position. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

No hydraulic pressure.

CORRECTIVE ACTION

Check that the HPU OIL LEVEL LOW light is not lit on the lower control panel A2. (WP 0006 00).

Perform operational check of WT. (WP 0022 00)

If the HPU OIL LEVEL LOW light is lit, contact unit maintenance.

MALFUNCTION

The pump-jet is still not delivering steering control.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PUMP-JET STEERING
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Engineer 88L

TROUBLESHOOTING PROCEDURE

STEERING REACTS SLUGGISHLY

NOTE

This troubleshooting procedure is typical for both the starboard and port steering systems.

SYMPTOM

Steering is reacting sluggishly.

MALFUNCTION

Air in the hydraulic system or low hydraulic pressure.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
STEERING SYSTEM
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Engineer 88L

TROUBLESHOOTING PROCEDURE**NO STEERING FROM OPERATORS CAB****NOTE**

This troubleshooting procedure is typical for both steering systems.

SYMPTOM

No steering from operators cab.

MALFUNCTION

The THRUSTER circuit breaker on the propulsion module circuit breaker panel (A6) is not on.

CORRECTIVE ACTION

Position THRUSTER circuit breaker to on. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Failed steering control lever.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

Hydraulic system not functioning.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PUMP-JET
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

NO STEERING CONTROL INDICATION FOR THE PUMP-JET

NOTE

This troubleshooting procedure is typical for both the starboard and port pump-jets.

SYMPTOM

The pump-jet has no steering control indication.

MALFUNCTION

The THRUSTER INDICATOR circuit breaker on the propulsion module circuit breaker panel A6 is in off position.

CORRECTIVE ACTION

Position THRUSTER circuit breaker to the on position. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Low voltage is being supplied by the thrust directional/auxiliary battery junction box A9 batteries.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

Failed feedback unit on the pump-jet.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

Pump-jet still has no steering control indication.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
OPERATORS CAB
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

AMMETER INDICATES DISCHARGING OF SYSTEM

NOTE

This troubleshooting procedure is typical for both starboard and port engines.

SYMPTOM

System discharge is indicated on the ammeter.

MALFUNCTION

Alternator belts loose, worn or broken or defective alternator.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
BILGE PUMPS
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

BILGE PUMP(S) WILL NOT FUNCTION

NOTE

This troubleshooting procedure is typical for all bilge pumps.

SYMPTOM

Bilge pump will not function.

MALFUNCTION

The CONTROL PANEL circuit breaker located on the operators cab circuit breaker panel A3 is off.

CORRECTIVE ACTION

Position CONTROL PANEL circuit breaker to on. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

A BILGE PUMP circuit breaker located on the propulsion module circuit breaker panel A6 in the machinery compartment is off.

CORRECTIVE ACTION

Position BILGE PUMP circuit breaker to on. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

The BILGE PUMP circuit breaker on bilge pump control panel (A5 or A7) is off.

CORRECTIVE ACTION

Position BILGE PUMP circuit breaker on A5 or A7 REMOTE. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Bilge pump(s) faulty.

CORRECTIVE ACTION

Contact unit maintenance.

MALFUNCTION

Bilge pump(s) still will not function.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
OPERATORS CAB
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

NO POWER TO THE OPERATORS CAB CONTROL PANELS

SYMPTOM

The operators cab control panels are not receiving power.

MALFUNCTION

The MAIN circuit breaker propulsion module circuit breaker panel (A6) is in the off position.

CORRECTIVE ACTION

Position MAIN circuit breaker to on. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

The OPR CAB circuit breaker on the propulsion module circuit breaker panel (A6) is in the off position.

CORRECTIVE ACTION

Position OPR CAB circuit breaker to on. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

There is still no power to the control panels in the operators cab.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
OPERATORS CAB
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

OPERATORS CAB ACCESSORIES DO NOT FUNCTION

SYMPTOM

The operators cab accessories are not functioning.

MALFUNCTION

The MAIN circuit breaker on the propulsion module circuit breaker panel (A6) is in the off position.

CORRECTIVE ACTION

Position MAIN circuit breaker to on. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

The OPR CAB circuit breaker on the propulsion module circuit breaker panel (A6) is in the off position.

CORRECTIVE ACTION

Position OPR CAB circuit breaker to on. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

The individual accessory circuit breakers located on the operators cab circuit breaker panel A3 are in the off position.

CORRECTIVE ACTION

Position accessory circuit breakers to on. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Operators cab accessories are still not functioning.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PUBLIC ADDRESS SET (LOUDHAILER)
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE PUBLIC ADDRESS SET (LOUDHAILER) HAS NO POWER

SYMPTOM

No indication of power displayed in the loudhailer display window.

MALFUNCTION

No power to loudhailer.

CORRECTIVE ACTION

Turn loudhailer on. Rotate the OFF/DIM knob clockwise cw on the loudhailer (WP 0025 00).

Perform operational check of loudhailer. (WP 0025 00)

Check that the power wires are securely attached on the back of the loudhailer.

Perform operational check of loudhailer. (WP 0025 00)

Check that the DC to DC converter power switch is in ON position. (WP 0035 00)

Perform operational check of loudhailer. (WP 0025 00)

Check to DC/DC CONV circuit breaker on the operators cab circuit breaker panel A3 is in the ON position. (WP 0006 00)

Perform operational check of loudhailer. (WP 0025 00)

Check the OPR CAB circuit breaker on the propulsion module circuit breaker panel A6 is in the on position. (WP 0006 00)

Perform operational check of loudhailer. (WP 0025 00)

MALFUNCTION

Still no indication of power displayed in the loudhailer display window.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PUBLIC ADDRESS SET (LOUDHAILER)
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

PUBLIC ADDRESS SET (LOUDHAILER) WILL NOT TRANSMIT VOICE TO HAILER HORN (LOUDHAILER EXTERNAL SPEAKER)

SYMPTOM

No voice is being transmitted through the hailer horn.

MALFUNCTION

No power to loudhailer.

CORRECTIVE ACTION

Turn loudhailer on. Rotate the OFF/DIM knob clockwise cw on the loudhailer.
(WP 0025 00)

MALFUNCTION

No indication of HAILER in the display.

CORRECTIVE ACTION

Press the HAL key. (WP 0025 00)

MALFUNCTION

No indication of TALK in the display when the microphone push to talk switch is pressed.

CORRECTIVE ACTION

Replace the microphone. Contact unit maintenance.

MALFUNCTION

No indication of FWD or AFT in the display after TALK appeared in display.

CORRECTIVE ACTION

Press the FWD or AFT key to select the forward or aft hailer horn. (WP 0025 00)

MALFUNCTION

No voice is being transmitted through the hailer horn.

CORRECTIVE ACTION

Check that speaker are wires securely attached to forward and aft terminal screws on the back of the loudhailer.

Perform operational check of loudhailer. (WP 0025 00)

MALFUNCTION

Still no voice is being transmitted through the hailer horn.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PUBLIC ADDRESS SET (LOUDHAILER)
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE PUBLIC ADDRESS SET (LOUDHAILER) WILL NOT TRANSMIT FOG SIGNAL TO HAILER HORN (LOUDHAILER EXTERNAL SPEAKER)

SYMPTOM

No fog signal is being transmitted through the hailer horn.

MALFUNCTION

No power to loudhailer.

CORRECTIVE ACTION

Turn loudhailer on. Rotate the OFF/DIM knob clockwise cw on the loudhailer.
(WP 0025 00)

MALFUNCTION

No indication of FOG in the display.

CORRECTIVE ACTION

Press the FOG key. (WP 0025 00)

MALFUNCTION

No indication of MANUAL in the display when manual mode is selected.

CORRECTIVE ACTION

Select manual mode. (WP 0025 00)

MALFUNCTION

No indication of FWD in the display after pressing the FOG key and pressing the push to talk switch on the microphone.

CORRECTIVE ACTION

Replace the microphone. Contact unit maintenance.

MALFUNCTION

No voice is being transmitted through the hailer horn.

CORRECTIVE ACTION

Check that speaker wires are securely attached to forward or aft terminal screws on the back of the hailer horn.

Perform operational check of loudhailer. (WP 0025 00)

MALFUNCTION

Still no fog signal is being transmitted through the hailer horn.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PUBLIC ADDRESS SET (LOUDHAILER)
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE PUBLIC ADDRESS SET (LOUDHAILER) WILL NOT TRANSMIT VHF/FM DSC TRANSCEIVER AUDIO TO HAILER HORN (LOUDHAILER EXTERNAL SPEAKER)

SYMPTOM

No VHF/FM DSC transceiver audio is being transmitted through the hailer horn.

MALFUNCTION

No power to loudhailer.

CORRECTIVE ACTION

Turn loudhailer on by rotating the OFF/DIM knob clockwise cw on the loudhailer.
(WP 0025 00)

MALFUNCTION

No indication of AUX in the display.

CORRECTIVE ACTION

Press the AUX key. (WP 0025 00)

MALFUNCTION

No audio is being transmitted through the hailer horn.

CORRECTIVE ACTION

Check that speaker wires are securely attached to forward or aft terminal screws on the back of the loudhailer.

Perform operational check of loudhailer. (WP 0025 00)

MALFUNCTION

Still no VHF/FM DSC transceiver audio is being transmitted through the hailer horn.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
VHF/FM DSC TRANSCEIVER
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE VHF/FM DSC TRANSCEIVER HAS NO POWER

SYMPTOM

No indication of power displayed in the transceiver display window.

MALFUNCTION

No power to transceiver.

CORRECTIVE ACTION

Turn transceiver on. Rotate the VOL knob clockwise cw on the transceiver.
(WP 0028 00)

MALFUNCTION

VHF-FM RADIO circuit breaker on the operators cab circuit breaker panel A3 is in the off position.

CORRECTIVE ACTION

Position VHF-FM RADIO circuit breaker to on. (WP 0006 00)

Perform operational check of transceiver. (WP 0028 00)

MALFUNCTION

Still no indication of power to transceiver displayed in display window.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
VHF/FM DSC TRANSCEIVER
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE VHF/FM DSC TRANSCEIVER WILL NOT RECEIVE

SYMPTOM

The transceiver will not receive a message.

MALFUNCTION

The transceiver will not receive messages.

CORRECTIVE ACTION

Check for transceiver receiving power. (WP 0028 00)

MALFUNCTION

Antenna cable is not secure at connection.

CORRECTIVE ACTION

Tighten antenna cable connector.

Perform operational check of transceiver. (WP 0028 00)

MALFUNCTION

The transceiver still will not receive messages.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
VHF/FM DSC TRANSCEIVER
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE VHF/FM DSC TRANSCEIVER WILL NOT TRANSMIT

SYMPTOM

The transceiver will not transmit a message.

MALFUNCTION

The transceiver will not transmit messages.

CORRECTIVE ACTION

Check to see if transceiver power is on. (WP 0028 00)

MALFUNCTION

Signal strength does not appear in display when microphone is keyed.

CORRECTIVE ACTION

Check microphone for proper operation. (WP 0028 00)

MALFUNCTION

Antenna cable is not secure at connection.

CORRECTIVE ACTION

Tighten antenna cable connector.

Perform operational check of transceiver. (WP 0028 00)

MALFUNCTION

The transceiver still will not transmit a message.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
VHF/FM DSC TRANSCEIVER
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

THE VHF/FM DSC TRANSCEIVER DOES NOT DISPLAY A VALID POSITION

SYMPTOM

Alarm will sound if current position shown in the transceiver display is invalid.

MALFUNCTION

The transceiver initial setup procedures are incorrectly entered.

CORRECTIVE ACTION

Perform initial set up of the transceiver. (WP 0027 00)

MALFUNCTION

PLGR initial setup procedures are incorrectly entered.

CORRECTIVE ACTION

Perform initial set up of PLGR. (WP 0031 00)

MALFUNCTION

OPERATE/PROGRAM switch on the AN/PSN-11 interface and switchbox is in the PROGRAM position.

CORRECTIVE ACTION

Position OPERATE/PROGRAM switch to OPERATE. (WP 0028 00)

MALFUNCTION

SW 3 switch on the interface and switchbox is in the down position.

CORRECTIVE ACTION

Place SW 3 on the interface and switchbox in the up position. (WP 0028 00)

MALFUNCTION

PLGR cable not secure to PLGR connector.

CORRECTIVE ACTION

Securely attach PLGR cable to PLGR connector.

Perform operational check of transceiver. (WP 0028 00)

MALFUNCTION

PLGR cable not secure to J7 connector on back of interface and switchbox.

CORRECTIVE ACTION

Securely attach PLGR cable to J7 connector on back of the interface and switchbox.

Perform operational check of transceiver. (WP 0028 00)

MALFUNCTION

Cable not secure to J3 connector on back of the interface and switchbox.

CORRECTIVE ACTION

Securely attach cable to J3 connector on back of the communications interface and switchbox.

Perform operational check of transceiver. (WP 0028 00)

MALFUNCTION

Current position in the transceiver display is still invalid.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR)
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR) HAS NO POWER

SYMPTOM

No indication of power displayed in the PLGR display window.

MALFUNCTION

No power to PLGR.

CORRECTIVE ACTION

Press the ON button on the PLGR. (WP 0031 00)

MALFUNCTION

Power switch is in the OFF position on the AN/PSN-11 Interface and Switchbox.

CORRECTIVE ACTION

Position power switch to ON PWR position. (WP 0024 00)

Perform operational check of PLGR. (WP 0031 00)

MALFUNCTION

DC/DC CONV circuit breaker on the operators cab circuit breaker panel (A3) is in off position.

CORRECTIVE ACTION

Position DC/DC CONV circuit breaker to on. (WP 0006 00)

Perform operational check of PLGR. (WP 0031 00)

MALFUNCTION

Power switch is in the OFF position on the DC to DC converter.

CORRECTIVE ACTION

Position DC to DC converter power switch to ON. (WP 0035 00)

Perform operational check of PLGR. (WP 0031 00)

MALFUNCTION

PLGR cable not secure to PLGR connector.

CORRECTIVE ACTION

Securely attach PLGR cable to PLGR connector.

Perform operational check of PLGR. (WP 0031 00)

MALFUNCTION

PLGR cable not secure to connector on back of the AN/PSN-11 Interface and Switchbox.

CORRECTIVE ACTION

Securely attach PLGR cable to connector on back of the AN/PSN-11 Interface and Switchbox.

Perform operational check of PLGR. (WP 0031 00)

MALFUNCTION

Still no power to PLGR.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR)
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR) DOES NOT DISPLAY A VALID POSITION

SYMPTOM

Current position shown in PLGR display is not valid.

MALFUNCTION

Initial setup procedures are incorrectly entered.

CORRECTIVE ACTION

Perform initial set up of PLGR. (WP 0031 00)

MALFUNCTION

PLGR external antenna cable connections on back of AN/PSN-11 Interface and Switchbox not securely tightened.

CORRECTIVE ACTION

Securely attach antenna cable connectors to antenna connector receptacles on back of AN/PSN-11 Interface and Switchbox.

Perform operational check of PLGR. (WP 0031 00)

MALFUNCTION

External antenna cable connection on back of GPS antenna not securely tightened.

CORRECTIVE ACTION

Securely attach antenna cable connector to antenna connector receptacle on back of GPS antenna.

Perform operational check of PLGR. (WP 0031 00)

MALFUNCTION

Current position shown in PLGR display is still invalid.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR)
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

PRECISION LIGHTWEIGHT GLOBAL POSITIONING RECEIVER (PLGR) HAS CLEARED MEMORY

SYMPTOM

While observing PLGR display, "WARNING, The receiver has cleared memory" appears in display.

MALFUNCTION

Memory battery voltage is low or memory battery is not installed.

CORRECTIVE ACTION

Replace memory battery. Contact unit maintenance.

Perform initial set up of PLGR. (WP 0031 00)

MALFUNCTION

PLGR still has a cleared memory

CORRECTIVE ACTION

Replace PLGR unit. Contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
NAVIGATION LIGHTS
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

NAVIGATION LIGHT AUDIBLE PULSE BEEPER SOUNDS

SYMPTOM

Audible pulse beeper sounds indicating one or more navigation lights not working.

MALFUNCTION

All lights on the mast are out.

CORRECTIVE ACTION

Check the NAV LIGHTS circuit breaker on the operators cab circuit breaker panel A3 is on. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

Only one light out.

CORRECTIVE ACTION

Check for burned out primary navigation light. Move the toggle switch from PRIMARY to SPARE on the mast enclosure assembly A7. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

If primary bulb is burned out, contact unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
WARPING TUG
NAVIGATION LIGHTS
TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Personnel Required**Seaman 88K

TROUBLESHOOTING PROCEDURE

NAVIGATION LIGHT (S) WILL NOT FUNCTION

SYMPTOM

No illumination from the navigation light (s).

MALFUNCTION

The NAV LIGHTS circuit breaker located on the operators cab circuit breaker panel A3 is off.

CORRECTIVE ACTION

Position NAV LIGHTS circuit breaker to on. (WP 0006 00)

Perform operational check of WT. (WP 0022 00)

MALFUNCTION

A blown fuse is found in the mast enclosure assembly.

CORRECTIVE ACTION

Replace the fuse. Contact unit maintenance.

MALFUNCTION

The navigation light(s) still do not illuminate.

CORRECTIVE ACTION

Contact unit maintenance.

END OF WORK PACKAGE

CHAPTER 4

OPERATOR MAINTENANCE INSTRUCTIONS

FOR

MODULAR CAUSEWAY SYSTEM (MCS)

WARPING TUG (WT)

**OPERATOR MAINTENANCE
WARPING TUG
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)
PROCEDURES INTRODUCTION**

INTRODUCTION

General

Preventive Maintenance Checks and Services (PMCS) are performed to keep the warping tug equipment in operating condition. The checks are used to find, correct or report problems. Crew members are to do the PMCS as shown in the PMCS table. Preventative maintenance checks and services are performed every day the equipment is operated, using the PMCS table.

Before you begin operating the equipment, do "Before PMCS".

During operation, do "During PMCS".

After operation, do "After PMCS".

Do "Monthly PMCS" once a month. If the equipment has not been operated in a month, also do "After PMCS" at the same time.

If you are operating the equipment for the first time, do the "Monthly PMCS" the first time you do your "Before PMCS".

If you find something wrong when performing PMCS fix it if you can using troubleshooting procedures and/or maintenance procedures.

The right-hand column of the PMCS table list conditions that make the vessel not fully mission capable. Write up items not fixed on DA Form 2404 for unit maintenance. For further information on how to use this form, see DA PAM 738-750.

Leakage Definition

CAUTION

Equipment operation is allowed with minor leakages (Class I or II), except for fuel leaks. Of course, consideration must be given to the fluid capacity of the item or system being checked. When in doubt, ask your supervisor. Failure to maintain proper fluid levels could result in damage to equipment.

When operating with Class I or II leaks, continue to check fluid levels as required in your PMCS.

Class III leaks should be reported immediately to your supervisor.

It is necessary to know how fluid leakage affects the status of the equipment. The following are definitions of the classes of leakage an operator or crew member needs to know to be able to determine the condition of the leak. Learn and then be familiar with them and REMEMBER - WHEN IN DOUBT, ASK YOUR SUPERVISOR.

Leakage definitions for Crew/Operator PMCS.

CLASS I - Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.

CLASS II - Leakage of fluid great enough to form drops, but not enough to cause drops to drip from item being checked.

CLASS III - Leakage of fluid great enough to form drops that fall from the item being checked.

Inspection

Look for signs of a problem or trouble. Senses help here. You can feel, smell, hear or see many problems. Be alert when on the equipment.

Inspect to see if items are in good condition. Are they correctly assembled, stowed, secured, excessively worn, leaking, corroded or properly lubricated? Correct any problems found or notify unit maintenance.

There are some common items to check all over the equipment. These include the following:

1. Bolts, clamps, nuts and screws: Continuously check for looseness. Look for chipped paint, bare metal, rust or corrosion around bolt and screw heads and nuts. Tighten them when you find them loose. If tools are not available, contact unit maintenance.
2. Welds: Many items on the equipment are welded. To check these welds, look for chipped paint, rust, corrosion or gaps. When these conditions exist, notify unit maintenance on DA Form 2404.
3. Electrical wires, connectors and harnesses: Tighten loose connectors. Look for cracked or broken insulation, bare wires and broken connectors. If any are found, notify unit maintenance.
4. Hoses and fluid lines: Look for wear, damage and leaks and make sure clamps and fittings are tight. Wet spots mean a leak. A stain by a fitting or connector can also mean a leak. When you find a leak, notify unit maintenance.

Lubrication Service Intervals - Normal Conditions

For safer, more trouble free operations, make sure that your equipment is serviced when it needs it. For the proper lubrication and service intervals, see the PMCS section of this manual.

Lubrication Service Intervals - Unusual Conditions

Your equipment will require extra service and care when you operate under unusual conditions. High or low temperatures or long periods of hard use will break down the lubricant, requiring you to add or change lubricant more often.

Lubrication Intervals

The following lubrication interval symbols are used in the PMCS table:

| | |
|------------------|--------------------|
| D - daily | W - weekly |
| M - monthly | Q - quarterly |
| S - semiannually | H - hours operated |
| A - annually | |

Lubrication Symbols

The following lubrication symbols are used in the PMCS table:

OE/HDO-30 - Lubricating Oil, internal combustion engine, tactical service, SAE 30, MIL-L-2104F or SAE 30, MIL-L-46152 Temperature Range -25° - 0°F.

OE/HDO-40 - Lubricating Oil, internal combustion engine, tactical service, SAE 40, API Class CD-II, MIL-L-2104D, Sulfated Ash: less than 1.0%, Temperature Range -25° - 150°F.

OE/HDO-50 - Lubricating Oil, internal combustion engine, tactical service, SAE 50, MIL-L-2104F or SAE 50, MIL-L-46152. Temperature Range 0° - 150°F.

GO-80/90 - Lubricating oil, gear, multipurpose, MIL-L-2105, Grade 80/90, ISO VG 150, AGMA4 EP.

DTE-25 - Hydraulic fluid, Mobil DTE-25, ISO viscosity grade 46.

LUBRIPLATE - Grease, wire rope, exposed gear, 1200-2, MIL-G-18458.

WTR - Grease, aircraft, general purpose, wide temperature.

GAA - Grease, Lithium Base, MIL-G-10924.

GGP - Grease, General Purpose, MIL-G-23549

S-750 - Antifreeze, ethylene glycol inhibited, heavy duty, MIL-A-46153. Temperature Range -25° - 150°F.

Oil Filters

Oil filters shall be serviced/cleaned/changed, as applicable, when:

They are known to be contaminated or clogged.

Service is recommended by AOAP laboratory analysis.

At prescribed hard time intervals.

Army Oil Analysis Program (AOAP)

The warping tug diesel engines, marine transmission gearcases, transfer cases, hydraulic systems and winch engine oil are enrolled in the Army Oil Analysis Program. Refer to DA PAM 738-750 for the Army Oil Analysis Program. Warping tug components will be sampled at the following intervals:

Warping Tug Engines - Sample crankcase oil every 90 days or 100 operating hours, whichever occurs first, as prescribed by DA PAM 738-750.

Marine Transmission Gearcases - Sample oil every 90 days or 100 operating hours, whichever occurs first, as prescribed by DA PAM 738-750.

Transfer Cases - Sample oil every 90 days or 100 operating hours, whichever occurs first, as prescribed by DA PAM 738-750.

Hydraulic Systems - Sample oil every 180 days, as prescribed by DA PAM 738-750.

Warping Tug Winch Engine - Sample oil every 90 days or 100 operating hours, whichever occurs first, as prescribed by DA PAM 738-750.

Warranty Information

For equipment under manufacturer's warranty, hard time oil service intervals shall be followed. Intervals shall be shortened if lubricants are known to be contaminated or if operation is under adverse conditions, such as: longer than usual operating hours, extended idling period or extreme dust.

Cleaning And Lubrication

Proper cleaning and lubrication can aid in avoiding possible problems or trouble, so make it a habit to do the following:

CAUTION

Follow all cleaning and lubrication instructions carefully, failure to do so can result in damage to equipment.

1. Thoroughly wash all equipment exposed to salt spray with clean, fresh water.
2. Clean parts to be lubricated with cleaner, type II, MIL-C-29602 or equivalent. Do not use fluid or semi-fluid lubricant on SFD coated surface. Wipe surface dry before lubricating.
3. Clean grease fittings before lubrication.
4. Lubricate all equipment at conclusion of the operation before equipment storage.
5. Always use the PMCS lubrication instructions as a guide.
6. Never use too much lubricant.
7. Never use the wrong type or grade of lubricant.
8. Lubricate more during constant use and less during inactive periods.
9. Use the correct grade of lubricant for seasonal temperature expected.

Corrosion Prevention And Control (CPC)

Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

Corrosion is typically associated with rusting of metals or galvanic corrosion which produces a white powder. The category of corrosion also includes deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of the materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using SF 368, Product Quality Deficiency Report. Use of key words such as "corrosion", "rust", "deterioration" or "cracking" will ensure that the information is identified as a CPC Problem. The form should be submitted to the address specified in DA PAM 738-750.

**OPERATOR MAINTENANCE
WARPING TUG
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)
AND LUBRICATION PROCEDURES**

INITIAL SETUP:**Tools**

Tool Kit, General Mechanic's (Rail and Marine) (Item 76, WP 0108 00)
Gloves, Men's and Women's (Leather Palm) (Item 31, WP 0108 00)
Goggles, Sun, Wind and Dust (Safety) (Item 34, WP 0108 00)
Life Preserver, Vest (Item 45, WP 0108 00)
Helmet, Safety (Brown) (Item 40, WP 0108 00)
Gloves, Chemical (Item 29, WP 0108 00)
Goggles, Industrial (Chipping, Chemical) (Item 32, WP 0108 00)
Apron, Utility (Item 7, WP 0108 00)
Respirator, Air Filtering (Item 4, WP 0110 00)
Lubricating Gun, Hand (Item 1, WP 0110 00)
Mop, Wet (Item 2, WP 0110 00)
Oiler, Hand (Item 3, WP 0110 00)

Materials/Parts

Antifreeze (Item 2, WP 0109 00)
Antiseize Compound (Item 3, WP 0109 00)
Cleaner (Item 6, WP 0109 00)
Grease, General Purpose (Item 11, WP 0109 00)
Grease, General Purpose (Molybdenum) (Item 12, WP 0109 00)
Grease, Aircraft (Item 8, WP 0109 00)
Grease, Automotive and Artillery (Item 9, WP 0109 00)
Grease, Ball and Roller Bearing (White Lithium) (Item 10, WP 0109 00)
Grease, Wire Rope-Exposed Gear (Item 13, WP 0109 00)
Fuel, Diesel (Item 7, WP 0109 00)
Lubricating Oil, Gear (Grade 80W90) (Item 16, WP 0109 00)
Lubricating Oil, Engine (Grade 30) (Item 15, WP 0109 00)
Lubricating Oil, Engine (Grade 40) (Item 14, WP 0109 00)
Lubricating Oil, General Purpose (DTE-25) (Item 17, WP 0109 00)
Lubricating Oil, Mobilgear 626 (Item 18, WP 0109 00)
Water, Reagent Distilled (Item 20, WP 0109 00)
Rag, Wiping (Item 19, WP 0109 00)

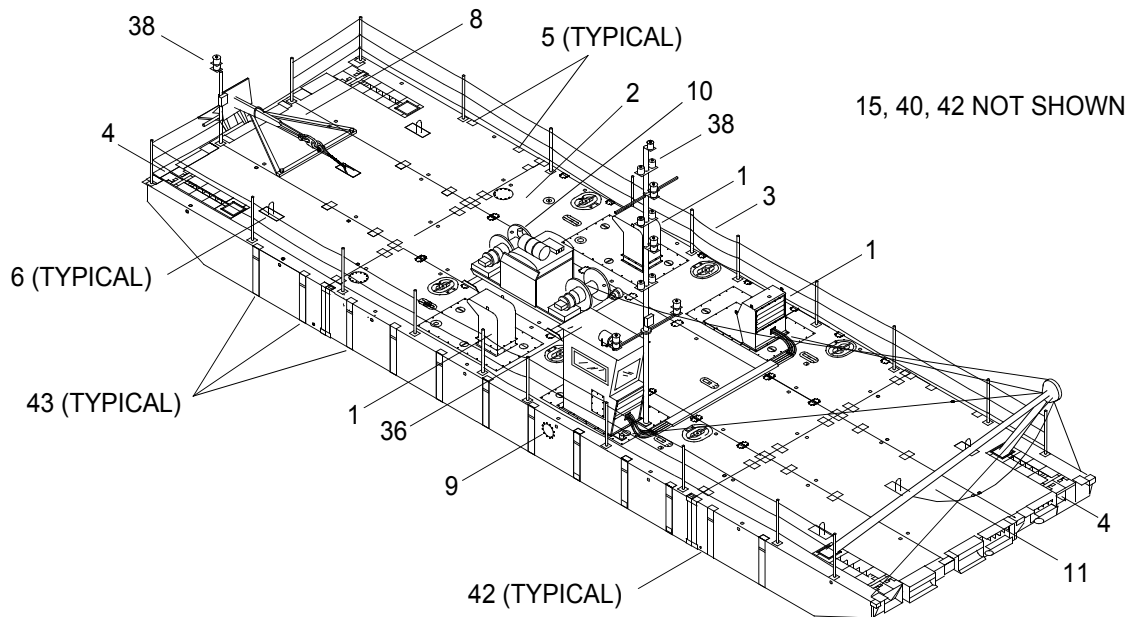
Personnel Required

Seaman 88K
Engineer 88L

References

TM 5-2815-258-10
TM 55-3950-204-14&P
DA PAM 738-750

- | | |
|---|---|
| 1. Intake and Exhaust Plenums | 23. Diesel Engine Intake and Exhaust |
| 2. Propulsion Module | 24. Batteries |
| 3. Railing Assembly | 25. Marine Gear |
| 4. Flexor | 26. Transfer Case |
| 5. Deck Fittings | 27. Drive Shafts |
| 6. Lift Shackles | 28. Hydraulic System |
| 7. Fenders | 29. Hydraulic Reservoir |
| 8. Stern Anchor | 30. Emergency Steering Hand Pump |
| 9. Exhaust Flapper Valves | 31. Pump-Jet |
| 10. Winch | 32. Fuel System |
| 11. Winch A-Frame | 33. Bilge Pump System (Lazaret) |
| 12. Propulsion Module Circuit Breaker Panel | 34. Emergency Steering Control Stand |
| 13. Cab Circuit Breaker panel | 35. Fire Suppression System |
| 14. Cab Lower Control Panel | 36. Operators Cab |
| 15. Ventilation Fan | 37. Cab Middle Control Panel |
| 16. Bilge Pump System Compartment | 38. Navigation Masts and Lights |
| 17. Electrical Junction and Terminal Boxes | 39. Powered Section |
| 18. Raw Water Cooling System | 40. Lifting Slings |
| 19. Bilge Pumps | 41. Powered and Non-Powered Modules |
| 20. Diesel Engine | 42. Steel Weight Lifting Chains, Rings, Hooks, Shackles and Swivels |
| 21. Diesel Engine Alternator | 43. Module Interlock Connector (Male Locking Pin) |
| 22. Diesel Engine Cooling System | 44. Horizontal and Vertical Connectors |



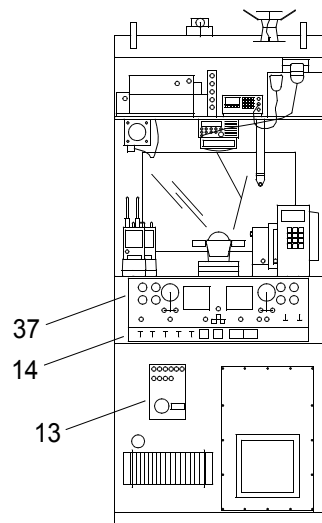
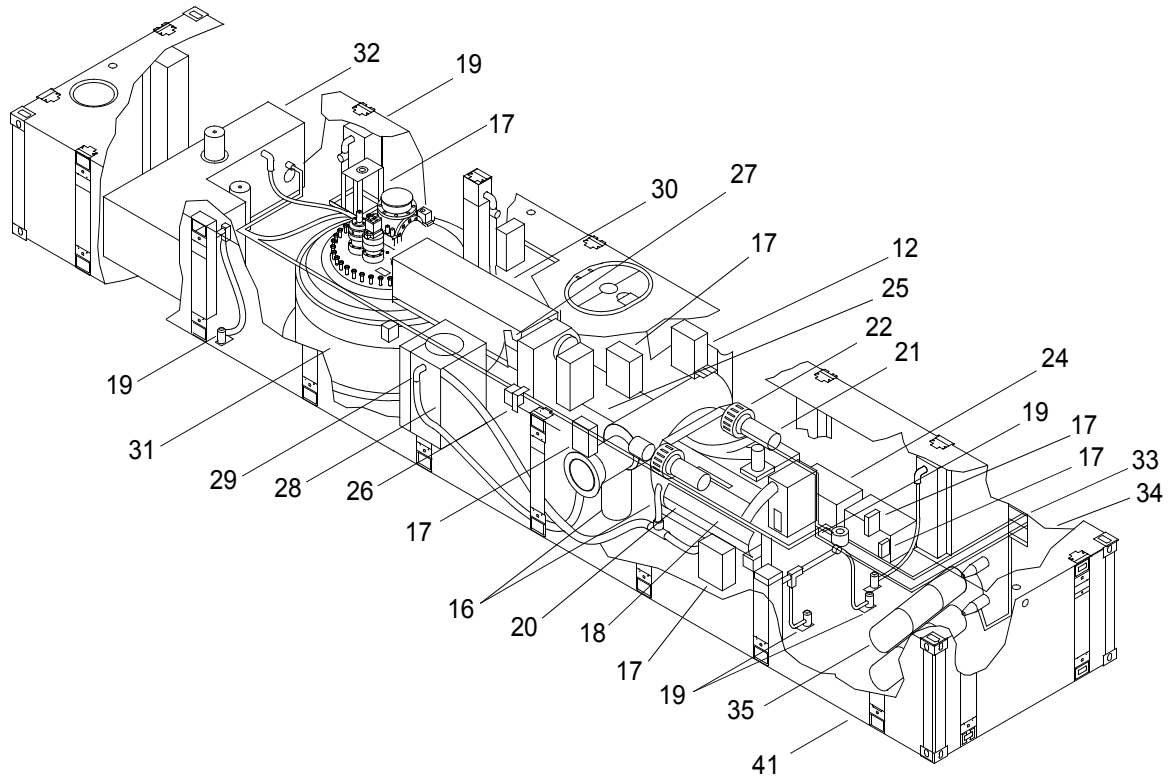


Table 1. Preventive Maintenance Checks and Services for the Warring Tug.

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|------------------------------------|
| 1 | Before | 0.05 | Intake and Exhaust Plenums | <ol style="list-style-type: none"> 1. Ensure plenums are secured to deck. If plenums are loose, attach plenums to deck. 2. Check electrical interconnection cable for secure attachment to intake plenum. If cable connections are disconnected or loose, connect or tighten cables. 3. Check that exhaust fan power cables are connected. Connect cables if disconnected. 4. Check that exhaust plenum door handles are in the OPEN position. If handles are in the CLOSED position, move handles to the OPEN position. 5. Check for loose hardware. If found, contact unit maintenance. 6. Inspect portable fire extinguisher for discharge nozzle obstruction, proper mounting, tag signed within the last month and that all seals and pins are in place. Record completion of the inspection in the deck logbook. If discharge nozzle is obstructed, fire extinguisher mounting is loose, tag is not signed within the last month or seals or pins are missing, contact unit maintenance. | |

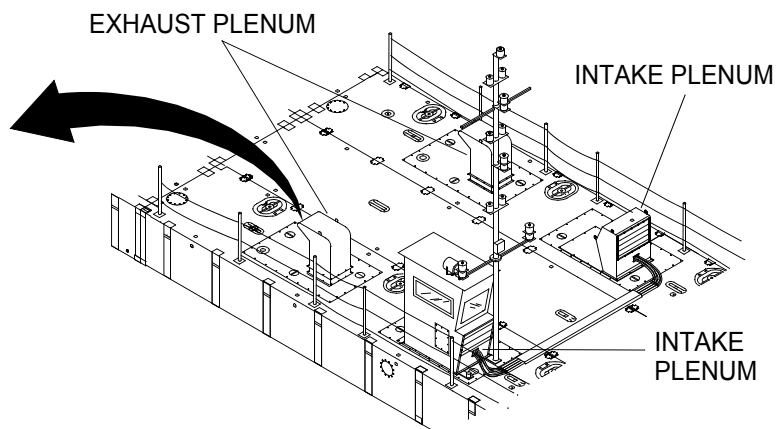
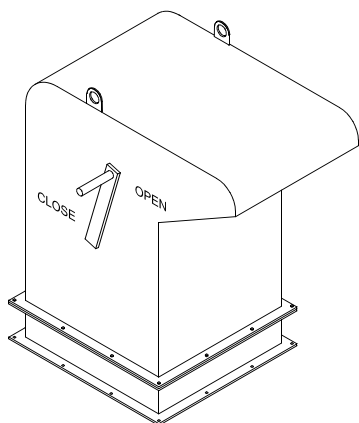


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|---|
| 2 | Before | 0.1 | Propulsion Module | <p>1. Ensure all soft patches are secured for sea operation, including exhaust port patches (opposite exhaust port flapper valves). If soft patches are not secure, contact unit maintenance.</p> <p>2. Inspect lazaret, machinery and fuel compartments for indications of water, oil or fuel leaks. Access via personnel hatches. If leaks are found, contact unit maintenance.</p> | Class III oil leakage or Class I fuel leakage is found. |

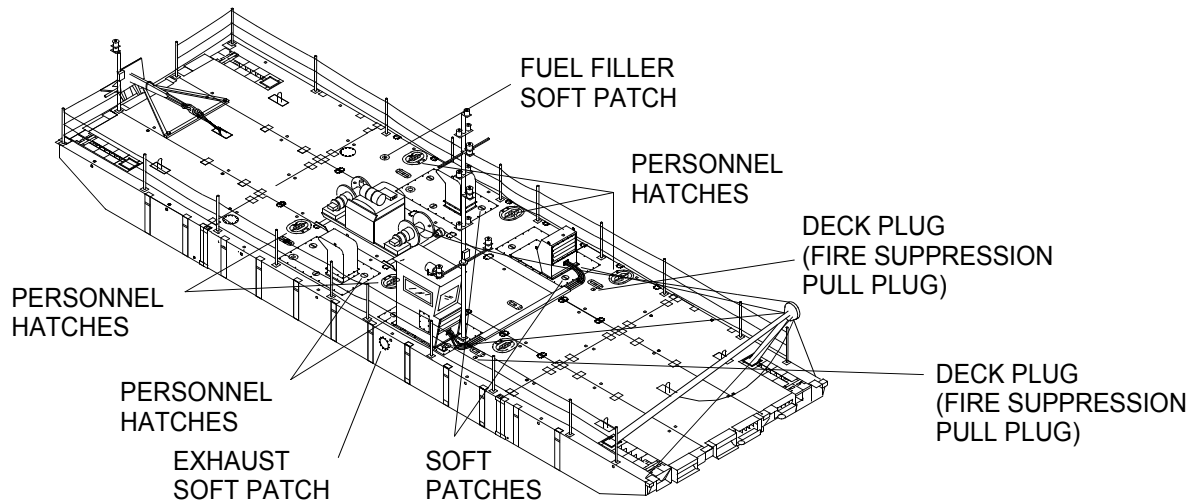


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|---|
| 3 | Before | 0.1 | Railing Assembly | <p>1. Inspect railing posts for broken welds, missing or broken bolts and broken connector. If railing post welds are broken, bolts are missing or broken or connectors are broken, contact unit maintenance.</p> <p>2. Inspect all cable connector posts on railings for proper installation (locked or pinned) to the deck openings. If locks or pins are missing, contact unit maintenance.</p> <p>3. Check all cables and connection points for worn or frayed areas. If cables or connection points are frayed, contact unit maintenance.</p> <p>4. Check that all cable assemblies are tight. If cables are loose, contact unit maintenance.</p> | <p>Railing posts have broken welds, bolts are missing or broken or connectors are broken.</p> <p>Locks or pins are missing.</p> |

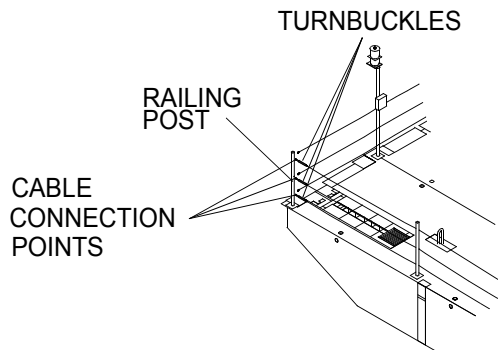
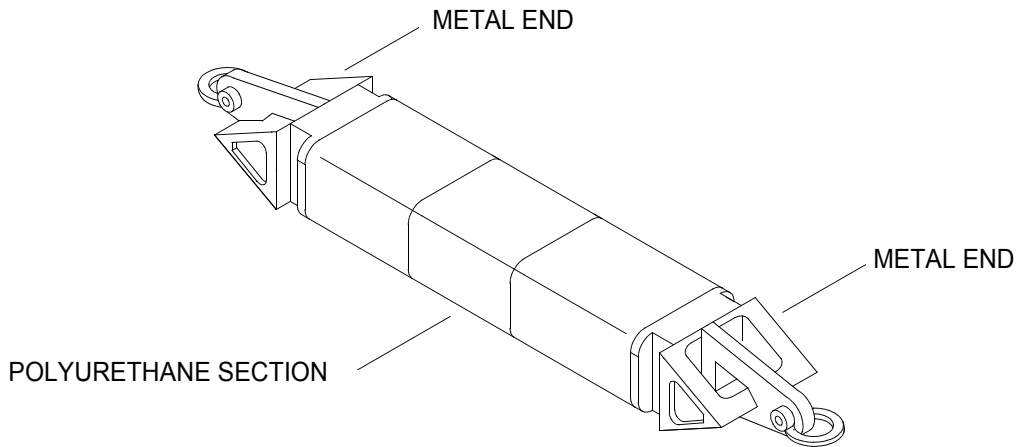


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|--|
| 4 | Before | 0.5 | Flexors | <p>1. Inspect uninstalled flexors for separation of the polyurethane material in the center. If separation of the polyurethane material in the center of the flexor is found, contact unit maintenance.</p> <p>2. Inspect uninstalled flexors for cracks in the external weldments on the ends. If cracks in the external weldments on the ends of the flexor are found, contact unit maintenance.</p> | <p>Separation of the polyurethane material in the center of the flexor is found.</p> <p>Cracks are discovered in the external weldments on the ends of the flexor.</p> |



| | | | | |
|---|--------|------|---------------|---|
| 5 | Before | 0.1 | Deck Fittings | Inspect D-rings/cloverleaf fittings and deck cleats for corrosion, breakage or missing parts. If corrosion is found or D-rings/cloverleaf fittings or deck cleats are broken or have missing parts, contact unit maintenance. |
| 6 | Before | 0.05 | Lift Shackles | Remove water from lift shackles. |

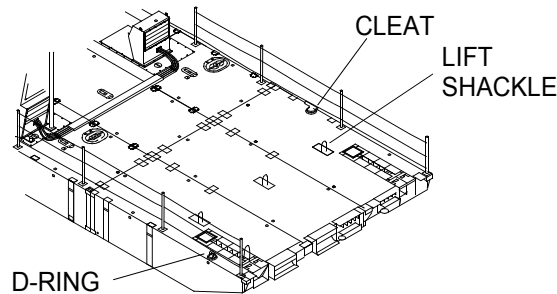


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

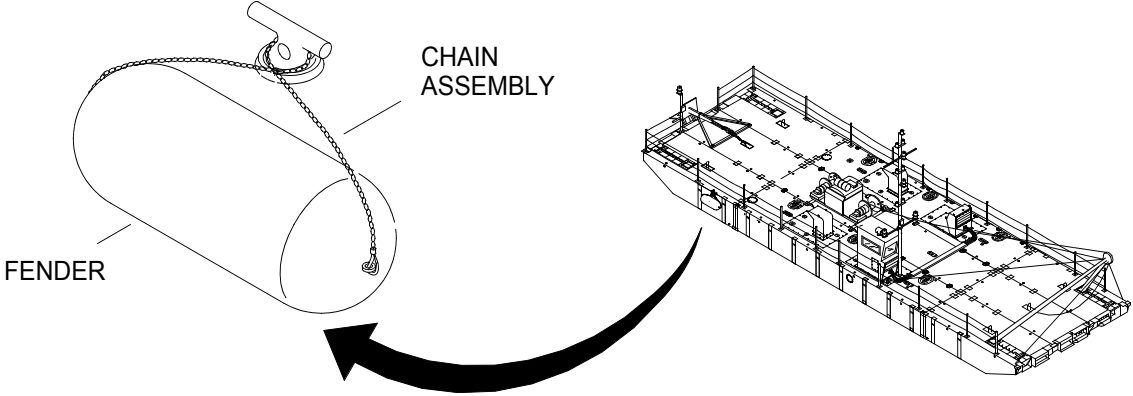
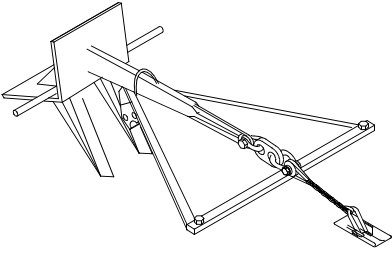
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|----------|-----------|--------------------------------|---|---------------------------------------|
| 7 | Before | 0.2 | Fenders | Inspect fenders and chains for damage that would prevent proper operation of the fenders. If damage is found that would prevent proper operation of the fenders, contact unit maintenance. | |
|  <p>The diagram illustrates the fender assembly, showing a cylindrical fender with a chain attached to its top and bottom. Labels 'FENDER' and 'CHAIN ASSEMBLY' are present. A curved arrow points from this assembly to a perspective view of the tug's deck, where the fenders are installed along the side.</p> | | | | | |
| 8 | Before | 0.1 | Stern Anchor | <ol style="list-style-type: none"> 1. Inspect stern anchor mount for broken welds, corrosion and damaged anchor roller. If broken welds, corrosion or damaged anchor roller is found, contact unit maintenance. 2. Inspect stern anchor for damage and secure installation. If damage is found, contact unit maintenance. | |
|  <p>The diagram shows a detailed view of the stern anchor mechanism, including the anchor roller, the anchor chain, and the mounting structure. The label 'STERN ANCHOR' is centered below the diagram.</p> | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

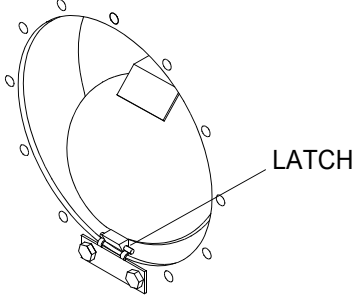
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|--------------------------------|--|------------------------------------|
| 9 | Before | 0.1 | Exhaust Flapper Valves | Open exhaust flapper valves on port or starboard modules. | |
|  <p>The diagram shows a circular exhaust flapper valve assembly. It consists of a main circular ring with several smaller circular components around its perimeter. A rectangular component is attached to the inner side of the ring. A line points from the word 'LATCH' to a specific point on the ring's edge.</p> | | | | | |
| 10 | Before | 0.5 | Winch | <ol style="list-style-type: none"> 1. Perform winch PMCS in accordance with TM 55-3950-204-14&P. 2. Perform winch engine PMCS in accordance with TM 55-3950-204-14&P. 3. Inspect winch mounting plates and transverse beams for cracks. If cracks are found, contact unit maintenance. 4. Check all mounting hardware for tightness. If hardware is loose, contact unit maintenance. | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|--|
| 11 | Before | 0.3 | Winch A-Frame | 1. Inspect A-frame mounting feet and attaching lugs for cracks and for loose bolts. If cracks or loose bolts are found, contact unit maintenance. | A-frame feet are cracked. |
| | | | | | |
| | | | | <p>2. Inspect A-frame legs for cracks. If cracks are found, contact unit maintenance.</p> <p>3. Inspect A-frame guy cable for breaks or fraying. If cable breaks or fraying is found, contact unit maintenance.</p> <p>4. Inspect A-frame attachment fittings for cracks and loose bolts. If cracks or loose bolts are found, contact unit maintenance.</p> <p>5. Inspect A-frame sheave attachment points for cracks and loose bolts. If cracks or loose bolts are found, contact unit maintenance.</p> | <p>A-frame legs are cracked.</p> <p>Cables are broken or frayed.</p> <p>Attachment fittings are cracked.</p> <p>Sheave is cracked.</p> |
| | | | | | |
| | | | | 6. Inspect A-frame sheave head plates for cracks. If sheave plate is cracked, contact unit maintenance. | Sheave head plate is cracked. |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

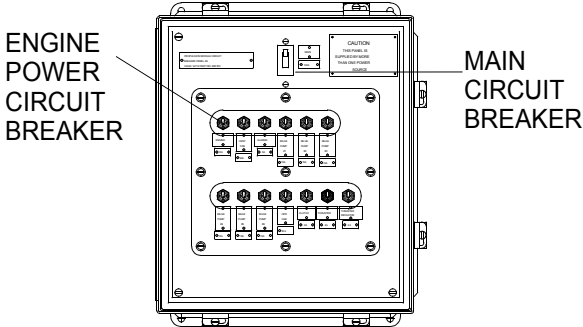
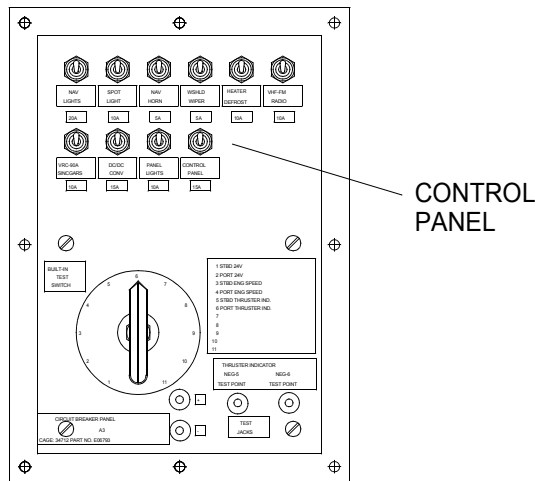
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|---|---|------------------------------------|
| <p>WARNING</p> <p>Ensure machinery compartment has been ventilated before resuming below deck PMCS. Failure to comply could result in injury or death to personnel.</p> | | | | | |
| 12 | Before | 0.1 | Propulsion Module Circuit Breaker Panel | <ol style="list-style-type: none"> 1. Switch ENGINE circuit breaker off (open breaker). If breaker does not function, contact unit maintenance. 2. Switch MAIN circuit breaker on (close breaker). If breaker does not function, contact unit maintenance. 3. Ensure all remaining circuit breakers are in on (closed) position. If breaker does not function, contact unit maintenance. Exit machinery compartment. Leave hatch open. | |
|  | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|---------------------------------------|
| 13 | Before | 0.1 | Cab Circuit Breaker Panel | Switch all circuit breakers to the on (closed) position. If breaker does not function, contact unit maintenance. | |



| | | | | | |
|----|--------|-----|-------------------------|--|----------------------------|
| 14 | Before | 0.1 | Cab Lower Control Panel | <ol style="list-style-type: none"> 1. Switch VENT FANS toggle switches port and stbd to ON position. green indicator lights should come on. If green lights do not come on, contact unit maintenance. 2. Verify that vent fans are working. If fans do not operate, contact unit maintenance. 3. Run the vent fans for at least 5 minutes to clear the air below deck before proceeding with, below deck PMCS start-up tasks. | Vent fans are inoperative. |
|----|--------|-----|-------------------------|--|----------------------------|

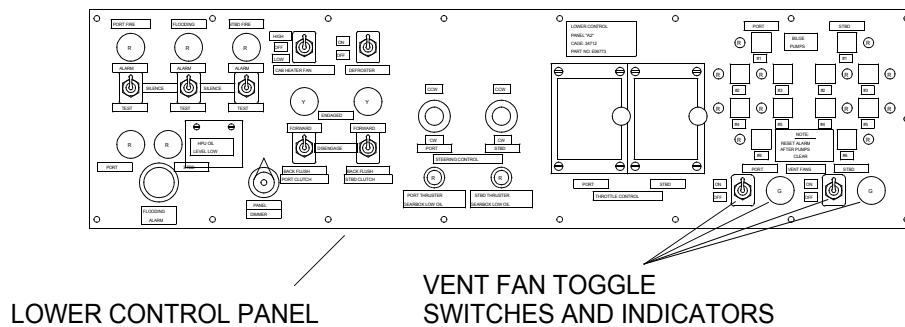


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|------------------------------------|
| 15 | Before | 0.1 | Ventilation Fan | When VENT FAN toggle switch is on (closed), verify that fans are working. Run the ventilation system for at least five minutes to clear the air below deck before going below deck to continue the preoperational start-up tasks. If vent fans are inoperative, contact unit maintenance. | |

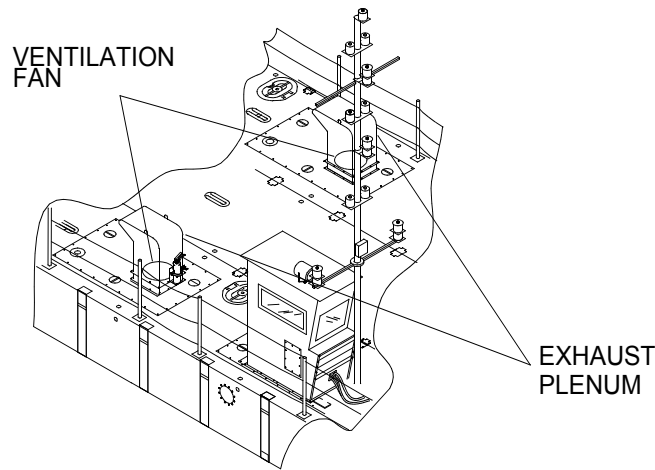


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|--|
| 16 | Before | 0.3 | Bilge Pump System Compartment | 1. Inspect compartment for evidence of water, oil and/or fuel leaks. If leaks are found, contact unit maintenance. | Evidence of Class III leakage of water or oil or Class I fuel leakage. |

NOTE

Do not pump bilges overboard. Pump bilges into holding tank. If holding tank is full, take vessel to sludge point.

2. If only water is present as indicated by the red flood light(s) on the operators cab control console, activate bilge pump(s) by pushing adjacent bilge pump push buttons. Once water is removed, the bilge pump(s) will automatically stop. If bilge pumps are inoperative, contact unit maintenance.

3. Test pumps by momentarily holding toggle switch(es) in TEST position and listening for pump operation. Switches will spring-return to the REMOTE position. If bilge pumps are inoperative, contact unit maintenance.

REMOTE POSITION

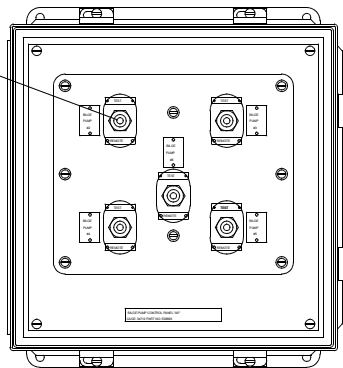


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--|---|---------------------------------------|
| 17 | Before | 0.3 | Electrical Junction and Terminal Boxes | <p>1. Inspect electrical wiring to see that it is securely connected, clean, and undamaged. If electrical wiring is not securely connected or is damaged, contact unit maintenance.</p> <p>2. Check all accessible fuse terminal blocks and connections to see that they are securely connected and supported, that insulation is not cracked or chafed, and that conduit and shielding are secure and in good condition. If fuse terminal blocks are not securely connected or supported, insulation is cracked or chafed, or conduit and shielding are not secure or damaged, contact unit maintenance.</p> | |

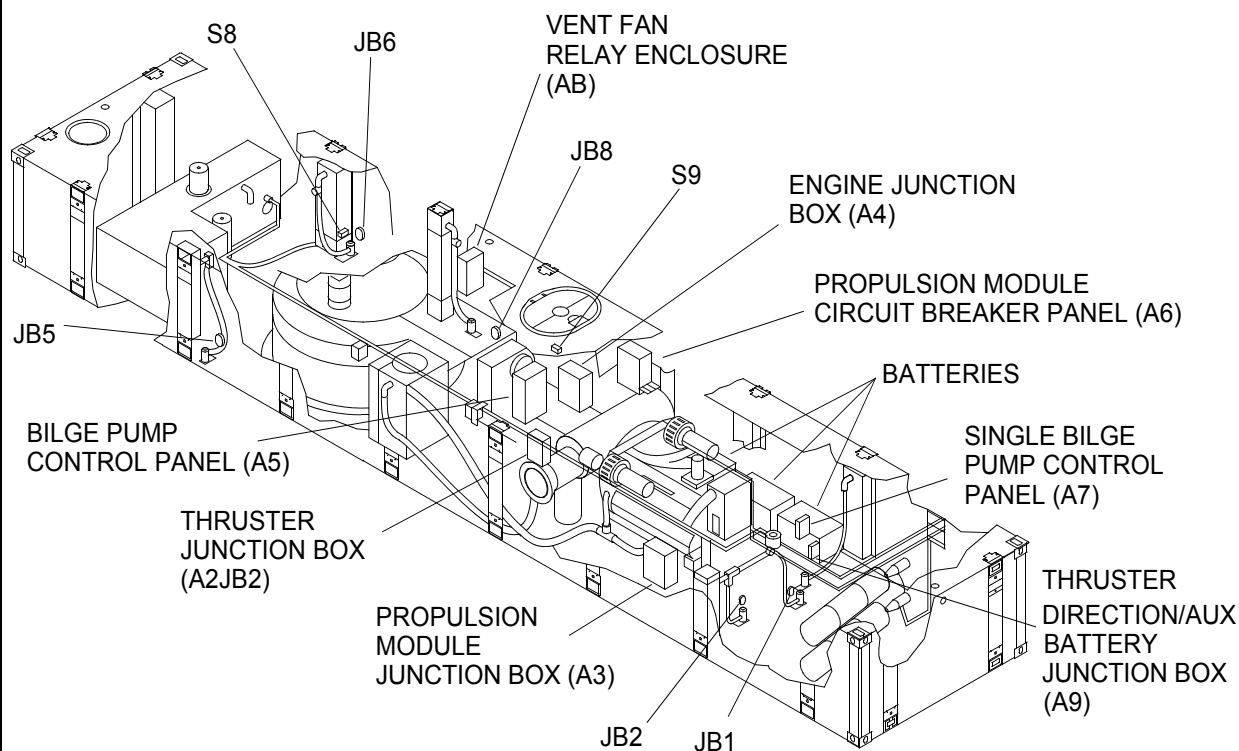


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|--|
| 18 | Before | 0.3 | Raw Water Cooling System | <ol style="list-style-type: none"> 1. Pull the duplex strainer baskets and clean. 2. Open sea chest butterfly valves, both port and starboard propulsion modules. 3. Check the raw water system for leaks. If leaks are found, contact unit maintenance. 4. Verify that the duplex strainer valve handle is in the extreme left or right position (allowing water to flow through only one of the two strainer baskets). If handle will not operate, contact unit maintenance. 5. Verify the exhaust discharge raw water valve lever is in the OPEN position. If valve will not operate, contact unit maintenance. 6. Verify the transfer case oil cooler raw water valve lever is in the OPEN position. If valve will not operate, contact unit maintenance. 7. Inspect the cooling system for leaks or excessive puddling around its base. If leakage is found, contact unit maintenance. | <p>Class II water leakage is found.</p> <p>Class III water leakage is found.</p> |

Table 1. Preventive Maintenance Checks and Services for the Warring Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|-----------------------------------|--|---------------------------------------|
| 18 | Before | 0.3 | Raw Water Cooling System (Cont'd) | 8. In freezing weather (below 32°F), close all petcocks in the raw water system. Prime the raw water pump. Inspect for leaks after start-up of engine. If leaks are found, contact unit maintenance. | |

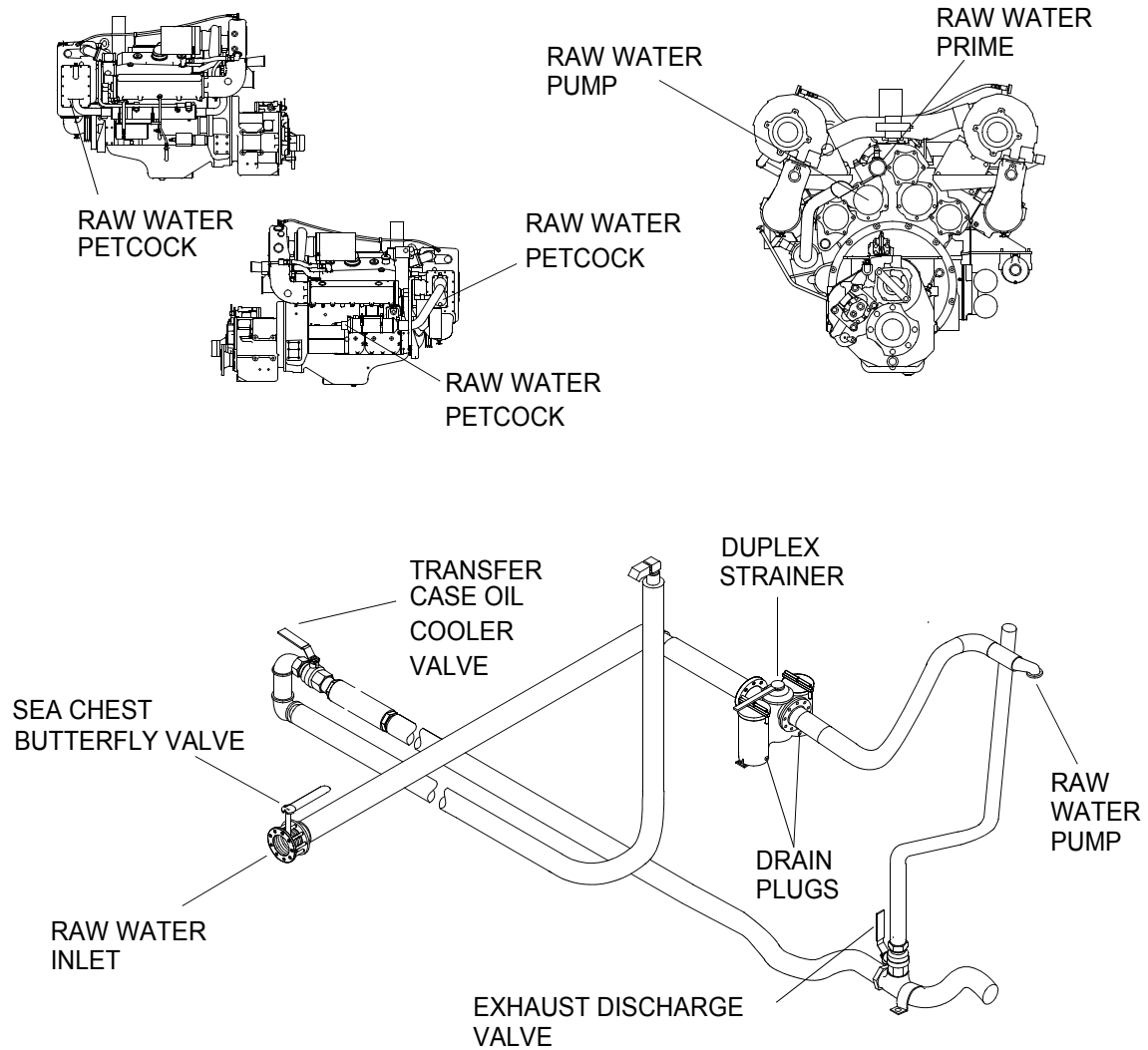


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|---------------------------------------|
| 19 | Before | 0.2 | Bilge Pumps | Check all bilge pumps and float switches for condition and proper operation. Look for evidence of water leaks, loose pump connections and/or damage. If bilge pumps are inoperative, leak, have loose connections or are damaged, contact unit maintenance. | |

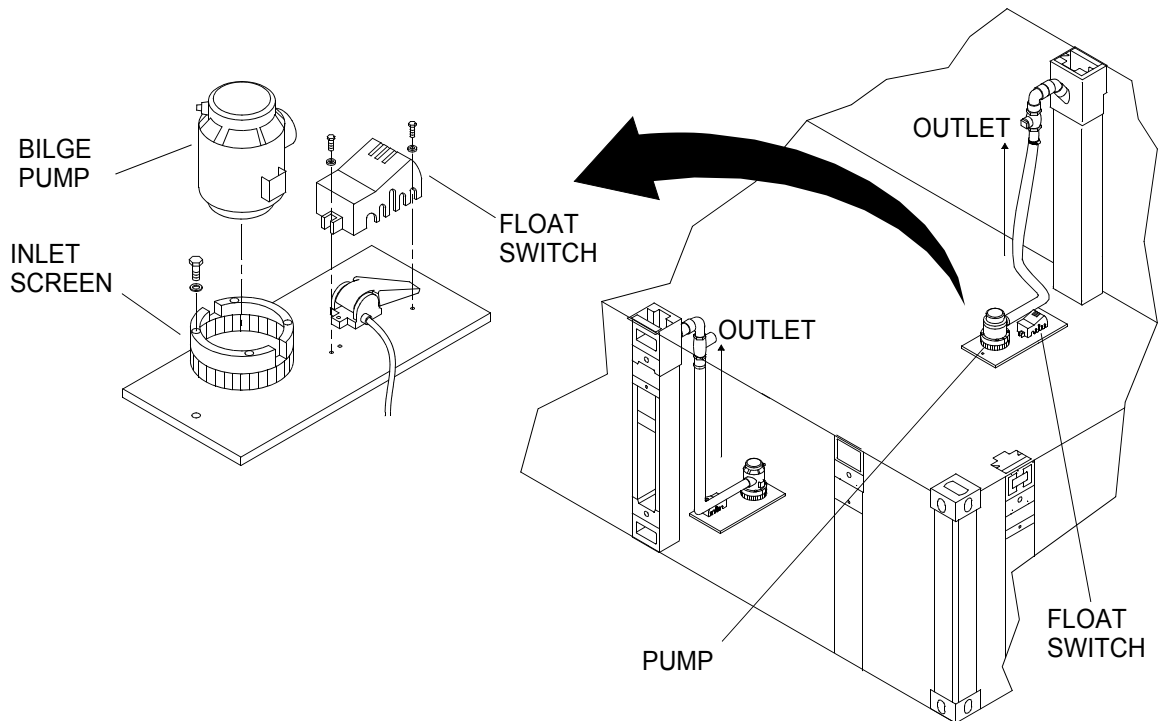
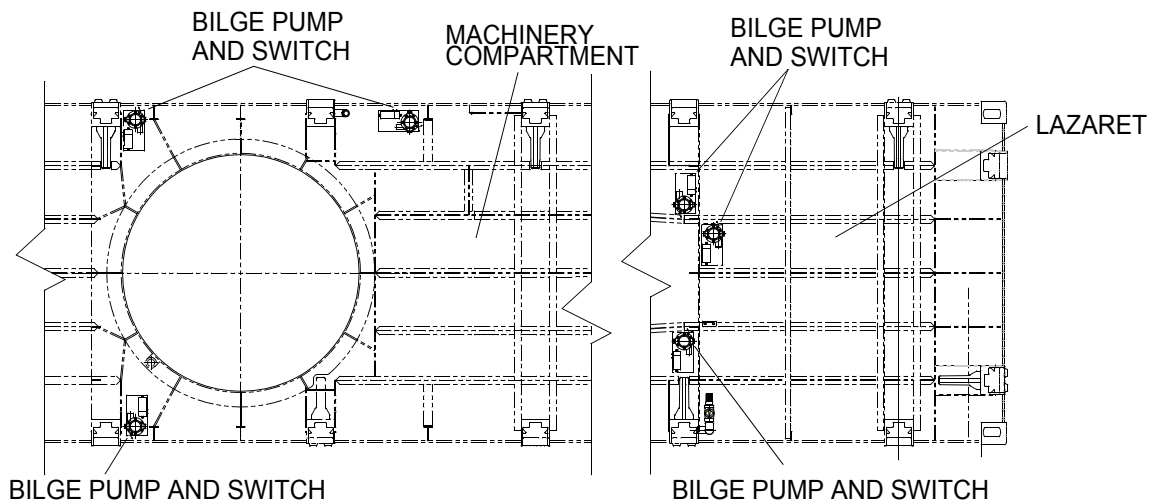


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)



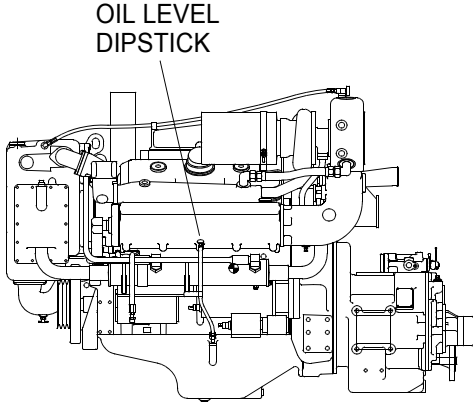
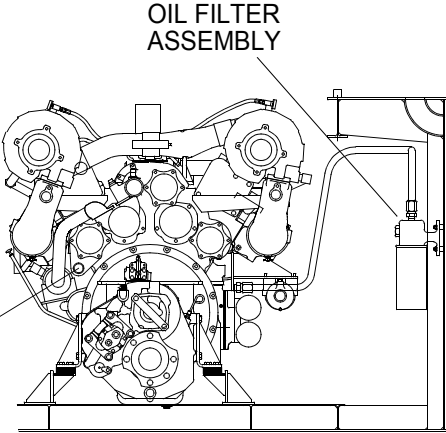

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: | |
|---|----------|-----------|--------------------------------|--|------------------------------------|--|
| <p>WARNING</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>CHEMICAL</p> </div> <div style="text-align: center;">  <p>EYE PROTECTION</p> </div> </div> | | | | | | |
| 20 | Before | 0.4 | Diesel Engine | <p>1. Check the engine oil level. Verify that it registers FULL on the dipstick. Engine must be cool when reading level. If hot, allow to cool for 20 minutes. Service with lubricating oil (grade 30). DO NOT OVERFILL.</p> <p>2. Make a visual inspection for oil leaks around the filters and the external oil lines. If leaks are found, contact unit maintenance.</p> | Class III leakage is found. | |
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>OIL LEVEL DIPSTICK</p> </div> <div style="text-align: center;">  <p>OIL FILTER ASSEMBLY</p> </div> </div> <div style="text-align: center; margin-top: 20px;">  <p>ENGINE HOUR METER</p> </div> | | | | | | |
| | | | | <p>3. Visually inspect the oil. If metal particles are found in it, the oil must be completely changed. Record current engine hour reading and compare with oil change repair records and contact unit maintenance.</p> | | |

Table 1. Preventive Maintenance Checks and Services for the Warring Tug. (Continued)

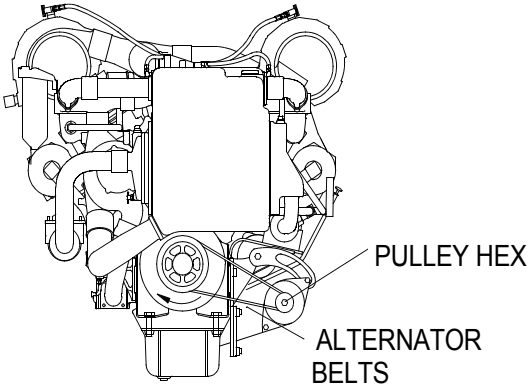



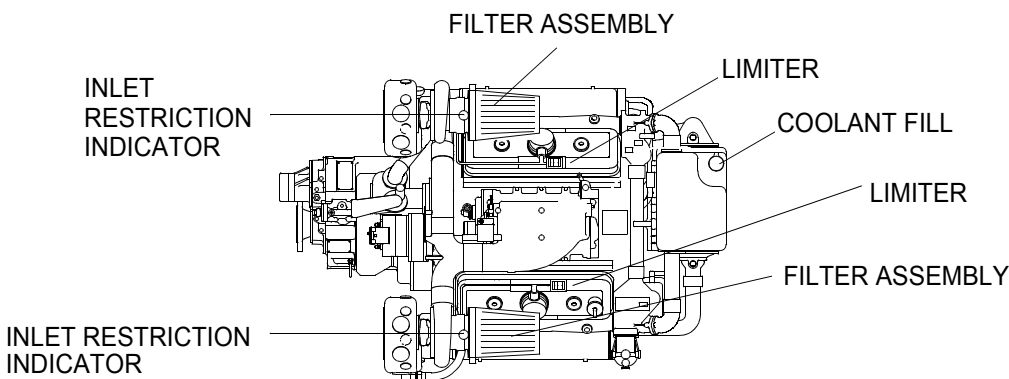
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|----------|-----------|--------------------------------|--|---|
| 21 | Before | 0.1 | Diesel Engine Alternator | <p>1. Check for split, dry-rotted or glazed alternator drive belts. If found, contact unit maintenance.</p> <p>2. Check belt tension. To check for proper tension with the engine off, use a 15/16 inches socket on the hex of the alternator pulley and try to turn it (clockwise). If the pulley turns, the belt can slip. If belt is loose, contact unit maintenance.</p> | <p>Belts are broken or missing.</p> <p>Belt has improper tension.</p> |
|  <p>The diagram shows a top-down view of a diesel engine alternator. A line points to a hexagonal nut on the pulley labeled 'PULLEY HEX'. Another line points to the drive belts on the pulley labeled 'ALTERNATOR BELTS'.</p> | | | | | |
| <hr/> <p style="text-align: center;">WARNING</p> <hr/> | | | | | |
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>CHEMICAL</p> </div> <div style="text-align: center;">  <p>EYE PROTECTION</p> </div> <div style="text-align: center;">  <p>POISON</p> </div> </div> | | | | | |
| 22 | Before | 0.2 | Diesel Engine Cooling System | <p>1. Check the engine coolant level. Verify that it is within 1 inch from the top of the heat exchanger, both port and starboard. Add proper coolant mixture as needed. Service with 50/50 water/antifreeze.</p> | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|---------------------------------------|---|---|
| 22 | Before | 0.2 | Diesel Engine Cooling System (Cont'd) | 2. Inspect the air inlet collector assemblies. If the air inlet restriction indicator is red, contact unit maintenance. | Air inlet restriction indicator is red. |



3. Verify fresh water filter hand valves are open. If valves will not operate, contact unit maintenance.

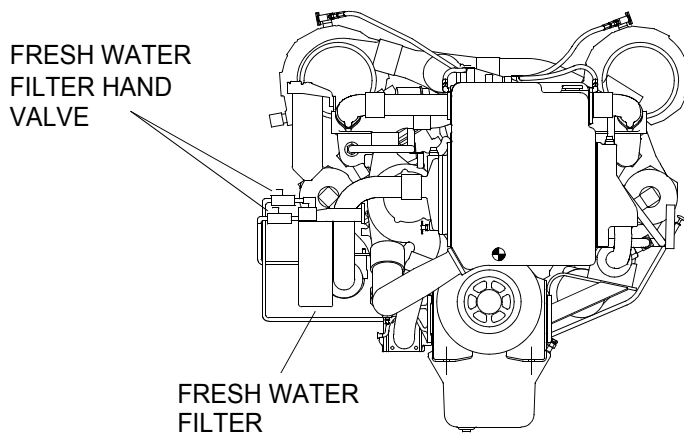


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|----------------------------------|--|------------------------------------|
| 23 | Before | 0.2 | Diesel Engine Intake and Exhaust | 1. Check the turbochargers and exhaust connections. Visually inspect the mountings, intake and exhaust ducting and connections for leaks. In temperatures below freezing (32°F), check freeze plugs for water leaks. 2. Inspect the engine air filtering system for leaks, torn boots, and loose or damaged clamps. | Evidence of leaks or restrictions. |

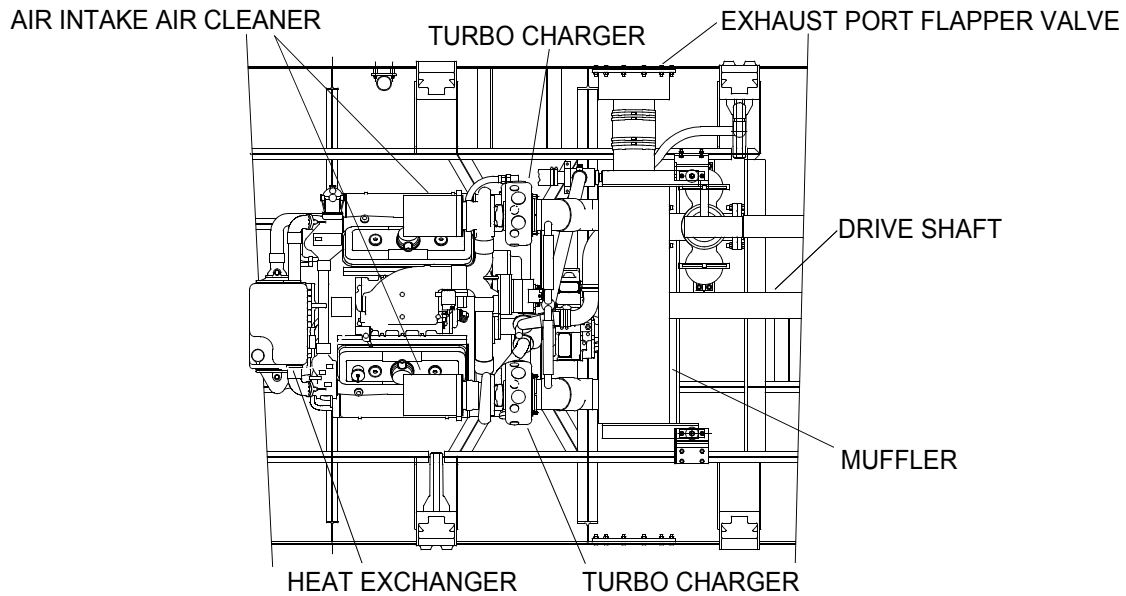


Table 1. Preventive Maintenance Checks and Services for the Warring Tug. (Continued)






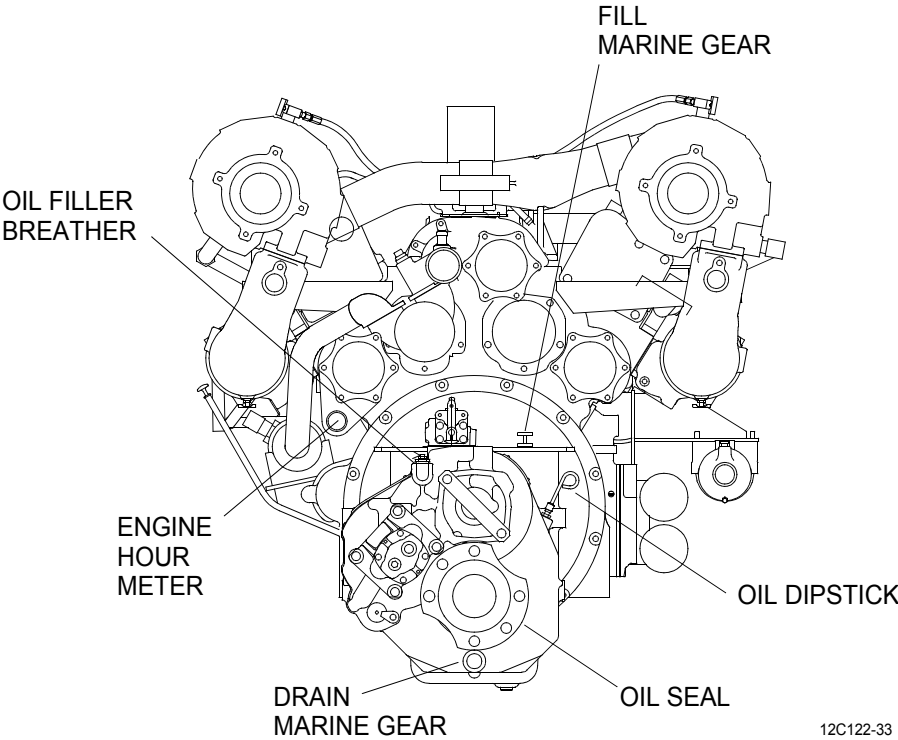


| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|--------------------------------|---|---|
| <p>WARNING</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>CHEMICAL</p> </div> <div style="text-align: center;">  <p>EYE PROTECTION</p> </div> <div style="text-align: center;">  <p>EXPLOSION</p> </div> </div> | | | | | |
| 24 | Before | 0.3 | Batteries | <ol style="list-style-type: none"> 1. Verify battery electrolyte levels completely cover the plates, without electrolyte overflowing the battery, and that connections are clean and tight, both port and starboard. Add reagent distilled water, if necessary. If connections are loose, batteries are unserviceable or will not start engines, contact unit maintenance. 2. Ensure all battery cable clamps and hold downs are tight. Make sure all are secure and free of corrosion. If battery cable clamps and hold downs are loose or corroded, contact unit maintenance. 3. Inspect battery system for damage. If batteries are damaged or inoperative, contact unit maintenance. 4. If operating charging levels are found to be too low while starting engine, contact unit maintenance. | <p>Batteries are unserviceable.</p> <p>Batteries will not start engine.</p> |

Table 1. Preventive Maintenance Checks and Services for the Warring Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|--------------------------------|--|------------------------------------|
| <p>WARNING</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>CHEMICAL</p> </div> <div style="text-align: center;">  <p>EYE PROTECTION</p> </div> </div> | | | | | |
| 25 | Before | 0.2 | Marine Gear | <ol style="list-style-type: none"> 1. Check the oil level in the marine gear. Fill to "F" mark on dipstick with oil. Service with lubricating oil (grade 40). 2. Inspect for leaks in the marine gear, particularly near the oil seals. If any leaks are found, contact unit maintenance. 3. Read engine hours and record in logbook. | Class III leakage is found. |
|  | | | | | |

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Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|--------------------------------|---|------------------------------------|
| WARNING | | | | | |
|   | | | | | |
| CHEMICAL EYE PROTECTION | | | | | |
| 26 | Before | 0.2 | Transfer Case | Check oil level in transfer case. Oil should be present at bottom of check plug hole. Service with lubricating oil (grade 30). DO NOT OVERFILL. | |
| 27 | Before | 0.1 | Drive Shafts | Inspect drive shafts between marine gear and transfer case and between pump-jet and transfer case. Inspect for physical damage or degradation. If damage or degradation is found, contact unit maintenance. | |

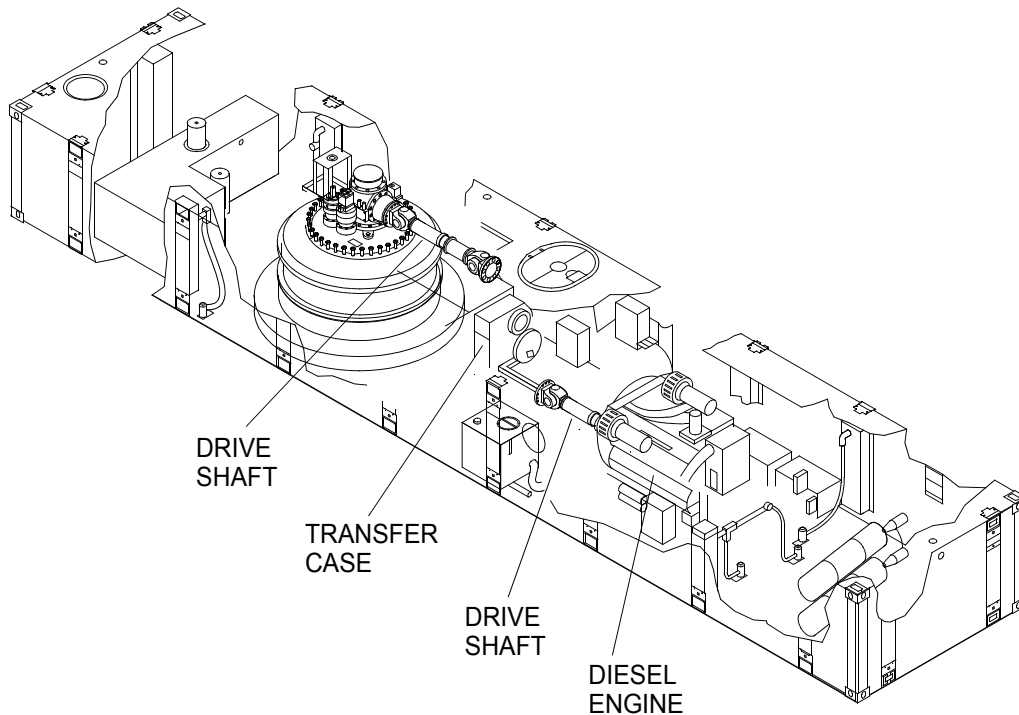




Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|----------|-----------|--------------------------------|--|---------------------------------------|
| WARNING | | | | | |
|   | | | | | |
| EYE PROTECTION VAPOR | | | | | |
| 28 | Before | 0.1 | Hydraulic System | Inspect all hydraulic components, including way valve assembly, hydraulic pump, hydraulic reservoir, hand pump and pump-jet main and auxiliary planetary gear housings for evidence of hydraulic fluid leakage. If hydraulic leakage is found, contact unit maintenance. | Class III hydraulic leakage is found. |

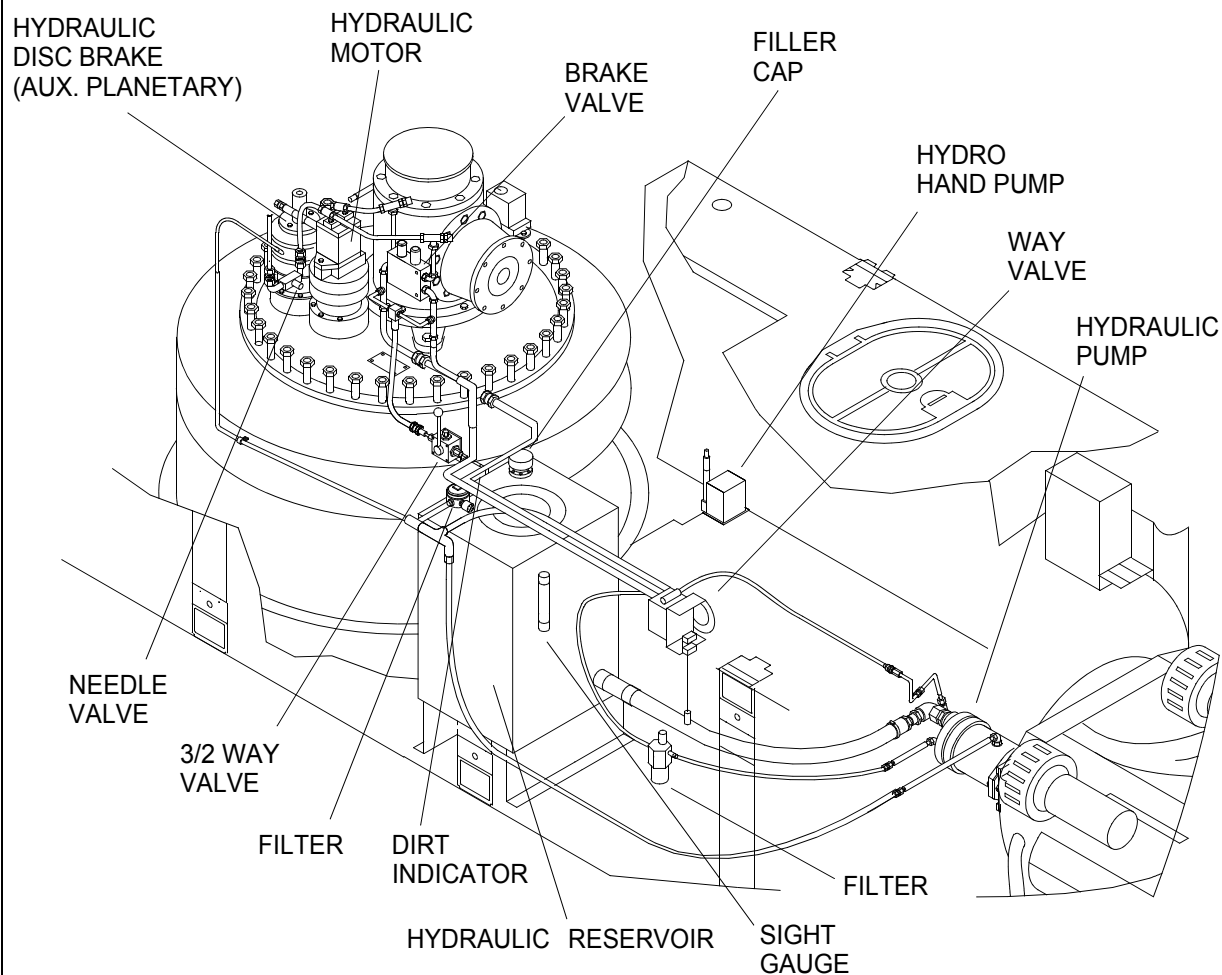


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)





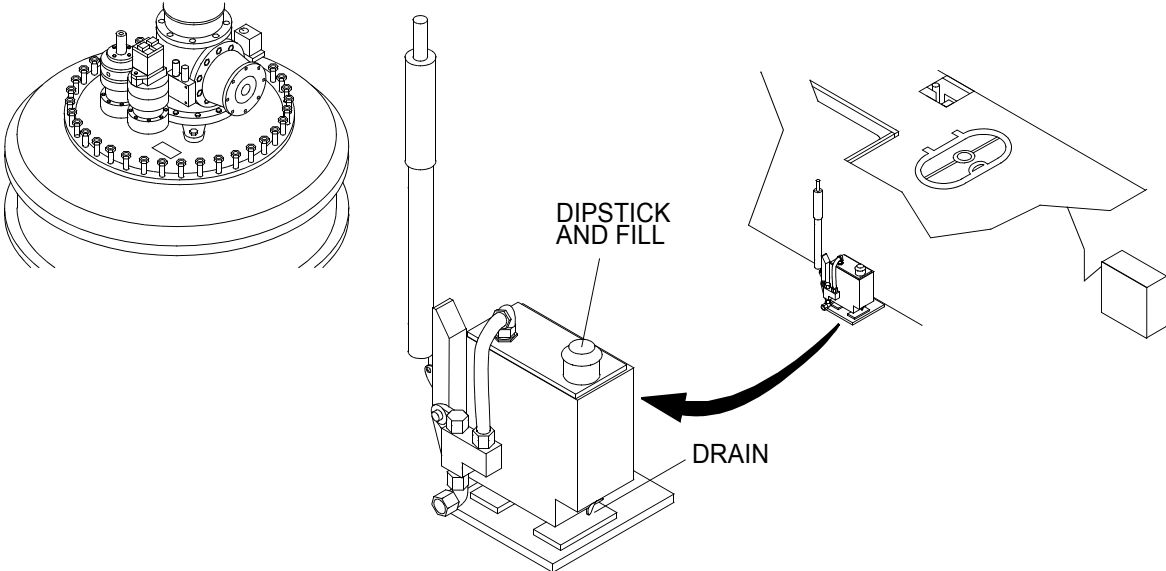
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|----------|-----------|--------------------------------|--|------------------------------------|
| WARNING | | | | | |
|   | | | | | |
| EYE PROTECTION VAPOR | | | | | |
| 29 | Before | 0.1 | Hydraulic Reservoir | Check that reservoir fluid level is more than ½ full but less than ¾ full in the sight gage. Add lubricating oil (DTE-25). Contact unit maintenance if leakage is found. | |
| WARNING | | | | | |
|   | | | | | |
| EYE PROTECTION VAPOR | | | | | |
| 30 | Before | 0.1 | Emergency Steering Hand Pump | Turn and pull out dipstick and ensure oil level is at FULL mark. Service with lubricating oil (DTE-25). Contact unit maintenance if leakage is found. | |
|  | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)



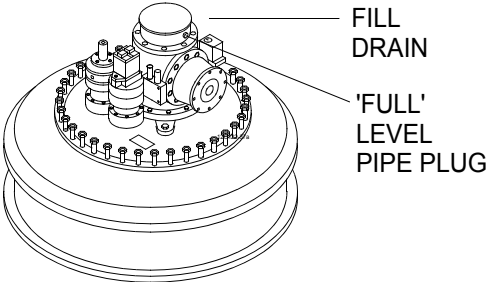
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|--------------------------------|--|---|
| <p>WARNING</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>EYE PROTECTION</p> </div> <div style="text-align: center;">  <p>VAPOR</p> </div> </div> | | | | | |
| 31 | Before | 0.1 | Pump-Jet | <p>1. Check oil level of pump-jet is at the level of the pipe plug at the forward (nearest drive shaft) top of pump-jet in cold condition. Add lube oil as necessary. Service with lubricating oil (Mobilgear 626). DO NOT OVERFILL. If oil leakage is found, contact unit maintenance.</p> <p>2. Check the expansion tank for leaks and loose mounting. If leaks or loose mounting is found, contact unit maintenance.</p> | <p>Class III hydraulic leakage is found.</p> <p>Class III hydraulic leakage is found.</p> |
|  | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warring Tug. (Continued)





| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|----------|-----------|--------------------------------|--|------------------------------------|
| <p>WARNING</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>CHEMICAL</p> </div> <div style="text-align: center;">  <p>EYE PROTECTION</p> </div> <div style="text-align: center;">  <p>EXPLOSION</p> </div> <div style="text-align: center;">  <p>FIRE</p> </div> </div> <p>Use approved procedures when cleaning up fuel spills. Take proper precautions when removing or installing any fuel system component. Failure to comply may result in serious injury or death to personnel.</p> | | | | | |
| 32 | Before | 0.3 | Fuel System | <ol style="list-style-type: none"> 1. Check for leaks around fuel tank and fuel lines. If leaks are found, contact unit maintenance. 2. Examine fuel lines and flexible hoses for leaks. Check that fittings, clamps and tiedown straps are secure. Hoses must not be resting or touching shafts, couplings, heated surfaces, sharp edges or other areas that might sever or rupture fuel system parts. If leaks, loose fittings, clamps or tiedown straps are found or hoses are resting on shafts, couplings, heated surfaces, sharp edges or other areas that might sever or rupture fuel system parts, contact unit maintenance. | Class I fuel leakage is found. |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|-----------|---------------------------------------|
| 32 | Before | 0.3 | Fuel System (Cont'd) | | |

The diagram illustrates the fuel system components and their locations. Key parts labeled include:

- FUEL TANK**: The main storage reservoir.
- FUEL WATER SEPARATOR**: A component that filters water from the fuel.
- FUEL SUPPLY** and **FUEL RETURN**: Lines connecting the tank to the engine.
- FILLER NECK**: The point where fuel is added to the tank.
- BALL VALVE (SUPPLY)** and **BALL VALVE (RETURN)**: Valves used to stop fuel flow.
- SIGHT LEVEL**: Two vertical indicators to check fuel levels.
- DRAIN**: A point for draining water from the separator.
- HULL**: The main body of the tug, shown in cross-section.

A 3D cutaway view at the bottom left shows the internal layout of the fuel tank and separator, with an arrow pointing to the corresponding 2D schematic above.

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

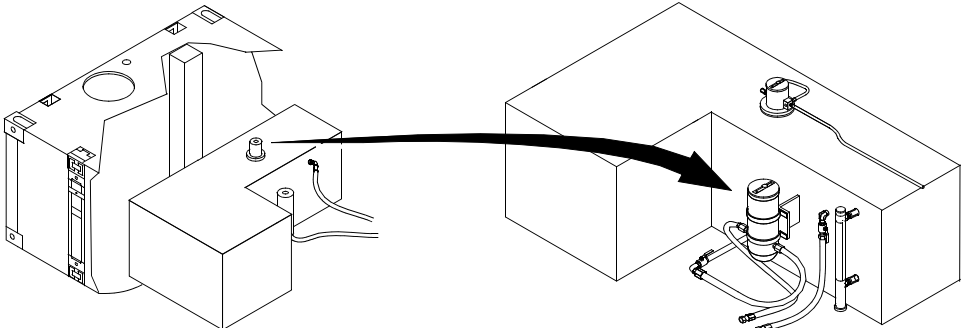
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|----------|-----------|--------------------------------|---|---|
| 32 | Before | 0.3 | Fuel System (Cont'd) | 3. Verify fuel tank is full by checking sight level or using a fuel stick. If necessary, add fuel. DO NOT OVER FILL. Service with diesel fuel. If tank fuel level indicator is cracked or broken or if fuel leaks are found, contact unit maintenance. | Broken fuel level indicator or Class I fuel leakage. |
|  | | | | | |
| | | | | <p>4. Open the fuel supply line ball valve.</p> <p>5. Open the fuel return line ball valve.</p> <p>6. Visually inspect and drain water and/or other contaminants from fuel/water separator into a drain pan. When pure fuel emerges, close drain. Dispose of fuel in accordance with local procedures. If fuel/water separator glass bowl is broken or tank has an excessive amount of water, contact unit maintenance.</p> | Broken fuel/water separator or water in fuel prevents engine from starting. |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|------------------------------------|
| 33 | Before | 0.3 | Bilge Pump System (Lazaret) | 1. Check compartment for evidence of water and leaks. If leaks are found, contact unit maintenance. | |

NOTE

Do not pump bilges overboard. Pump bilges into holding tank. If holding tank is full, take vessel to sludge point.

2. If water is present, activate bilge pump, as indicated by red flood location light on the operators cab control console in the operators cab, by pushing the adjacent bilge pump push button. Once water is removed, the bilge pump will automatically stop. If pumps are inoperative, contact unit maintenance.

3. Test pump by momentarily holding toggle switch in the TEST position and listening for pump operation. Switch will spring-return to the REMOTE position. If pumps are inoperative, contact unit maintenance.

4. Clean debris from the float switch and bilge pump suction inlet screen. Wipe clean all bilges.

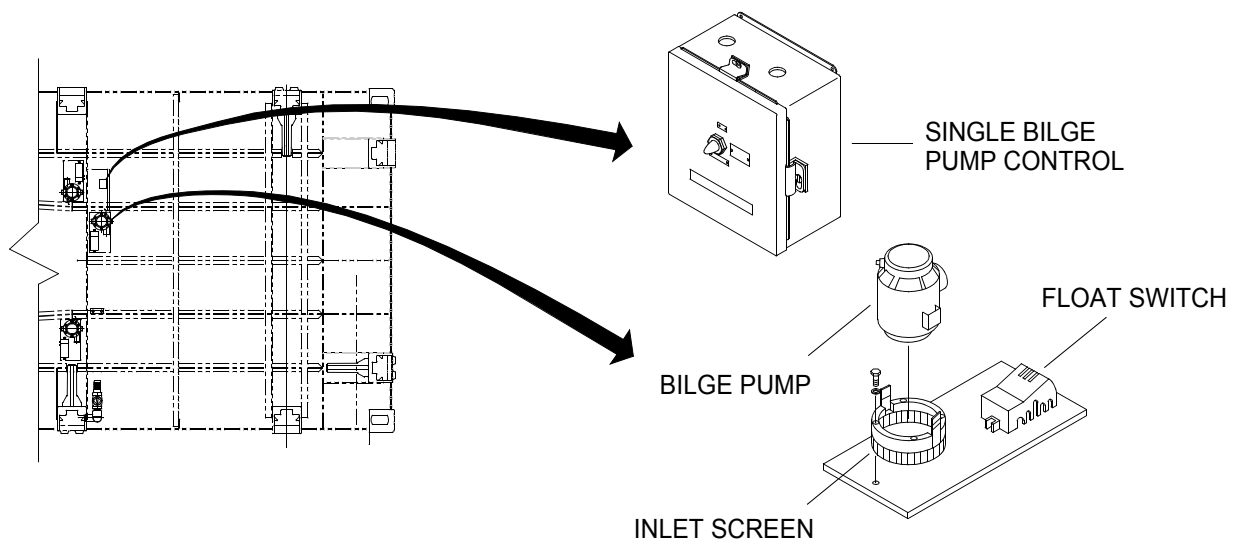
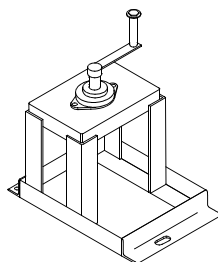


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--|---|------------------------------------|
| 34 | Before | 0.1 | Emergency Steering Control Stand (stowed in lazaret) | Visually inspect control stand for obvious damage, evidence of corrosion, wear and loose or missing parts. If control stand is damaged, corroded or has loose or missing parts, contact unit maintenance. | Control stand is inoperative. |



WARNING

Use extreme care when inspecting or servicing CO₂. Failure to comply could result in injury or death.

| | | | | | |
|----|--------|-----|-------------------------|---|---|
| 35 | Before | 0.1 | Fire Suppression System | Inspect for discharge, leakage, expansion or damaged or broken seals. If discharge, leakage, expansion, damaged or broken seals are found contact unit maintenance. | Seals are damaged or broken, or evidence of excessive discharge is found. |
|----|--------|-----|-------------------------|---|---|

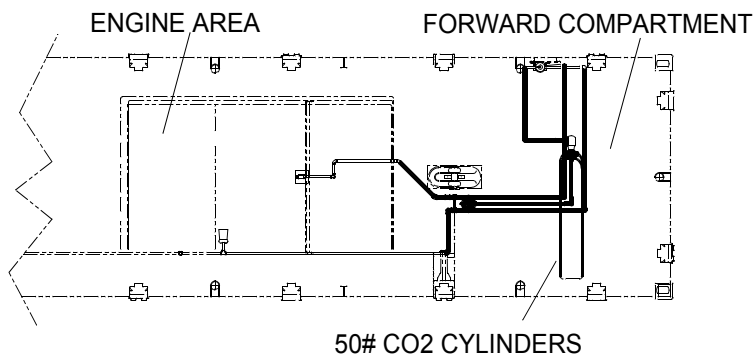


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|---|
| 36 | Before | 0.3 | Operators Cab | <p>1. Check operator cab structure for damage to mountings. If damage is found, contact unit maintenance.</p> <p>2. Visually inspect cab mounted antennas, spotlight, bell, horn and mast for damage that would prevent operation. If damage is found that would prevent operation, contact unit maintenance.</p> <p>3. Functionally check windshield wiper. If windshield wiper is inoperative, contact unit maintenance.</p> <p>4. Functionally check spotlight. If spotlight is inoperative, contact unit maintenance.</p> <p>5. Functionally test battle lantern. If battle lantern is inoperative, contact unit maintenance.</p> <p>6. Functionally check VHF/FM DSC transceiver. If VHF/FM DSC transceiver is inoperative, contact unit maintenance.</p> <p>7. Functionally check loudhailer. If loudhailer is inoperative, contact unit maintenance.</p> <p>8. Functionally check Precision Lightweight Global Positioning Receiver (PLGR). If PLGR is inoperative, contact unit maintenance.</p> <p>9. Functionally check VHF/FM handheld transceivers and battery chargers. If transceivers or battery chargers are inoperative, contact unit maintenance.</p> | <p>VHF/FM DSC transceiver is inoperative. VHF/FM DSC transceiver is a safety requirement and must be operational.</p> |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|---------------------------------------|
| 36 | Before | 0.3 | Operators Cab (Cont'd) | <p>10. Functionally check SINGGARS radio. If SINGGARS radio is inoperative, contact unit maintenance.</p> <p>11. Inspect all radio antennae, handsets, cables and batteries. If damage is found that would prevent operation, contact unit maintenance.</p> | |

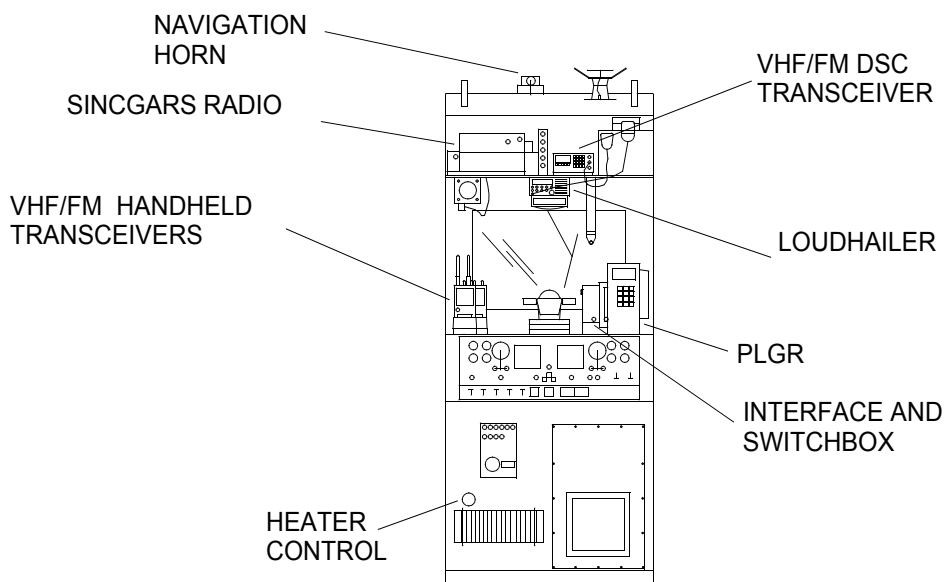
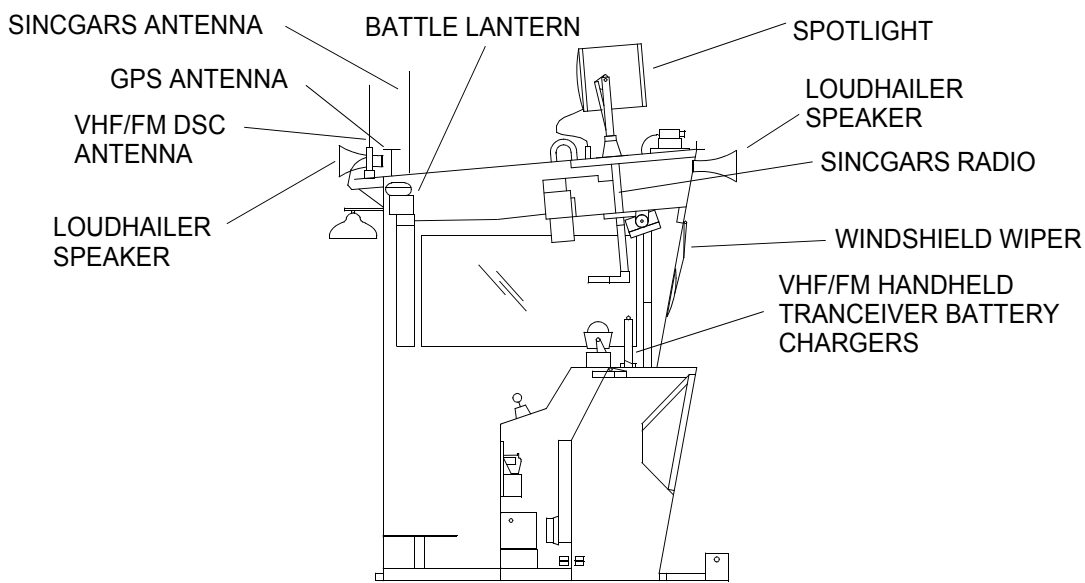


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|--|
| 14 | Before | 0.4 | Cab Lower Control Panel | <p>1. Check all control panels and associated switches, gages, steering levers, throttle and other controls and indicators for obvious damage. If damaged or non-functioning control panels and associated switches, gages, steering levers, throttle and other controls and indicators are found, contact unit maintenance.</p> <p>2. HPU OIL LEVEL LOW indicator light(s). Port and stbd, red, indicator light(s) off. If on, check and fill appropriate hydraulic tank to proper level.</p> <p>3. THRUSTER GEARBOX LOW OIL indicator light(s). Port and stbd indicator light(s) off. If on, check and fill appropriate pump-jet gearbox to proper level.</p> | Damage or non-functioning control panels and associated switches gages, steering levers, throttle and other controls and indicators. |

NOTE

At initial start-up thruster gearbox low oil indicator will go ON momentarily and then go OUT.

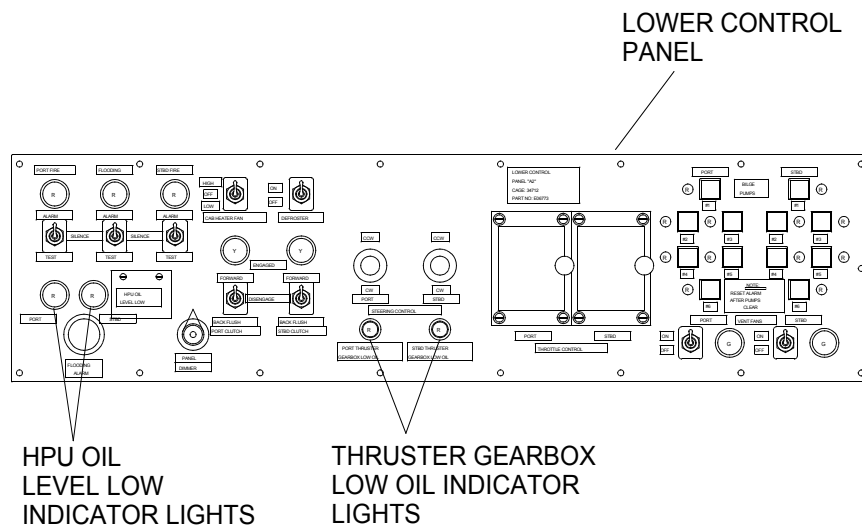


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

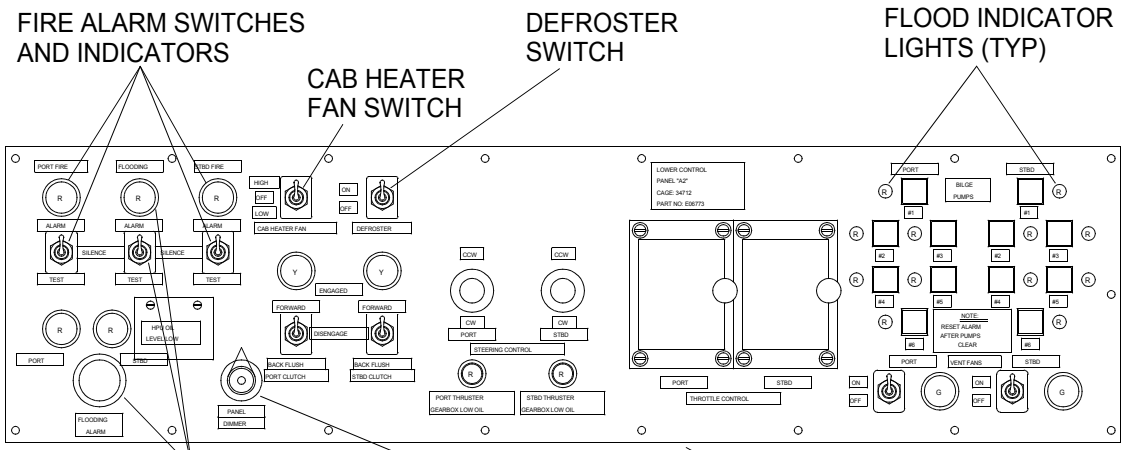
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|----------|-----------|----------------------------------|--|---|
| 14 | Before | 0.4 | Cab Lower Control Panel (Cont'd) | <p>4. PORT and STBD FIRE ALARM/SILENCE/ TEST switch and indicator. Select TEST position momentarily. Horn sounds, red light comes on. Return switch to ALARM position. If red light does not come on or horn does not sound, contact unit maintenance.</p> <p>5. FLOODING ALARM/ SILENCE/TEST switch and Indicator. Select TEST position momentarily. Horn sounds, red light comes ON. Return switch to ALARM position. If red light does not come on or horn does not sound, contact unit maintenance.</p> <p>6. PANEL DIMMER switch. Functionally test switch. If switch is inoperative, contact unit maintenance.</p> | <p>Fire alarms are inoperative.</p> <p>Flooding alarm is inoperative.</p> |
|  <p>The diagram shows a detailed view of the Cab Lower Control Panel. Callouts point to several key areas: <ul style="list-style-type: none"> FIRE ALARM SWITCHES AND INDICATORS: Points to the PORT FIRE, FLOODING, and STBD FIRE sections, each containing ALARM, SILENCE, and TEST switches and indicators. DEFROSTER SWITCH: Points to the DEFROSTER switch. FLOOD INDICATOR LIGHTS (TYP): Points to the PORT, STBD, and BILGE PUMPS indicator lights. FLOOD ALARM SWITCHES AND INDICATORS: Points to the FLOODING ALARM and SILENCE switches and indicators. PANEL DIMMER SWITCH: Points to the PANEL DIMMER switch. LOWER CONTROL PANEL: Points to the main control area containing PORT and STBD THRUSTERS, STEERING CONTROL, and THROTTLE CONTROL levers. </p> | | | | | |
| | | | | <p>7. THROTTLE CONTROL levers. Check port and stbd control levers for ease of movement. Throttles must move easily back and forth. Return throttles to the idle position. If levers are binding or inoperative, contact unit maintenance.</p> | <p>Levers binding or inoperative.</p> |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|----------|-----------|----------------------------------|---|---|
| 14 | Before | 0.4 | Cab Lower Control Panel (Cont'd) | <p>8. STEERING CONTROL joystick levers. Check port and stbd levers for ease of movement. Levers must move easily back and forth. If levers are binding or inoperative, contact unit maintenance.</p> <p>9. Functionally check PORT/STBD CLUTCH toggle switches and indicators.</p> <p>a. Place toggle switches in the FORWARD and then BACK FLUSH positions. Engaged indicator yellow lights will come on in both positions. If toggle switches or lights are inoperative, contact unit maintenance.</p> <p>b. Place toggle switches in the DISENGAGED position. Yellow indicator lights are off. If toggle switches or lights are inoperative, contact unit maintenance.</p> | <p>Levers binding or inoperable.</p> <p>Switch and/or indicator inoperable.</p> |
| <p>The diagram shows a detailed view of the lower control panel. It features several control elements: two steering levers (port and starboard), a central throttle lever, and two sets of clutch toggle switches. Labels with leader lines point to these components: 'CLUTCH ENGAGED INDICATORS' points to two indicator lights on the left; 'STEERING CONTROL LEVERS' points to the two joystick levers; 'THROTTLE' points to the central lever; 'CLUTCH TOGGLE SWITCH' points to the two toggle switches at the bottom; and 'LOWER CONTROL PANEL' points to the entire assembly.</p> | | | | | |
| 37 | Before | .2 | Cab Middle Control Panel | <p>1. Momentary press NAV HORN push button. If NAV HORN is inoperative, contact unit maintenance.</p> | <p>Navigation horn is not functioning.</p> |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|-----------------------------------|--|--|
| 37 | Before | .2 | Cab Middle Control Panel (Cont'd) | <p>2. ENG GAGES TEST switch(s). Momentarily hold port and stbd switches in the TEST position to activate engine status gages. If engine status gages are inoperative, contact unit maintenance.</p> <p>3. WSHLD WIPER switch. Switch to ON position. Windshield wiper comes on. Return switch to OFF position.</p> <p>4. ENG ALARM/TEST/SILENCE switch(es) and indicator(s):</p> <ul style="list-style-type: none"> a. Momentarily hold port and stbd toggle switches in the TEST position. Alarm bell will sound and red indicator(s) will come on. If toggle switches or lights are inoperative, contact unit maintenance. b. Return switch to the ALARM position when test is complete. | <p>Alarm is not functioning.</p> <p>Alarm bell does not sound.</p> |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> </div> <div style="width: 45%;"> </div> </div> | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|-------------------------------------|---|------------------------------------|
| 14 37 | Before | 0.1 | Cab Lower and Middle Control Panels | Start Engines. (WP 0023 00) | |
| 38 | Before | 0.1 | Navigation Masts and Lights | <p>1. Visually inspect navigation mast, stub mast and junction boxes for evidence of corrosion, physical damage, broken welds, missing or broken bolts and/or components. If evidence of corrosion, physical damage, broken welds, missing or broken bolts and/or components is found, contact unit maintenance.</p> <p>2. Visually inspect cable assemblies for loose connections and evidence of physical damage or wear. If loose connections or evidence of physical damage or wear is found, contact unit maintenance.</p> <p>3. Visually inspect all navigational lights for cleanliness and evidence of physical damage. If damage is found, contact unit maintenance.</p> <p>4. Ensure that all lights are in working condition by operating the switches on mast enclosure (NAV Light Switch Box) in the cab to the ON and OFF positions. If lights or switches are inoperative, contact unit maintenance.</p> | |

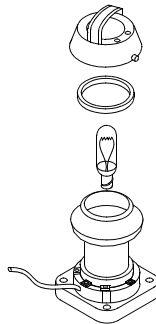


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------------|-----------|---------------------------------------|
| 38 | Before | 0.1 | Navigation Masts and Lights (Cont'd) | | |

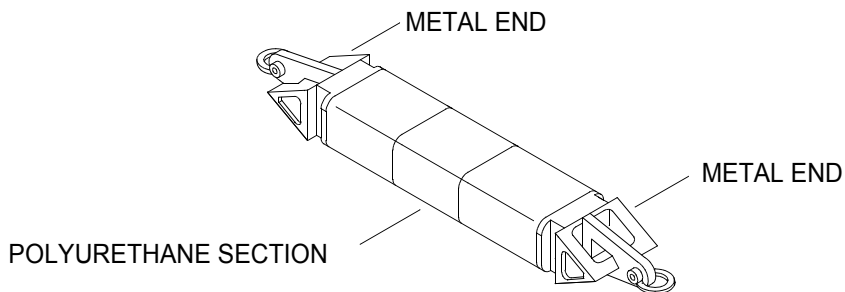
The diagram illustrates the electrical control panel for navigation masts and lights. It features a central vertical panel with various switches, indicators, and controls. To the left is a 'STUB MAST' with a single lamp. To the right is a 'MAIN MAST' with multiple lamps, including a 'SINGLE LAMP' and a 'DOUBLE LAMP PRIMARY AND SPARE'. An 'ALARM SILENCE' button is also shown. Lines connect the physical components to their corresponding labels on the diagram.

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|---|
| 2 | During | 0.1 | Propulsion Module | 1. Ensure all soft patches are secured for sea operation, including exhaust port patches (opposite exhaust port flapper valves). If soft patches are not secured, contact unit maintenance. | |
| | | | | | |
| 4 | During | 0.5 | Flexors | <p>2. Inspect lazaret, machinery, and fuel compartments for indications of water, oil or fuel leaks. Access via personnel hatches.</p> <p>1. Inspect visible portions of installed flexors for separation of the polyurethane material in the center. If found, contact unit maintenance.</p> | <p>Class I fuel leaks or Class III water or oil leaks are found.</p> <p>Separation of the polyurethane material in the center of the flexor is found.</p> |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|--|
| 4 | During | 0.5 | Flexors (Cont'd) | 2. Inspect visible portions of installed flexors for cracks in the external weldments on the ends. If found, contact unit maintenance. | Cracks are discovered in the external weldments on the ends of the flexor. |



| | | | | | |
|----|--------|-----|---------------------|--|---|
| 10 | During | 0.2 | Winch | 1. Perform winch engine PMCS in accordance with TM 5-2815-258-10. 2. Perform winch PMCS in accordance with TM 55-3950-204-14&P. | |
| 29 | During | 0.1 | Hydraulic Reservoir | Check return filter dirt indicator. Dirt level must be at acceptable level as displayed on indicator. If dirt level is out of acceptable range (in red colored area) as indicated on dirt alarm, contact unit maintenance. | Dirt level is out of acceptable range (in red colored area) as indicated on dirt alarm. |

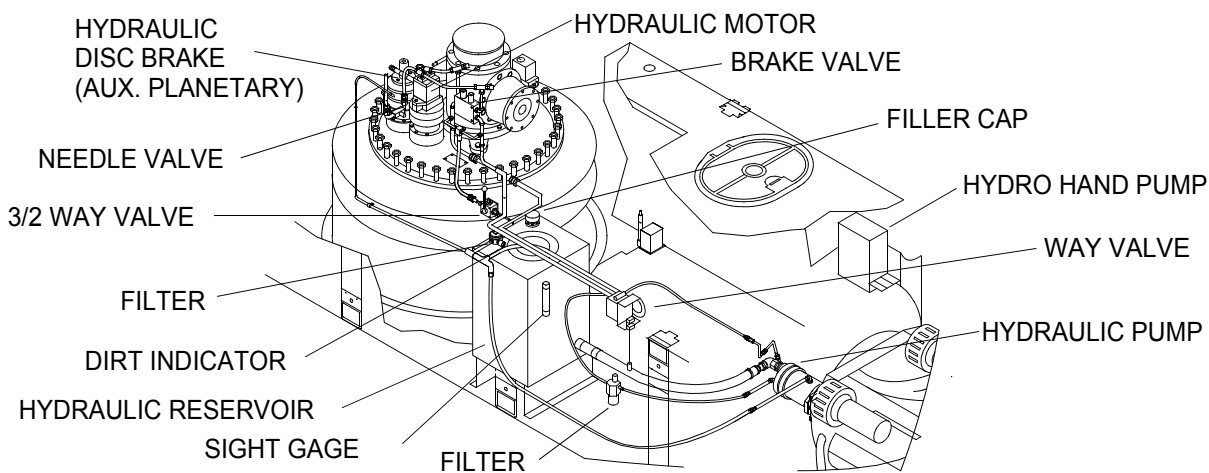


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

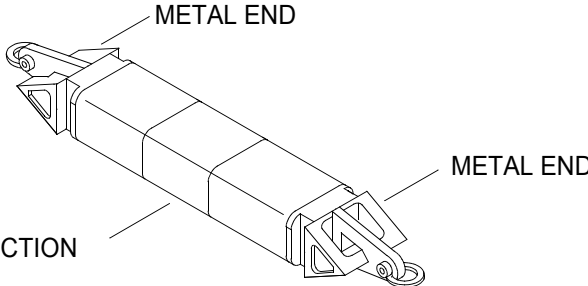
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|-------------------------------------|---|--|
| 31 | During | 0.05 | Pump-Jet | Inspect pump-jet assembly for unusual noise or vibration. If unusual noise or vibration is discovered, contact unit maintenance. | Unusual noise or vibration is discovered. |
| 14 37 | After | 0.3 | Cab Middle and Lower Control Panels | Perform engine shut-down. (WP 0022 00) | |
| 2 | After | 0.1 | Propulsion Module | Inspect lazaret, machinery, and fuel compartments for indications of water, oil or fuel leaks. Access via personnel hatches. Inspect all powered and non-powered modules for major deformation. If major deformation or leaks are found, contact unit maintenance. | Class I fuel leaks or Class III water or oil leaks are found. Major deformation is found. |
| 4 | After | 0.5 | Flexors | <p>1. Inspect uninstalled flexors for separation of the polyurethane material in the center. If found, contact unit maintenance.</p> <p>2. Inspect uninstalled flexors for cracks in the external weldments on the ends. If cracks in the external weldments on the ends of the flexor are found, contact unit maintenance.</p> | <p>Separation of the polyurethane material in the center of the flexor is found.</p> <p>Cracks are discovered in the external weldments on the ends of the flexor.</p> |
| | | | |  <p>METAL END</p> <p>POLYURETHANE SECTION</p> <p>METAL END</p> | |
| 6 | After | 0.1 | Lift Shackles | Remove water from lift shackles. | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

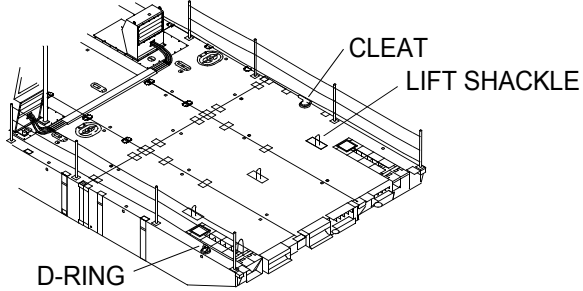
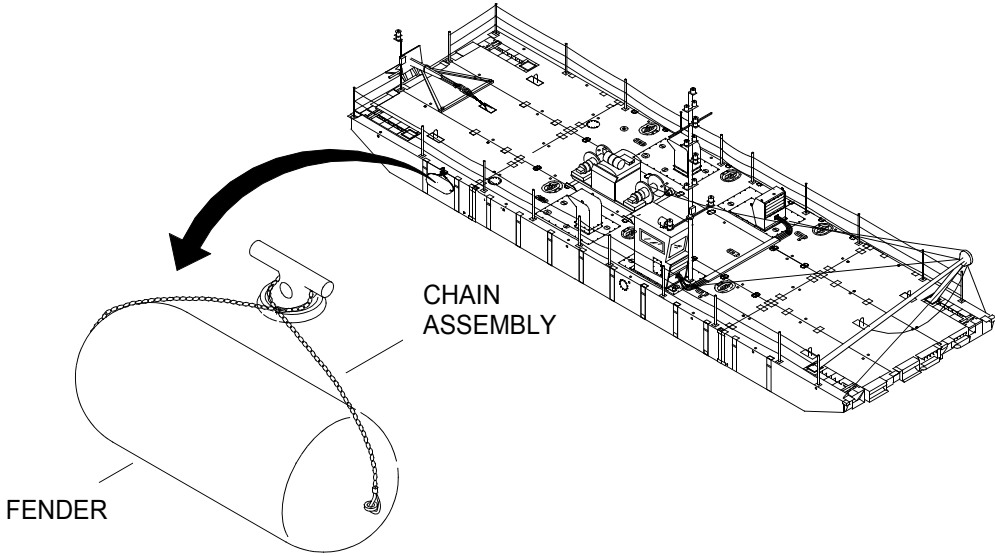
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|------------------------------------|
| 7 | After | 0.1 | Fenders |  <p>Inspect fenders and chains for damage or wear. If damage or wear is found that would affect operation of the fender, contact unit maintenance.</p> | |
| 8 | After | 0.1 | Stern Anchor |  <p>1. Inspect stern anchor for any damage that may have occurred during operation. 2. Clean stern anchor and cable, if used.</p> | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|--|
| 10 | After | | Winch | 1. Perform winch engine PMCS in accordance with TM 5-2815-258-10. 2. Perform winch PMCS in accordance with TM 55-3950-204-14&P. 3. Inspect winch mounting plates and transverse beams for cracks. If transverse beams or mounting plates are cracked, contact unit maintenance. 4. Check all mounting hardware for tightness. If mounting hardware is loose, contact unit maintenance. | |
| 11 | After | 0.3 | Winch A-Frame | 1. Inspect A-frame mounting feet and attaching lugs for cracks and for loose bolts. If mounting feet or attaching lugs are cracked or loose hardware is found, contact unit maintenance. | A-frame feet are cracked or bolts are loose. |

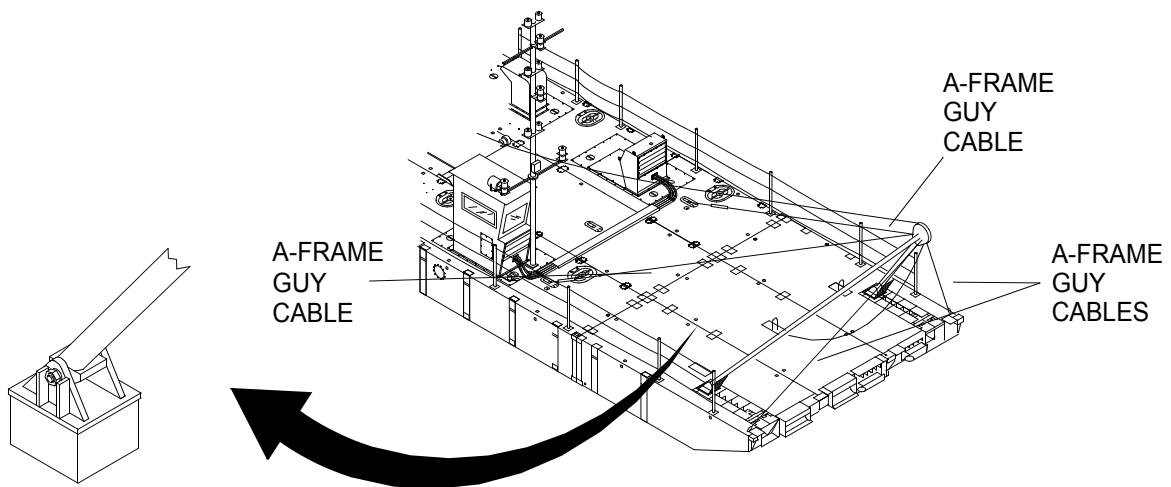


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|--|
| 11 | After | 0.3 | Winch A-Frame (Cont'd) | <p>2. Inspect A-frame legs for cracks. If A-frame legs are cracked, contact unit maintenance.</p> <p>3. Inspect A-frame guy cable for breaks or fraying. If cables are broken or frayed, contact unit maintenance.</p> <p>4. Inspect A-frame attachment fittings for cracks and loose bolts. If attachment fittings are cracked or loose bolts are found, contact unit maintenance.</p> <p>5. Inspect A-frame sheave attachment points for cracks and loose bolts. If sheave attachment points are cracked or loose bolts are found, contact unit maintenance.</p> | <p>A-frame legs are cracked.</p> <p>Cables are broken or frayed.</p> <p>Attachment fittings are cracked.</p> <p>Sheave or attachment points are cracked.</p> |
| | | | | <p>6. Inspect A-frame sheave head plates for cracks. If sheave head plates are cracked, contact unit maintenance.</p> | <p>Sheave head plate is cracked.</p> |

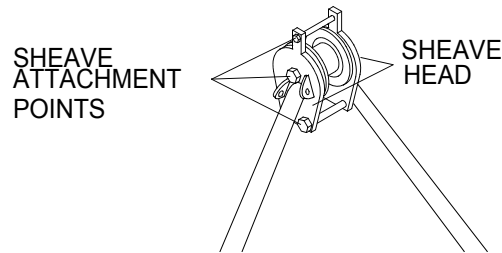


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--|---|---|
| 16 | After | 0.1 | Bilge Pump System Compartment | <p>1. Inspect compartment for evidence of leaks of water, oil, and/ or fuel. If leakage is found, contact unit maintenance.</p> <p>2. If only water is present, activate bilge pump(s), as indicated by the red flood location light(s) on the operators control console in the operators cab, by pushing adjacent bilge pump push buttons. Once water is removed, the bilge pump(s) will automatically stop.</p> | Evidence of Class III leakage of water, oil, or Class I leakage of fuel is found. |
| 17 | After | 0.1 | Electrical Junction and Terminal Boxes | <p>1. Inspect electrical wiring to see that it is securely connected, clean, and undamaged. If wiring is not securely connected, dirty or damaged, contact unit maintenance.</p> | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|---|--|---------------------------------------|
| 17 | After | 0.1 | Electrical Junction and Terminal Boxes (Cont'd) | 2. Check all accessible fuse terminal blocks and connections to see that they are securely connected and supported, that insulation is not cracked or chafed, and that conduit and shielding are secure and in good condition. If fuse and terminal blocks are not securely connected, cracked, chafed or damaged, contact unit maintenance. | |

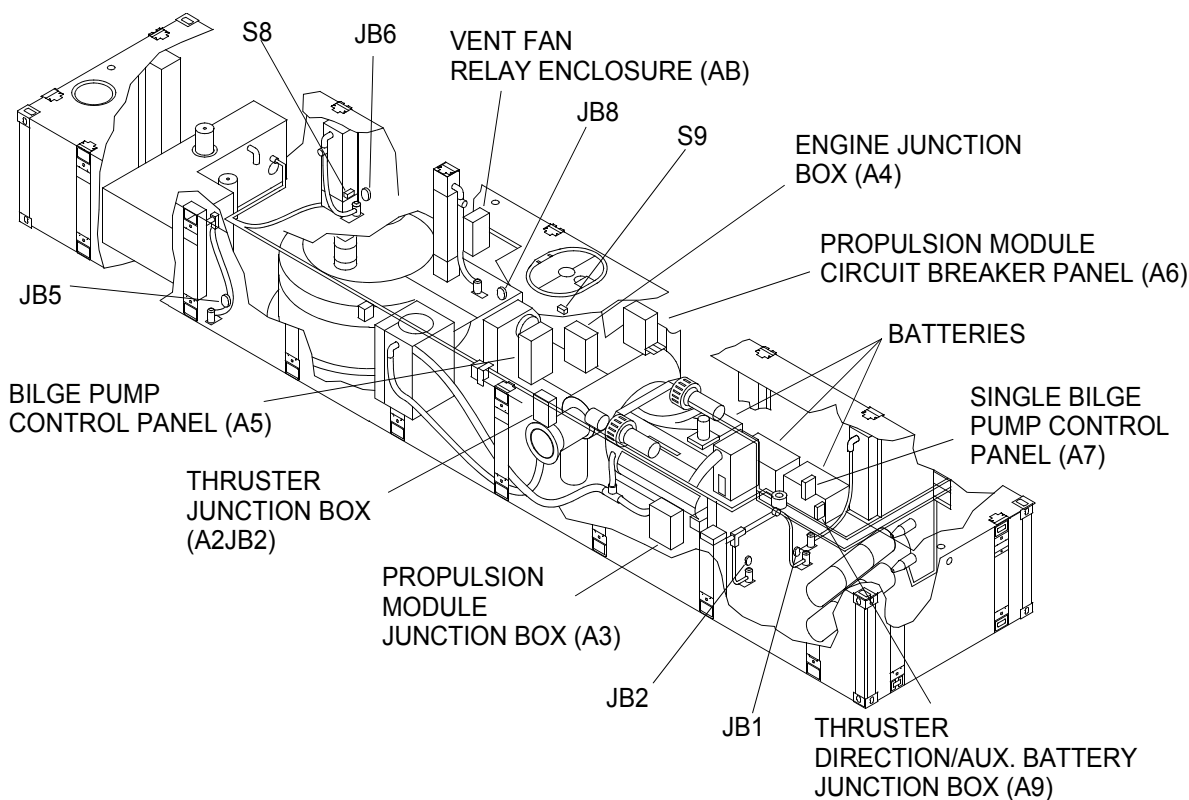


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

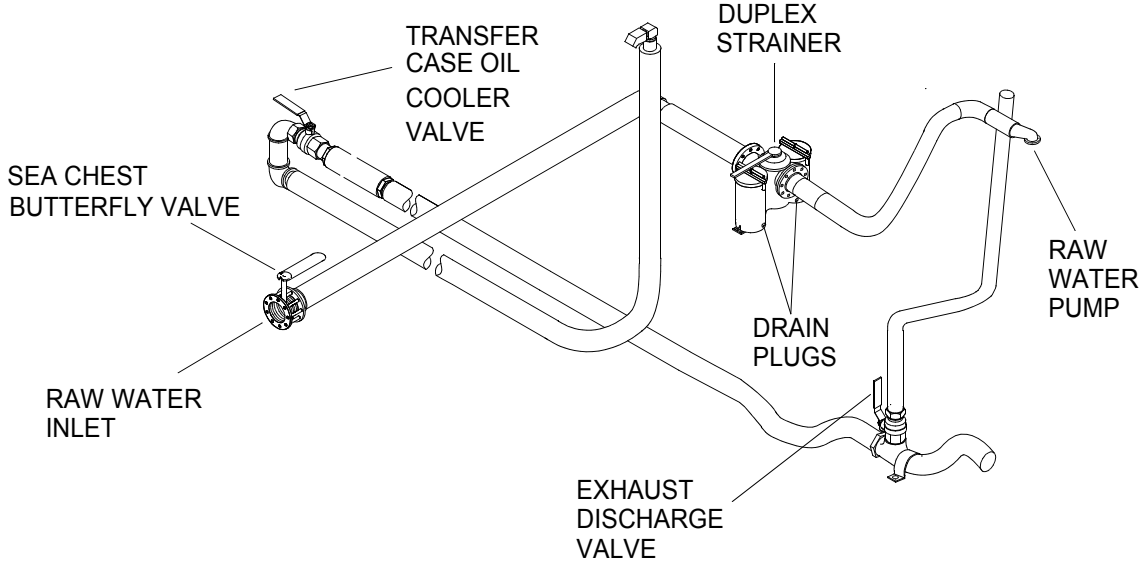
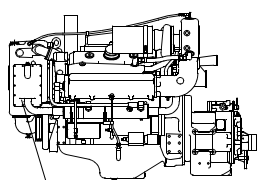
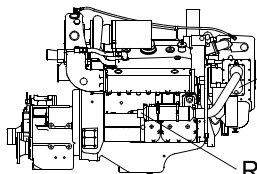
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|----------|-----------|--------------------------------|---|------------------------------------|
| <p>WARNING</p> <p>Coolant is hot and under pressure. Contact with hot coolant could cause injury to personnel.</p> | | | | | |
| 18 | After | 0.1 | Raw Water Cooling System | <p>1. Inspect the cooling system for leaks or excessive puddling around its base. If leaks or puddling are found, contact unit maintenance.</p> <p>2. Close the sea chest butterfly valves, both port and starboard. If valves are inoperative, contact unit maintenance.</p> | Class III leakage is found. |
| <p>PETCOCK</p>  | | | | | |
| | | | | <p>3. Freezing weather (below 32°F) only, drain all raw water from the raw water cooling system as follows:</p> <p>a. Open all raw water system petcock drains to drain the system. Leave petcocks open until the next start-up. If valves are inoperative, contact unit maintenance.</p> | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|-----------------------------------|---|------------------------------------|
| 18 | After | 0.1 | Raw Water Cooling System (Cont'd) | <p>b. Drain the transfer case oil cooler by disconnecting the raw water outlet hose at the lowest point. Connect hose when system has drained.</p> <p>c. Drain the raw water pump as follows: Loosen the six cap screws from the cover. Tap the cover to break the seal. Drain any water. Replace the cover and cap screws. Tighten the cap screws to secure the seal.</p> <p>d. Drain the muffler by removing drain plugs. Install plugs when muffler has drained.</p> <p>e. Drain the duplex strainer by removing the drain plugs at the bottom of each basket housing. Replace plugs when the strainer has drained.</p> <p>f. In the event of freeze up or other damage, contact unit maintenance.</p> | |

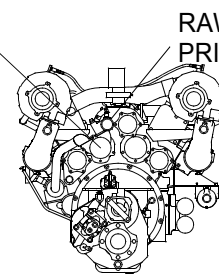


RAW WATER PETCOCK



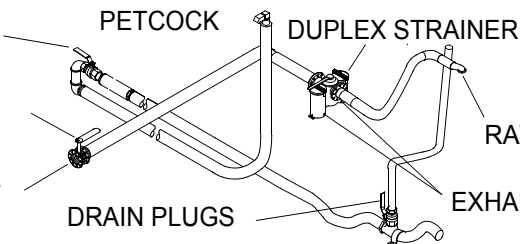
RAW WATER PETCOCK

RAW WATER PUMP
RAW WATER PETCOCK



RAW WATER PUMP
PRIME

TRANSFER CASE OIL COOLER VALVE
SEA CHEST BUTTERFLY VALVE
RAW WATER INLET



PETCOCK
DRAIN PLUGS
DUPLEX STRAINER
RAW WATER PUMP
EXHAUST DISCHARGE VALVE

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|---------------------------------------|
| 19 | After | 0.1 | Bilge Pumps | Check all bilge pumps and float switches for condition and proper operation. Look for evidence of water leaks, loose pump connections and/or damage. If pumps or float switches are inoperative or water leaks, loose connections or damage is found, contact unit maintenance. | |
| | | | | | |
| 20 | After | 0.1 | Diesel Engine | <ol style="list-style-type: none"> 1. Make a visual inspection for oil leaks around the filters and the external oil lines. If oil leaks are found, contact unit maintenance. 2. Visually inspect the oil dipstick. If metal particles are found in it, the oil must be completely changed. Contact unit maintenance. Record current engine hour reading and compare with oil change repair records. | Class III oil leakage is found. |
| | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)




| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|--------------------------------|---|---|
| <p>WARNING</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>CHEMICAL</p> </div> <div style="text-align: center;">  <p>EYE PROTECTION</p> </div> <div style="text-align: center;">  <p>EXPLOSION</p> </div> </div> | | | | | |
| 24 | After | 0.2 | Batteries | <p>1. Verify battery electrolyte levels completely cover the plates, without electrolyte overflowing the battery, and that connections are clean and tight, both port and starboard. Add reagent distilled water, if necessary. If connections are loose, batteries are unserviceable or will not start engines, contact unit maintenance.</p> <p>2. Inspect battery system for damage. If damage is found, contact unit maintenance.</p> | Batteries are unserviceable or will not start engine. |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)



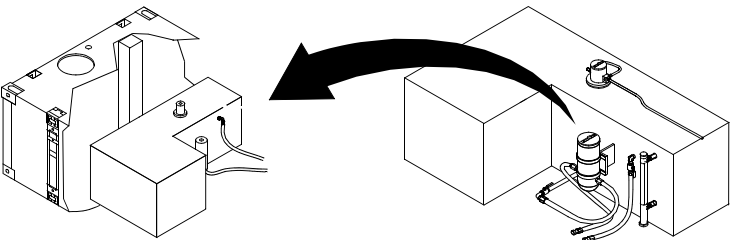
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|--------------------------------|---|---|
| <p>WARNING</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>EXPLOSION</p> </div> <div style="text-align: center;">  <p>FIRE</p> </div> </div> <p>Fuel and engine oil are highly flammable. Sparks or open flames should be kept away. Failure to comply may result in serious injury or death to personnel.</p> <p>Provide adequate ventilation of the vessel spaces. Failure to comply may result in serious injury or death to personnel.</p> <p>Use approved procedures when cleaning up fuel spills. Take proper precautions when removing or installing any fuel system component. Failure to comply may result in serious injury to death to personnel.</p> | | | | | |
| 32 | After | 0.2 | Fuel System | <ol style="list-style-type: none"> 1. Check for leaks around fuel tank and fuel lines. If leaks are found, contact unit maintenance. 2. Examine fuel lines and flexible hoses for leaks. Check that fittings, clamps and ties are secure. Hoses must not be resting or touching shafts, couplings, heated surfaces, sharp edges or other areas that might sever or rupture fuel system parts. If fuel leakage is found or hoses are resting or touching shafts, couplings, heated surfaces, sharp edges or other areas that might sever or rupture fuel system parts, contact unit maintenance. 3. Refill fuel tank. DO NOT OVER FILL. Service with diesel fuel. | <p>Class I fuel leakage is found.</p> <p>Class I fuel leakage is found.</p> |
|  | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|--|
| 32 | After | 0.2 | Fuel System (Cont'd) | <p>4. Visually inspect and drain water and/or other contaminants from fuel/water separator into an appropriate container. When pure fuel emerges, close drain cock. Check for leaks around tank. Ensure that fuel water separator was inspected and is operational. If fuel/water separator glass bowl is broken, tank has an excessive amount of water or fuel leaks are found, contact unit maintenance.</p> <p>5. Close fuel supply and return ball valves in both fuel compartments; port and starboard. If valves are inoperative, contact unit maintenance.</p> | Water in fuel prevents engine from starting or, broken fuel separator or glass or Class I fuel leakage is found. |

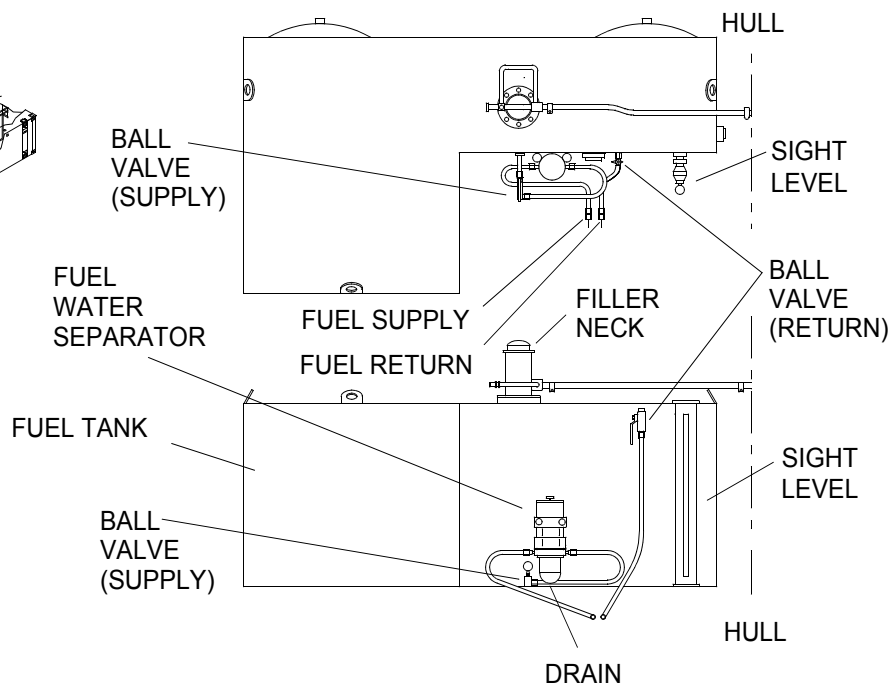
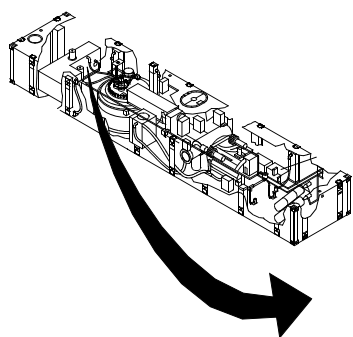


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

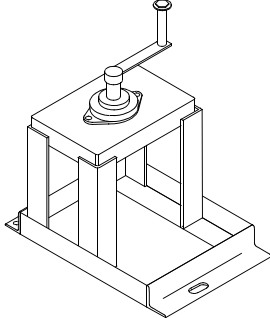
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|----------|-----------|--|--|------------------------------------|
| 33 | After | 0.2 | Bilge Pump System (Lazaret) | 1. Check compartment for evidence of water and leaks. If leaks are found, contact unit maintenance. | Class III water leaks are found. |
| NOTE | | | | | |
| Do not pump bilges overboard. Pump bilges into holding tank. If holding tank is full, take vessel to sludge point. | | | | | |
| 34 | After | 0.1 | Emergency Steering Control Stand (stowed in lazaret) | 2. If water is present, activate bilge pump, as indicated by red flood location light on the operators cab control console in the operators cab, by pushing the adjacent bilge pump push button. Once water is removed, the bilge pump will automatically stop. If bilge pumps are inoperative, contact unit maintenance. Visually inspect control stand for obvious damage, evidence of corrosion, wear and loose or missing parts. If control stand is damaged, corroded, worn or has loose or missing parts, contact unit maintenance. | Control stand is inoperative. |
|  | | | | | |
| 36 | After | 0.3 | Operators Cab | 1. Check operator cab structure for damage to mountings. If damage is found, contact unit maintenance. 2. Visually inspect cab mounted antennas, spotlight, bell, horn and mast for damage that would prevent operation. If damage is found that would prevent operation, contact unit maintenance. | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|---|
| 36 | After | 0.3 | Operators Cab (Cont'd) | <p>3. Functionally check windshield wiper. If windshield wiper is inoperative, contact unit maintenance.</p> <p>4. Functionally check spotlight. If spotlight is inoperative, contact unit maintenance.</p> <p>5. Functionally test battle lantern. If battle lantern is inoperative, contact unit maintenance.</p> | |
| | | | | | |
| | | | | <p>6. Functionally check VHF/FM DSC transceiver. If VHF/FM DSC transceiver is inoperative, contact unit maintenance.</p> <p>7. Functionally check loudhailer. If loudhailer is inoperative, contact unit maintenance.</p> <p>8. Functionally check Precision Lightweight Global Positioning Receiver (PLGR). If PLGR is inoperative, contact unit maintenance.</p> | <p>VHF/FM DSC transceiver is inoperative. VHF/FM DSC transceiver is a safety requirement and must be operational.</p> |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|---------------------------------------|
| 36 | After | 0.3 | Operators Cab (Cont'd) | <p>9. Functionally check VHF/FM handheld transceivers and battery chargers. If transceivers or battery chargers are inoperative, contact unit maintenance.</p> <p>10. Functionally check SINCGARS radio. If SINCGARS radio is inoperative, contact unit maintenance.</p> <p>11. Inspect all radio antennae, handsets, cables and batteries. If damage is found that would prevent operation, contact unit maintenance.</p> | |
| | | | | | |
| 38 | After | 0.1 | Navigation Masts and Lights | <p>1. Visually inspect navigation mast, stub mast and junction boxes for evidence of corrosion, physical damage, broken welds, missing or broken bolts and/or components. If evidence of corrosion, physical damage, broken welds, missing or broken bolts and/or components is found, contact unit maintenance.</p> <p>2. Visually inspect cable assemblies for loose connections and evidence of physical damage or wear. If loose connections or evidence of physical damage or wear is found, contact unit maintenance.</p> | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------------|---|------------------------------------|
| 38 | After | 0.1 | Navigation Masts and Lights (Cont'd) | <p>3. Visually inspect all navigational lights for cleanliness and evidence of physical damage. If damage is found, contact unit maintenance.</p> <p>4. Ensure that all lights are in working condition by operating the switches on mast enclosure (NAV Light Switch Box) in the cab to the ON and OFF positions. If lights or switches are inoperative, contact unit maintenance.</p> | |

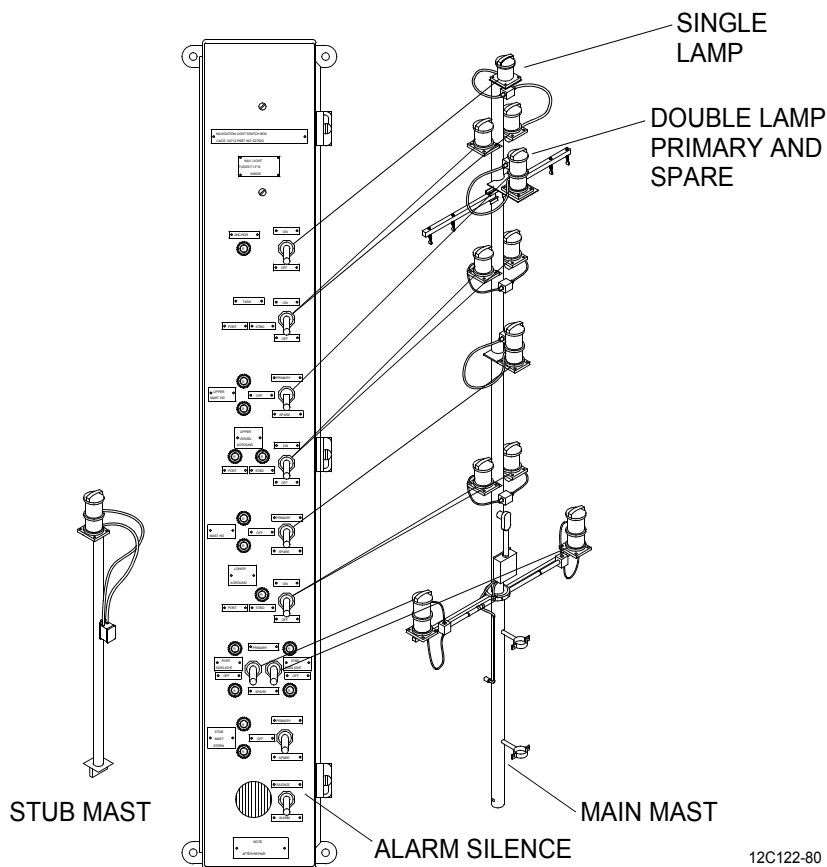


Table 1. Preventive Maintenance Checks and Services for the Warring Tug. (Continued)





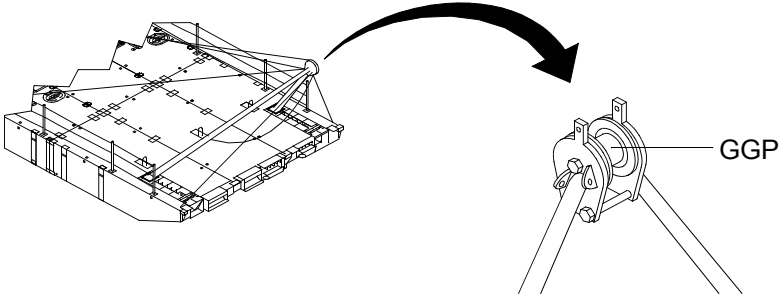
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|----------|-----------|---|---|---|
| WARNING | | | | | |
| | | |  |  | |
| | | | CHEMICAL | EYE PROTECTION | |
| 39 | After | 0.2 | Powered Section | Using cleaner, clean engine and engine compartment with hot soapy water. Use clean cloth and mop to thoroughly dry. | |
| 40 | After | 0.2 | Lifting Slings | Check lifting slings for cuts, loose stitching and fraying. | Slings are cut, have loose stitching or frayed. |
| 41 | Weekly | 1.0 | Powered and Non-powered Modules | Inspect modules for broken welds, cracks, punctures and corrosion. If found, contact unit maintenance. | Broken welds, cracks or punctures are present. |
| WARNING | | | | | |
| | | |  |  | |
| | | | CHEMICAL | EYE PROTECTION | |
| 11 | Weekly | 0.5 | Winch A-Frame | Grease A-frame sheave. Use general purpose grease and a hand lubricating gun. | |
|  | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warring Tug. (Continued)




| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|--------------------------------|--|--|
| <p>WARNING</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>CHEMICAL</p> </div> <div style="text-align: center;">  <p>EYE PROTECTION</p> </div> <div style="text-align: center;">  <p>EXPLOSION</p> </div> </div> | | | | | |
| 24 | Weekly | 0.3 | Batteries | <ol style="list-style-type: none"> 1. Verify battery electrolyte levels completely cover the plates, without electrolyte overflowing the battery, and that connections are clean and tight, both port and starboard. Add reagent distilled water, if necessary. If connections are loose, batteries are unserviceable or will not start engines, contact unit maintenance. 2. Ensure all battery cable clamps and hold downs are tight. Make sure all are secure and free of corrosion. Tighten and clean if necessary and apply light layer of grease on cable clamps. 3. Inspect battery system for damage. If batteries are damaged or inoperative, contact unit maintenance. 4. If operating charging levels are found to be too low while starting engine, contact unit maintenance. DO NOT run battery down. | <p>Batteries are unserviceable.</p> <p>Batteries will not start engines.</p> |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)



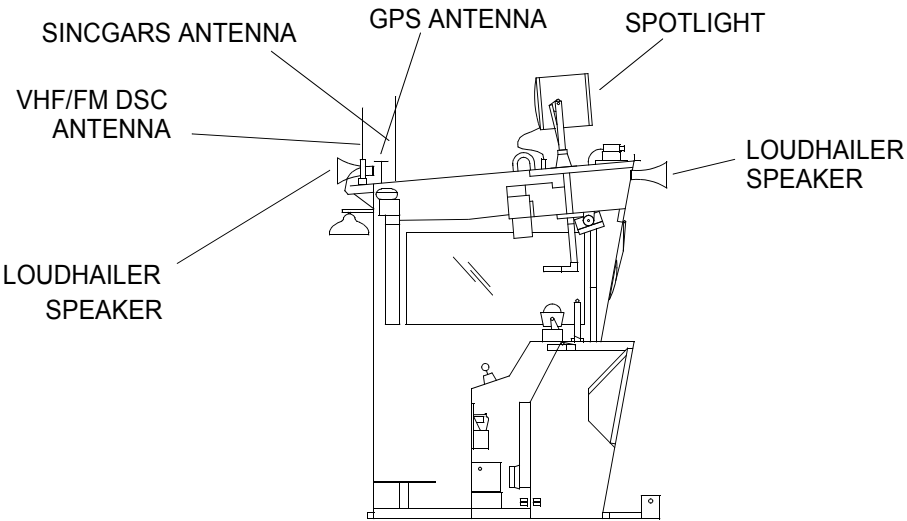
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|--------------------------------|--|------------------------------------|
| <p>WARNING</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>CHEMICAL</p> </div> <div style="text-align: center;">  <p>EYE PROTECTION</p> </div> </div> | | | | | |
| 25 | Weekly | 0.1 | Marine Gear | Lubricate marine gear output seal weekly if water is present in the bilge. Use automotive and artillery grease and a hand lubricating gun. | |
| 36 | Weekly | 0.3 | Operators Cab | <ol style="list-style-type: none"> 1. Check operator cab structure for damage to mountings. If damage is found, contact unit maintenance. 2. Visually inspect cab mounted antennas, spotlight, bell, horn and mast for damage that would prevent operation. If damage is found that would prevent operation, contact unit maintenance. | |
|  | | | | | |
| | | | | 3. Functionally check windshield wiper. If windshield wiper is inoperative, contact unit maintenance. | |

Table 1. Preventive Maintenance Checks and Services for the Warring Tug. (Continued)



| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|----------|-----------|--------------------------------|---|---|
| 36 | Weekly | 0.3 | Operators Cab (Cont'd) | 4. Functionally check spotlight. If spotlight is inoperative, contact unit maintenance. | |
| WARNING | | | | | |
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>CHEMICAL</p> </div> <div style="text-align: center;">  <p>EYE PROTECTION</p> </div> </div> | | | | | |
| | | | | <p>5. Lubricate shafts and pivot points. Use automotive and artillery grease and a hand lubricating gun.</p> <p>6. Functionally test battle lantern. If battle lantern is inoperative, contact unit maintenance.</p> <p>7. Functionally check VHF/FM DSC transceiver. If VHF/FM DSC transceiver is inoperative, contact unit maintenance.</p> <p>8. Functionally check loudhailer. If loudhailer is inoperative, contact unit maintenance.</p> <p>9. Functionally check Precision Lightweight Global Positioning Receiver (PLGR). If PLGR is inoperative, contact unit maintenance.</p> <p>10. Functionally check VHF/FM handheld transceivers and battery chargers. If transceivers or battery chargers are inoperative, contact unit maintenance.</p> <p>11. Functionally check SINCGARS radio. If SINCGARS radio is inoperative, contact unit maintenance.</p> | <p>VHF/FM DSC transceiver is inoperative.</p> |

Table 1. Preventive Maintenance Checks and Services for the Warring Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|--|---------------------------------------|
| 36 | Weekly | 0.3 | Operators Cab (Cont'd) | 12. Inspect all radio antennae, handsets, cables and batteries. If damage is found that would prevent operation, contact unit maintenance. | |

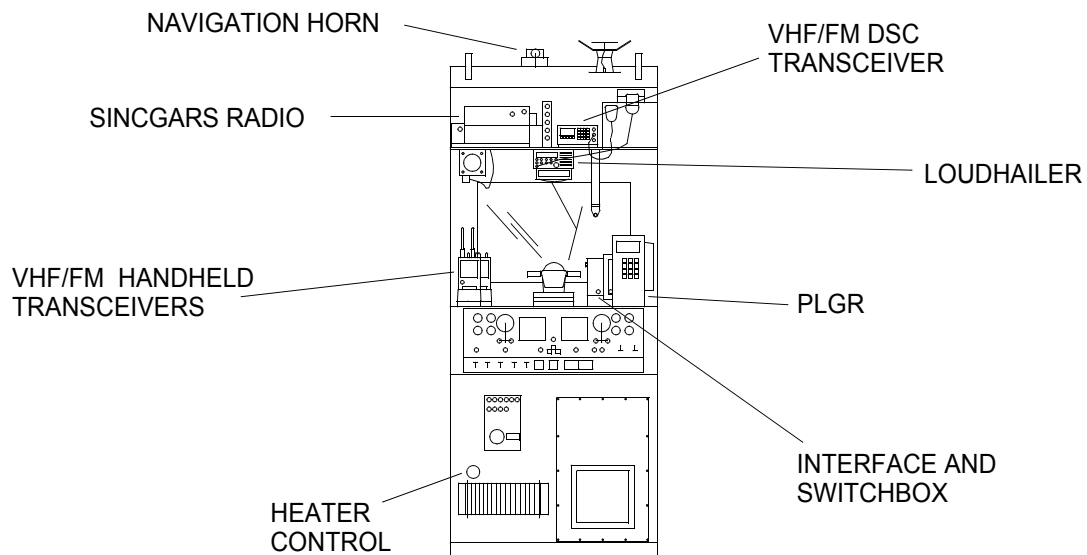
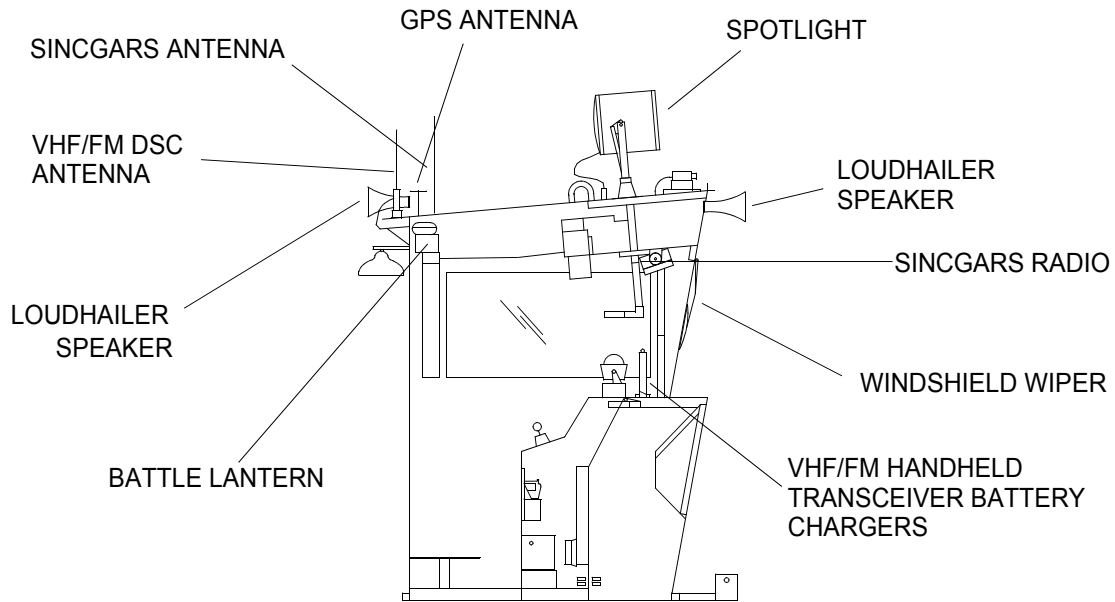


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

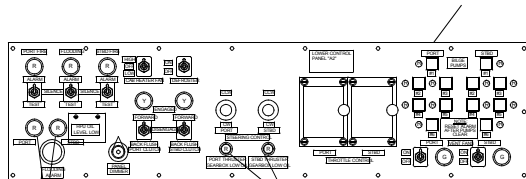
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|--|
| 14 | Weekly | 0.4 | Cab Lower Control Panel | <p>1. Check all control panels and associated switches, gages, steering levers, throttle and other controls and indicators for obvious damage. If damaged or non-functioning control panels and associated switches, gages, steering levers, throttle and other controls and indicators are found, contact unit maintenance.</p> <p>2. HPU OIL LEVEL LOW indicator light(s). Port and stbd, red indicator light(s) off. If on, check and fill appropriate hydraulic tank to proper level.</p> | Damage or non-functioning control panels and associated switches gages, steering levers, throttle and other controls and indicators. |

NOTE

At initial start-up thruster gearbox low oil indicator will go on momentarily and then go out.

| | | | | |
|--|--|--|--|--|
| | | | <p>3. THRUSTER GEARBOX LOW OIL indicator light(s). Port and stbd indicator light(s) off. If on, check and fill appropriate pump-jet gearbox to proper level.</p> | |
|--|--|--|--|--|

LOWER CONTROL PANEL



HPU OIL LEVEL LOW INDICATOR LIGHTS

THRUSTER GEARBOX LOW OIL INDICATOR LIGHTS

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|----------------------------------|--|---|
| 14 | Weekly | 0.4 | Cab Lower Control Panel (Cont'd) | <p>4. PORT and STBD FIRE ALARM/SILENCE/ TEST switches and indicators. Select TEST position momentarily. Horn sounds, red light comes on. Return switch to ALARM position. If red light does not come on or horn does not sound, contact unit maintenance.</p> <p>5. FLOODING ALARM/SILENCE/TEST Switch and indicator. Select TEST position momentarily. Horn sounds, red light comes on. Return switch to ALARM position. If red light does not come on or horn does not sound, contact unit maintenance.</p> <p>6. PANEL DIMMER switch. Functionally test switch. If switch is inoperative, contact unit maintenance.</p> | <p>Fire alarms are inoperative.</p> <p>Flooding alarm is inoperative.</p> |
| | | | | | |
| | | | | <p>7. THROTTLE CONTROL levers. Check port and stbd control levers for ease of movement. Throttles must move easily back and forth. Return throttles to the idle position. If levers binding or inoperative, contact unit maintenance.</p> | <p>Levers binding or inoperative.</p> |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|----------------------------------|---|---|
| 14 | Weekly | 0.4 | Cab Lower Control Panel (Cont'd) | <p>8. STEERING CONTROL joystick levers. Check port and stbd levers for ease of movement. Levers must move easily back and forth. If levers binding or inoperative, contact unit maintenance.</p> <p>9. Functionally check PORT/STBD CLUTCH toggle switches and indicators.</p> <p>a. Place toggle switches in the FORWARD and then BACK FLUSH positions. Engaged indicator yellow lights will come on in both positions. If toggle switches or lights are inoperative, contact unit maintenance.</p> <p>b. Place toggle switches in the DISENGAGED position. yellow indicator lights are off. If toggle switches or lights are inoperative, contact unit maintenance.</p> | <p>Levers binding or inoperative.</p> <p>Switch and/or indicator inoperative.</p> |

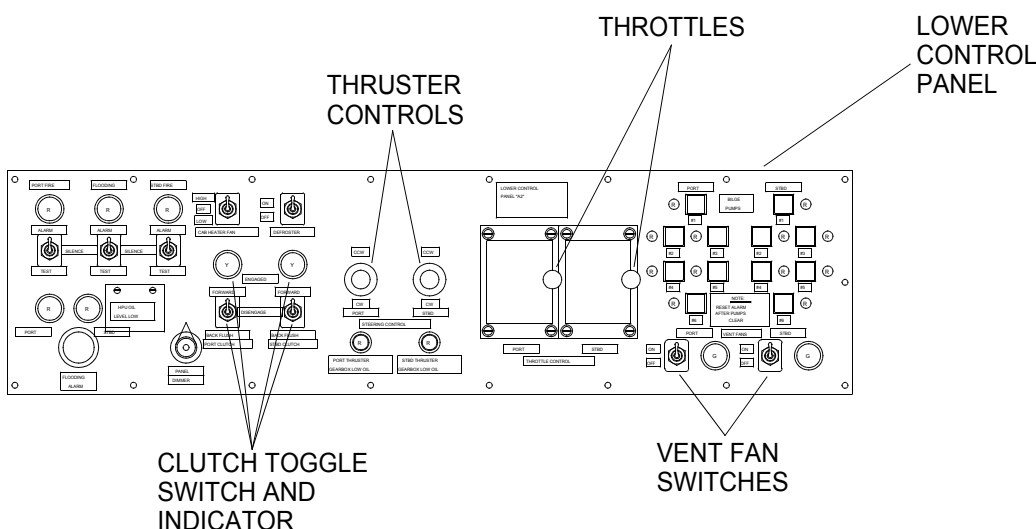


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|---------------------------------------|
| 38 | Weekly | 1.5 | Navigation Masts and Lights | <p>1. Lower the main and stub masts and check for damaged or cracked lenses, bad gaskets, structural damage or inoperative condition. If damage is found, contact unit maintenance.</p> <p>2. Visually inspect navigation mast, stub mast and junction boxes for evidence of corrosion, physical damage, broken welds, missing or broken bolts and/or components. If evidence of corrosion, physical damage, broken welds, missing or broken bolts and/or components is found, contact unit maintenance.</p> <p>3. Visually inspect cable assemblies for loose connections and evidence of physical damage or wear. If loose connections or evidence of physical damage or wear is found, contact unit maintenance.</p> <p>4. Visually inspect all navigational lights for cleanliness and evidence of physical damage. If damage is found, contact unit maintenance.</p> <p>5. Ensure that all lights are in working condition by operating the switches on mast enclosure (NAV Light Switch Box) in the cab to the ON and OFF positions. If lights or switches are inoperative, contact unit maintenance.</p> | |

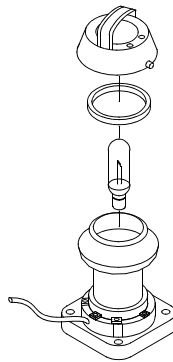


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|-----------|------------------------------------|
| | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

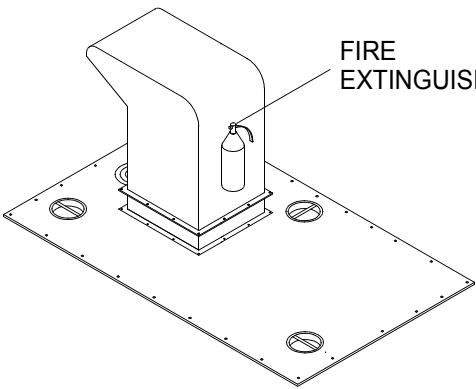
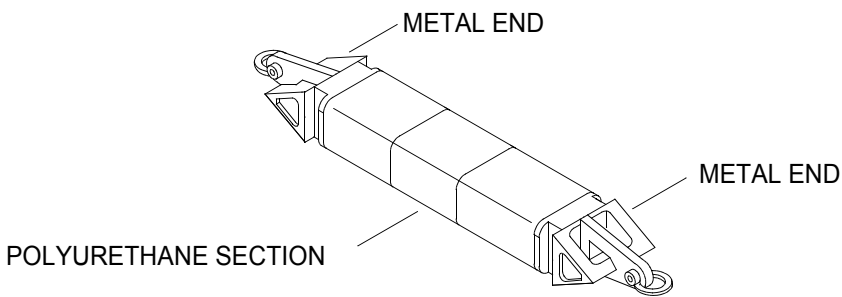
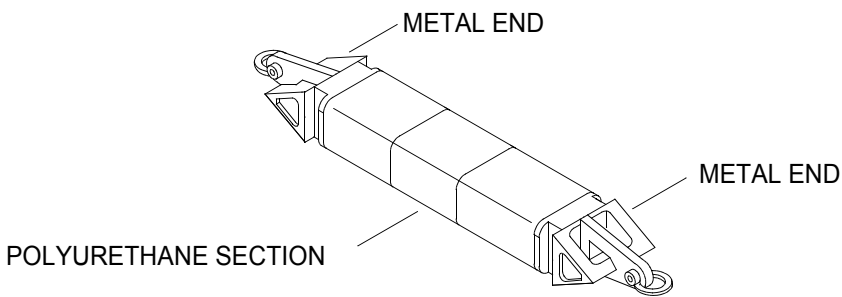
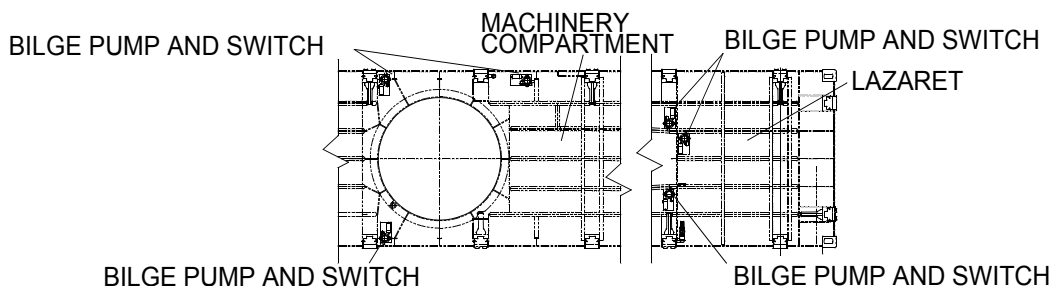
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: | | | | | | | | | | | | |
|--|----------|-----------|--------------------------------|---|--|---|---------|-----|---------|--|--|--|--|--|--|--|--|
| 1 | Monthly | 0.5 | Intake and Exhaust Plenums | <p>1. Inspect fire extinguisher for broken seal, damage to nozzle or red zone indication on gage. If seal is broken, nozzle is damaged, or a red zone indication is seen on gage, contact unit maintenance.</p> <p>2. Sign and date the fire extinguisher inspection tag and record the inspection in the deck logbook.</p> | Seal is broken, nozzle is damaged, or a red zone indication is seen on gage. | | | | | | | | | | | | |
|  | | | | | | 4 | Monthly | 1.0 | Flexors | <p>1. Inspect uninstalled flexors for separation of the polyurethane material in the center. If found, contact unit maintenance.</p> <p>2. Inspect uninstalled flexors for cracks in the external welds on the ends. If found, contact unit maintenance.</p> | <p>Separation of the polyurethane material in the center of the flexor is found.</p> <p>Cracks are discovered in the external weldments on the ends of the flexor.</p> |  | | | | | |
| 4 | Monthly | 1.0 | Flexors | <p>1. Inspect uninstalled flexors for separation of the polyurethane material in the center. If found, contact unit maintenance.</p> <p>2. Inspect uninstalled flexors for cracks in the external welds on the ends. If found, contact unit maintenance.</p> | <p>Separation of the polyurethane material in the center of the flexor is found.</p> <p>Cracks are discovered in the external weldments on the ends of the flexor.</p> | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|---|------------------------------------|
| 19 | Monthly | 0.2 | Bilge Pumps | Check all bilge pumps and float switches for condition and proper operation. Look for evidence of water leaks, loose pump connections and/or damage. If damage or leakage is found, contact unit maintenance. | |



WARNING

Use extreme care when inspecting or servicing CO₂. Failure to comply could result in injury or death.

| | | | | | |
|----|---------|-----|-------------------------|--|---|
| 35 | Monthly | 0.1 | Fire Suppression System | Inspect for discharge, leakage or expansion. Look for damaged or broken seals. If evidence of discharge, leakage, expansion or damaged or broken seals is found, contact unit maintenance. | Seals are damaged or broken, or evidence of excessive discharge is found. |
|----|---------|-----|-------------------------|--|---|

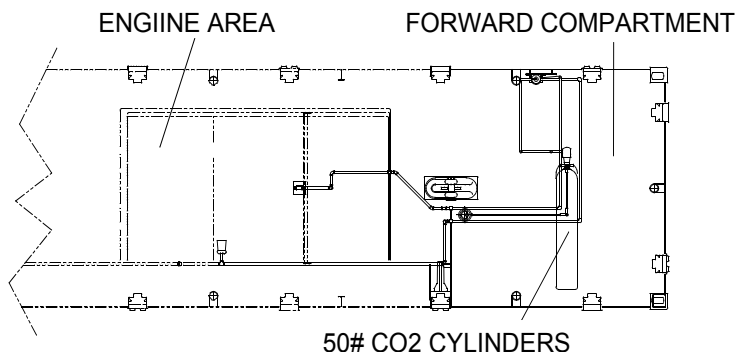


Table 1. Preventive Maintenance Checks and Services for the Warring Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|---|---|--|
| 43 | Monthly | 5.0 | Module Interlock Connector (Male Locking Pin) | 1. Check male connector pin for deformation, twisting, bending and flatness. If any deformation of the pin is present, remove pin from service. Contact unit maintenance. 2. Check contact area where the pins seat against the guillotine bars for wear. If excessive wear is present, remove pin from service. Contact unit maintenance. 3. Check the pin to ensure stop bar is attached. If stop bar is removed, remove pin from service and replace stop bar. Contact unit maintenance. 4. Check the connector pin for cracks and/or unusual damage (missing material, notches, etc.) If any cracks and/or unusual damage is present, remove pin from service. Contact unit maintenance. | Any deformation of the pin is present. Excessive wear is present. If stop bar is removed. If any cracks and/or unusual damage is present. |

WARNING



CHEMICAL



EYE PROTECTION

| | | | | |
|----|----------------------|-----|---|--|
| 27 | Monthly or 200 Hours | 0.5 | Drive Shafts (Cross and Bearing Grease Zerks) | Lubricate after first 200 hours of operation and monthly thereafter. Add lubricant until it appears at all journal cross bearings. Use automotive and artillery grease and a hand lubricating gun. |
|----|----------------------|-----|---|--|

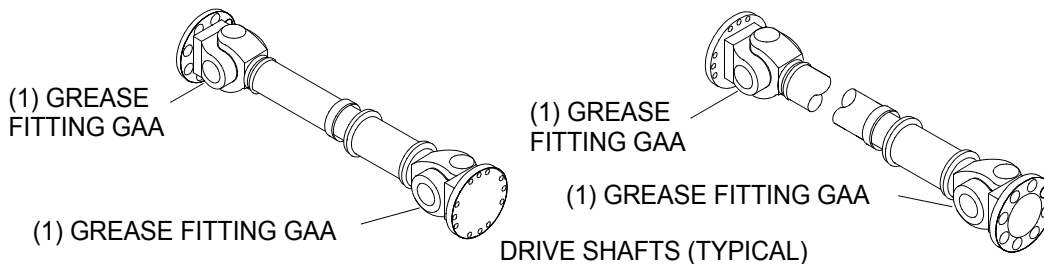


Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)


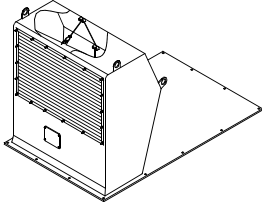

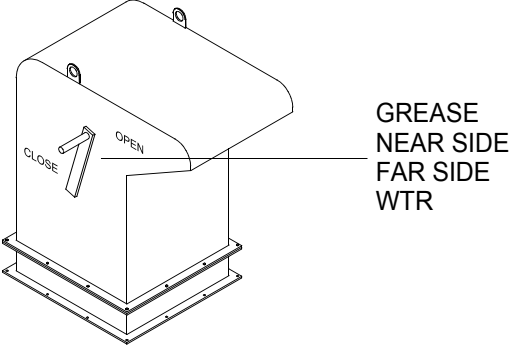
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|-----------|-----------|--------------------------------|---|------------------------------------|
| <p>WARNING</p>  <p>CHEMICAL</p> | | | | | |
| 1 | Quarterly | 0.5 | Intake Plenum Hinges | Lubricate as required. Service with aircraft grease and hand lubricating gun. | |
|  <p>INTAKE PLENUM HINGES</p> | | | | | |
| <p>WARNING</p>  <p>CHEMICAL</p> | | | | | |
| 1 | Quarterly | 0.5 | Exhaust Plenum Pivots | Lubricate as required. Service with aircraft grease and hand lubricating gun. | |
|  <p>GREASE NEAR SIDE FAR SIDE WTR</p> <p>EXHAUST PLENUM PIVOTS</p> | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)




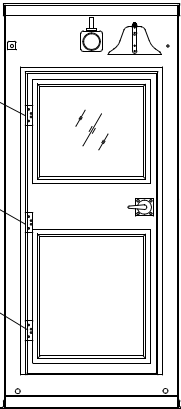
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|-----------|-----------|--------------------------------|--|------------------------------------|
| <p>WARNING</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>CHEMICAL</p> </div> <div style="text-align: center;">  <p>EYE PROTECTION</p> </div> </div> | | | | | |
| 11 | Quarterly | 0.7 | Winch A-Frame | Grease A-frame guy cables. Service by hand with wire rope-exposed gear grease. | |
| <p>WARNING</p> <div style="text-align: center;">  <p>CHEMICAL</p> </div> | | | | | |
| 36 | Quarterly | 0.5 | Operators Cab (Door Hinges) | Lubricate as required. Service with aircraft grease and hand lubricating gun. | |
| <div style="display: flex; justify-content: center; align-items: center;"> <div style="margin-right: 10px;">GREASE WTR</div>  </div> <p style="text-align: center;">OPERATOR CAB DOOR HINGES</p> | | | | | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)


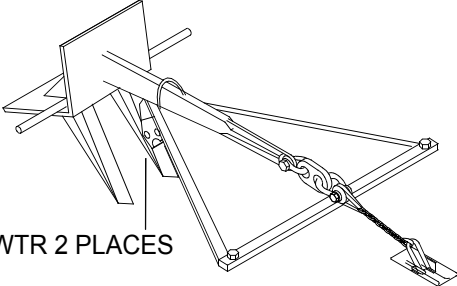
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|--|-----------|-----------|--------------------------------|---|------------------------------------|
| <p>WARNING</p>  <p>CHEMICAL</p> | | | | | |
| 8 | Quarterly | 0.5 | Stern Anchor Roller | Lubricate as required. Service with aircraft grease and hand lubricating gun. | |
|  <p>WTR 2 PLACES</p> <p>STERN ANCHOR</p> | | | | | |
| 20 | Quarterly | 1.0 | Diesel Engine | Perform AOAP sampling every 90 days or 100 hours, whichever comes first, as prescribed by DA PAM 738-750. | |
| 25 | Quarterly | 1.0 | Marine Gear | Perform AOAP sampling every 90 days or 100 hours, whichever comes first, as prescribed by DA PAM 738-750. | |
| 26 | Quarterly | 0.5 | Transfer Case | Perform AOAP sampling every 90 days or 100 hours, whichever comes first, as prescribed by DA PAM 738-750. | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)



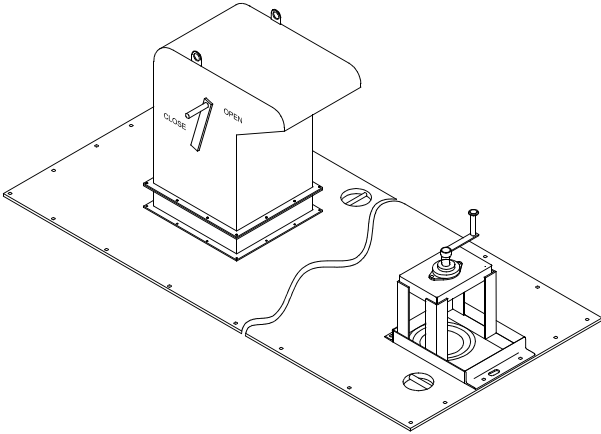


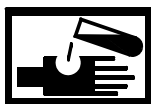
| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|---------------|-----------|----------------------------------|--|------------------------------------|
| WARNING | | | | | |
|   | | | | | |
| CHEMICAL EYE PROTECTION | | | | | |
| 34 | Quarterly | 0.1 | Emergency Steering Control Stand | Lubricate flange grease fittings with automotive and artillery grease and a hand lubricating gun. | |
|  | | | | | |
| EMERGENCY STEERING SYSTEM - FLANGE GREASE FITTINGS | | | | | |
| WARNING | | | | | |
|   | | | | | |
| CHEMICAL EYE PROTECTION | | | | | |
| NOTE | | | | | |
| Most starters do not require any lubrication between overhauls. | | | | | |
| 20 | Semi-annually | 0.1 | Diesel Engine (Starter) | <ol style="list-style-type: none"> 1. Lubricate starters equipped with hinge type oilers with 8 to 10 drops of lubricating oil (grade 40) and a hand oiler. 2. Lubricate starters equipped with grease cups by turning the grease cups down one turn. Refill grease cups as necessary with automotive and artillery grease, by hand. | |

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|---------------|-----------|---|--|------------------------------------|
| 20 | Semi-annually | 0.1 | Diesel Engine (Starter) (Cont'd) | 3. Lubricate starters equipped with sealed tubes by removing the pipe plugs, adding 8 to 10 drops of lubricating oil (grade 40) and resealing the tubes with the pipe plugs. Use hand oiler. | |
| 28 | Semi-annually | 0.5 | Hydraulic System | Perform AOAP sampling as prescribed by DA PAM 738-750. | |
| 35 | Annually | 2.0 | Fire Suppression System | Inspect fire suppression system in accordance with 46 CFR Parts 91.25-20 and 97.15-60. Contact Specialized Repair Activity (SRA). | |
| 42 | Annually | 2.0 | Steel Weight Lifting Chains, Rings, Hooks, Shackles and Swivels | Anneal all steel weight lifting chains, rings, hooks, shackles and swivels per 29 CFR Parts 1919.16 and 1919.36. Contact Specialized Repair Activity (SRA). | |

WARNING

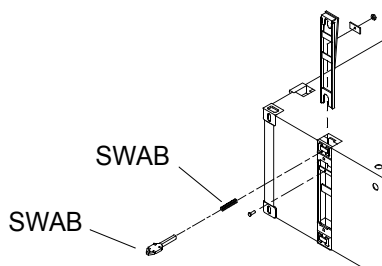


CHEMICAL



EYE PROTECTION

| | | | | | |
|----|----------|------------------|--|---|--|
| 43 | Annually | .3 each assembly | Module Interlock Connector and Spring (Male Locking Pin) | Lubricate annually and On Condition (before and after operation). Service with general purpose grease, by hand. | |
|----|----------|------------------|--|---|--|



INTERLOCK CONNECTOR SPRING PIN

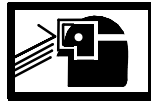
Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|----------|----------|-----------|--------------------------------|-----------|------------------------------------|
|----------|----------|-----------|--------------------------------|-----------|------------------------------------|

WARNING

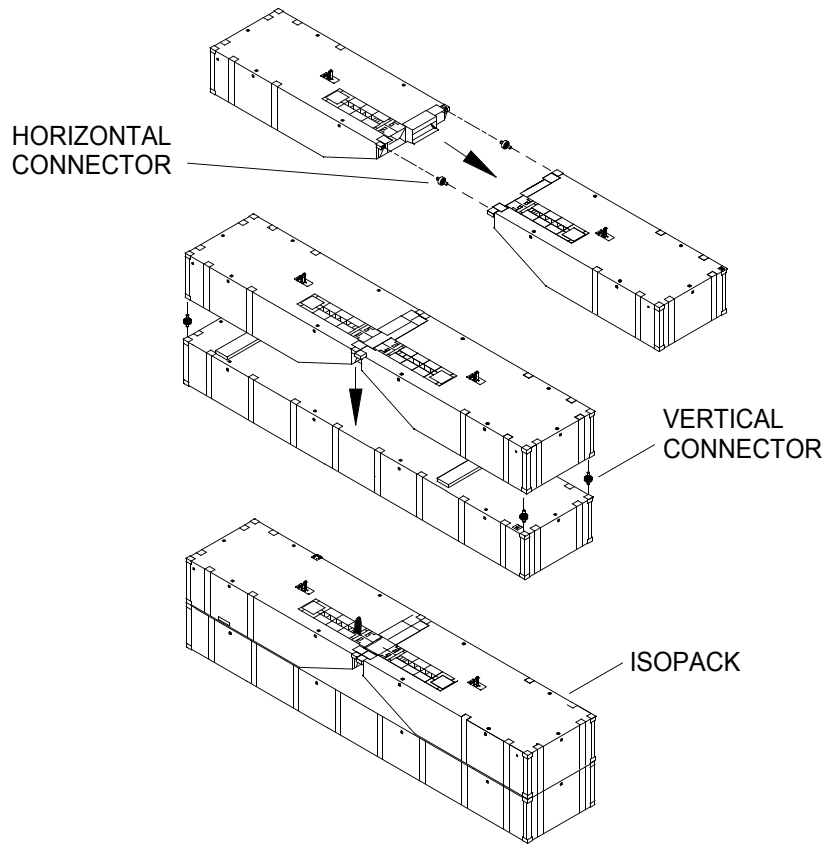


CHEMICAL



EYE PROTECTION

| | | | | | |
|----|----------|--------------------|------------------------------------|--|--|
| 44 | Annually | 0.1 each connector | Horizontal and Vertical Connectors | Lubricate annually and On Condition (before and after operation). Service with general purpose grease. | |
|----|----------|--------------------|------------------------------------|--|--|



HORIZONTAL AND VERTICAL CONNECTORS - MODULES

Table 1. Preventive Maintenance Checks and Services for the Warping Tug. (Continued)



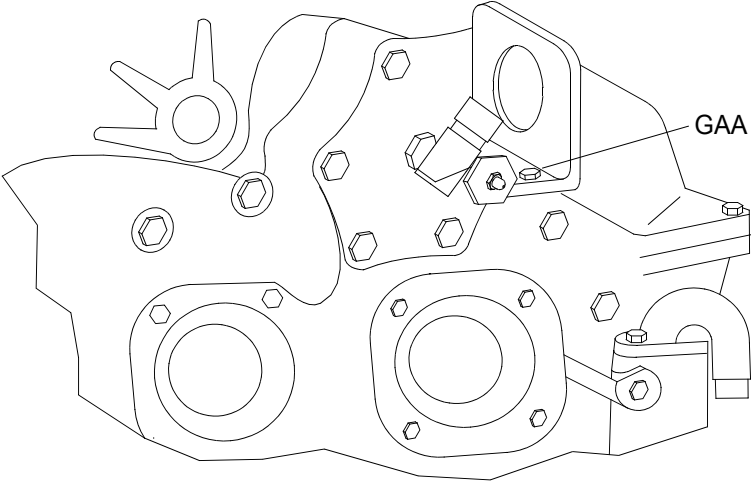






| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|-----------|-----------|---------------------------------------|--|------------------------------------|
| WARNING | | | | | |
|   | | | | | |
| CHEMICAL EYE PROTECTION | | | | | |
| 20 | 100 Hours | 0.2 | Engine (Tachometer Drive) | Lubricate engine tachometer drive. Use automotive and artillery grease and a hand lubricating gun. | |
|  | | | | | |
| WARNING | | | | | |
|   | | | | | |
| CHEMICAL EYE PROTECTION | | | | | |
| 20 | 200 Hours | 0.1 | Engine (Throttle and Clutch Controls) | Lubricate the engine throttle and clutch controls with automotive and artillery grease. | |

Table 1. Preventive Maintenance Checks and Services for the Warring Tug. (Continued)

| ITEM NO. | INTERVAL | MAN-HOURS | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|-----------|-----------|--------------------------------|--|------------------------------------|
| WARNING | | | | | |
|   | | | | | |
| CHEMICAL EYE PROTECTION | | | | | |
| 25 | 300 Hours | 0.1 | Marine Gear | Lubricate marine gear output seal using automotive and artillery grease and a hand lubricating gun. | |
| WARNING | | | | | |
|   | | | | | |
| CHEMICAL EYE PROTECTION | | | | | |
| 20 | 500 Hours | 1.0 | Diesel Engine | Lubricate the overspeed governor, if equipped with a hinge cap oiler or oil cup, with 5 to 6 drops of lubricating oil (grade 40) and hand oiler. | |
| 10 11 | 4 Years | 5.0 | Winch and A-Frame | Perform proof test of winch and A-frame in accordance with 29 CFR Part 1919.27. Contact Specialized Repair Activity (SRA). | |

END OF WORK PACKAGE

CHAPTER 5

OPERATOR SUPPORTING INFORMATION

FOR

MODULAR CAUSEWAY SYSTEM (MCS)

WARPING TUG (WT)

**UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE
WARPING TUG
REFERENCES**

SCOPE

This work package lists all field manuals, forms, technical manuals and miscellaneous publications referenced in this manual.

ARMY REGULATIONS

AR 700-138 Army Logistics Readiness and Sustainability

CODE OF FEDERAL REGULATIONS

29 CFR Labor, Parts 1911 to 1925

46 CFR Shipping, Parts 90 to 139

DA PAMPHLETS

DA PAM 738-750 The Army Maintenance Management Systems (TAMMS)

FIELD MANUALS

FM 3-5 NBC, Decontamination

FM 55-502 Army Watercraft Safety

FORMS

DA Form 2028 Recommended Changes to Publications and Blank Forms

DA Form 2028-2 Recommended Changes to Equipment Technical Publications

DA Form 2404 Equipment Inspection and Maintenance Worksheet

SF 368 Product Quality Deficiency Report

MISCELLANEOUS

ASME Y14.38-1999 The American Society of Mechanical Engineers Abbreviations and Acronyms

CTA 8-100 Common Table of Allowances, Army Medical Department
Expendable/Durable Items

CTA 50-970 Common Table of Allowances, Expendable/Durable Items (Except
Medical, Class V Repair Parts, and Heraldic Items)

SUPPLY CATALOG

SC 4910-95-A68 Shop Equipment, Automotive Equipment and Repair, Field Maintenance

SC 4910-95-A72 Shop Equipment, Automotive Equipment and Repair, Organizational Maintenance

TECHNICAL MANUALS

| | |
|-----------------------|---|
| TM 5-2815-258-10 | Operator's Manual for Detroit Diesel Engine Series 53 |
| TM 5-2815-258-24 | Unit, Direct Support and General Maintenance Manual for Detroit Diesel Engine Series 53 |
| TM 9-6115-643-24 | Unit, Direct Support and General Maintenance Manual for Generator Set, Skid Mounted, Tactical Quiet 15KW |
| TM 9-6140-200-14 | Operator's, Unit, Direct Support and General Support Maintenance Manual for Lead-Acid Storage Batteries |
| TM 11-5820-890-10-8 | SINCGARS Operators Manual |
| TM 11-5825-291-13 | Operations and Maintenance Manual, Satellite Signals Navigation Sets |
| TM 55-1925-257-14&P | Operator, Unit, Direct Support and General Support Maintenance Manual for Incinerator Toilet/Urinal, Galley Equipment and Electric Water Heater |
| TM 55-1945-205-24-3-2 | Unit, Direct Support and General Maintenance, Warping Tug Diesel Engine |
| TM 55-1945-205-24-3-3 | Unit, Direct Support and General Maintenance, Warping Tug Marine Gear |
| TM 55-1945-205-24-3-4 | Unit, Direct Support and General Maintenance, Warping Tug Transfer Case |
| TM 55-3950-204-14&P | Unit, Direct Support and General Maintenance Manual for Winch, Warping Tug |
| TM 750-244-6 | Destruction of TACOM Equipment |

**OPERATOR MAINTENANCE
WARPING TUG
MAINTENANCE ALLOCATION CHART (MAC)**

INTRODUCTION

The Army Maintenance System MAC

This introduction provides a general explanation of all maintenance and repair functions authorized at various levels under the standard Army Maintenance System concept.

The MAC (immediately following the introduction) 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 shall be consistent with the capacities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Unit - includes two subcolumns, C (operator/crew) and O (unit) maintenance.

Direct Support - includes an F subcolumn.

General Support - includes an H subcolumn.

Depot - includes a D subcolumn.

The tools and test equipment requirements, immediately following the MAC, if applicable, list the tools and test equipment, both special tools and common tool sets, required for each maintenance function as referenced from the MAC.

The remarks, immediately following the tools and test equipment requirements, if applicable, contain supplemental instructions and explanatory notes for a particular maintenance function.

Maintenance Functions

Maintenance functions are limited to and defined as follows:

1. 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. This includes scheduled inspection and gaugings and evaluation of cannon tubes.
2. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.
3. Service. Operations required periodically to keep an item in proper operating conditions; e.g., to clean, includes decontaminate, when required, to preserve, to drain, to paint or to replenish fuel, lubricants, chemical fluids or gases. This includes scheduled exercising and purging of recoil mechanisms.
4. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.
5. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

6. 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 of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.
7. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating or fixing into position a spare, repair part or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.
8. 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 third position code of the Source, Maintenance and Recoverability (SMR) code.
9. Repair. The application of the maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures and maintenance actions 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.

NOTE

The following definitions are applicable to the "repair" maintenance function:

Services - inspect, test, service, adjust, align, calibrate and/or replace.

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).

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 (i.e., identified as maintenance significant).

Actions - welding, grinding, riveting, straightening, facing, machining and/or resurfacing.

10. 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. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.
11. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

Explanation of Columns in the MAC

Column (1) - Group Number. Column (1) lists FGC numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

Column (2) - Component/Assembly. Column (2) contains the item names of components, assemblies, subassemblies and modules for which maintenance is authorized.

Column (3) - Maintenance Function. Column (3) lists the functions to be performed on the item listed in column (2). For a detailed explanation of these functions refer to "Maintenance Functions" outlined above.

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 manhours 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 varies at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figures represent 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 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)

H - General support maintenance

D - Depot maintenance

NOTE

The "L" maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by a work time figure in the "H" column of column (4) and an associated reference code is used in the remarks column (6). This code is keyed to the remarks and the SRA complete repair application is explained there.

Column (5) - Tools and Equipment Reference Code. Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

Column (6) - Remarks Code. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

Explanation of Columns in the Tools and Test Equipment Requirements

Column (1) - Tool or Test Equipment Reference Code. The tool or test equipment reference code correlates with a code used in column (5) of the MAC.

Column (2) - Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

Column (3) - Nomenclature. Name or identification of the tool or test equipment.

Column (4) - National Stock Number (NSN). The NSN of the tool or test equipment.

Column (5) - Tool Number. The manufacturer's part number, model number or type number.

Explanation of the Columns in the Remarks

Column (1) - Remarks Code. The code recorded in column (6) of the MAC.

Column (2) - Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

**OPERATOR MAINTENANCE
WARPING TUG
MAINTENANCE ALLOCATION CHART**

MAINTENANCE ALLOCATION CHART

Table 1. MAC for Modular Causeway System. (MCS)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|--|------------------------------------|--------------------------|-----|-----|------|---------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 00 | MODULAR CAUSEWAY SYSTEM (MCS) | | | | | | | | |
| 01 | CAUSEWAY FERRY (CF) | | | | | | | | |
| 0101 | POWERED SECTION | | | | | | | | |
| 010101 | POWERED MODULE | | | | | | | | |
| 01010101 | DRIVE TRAIN | | | | | | | | |
| 0101010101 | DIESEL ENGINE | | | | | | | A | |
| 0101010102 | MARINE GEAR | | | | | | | B | |
| 0101010103 | TRANSFER CASE | | | | | | | C | |
| 0101010104 | PUMP-JET | Inspect | 0.5 | | | | | E | |
| | | Service | | 3.0 | | | 1 | E | |
| | | Repair | | | | 10.0 | | D | |
| | | Replace | | | | 50.0 | | D | |
| 010101010401 | HYDRAULIC SYSTEM | Inspect | 1.0 | | | | | E | |
| | | Service | 1.0 | 3.0 | | | 1 | E | |
| | | Repair | | | 3.0 | | 2, 4, 7 | | |
| | | Replace | | | 6.0 | | 2, 4, 7 | | |
| 01010101040101 | HYDRAULIC PUMP | Test | 0.5 | | | | | E | |
| | | Inspect | 1.0 | | | | | E | |
| | | Repair | | | 4.0 | | 2, 4, 7 | E | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE | |
|------------------|----------------------------|--------------------------------|--------------------------|-----|-----|-----|---|------------------------|-------|
| | | | UNIT | | DS | GS | | | DEPOT |
| | | | C | O | F | H | | | D |
| 01010101040101 | HYDRAULIC PUMP (CONT'D) | Replace | | 6.0 | | | | 1, 2, 4 | |
| 01010101040102 | HYDRAULIC HAND PUMP | Inspect | 1.0 | | | | | | E |
| | | Repair | | | | | 20.0 | | |
| | | Replace | | 2.0 | | | | 1, 2, 4 | |
| 01010101040103 | HYDRAULIC WAY-VALVE | Repair | | | | 2.0 | | 2, 4, 7 | |
| | | Replace | | 1.5 | | | | 1, 2, 4 | |
| 010101010403 | FEEDBACK UNIT | Inspect | 1.0 | | | | | | E |
| | | Repair | | | | 2.5 | | 2, 4, 7 | |
| | | Replace | | | 2.0 | | | 2, 4, 7 | |
| 0101010105 | ALTERNATOR | Test | | | 1.0 | | | 7, 14, 15 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Replace | | | 2.0 | | | 7, 14, 15 | |
| 01010102 | ENGINE EXHAUST SYSTEM | Clean | | 2.0 | | | | 1, 3, 9 | E |
| | | Inspect | | 2.0 | | | | 1, 3, 9 | E |
| | | Repair | | | 6.0 | | | 3, 7, 9 | |
| 01010103 | BILGE PUMP | Test | | 2.0 | | | | 1 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Replace | | 8.0 | | | | 1 | F |
| 01010104 | FIRE SUPPRESSION SYSTEM | Test | | | | | 3.0 | | E |
| | | Inspect | 2.0 | | | | 3.0 | | E |
| | | Repair | | | | | 8.0 | | G |
| | | Replace | | | | | 24.0 | | G |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|------|----|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 01010105 | FUEL SYSTEM | Test | 1.0 | | | | | | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Repair | | | 4.0 | | | 7 | |
| | | Replace | | | 12.0 | | | 7 | |
| 0101010501 | FUEL/WATER SEPARATOR | Clean | 1.0 | | | | | | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Repair | | 2.0 | | | | 1 | |
| | | Replace | | | 4.0 | | | 7 | |
| 01010106 | ELECTRICAL SYSTEM | Test | | | 1.0 | | | 7, 14, 15 | E |
| | | Adjust | | | 1.0 | | | 7, 14, 15 | |
| | | Repair | | | 2.0 | | | 7, 14, 15 | |
| | | Replace | | | 8.0 | | | 7, 14, 15 | |
| 01010107 | EMERGENCY STEERING SYSTEM | Inspect | 2.0 | | | | | | E |
| | | Service | 1.0 | | | | | | E |
| | | Replace | | 4.0 | | | | 1 | |
| 0101010701 | STEERING UNIT | Inspect | 0.5 | | | | | | E |
| | | Replace | | 2.0 | | | | 1, 2 | |
| 0101010702 | STEERING ADAPTOR | Inspect | 0.5 | | | | | | E |
| | | Replace | | 1.5 | | | | 1 | |
| 01010108 | HULL | | | | | | | | |
| 0101010801 | EXTERIOR | Clean | | 4.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Service | 1.5 | | | | | | E |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE | |
|------------------|---------------------------|--------------------------------|--------------------------|-----|----|----|---|------------------------|-------|
| | | | UNIT | | DS | GS | | | DEPOT |
| | | | C | O | F | H | | | D |
| 0101010801 | EXTERIOR (CONT'D) | Repair | | 4.0 | | | | 1, 16 | |
| | | Overhaul | | | | | 24.0 | | |
| 0101010802 | INTERIOR | Clean | | | | | 4.0 | | |
| | | Inspect | | | | | 2.0 | | |
| | | Test | | 8.0 | | | 5.0 | 1, 25, 26 | E |
| | | Repair | | | | | 6.0 | | |
| | | Overhaul | | | | | 50.0 | | |
| 01010109 | GUILLOTINE FITTINGS | Clean | | 1.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Repair | | 3.0 | | | | 1, 16 | |
| | | Replace | | 1.0 | | | | 1 | |
| 01010110 | HATCHES & HINGES | Clean | 1.0 | | | | | 8, 9, 23, 24 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Service | 0.5 | | | | | | E |
| | | Repair | | 2.0 | | | | 1, 16 | |
| | | Replace | | 2.0 | | | | 1 | |
| 0101010111 | FLEXORS | Inspect | 0.5 | | | | | | E |
| | | Replace | 4.0 | | | | | | |
| 010102 | NON-POWERED MODULES | | | | | | | | |
| 01010201 | HULL | | | | | | | | |
| 0101020101 | EXTERIOR | Clean | | 4.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Service | 1.5 | | | | | | E |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|------|----|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 0101020102 | INTERIOR | Repair | | 4.0 | | | | 1, 16 | |
| | | Overhaul | | | | | 24.0 | | |
| | | Clean | | | | | 4.0 | | |
| | | Inspect | | | | | 2.0 | | |
| | | Test | | | | | 5.0 | 1, 25, 26 | E |
| | | Repair | | | | | 6.0 | | |
| 01010202 | GUILLOTINE FITTINGS | Overhaul | | | | | 50.0 | | |
| | | Clean | | 1.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Repair | | 3.0 | | | | 1, 16 | |
| | | Replace | | 1.0 | | | | 1 | |
| | | Inspect | 0.5 | | | | | | E |
| 01010203 | FLEXORS | Replace | 4.0 | | | | | | |
| | | Inspect | 0.5 | | | | | | E |
| 010103 | OPERATORS CAB | | | | | | | | |
| 01010301 | MIDDLE CONTROL PANEL | Test | | | 2.0 | | | 7, 14, 15 | E |
| | | Inspect | | | 2.0 | | | 7, 14, 15 | E |
| | | Repair | | | 3.0 | | | 7, 14, 15 | |
| | | Replace | | | 16.0 | | | 7, 14, 15 | |
| 01010302 | LOWER CONTROL PANEL | Test | | | 2.0 | | | 7, 14, 15 | E |
| | | Inspect | | | 2.0 | | | 7, 14, 15 | E |
| | | Repair | | | 3.0 | | | 7, 14, 15 | |
| | | Replace | | | 16.0 | | | 7, 14, 15 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|-----------------------------------|--------------------------------|--------------------------|-----|------|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 01010303 | CIRCUIT BREAKER PANEL | Test | | | 1.0 | | | 7, 14, 15 | E |
| | | Inspect | | | 1.0 | | | 7, 14, 15 | E |
| | | Repair | | | 2.0 | | | 7, 14, 15 | |
| | | Replace | | | 12.0 | | | 7, 14, 15 | |
| 01010304 | TERMINAL STRIP A-4 | Test | | | 1.0 | | | 7, 14, 15 | E |
| | | Inspect | | | 1.0 | | | 7, 14, 15 | E |
| | | Repair | | | 2.0 | | | 7, 14, 15 | |
| | | Replace | | | 10.0 | | | 7, 14, 15 | |
| 01010305 | SPOTLIGHT | Adjust | | 1.0 | | | | 1 | |
| | | Replace | | 1.0 | | | | 1 | |
| 01010306 | DEFROSTER | Inspect | 1.0 | | | | | | E |
| | | Replace | | | 4.0 | | | 7, 14, 15 | |
| 01010307 | HEATER | Inspect | | 2.0 | | | | 1 | |
| | | Repair | | | 4.0 | | | 7, 14, 15 | |
| | | Replace | | | 6.0 | | | 7, 14, 15 | |
| 01010308 | WINDSHIELD WIPER | Repair | | 1.0 | | | | 1 | |
| | | Replace | | 2.0 | | | | 1 | |
| 01010309 | COMMUNICATIONS EQUIPMENT | | | | | | | | |
| 0101030901 | VHF/FM HANDHELD TRANSCEIVER | Repair | | | | | 8.0 | | |
| | | Replace | | 1.0 | | | | 1 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|---------------------------------------|------------------------------------|--------------------------|-----|------|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 0101030902 | AN/PSN-11 INTERFACE & SWITCHBOX | Repair | | | | | 6.0 | | |
| | | Replace | | | 1.0 | | | 7, 14, 15 | |
| 0101030903 | LOUDHAILER | Repair | | | | | 8.0 | | |
| | | Replace | 0.5 | | | | | | |
| 0101030904 | SINGARS RADIO | | | | | | | | H |
| 0101030905 | VHF/FM DCS TRANSCEIVER | Repair | | | | | 12.0 | | |
| | | Replace | | 1.0 | | | | 1 | |
| 01010310 | NAVIGATION EQUIPMENT | Test | 0.5 | | | | | | E |
| | | Inspect | 1.0 | | | | | | E |
| 0101031001 | COMPASS | Inspect | 2.0 | | | | | | E |
| | | Replace | | 2.0 | | | | 1 | |
| | | Calibrate | | 4.0 | | | | 1 | E |
| 0101031002 | PLGR | | | | | | | | I |
| 01010311 | MAST | Inspect | 3.0 | | | | | | E |
| | | Repair | | 3.0 | | | | 1 | |
| 0101031101 | NAVIGATION LIGHTS | Repair | | 1.0 | | | | 1 | |
| | | Replace | | 1.0 | | | | 1 | |
| 0101312 | OPERATORS CAB ELECTRICAL SYSTEM | Test | | | 4.0 | | | 7, 14, 15 | E |
| | | Inspect | | | 4.0 | | | 7, 14, 15 | E |
| | | Repair | | | | 6.0 | | 7, 14, 15 | |
| | | Replace | | | 10.0 | | | 7, 14, 15 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|---------------------------|--------------------------------|--------------------------|-----|----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 010104 | ANCHOR ASSEMBLY | Inspect | 1.0 | | | | | | E |
| | | Repair | | 1.0 | | | | 1 | |
| | | Replace | | 1.0 | | | | 1 | |
| 0102 | INTERMEDIATE SECTION | | | | | | | | |
| 010201 | NON-POWERED MODULES | | | | | | | | |
| 01020101 | HULL | | | | | | | | |
| 0102010101 | EXTERIOR | Clean | | 4.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Service | 1.5 | | | | | | E |
| | | Repair | | 4.0 | | | | 1, 16 | |
| | | Overhaul | | | | | 24.0 | | |
| 0102010102 | INTERIOR | Clean | | | | | 4.0 | | |
| | | Inspect | | | | | 2.0 | | |
| | | Test | | 8.0 | | | 5.0 | 1, 25, 26 | E |
| | | Repair | | | | | 6.0 | | |
| | | Overhaul | | | | | 50.0 | | |
| 01020102 | GUILLOTINE FITTINGS | Clean | | 1.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Repair | | 3.0 | | | | 1, 16 | |
| | | Replace | | 1.0 | | | | 1 | |
| 01020103 | FLEXORS | Inspect | 0.5 | | | | | | E |
| | | Replace | 4.0 | | | | | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE | |
|----------------------|---|------------------------------------|--------------------------|-----|-----|----|---|----------------------------|-------|
| | | | UNIT | | DS | GS | | | DEPOT |
| | | | C | O | F | H | | | D |
| 0103 | CAUSEWAY FERRY BEACH- END SECTION | | | | | | | | |
| 010301 | NON-POWERED MODULE | | | | | | | | |
| 01030101 | HULL | | | | | | | | |
| 0103010101 | EXTERIOR | Clean | | 4.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Service | 1.5 | | | | | | E |
| | | Repair | | 4.0 | | | | 1, 16 | |
| | | Overhaul | | | | | 24.0 | | |
| 0103010102 | INTERIOR | Clean | | | | | 4.0 | | |
| | | Inspect | | | | | 2.0 | | |
| | | Test | | 8.0 | | | 5.0 | 1, 25, 26 | E |
| | | Repair | | | | | 6.0 | | |
| | | Overhaul | | | | | 50.0 | | |
| 01030102 | GUILLOTINE FITTINGS | Clean | | 1.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Repair | | 3.0 | | | | 1, 16 | |
| | | Replace | | 1.0 | | | | 1 | |
| 01030103 | FLEXORS | Inspect | 0.5 | | | | | | E |
| | | Replace | 4.0 | | | | | | |
| 0104 | CONTAINERS | Clean | 1.0 | | | | | | E |
| | | Inspect | 2.0 | | | | | | E |
| | | Repair | | | 4.0 | | | 7 | |
| | | Replace | | | | | 8.0 | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|---|----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| | | | | | | | | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|--|--------------------------------|--------------------------|-----|-------|-------|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 00 | MODULAR CAUSEWAY SYSTEM (MCS) | | | | | | | | |
| 01 | CAUSEWAY FERRY (CF) | | | | | | | | |
| 0101010101 | DIESEL ENGINE | Inspect | 4.0 | | | | | E | |
| | | Service | 4.0 | 4.0 | | | | E | |
| | | Repair | | | | 30.0 | | 7, 27-218 | |
| | | Replace | | | 120.0 | | | 7, 27-218 | |
| | | Overhaul | | | | | 80.0 | | |
| 010101010101 | ENGINE BLOCK ASSEMBLY | Inspect | 2.0 | | | | | E, J | |
| | | Repair | | | | 6.0 | | 7, 27-52 J | |
| | | Replace | | | | 120.0 | | 7, 27-52 J | |
| 010101010102 | CYLINDER HEAD ASSEMBLY | Clean | | | | 5.0 | | 7, 53-85 E, K | |
| | | Repair | | | | 12.0 | | 7, 53-85 K | |
| | | Inspect | | | 6.0 | | | 7, 53-85 E, K | |
| | | Replace | | | 8.0 | | | 7, 53-85 K | |
| 010101010103 | CRANKSHAFT ASSEMBLY | Repair | | | 16.0 | | | 7, 86-106 L | |
| | | Replace | | | 24.0 | | | 7, 86-106 L | |
| 010101010104 | CAMSHAFT ASSEMBLY | Repair | | | | 12.0 | | 7, 131-141 | |
| | | Replace | | | | 16.0 | | 7, 131-141 | |
| 010101010105 | FLYWHEEL ASSEMBLY | Inspect | | | 3.0 | | | 7, 107-112 M | |
| | | Replace | | | 5.0 | | | 7, 107-112 M | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|---------------------------|--------------------------------|--------------------------|-----|-----|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 010101010106 | PISTON ASSEMBLY | Clean | | | | 2.0 | | 7, 113-130 | N |
| | | Repair | | | | 3.0 | | 7, 107-112 | M |
| | | Inspect | | | | 2.0 | | 7, 113-130 | N |
| | | Rebuild | | | | 4.5 | | 7, 113-130 | N |
| | | Replace | | | | 3.0 | | 7, 113-130 | N |
| 010101010107 | ENGINE BALANCE | Inspect | | | | 6.0 | | 7, 131-141 | O |
| | | Adjust | | | | 3.0 | | 7, 131-141 | O |
| | | Replace | | | | 8.0 | | 7, 131-141 | O |
| | | Repair | | | | 8.0 | | 7, 131-141 | O |
| 010101010108 | FUEL SYSTEM | Inspect | 0.5 | | | | | E, P | |
| 01010101010801 | FUEL PUMP | Inspect | | | | 1.0 | | 7, 142-187 | E |
| | | Repair | | | | 4.0 | | 7, 142-187 | |
| | | Replace | | | | 2.0 | | 7, 142-187 | |
| 01010101010802 | PRIMING PUMP | Inspect | | 1.5 | | | | 1, 142-187 | E |
| | | Replace | | 2.0 | | | | 1, 142-187 | |
| 010101010109 | ELECTRIC GOVERNOR | Test | | | 0.5 | | | | E |
| | | Adjust | | 1.0 | | | | 7, 142-187 | |
| | | Repair | | | | | 5.0 | | |
| | | Replace | | 2.0 | | | | 1, 142-187 | |
| | | Inspect | 0.5 | | | | | | E, Q |
| 010101010110 | AIR INTAKE SYSTEM | Clean | | 2.0 | | | | 1, 188-195 | E, Q |
| | | Replace | | 3.0 | | | | 1, 188-195 | Q |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|-----|------|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 01010101011001 | BLOWER | Inspect | | | 2.0 | 2.0 | | 7, 188-195 | E |
| | | Adjust | | | | 4.0 | | 7, 188-195 | |
| | | Repair | | | | 18.0 | | 7, 188-195 | |
| 01010101011002 | TURBOCHARGER | Inspect | | 2.0 | | | | 1, 188-195 | E, R |
| | | Replace | | | 8.0 | | | 7, 188-195 | |
| | | Repair | | | | | 18.0 | | |
| | | Replace | | | 6.0 | | | 7, 188-195 | |
| 010101010111 | LUBE OIL SYSTEM | Service | 5.0 | 5.0 | | | | | E, S |
| | | Inspect | 1.0 | | | | | | E |
| 01010101011101 | LUBE OIL PUMP | Inspect | | | | 3.0 | | 7, 196-203 | E |
| | | Repair | | | | 4.0 | | 7, 196-203 | |
| | | Replace | | | | 4.0 | | 7, 196-203 | |
| 01010101011102 | LUBE OIL COOLER | Clean | | | 2.0 | | | 7 | E |
| | | Test | | | 1.5 | | | 7, 25, 26 | E |
| | | Inspect | | | 2.0 | | | 7 | E |
| | | Repair | | | 4.0 | | | 7 | E |
| | | Replace | | | 2.0 | | | 7 | |
| 010101010112 | FRESH WATER COOLING SYSTEM | Inspect | 1.0 | | | | | | E, T |
| | | Clean | | 1.0 | | | | 1 | |
| 01010101011201 | FRESH WATER PUMP | Inspect | | | 2.5 | | | 7, 212-215 | E |
| | | Repair | | | 6.0 | | | 7, 212-215 | |
| | | Replace | | | 3.0 | | | 7, 212-215 | |
| | | Test | | | 2.0 | | | 7, 25, 26 | E |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|-----------------------------|--------------------------------|--------------------------|-----|------|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 01010101011202 | FRESH WATER COOLER | Clean | | | 2.0 | | | 7 | E |
| | | Inspect | | | 1.0 | | | 7 | E |
| | | Repair | | | 4.0 | | | 7 | |
| | | Replace | | | 3.0 | | | 7 | |
| 010101010113 | RAW WATER COOLING SYSTEM | Inspect | 1.0 | | | | | E, U | |
| 01010101011301 | RAW WATER PUMP | Inspect | | 2.0 | | | | 1 | E |
| | | Clean | | 2.0 | | | | 1 | E, U |
| | | Repair | | | 4.0 | | | 7, 212-215 | |
| | | Replace | | 2.5 | | | | 1, 212-215 | |
| 010101010114 | ELECTRICAL SYSTEM | Test | | | 4.0 | | | 7, 14, 15 | E, V |
| | | Inspect | | | 2.0 | | | 7, 14, 15 | E, V |
| | | Repair | | | 3.0 | | | 7, 14, 15 | V |
| | | Replace | | | 16.0 | | | 1, 7, 14, 15 | V |
| 01010101011401 | STARTER | Inspect | 1.0 | | | | | | E |
| | | Repair | | | | 6.0 | | 7, 14, 15 | |
| | | Replace | | 3.0 | | | | 1, 14, 15 | |
| 01010101011402 | COLD PACK STARTER | Clean | | 1.0 | | | | 1 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Adjust | | 1.0 | | | | 1, 14, 15 | |
| | | Repair | | 2.5 | | | | 1, 14, 15 | |
| | | Replace | | 3.0 | | | | 1, 14, 15 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|-----|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 010101010115 | OVER SPEED GOVERNOR | Test | | | | 1.0 | | 7 | E |
| | | Adjust | | | | 1.5 | | 7, 184-187 | |
| | | Repair | | | | 5.0 | | 7, 184-187 | |
| | | Replace | | | | 4.0 | | 7, 184-187 | |
| 010101010116 | AUTO SHUTDOWN SYSTEM | Test | | 1.0 | | | | | E |
| | | Adjust | | | 2.0 | | | 7, 14, 15 | |
| | | Repair | | | | 6.0 | | 7, 14, 15 | |
| | | Replace | | 4.0 | | | 8.0 | 1 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|---|----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| | | | | | | | | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|--|------------------------------------|--------------------------|-----|------|------|-----------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 00 | MODULAR CAUSEWAY SYSTEM (MCS) | | | | | | | | |
| 01 | CAUSEWAY FERRY (CF) | | | | | | | | |
| 0101010102 | MARINE GEAR | Inspect | 1.0 | | | | | E | |
| | | Align | | | 2.0 | | 7, 17 | | |
| | | Service | 1.0 | 4.0 | | | 1 | E | |
| | | Rebuild | | | | 25.0 | | W | |
| | | Replace | | | 28.0 | | 4, 7, 17 | | |
| 010101010201 | OIL SYSTEM | Inspect | 0.5 | | | | | E, X | |
| | | Repair | | .5 | | | 1, 11 | X | |
| 01010101020101 | OIL COOLER | Clean | 1.0 | | | | | E | |
| | | Inspect | 1.0 | | | | | E | |
| | | Replace | | 4.0 | | | 1 | | |
| 01010101020102 | LINES & HOSES | Inspect | 0.5 | | | | | E | |
| | | Repair | | 1.0 | | | 1 | | |
| 01010101020103 | OIL PUMP | Inspect | 1.0 | | | | | E | |
| | | Repair | | 2.0 | | | 1, 3 | | |
| 01010101020104 | ELECTRIC CONTROL VALVE | Repair | | | | 8.0 | | | |
| | | Replace | | | 6.0 | | 7, 14, 15 | | |
| 010101010202 | GEAR MOUNTS | Inspect | .05 | | | | | E | |
| | | Replace | | | 2.0 | | 3,7 | | |
| 010101010203 | COUPLING BLOCKS | Clean | | | 1.0 | | 7 | E | |
| | | Inspect | | | 1.0 | | 7 | E | |
| | | Replace | | | 4.0 | | 3, 7 | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|--|--------------------------------|--------------------------|---|-----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 010101010204 | OUTPUT FLANGE | Inspect | 0.5 | | | | | | E |
| | | Align | | | 2.0 | | | 3, 7, 17 | |
| | | Replace | | | 4.0 | | | 3, 7, 17 | |
| 010101010205 | OUTPUT SEAL | Inspect | | | 2.0 | | | 7 | E |
| | | Replace | | | 2.0 | | | 3, 7 | |
| 010101010206 | INPUT FLANGE (ENGINE CONNECTION) | Inspect | 0.5 | | | | | | E |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|--|--------------------------------|--------------------------|-----|------|------|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 00 | MODULAR CAUSEWAY SYSTEM (MCS) | | | | | | | | |
| 01 | CAUSEWAY FERRY (CF) | | | | | | | | |
| 0101010103 | TRANSFER CASE | Clean | | 2.0 | | | | 1 | E |
| | | Service | 1.0 | 4.0 | | | | 1 | E |
| | | Overhaul | | | | 24.0 | | | |
| | | Rebuild | | | | | 24.0 | 2, 7, 17 | Y |
| | | Replace | | | 24.0 | | | 2, 7, 17 | |
| 010101010301 | OIL SYSTEM | Inspect | 1.0 | | | | | | E |
| | | Repair | | 2.5 | | | | 1 | |
| 01010101030101 | OIL PUMP | Inspect | 4.0 | | | | | | E |
| | | Replace | | 2.5 | | | | 1 | |
| 01010101030102 | HOSES & FITTINGS | Inspect | 0.2 | | | | | | E |
| | | Replace | | 2.0 | | | | 1 | |
| 01010101030103 | OIL COOLER | Inspect | 0.2 | | | | | | E |
| 010101010302 | GEAR SHAFT | Inspect | | | | 5.0 | | 7 | E |
| | | Replace | | 3.5 | | | | 1 | |
| | | Repair | | | | 8.0 | | 3, 7, 17 | |
| | | Replace | | | | 7.0 | | 3, 7, 17, 19 | |
| 01010101030201 | UPPER SHAFT | Inspect | | | | 5.0 | | 7 | X E |
| | | Repair | | | | 8.0 | | 3, 7, 17 | |
| | | Replace | | | | 7.0 | | 3, 7, 17, 19 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|---------------------------|--------------------------------|--------------------------|---|-----|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 0101010103020101 | INPUT SEAL | Clean | | | 2.0 | | | 7 | E |
| | | Inspect | | | 2.0 | | | 7 | E |
| | | Replace | | | 2.0 | | | 3, 7, 17, 19 | |
| 0101010103020102 | OUTPUT SEAL | Clean | | | 2.0 | | | 7 | E |
| | | Inspect | | | 2.0 | | | 7 | E |
| | | Replace | | | 2.0 | | | 3, 7, 17, 19 | |
| 01010101030202 | INTERMEDIATE SHAFT | Inspect | | | | 2.5 | | 7 | E |
| | | Repair | | | | 5.5 | | 3, 7, 17 | |
| | | Replace | | | | 6.5 | | 3, 7, 17, 19 | |
| 01010101030203 | LOWER SHAFT | Inspect | | | | 4.0 | | 7 | E |
| | | Repair | | | | 8.0 | | 3, 7, 17 | |
| | | Replace | | | | 6.0 | | 3, 7, 17, 19 | |
| 0101010103020301 | INPUT SEAL | Clean | | | 2.0 | | | 7 | E |
| | | Replace | | | 2.0 | | | 3, 7, 17, 19 | |
| | | Inspect | | | 2.0 | | | 7 | E |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|--|------------------------------------|--------------------------|-----|----|----|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 00 | MODULAR CAUSEWAY SYSTEM (MCS) | | | | | | | | |
| 01 | CAUSEWAY FERRY (CF) | | | | | | | | |
| 02 | ROLL-ON/ROLL- OFF DISCHARGE FACILITY (RRDF) | | | | | | | | |
| 0201 | INTERMEDIATE SECTION | | | | | | | | |
| 020101 | NON-POWERED MODULE | | | | | | | | |
| 02010101 | HULL | | | | | | | | |
| 0201010101 | EXTERIOR | Clean | | 4.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Repair | | 4.0 | | | | 1, 16 | |
| | | Service | 1.5 | | | | | | E |
| | | Overhaul | | | | | 24.0 | | |
| | | Inspect | | | | | 2.0 | | |
| 0201010102 | INTERIOR | Clean | | | | | 4.0 | | |
| | | Test | | 6.0 | | | 5.0 | 1, 25, 26 | E |
| | | Repair | | | | | 6.0 | | |
| 02010102 | GUILLOTINE FITTINGS | Clean | | 1.0 | | | | 8, 9, 23, 24 | E |
| | | Overhaul | | | | | 50.0 | | |
| | | Inspect | 0.5 | | | | | | E |
| | | Repair | | 3.0 | | | | 1, 16 | |
| | | Replace | | 1.0 | | | | 1 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|-------------------------------------|--------------------------------|--------------------------|-----|----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 02010103 | FLEXORS | Inspect | 0.5 | | | | | | E |
| | | Replace | 4.0 | | | | | | |
| 0202 | COMBINATION BEACH-END SECTION | | | | | | | | |
| 020201 | NON-POWERED MODULE | | | | | | | | |
| 02020101 | HULL | | | | | | | | |
| 0202010101 | EXTERIOR | Clean | | 4.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Service | 1.5 | | | | | | E |
| | | Repair | | 4.0 | | | | 1, 16 | |
| | | Overhaul | | | | | 24.0 | | |
| | | Inspect | | | | | 2.0 | | |
| 0202010102 | INTERIOR | Clean | | | | | 4.0 | | |
| | | Test | | 6.0 | | | 5.0 | 1, 25, 26 | E |
| | | Repair | | | | | 6.0 | | |
| | | Overhaul | | | | | 50.0 | | |
| 02020102 | GUILLOTINE FITTINGS | Clean | | 1.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Repair | | 3.0 | | | | 1, 16 | |
| | | Replace | | 1.0 | | | | 1 | |
| 02020103 | FLEXORS | Inspect | 0.5 | | | | | | E |
| | | Replace | 4.0 | | | | | | |
| 0203 | GENERATOR SHELTER | | | 4.0 | | | | 1 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|--|------------------------------------|--------------------------|-----|-----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 020301 | ARMY TACTICAL QUIET GENERATOR (ATQG) | | | | | | | | AD |
| 020302 | FUEL SYSTEM | Inspect | 1.0 | | | | | | E |
| | | Repair | | | 1.5 | | | 7 | |
| | | Replace | | 1.0 | | | | 1 | |
| 02030201 | MANUAL FUEL PUMP | Clean | | 1.0 | | | | 1 | E |
| | | Inspect | 1.0 | 1.0 | | | | 1 | E |
| | | Repair | | 2.0 | | | | 1 | |
| | | Replace | | 2.0 | | | | 1 | |
| 020303 | LOUVERS | Clean | | 1.0 | | | | 1 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Service | | 1.0 | | | | 1 | E |
| | | Repair | | 3.0 | | | | 1 | |
| | | Replace | | 4.0 | | | | 1 | |
| 020304 | ELECTRICAL SYSTEM | Test | | | 2.0 | | | 7, 14, 15 | E |
| | | Repair | | 2.0 | 3.0 | | | 1, 7, 14, 15 | |
| | | Replace | | | 5.0 | | | 7, 14, 15 | |
| 020305 | FIRE SUPPRESSION SYSTEM | Test | | | | | 4.0 | | E, G |
| | | Inspect | 1.0 | | | | | | E |
| | | Repair | | | | | 4.0 | 1, 14, 15 | G |
| | | Replace | | | | | 40.0 | | G |
| 0204 | PERSONNEL SHELTER | | | | | | | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|-----------------------------------|--------------------------------|--------------------------|------|------|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 020401 | HEAT PUMP | Clean | | 4.0 | | | | 1 | E |
| | | Inspect | | 1.0 | | | | 1 | E |
| | | Service | | | 3.0 | | | 7, 21 | E |
| | | Repair | | 2.0 | 4.0 | | | 1, 7, 14, 15, 21 | |
| | | Replace | | | 8.0 | | | 7, 14, 15, 21 | |
| | | Rebuild | | | | 8.0 | | 7, 14, 15, 21 | |
| 020402 | INCINOLET | | | | | | | AE | |
| 020403 | ELECTRICAL SYSTEM | Inspect | 2.0 | | | | | | E |
| | | Repair | | 12.0 | 3.0 | | | 1, 7, 14, 15 | |
| | | Replace | | | 12.0 | | | 7, 14, 15 | |
| 020404 | COMMUNICATIONS EQUIPMENT | | | | | | | | |
| 02040401 | VHF\FM HANDHELD TRANSCEIVER | Replace | 1.0 | | | | | | |
| | | Repair | | | | | 8.0 | | |
| 0205 | LIGHT TOWER | | | | | | | | |
| 020501 | ELECTRICAL SYSTEM | Inspect | | | 0.5 | | | 10, 15 | E |
| | | Test | | | 1.0 | | | 10, 15 | E |
| 02050101 | BATTERIES | Repair | | | 6.0 | | | 10, 15 | |
| | | Test | | | 1.0 | | | 10, 13 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Replace | | 2.0 | | | 1 | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|-------------------------------|--------------------------------|--------------------------|-----|-----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 02050102 | OIL PRESSURE UNIT | Test | | | 1.0 | | | 10 | E |
| | | Repair | | | 1.0 | | | 10 | |
| | | Replace | | | 1.5 | | | 10 | |
| 02050103 | STARTING CIRCUIT | Repair | | | 2.0 | | | 10, 15 | |
| | | Replace | | | 3.0 | | | 10, 15 | |
| 02050104 | ENGINE TEMPERATURE UNIT | Test | | | 1.0 | | | 10, 18 | E |
| | | Replace | | | 2.5 | | | 10, 18 | |
| | | Repair | | | 2.0 | | | 10, 18 | |
| 02050105 | HOURMETER UNIT | Repair | | | 1.5 | | | 10 | |
| | | Replace | | | 2.0 | | | 10 | |
| 02050106 | SHUTDOWN CIRCUIT | Repair | | | 2.0 | | | 10 | |
| | | Replace | | | 4.0 | | | 10 | |
| 02050107 | LAMP SYSTEM | Test | 1.0 | | | | | | E |
| | | Repair | | | 2.0 | | | 10, 15 | |
| | | Replace | | | 6.0 | | | 10, 15 | |
| 02050108 | LAMP BALLAST SYSTEM | Test | | | 0.5 | | | 10, 15 | E |
| | | Repair | | | 2.0 | | | 10, 15 | |
| | | Replace | | | 3.0 | | | 10, 15 | |
| 020502 | GENERATOR | Clean | | 2.0 | | | | 1 | E |
| | | Inspect | | | | | 12.0 | | |
| | | Repair | | | | | 18.0 | | |
| | | Replace | | | | | 24.0 | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|---------------------------|--------------------------------|--------------------------|-----|------|------|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 02050202 | CONTROL PANEL | Inspect | 1.0 | | | | | | E |
| | | Repair | | | 3.0 | | | 10, 15 | |
| | | Replace | | | 4.5 | | | 10, 15 | |
| 02050205 | DIESEL ENGINE | Service | 4.0 | 2.0 | | | | 1 | E |
| | | Adjust | | 3.0 | | | | 1 | |
| | | Overhaul | | | | | 16.0 | | |
| | | Repair | | | | 16.0 | | 10 | |
| | | Replace | | | 16.0 | | | 10 | |
| | | | | | | | | | |
| 0205020501 | ENGINE FUEL SYSTEM | Inspect | 1.0 | | | | | | E |
| | | Repair | | 4.0 | | | | 1 | |
| | | Replace | | | 8.0 | | | 10 | |
| 020502050101 | FUEL PUMP | Inspect | 1.0 | | | | | | E |
| | | Repair | | | | 4.0 | | 10 | |
| | | Replace | | | 5.0 | | | 10 | |
| 020502050102 | FUEL TANK | Clean | 2.0 | | | | | | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Repair | | 2.0 | | | | 1 | |
| | | Replace | | 2.0 | | | | 1 | |
| | | | | | | | | | |
| 0205020502 | ENGINE AIR SYSTEM | Inspect | 1.0 | | | | | | E |
| | | Repair | | 2.0 | | | | 1 | |
| | | Replace | | 4.0 | | | | 1 | |
| 0205020503 | ENGINE COOLING SYSTEM | Inspect | 1.0 | | | | | | E |
| | | Repair | | 3.0 | | | | 1 | |
| | | Replace | | 2.0 | | 5.0 | | 1, 10 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|-----|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 020502050301 | FAN ASSEMBLY | Inspect | 0.5 | | | | | | E |
| | | Repair | | 1.5 | | | | 1 | |
| | | Replace | | 2.0 | | | | 1 | |
| 020502050302 | COOLING WATER PUMP | Inspect | | | 1.0 | | | 10 | E |
| | | Repair | | | | 4.0 | | 10 | |
| | | Replace | | | 5.0 | | | 10 | |
| 020502050303 | RADIATOR | Clean | 1.0 | | | | | | E |
| | | Inspect | | 1.0 | | | | 1 | E |
| | | Service | 2.0 | 4.0 | | | | 1 | E |
| | | Repair | | | | 4.0 | | 10 | |
| | | Replace | | 2.0 | 3.0 | | | 1, 10 | |
| 0205020504 | CYLINDER HEAD | Inspect | | 1.0 | | | | 1 | E |
| | | Adjust | | | | | 2.0 | | |
| | | Repair | | | | | 8.0 | | |
| | | Replace | | | | | 5.0 | | |
| 0205020505 | VIBRATION DAMPER | Repair | | | | | 4.0 | | |
| | | Replace | | | | | 4.0 | | |
| 0205020506 | EXHAUST SYSTEM | Clean | 1.5 | | | | | | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Repair | | 3.0 | | | | 1, 16 | |
| | | Replace | | 5.0 | | | | 1 | |
| 0205020507 | CRANKSHAFT | Inspect | | | | | 4.0 | | |
| | | Repair | | | | | 8.0 | | |
| | | Replace | | | | | 8.0 | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|---------------------------|--------------------------------|--------------------------|------|-----|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 0205020508 | PISTON | Inspect | | | | | 4.0 | | |
| | | Repair | | | | | 4.0 | | |
| | | Replace | | | | | 4.0 | | |
| 02050206 | RUNNING GEAR | Service | | 2.0 | | | | 1 | E |
| | | Repair | | 2.0 | | 2.0 | | 1, 10 | |
| | | Replace | | 18.0 | | | | 1 | |
| 0205020601 | TIRES | Inspect | 0.5 | | | | | | E |
| | | Repair | | | | 1.0 | | 10 | |
| | | Replace | | | | 1.0 | | 10 | |
| 02050207 | SUPPORT TOWER | Inspect | 0.5 | | | | | | E |
| | | Service | 1.0 | | | | | | E |
| | | Repair | | | 2.0 | | | 10 | |
| | | Replace | | | 6.0 | | | 10 | |
| 02050208 | TOWER RAISING ASSEMBLY | Inspect | 0.5 | | | | | | E |
| | | Repair | | | 1.0 | | | 10 | |
| | | Replace | | | 3.0 | | | 10 | |
| 02050209 | ENCLOSURE | Inspect | 0.5 | | | | | | E |
| | | Repair | | | 2.0 | | | 10 | |
| | | Replace | | | 6.0 | | | 10 | |
| 0206 | EASY ANCHOR | Inspect | 2.0 | | | | | | E |
| | | Service | | 1.0 | | | | 1 | E |
| | | Repair | | | 4.0 | | | 6, 7 | |
| | | Replace | | | 6.0 | | | 6, 7 | |
| 0207 | RHIB (ZODIAC) | | | | | | | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|-----|------|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 020701 | STEERING & THROTTLE | Inspect | 1.0 | | | | | | E |
| | | Service | 1.0 | | | | | | E |
| | | Repair | | | 4.0 | | | 10 | |
| | | Replace | | | 8.0 | | | 10 | |
| 020702 | CONTROL PANEL | Inspect | | | 2.0 | | | 10, 15 | E |
| | | Repair | | | 4.0 | | | 10, 15 | |
| | | Replace | | | 6.0 | | | 10, 15 | |
| 020703 | BOAT HULL | Inspect | 1.0 | | | | | | E |
| | | Repair | | 2.0 | | 20.0 | | 1, 219-230 | |
| | | Replace | | | | 18.0 | | 1, 219-230 | |
| 020704 | NAVIGATION SYSTEM | Repair | | | 3.0 | | 12.0 | 7 | |
| | | Replace | | 2.0 | | | | 1 | |
| 020705 | OUTBOARD ENGINE | Test | | 4.0 | | | | | E |
| | | Repair | | | | | 12.0 | | |
| | | Rebuild | | | | | 12.0 | | |
| | | Replace | | 4.0 | | | | | |
| 02070501 | ENGINE COVER | Inspect | 1.0 | | | | | | E |
| | | Repair | | | 2.0 | | | 10 | |
| | | Replace | | | 2.0 | | | 10 | |
| 02070502 | LOWER ENGINE COVER | Inspect | 1.0 | | | | | | E |
| | | Repair | | | 2.0 | | | 10 | |
| | | Replace | | | 2.0 | | | 10 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|-------------------------------|--------------------------------|--------------------------|-----|-----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 02070503 | ELECTRICAL STARTER | Repair | | | 2.0 | | | 10, 15 | |
| | | Replace | | | 3.0 | | | 10, 15 | |
| 02070504 | POWER TRIM/TILT ELECTRICAL | Adjust | | 1.0 | | | | 1 | |
| | | Repair | | | 2.0 | | | 10, 15 | |
| | | Replace | | | 2.5 | | | 10, 15 | |
| 02070505 | IGNITION | Repair | | | | | 8.0 | | |
| | | Replace | | | | | 8.0 | 2, 17 | |
| 02070506 | INTAKE MANIFOLD | Inspect | | | 1.0 | | | 10 | E |
| | | Repair | | | 3.0 | | | 10 | |
| | | Replace | | | 3.0 | | | 10 | |
| 02070507 | CARBURETOR | Adjust | | 1.0 | | | | 1 | |
| | | Repair | | | 3.0 | | | 10 | |
| | | Replace | | | 3.0 | | | 10 | |
| 02070508 | ELECTRIC PRIMER SYSTEM | Repair | | | 3.0 | | | 10, 15 | |
| | | Replace | | | 2.0 | | | 10, 15 | |
| 02070509 | FUEL TANK | Inspect | 1.0 | | | | | | E |
| | | Repair | | | 3.0 | | | 10 | |
| | | Replace | 2.0 | | | | | | |
| 02070510 | FUEL HOSE & PRIMER BULB | Repair | | 1.0 | | | | 1 | |
| | | Replace | 1.0 | | | | | | |
| 02070511 | FUEL PUMP | Repair | | | 2.0 | | | 10 | |
| | | Replace | | | 2.0 | | | 10 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|---|-----|----|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 02070512 | CRANKSHAFT & PISTON | Inspect | | | | | 6.0 | | |
| | | Repair | | | | | 8.0 | | |
| | | Replace | | | | | 8.0 | | |
| 02070513 | CYLINDER & CRANKCASE | Inspect | | | | | 6.0 | | |
| | | Rebuild | | | | | 16.0 | | |
| | | Replace | | | | | 8.0 | | |
| 02070514 | EXHAUST HOUSING | Inspect | 1.0 | | | | | | E |
| | | Repair | | | 3.0 | | | 10 | |
| | | Replace | | | 3.0 | | | 10 | |
| 02070515 | POWER TRIM/TILT HYDRAULIC | Repair | | | | | 4.0 | | |
| | | Replace | | | | | 3.0 | | |
| 02070516 | POWER TRIM/TILT MIDSECTION | Inspect | | | | | 2.0 | | |
| | | Repair | | | | | 4.0 | | |
| | | Replace | | | | | 4.0 | | |
| 02070517 | GEARCASE | Inspect | | | 3.0 | | | 10 | E |
| | | Repair | | | | | 8.0 | | |
| | | Replace | | | | | 8.0 | | |
| 0207051701 | BEARING HOUSING ASSEMBLY | Inspect | | | | | 2.0 | | |
| | | Repair | | | | | 3.0 | | |
| | | Replace | | | | | 3.0 | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE | |
|------------------|-----------------------------|--------------------------------|--------------------------|-----|-----|----|---|------------------------|-------|
| | | | UNIT | | DS | GS | | | DEPOT |
| | | | C | O | F | H | | | D |
| 0207051702 | PROPELLER SHAFT ASSEMBLY | Inspect | | | | | 2.0 | | |
| | | Repair | | | | | 4.0 | | |
| | | Replace | | | | | 3.0 | | |
| 0207051703 | IMPELLER ASSEMBLY | Inspect | | | | | 4.0 | | |
| | | Repair | | | | | 4.0 | | |
| | | Replace | | | | | 4.0 | | |
| 0207051704 | WATER PUMP ASSEMBLY | Inspect | | | | | 4.0 | | |
| | | Repair | | | | | 4.0 | | |
| | | Rebuild | | | | | 8.0 | | |
| | | Replace | | | | | 4.0 | | |
| 02070518 | STEERING LINK KIT | Inspect | 1.0 | | | | | E | |
| | | Repair | | 1.0 | | | 1 | | |
| | | Replace | | 2.0 | | | 1 | | |
| 02070519 | BATTERY | Test | | | 2.0 | | 10, 13 | | |
| | | Service | | | 2.0 | | 10 | | |
| | | Replace | | | 2.0 | | 10 | | |
| 0207051901 | BATTERY CABLE | Clean | 0.5 | | | | | | |
| | | Inspect | 0.5 | | | | | E | |
| | | Repair | | 1.0 | | | 1 | | |
| | | Replace | | 1.0 | | | 1 | | |
| 020706 | FIRE EXTINGUISHER | Inspect | 0.5 | | | | | E | |
| | | Replace | 2.0 | | | | | E | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|---------------------------|--------------------------------|--------------------------|---|-----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 0208 | CONTAINERS | Inspect | 2.0 | | | | | | E |
| | | Clean | 1.0 | | | | | | E |
| | | Repair | | | 4.0 | | | 7 | |
| | | Replace | | | | | 8.0 | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|---|----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| | | | | | | | | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|--|------------------------------------|--------------------------|-----|-----|------|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 00 | MODULAR CAUSEWAY SYSTEM (MCS) | | | | | | | | |
| 01 | CAUSEWAY FERRY (CF) | | | | | | | | |
| 02 | ROLL-ON/ROLL- OFF DISCHARGE FACILITY (RRDF) | | | | | | | | |
| 03 | MODULAR WARPING TUG (WT) | | | | | | | | |
| 0301 | POWERED SECTION | | | | | | | | |
| 030101 | POWERED MODULE | | | | | | | | |
| 03010101 | DRIVE TRAIN | | | | | | | | |
| 0301010101 | DIESEL ENGINE | | | | | | | | Z |
| 0301010102 | MARINE GEAR | | | | | | | | AA |
| 0301010103 | TRANSFER CASE | | | | | | | | AB |
| 0301010104 | PUMP-JET ASSEMBLY | Inspect | 0.5 | | | | | | E |
| | | Service | | 3.0 | | | | 1 | E |
| | | Repair | | | | 10.0 | | | D |
| | | Replace | | | | 50.0 | | | |
| 030101010401 | HYDRAULIC SYSTEM | Inspect | 1.0 | | | | | 1 | E |
| | | Service | 1.0 | 3.0 | | | | 1 | E |
| | | Repair | | | 3.0 | | | 2, 4, 7 | |
| | | Replace | | | 6.0 | | | 2, 4, 7 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|----------------------------|--------------------------------|--------------------------|-----|-----|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 03010101040101 | HYDRAULIC PUMP | Test | 0.5 | | | | | | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Repair | | | | 4.0 | | 2, 4, 7 | |
| | | Replace | | 6.0 | | | | 1, 2, 4 | |
| 03010101040102 | HYDRAULIC HAND PUMP | Inspect | 1.0 | | | | | | E |
| | | Repair | | | | | 20.0 | | |
| | | Replace | | 2.0 | | | | 1, 2, 4 | |
| 03010101040103 | HYDRAULIC WAY-VALVE | Repair | | | | 2.0 | | 2, 4, 7 | |
| | | Replace | | 1.5 | | | | 1, 2, 4 | |
| 030101010402 | FEEDBACK UNIT | Inspect | 1.0 | | | | | | E |
| | | Repair | | | | 2.5 | | 2, 4, 7 | |
| | | Replace | | | 2.0 | | | 2, 4, 7 | |
| 0301010105 | ALTERNATOR | Test | | | 1.0 | | | 7, 14, 15 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Replace | | | 2.0 | | | 7, 14, 15 | |
| 03010102 | ENGINE EXHAUST SYSTEM | Clean | | 2.0 | | | | 1, 3, 9 | E |
| | | Inspect | | 2.0 | | | | 1, 3, 9 | E |
| | | Repair | | | 6.0 | | | 3, 7, 9 | |
| 03010103 | BILGE PUMP SYSTEM | Test | | 2.0 | | | | 1 | E |
| | | Inspect | 1.0 | | | | | | E |
| 03010104 | FIRE SUPPRESSION SYSTEM | Test | | | | | 3.0 | | E |
| | | Inspect | 2.0 | | | | 3.0 | | E |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------------|------------------------------------|--------------------------|-----|------|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 03010104 | FIRE SUPPRESSION SYSTEM (CONT'D) | Repair | | | | | 8.0 | | G |
| | | Replace | | | | | 24.0 | | G |
| 03010105 | FUEL SYSTEM | Test | 1.0 | | | | | | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Repair | | | 4.0 | | | 7 | |
| | | Replace | | | 12.0 | | | 7 | |
| 0301010501 | FUEL/WATER SEPARATOR | Clean | 1.0 | | | | | | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Repair | | 2.0 | | | | 1 | |
| | | Replace | | | 4.0 | | | 7 | |
| 03010106 | ELECTRICAL SYSTEM | Test | | | 1.0 | | | 7, 14, 15 | E |
| | | Adjust | | | 1.0 | | | 7, 14, 15 | |
| | | Repair | | | 2.0 | | | 7, 14, 15 | |
| | | Replace | | | 8.0 | | | 7, 14, 15 | |
| 03010107 | EMERGENCY STEERING SYSTEM | Inspect | 2.0 | | | | | | E |
| | | Service | 1.0 | | | | | | E |
| | | Replace | | 4.0 | | | | 1 | |
| 0301010701 | STEERING UNIT | Inspect | 0.5 | | | | | | E |
| | | Replace | | 2.0 | | | | 1 | |
| 0301010702 | STEERING ADAPTOR | Inspect | 0.5 | | | | | | E |
| | | Replace | | 1.5 | | | | 1 | |
| 03010108 | HULL | | | | | | | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE | |
|------------------|---------------------------|--------------------------------|--------------------------|-----|----|----|---|------------------------|-------|
| | | | UNIT | | DS | GS | | | DEPOT |
| | | | C | O | F | H | | | D |
| 0301010801 | EXTERIOR | Clean | | 4.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Service | 1.5 | | | | | | E |
| | | Repair | | 4.0 | | | | 1, 16 | |
| | | Overhaul | | | | | 24.0 | | |
| 0301010802 | INTERIOR | Clean | | | | | 4.0 | | |
| | | Inspect | | | | | 2.0 | | |
| | | Test | | | | | 5.0 | 1, 25, 26 | E |
| | | Repair | | | | | 6.0 | | |
| | | Overhaul | | | | | 50.0 | | |
| 03010109 | GUILLOTINE FITTINGS | Clean | | 1.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Repair | | 3.0 | | | | 1, 16 | |
| | | Replace | | 1.0 | | | | 1 | |
| 03010110 | HATCHES & HINGES | Clean | 1.0 | | | | | | E |
| | | Inspect | 0.5 | | | | | 1 | E |
| | | Service | 0.5 | | | | | | E |
| | | Repair | | 2.0 | | | | 1, 16 | |
| | | Replace | | 2.0 | | | | 1 | |
| 03010111 | FLEXORS | Inspect | 0.5 | | | | | | E |
| | | Replace | 4.0 | | | | | | |
| 030102 | NON-POWERED MODULE | | | | | | | | |
| 03010201 | HULL | | | | | | | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|------|----|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 0301020101 | EXTERIOR | Clean | | 4.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Service | 1.5 | | | | | | E |
| | | Repair | | 4.0 | | | | 1, 16 | |
| | | Overhaul | | | | | 24.0 | | |
| 0301020102 | INTERIOR | Clean | | | | | 4.0 | | |
| | | Inspect | | | | | 2.0 | | |
| | | Test | | 8.0 | | | 5.0 | 1, 25, 26 | E |
| | | Repair | | | | | 6.0 | | |
| | | Overhaul | | | | | 50.0 | | |
| 03010202 | GUILLOTINE FITTINGS | Clean | | 1.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Repair | | 3.0 | | | | 1, 16 | |
| | | Replace | 1.0 | | | | | 1 | |
| 030103 | OPERATORS CAB | | | | | | | | |
| 03010301 | MIDDLE CONTROL PANEL | Test | | | 2.0 | | | 7, 14, 15 | E |
| | | Inspect | | | 2.0 | | | 7, 14, 15 | E |
| | | Repair | | | 3.0 | | | 7, 14, 15 | |
| | | Replace | | | 16.0 | | | 7, 14, 15 | |
| 03010302 | LOWER CONTROL PANEL | Test | | | 2.0 | | | 7, 14, 15 | E |
| | | Inspect | | | 2.0 | | | 7, 14, 15 | E |
| | | Repair | | | 3.0 | | | 7, 14, 15 | |
| | | Replace | | | 16.0 | | | 7, 14, 15 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|-----------------------------------|--------------------------------|--------------------------|-----|------|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 03010303 | CIRCUIT BREAKER PANEL | Test | | | 1.0 | | | 7, 14, 15 | E |
| | | Inspect | | | 1.0 | | | 7, 14, 15 | E |
| | | Repair | | | 2.0 | | | 7, 14, 15 | |
| | | Replace | | | 12.0 | | | 7, 14, 15 | |
| 03010304 | TERMINAL BOARD A-4 | Test | | | 1.0 | | | 7, 14, 15 | E |
| | | Inspect | | | 1.0 | | | 7, 14, 15 | E |
| | | Repair | | | 2.0 | | | 7, 14, 15 | |
| | | Replace | | | 10.0 | | | 7, 14, 15 | |
| 03010305 | SPOTLIGHT | Adjust | | 1.0 | | | | 1 | |
| | | Replace | | 1.0 | | | | 1 | |
| 03010306 | DEFROSTER | Inspect | 1.0 | | | | | | E |
| | | Replace | | | 4.0 | | | 7, 14, 15 | |
| 03010307 | HEATER | Inspect | | 2.0 | | | | 1 | E |
| | | Repair | | | 4.0 | | | 7, 14, 15 | |
| | | Replace | | | 6.0 | | | 7, 14, 15 | |
| 03010308 | WINDSHIELD WIPER | Repair | | 1.0 | | | | 1 | |
| | | Replace | | 2.0 | | | | 1 | |
| 03010309 | COMMUNICATIONS EQUIPMENT | | | | | | | | |
| 0301030901 | VHF/FM HANDHELD TRANSCEIVER | Repair | | | | | 8.0 | | |
| | | Replace | | 1.0 | | | | 1 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|---------------------------------------|------------------------------------|--------------------------|-----|------|-----|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 0301030902 | AN/PSN-11 INTERFACE & SWITCHBOX | Repair | | | | | 6.0 | | |
| | | Replace | | | 1.0 | | | 7, 14, 15 | |
| 0301030903 | LOUDHAILER | Test | 0.5 | | | | | | E |
| | | Repair | | | | | 8.0 | | |
| | | Replace | 0.5 | | | | | | |
| 0301030904 | SINGARS RADIO | | | | | | | | H |
| 0301030905 | VHF/FM DSC TRANSCEIVER | Repair | | | | | 12.0 | | |
| | | Replace | | 1.0 | | | | 1 | |
| 03010310 | NAVIGATION EQUIPMENT | Test | 0.5 | | | | | | E |
| | | Inspect | 1.0 | | | | | | E |
| 0301031001 | COMPASS | Inspect | 2.0 | | | | | | E |
| | | Replace | | 2.0 | | | | 1 | |
| | | Calibrate | | 4.0 | | | | 1 | |
| 0301031002 | PLGR | | | | | | | | I |
| 03010311 | MAST | Inspect | 3.0 | | | | | | E |
| | | Repair | | 3.0 | | | | 1 | |
| 0301031101 | NAVIGATION LIGHTS | Repair | | 1.0 | | | | 1 | |
| | | Replace | | 1.0 | | | | 1 | |
| 03010312 | OPERATORS CAB ELECTRICAL SYSTEM | Test | | | 4.0 | | | 7, 14, 15 | E |
| | | Inspect | | | 4.0 | | | 7, 14, 15 | E |
| | | Repair | | | | 6.0 | | 7, 14, 15 | |
| | | Replace | | | 10.0 | | | 7, 14, 15 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|-----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 030104 | ANCHOR ASSEMBLY | Inspect | 1.0 | | | | | | E |
| | | Repair | | 1.0 | | | | 1 | |
| | | Replace | | 1.0 | | | | 1 | |
| 0302 | CONTAINERS | Clean | 1.0 | | | | | | E |
| | | Inspect | 2.0 | | | | | | E |
| | | Repair | | | 4.0 | | | 7 | |
| | | Replace | | | | | 8.0 | | |
| 0303 | WINCH | | | | | | | | AC |
| 030301 | WINCH DIESEL ENGINE | | | | | | | | AD |
| 030302 | WINCH ASSEMBLY | Clean | | | 8.0 | | | 7 | E |
| | | Test | | | 4.0 | | | 7 | E |
| | | Inspect | | | 4.0 | | | 7 | E |
| | | Service | 4.0 | | | | | | |
| | | Repair | | | 4.0 | | | 7 | |
| | | Replace | 3.0 | | | | | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|--|------------------------------------|--------------------------|-----|-------|-------|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 00 | MODULAR CAUSEWAY SYSTEM (MCS) | | | | | | | | |
| 01 | CAUSEWAY FERRY (CF) | | | | | | | | |
| 02 | ROLL-ON/ROLL- OFF DISCHARGE FACILITY (RRDF) | | | | | | | | |
| 03 | MODULAR WARPING TUG (WT) | | | | | | | | |
| 0301010101 | DIESEL ENGINE | Inspect | 4.0 | | | | | | E |
| | | Service | 4.0 | 4.0 | | | | | E |
| | | Repair | | | | 30.0 | | 7, 27-218 | |
| | | Replace | | | 120.0 | | | 7, 27-218 | |
| | | Overhaul | | | | | 80.0 | | |
| 030101010101 | ENGINE BLOCK ASSEMBLY | Inspect | 2.0 | | | | | | E, J |
| | | Repair | | | | 6.0 | | 7, 27-52 | J |
| | | Replace | | | | 120.0 | | 7, 27-52 | J |
| 030101010102 | CYLINDER HEAD ASSEMBLY | Clean | | | | 5.0 | | 7, 53-85 | K |
| | | Inspect | | | 6.0 | | | 7, 53-85 | K |
| | | Repair | | | | 12.0 | | 7, 53-85 | K |
| | | Replace | | | 8.0 | | | 7, 53-85 | K |
| 030101010103 | CRANKSHAFT ASSEMBLY | Repair | | | 16.0 | | | 7, 86-106 | L |
| | | Replace | | | 24.0 | | | 7, 86-106 | L |
| 030101010104 | CAMSHAFT ASSEMBLY | Repair | | | | 12.0 | | 7, 131-141 | |
| | | Replace | | | | 16.0 | | 7, 131-141 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|---------------------------|--------------------------------|--------------------------|-----|-----|-----|------------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 030101010105 | FLYWHEEL ASSEMBLY | Inspect | | | 3.0 | | | 7, 107-112 | M |
| | | Repair | | | | 3.0 | | 7, 107-112 | M |
| | | Replace | | | 5.0 | | | 7, 107-112 | M |
| 030101010106 | PISTON ASSEMBLY | Clean | | | | 2.0 | | 7, 113-130 | N |
| | | Inspect | | | | 2.0 | | 7, 113-130 | N |
| | | Rebuild | | | | 4.5 | | 7, 113-130 | N |
| | | Replace | | | | 3.0 | | 7, 113-130 | N |
| 030101010107 | ENGINE BALANCE | Inspect | | | | 6.0 | | 7, 131-141 | O |
| | | Adjust | | | | 3.0 | | 7, 131-141 | O |
| | | Repair | | | | 8.0 | | 7, 131-141 | O |
| | | Replace | | | | 8.0 | | 7, 131-141 | O |
| 030101010108 | FUEL SYSTEM | Inspect | 0.5 | | | | | | E, P |
| 03010101010801 | FUEL PUMP | Inspect | | | 1.0 | | | 7, 142-187 | E |
| | | Repair | | | 4.0 | | | 7, 142-187 | |
| | | Replace | | | 2.0 | | | 7, 142-187 | |
| 03010101010802 | PRIMING PUMP | Inspect | | 1.5 | | | | 1, 142-187 | E |
| | | Replace | | 2.0 | | | | 1, 142-187 | |
| 030101010109 | ELECTRIC GOVERNOR | Test | | 0.5 | | | | | E |
| | | Adjust | | | 1.0 | | | 7, 142-187 | |
| | | Repair | | | | | 5.0 | | |
| 030101010110 | AIR INTAKE SYSTEM | Replace | | 2.0 | | | | 1, 142-187 | |
| | | Clean | | 2.0 | | | | 1, 188-195 | E, Q |
| | | Inspect | 0.5 | | | | | | E, Q |
| | | Replace | | 3.0 | | | 1, 188-195 | Q | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|-----|------|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 03010101011001 | BLOWER | Inspect | | | 2.0 | 2.0 | | 7, 188-195 | E |
| | | Adjust | | | | 4.0 | | 7, 188-195 | |
| | | Repair | | | | 18.0 | | 7, 188-195 | |
| | | Replace | | | 8.0 | | | 7, 188-195 | |
| 03010101011002 | TURBOCHARGER | Inspect | | | 2.0 | | | 1, 188-195 | E, R |
| | | Repair | | | | | 18.0 | | |
| | | Replace | | | 6.0 | | | 7, 188-195 | |
| 030101010111 | LUBE OIL SYSTEM | Service | 5.0 | 5.0 | | | | | E, S |
| | | Inspect | 1.0 | | | | | | E, S |
| 03010101011101 | LUBE OIL PUMP | Inspect | | | | 3.0 | | 7, 196-203 | E |
| | | Repair | | | | 4.0 | | 7, 196-203 | |
| | | Replace | | | | 4.0 | | 7, 196-203 | |
| 03010101011102 | LUBE OIL COOLER | Clean | | | 2.0 | | | 7 | E |
| | | Test | | | 1.5 | | | 7, 25, 26 | E |
| | | Inspect | | | 2.0 | | | 7 | E |
| | | Repair | | | 4.0 | | | 7 | |
| | | Replace | | | 2.0 | | | 7 | |
| 030101010112 | FRESH WATER COOLING SYSTEM | Inspect | 1.0 | | | | | | E, T |
| | | Clean | | 1.0 | | | | 1 | |
| 03010101011201 | FRESH WATER PUMP | Inspect | | | 2.5 | | | 7, 212-215 | E |
| | | Repair | | | 6.0 | | | 7, 212-215 | |
| | | Replace | | | 3.0 | | | 7, 212-215 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|-----------------------------|--------------------------------|--------------------------|-----|------|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 03010101011202 | FRESH WATER COOLER | Clean | | | 2.0 | | | 7 | E |
| | | Test | | | 2.0 | | | 7, 25, 26 | E |
| | | Inspect | | | 1.0 | | | 7 | E |
| | | Repair | | | 4.0 | | | 7 | |
| | | Replace | | | 3.0 | | | 7 | |
| 030101010113 | RAW WATER COOLING SYSTEM | Clean | 1.0 | | | | | | E, U |
| | | Inspect | | 2.0 | | | | 1 | E, U |
| 03010101011301 | RAW WATER PUMP | Inspect | | 2.0 | | | | 1 | E |
| | | Repair | | | 4.0 | | | 7, 212-215 | |
| | | Replace | | 2.5 | | | | 1, 211-215 | |
| 030101010114 | ELECTRICAL SYSTEM | Test | | | 4.0 | | | 7, 14, 15 | E, V |
| | | Inspect | | | 2.0 | | | 7, 14, 15 | E, V |
| | | Repair | | | 3.0 | | | 7, 14, 15 | V |
| | | Replace | | 4.0 | 16.0 | | | 1, 7, 14, 15 | V |
| 03010101011401 | STARTER | Inspect | 1.0 | | | | | | E |
| | | Repair | | | | 6.0 | | 7, 14, 15 | |
| | | Replace | | 3.0 | | | | 1, 14, 15 | |
| 03010101011402 | COLD PACK STARTER | Clean | | 1.0 | | | | 1 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Adjust | | 1.0 | | | | 1, 14, 15 | |
| | | Repair | | 2.5 | | | | 1, 14, 15 | |
| | | Replace | | 3.0 | | | | 1, 14, 15 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|-----|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 030101010115 | OVER SPEED GOVERNOR | Test | | | | 1.0 | | 7 | E |
| | | Adjust | | | | 1.5 | | 7, 184-187 | |
| | | Repair | | | | 5.0 | | 7, 184-187 | |
| | | Replace | | | | 4.0 | | 7, 184-187 | |
| 030101010116 | AUTO SHUTDOWN SYSTEM | Test | | 1.0 | | | | | E |
| | | Adjust | | | 2.0 | | | 7, 14, 15 | |
| | | Repair | | | | 6.0 | | 7, 14, 15 | |
| | | Replace | | 4.0 | | | 8.0 | 1 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|---|----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| | | | | | | | | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|--|--------------------------------|--------------------------|-----|------|------|-----------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 00 | MODULAR CAUSEWAY SYSTEM (MCS) | | | | | | | | |
| 01 | CAUSEWAY FERRY (CF) | | | | | | | | |
| 02 | ROLL-ON/ROLL- OFF DISCHARGE FACILITY (RRDF) | | | | | | | | |
| 03 | MODULAR WARPING TUG (WT) | | | | | | | | |
| 0301010102 | MARINE GEAR | Inspect | 1.0 | | | | | E | |
| | | Align | | | 2.0 | | 7, 17 | | |
| | | Service | 1.0 | 4.0 | | | 1 | E | |
| | | Replace | | | 28.0 | | 4, 7, 17 | | |
| | | Rebuild | | | | 25.0 | | W | |
| 030101010201 | OIL SYSTEM | Inspect | 0.5 | | | | | E, X | |
| | | Repair | | 0.5 | | | 1, 11 | X | |
| 03010101020101 | OIL COOLER | Clean | 1.0 | | | | | E | |
| | | Inspect | 1.0 | | | | | E | |
| | | Replace | | 4.0 | | | 1 | | |
| 03010101020102 | LINES & HOSES | Inspect | 0.2 | | | | | E | |
| | | Repair | | 0.5 | | | 1 | | |
| | | Replace | | 2.0 | | | 1 | | |
| 03010101020103 | OIL PUMP | Inspect | 1.0 | | | | | E | |
| | | Replace | | | 2.0 | | 1, 3 | | |
| 03010101020104 | ELECTRIC CONTROL VALVE | Repair | | | | 8.0 | | | |
| | | Replace | | | 6.0 | | 7, 14, 15 | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|--|--------------------------------|--------------------------|---|-----|----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 030101010202 | GEAR MOUNTS | Inspect | 0.5 | | | | | | E |
| | | Replace | | | 2.0 | | | 3, 7 | |
| 030101010203 | COUPLING BLOCKS | Clean | | | 1.0 | | | 7 | E |
| | | Inspect | | | 1.0 | | | 7 | E |
| | | Replace | | | 4.0 | | | 3, 7 | |
| 030101010204 | OUTPUT FLANGE | Inspect | 0.5 | | | | | | E |
| | | Align | | | 2.0 | | | 3, 7, 17 | |
| | | Replace | | | 4.0 | | | 3, 7, 17 | |
| 030101010205 | OUTPUT SEAL | Inspect | | | 2.0 | | | 7 | E |
| | | Replace | | | 2.0 | | | 3, 7 | |
| 030101010206 | INPUT FLANGE (ENGINE CONNECTION) | Inspect | 0.5 | | | | | | E |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|--|--------------------------------|--------------------------|-----|------|------|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 00 | MODULAR CAUSEWAY SYSTEM (MCS) | | | | | | | | |
| 01 | CAUSEWAY FERRY (CF) | | | | | | | | |
| 02 | ROLL-ON/ROLL- OFF DISCHARGE FACILITY (RRDF) | | | | | | | | |
| 03 | MODULAR WARPING TUG (WT) | | | | | | | | |
| 0301010103 | TRANSFER CASE | Clean | | 2.0 | | | | 1 | E |
| | | Service | 1.0 | 4.0 | | | | 1 | E |
| | | Overhaul | | | | 24.0 | | | |
| | | Rebuild | | | | | 24.0 | 2, 7, 17 | Y |
| | | Replace | | | 24.0 | | | 2, 7, 17 | |
| 030101010301 | OIL SYSTEM | Inspect | 1.0 | | | | | | E |
| | | Repair | | 2.5 | | | | 1 | |
| 03010101030101 | OIL PUMP | Inspect | 4.0 | | | | | | E |
| | | Replace | | 2.5 | | | | 1 | |
| 03010101030102 | HOSES & FITTINGS | Inspect | 0.2 | | | | | | E |
| | | Replace | | 2.0 | | | | 1 | |
| 03010101030103 | OIL COOLER | Inspect | 0.2 | | | | | | E |
| | | Replace | | 3.5 | | | | 1 | |
| 030101010302 | GEAR SHAFT | Inspect | | | | 5.0 | | 7 | E |
| | | Repair | | | | 8.0 | | 3, 7, 17 | |
| | | Replace | | | | 7.0 | | 3, 7, 17, 19 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|---------------------------|--------------------------------|--------------------------|---|-----|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 03010101030201 | UPPER SHAFT | Inspect | | | | 5.0 | | 7 | E |
| | | Repair | | | | 8.0 | | 3, 7, 17 | |
| | | Replace | | | | 7.0 | | 3, 7, 17, 19 | |
| 0301010103020101 | INPUT SEAL | Clean | | | 2.0 | | | 7 | E |
| | | Inspect | | | 2.0 | | | 7 | E |
| | | Replace | | | 2.0 | | | 3, 7, 17, 19 | |
| 0301010103020102 | OUTPUT SEAL | Clean | | | 2.0 | | | 7 | E |
| | | Inspect | | | 2.0 | | | 7 | E |
| | | Replace | | | 2.0 | | | 3, 7, 17, 19 | |
| 03010101030202 | INTERMEDIATE SHAFT | Inspect | | | | 2.5 | | 7 | E |
| | | Repair | | | | 5.5 | | 3, 7, 17 | |
| | | Replace | | | | 6.5 | | 3, 7, 17, 19 | |
| 03010101030203 | LOWER SHAFT | Inspect | | | | 4.0 | | 7 | E |
| | | Repair | | | | 8.0 | | 3, 7, 17 | |
| | | Replace | | | | 6.0 | | 3, 7, 17, 19 | |
| 0301010103020301 | INPUT SEAL | Clean | | | 2.0 | | | 7 | E |
| | | Inspect | | | 2.0 | | | 7 | E |
| | | Replace | | | 2.0 | | | 3, 7, 17, 19 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|--|------------------------------------|--------------------------|-----|----|----|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 00 | MODULAR CAUSEWAY SYSTEM (MCS) | | | | | | | | |
| 01 | CAUSEWAY FERRY (CF) | | | | | | | | |
| 02 | ROLL-ON/ROLL- OFF DISCHARGE FACILITY (RRDF) | | | | | | | | |
| 04 | FLOATING CAUSEWAY (FC) | | | | | | | | |
| 0401 | INTERMEDIATE SECTION | | | | | | | | |
| 040101 | NON-POWERED MODULE | | | | | | | | |
| 04010101 | HULL | | | | | | | | |
| 0401010101 | EXTERIOR | Clean | | 4.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Service | 1.5 | | | | | | E |
| | | Repair | | 4.0 | | | | 1, 16 | |
| | | Overhaul | | | | | 24.0 | | |
| 0401010102 | INTERIOR | Clean | | | | | 4.0 | | |
| | | Inspect | | | | | 2.0 | | |
| | | Test | | 6.0 | | | 5.0 | 1, 25, 26 | E |
| | | Repair | | | | | 6.0 | | |
| | | Overhaul | | | | | 50.0 | | |
| 04010102 | GUILLOTINE FITTINGS | Clean | | 1.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Repair | | 3.0 | | | | 1, 16 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE | |
|------------------|-------------------------------------|--------------------------------|--------------------------|-----|----|----|---|------------------------|-------|
| | | | UNIT | | DS | GS | | | DEPOT |
| | | | C | O | F | H | | | D |
| 04010102 | GUILLOTINE FITTINGS (CONT'D) | Replace | | 1.0 | | | | 1 | |
| 04010103 | FLEXORS | Inspect | 0.5 | | | | | | E |
| | | Replace | 4.0 | | | | | | |
| 0402 | COMBINATION BEACH-END SECTION | | | | | | | | |
| 040201 | NON-POWERED MODULES | | | | | | | | |
| 04020101 | HULL | | | | | | | | |
| 0402010101 | EXTERIOR | Clean | | 4.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Service | 1.5 | | | | | | E |
| | | Repair | | 4.0 | | | | 1, 16 | |
| | | Overhaul | | | | | 24.0 | | |
| 0402010102 | INTERIOR | Clean | | | | | 4.0 | | |
| | | Inspect | | | | | 2.0 | | |
| | | Test | | | | | 5.0 | 1, 25, 26 | E |
| | | Repair | | | | | 6.0 | | |
| | | Overhaul | | | | | 50.0 | | |
| 04020102 | GUILLOTINE FITTINGS | Clean | | 1.0 | | | | 8, 9, 23, 24 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Repair | | 3.0 | | | | 1, 16 | |
| | | Replace | | 1.0 | | | | 1 | |
| 04020103 | FLEXORS | Inspect | 0.5 | | | | | | E |
| | | Replace | 4.0 | | | | | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|--|------------------------------------|--------------------------|-----|-----|----|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 0403 | GENERATOR SHELTER | Repair | | 4.0 | | | | 1 | |
| 040301 | ARMY TACTICAL QUIET GENERATOR (ATQG) | | | | | | | | |
| 040302 | FUEL SYSTEM | Clean | | | | | 1.0 | | E |
| | | Inspect | | | | | 1.0 | 7 | |
| | | Repair | | | | | 5.0 | 1 | |
| 04030201 | MANUAL FUEL PUMP | Clean | | 1.0 | | | | 1 | E |
| | | Inspect | 1.0 | 1.0 | | | | 1 | E |
| | | Repair | | 2.0 | | | | 1 | |
| | | Replace | | 2.0 | | | | 1 | |
| 040303 | LOUVERS | Clean | | 1.0 | | | | 1 | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Service | | 1.0 | | | | | E |
| | | Repair | | 3.0 | | | | 1 | |
| | | Replace | | 4.0 | | | | 1 | |
| 040304 | ELECTRICAL SYSTEM | Test | | | 2.0 | | | 7, 14, 15 | E |
| | | Repair | | 2.0 | 3.0 | | | 1, 7, 14, 15 | |
| | | Replace | | | 5.0 | | | 7, 14, 15 | |
| 040305 | FIRE SUPPRESSION SYSTEM | Test | | | | | 4.0 | | E, G |
| | | Inspect | 1.0 | | | | | | E |
| | | Repair | | 2.0 | | | 4.0 | 1, 14, 15 | G |
| | | Replace | | | | | 40.0 | | G |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|-----------------------------------|--------------------------------|--------------------------|------|------|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 0404 | PERSONNEL SHELTER | | | | | | | | |
| 040401 | HEAT PUMP | Clean | | 4.0 | | | | 1 | E |
| | | Inspect | | 1.0 | | | | 1 | E |
| | | Service | | | 3.0 | | | 7, 21 | E |
| | | Repair | | | 4.0 | | | 1, 7, 14, 15, 21 | |
| | | Rebuild | | | | 8.0 | | 7, 14, 15, 21 | |
| | | Replace | | | 8.0 | | | 7, 14, 15, 21 | |
| 040402 | INCINOLET | | | | | | | | AE |
| 040403 | ELECTRICAL SYSTEM | Inspect | 2.0 | | | | | | E |
| | | Repair | | 12.0 | 3.0 | | | 1, 7, 14, 15 | |
| | | Replace | | | 12.0 | | | 7, 14, 15 | |
| 040404 | COMMUNICATIONS EQUIPMENT | | | | | | | | |
| 04040401 | VHF/FM HANDHELD TRANSCEIVER | Replace | 1.0 | | | | | 1 | |
| | | Repair | | | | | 8.0 | | |
| 0405 | LIGHT TOWER | | | | | | | | |
| 040501 | ELECTRICAL SYSTEM | Test | | | 1.0 | | | 10, 15 | E |
| | | Inspect | | | 0.5 | | | 10, 15 | E |
| | | Repair | | | 6.0 | | | 10, 15 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|-----|----|-------|---|----------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 04050101 | BATTERIES | Test | | | 1.0 | | | 10, 13 | E |
| | | Inspect | 0.5 | | | | | | E |
| | | Replace | | 2.0 | | | | 1 | |
| 04050102 | OIL PRESSURE UNIT | Test | | | 1.0 | | | 10 | E |
| | | Repair | | | 1.0 | | | 10 | |
| | | Replace | | | 1.5 | | | 10 | |
| 04050103 | STARTING CIRCUIT | Repair | | | 2.0 | | | 10, 15 | |
| | | Replace | | | 3.0 | | | 10, 15 | |
| 04050104 | ENGINE TEMPERATURE UNIT | Test | | | 1.0 | | | 10, 18 | E |
| | | Repair | | | 2.0 | | | 10, 18 | |
| | | Replace | | | 2.5 | | | 10, 18 | |
| 04050105 | HOUR METER UNIT | Repair | | | 1.5 | | | 10 | |
| | | Replace | | | 2.0 | | | 10 | |
| 04050106 | SHUTDOWN CIRCUIT | Repair | | | 2.0 | | | 10 | |
| | | Replace | | | 4.0 | | | 10 | |
| 04050107 | LAMP SYSTEM | Test | 1.0 | | | | | | E |
| | | Repair | | | 2.0 | | | 10, 15 | |
| | | Replace | | | 6.0 | | | 10, 15 | |
| 04050108 | LAMP BALLAST SYSTEM | Test | | | 0.5 | | | 10, 15 | E |
| | | Repair | | | 2.0 | | | 10, 15 | |
| | | Replace | | | 3.0 | | | 10, 15 | |
| 040502 | GENERATOR | Clean | | 2.0 | | | | 1 | E |
| | | Inspect | | | | | 12.0 | | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE | |
|------------------|---------------------------|--------------------------------|--------------------------|-----|------|------|-------|---|------------------------|---|
| | | | UNIT | | DS | GS | DEPOT | | | |
| | | | C | O | F | H | D | | | |
| 040502 | GENERATOR (CONT'D) | Repair | | | | | | 18.0 | | |
| | | Replace | | | | | | 24.0 | | |
| 04050202 | CONTROL PANEL | Test | 1.0 | | | | | | E | |
| | | Inspect | 1.0 | | | | | | E | |
| | | Repair | | | 3.0 | | | | 10, 15 | |
| | | Replace | | | 4.5 | | | | 10, 15 | |
| 04050205 | DIESEL ENGINE | Service | 4.0 | 2.0 | | | | | 1 | E |
| | | Adjust | | 3.0 | | | | | 1 | |
| | | Repair | | | | 16.0 | | | 10 | |
| | | Overhaul | | | | | | 16.0 | | |
| | | Replace | | | 16.0 | | | | 10 | |
| 0405020501 | ENGINE FUEL SYSTEM | Inspect | 1.0 | | | | | | | E |
| | | Repair | | 4.0 | | | | | 1 | |
| | | Replace | | | 8.0 | | | | 10 | |
| 040502050101 | FUEL PUMP | Inspect | 1.0 | | | | | | | E |
| | | Repair | | | | 4.0 | | | 10 | |
| | | Replace | | | 5.0 | | | | 10 | |
| 040502050102 | FUEL TANK | Clean | 2.0 | | | | | | | E |
| | | Inspect | 1.0 | | | | | | | E |
| | | Repair | | 2.0 | | | | | 1 | |
| | | Replace | | 2.0 | | | | | 1 | |
| 0405020502 | ENGINE AIR SYSTEM | Inspect | 1.0 | | | | | | | E |
| | | Repair | | 2.0 | | | | | 1 | |
| | | Replace | | 4.0 | | | | | 1 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|----------------------|-------------------------------|------------------------------------|--------------------------|-----|-----|-----|-------|---|------------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 0405020503 | ENGINE COOLING SYSTEM | Inspect | 1.0 | | | | | | E |
| | | Repair | | 3.0 | | | | 1 | |
| | | Replace | | 7.0 | | | | 1, 10 | |
| 040502050301 | FAN ASSEMBLY | Inspect | 0.5 | | | | | | E |
| | | Repair | | 1.5 | | | | 1 | |
| | | Replace | | 2.0 | | | | 1 | |
| 040502050302 | COOLING WATER PUMP | Inspect | | | | | | 10 | E |
| | | Repair | | | | 4.0 | | 10 | |
| | | Replace | | | 5.0 | | | 10 | |
| 040502050303 | RADIATOR | Clean | 1.0 | | | | | | E |
| | | Inspect | | 1.0 | | | | 1 | E |
| | | Service | 2.0 | 4.0 | | | | 1 | E |
| | | Repair | | | | 4.0 | | 10 | |
| | | Replace | | 2.0 | 3.0 | | | 1, 10 | |
| 0405020504 | CYLINDER HEAD | Inspect | | 1.0 | | | | 1 | E |
| | | Adjust | | | | | 2.0 | | |
| | | Repair | | | | | 8.0 | | |
| | | Replace | | | | | 5.0 | | |
| 0405020505 | VIBRATION DAMPER | Repair | | | | | 4.0 | | |
| | | Replace | | | | | 4.0 | | |
| 0405020506 | EXHAUST SYSTEM | Inspect | 0.5 | | | | | | E |
| | | Clean | 1.5 | | | | | | E |
| | | Repair | | | 3.0 | | | 1, 16 | |
| | | Replace | | | 5.0 | | | 1 | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE | |
|------------------|---------------------------|--------------------------------|--------------------------|------|-----|-----|-------|---|------------------------|--|
| | | | UNIT | | DS | GS | DEPOT | | | |
| | | | C | O | F | H | D | | | |
| 0405020507 | CRANKSHAFT | Inspect | | | | | 4.0 | | | |
| | | Repair | | | | | 8.0 | | | |
| | | Replace | | | | | 8.0 | | | |
| 0405020508 | PISTON | Inspect | | | | | 4.0 | | | |
| | | Repair | | | | | 4.0 | | | |
| | | Replace | | | | | 4.0 | | | |
| 04050206 | RUNNING GEAR | Service | | 2.0 | | | | 1 | E | |
| | | Repair | | 2.0 | | | | 1, 10 | | |
| | | Replace | | 18.0 | | | | 1 | | |
| 0405020601 | TIRES | Inspect | 0.5 | | | | | | E | |
| | | Repair | | | | 1.0 | | 10 | | |
| | | Replace | | | | 1.0 | | 10 | | |
| 04050207 | SUPPORT TOWER | Inspect | 0.5 | | | | | | E | |
| | | Service | 1.0 | | | | | | E | |
| | | Repair | | | 2.0 | | | | 10 | |
| | | Replace | | | 6.0 | | | | 10 | |
| 04050208 | TOWER RAISING ASSEMBLY | Inspect | 0.5 | | | | | | E | |
| | | Repair | | | 1.0 | | | | 10 | |
| | | Replace | | | 3.0 | | | | 10 | |
| 04050209 | ENCLOSURE | Inspect | 0.5 | | | | | | E | |
| | | Repair | | | 2.0 | | | | 10 | |
| | | Replace | | | 6.0 | | | | 10 | |
| 0406 | OFFSHORE ANCHOR | Clean | 1.0 | | | | | | E | |
| | | Inspect | 1.0 | | | | | | E | |

Table 1. MAC for Modular Causeway System. (MCS) (Continued)

| (1) GROUP NO. | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL | | | | | (5) TOOLS AND EQUIP REF CODE | (6) REMARKS CODE |
|------------------|---------------------------|-----------------------------|--------------------------|-----|-----|----|-------|---------------------------------|---------------------|
| | | | UNIT | | DS | GS | DEPOT | | |
| | | | C | O | F | H | D | | |
| 0406 | OFFSHORE ANCHOR (CONT'D) | Repair | | | 4.0 | | | 7 | |
| | | Replace | | 2.0 | | | | 1 | |
| 0407 | ONSHORE ANCHOR | Clean | 1.0 | | | | | | E |
| | | Inspect | 1.0 | | | | | | E |
| | | Repair | | | 4.0 | | | 7 | |
| | | Replace | | 2.0 | | | | 1 | |
| 0408 | CONTAINERS | Clean | 1.0 | | | | | | E |
| | | Inspect | 2.0 | | | | | | E |
| | | Repair | | | 4.0 | | | 7 | |
| | | Replace | | | | | 8.0 | | |

Table 2. Remarks for Modular Causeway System. (MCS)

| REMARKS CODE | REMARKS |
|--------------|---|
| A | See MAC Chart for Causeway Ferry Diesel Engine Group Number 0101010101. |
| B | See MAC Chart for Causeway Ferry Marine Gear Group Number 0101010102. |
| C | See MAC Chart for Causeway Ferry Marine Gear Group Number 0101010103. |
| D | All repairs to the pump-jet must be done at depot level due to lack of technical information provided by the manufacturer, Schottel of Germany. |
| E | Preventive Maintenance Checks and Services (PMCS). |
| F | Includes replacement of level sensors, pump and motor. |
| G | Most work needs to be done by an authorized manufacturer's technical representative. |
| H | Refer to Army Technical Manual TM 11-5820-890-10-8. |
| I | Refer to Army Technical Manual TM 11-5825-291-13. |
| J | Includes cylinder liner, crankcase, crankcase breather and engine mounts. |
| K | Includes valves, springs, rocker arm, push rods, etc. |
| L | Includes valves, main bearings, vibration damper and crankshaft pulley. |

Table 2. Remarks for Modular Causeway System. (MCS) (Continued)

| REMARKS CODE | REMARKS |
|-----------------|---|
| M | Includes drive shaft flex coupling. |
| N | Includes rings, connecting rod and connecting rod bearings. |
| O | Includes gear train, camshaft, idler gear, idler gear bearing, crankshaft timing gear, blower drive gear, and front and rear accessory drive gears. |
| P | Includes fuel water separator, fuel lines, fuel filter/strainer, fuel cooler, fuel manifold, fuel injector, fuel injector tube and valves. |
| Q | Includes air shutdown housing and air box check valves. |
| R | Includes intercooler and after cooler. |
| S | Includes lube oil pump driving gear, lube oil pressure regulator, lube oil relief valves, lube oil filter by-pass valve, lube oil cooler by-pass valve, lube oil pan and lube oil ventilation system. |
| T | Includes fresh water manifold and thermostat. |
| U | Includes raw water duplex strainer. |
| V | Includes starting batteries. |
| W | Rebuild of the marine gear is a depot level function. |
| X | Includes oil filter screen, pressure gage, temperature gage, selector valve, oil pump drive, output seal and gear mounts. |
| Y | Rebuild of the transfer case is a depot level function. |
| Z | See MAC Chart for Modular Warping Tug Diesel Engine Group Number 0301010101. |
| AA | See MAC Chart for Modular Warping Tug Marine Gear Group Number 0301010102. |
| AB | See MAC Chart for Modular Warping Tug Transfer Case Group Number 0301010103. |
| AC | Refer to Army Technical Manual TM 55-1925-257-14&P. |
| AD | Refer to Army Technical Manual TM 5-2815-258-24. |
| AE | Refer to Army Technical Manual TM 55-1925-257-14&P. |

Table 3. Tools and Test Equipment for Modular Causeway System. (MCS)

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE LEVEL | NOMENCLATURE | NATIONAL STOCK NUMBER | TOOL NUMBER |
|---------------------------------|-------------------|--|-----------------------|-------------|
| 1 | O | General Mechanics Rail and Marine Tool Kit | 5180-00-629-9783 | |
| 2 | O | Torque Wrench, 30-150 in. lbs 3/8 in. Drive | 5120-00-230-6380 | |
| 3 | O | Torque Wrench, 30-150 ft lbs 1/2 in. Drive | 5120-00-247-2540 | |
| 4 | D | Torque Wrench, 100-500 ft lbs | 5120-00-542-5577 | |
| 5 | D | Pinch Pry Bar 60 | 5120-00-224-1384 | |
| 6 | D | Hammer, Hand, (sledge hammer) 10 lb | 5120-00-251-4489 | |
| 7 | D | General Mechanics Tool Kit | 5180-00-177-7033 | |
| 8 | O | Hammer, Hand, Scaling | 5120-00-224-4111 | |
| 9 | O | Wire Brush | 7920-00-291-5815 | |
| 10 | D | Automotive Tool Kit | 5810-00-177-7033 | |
| 11 | O | Wrench, Strap | 5120-00-776-1840 | |
| 12 | D | Wrench, Monkey | 5120-00-277-3120 | |
| 13 | D | Electrolyte Solution Battery Tester | 6630-00-171-5126 | |
| 14 | O | Fuse Puller and Tester | 5120-00-319-3295 | |
| 15 | O | Multimeter | 6625-00-171-5126 | |
| 16 | O | Welder Tool Kit | 5180-00-754-0661 | |
| 17 | D | Dial Indicator | 5120-00-402-9619 | |
| 18 | D | Thermometer, Test | 6685-00-056-3109 | |
| 19 | G | Wheel Puller | | |
| 20 | D | Pliers, Snap Ring | | |
| 21 | D | Tool Kit, Compressor | 5180-01-188-5075 | |
| 22 | | Megger | 6625-01-015-1451 | |
| 23 | O | Power Washer | | |
| 24 | O | Scraper, Long Handle | | |

Table 3. Tools and Test Equipment for Modular Causeway System. (MCS) (Continued)

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE LEVEL | NOMENCLATURE | NATIONAL STOCK NUMBER | TOOL NUMBER |
|---------------------------------|-------------------|---|-----------------------|-------------|
| 25 | O | Air Tester | | |
| 26 | O | Air Compressor | | |
| 27 | D | Adaptor (1 5/8 in. Dia plugs) (Cylinder Block) | | J21850 |
| 28 | D | Aftercooler Adaptor Cup Plug Installer | | J28711 |
| 29 | D | Aftercooler Adaptor Plug Remover and Installer | | J25275 |
| 30 | D | Aftercooler Cup Plug Installer (2 1/2 in. Dia) | | J24597 |
| 31 | D | Alignment Tool | | J21799 |
| 32 | D | Block Assembly Wrench Set | | J25451-B |
| 33 | D | Block Thread Repair Kit | | J29513 |
| 34 | D | Cup Plug Installer (1 in. Dia) | | J33420 |
| 35 | D | Cylinder Block Air Box Plugging Tool | | J29571 |
| 36 | D | Cylinder Block Line Boring Tool | | J29005 |
| 37 | D | Cylinder Block Tap | | J25384 |
| 38 | D | Cylinder Diameter Checking Gage | | J5347-B |
| 39 | D | Cylinder Hone Set (2 1/2 in. to 5 3/4 in.) | | J5902-01 |
| 40 | D | Dial Bore Gage Master Setting Fixture | | J23059-01 |
| 41 | D | Dial Indicator Set | | J22273-01 |
| 42 | D | Diesel Engine Parts Dolly | | J6387 |
| 43 | D | Handle | | J7079-02 |
| 44 | D | Loctite "Chisel" Gasket Remover | | PT7275 |
| 45 | D | Master Ring Gage for Block Bore | | J24564 |

Table 3. Tools and Test Equipment for Modular Causeway System. (MCS) (Continued)

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE LEVEL | NOMENCLATURE | NATIONAL STOCK NUMBER | TOOL NUMBER |
|---------------------------------|-------------------|---|-----------------------|-------------|
| 46 | D | Overhaul Stand (6V and 8V engines) | | J29109 |
| 47 | D | Overhaul Stand (12V and 16V engines) | | J9384-04 |
| 48 | D | Overhaul Stand Adaptor (6V and 8V engines) | | J33850 |
| 49 | D | Overhaul Stand Adaptor (12V and 16V engines) | | J8650 |
| 50 | D | Pipe Plug Remover/Installer (1/8 in. Dia) | | J34650 |
| 51 | D | Special Plug Remover (dry cylinder block) | | J21995-01 |
| 52 | D | Special Plug Remover | | J23019 |
| 53 | D | Load Cell Kit, Cam Follower Roller Fixture (Cylinder Head) | | J33421-25 |
| 54 | D | Cam Follower Service Fixture | | J33421-A |
| 55 | D | Cylinder Head Bolt Hole Cleanout Tap | | J25384 |
| 56 | D | Cylinder Head Guide Studs (set of two) | | J24748 |
| 57 | D | Cylinder Head Holding Plate Set | | J3087-01 |
| 58 | D | Cylinder Head Lifting Fixture | | J22062-01 |
| 59 | D | Engine Barring Tool | | J22582 |
| 60 | D | Feeler Gage Set (.0015 in. to .015 in.) | | J3172 |
| 61 | D | Feeler Stock (.0015 in.) | | J23185 |
| 62 | D | Fuel Line Nut Wrench | | J8932B |
| 63 | D | Injector Fuel Hole Brush | | J8152 |
| 64 | D | Pressure Checking Tool | | J28454 |
| 65 | D | Push Rod Remover (set of three) | | J3092-01 |
| 66 | D | Slide Hammer | | J2619-01 |

Table 3. Tools and Test Equipment for Modular Causeway System. (MCS) (Continued)

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE LEVEL | NOMENCLATURE | NATIONAL STOCK NUMBER | TOOL NUMBER |
|---------------------------------|-------------------|---|-----------------------|-------------|
| 67 | D | Spring Tester | | J22738-02 |
| 68 | D | Valve Bridge Holding Fixture | | J21772 |
| 69 | D | Valve Bridge Gage Remover (broken) | | J7453 |
| 70 | D | Valve Bridge Guide Remover Set | | J7091-01 |
| 71 | D | Valve Bridge Guide Installer | | J7482 |
| 72 | D | Valve Guide Cleaner | | J5437 |
| 73 | D | Valve Guide Installer (machined) | | J21520 |
| 74 | D | Valve Guide Remover | | J6569-A |
| 75 | D | Valve Seat Dial Gage | | J8165-2 |
| 76 | D | Valve Guide Oil Seal Installer | | J35373 |
| 77 | D | Valve Seat Grinder (Model VIP) | | J7040-A |
| 78 | D | Valve Seat Grinder | | J8165-1A |
| 79 | D | Valve Seat Grinder Adaptor Set | | J24566 |
| 80 | D | Valve Seat Insert Installer | | J24357 |
| 81 | D | Valve Seat Insert Remover Assembly | | J23479-492 |
| 82 | D | Valve Seat Insert Remover Collet | | J23479-33 |
| 83 | D | Valve Spring Checking Gage | | J25076-B |
| 84 | D | Valve Spring Compressor | | J7455-A |
| 85 | D | Water Nozzle Installer (intermediate) | | J24857-A |
| 86 | D | Front Oil Seal Installer (6V and 8V) (Crankshaft) | | J9783 |
| 87 | D | Rear Oil Seal Installer (std and ovs seals) | | J21112-B |
| 88 | D | Handle | | J3154-A |
| 89 | D | Guide Studs (c/s with dowels) | | J9727-2 |
| 90 | D | Guide Studs (c/s without dowels) | | J9727-5 |

Table 3. Tools and Test Equipment for Modular Causeway System. (MCS) (Continued)

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE LEVEL | NOMENCLATURE | NATIONAL STOCK NUMBER | TOOL NUMBER |
|---------------------------------|-------------------|--|-----------------------|-------------|
| 91 | D | Expander (std seal) | | J4239 |
| 92 | D | Handle | | J8092 |
| 93 | D | Guide Studs | | J25002 |
| 94 | D | Expander (ovs seal, no handle or guide studs) | | J8682 |
| 95 | D | Sleeve Installer (ovs seal) | | J21983 |
| 96 | D | Installer | | J9727-A |
| 97 | D | Handle | | J3154-1A |
| 98 | D | Expander (std seal, no handle) | | J22425-A |
| 99 | D | Expander (ovs seal, no handle or guide studs) | | J4195-01 |
| 100 | D | Installer (ovs seal) | | J4194-01 |
| 101 | D | Dial Indicator Set | | J5959-01 |
| 102 | D | Engine Barring Tool | | J22582 |
| 103 | D | Flywheel Housing Alignment Studs | | J1927-01 |
| 104 | D | Micrometer Ball Attachment | | J4757 |
| 105 | D | Torque Wrench Adaptor (12V and 16V engines) | | J22898-A |
| 106 | D | Universal Bar Type Puller | | J24420-B |
| 107 | D | Flywheel Lifting Fixture (Flywheel) | | J25026 |
| 108 | D | Flywheel Lifting Tool | | J6361-01 |
| 109 | D | Oil Seal Removing and Replacing Tool Set | | J3154-04 |
| 110 | D | Slide Hammer Set | | J5901-01 |
| 111 | D | Flywheel Housing Aligning Studs (set of four) (Flywheel Housing) | | J1927-01 |
| 112 | D | Flywheel Housing Concentricity Gage Set | | J9734-C |

Table 3. Tools and Test Equipment for Modular Causeway System. (MCS) (Continued)

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE LEVEL | NOMENCLATURE | NATIONAL STOCK NUMBER | TOOL NUMBER |
|---------------------------------|-------------------|--|-----------------------|-------------|
| 113 | D | Connecting Rod Holding Fixture (Piston, Connecting Rod and Cylinder Liner) | | J7632 |
| 114 | D | Cylinder Liner Master Ring Gage | | J24564 |
| 115 | D | Cylinder Hone Set (2½ in. to 5¾ in. range) | | J5902-01 |
| 116 | D | Cylinder Liner Hold-Down Tool | | J24565-02 |
| 117 | D | Cylinder Liner Remover Set | | J24563-A |
| 118 | D | Dial Bore Gage Setting Fixture | | J23059-01 |
| 119 | D | Dial Indicator Set | | J24898 |
| 120 | D | Feeler Gage Set | | J3172 |
| 121 | D | Micrometer Ball Attachment | | J4757 |
| 122 | D | Piston Crown Identification Gage | | J25397-A |
| 123 | D | Piston Pin Alignment Tool | | J24285 |
| 124 | D | Piston Pin Retainer Installer | | J23762-A |
| 125 | D | Piston Pin Retainer Leak Detector (plastic) | | J23987-B |
| 126 | D | Piston Pin Retainer Leak Detector (all metal) | | J35134 |
| 127 | D | Piston Ring Compressor | | J24227 |
| 128 | D | Piston Ring Remover Installer | | J8128 |
| 129 | D | Piston to Liner Feeler Gage Set | | J5438-01 |
| 130 | D | Seal Ring Compressor | | J24226 |
| 131 | D | Accessory Drive Hub Oil Seal Aligning Tool (Camshaft) | | J21166 |
| 132 | D | Alternator Drive Step-Up Gear Aligning Gage | | J29893 |
| 133 | D | Balance Weight Cover Oil Seal Installer | | J9791 |
| 134 | D | Camshaft Gear Puller | | J1902-B |

Table 3. Tools and Test Equipment for Modular Causeway System. (MCS) (Continued)

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE LEVEL | NOMENCLATURE | NATIONAL STOCK NUMBER | TOOL NUMBER |
|---------------------------------|-------------------|--|-----------------------|-------------|
| 135 | D | Camshaft Gear Puller Adaptor Plate Set | | J6202-01 |
| 136 | D | Camshaft and Oil Pump Gear Installer | | J1903 |
| 137 | D | Dial Indicator and Attachment Set | | J5959-01 |
| 138 | D | Puller Adaptor | | J7932 |
| 139 | D | Slide Hammer Set | | J6471-02 |
| 140 | D | Spring Scale | | J8129 |
| 141 | D | Universal Bar Type Puller | | J24420-B |
| 142 | D | Pullers (Fuel & Governors) | | J6270-1 |
| 143 | D | Oil Seal Remover and Installer | | J6270-3 |
| 144 | D | Buffing Wheel (brass wire) | | J7944 |
| 145 | D | Fuel Pipe Socket | | J8932-B |
| 146 | D | Fuel System Primer | | J5956 |
| 147 | D | Injector Auxiliary Tester | | J22640-A |
| 148 | D | Injector Body Reamer | | J21089 |
| 149 | D | Injector Calibrator | | J22410 |
| 150 | D | Injector Carbon Remover Set | | J9418 |
| 151 | D | Injector Holding Fixture | | J22396 |
| 152 | D | Injector Nut Seal Ring Installer | | J29197 |
| 153 | D | Injector Service Tool Set | | J23435-C |
| 154 | D | Body Brush | | J8152 |
| 155 | D | Nut Socket Wrench | | J4983-01 |
| 156 | D | Rack Hole Brush | | J8150 |
| 157 | D | Spray Hole Cleaner Vice | | J4298-1 |
| 158 | D | Spray Tip Carbon Remover (high sack) | | J9464-01 |

Table 3. Tools and Test Equipment for Modular Causeway System. (MCS) (Continued)

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE LEVEL | NOMENCLATURE | NATIONAL STOCK NUMBER | TOOL NUMBER |
|---------------------------------|-------------------|--|-----------------------|-------------|
| 159 | D | Spray Tip Carbon Remover (low sack) | | J24838 |
| 160 | D | Spray Tip Driver and Brushing Cleaner | | J129101 |
| 161 | D | Wire Sharpening Stone | | J8170 |
| 162 | D | Injector Tag Remover and Installer | | J24767 |
| 163 | D | Injector Test Oil (5, 10, 30 and 55 GAL) | | J26400 |
| 164 | D | Injector Tester | | J23010-B |
| 165 | D | DDEC Injector Adaptor Kit | | J23010-500 |
| 166 | D | Lapping Block Set | | J22090-A |
| 167 | D | Master Injector Calibrating Kit | | J35369 |
| 168 | D | Needle Valve Lift Gage | | J9462-02 |
| 169 | D | Polishing Compound | | J23038 |
| 170 | D | Polishing Stick Set | | J22964 |
| 171 | D | Spray Tip Cleaning Wire (.007 in. Dia holes) | | J21462-01 |
| 172 | D | Spray Tip Flow Gage | | J25600-B |
| 173 | D | Field Modification Kit | | J25600-103 |
| 174 | D | Spring Tester | | J29196 |
| 175 | D | Tip Conical. Gage and Rack Freeness Tester | | J29584 |
| 176 | D | Cylinder Head Holding Plate Set | | J3087-01 |
| 177 | D | Cylinder Liner Depth Gage | | J22273-01 |
| 178 | D | Injector Protrusion Gage | | J25521 |
| 179 | D | Injector Tube Service Tool Set | | J22525-B |
| 180 | D | Injector Tube Swaging Tool | | J28611-A |
| 181 | D | Fuel Pump Tool Set | | J1508-E |

Table 3. Tools and Test Equipment for Modular Causeway System. (MCS) (Continued)

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE LEVEL | NOMENCLATURE | NATIONAL STOCK NUMBER | TOOL NUMBER |
|---------------------------------|-------------------|--|-----------------------|-------------|
| 182 | D | Fuel Pump Wrench | | J4242 |
| 183 | D | Control Link Operating Lever Bearing Remover and Installer | | J8985 |
| 184 | D | Governor Cover Bearing Installer | | J21068 |
| 185 | D | Governor Cover Bearing Remover and Installer | | J21967-01 |
| 186 | D | High Speed Spring Retainer and Installer | | J5345-12 |
| 187 | D | Governor Weight Shaft Retaining Ring Installer | | J36840 |
| 188 | D | Blower Alignment Tool (Air System) | | J33001 |
| 189 | D | Blower Clearance Feeler Set | | J1698-02 |
| 190 | D | Blower Service Tool Set | | J6270-G |
| 191 | D | Installer, Lip Type Oil Seal/Water Sleeve | | J35787-A |
| 192 | D | Dial Indicator Set (magnetic base) | | J7872 |
| 193 | D | Turbocharger Inlet Shield | | J26554-A |
| 194 | D | Adaptor Cup Plug Installer | | J28711 |
| 195 | D | Adaptor Plug Remover and Installer | | J25275 |
| 196 | D | Bar Type Gear Puller (Lubrication System) | | J24420 |
| 197 | D | Oil Pump Drive Gear Installer (16V) | | J9380 |
| 198 | D | Oil Pump Drive Shaft Gear Installer (6V and 8V) | | J22397 |
| 199 | D | Oil Pump Driven Gear Installer (16V) | | J9381 |
| 200 | D | Oil Pump Driven Shaft Gear Installer (6V and 8V) | | J22398 |

Table 3. Tools and Test Equipment for Modular Causeway System. (MCS) (Continued)

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE LEVEL | NOMENCLATURE | NATIONAL STOCK NUMBER | TOOL NUMBER |
|---------------------------------|-------------------|--|-----------------------|-------------|
| 201 | D | Oil Pump Driving Gear Installer (6V and 8V) | | J22285 |
| 202 | D | Spring Tester (1-125 lbs) | | J29196 |
| 203 | D | Strap Wrench (spin-on filter) | | J24783 |
| 204 | D | Cooling System Radiator Cap Pressure Tester (Cooling System) | | J24460-01 |
| 205 | D | Fingers, Fan Hub Nut Socket (16V) | | J6534-8 |
| 206 | D | Handle | | J7079-2 |
| 207 | D | Oil Seal Installer | | J8501 |
| 208 | D | Pliers | | J4646 |
| 209 | D | Puller | | J24420-A |
| 210 | D | Socket, Fan Hub Nut (16V) | | J22556-2 |
| 211 | D | Thermostat Seal Installer | | J8550 |
| 212 | D | Water Pump Bearing and Gear Installer | | J25257 |
| 213 | D | Water Pump Impeller/Gear Slip Torque Tool | | J33765 |
| 214 | D | Water Pump Seal Remover Set | | J22150-B |
| 215 | D | Water Pump Impeller Slip Checking Fixture | | J34034 |
| 216 | D | Slide Hammer (Electrical Equipment) | | J23907-1 |
| 217 | D | Tachometer Drive Alignment Tool Set | | J23068 |
| 218 | D | Tachometer Drive Shaft Remover | | J5901-3 |
| 219 | O | Coveralls, Eye Protection, Respirator, Gloves (Zodiac Boat Hull) | | |
| 220 | O | Grease Pencil Or Chalk | | |

Table 3. Tools and Test Equipment for Modular Causeway System. (MCS) (Continued)

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE LEVEL | NOMENCLATURE | NATIONAL STOCK NUMBER | TOOL NUMBER |
|---------------------------------------|----------------------|---|--------------------------|-------------|
| 221 | O | Saber Saw With Metal Cutting Blades | | |
| 222 | D | Grinder or Disc Sander w/ Coarse Medium Grit | | |
| 223 | O | Measuring Tape | | |
| 224 | D | Scissors, Shears | | |
| 225 | O | Cardboard, Kraft Paper | | |
| 226 | D | Disposable Containers, Mixing Sticks | | |
| 227 | D | Disposable Brushes, Putty Knife | | |
| 228 | D | Polyethylene Sheet | | |
| 229 | D | Heavy Cardboard, Thin Plywood, Sheet Metal | | |
| 230 | D | Acetone | | |

**OPERATOR MAINTENANCE
WARPING TUG
COMPONENTS OF END ITEM (COEI) LIST**

INTRODUCTION**Scope**

This work package lists COEI for the Warping Tug to help you inventory items for safe and efficient operation of the equipment.

General

This list is for information purposes only and is not authority to requisition replacements. These items are part of the Warping 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 in the COEI List

Column (1) - Illus Number. Gives you the number of the item illustrated.

Column (2) - National Stock Number (NSN). Identifies the stock number of the item to be used for requisitioning purposes.

Column (3) - Description, CAGEC, and Part Number. Identifies the Federal item name followed by a minimum description when needed. The stowage location of COEI is also included in this column. The last line below the description is the CAGEC (commercial and government entity code) (in parentheses) and the part number.

Column (4) - Usable on Code. When applicable, gives you a code if the item you need is not the same for different models of equipment.

Column (5) - Unit of Measure (U/M). Indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (2).

Column (6) - Qty Rqd. Indicates the quantity required.

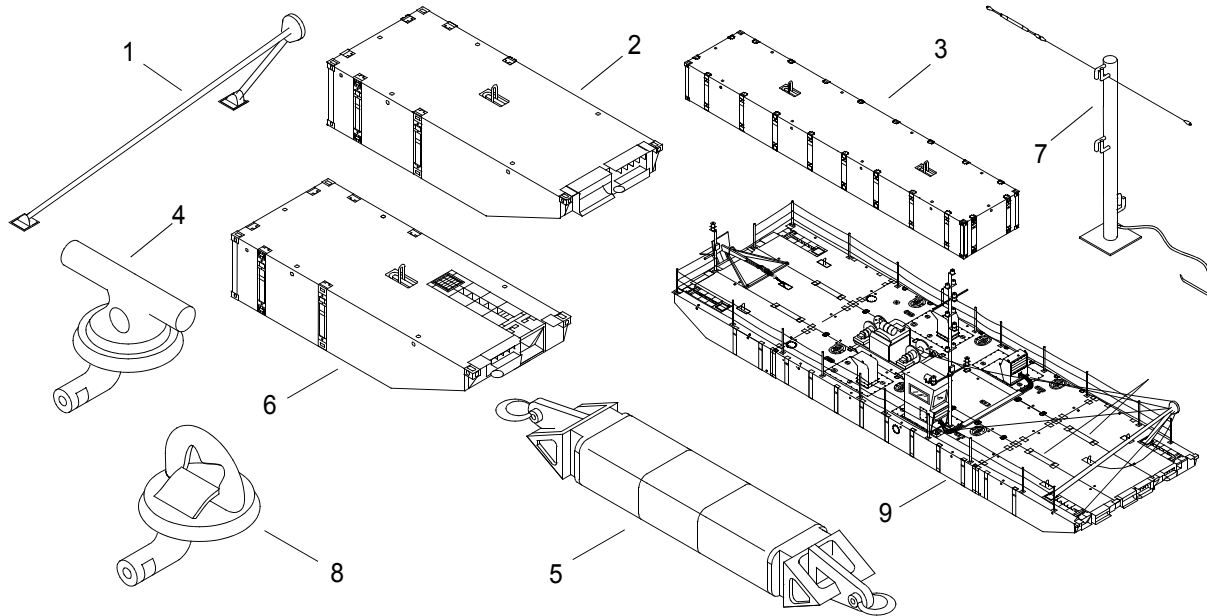


Table 1. Component of End Item. (COEI)

| (1) ILLUS NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|------------------------|---------------------------------|---|--------------------------|------------|-------------------|
| 1 | | A-FRAME (shipping rack and WT conversion container) (19099) FCMWT-96-573-001 | | EA | 1 |
| 2 | | CENTER END RAKE (ISOPAK) (34712) E02823 | | EA | 2 |
| 3 | | CENTER MODULE (ISOPAK) (34712) E02803 | | EA | 1 |
| 4 | | D-RING MOORING ASSEMBLY (34712) E07803 | | EA | 4 |
| 5 | 2040-01-092-3081 | FLEXOR COUPLING, PONTOON CAUSEWAY (left hand rakes) (80091) 6138992 | | EA | 2 |
| 6 | | LEFT END RAKE (ISOPAK) (34712) E02833 | | EA | 2 |
| 7 | | LIFELINES AND STANCHION ASSEMBLY (BII container) (34712) E03136 | | EA | 1 |
| 8 | | MOORING CLEAT ASSEMBLY (34712) E02783 | | EA | 4 |
| 9 | | PROPULSION MODULE (ISOPAK with shipping rack) (34712) E28403 | | EA | 2 |

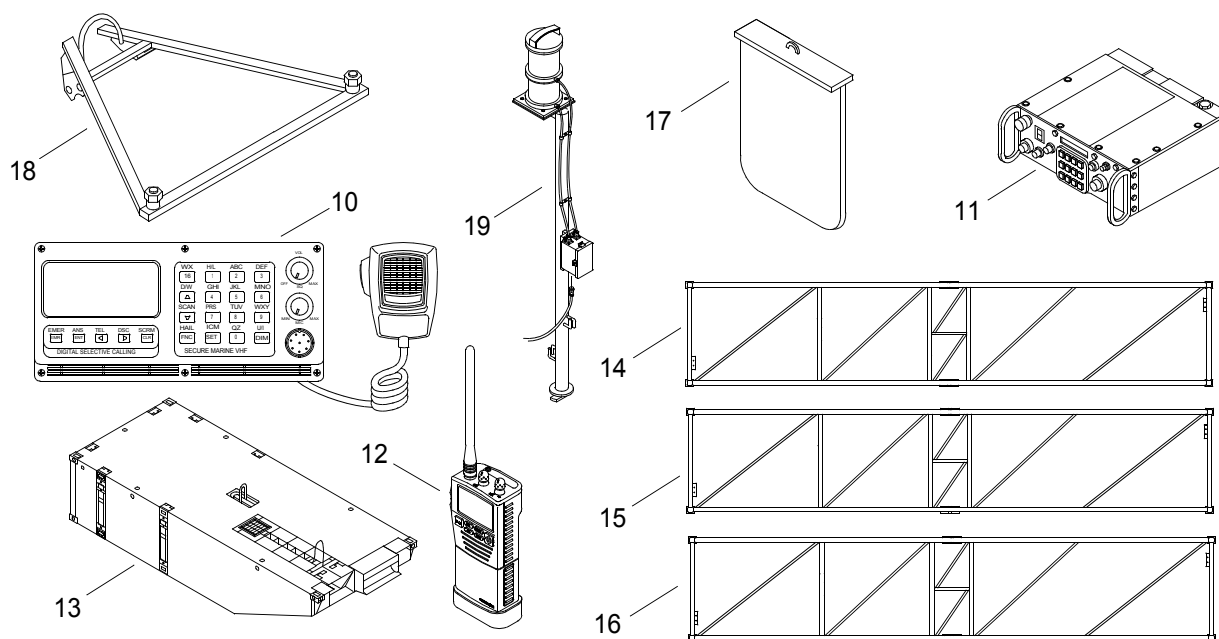


Table 1. Component of End Item. (COEI)

| (1) ILLUS NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|------------------------|---------------------------------|--|--------------------------|------------|-------------------|
| 10 | | RADIO SET (pilothouse) (0WF67) DSC 500 | | EA | 1 |
| 11 | | RADIO SET (pilothouse) (80063) A3080229-1 | | EA | 1 |
| 12 | | RECEIVER/XMTR (BII container) (0JDM6) 50-200029 | | EA | 2 |
| 13 | | RIGHT END RAKE (ISOPAK) (34712) E02813 | | EA | 2 |
| 14 | | SHIPPING RACK (ISOPAK) (19207) FCMWT-98-699-001 | | EA | 2 |
| 15 | | SHIPPING RACK, MAST (ISOPAK) (19207) FCMWT-98-699-001, Arrangement 2 | | EA | 1 |
| 16 | | SHIPPING RACK, PLENUM (ISOPAK) (19207) FCMWT-98-699-002, Arrangement 1 | | EA | 1 |
| 17 | | SKEG (WT conversion container) (19207) MCS-99-673-001-114 | | EA | 4 |
| 18 | | STERN ANCHOR FRAME ASSEMBLY (WT conversion container) (19207) FCMWT-98-699-001 | | EA | 1 |
| 19 | | STUB MAST ASSEMBLY (BII container) (37412) E18343 | | EA | 1 |

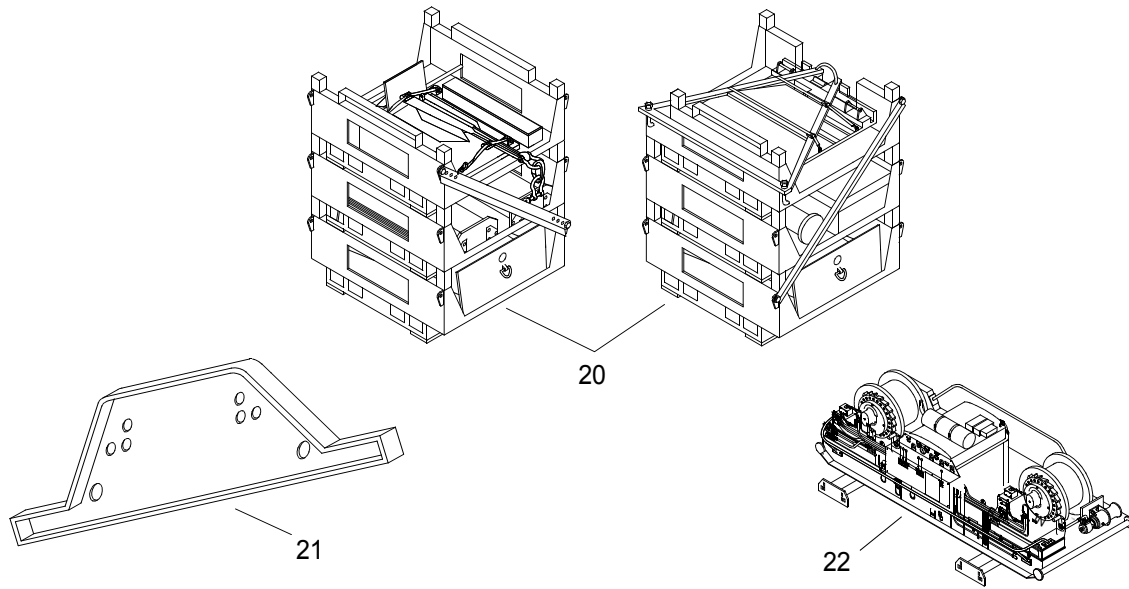


Table 1. Component of End Item. (COEI)

| (1) ILLUS NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|------------------------|---------------------------------|--|--------------------------|------------|-------------------|
| 20 | | WARPING TUG CONVERSION KIT (20 ft end-opening container) (81340) MCS-99-673-001, SHEET 7 | | EA | 1 |
| 21 | | WINCH FOUNDATION ADAPTOR (20 ft end-opening container) (19099) FCMWT-96-180-001 | | EA | 4 |
| 22 | | WINCH, DOUBLE DRUM (break bulk) (80091) 6304148 | | EA | 1 |

**OPERATOR MAINTENANCE
WARPING TUG
BASIC ISSUE ITEMS LIST (BII)**

INTRODUCTION

Scope

This work package lists BII for the Warping Tug to help you inventory items for safe and efficient operation of the equipment.

General

These essential items are required to place the Warping Tug in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the Warping Tug during operation and when it is transferred between property accounts. Listing these items 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 in the BII List

Column (1) - Illus Number. Gives you the number of the item illustrated.

Column (2) - National Stock Number (NSN). Identifies the stock number of the item to be used for requisitioning purposes.

Column (3) - Description, CAGEC, and Part Number. Identifies the Federal item name followed by a minimum description when needed. The stowage location of BII is also included in this column. The last line below the description is the CAGEC (commercial and government entity code) (in parentheses) and the part number.

Column (4) - Usable on Code. When applicable, gives you a code if the item you need is not the same for different models of equipment.

Column (5) - Unit of Measure (U/M). Indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (2).

Column (6) - Qty Rqd. Indicates the quantity required.

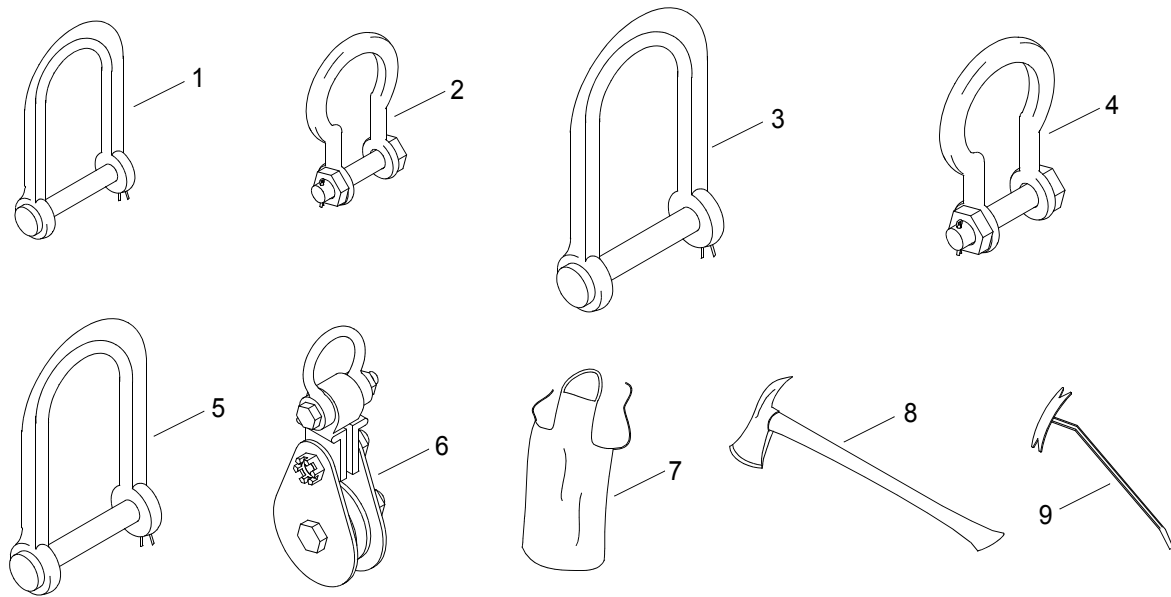


Table 1. Basic Issue Items. (BII)

| (1) ITEM NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|-----------------------|---------------------------------|---|--------------------------|------------|-------------------|
| 1 | | 2-TON 1/2 in. ANCHOR SHACKLE (75535) 1019472 | | EA | 8 |
| 2 | | 30-TON 1-1/2 in. ANCHOR BOLT SHACKLE (75535) 102110 | | EA | 4 |
| 3 | | 3-1/4 TON 5/8 in. SHACKLE (75535) 75535 | | EA | 8 |
| 4 | | 40-TON 1-3/4 in. ALLOY ANCHOR SHACKLE (75535) 1021138 | | EA | 4 |
| 5 | | 4-3/4 TON 3/4 in. SHACKLE (75535) 1019515 | | EA | 8 |
| 6 | | 8 in. SNATCH BLOCK (75535) 121022 | | EA | 4 |
| 7 | 8415-00-082-6108 | APRON, UTILITY (64067) 8415-00-082-6108 | | EA | 2 |
| 8 | 4210-00-142-4949 | AX, PICKHEAD (76109) GGGA296TYPE2 | | EA | 1 |
| 9 | 5120-00-242-0762 | BAR, WRECKING (57068) 55-136 | | EA | 2 |

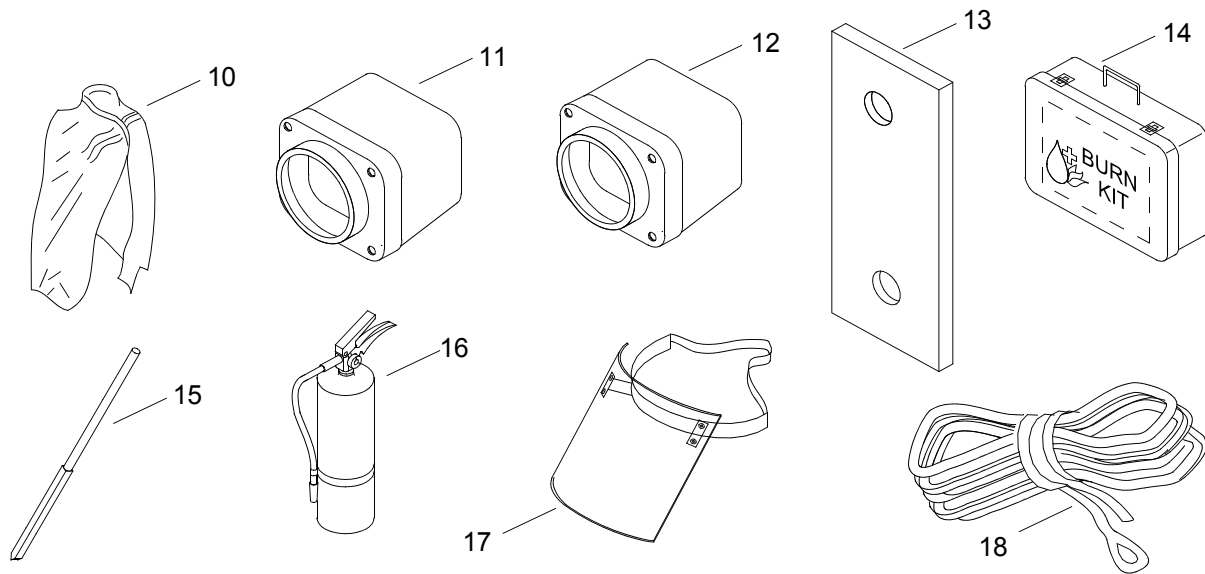


Table 1. Basic Issue Items. (BII) (Continued)

| (1) ITEM NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|-----------------------|---------------------------------|--|--------------------------|------------|-------------------|
| 10 | | BLANKET, BURN (1BJ97) 7260C | | PG | 1 |
| 11 | 6230-00-783-6519 | BODY ASSEMBLY, LANTERN (red) (81349) MIL-F-16377-53 | | EA | 1 |
| 12 | 6230-00-783-6519 | BODY ASSEMBLY, LANTERN (81349) MIL-F-16377-53 | | EA | 3 |
| 13 | 6230-00-968-7831 | BRACKET (81349) MIL-F-16377-53 | | EA | 3 |
| 14 | 6515-01-309-3444 | BURN CARE KIT, MEDICAL (06345) B95190 | | EA | 1 |
| 15 | 5120-00-224-1390 | CROWBAR (58536) A-A-2563 | | EA | 2 |
| 16 | 4210-00-203-0217 | EXTINGUISHER, FIRE (15 lb) (81349) MIL-E-24269 | | EA | 3 |
| 17 | 4220-00-542-2048 | FACESHIELD, INDUSTRIAL (80204) ANSI Z87.1 | | EA | 6 |
| 18 | 4020-01-387-8795 | FIBER ROPE ASSEMBLY, SINGLE LEG (64249) 228 | | EA | 2 |

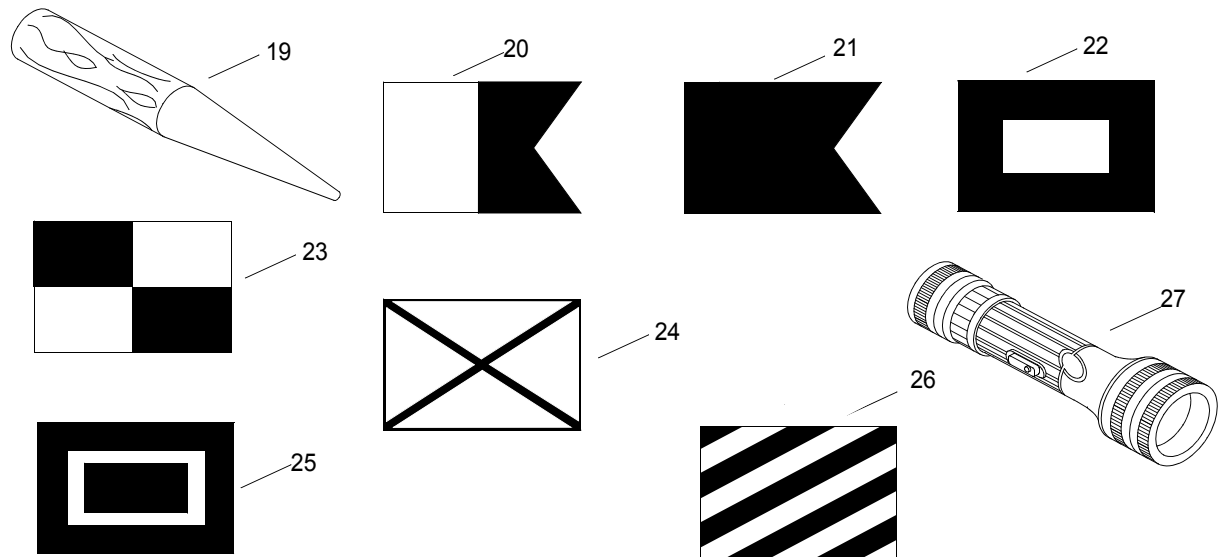


Table 1. Basic Issue Items. (BII) (Continued)

| (1) ITEM NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|-----------------------|---------------------------------|---|--------------------------|------------|-------------------|
| 19 | 5120-00-223-8921 | FID (80244) A-A-52129 | | EA | 2 |
| 20 | 8345-00-935-0445 | FLAG, SIGNAL ("A" INTL CODE SIZE 6) (81349) MIL-F-2692 | | EA | 1 |
| 21 | 8345-00-926-6803 | FLAG, SIGNAL ("B" INTL CODE SIZE 6) (80064) 16696SHEET6B | | EA | 1 |
| 22 | 8345-00-935-0451 | FLAG, SIGNAL ("O" INTL CODE SIZE 6) (81349) MIL-F-2692 | | EA | 1 |
| 23 | 8345-00-926-6814 | FLAG, SIGNAL ("U" INTL CODE SIZE 6) (81349) MIL-F-2692 | | EA | 1 |
| 24 | 8345-00-935-0455 | FLAG, SIGNAL ("V" INTL CODE SIZE 6) (81349) MIL-F-2692 | | EA | 1 |
| 25 | 8345-00-935-0456 | FLAG, SIGNAL ("W" INTL CODE SIZE 6) (81349) MIL-F-2692 | | EA | 1 |
| 26 | 8345-00-935-0457 | FLAG, SIGNAL ("Y" INTL CODE SIZE 6) (81349) MIL-F-2692 | | EA | 1 |
| 27 | 6230-00-264-8261 | FLASHLIGHT (81349) MIL-F-3747 | | EA | 2 |

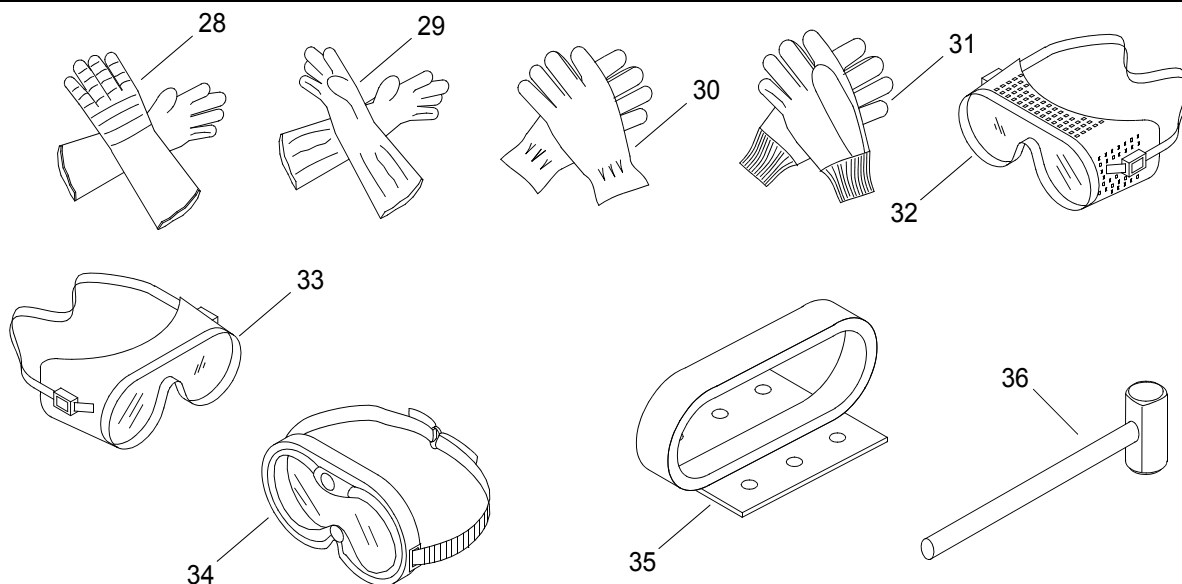


Table 1. Basic Issue Items. (BII) (Continued)

| (1) ITEM NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|-----------------------|---------------------------------|---|--------------------------|------------|-------------------|
| 28 | 8415-01-267-9661 | GLOVES, ANTIFLASH (81349) MIL-G-2874 | | PR | 6 |
| 29 | 8415-00-266-8677 | GLOVES, CHEMICAL (81349) ZZ-G-381 | | PR | 2 |
| 30 | 8415-00-266-8691 | GLOVES, ELECTRICAL (81348) ZZ-G-401 | | PR | 6 |
| 31 | 8415-00-634-4658 | GLOVES, MEN'S AND WOMEN'S (leather palm) (81348) ZZ-G-401 | | PR | 6 |
| 32 | 4240-00-052-3776 | GOGGLES, INDUSTRIAL (chipping, chemical) (80204) ANSI Z87.1 | | PR | 6 |
| 33 | 4240-00-190-6432 | GOGGLES, INDUSTRIAL (58536) A-A-110 | | PR | 2 |
| 34 | 8465-01-004-2893 | GOGGLES, SUN, WIND AND DUST (safety) (81349) MIL-G-43914 | | PR | 6 |
| 35 | 6230-00-776-5920 | GRIP, HANDLE (81349) MIL-F-16377-53 | | EA | 3 |
| 36 | 5120-00-243-2957 | HAMMER, HAND (10 lb sledge) (58536) 75H | | EA | 2 |

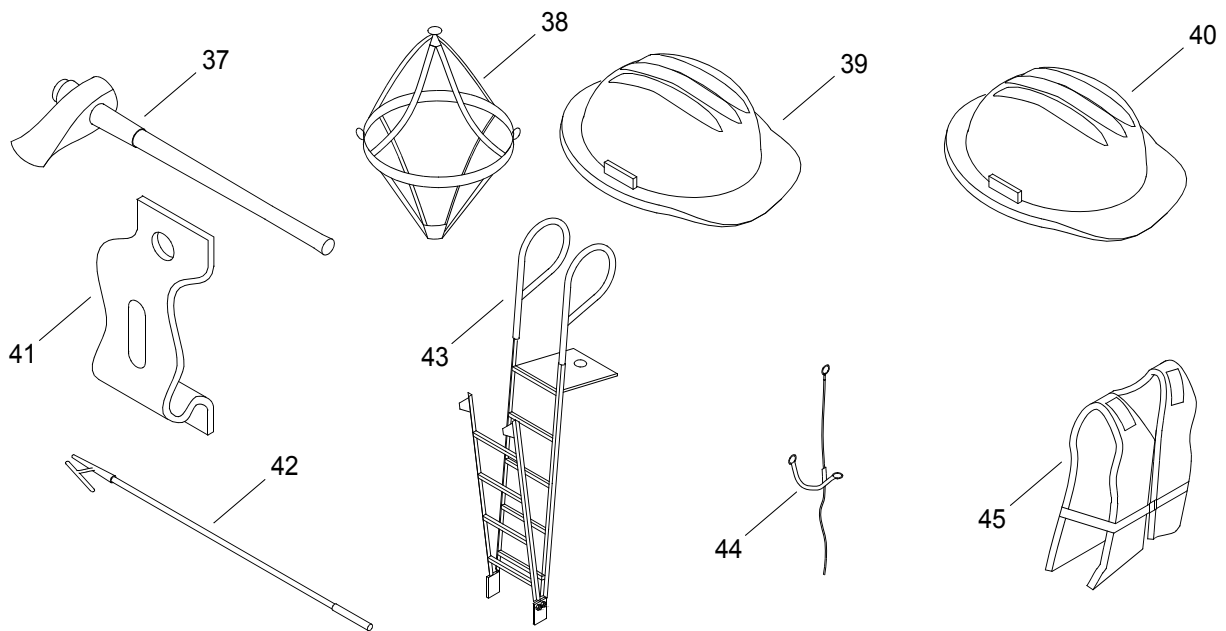


Table 1. Basic Issue Items. (BII) (Continued)

| (1) ITEM NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|-----------------------|---------------------------------|---|--------------------------|------------|-------------------|
| 37 | 5120-00-255-1476 | HAMMER, HAND (5 lb ship's maul) (58536) A-A-1285 | | EA | 1 |
| 38 | 4240-00-022-2522 | HARNESS, SAFETY INDUSTRIAL (55799) 502644 | | EA | 6 |
| 39 | 8415-00-279-2205 | HELMET, SAFETY (blue) (80204) ISEA/ANSI Z89.1 | | EA | 2 |
| 40 | 8415-00-823-7575 | HELMET, SAFETY (brown) (3A054) 9131T34 | | EA | 4 |
| 41 | 6230-00-578-7401 | HOLDER, LIGHT (81349) MIL-F-16377/54 | | EA | 3 |
| 42 | 2040-00-268-9250 | HOOK, BOAT (21530) H389 | | EA | 2 |
| 43 | | LADDER (06101) MCS-99-673-001-128 | | EA | 1 |
| 44 | 4240-00-022-2518 | LANYARD, SAFETY HARNESS (80204) ANSI Z359.1 | | EA | 6 |
| 45 | 4220-00-276-8926 | LIFE PRESERVER, VEST (work vest) (81349) MIL-L-17653 | | EA | 8 |

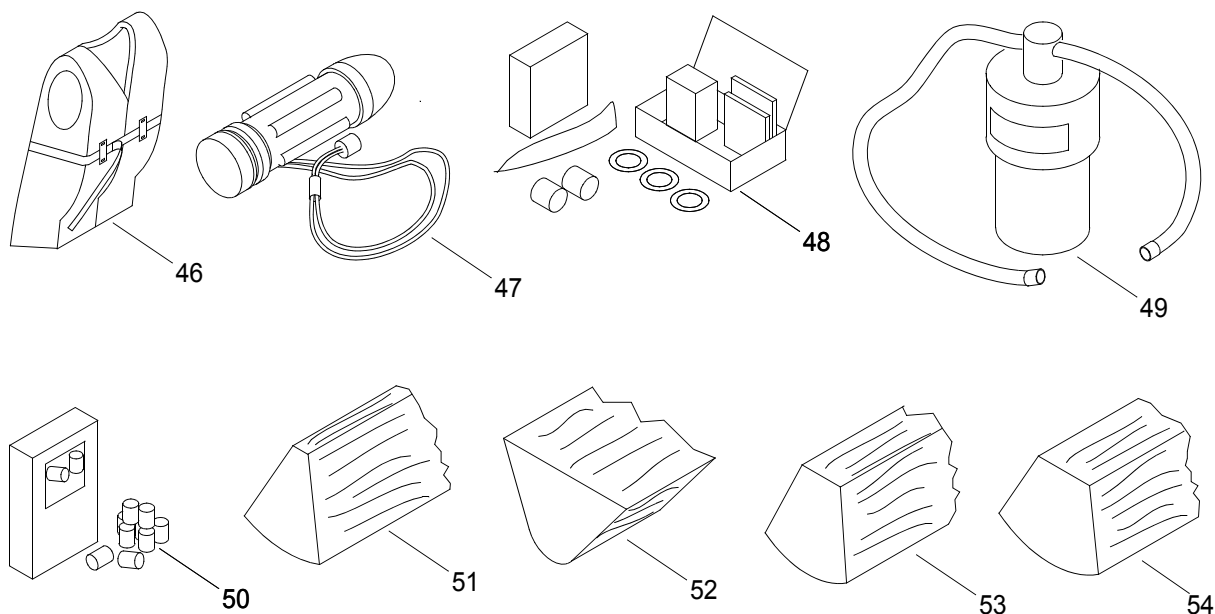


Table 1. Basic Issue Items. (BII) (Continued)

| (1) ITEM NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|-----------------------|---------------------------------|--|--------------------------|------------|-------------------|
| 46 | 4220-00-200-0538 | LIFE PRESERVER, VEST (81349) MIL-L-18045 | | EA | 8 |
| 47 | 6260-01-086-8077 | LIGHT, CHEMILUMINESCENT (0BY83) 9-42740 | | BX | 24 |
| 48 | | LOCKOUT TOOL BOX (1MZZ1) BRA 65289 | | KT | 1 |
| 49 | | OIL REMOVAL SYSTEM (FLOCS) (6V008) Q4929112 | | KT | 1 |
| 50 | 6515-00-137-6345 | PLUG, EAR (89875) 4-375 | | BX | 1 |
| 51 | 5510-00-260-8953 | PLUG, WOOD (1 in. x 0 in. x 8 in.) (80064) 803-461043 | | EA | 5 |
| 52 | 5510-00-260-8949 | PLUG, WOOD (10 in. x 7 in. x 12 in.) (80064) S8800-461043 | | EA | 5 |
| 53 | 5510-00-260-8958 | PLUG, WOOD (2 in. x 0 in. x 4 in.) (80064) S8800-461043 | | EA | 5 |
| 54 | 5510-00-260-8962 | PLUG, WOOD (3 in. x 0 in. x 8 in.) (80064) 803-461043 | | EA | 5 |

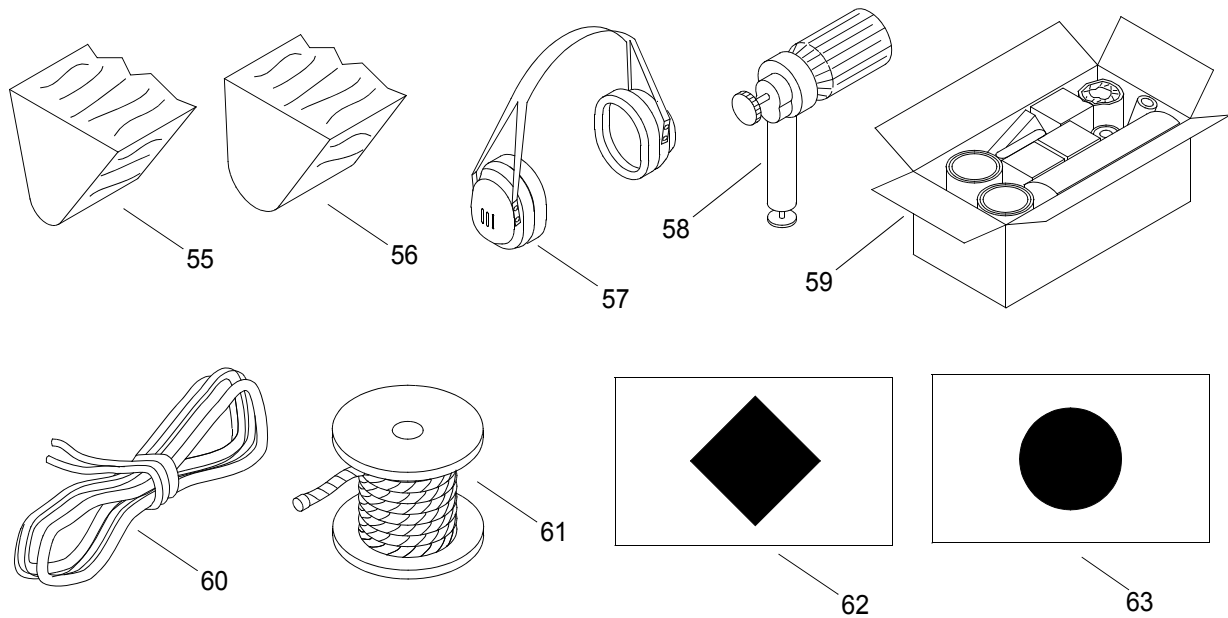


Table 1. Basic Issue Items. (BII) (Continued)

| (1) ITEM NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|-----------------------|---------------------------------|---|--------------------------|------------|-------------------|
| 55 | 5510-00-260-8969 | PLUG, WOOD (7 in. x 3 in. x 10 in.) (80064) 803-461043 | | EA | 5 |
| 56 | 5510-00-260-8973 | PLUG, WOOD (8 in. x 4 in. x 10 in.) (80064) S8800-461043 | | EA | 5 |
| 57 | 4240-00-022-2946 | PROTECTOR, HEARING (58536) A-A-58084 | | EA | 6 |
| 58 | 4930-01-119-4030 | PUMP, SAMPLER (59578) 43-XV | | EA | 1 |
| 59 | 4730-00-542-3359 | REPAIR (repair kit, emergency pipe) (81349) MILR17882 | | EA | 1 |
| 60 | 4020-00-240-2161 | ROPE, FIBROUS (81349) MIL-H-226 | | EA | 1 |
| 61 | 4020-00-530-0698 | ROPE, FIBROUS (81349) MIL-R-24049 | | RL | 1 |
| 62 | 8345-01-101-1101 | SHAPE, DAY, MARITIME (black diamond) (81349) MIL-S-29134 | | EA | 1 |
| 63 | 8345-00-174-0453 | SHAPE, DAY, MARITIME (black round) (81349) MIL-S-29108 | | EA | 2 |

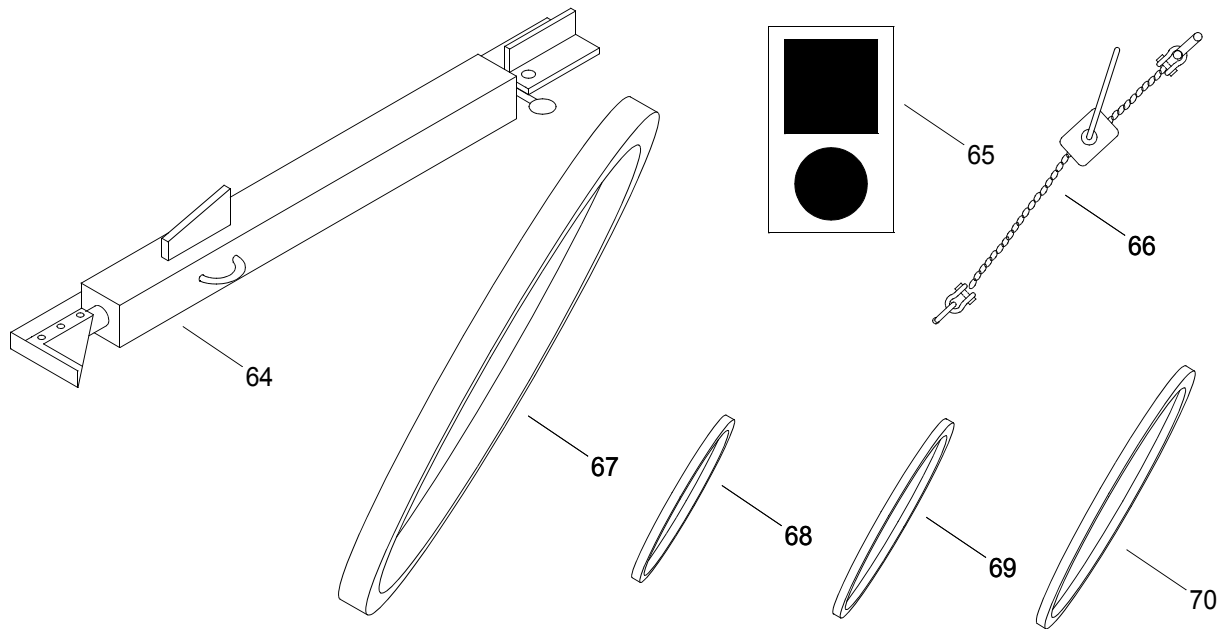


Table 1. Basic Issue Items. (BII) (Continued)

| (1) ITEM NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|-----------------------|---------------------------------|--|--------------------------|------------|-------------------|
| 64 | 2090-00-058-3737 | SHORE, DAMAGE (81349) MIL-S-23965MODEL3-5 | | EA | 4 |
| 65 | 1370-01-030-8330 | SIGNAL, SMOKE AND ILLUMINATION (10001) DL3139734 | | EA | 12 |
| 66 | | SLING, 36,000 lbs ADJUSTABLE CHAIN Consisting Of: 1-1/4 in. Alloy Master Link (75535) 1014342 200 ft-5/8 in. Chain (75535) 273563 5/8 in. Clevis Grab Hook (75535) 1027695 5/8 in. Lokalloy (75535) 1014723 | | EA | 4 |
| 67 | | SLING, LIFTING, 53,000 lbs (brown) (3AJ34) EN600X25FT | | EA | 4 |
| 68 | | SLING, LIFTING, 5300 lbs (green) (3AJ34) EN60X4FT | | EA | 4 |
| 69 | | SLING, LIFTING, 5300 lbs (green) (3AJ34) EN60X5FT | | EA | 4 |
| 70 | | SLING, LIFTING, 5300 lbs (green) (3AJ34) EN60X6FT | | EA | 4 |

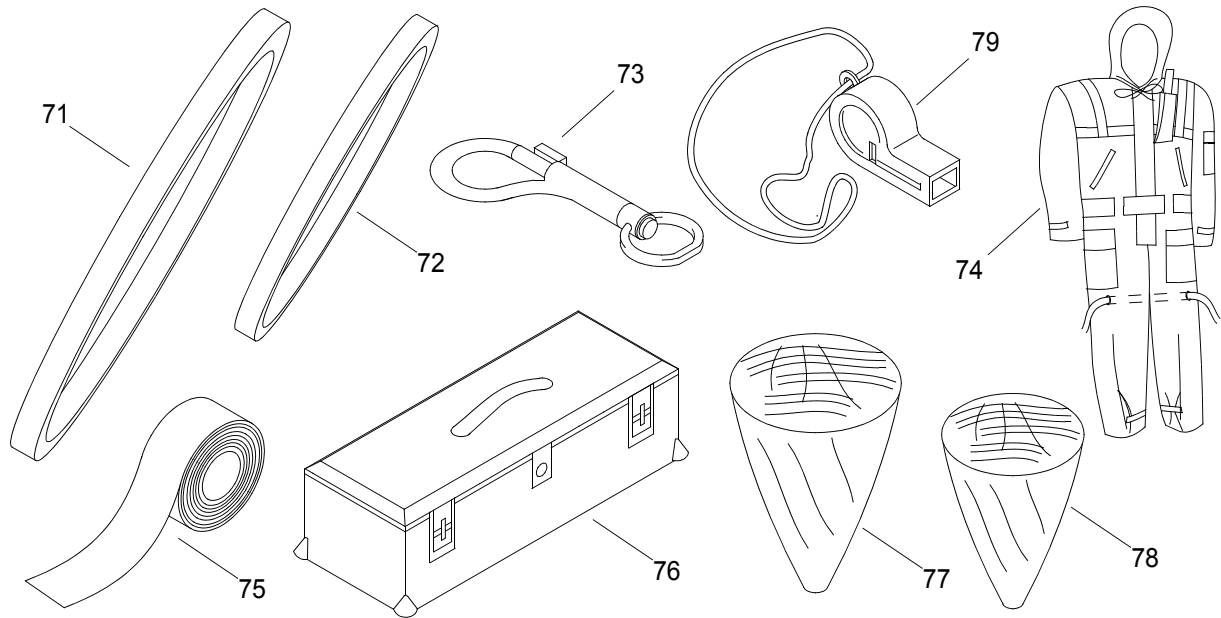


Table 1. Basic Issue Items. (BII) (Continued)

| (1) ITEM NUMBER | (2) NATIONAL STOCK NUMBER | (3) DESCRIPTION, CAGEC AND PART NUMBER | (4) USABLE ON CODE | (5) U/M | (6) QTY RQD |
|-----------------------|---------------------------------|--|--------------------------|------------|-------------------|
| 71 | | SLING, LIFTING, 66,000 lbs (olive) (3AJ34) EN800X30FT | | EA | 4 |
| 72 | | SLING, LIFTING, 8400 lbs (yellow) (3AJ34) EN90X20FT | | EA | 4 |
| 73 | 5340-00-275-4583 | SNAP HOOK (81349) MIL-H-15021 | | EA | 2 |
| 74 | 4220-01-251-6466 | SUIT, SURVIVAL, COLD (63806) ISS-590 | | EA | 8 |
| 75 | 9390-01-078-8660 | TAPE, REFLECTIVE (63156) 3150-3X50YD | | RL | 1 |
| 76 | 5180-00-629-9783 | TOOL KIT, GENERAL MECHANIC'S (rail and marine) (50980) SC 5180-90-CL-N55 | | EA | 1 |
| 77 | 5510-00-268-3475 | WEDGE, WOOD (1-1/2 in. x 2 in. x 12 in.) (80064) S8800-461043 | | EA | 5 |
| 78 | 5510-00-268-3479 | WEDGE, WOOD (2 in. x 2 in. x 8 in.) (80064) S8800-461043 | | EA | 5 |
| 79 | 8465-00-254-8803 | WHISTLE, BALL (58536) A-A-55106 | | EA | 24 |

**OPERATOR MAINTENANCE
WARPING TUG
EXPENDABLE AND DURABLE ITEMS LIST (EDIL)**

INTRODUCTION**Scope**

This work package lists expendable and durable items that you will need to operate and maintain the Warping Tug. This list is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

Explanation of Columns in the Expendable/Durable Items List

Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the item (e.g., Use antiseize compound. (Item 3, WP 0106 00)).

Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item. (C = Operator/Crew, O = Unit/AVUM, F = Direct Support/AVUM, H = General Support, D = Depot)

Column (3) - National Stock Number (NSN). This is the NSN assigned to the item which you can use to requisition it.

Column (4) - Item Name, Description, Commercial and Government Entity Code (CAGEC), and Part Number (PN). This column provides the other information you need to identify the item.

Column (5) - Unit of Measure (U/M). This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

EXPENDABLE AND DURABLE ITEMS LIST**Table 1. Expendable and Durable Items List. (EDIL)**

| (1) ITEM NUMBER | (2) LEVEL | (3) NATIONAL STOCK NUMBER | (4) ITEM NAME, DESCRIPTION, CAGEC AND PART NUMBER | (5) U/M |
|-----------------------|--------------|---------------------------------|---|------------|
| 1 | C | 8040-01-250-3969 | Adhesive, general purpose, medium strength, threadlocker (05972) 242 | EA |
| 2 | C | 6850-00-181-7933 | Antifreeze, blue green with boiling point of 300°F (81349) MIL-A-46153 | CN |
| 3 | C | 8030-01-044-5034 | Antiseize Compound, MIL-T-5544C, graphite and petroleum, one pound can for use on threaded fasteners and fittings (81348) MIL-T-5544 | CN |
| 4 | C | 6135-00-643-1310 | Battery, Nonrechargeable, 6 volt battery (83740) EV90 | PKG |
| 5 | C | 6135-00-835-7210 | Battery, Nonrechargeable, D size battery (90303) MN1300 | PKG |

Table 1. Expendable and Durable Items List. (EDIL) (Continued)

| (1) ITEM NUMBER | (2) LEVEL | (3) NATIONAL STOCK NUMBER | (4) ITEM NAME, DESCRIPTION, CAGEC AND PART NUMBER | (5) U/M |
|-----------------------|--------------|---------------------------------|---|------------|
| 6 | O | 6850-01-431-9025 | Cleaner, Type II, 50 lb container (81349) MIL-C-29602 | CO |
| 7 | C | 9140-01-413-7511 | Fuel, Diesel, summer grade DF2 low sulfur (81348) VV-F-800 | GL |
| 8 | C | 9150-00-145-0268 | Grease, Aircraft, Grade 2, resistant to corrosion, water, low evaporation and oxidation (81349) MIL-G-81322 | CN |
| 9 | C | 9150-010197-7689 | Grease, Automotive and Artillery, 6.5 lb can, conforms to PPP-C-96, Type V Class 2 (81399) MIL-10924-D | CN |
| 10 | C | 9150-01-095-5512 | Grease, Ball and Roller Bearing, lithium soap, temperature range -35° to 325°F (-54° to 163°C) (White Lithium Grease) (73219) L0189.001 | CN |
| 11 | C | 9150-00-929-7946 | Grease, General Purpose, 14 oz cartridge, oxidation, corrosion, water, salt water, wear and extreme pressure resistant (76736) Dura-Lith Grease EP 2 | CA |
| 12 | C | 9150-00-235-5555 | Grease, General Purpose, mineral oil and molybdenum disulfide, low evaporations, corrosive and salt water resistive (81349) MIL-G-23549 | CN |
| 13 | C | 9150-00-530-6814 | Grease, Wire Rope - Exposed Gear, 35 lb can, petroleum oil based, corrosion and water resistant (81349) MIL-G-18458 | CN |
| 14 | C | 9150-00-189-6730 | Lubricating Oil, Engine, 1 qt can, internal combustion engine, MIL-L-2104, 40 Grade (81349) MILL2104 | QT |
| 15 | C | 9150-00-186-6681 | Lubricating Oil, Engine, 5 gallon can, internal combustion engine, MIL-L-2104, 30 Grade (81349) M2104-1-30W | QT |
| 16 | C | 9150-01-035-5392 | Lubricating Oil, Gear, 1 qt can, 80W90 Grade (81349) M2105-1-80W90 | QT |
| 17 | C | 9150-00-993-6621 | Lubricating Oil, General Purpose, 55 gallon drum, conforms to PPP-D-729, Type 2 (19135) DTE-25 | DR |

Table 1. Expendable and Durable Items List. (EDIL) (Continued)

| (1) ITEM NUMBER | (2) LEVEL | (3) NATIONAL STOCK NUMBER | (4) ITEM NAME, DESCRIPTION, CAGEC AND PART NUMBER | (5) U/M |
|-----------------------|--------------|---------------------------------|---|------------|
| 18 | C | | Lubricating Oil, Mobilgear 626, 55 gallon drum, amber color, for use in all types of industrial enclosed gears (0AHK0) 610857-00 | DR |
| 19 | C | 7920-00-205-1711 | Rag, Wiping, cotton, contains 50 lbs, mixed colors (80244) 7920-00-205-1711 | BE |
| 20 | C | 6550-01-310-1677 | Water, Reagent Distilled, four 1 gallon per package (07T46) C4350-1A | PG |

**OPERATOR MAINTENANCE
WARPING TUG
TOOL IDENTIFICATION LIST (TIL)**

INTRODUCTION**Scope**

This work package lists all common tools and supplements and special tool/fixtures needed to maintain the Warping Tug.

Explanation of Columns in the Tool Identification List

Column (1) - Item Number. This number is assigned to the entry in the list and is referenced in the initial setup to identify the item (e.g., Respirator (Item 4, WP 0110 00)).

Column (2) - Item Name. This column lists the item by noun nomenclature and descriptive features (e.g. Gage, belt tension).

Column (3) - National Stock Number. This is the National Stock Number (NSN) assigned to the item; use it to requisition the item.

Column (4) - Part Number/CAGEC. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity) which controls design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items. The manufacturer's Commercial and Government Entity Code (CAGEC) is also included.

Column (5) - Reference. This column identifies the authorizing supply catalog or RPSTL for items listed in this work package.

TOOL IDENTIFICATION LIST**Table 1. Tool Identification List. (TIL)**

| (1) ITEM NO. | (2) ITEM NAME | (3) NATIONAL STOCK NUMBER | (4) PART NUMBER/ CAGEC | (5) REFERENCE |
|--------------------|---------------------------|------------------------------------|---------------------------------|------------------|
| 1 | Lubricating gun, hand | 4930-00-965-0288 | 30415 (77335) | |
| 2 | Mop, wet | 7920-00-224-8726 | 7920-00-224-8726 (83421) | |
| 3 | Oiler, hand | 4930-00-274-5713 | A-A-50477B (58536) | SC 4910-95-A72 |
| 4 | Respirator, air filtering | 4240-01-088-8546 | 14130047 (79687) | SC 4910-95-A68 |

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These are the instructions for sending an electronic 2028.

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however, only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17 and 27.

From: "Whomever" whomever@avma27.army.mil
To: whomever@avma27.army.mil
To: TACOM-TECH-PUBS@ria.army.mil

Subject:DA Form 2028

1. **From:** Joe Smith
2. **Unit:** home
3. **Address:** 4300 Park
4. **City:** Hometown
5. **St:** MO
6. **Zip:** 77777
7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-1915-200-10
9. **Pub Title:** TM
10. **Publication Date:** 11-APR-88
11. **Change Number:** 12
12. **Submitter Rank:** MSG
13. **Submitter Fname:** Joe
14. **Submitter Mname:** T
15. **Submitter Lname:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem:** 1
18. **Page:** 1
19. **Paragraph:** 3
20. **Line:** 4
21. **NSN:** 5
22. **Reference:** 6
23. **Figure:** 7
24. **Table:** 8
25. **Item:** 9
26. **Total:** 123
27. **Text:**

This is the text for the problem below line 27.


| | | | | | | | |
|--|------|----------------|------|--|-------|--|-------|
| RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS | | | | | | Use Part II (<i>reverse</i>) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM). | DATE |
| For use of this form, see AR 25-30; the proponent agency is OAASA | | | | | | | |
| TO: (<i>Forward to proponent of publication or form</i>) (<i>Include ZIP Code</i>) | | | | FROM: (<i>Activity and location</i>) (<i>Include ZIP Code</i>) | | | |
| PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS | | | | | | | |
| PUBLICATION/FORM NUMBER | | | | | | DATE | TITLE |
| ITEM | PAGE | PARA- GRAPH | LINE | FIGURE NO. | TABLE | RECOMMENDED CHANGES AND REASON | |
| | | | | | | | |
| * Reference to line numbers within the paragraph or subparagraph. | | | | | | | |
| 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 | |
|---|----------|----------|--|--|------------|----------|------------------------------------|--------------------|
| PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS | | | | | | | | |
| PUBLICATION NUMBER | | | | DATE | | | TITLE | |
| 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 <i>(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.)</i> | | | | | | | | |
| | | | | | | | | |
| TYPED NAME, GRADE OR TITLE | | | | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION | | | SIGNATURE | |

By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:


JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0225903

To be distributed in accordance with the initial distribution number (IDN) 256756 requirements for
TM 55-1945-205-10-3.

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 decigram = .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 cu. 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 | kilograms | short tons | 1.102 |
| pound-inches | newton-meters | .11296 | metric tons | | |

Temperature (Exact)

| | | | | |
|----|---------------------------|-------------------------------|------------------------|----|
| °F | Fahrenheit temperature | 5/9 (after subtracting 32) | Celsius temperature | °C |
|----|---------------------------|-------------------------------|------------------------|----|

