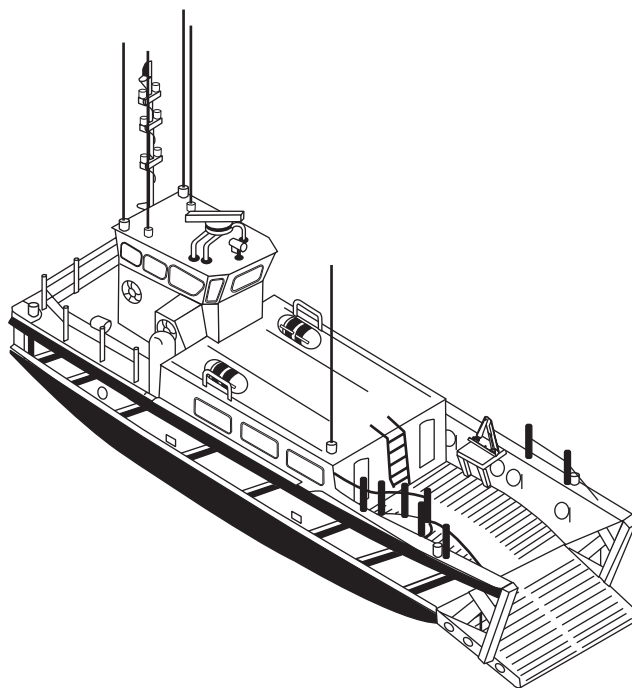


TM 55-1905-242-14

TECHNICAL MANUAL

OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION) (ROHR MODELS) NSN 1905-01-465-7599 (EIC DWD)



DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY
SEPTEMBER 2005

WARNING SUMMARY

FIRST AID

The ability to promptly administer first aid to another crewmember could mean the difference between life and death for that crewmember. First aid procedures for soldiers are contained in FM 4-25.11.

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation and maintenance of this vessel and its equipment. Failure to observe these precautions could result in serious injury or death to personnel. Also included are explanations of safety and hazardous materials used within the technical manual.

EXPLANATION OF SAFETY WARNING ICONS



EAR PROTECTION - headphones over ears show that noise level will harm ears.



ELECTRICAL - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.



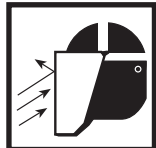
ELECTRICAL - electrical wire to hand with electricity symbol running through hand shows that shock hazard is present.



FALLING PARTS - arrow bouncing off human shoulder and head shows that falling parts present a danger to life or limb.



FLYING PARTICLES - arrows bouncing off face show that particles flying through the air will harm face.



FLYING PARTICLES - arrows bouncing off face with faceshield show that particles flying through the air will harm face.



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

EXPLANATION OF SAFETY WARNING ICONS (continued)



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



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



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



HEAVY PARTS - heavy object pinning human figure against wall shows that heavy, moving parts present a danger to life or limb.



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



HOT AREA - hand over object radiating heat shows that part is hot and can burn.



LASER LIGHT - laser light hazard symbol indicates extreme danger for eyes from laser beams and reflections.



MOVING PARTS - human figure with an arm caught between gears shows that the moving parts of the equipment present a danger to life or limb.



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

EXPLANATION OF SAFETY WARNING ICONS (continued)

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



SHARP OBJECT - pointed object in hand shows that a sharp object presents a danger to limb.



SHARP OBJECT - pointed object in hand shows that a sharp object presents a danger to limb.



SHARP OBJECT - pointed object in foot shows that a sharp object presents a danger to limb.



SLICK FLOOR - wavy line on floor with legs prone shows that slick floor presents a danger for falling.

GENERAL SAFETY WARNINGS DESCRIPTIONS

Failure to follow the warnings below can result in damaged equipment and serious injury or death to personnel.

FIREFIGHTING EQUIPMENT

Volatile materials must not be brought aboard, electrical circuits must not be energized, fuel tanks must not be topped off, and engines must not be started before firefighting equipment is available and operative.

All personnel must be evacuated from the engine room before the engine room fire suppression system is discharged.

FUEL/FUELING

Do not fill the fuel tank while the engine(s) is(are) running. Provide metallic contact between the fuel container and the fuel tank to prevent a static spark from igniting fuel.

Diesel fuel is volatile. Diesel fumes can be explosive. Observe NO SMOKING rules when refueling.

Fuel oil and other petroleum products are highly volatile in extreme heat. To minimize the possibility an explosion, wipe up all spills at once, see that fuel lines and valves are not leaking, and pump bilges regularly.

Never use a blow torch or other similar means for heating fuel or oil lines.

GENERAL SAFETY WARNINGS DESCRIPTIONS (continued)**BATTERIES**

Do not smoke or use open flame in the vicinity of servicing batteries as hydrogen gas, an explosive, is generated.

WELDING AND CUTTING

When cutting with a torch, or when welding, always station fire watches, ready with fire extinguishers, in the vicinity on both sides of the plate that is being cut or welded.

Prior to cutting or welding on the ramp, remove the drain plugs on both sides of the ramp and check to see if the ramp interior is primer coated. If primer coated, flush the void thoroughly with steam, carbon dioxide, or water. Do not reinstall the drain plugs until the cutting and/or welding operation is completed. Failure to take this precaution may result in explosion of accumulated primer vapors.

ELECTRICITY

Electricity can cause injury or death to personnel. Do not work on live circuits. Lock out and tag out circuits in accordance with FM 55-502 and warn other personnel not to energize the circuits.

Do not be misled by the term "low voltage." Potentials as low as 50 volts may cause death under adverse conditions. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas. Whenever possible, the input power supply to the equipment must be shut off, locked out, and tagged out before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it. Do not operate the equipment without all grilles, guards, louvers, and covers in place and tightly secured.

ENGINE ROOM

The diesel engines and various other equipment are excessively noisy. Serious hearing loss or deafness could occur if this equipment is operated without proper hearing protection. Hearing protection must be worn at all times in the engine room when the engines are running. Unprotected and unnecessary personnel must keep out of the engine room.

Be sure engine room ventilators are open and ventilation fans are operating whenever the engines are operating. The engine exhaust gases contain carbon monoxide, which is a colorless, odorless, and poisonous gas. Breathing air with carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Brain damage or death can result from heavy exposure. Precautions must be followed to insure crew safety. Be alert at all times during vessel operation for exhaust odors and exposure symptoms. If either is present immediately ventilate the compartment. The field protective mask for Nuclear-Biological-Chemical (NBC) protection will not protect you from carbon monoxide poisoning. The best defense against carbon monoxide poisoning is good ventilation. If symptoms persist, remove the affected person to fresh air, keep warm, do not permit physical exercise, and, if necessary, perform rescue breathing. For rescue breathing instructions, refer to FM 4-25.11.

COMPRESSED FLUIDS

Before attempting to remove any compressed air system lines or components, relieve the air pressure from the system.

Before disconnecting a line in the hydraulic system, bleed the pressure from that portion of the line.

Wear eye protection when using compressed air to blow parts clean. Compressed air used for cleaning purposes must not exceed 30 lb/in² (2.1 bar).

GENERAL SAFETY WARNINGS DESCRIPTIONS (continued)**CONFINED SPACE ENTRY**

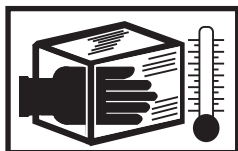
Only properly trained personnel may enter confined spaces, or act as supervisors and/or attendants for those working in confined spaces. Before entering a confined space, the space must be cleared for entry and a Confined Space Entry Permit must be secured. All entry into confined spaces must be in accordance with the Organizational Confined Space Entry Standard Operating Procedure and FM 55-502. Entry into an uninspected confined space can result in serious injury or death.

EXPLANATION OF HAZARDOUS MATERIALS ICONS

BIOLOGICAL - abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to life or health.



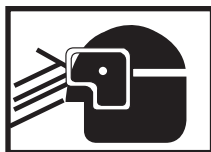
CHEMICAL - drops of liquid on hand show that the material will cause burns or irritation to human skin or tissue.



CRYOGENIC - hand in block of ice shows that the material is extremely cold and can injure human skin or tissue.



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



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



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



POISON - skull and crossbones show that a material is poisonous or is a danger to life.

EXPLANATION OF HAZARDOUS MATERIALS ICONS (continued)

RADIATION - three circular wedges show that the material emits radioactive energy and can injure human tissue.



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

HAZARDOUS MATERIALS DESCRIPTION

The following hazardous materials are potentially dangerous to personnel and to property. Failure to follow the warnings below can result in injury or death to personnel and/or damage to equipment.

BATTERY ELECTROLYTE

Battery electrolyte is extremely corrosive. Third degree (full thickness) burns may result from skin contact, serious chemical burns upon eye contact, severe respiratory irritation or chemical burns upon inhalation, and severe abdominal distress upon ingestion. Always wear chemical protective gloves, apron, goggles, and face shield when handling or servicing batteries. If electrolyte is spilled on clothing or other material, wash immediately with soap and clean water. If spilled on personnel, start flushing the affected area immediately with clean water and continue washing until medical assistance arrives. In case of inhalation, remove to fresh air, give oxygen or perform rescue breathing as the situation dictates, and get medical attention. If electrolyte makes contact with the eyes, flush them immediately with large volumes of water, and continue flushing until medical assistance arrives.

CLEANING SOLVENT

Cleaning solvent may cause moderate skin irritation, defatting, and possible secondary infection upon contact with the skin; severe eye irritation and conjunctivitis upon contact with the eyes; respiratory tract irritation and central nervous system effect upon inhalation; and vomiting, diarrhea, or death upon ingestion. Always wear chemical protective gloves and goggles when handling cleaning solvent. Clean parts in a well ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvent. In case of contact with the skin, remove contaminated clothing, wash with soap and water, and get medical attention if irritation develops. In case of eye contact, flush the eyes with fresh water for at least 15 minutes, and get medical attention if irritation continues. In case of inhalation, remove to fresh air, give oxygen or perform rescue breathing as the situation dictates, and get medical attention. In case of ingestion, give nothing by mouth, and get immediate medical attention. Do not induce vomiting. Lung damage may result from vomiting after ingestion.

ANTIFREEZE

Ethylene glycol antifreeze may cause skin irritation, defatting, and dermatitis upon contact with the skin; irritation, redness, tearing, and blurred vision upon contact with the eyes; and abdominal irritation, nausea, vomiting, diarrhea, or death upon ingestion. Always wear chemical protective gloves and goggles when handling ethylene glycol antifreeze. In case of contact with the skin, flush the affected area with large volumes of water, and wash the area with soap and fresh water. In case of eye contact, flush the eyes with fresh water for at least 15 minutes, and get medical attention as required. In case of inhalation, remove to fresh air, and give oxygen, or perform rescue breathing as the situation dictates. In case of ingestion, get immediate medical attention, and induce vomiting following appropriate medical instructions.

HAZARDOUS MATERIALS DESCRIPTION (continued)**HYDRAULIC FLUID AND ENGINE OIL**

Hydraulic fluid and engine oil may cause skin irritation upon contact with the skin, eye irritation upon contact with the eyes, and illness if ingested. Always wear chemical protective gloves and goggles when handling hydraulic fluid and engine oil. In case of contact with the skin, remove contaminated clothing, and wash with soap and water. In case of eye contact, flush the eyes with fresh water for at least 15 minutes, and get medical attention if irritation develops. In case of inhalation, remove to fresh air and give oxygen, or perform rescue breathing as the situation dictates. In case of ingestion, get immediate medical attention. Do not induce vomiting. Lung damage may result from vomiting after ingestion.

DIESEL FUEL

Diesel fuel may cause skin irritation upon contact with the skin, eye irritation upon contact with the eyes, and illness if ingested. Always wear chemical protective gloves and goggles when handling diesel fuel. In case of contact with the skin, remove contaminated clothing and wash with soap and water. In case of large scale skin contamination, get medical attention immediately. In case of eye contact, flush the eyes with fresh water for at least 15 minutes, and get medical attention immediately. In case of inhalation, remove to fresh air, and give oxygen, or perform rescue breathing as the situation dictates. In case of ingestion, give two glasses (16 oz.) of water (if the victim is conscious and able to swallow), and get immediate medical attention. Do not induce vomiting. Lung damage may result from vomiting after ingestion. If vomiting occurs, give fluids again.

LIST OF EFFECTIVE PAGES/WORK PACKAGES

NOTE: The portion of text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages/work packages are:

Original 12 September 2005

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HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 12 SEPTEMBER 2005

TECHNICAL MANUAL
OPERATOR, UNIT,
DIRECT SUPPORT, AND GENERAL SUPPORT
MAINTENANCE MANUAL
FOR
LANDING CRAFT, MECHANIZED
(LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
(ROHR MODELS)
NSN 1905-01-465-7599 (EIC DWD)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Equipment Technical Publications) through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is <http://aeps.ria.army.mil>. The DA Form 2028 is located under the Public Applications section of the AEPS public home page. Fill out the form and click on SUBMIT. Using this form on the AEPS site will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or e-mail your letter or DA Form 2028 directly to: AMSTA-LC-LMIT/ TECH PUBS, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The email address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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(LCM-8) (All Vessels With Mod 2 Application)

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HOW TO USE THIS MANUAL

USING THIS MANUAL

When using this manual, read and understand the 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.

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.

To locate information using the table of contents, first scan the chapter titles to determine the general area in which your information will be contained. After locating the proper chapter, look beneath the chapter title to find the desired informational or procedural work package title. To the right of the work package title is a work package sequence number. This work package sequence number will direct you to the proper work package. Work packages are arranged in numerical order in this manual.

To locate information using the alphabetical index, look down the subject column on the left side of the page until you find the desired subject. To the right of the subject is the work package sequence number and page number. Go to the indicated work package and indicated page number to find the desired information.

INITIAL SETUP

Initial setup requirements are located directly above many of the procedures in this manual. 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. There are five basic headings listed under the initial setup:

Tools and Special Tools: This section lists all tools (standard or special) required to perform the task. Tools are identified with an item number and work package number from table 2 of the Maintenance Allocation Chart (MAC).

Materials/Parts: This section lists all of the materials and parts required to perform the task. If the materials or part is needed each time the work package is used, then it's listed here. If the part is optional, replaced on a conditional basis, or is only needed each for certain specific procedures within the work package it is not listed.

Personnel Required: This section lists all personnel necessary to perform the task. When a specific MOS or other personnel qualification is required, this MOS or additional requirement is also included.

References: This section lists any other publications 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 Supporting Information chapter at the rear of this manual.

Equipment Condition: This section 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 that contains the required maintenance task.

ILLUSTRATIONS

Various visual methods are used to locate and repair components. Locator illustrations in Control and Indicator tables, Preventive Maintenance Checks and Services (PMCS) table, exploded views, and cut-away diagrams make the information in the manual easier to understand and follow.

LOCATING MAJOR COMPONENTS

This work package gives a brief description of the major components, and provides illustrations showing the location of the components. Knowing the major component of the system is the first step to understanding system operation and maintenance.

THEORY OF OPERATION

This work package contains the theory of operation for the system. Theory of operation is provided to familiarize the user system operating principles. Once the operating principles are understood, the user is better equipped to operate, troubleshoot, and maintain the system.

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS

This work package describes all of the operator controls and indicators contained in the system. Use of the operator controls and indicators is also described. Turn to the figure that shows the desired control or indicator. Note the key number corresponding to the control or indicator. Refer to the table below the illustration and find the desired key number in the column on the far left hand side. The center column contains the name of the control or indicator and the right hand column briefly describes the control or indicator's function.

OPERATOR INSTRUCTIONS

Work packages are included in this manual to describe the operation under the usual conditions as well as operation under unusual conditions. Prior to performing any operating procedure, perform the initial setup by obtaining the expendables, tools, materials and other items listed prior to starting the task. Always perform the listed steps in the listed order.

TROUBLESHOOTING PROCEDURES

A troubleshooting index work package is contained in this manual to permit easy location of troubleshooting procedures. Full directions for using the troubleshooting index and the accompanying troubleshooting procedures are contained in the troubleshooting index work packages. The troubleshooting procedure work package(s) immediately follow the troubleshooting index.

MAINTENANCE PROCEDURES

To locate a maintenance procedure, consult the table of contents or the alphabetical index. Each level of maintenance (operator, unit, direct support, and general support) has a chapter dedicated to maintenance procedures for the appropriate level of maintenance. Each maintenance work package contains complete maintenance procedures, starting with initial setup and continuing through follow on service as appropriate. Always ensure that all of the initial setup is complete before beginning a maintenance procedure and always ensure that all warnings, cautions, and notes are heeded.

MAINTENANCE ALLOCATION CHART

The MAC lists all of the authorized maintenance for the system and assigns that maintenance to the appropriate maintenance level (operator, unit, direct support, general support). Use of the MAC is explained fully in the Maintenance Allocation Chart Introduction work package.

ALPHABETICAL INDEX

The Alphabetical Index, located in the back of this manual, contains an alphabetical list of all sections of this manual. The work package sequence number 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.

CHAPTER 1

DESCRIPTION AND THEORY OF OPERATION FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
GENERAL INFORMATION**

SCOPE

This technical manual contains instructions for operation, checks, adjustments, and corrective maintenance for the Landing Craft, Mechanized (LCM-8) Mod 2. This manual is applicable to all LCM-8 Mod 2 vessels manufactured by Rohr. The primary mission of the LCM-8 Mod 2 consists of personnel transfer, light salvage, and Command and Control (C2). The vessel will be used in coastal, harbor, and inland waterways and is capable of operating up to Sea State 3. It is also capable of working in shallow inlets and rivers while retaining its ability to land on unimproved beaches. As a C2 platform, the LCM-8 Mod 2 will provide the critical link between ship and shore operation centers during Joint Logistics Over the Shore (JLOTS) operations. The vessel will transport Army stevedores between shore points and a ship in a protected environment. Secondary missions of the LCM-8 Mod 2 include medical evacuation, diver support, firefighting, and light salvage.

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, Functional Users Manual for the Army Maintenance Management System (TAMMS).

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your landing craft 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). Mail it to the address specified in DA PAM 738-750, or to Commander, U.S. Army Tank Automotive and Armaments Command, ATTN: AMSTA-AC-NML, Rock Island, IL 61299-7630. The email address is amsta-ac-nml@ria.army.mil. We will send you a reply.

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.

While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

If 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.

OZONE DEPLETING SUBSTANCES (ODS)

The air conditioning and heating units used on the LCM-8 Mod 2 contain R-22 refrigerant, which is a Class II ODS. Care must be taken not to release ODS into the atmosphere during service or repair. All personnel performing service or repair operations on this equipment must be properly trained and certified, and must perform such work in compliance with all applicable regulations.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

For procedures to destroy this equipment to prevent its use by the enemy, refer to TM 750-244-6, Procedures for Destruction of Tank--Automotive Equipment to Prevent Enemy Use.

PREPARATION FOR STORAGE OR SHIPMENT

Detailed procedures for preparing the LCM-8 Mod 2 for storage or shipment are contained in TB 740-97-4, Preservation of Vessels for Storage.

WARRANTY INFORMATION

Unit maintenance maintains records of the warranty status of equipment on the LCM-8 Mod 2. The warranty starts on the date found in block 23 of DA Form 2408-9 (Equipment Control Record). Report all defects to your supervisor, who will take appropriate action.

NOMENCLATURE CROSS-REFERENCE LIST**Common Name**

Alternating current transformer
Compass
Data modem
Diesel generator
Fire alarm system
Fire monitor
Fire pump
"Hand charging pump, propulsion engine starting"
"Hydraulic pump, steering"
Loudhailer
"Nozzle, fire monitor"
Oily water collection and pumping system
Pressure set
Radar
Ramp control valve
Ramp hand pump
SSB radio
VHF/FM radio
Watch receiver
Winch

Official Nomenclature

Power transformer
Digital compass system (KVH MV103AC)
SEATOR SEA 3000 Modem
Generator assembly
Fire detection system
Fire/waterway monitor
Ballast/fire pump
Hand pump
Steering pump
RAY 430 Loudhailer
Fire nozzle
Oily water collection system
Water pressure set
AN/SPX-69 R80 Radar
Ramp hoist control valve
Ramp hoist hand pump
HF/SSB Radio telephone SEA330
VHF-FM DSC 500A
MF/HF DSC Watch receiver
Ramp winch

LIST OF ABBREVIATIONS/ACRONYMS

Abbreviation/Acronym

Name

A

AAL	Additional Authorization List
AEPS	Army Electronic Product Support

B

BERP	Bolted Engine Removal Plate
BII	Basic Issue Items

C

C2	Command and Control
CFR	Code of Federal Regulations
CO ₂	Carbon Dioxide
COEI	Components of End Item
CPC	Corrosion Prevention and Control
CRES	Corrosion Resistant Steel

D

d/b	Distribution box
DSC	Digital Selective Calling

E

EIR	Equipment Improvement Recommendations
EPIRB	Emergency Position Indicating Radio Beacon
ESD	Electrostatic Discharge

F

FM	Frequency Modulation
FP	Fuel Pressure
ft	foot (feet)
ft ³ /min	Cubic feet per minute

G

gal	Gallon(s)
gal/min	Gallons per minute
GFE	Government Furnished Equipment
GPS	Global Positioning System

H

HCFC	Hydrochlorofluorocarbon
HF	High Frequency; Hydrogen Fluoride
HF/SSB	High Frequency, Single Sideband
HWT	High Water Temperature

I

I.D.	Inside Diameter
IFF	Identification, Friend or Foe
in	inch(es)

J

JLOTS	Joint Logistics Over the Shore

LIST OF ABBREVIATIONS/ACRONYMS (continued)

Abbreviation/Acronym	Name
K	
KDF	Kinetic Degradation Fluxion
kg	Kilogram
kg/cm ²	Kilograms per Square Centimeter
kHz	Kilohertz
km	Kilometer(s)
km/hr	Kilometers per hour
kW	Kilowatt(s)
L	
L	Liter(s)
L/min	Liters per minute
L/sec	Liters per second
lb	Pound
lb/in ²	Pounds per square inch
lb-ft	Pounds Feet (torque)
LCM-8 Mod 2	Landing Craft, Mechanized (All Vessels with Mod 2 Application)
LED	Light Emitting Diode
LOP	Low Oil Pressure; Local Operating Panel
LUT	Local User Terminal
M	
m	meter(s)
MAC	Maintenance Allocation Chart
MF	Medium Frequency
MHz	Megahertz
mW	Milliwatt
N	
NBC	Nuclear, Biological, and Chemical
NDT	Nondestructive Testing
Nm	Newton-meters (torque)
nmi	Nautical mile(s)
NUC	Not Under Command
O	
OBA	Oxygen Breathing Apparatus
O.D.	Outside Diameter
ODS	Ozone Depleting Substance(s)
P	
PMCS	Preventive Maintenance Checks and Services
p/n	Part Number
PPE	Personal Protective Equipment
PPM	Parts Per Million
PTO	Power Take-Off
Q	
QAWT	Quick-Acting Watertight Door
qt	Quart(s)
qty	Quantity

LIST OF ABBREVIATIONS/ACRONYMS (continued)**Abbreviation/Acronym****Name****R**

r/min	Revolutions per minute
RAI	Rudder Angle Indicator

S

SAR	Search and Rescue
SART	Search and Rescue Transponder
sec	Second(s)
SINCGARS	Single Channel Ground and Airborne Radio System
SSB	Single Sideband

T

t	tonne (metric)
TAMMS	The Army Maintenance Management System
TMDE	Test, Measurement, and Diagnostic Equipment

V

Vac	Volts alternating current
Vdc	Volts direct current
VHF	Very High Frequency

W

W	Watt(s)

Y

yds	Yards

QUALITY OF MATERIAL

Material used for replacement, repair, or modification must meet the requirements of this manual. If quality of material requirements are not stated in this manual, the material must meet the requirements of the drawings, standards, specifications, or approved engineering change proposals applicable to the subject equipment.

SAFETY, CARE, AND HANDLING

The following procedures should be observed when handling all Electrostatic Discharge (ESD) sensitive components and units containing such components. Failure to observe all of these precautions can cause permanent damage to the electrostatic device. This damage can cause the device to fail either immediately, or at a later date, when exposed to an adverse environment.

1. Turn off and /or disconnect all power, signal sources, and loads used with the unit.
2. Place the unit on a grounded, nonconductive work surface.
3. Ground the repair operator using a nonconductive wrist strap or other device using 1 megaohm series resistor to protect the operator.
4. Ground any tools (including soldering equipment) that will contact the unit. Contact with the operator's hand provides a sufficient ground for tools that are otherwise electrically isolated.
5. All electrostatic sensitive replacement components are shipped in nonconductive foam or tubes and must be stored in the original shipping container until installed.
6. When these devices and assemblies are removed from the unit, they should be placed on the nonconductive work surface or in nonconductive containers.
7. When not being worked on, place disconnected circuit boards in plastic bags that have been coated or impregnated with a nonconductive material.
8. Do not handle these devices unnecessarily or remove them from their packages until actually used or tested.

END OF WORK PACKAGE

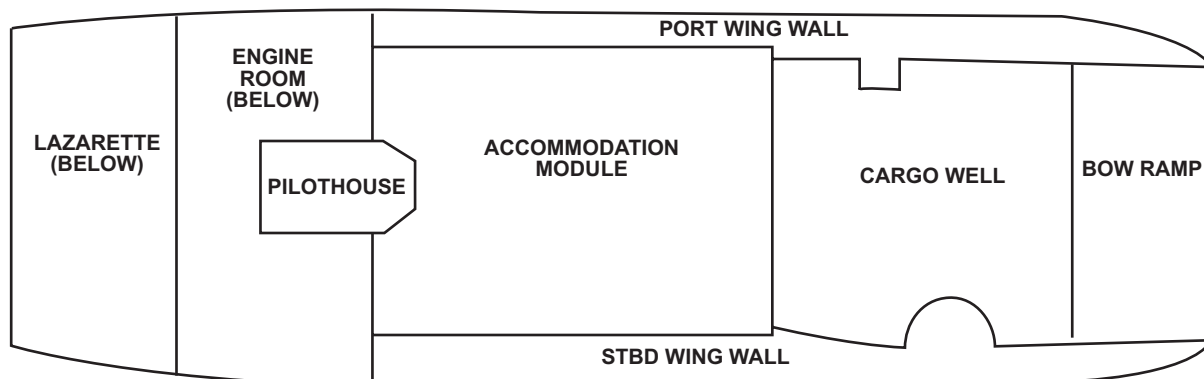
**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
EQUIPMENT DESCRIPTION AND DATA**

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

The LCM-8 Mod 2 is a watercraft intended for use in rough or exposed waters. It is capable of operating through breakers and grounding on a beach, remaining upright and tight, and retracting under its own power. It can be transported to overseas destinations as cargo aboard transport ships. This craft is all weather operational in sea states 1, 2, and 3.

The hull is an all steel welded structure. There are nine watertight bulkheads at frames 3, 7, 11, 15, 19, 23, 27, 31 and 39. The compartments forward of frame 31, below the cargo well and accommodation module, form seven sealed watertight buoyancy holds or voids. The watertight void between frames 3 and 7 is configured to serve as a forward ballast tank. The main deck spans the full width of the vessel from the transom forward to frame 31. From frame 31 forward, the main deck extends along the top of the port and starboard wing walls.

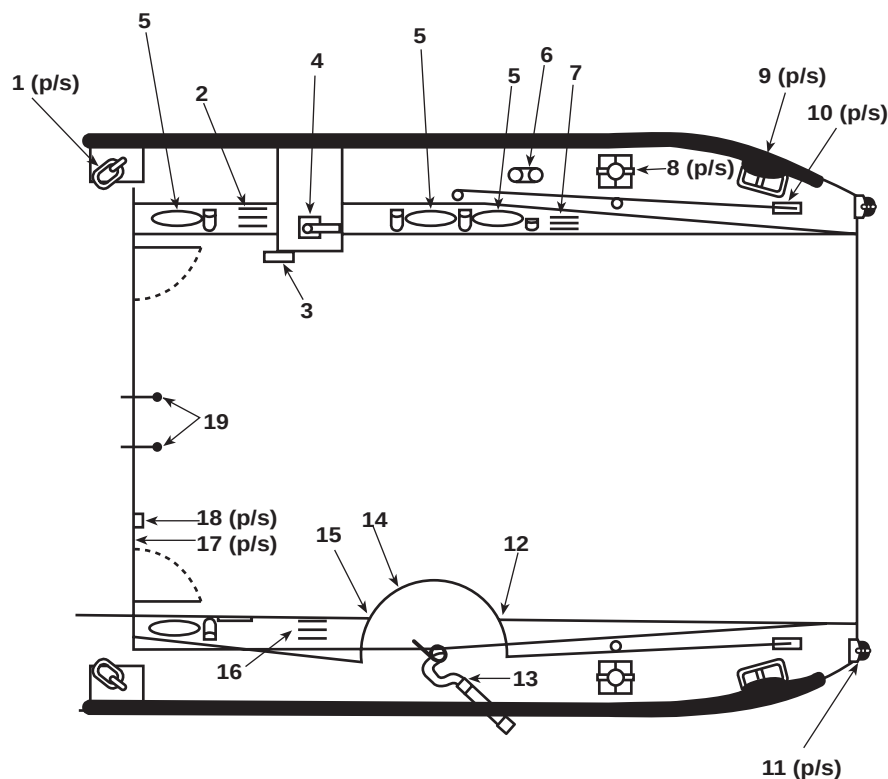
Two wing walls, one port and one starboard, extend from the bow to frame 31. A cargo well and hinged bow ramp are located between the wing walls forward of frame 15. An accommodation module containing communication gear, seating, and sanitary facilities is located between the wing walls. The accommodation module extends from frame 15 aft to frame 31. A pilothouse is located amidships between frames 28 and 35. The pilothouse is raised above the main deck and situated so that its deck is at the level of the accommodation module top. The engine room is located below the main deck between frames 31 and 39. The lazarette is located below the main deck between frame 39 and the transom.



LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

TOPSIDE COMPONENTS--FORWARD

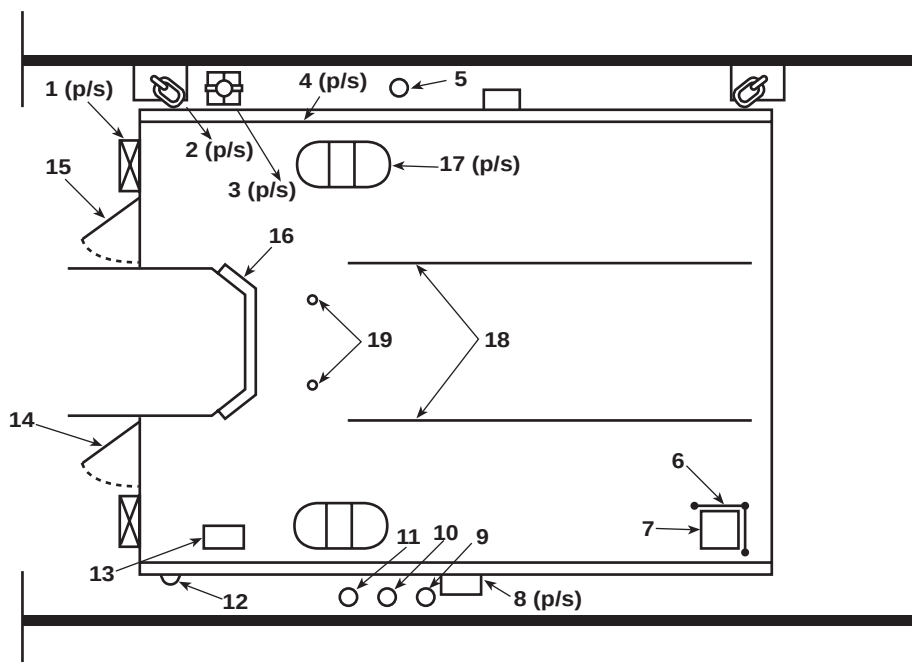
1. Lifting eye (port and starboard). Used to lift the vessel.
2. Port access ladder, aft. Allows personnel access from the port wing wall to the cargo well.
3. Crane controls. Operator controls for crane. The controls are stowed on the cargo well level when the crane is not in use.
4. Crane. Used to lift cargo and equipment into, out of, and around the cargo well.
5. Bolted access plates (4 port, 3 starboard). Permit access to the watertight voids beneath the cargo well.
6. Forward ballast tank vent. Vents the forward ballast tank during filling and draining.
7. Port access ladder, forward. Allows personnel access from the port wing wall to the cargo well.
8. Mooring bitt (port and starboard). Used to secure mooring lines.
9. Chock (port and starboard). Used to direct mooring lines.
10. Lifeline deck fitting (port and starboard). Secures the forward ends of the forward lifelines.
11. Pusher knee (port and starboard). Allows the LCM-8 Mod 2 to push causeway sections and other vessels without damaging the LCM-8 Mod 2 or the causeway/other vessel.
12. Winch access door (under fire monitor platform). Permits access to the bow ramp winch for maintenance and inspection.
13. Fire monitor. Used to aid in firefighting operations both onboard the LCM-8 Mod 2 and when alongside other vessels.
14. Bow ballast tank fill valve (under fire monitor platform). Allows filling of the bow ballast tank.
15. Emergency hydraulic pump access door (under fire monitor platform). Allows access to the emergency hydraulic pump for repair, inspection, and use.
16. Starboard access ladder. Allows personnel access from the starboard wing wall to the cargo well.
17. Red deck light (port and starboard). Illuminates the cargo well for nighttime operations.
18. Accommodation module vent cover (port and starboard). Protects the accommodation module forward vents from damage. The cover has a hinged bottom that may be secured in the closed position by means of two wing nuts.
19. Access ladder, accommodation module top. Allows access from the cargo well to the top of the accommodation module.



TOPSIDE COMPONENTS--FORWARD

TOPSIDE COMPONENTS--AMIDSHIPS

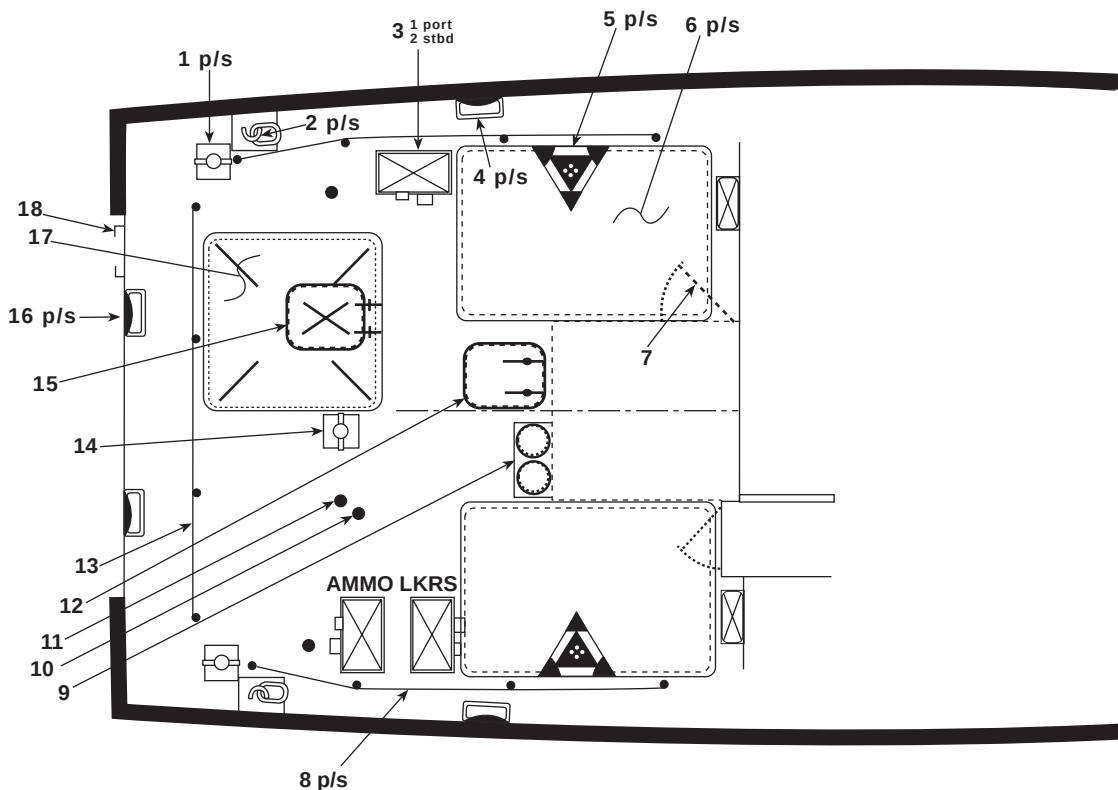
1. Engine room ventilation, intake (port and starboard). Permits flow of fresh air into engine room.
2. Lifting eye (port and starboard). Used to lift vessel.
3. Mooring bitt (port and starboard). Used to secure mooring lines.
4. Handrail (port and starboard). Provides handhold for personnel using the wing walls.
5. Potable water fill. Used to fill potable water tank from shore supply.
6. Guard rail. Protects base of HF/SSB (High Frequency/Single Sideband) radio antenna and antenna coupler from damage.
7. HF/SSB antenna and antenna coupler. Antenna and antenna coupler for HF/SSB radio. Antenna folds aft for stowage.
8. Accommodation module vent fan outlet cover (port and starboard). Protects the accommodation module vent fan outlets from damage. The cover has a hinged bottom that can be secured in the closed position by means of two wing nuts.
9. Black water discharge fitting. Permits discharge of contents of black water discharge tank to a suitable shore station.
10. Black water tank vent. Provides ventilation for the black water tank.
11. Potable water tank vent. Provides ventilation for the potable water tank.
12. Battery compartment vent cover. Protects the battery compartment vent outlet from damage. The cover has a hinged bottom that can be secured in the closed position by means of two wing nuts.
13. SINCGARS radio antenna. Antenna for SINCGARS radio.
14. Accommodation module access door. Weathertight door provides access from the aft deck to the accommodation module.
15. Deck locker door. Permits access to the deck locker.
16. Handrail. Provides handhold for personnel working on the accommodation module top near the pilothouse.
17. Life raft (port and starboard). 25-man life raft.
18. Cargo lashing rails. Used to lash cargo to accommodation module top.
19. Accommodation module vents. Provide ventilation in the overhead of the accommodation module.



TOPSIDE COMPONENTS--AMIDSHIPS

TOPSIDE COMPONENTS—AFT

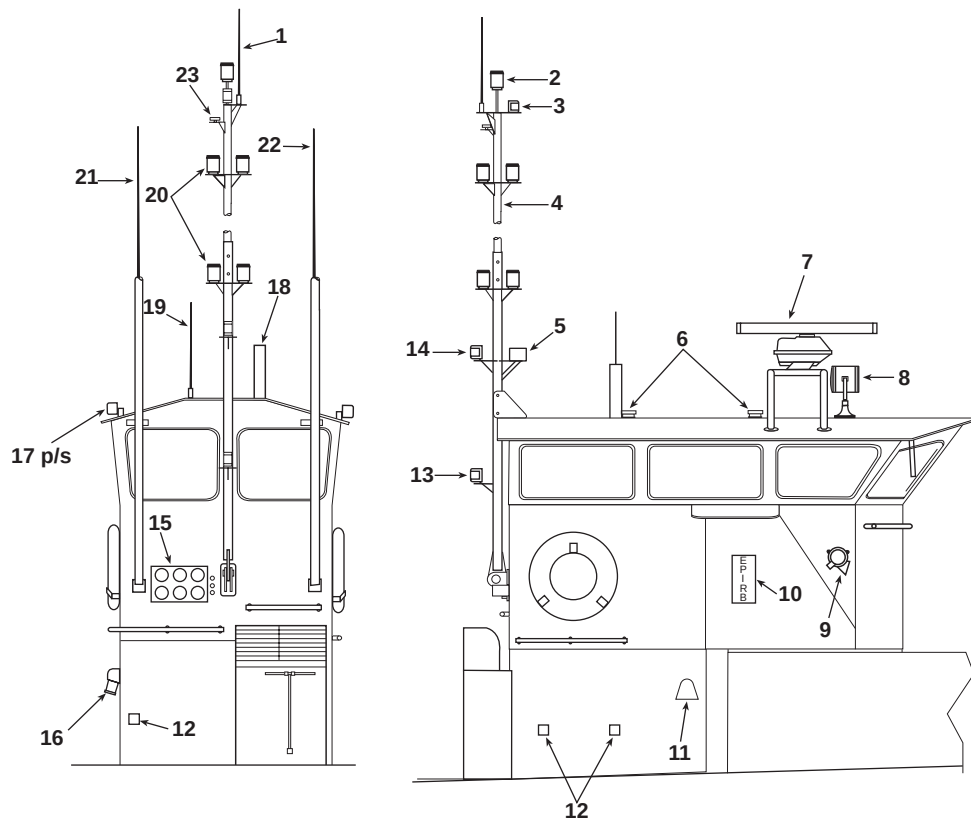
1. Mooring bitt (port and starboard). Used to secure mooring lines.
2. Lifting eye (port and starboard). Used to lift vessel.
3. .50 caliber ammunition storage (1 port, 2 starboard). Used to store .50 caliber ammunition on deck.
4. Chock (port and starboard). Used to route mooring lines.
5. .50 caliber gun mount (port and starboard). Used to mount .50 caliber guns for use on deck.
6. Engine room BERP (Bolted Equipment Removal Plate) (port and starboard). May be removed to allow access to engine room for removal of engines or other large equipment.
7. Pilothouse access door. Weathertight door allowing personnel access from the aft deck to the pilothouse.
8. Lifeline (port and starboard). Prevents personnel from falling overboard.
9. Engine room ventilation exhaust. Allows engine room ventilation fans to vent air from the engine room. The vent duct may be manually closed from the aft deck in case of fire or other emergency.
10. Fuel tank vent. Combined vent that vents both fuel tanks. Vent is protected by an inverted check valve.
11. Fuel tank fill. Common fill port for both fuel tanks. Valves in lazarette control fuel filling flow to each tank.
12. Engine room hatch. Raised watertight hatch permits access to the engine room.
13. Handrail. Welded steel handrail with opening centerline.
14. Towing bitt. Permits the LCM-8 Mod 2 to tow another vessel.
15. Lazarette hatch. Raised watertight hatch permits access to the lazarette.
16. Chock (port and starboard). Used to route mooring lines.
17. Lazarette BERP. May be removed to allow access to lazarette for removal of tanks and/or equipment.
18. Anchor bracket. Used to stow anchor when not in use.



TOPSIDE COMPONENTS - AFT

PILOTHOUSE EXTERIOR COMPONENTS

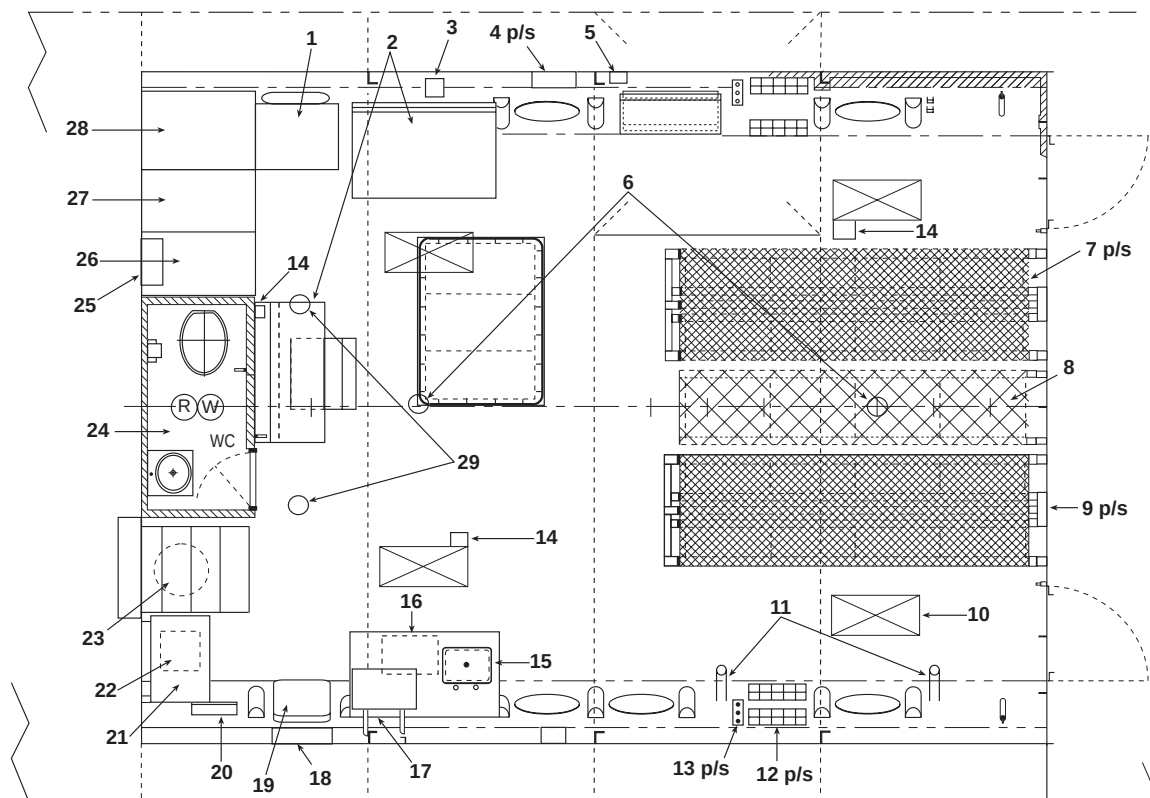
1. VHF Antenna. Antenna for command and control VHF radio.
2. Anchor light. White 360-degree light.
3. Masthead light. White 225-degree light.
4. Mast. Supports various navigation lights and antennas. Telescopes and folds aft for stowage.
5. MV-103 compass sender. Determines bearing relative to magnetic north and sends information to display in pilothouse.
6. Vents. Overhead vents for pilothouse.
7. Radar antenna. Antenna for radar. Display is located in pilothouse.
8. Searchlight. Used for nighttime illumination of cargo well, other vessels; aids navigation.
9. Horn. Used for navigation signalling.
10. EPIRB. Emergency Position Indicating Radio Beacon. Transmits emergency signal and vessel identification when activated. Aids in locating vessel in emergency.
11. Water closet exhaust fan outlet vent cover. Protects the vent from damage and/or contamination. The cover is provided with a hinged bottom that may be secured with two wing nuts.
12. Deck lights. 2 starboard, 1 aft, 1 port. Illuminate the aft deck.
13. Stern light. 135-degree white light.
14. Towing light. 135-degree white light.
15. Navigation light connection panel. Provides connections for navigation lights located on mast. Lights are disconnected when the mast is stowed.
16. Shore power receptacle. Allows vessel to connect to shore power via shore power cable.
17. Side light (port and starboard). 112.5-degree light; red port, green starboard.
18. IFF (Identification, Friend or Foe) antenna. Antenna for AN/APX-72 IFF transceiver.
19. VHF antenna. Antenna for pilothouse VHF radio.
20. NUC (Not Under Command) lights. 360-degree red lights.
21. Navtex antenna. Antenna for Navtex receiver.
22. Watch receiver and MF/HF (Medium Frequency/High Frequency) antenna. Antenna for watch receiver and MF/HF radio.
23. GPS (Global Positioning System) antenna. Antenna for GPS receiver.



PILOTHOUSE EXTERIOR COMPONENTS

ACCOMMODATION MODULE COMPONENTS

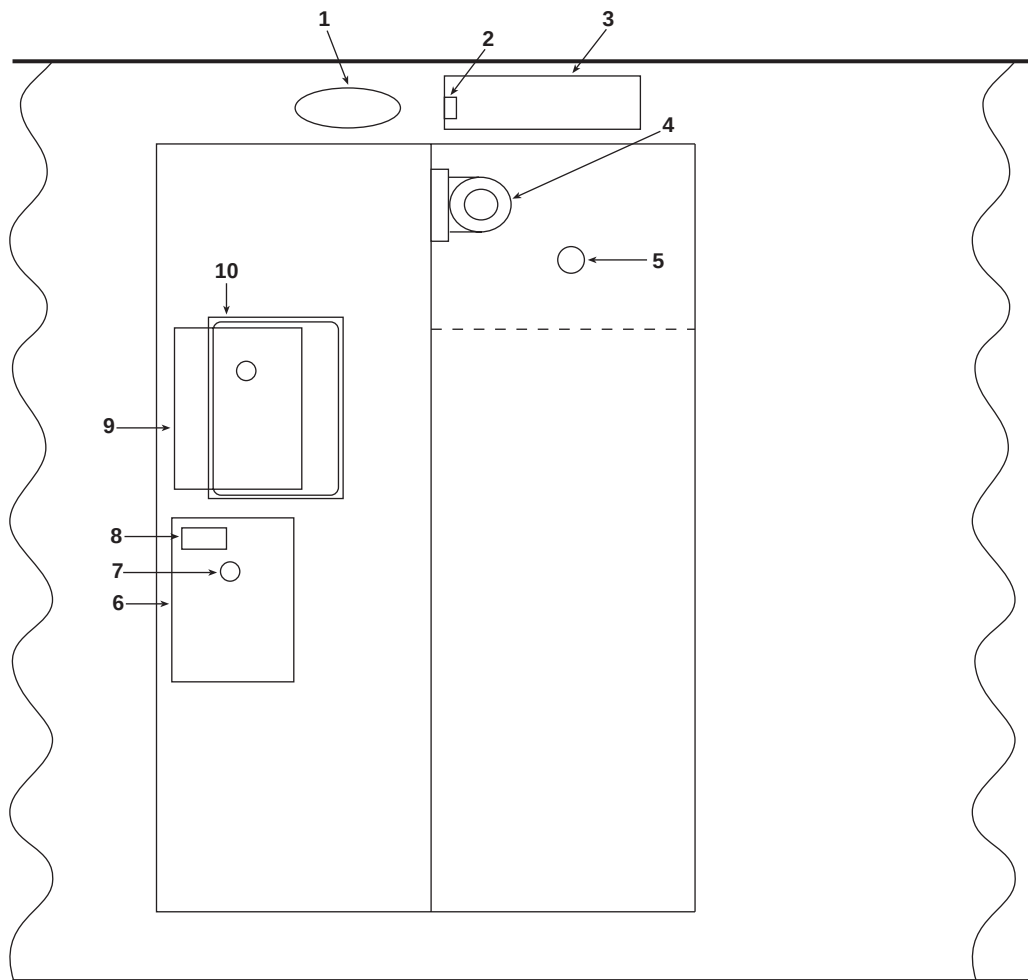
1. Comms shelf. Used to facilitate writing at comms station. Folds upward to stow.
2. Chart table. Used as workspace. Folds upward to stow.
3. Chart light. Illuminates outboard chart table.
4. Vent fan (port and starboard). Exhausts air from accommodation module.
5. 24 Vdc receptacle. Provides 24 Vdc power for accessories.
6. Smoke detectors. Monitor for smoke in accommodation module. Activate alarm in pilothouse if smoke detected.
7. Bench seat (port and starboard). Provides seating for passengers.
8. Table. Used as messing or work space.
9. Vent (port and starboard). Provides natural ventilation to accommodation module.
10. Fluorescent light (4 places). Combination white and red lighting for illumination of accommodation module.
11. Stowage rack. Allows for stowage of bench seats (7) and table (8) when disassembled.
12. Air conditioning/heating vent (port and starboard). Provides heated or cooled air to accommodation module as needed.
13. Air conditioning/heating control (port and starboard). Controls air conditioning/heating units.
14. Loudhailer speakers (3 places). Allow loudhailer to broadcast and receive to/from the accommodation module.
15. Sink. Allows washing of hands, food, material, etc. Drains to black water storage tank.
16. Black water discharge pump (beneath sink). Pumps black water from the blackwater tank to a shore facility.
17. Microwave oven. Allows for heating of food for passengers/crew.
18. Battery distribution box. Controls distribution of 24 Vdc power to other distribution boxes aboard the vessel.
19. Battery compartment hatch. Provides access to battery compartment for inspection, maintenance, service, etc.
20. Battery compartment vent fan. Ventilates battery compartment to prevent buildup of explosive gases.
21. Battery charger. Charges 24 Vdc battery bank used for vessel's supply.
22. Potable water pressure set. Pressurizes potable water for distribution.
23. Water heater. Heats potable water for water closet and sink.
24. Water closet. For components see "Water Closet Components."
25. Command and control distribution box. Distributes 24 Vdc power to comms rack components.
26. File cabinet. Permits stowage of documents near comms rack.
27. Comms rack. Provides mounting/stowage space for communications gear.
28. Printer shelves. Provide mounting for serial port and parallel port printers.
29. Vents (overhead). Provide natural ventilation to accommodation module.



ACCOMMODATION MODULE COMPONENTS

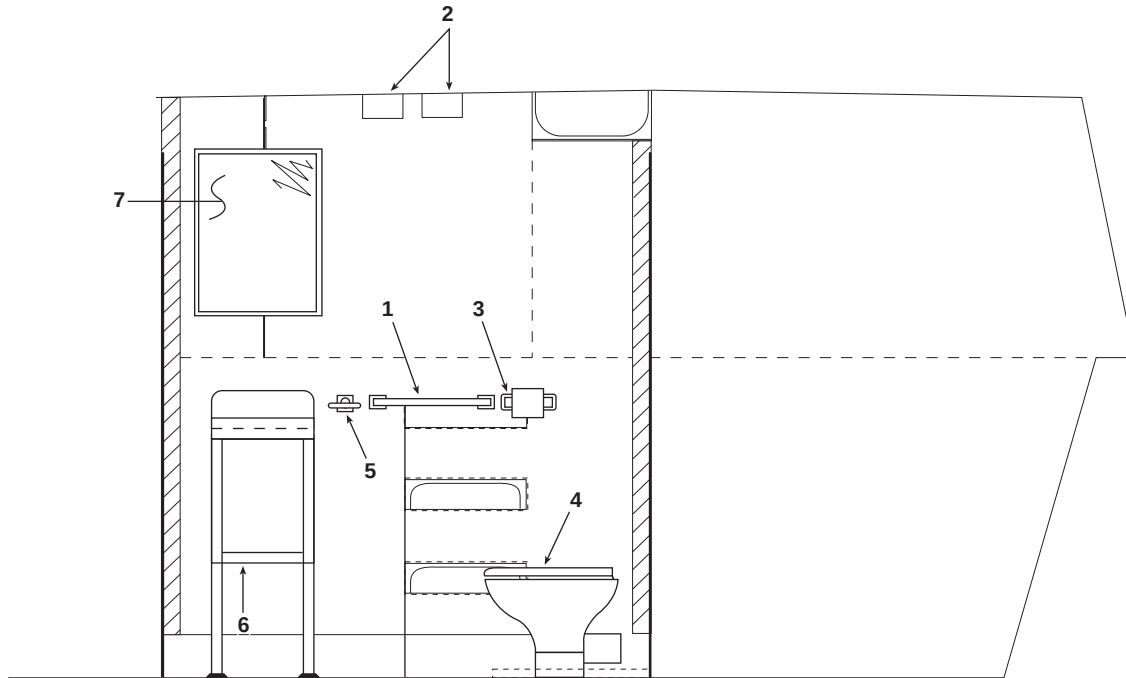
PORT STOWAGE LOCKER AND TANK VOID COMPONENTS

1. Bolted access plate. Allows personnel access to tank void.
2. Light switch. Controls light in port stowage locker.
3. Port stowage locker access hatch. Allows personnel access to port stowage locker.
4. FM-200 canister. FM-200 canister for engine room fire suppression system.
5. White light. Illuminates port stowage locker.
6. Potable water tank. 150-gallon tank stores potable water for use on the vessel.
7. Tank watch monitor sender. Transmits tank level data to the tank watch monitor display mounted in the pilothouse.
8. Windshield washdown pump. Pressurizes and supplies potable water to the windshield washdown nozzles.
9. Black water tank. 190-gallon tank stores black water for later discharge to a suitable shore station.
10. Accommodation deck soft patch. Removable plate that allows access to the tank void for tank removal.

**PORT STOWAGE LOCKER AND TANK VOID COMPONENTS**

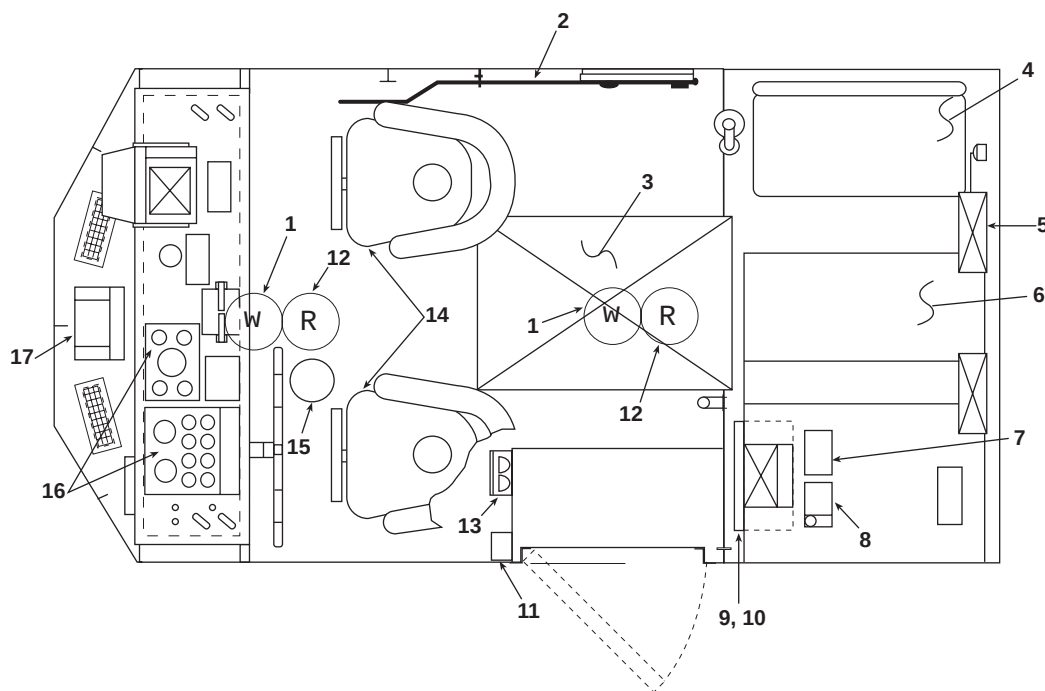
WATER CLOSET COMPONENTS

1. Towel rack. Used to hang towels.
2. Lights. One white light and one red light illuminate the water closet.
3. Toilet tissue holder. Used to hold toilet tissue.
4. Marine head. Provides sanitary facilities for passengers/crew. Discharges to black water tank.
5. Soap dish. Holds soap.
6. Sink. Used for washing hands. Supplied from potable water tank and hot water heater. Drains to black water tank.
7. Mirror. Mounted above sink, allows for personal grooming.

**WATER CLOSET COMPONENTS**

PILOTHOUSE COMPONENTS

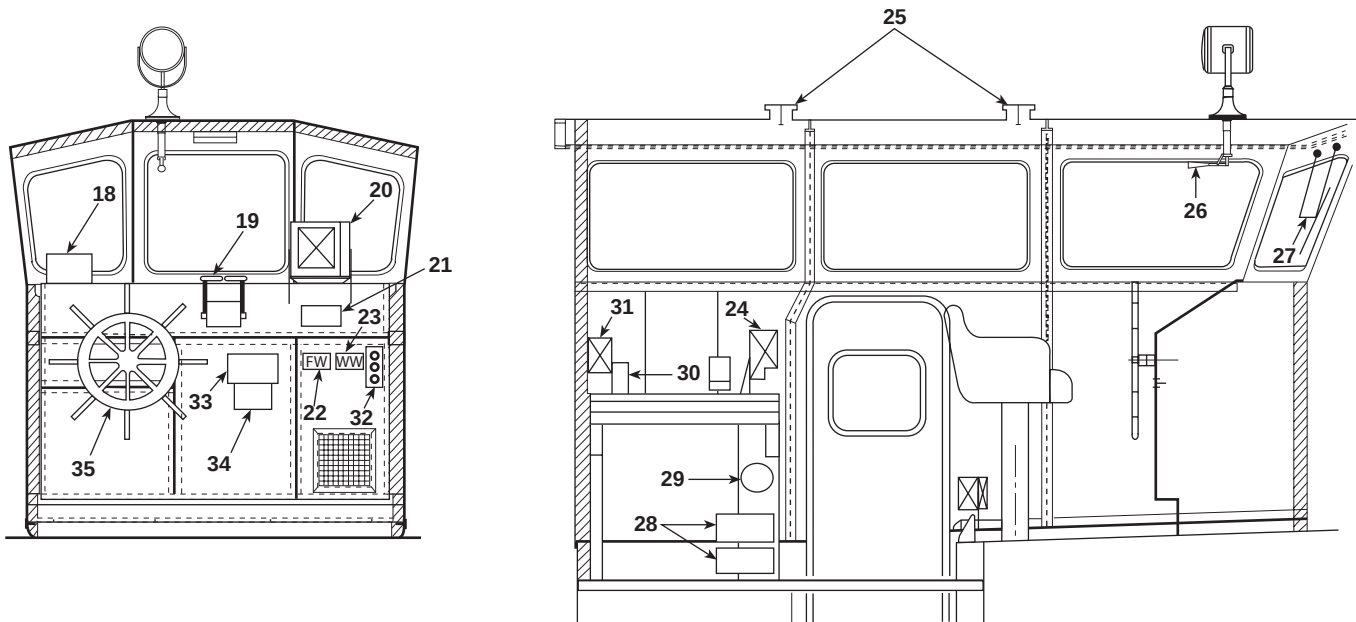
1. White light. Located in overhead, illuminates the pilothouse.
2. Ramp control lever. Controls raising and lowering of bow ramp.
3. Removable deck plate. Allows access to air conditioning equipment located under pilothouse deck.
4. Bench seat. Provides seating at chart table. Bench seat has stowage underneath.
5. HF/SSB radio. Provides long range communication capability.
6. Chart table. Provides working space in aft section of pilothouse. Top of chart table raises to allow access to chart stowage underneath.
7. DE-ICER Switch. Permits the operator to turn ON and OFF the pilothouse windshield de-icer.
8. GPS receiver. Provides readout of vessel's position and other navigational data.
9. Control and distribution panel. Contains breakers that control many of the vessel's 24 Vdc electrical circuits.
10. Comms nav aids distribution box. Contains breakers that control the communication gear and navigational aids located in the pilothouse.
11. Engine room fire suppression pull box. Remotely controls the discharge of FM-200 into the engine room.
12. Red light. Located in overhead, illuminates the pilothouse.
13. Engine room ventilation shutdown controls. T-handle controls close the engine room intake ducts in case of fire.
14. Chairs. Provide seating for coxswain (port) and for engineer (starboard).
15. General alarm contactor. Located on overhead. Activates general alarm.
16. Instrument panel. Allows coxswain and engineer to monitor and control propulsion, mechanical, navigation, communication, and lighting systems.
17. Digital compass. Provides digital readout of compass heading. Sender located on mast.



PILOTHOUSE COMPONENTS

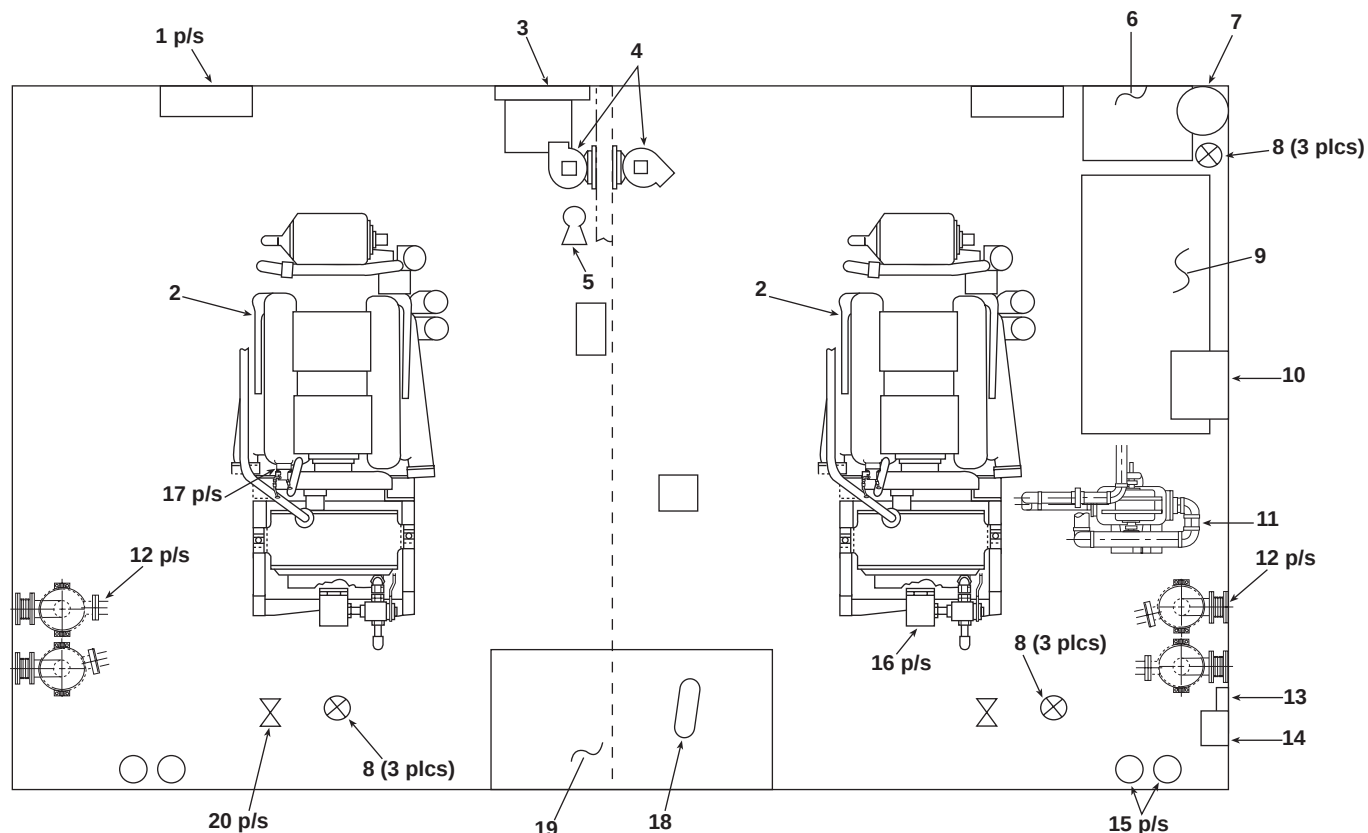
PILOTHOUSE COMPONENTS (continued)

18. Loudhailer. Allows communication between the pilothouse and the accommodation module.
19. Propulsion control head. Controls propulsion engine speed and marine drive gear engagement.
20. Radar display. Aids in navigation of vessel. Antenna mounted on pilothouse top.
21. VHF/FM DSC radio. Permits ship-to-shore and ship-to-ship communication.
22. Potable water tank level indicator. Displays level of potable water in potable water tank.
23. Black water tank level indicator. Displays level of black water in black water tank.
24. Fire detection system panel. Warns of fire in engine room and/or smoke in accommodation module.
25. Vent. Provides ventilation for pilothouse.
26. Searchlight control handle. Permits coxswain to remotely operate searchlight.
27. Windshield wiper. Located on all three windshields. Clears water from windshield to improve visibility.
28. DC to DC converters. Transform 24 Vdc to 12 Vdc for the VHF/FM radio and for the loudhailer.
29. 24 Vdc receptacle. Provides 24 Vdc power for portable accessories.
30. AN/PSN-11 interface switchbox. Permits GPS to interface with VHF/FM DSC radio, radar, digital compass, and MF/HF radio.
31. Ground detector. Used to detect presence of ground in 24 Vdc electrical system.
32. Air conditioner/heater control panel. Controls cockpit air conditioning/heating unit.
33. 220 Vac instrument panel. Monitors 220 Vac electrical system.
34. Generator instrument and control panel. Allows remote monitoring and control of the generator.
35. Helm. Used to control movement of vessel's rudders.

**PILOTHOUSE COMPONENTS (CONTINUED)**

ENGINE ROOM COMPONENTS

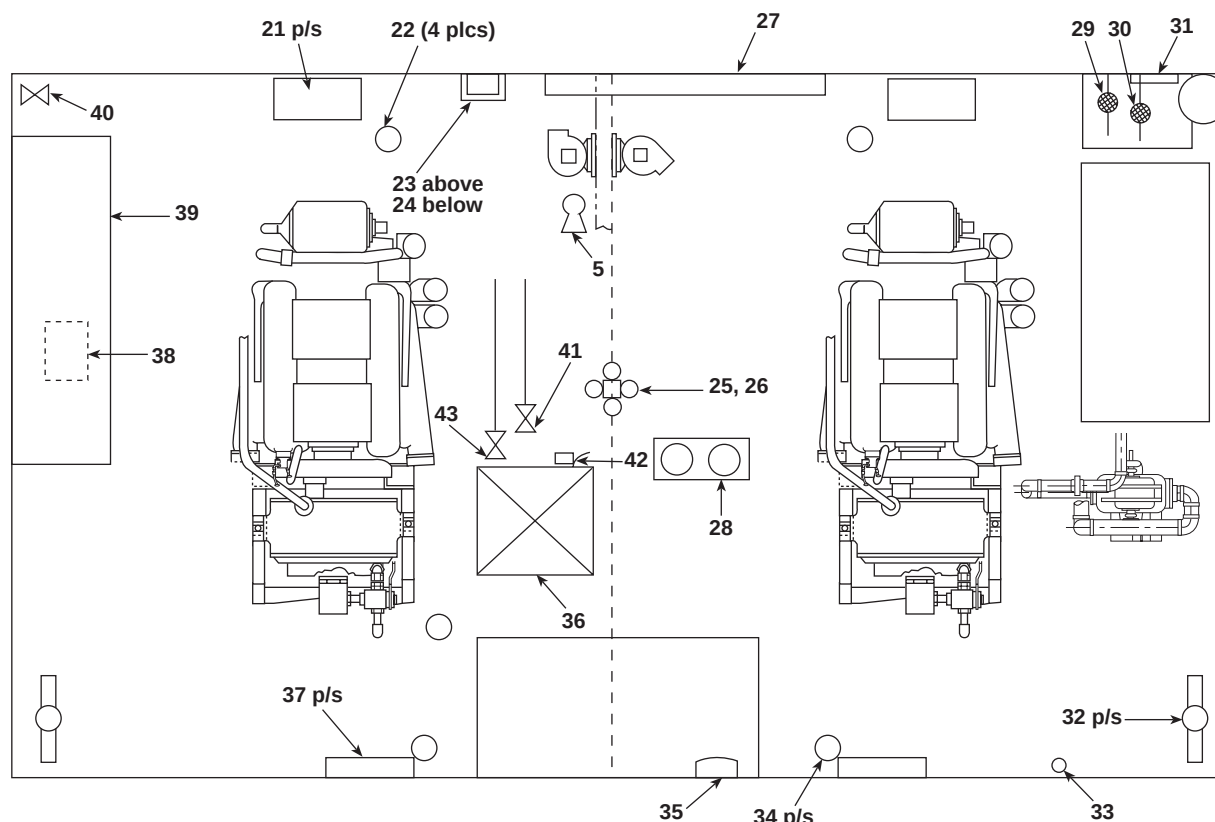
1. Intake air ducts (port and starboard). Provide fresh air to engine room.
2. Propulsion engine (port and starboard). Provides power to propel vessel and to run various accessories.
3. Steering hydraulic reservoir. Supplies hydraulic fluid to steering hydraulic system.
4. Bilge pumps. Hydraulically-powered pumps drain bilges and forward ballast tank.
5. FMS-200 discharge head. Discharges FMS-200 fire suppressant into the engine room to suppress fire.
6. Sea chest. Raw water intake for air conditioning, generator, fire pump, and water closet.
7. Generator muffler. Quiets generator engine.
8. Fire detector sensor (3 places). Detects fire and sends signal to panel in pilothouse.
9. Generator. Provides 220 Vac and 110 Vac power to vessel's electrical system.
10. Generator battery box. Houses 12 Vdc starting battery for generator.
11. Fire pump. Provides water to the fire monitor (forward, starboard) and fills the forward ballast tank.
12. Propulsion engine mufflers (port and starboard). Quiet propulsion engines.
13. Shore power transfer switch. Permits the operator to select between shore power and generator power.
14. 220 Vac to 110 Vac transformer. Converts 220 Vac power to 110 Vac power.
15. Accumulators (port and starboard). Store hydraulic pressure for use by propulsion engine starting motors.
16. Bilge/ramp hydraulic pump (port and starboard). Driven by the engine, powers bilge pumps, bow ramp winch, and crane.
17. Steering hydraulic pump (port and starboard). Driven by the engine, powers hydraulic steering system.
18. Hydraulic filters. Filter hydraulic oil returning to the main hydraulic reservoir.
19. Main hydraulic reservoir. Supplies hydraulic fluid for the bilge/ramp hydraulic system and for the starting hydraulic system.
20. Propulsion engine raw water intake valve (port and starboard). Supplies raw water for cooling the propulsion engine exhaust.



ENGINE ROOM COMPONENTS

ENGINE ROOM COMPONENTS (continued)

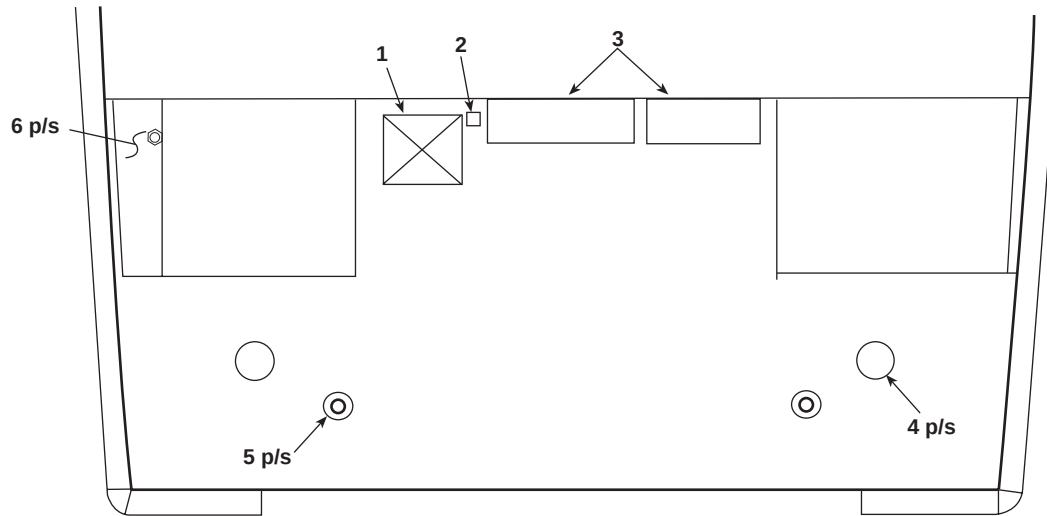
21. Expansion tank (port and starboard). Allows filling of propulsion cooling system and for expansion of coolant.
22. White light (4 places). Illuminates engine room. Controlled by switch (42).
23. General alarm panel. Fuse and junction box for general alarm system.
24. Fire and smoke junction box. Junction box for fire detection system.
25. Fire extinguishers. Two CO₂ and two dry chemical extinguishers provide protection for engine room.
26. Fire alarm horn and strobe. Alerts engine room personnel to presence of fire on board.
27. Bilge manifold. Contains valves used to drain various bilge compartments and the forward ballast tank.
28. Exhaust fans. Draw air from the engine room. Fresh air is drawn in through intake ducts (1).
29. Air conditioning raw water strainer. Strains raw water entering air conditioning raw water system to protect pump.
30. Generator raw water strainer. Strains raw water entering generator exhaust cooling system to protect pump.
31. 220/110 Vac distribution panel. Controls distribution of 220 Vac and 110 Vac electrical power on vessel.
32. Propulsion engine raw water strainer (port and starboard). Removes contaminants from the propulsion engine exhaust cooling water.
33. Fuel filter/water separator, generator. Removes water from generator fuel and acts as primary filter.
34. Fuel filter/water separator, propulsion (port and starboard). Removes water from propulsion engine fuel and acts as primary filter.
35. General alarm bell. Alerts engine room personnel to general alarm condition.
36. Access hatch. Permits personnel access to engine room from aft deck.
37. Local operating panel (port and starboard). Contains gauges for propulsion engines and local/remote switch.
38. Oily water discharge pump. Pumps oily water into, and out of, the oily water storage tank.
39. Oily water storage tank. 150-gallon tank holds oily water until discharged to a suitable shore station.
40. Bilge overboard discharge valve. Allows discharge of bilge overboard when open.
41. Oily water storage tank vent valve. Provides venting for oily water storage tank during pump-out.
42. Light switch. Controls engine room lights.
43. Oily water storage tank discharge valve. Provides connection for discharge hose during pump-out. Closes to prevent leakage.



ENGINE ROOM COMPONENTS (CONTINUED)
Items not shown omitted for clarity.

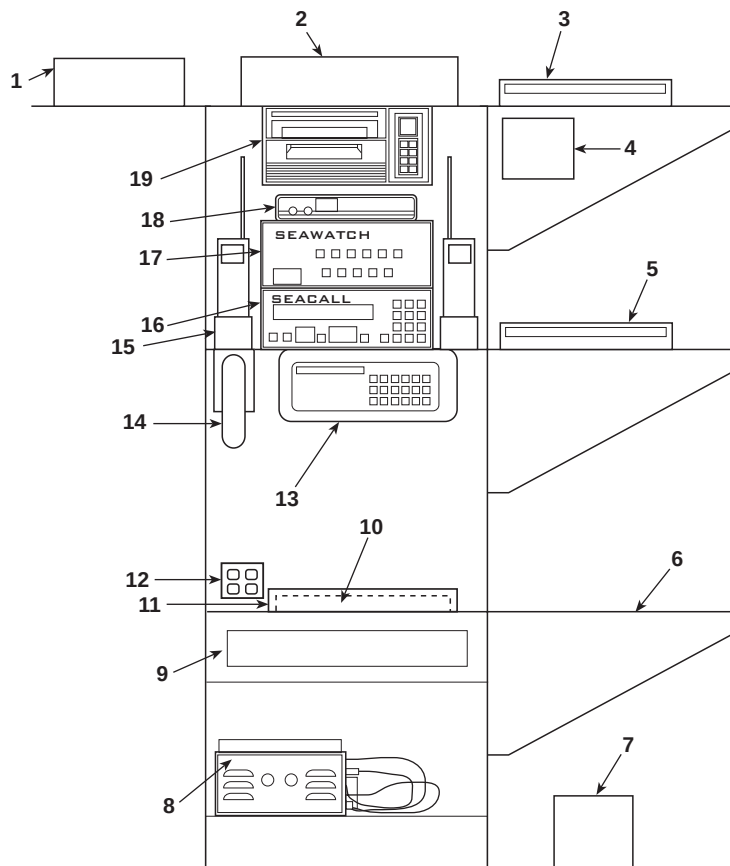
LAZARETTE COMPONENTS

1. Access hatch. Allows personnel access into lazarette.
2. Light switch. Controls lazarette lighting.
3. Weapons lockers. Provides storage for weapons.
4. White light (port and starboard). Illuminates lazarette.
5. Rudder post (port and starboard). Connected to rudder, permits control of rudder position.
6. Fuel tank (port and starboard). Stores fuel for propulsion engines and for generator.

**LAZARETTE COMPONENTS**

COMMUNICATIONS LOCKER COMPONENTS

1. AN/VRC SINCGARS Radio. Provides secure voice communication between LCM-8 Mod 2 and other vessels, vehicles, and aircraft.
2. IFF-APX 72. Used to identify LCM-8 Mod 2 to other vessels, vehicles, and aircraft and to identify other vessels, vehicles, and aircraft to the LCM-8 Mod 2.
3. GMDSS serial printer. Prints output from the MF/HF DSC radio and the MF/HF DSC watch receiver.
4. Loudhailer speaker. Permits RAY 430 loudhailer to broadcast to the communications locker area.
5. GMDSS parallel printer. Prints output from HF/SSB radio and from data terminal.
6. Chart table. Provides working area for personnel in the communications locker area.
7. Transformer. Transforms 220 Vac to 110 Vac for data terminal, serial printer, and parallel printer.
8. SEA 3301 transceiver. Transceiver shared by both SEA 330 HF/SSB radio terminals and the SEATOR 3000 modem.
9. Drawer. Drawer with flip up tray cover provides storage for manuals, papers, and supplies.
10. Surge suppressor (back of cabinet). Provides electrical surge protection for data terminal, serial printer, and parallel printer.
11. Data terminal (front of cabinet). Laptop computer acts as data terminal for HF/SSB and modem communication.
12. 110 Vac receptacle. Provides 110 Vac power to surge suppressor which, in turn, powers data terminal and printers.
13. HF/SSB radio. SEA 330 radio provides long-range communication for voice and data transmission.
14. Handset. Handset for HF/SSB radio. Used for voice communication.
15. Handheld VHF/FM radio. Standard Horizon HX350 handheld VHF/FM radios are used whenever short-range portable communication capability is required.
16. MF/HF DSC controller. SeaCall 7000 radio is used for long-range communication. DSC feature allows secure transmissions.
17. MF/HF DSC watch receiver. SeaWatch watch receiver monitors MF/HF distress frequencies and DSC transmissions and alerts when a distress call is received.
18. Modem. SEATOR modem allows data terminal to send and receive data via the HF/SSB radio.
19. Navtex receiver. Furuno Navtex NX-500 receiver automatically monitors for maritime safety alerts and prints the alerts. The unit also gives an audible alert when search and rescue alerts are received.



COMMUNICATIONS LOCKER COMPONENTS

EQUIPMENT DATA**MOBILITY DATA**

Speed	
(light displacement)	10.8 knots (20 km/hr)
(full load displacement)	9 knots (16.7 km/hr)
Cruising Range	
(light)	320 nautical miles (592.6 km)
(loaded)	271 nautical miles (501.9 km)

HULL AND ACCOMMODATIONS DATA

Length, overall (over fendering)	74 ft. (22.2 m)
Beam (over fendering)	22 ft. 0 1/8 in. (6.7 m)
Beam, molded	20 ft. 11 3/4 in. (6.4 m)
Depth, molded (amidships)	9 ft. 4 in. (2.8 m)
Draft (full load)	4 ft. 6 in. (1.4 m)
Freeboard, loaded, mean	4 ft. 10 in. (1.5 m)
Displacement	
(light)	71.8 tons (72.0 t)
(loaded)	116.07 tons (118.0 t)
Payload	41.3 tons (37.5 t)
Cargo Space	
(length)	18 ft 7 in (5.7 m)
(width)	14 ft 6 in (4.4 m)
Accommodation Module	
(length)	24 ft 2 in (7.4 m)
(width)	14 ft 6 in (4.4 m)
Complement:	
Crew	3
Troops	47

PROPULSION ENGINE**Base Engine**

Manufacturer	Detroit Diesel
Model	7122-7000
Shaft horsepower	400
Full load speed	2100 r/min
Rotation	Right-hand
Number of cylinders	12
Lube oil capacity	40 qts (37.9 L)

Engine Coolant System

Coolant type	Ethylene glycol/water mix
Coolant capacity	21 gal (79.5 L)
Keel cooler	Buships Dwg. No. C-3166915-D
Pump	(Furnished with engine)

Raw Water Cooling System

Pump	(Furnished with engine)
Duplex strainer Manufacturer/Model	Gross Mechanical Laboratory/HD 2000A

GENERATOR SET**Base Generator**

Manufacturer	Northern Lights
Model	ML844L
Capacity	20kW

GENERATOR SET (continued)**Engine Coolant System**

Coolant type	Ethylene glycol/water mix
Keel cooler manufacturer/model	F.W. Fernstrum/B654U

Raw Water Cooling System

Pump	Furnished with Engine
Strainer manufacturer/model	Groco/ARG-750-S

FUEL SYSTEM

Fuel tank capacity (each)	432 gal (1635.3 L)
Fuel filter/water separator (propulsion engine)	
Manufacturer	Racor
Model	1000FG
Fuel filter/water separator (generator engine)	
Manufacturer	Racor
Model	120R

MARINE TRANSMISSION

Manufacturer	Twin Disc
Model	MG-514C
Minimum oil pressure (cruising)	215 lb/in ² (14.8 bar)
Oil capacity	6 gal (22.7 L)

HYDRAULIC STARTING SYSTEM

Operating pressure	3250 lb/in ² (224.1 bar)
Relief pressure	3400 lb/in ² (234. bar)
System refill capacity	7 gal (27 L)
Recharging pump w/adaptor plate (engine)	Bosch RPA 300412B
Recharging pump (hand)	Bosch HPA 300118
Starting motor	Bosch CMD2A111
Accumulator	(2) Bosch ACB-30A-7109A
	(2) Bosch ACB-30B-7110B
Filter, high pressure "T"	Bosch FRK 300382-3A
Filter, high pressure inline	Bosch FRH 300116
Control valve	Waterman 314LE-6-24
Level indicator	Gems Sensors (Type M2) 87744
Relief valve	Fluid controls 1A32-F4-60S

HYDRAULIC STEERING SYSTEM

Operating pressure	1050 lb/in ² (72.4 bar)
Relief pressure	1500 lb/in ² (103.4 bar)
System refill capacity	18 gal (68.1 L)
Helm Unit	Char Lynn WK-11-SCC
Pump	Vickers
	VTM42-40-15-15-ME-R1-14
Cylinder	Ortman Miller 2TH--Style G
Return filter	Gresen FSP107-1ED1A
Flow divider	Gresen DVD50-3
Relief valve	Gresen J-50
Suction strainer	Hydrocraft HA-FS-5
Counterbalance valve	Double A SAS-175-C-K144
Check valve	Double AD-06-10A1

HYDRAULIC STEERING SYSTEM (continued)

Ball valve	Worcester 444B
Temperature/level indicator	Hydrocraft HSG-88

RAMP AND CRANE HYDRAULIC SYSTEM

Operating pressure	Determined by load
Relief pressure (ramp hoist)	2100 lb/in ² (144.8 bar)
Relief pressure (crane)	2500 lb/in ² (172.4 bar)
System refill capacity	90 gal (340.7 L)
Winch	Gearmatic 22-SEC
Pump (starboard)	Vickers 35V25A-1C-10L-002
Pump (port)	Vickers 35V25A-1C-10L-132
Control valve	Vickers CM3N02R20-BL-30
Suction strainer	Jelliff J75-600-100-2-1
Return filter	Gresen FLR 415
Hand pump	Pine 160-8
Check valve	Double A D4-185
Shuttle valve	Gearmatic 50835

ELECTRICAL SYSTEM**12 Vdc System (Generator Starting)**

Alternator	Supplied with generator
Voltage regulator	Integral to alternator
Battery	29HMEV
Cold cranking amps (CCA)	675
Amp-hour capacity	120

12 Vdc System (Communications)

Transformers (under chart table in pilothouse)	Newmar 48-12-6I

24 Vdc System (Ship's Service)

Batteries	
Number	4
Make	Exide
Type	8D-900-D
Connection	2 pairs connected in series
Alternator (mounted on propulsion engines)	
Manufacturer	Leece-Neville
Model	8LHA 3096U
Output	24 Vdc/110 Amps
Battery Charger	
Manufacturer	LaMarche
Model	A12B-100-24V-B1-12L-10055
Input volts	240 Vac, single phase
Input amps	26
Output volts	24 Vdc
Output amps	100

110 Vac Service

Transformer (at comms rack)	
Make	Wades Electrical Distributors, PT 1500
Model	Type PT 1500

110 Vac Service (continued)

Transformer (engine room)

Make	Acme Electric
Model	T-2-53516-3S
Generator	(see 220 Vac below)

220 Vac Service

Generator

Make	Northern Light
Model	ML844L
Output voltage	220/110 Vac
Rating	20 kW

COMMUNICATION AND NAVIGATION EQUIPMENT

VHF-FM DSC Radio	Ross DSC-500
Primary frequency range	
Transmit	156.025 - 157.425
Receive	156.025 - 163.775
Programmable frequency range	
Transmit	156.000 - 159.175
Receive	156.025 - 163.775
Input power	12 Vdc
Output power	1 or 25 W, selectable
Handheld VHF transceiver	Standard Horizon HX350SAS1S1
HF/SSB transceiver	SEA 330
Frequency range	
Transmit	1.6 MHz - 30 MHz
Receive	490 kHz - 30 MHz
Input power	24 Vdc
Output power	300 W
MF/HF DSC watch receiver	SEA 7001
Operating frequencies	2187.5, 8414.5, 4207.5, 12577, and 16804.5 kHz
Input power	12 Vdc
MF/HF DSC controller	SeaCall 7000
Input power	12 Vdc
MF/HF transceiver	SEA 3301
Modem	Seator 3000
Input power	24 Vdc (from HF/SSB)
NAVTEX receiver	Furuno NX500
Receiving frequency	518 kHz
Input power	24 Vdc
AN/VRC-46 SINCGARS transceiver	GFE
IFF-APX 72	GFE
Loudhailer	Raytheon RAY 430
Input power	12 Vdc
Audio output	30 W
Radar	Raytheon Pathfinder R80
Minimum range	25 yds (22.9 m)
Maximum range	72 nmi (133.3 km)
Input power	24 Vdc
GPS Receiver (Handheld), AN/PSN-11	GFE
Digital compass	KVH Model MV103AC
Input power	24 Vdc
Data terminal	IBM ThinkPad
Input power	110 Vac

COMMUNICATION AND NAVIGATION EQUIPMENT (continued)

GMDSS serial port printer	
Make	Okidata
Model	Microline 184 Turbo
Input power	110 Vac
GMDSS parallel port printer	
Make	Okidata
Model	Microline 184 Turbo
Input power	110 Vac
Emergency Position Indicating Radio Beacon (EPIRB)	Alden Marine, Satfind-406
Output frequency	406.025 MHz 5W
	121.50 MHz 25mW
Search and Rescue Transponder (SART)	TELLUSART MkII
Type	Carry off

WINDSHIELD WIPERS

System	Wynn S1602C

EMERGENCY BILGE SYSTEM

Bilge pump	MP Pump 27805
Hydraulic motor	HPI M2-169
Bypass flow regulator	Fluids Controls
	2FA86-R-12T-12T-12T-25-S
Hydraulic diverter valve (directional ball valve)	Worcester 1 1/2--D44 6YSEVI

OILY WATER DISCHARGE SYSTEM

Tank capacity	150 gal (567.8 L)
Electric pump	Oberdorfer 991-43-C82
Capacity	3.0 gal/min (L/min)
Input power	24 Vdc
Current draw (maximum)	17.0

BLACK WATER SYSTEM

Tank capacity	190 gal (719.2 L)
Electric marine toilet	Jabsco 37010-1096
Tank monitor system	SeaLand Tankwatch III
Discharge pump	SeaLand 317-302400

POTABLE WATER SYSTEM

Tank capacity	150 gal (567.8 L)
Water pressure set	Raritan GMPT 24
Potable water filter	Aqua City AIM-3
Water heater	Torrid MV-10
Tank monitoring system	SeaLand Tankwatch III
Windshield washdown pump	Jabsco 44010-2011

FIREFIGHTING/BALLAST SYSTEM

Forward ballast tank capacity	6 tons (5.4 metric ton)
Fire pump	Deming 5061-2256-2061
Driven by	Generator via electric clutch
Capacity	200gal/min ³ (909 L/min)
	@ 1800 r/min
Working pressure	
80 lb/in ² (5.5 bar)	

FIREFIGHTING/BALLAST SYSTEM(continued)

Strainer	Hayward 85
Pressure relief valve setting	100 lb/in ² (6.9 bar)
Fire monitor	Akron Brass, Omega Monitor 3"
Fire nozzle	0489 0087 Akron Brass

AIR CONDITIONING/HEATING SYSTEM

Operating voltage	220 Vac, single phase
Refrigerant	
Type	R-22A
Capacity	25 lb (11.3 kg)
Cooling Unit	
Wheelhouse	Cruisair EBO10C
Accommodation module (2)	Cruisair EBO24C
Condensing Unit	
Wheelhouse	Cruisair WFAH10C
Accommodation module (2)	Cruisair F24C-P
Raw water pump	Cruisair P1500BX

VENTILATION SYSTEM

Engine room ventilation fans	Elta 250 mm
Operating voltage	24 Vdc
Capacity	1250 ft ³ /min (590 L/sec)
Battery compartment ventilation fan	Elta 3-inch
Operating voltage	24 Vdc
Capacity	40 ft ³ /min (18.9 L/sec)
Accommodation module ventilation fan	Sutton MB324
Operating voltage	24 Vdc
Capacity	115 ft ³ /min (54.2 L/sec)
Water closet ventilation fan	Sutton MB324
Operating voltage	24 Vdc
Capacity	115 ft ³ /min (54.2 L/sec)

CRANE

Manufacturer and model	Effer 26001E
Load capability	1000 lb (453.6 kg) @ 12 ft (3.7 m) reach
Slewing capability	380 degrees

FIRE SUPPRESSION SYSTEM

Manufacturer and model	Walter Kidde FM-200
Fire suppression agent	FM-200
CO ₂ capacity	70 lb (31.6 kg)
Space protected	Engine room

FIRE DETECTION/ALARM SYSTEM

Manufacturer	Walter Kidde
Operating voltage	24 Vdc
Zones	2--Engine room & accommodation module
Actuated from	Pilothouse
Detectors	
Engine room	3 flame detectors
Accommodation module	2 smoke detectors

EQUIPMENT CONFIGURATION

There are no significant differences in configuration among the LCM-8 Mod 2 vessels. Vessel LCM-8594 provides the baseline configuration for this modification. All follow-on vessels will conform to this configuration.

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THEORY OF OPERATION
PROPULSION SYSTEM**

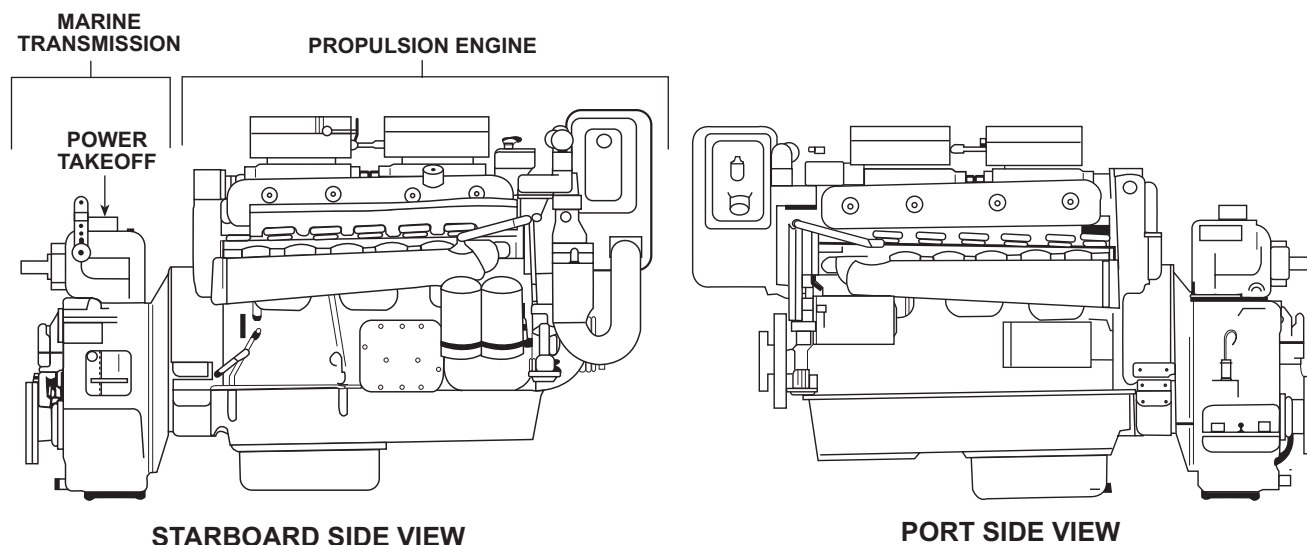
PROPULSION ENGINES

Two Detroit Diesel 12V71 engines power the LCM-8 Mod 2 propulsion system. Each engine has 12 cylinders arranged in a “V” configuration. Engine rotation is right hand (flywheel rotates counterclockwise when viewed from the rear) for both engines. The propulsion engines power the following components:

1. Marine transmissions that propel the vessel.
2. 24 Vdc alternators that provide ship's power when the propulsion engines are operating (see WP 0005 00).
3. Hydraulic pumps for the steering, starting, bilge, ramp, and crane systems (see WP 0006 00).

Engine speed is controlled by a dual function control head, located in the pilothouse console. The control head lever actuates the engine's governor lever by means of a double acting cable assembly. The engine's governor, in turn, controls engine speed throughout a preset range. The governor also acts to prevent the engine from exceeding a preset speed.

Refer to TM 5-2815-231-14 for further information on the propulsion engines.



MARINE DRIVE GEARS

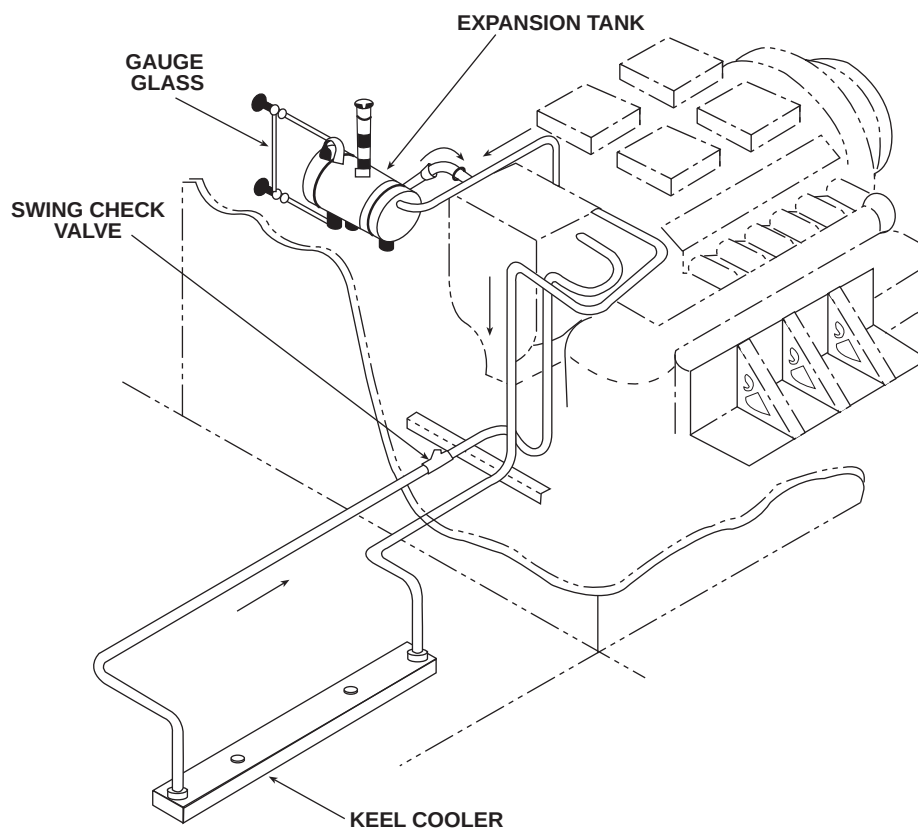
Two Twin Disc MG-514C marine transmissions transmit the engine's rotating power to the propellers. The transmissions allow shifting between forward, neutral, and reverse. The transmissions have a 2:1 reduction ratio. A power takeoff is mounted on top of each transmission to drive the bilge/ramp/crane hydraulic pump.

The marine transmissions also facilitate counterrotation of the propellers. Although both propulsion engines are right hand rotation, good marine engineering practice dictates that the starboard propeller should be left hand rotation while the port propeller is right hand rotation. The internal gearing of the marine transmissions permits this counterrotation.

Refer to TM 5-2815-231-14 for further information on the marine transmissions.

ENGINE COOLING SYSTEM

The propulsion engines are cooled by a mixture of water and ethylene glycol antifreeze. This mixture of water and antifreeze protects against freezing, overheating, and corrosion. A 50/50 mixture of ethylene glycol antifreeze and water will freeze at -34°F (-36.7°C), which is significantly lower than the freezing temperature of water alone. The same 50/50 mixture has a boiling point of up to 276°F (135.6°C), depending upon cooling system pressure. Ethylene glycol antifreeze also contains additives that help prevent corrosion of cooling system components.



ENGINE COOLING SYSTEM

The engine coolant is circulated through the closed loop cooling system by an engine-driven centrifugal water pump. As the coolant circulates through the engine, it absorbs heat from the engine's cylinder block, cylinder heads, exhaust manifold surfaces, and from the engine oil and the marine transmission oil. After circulating through the engine, the coolant passes through a keel cooler that is longitudinally recessed in the hull between frames 25 and 31. As the coolant circulates through the keel cooler, the heat absorbed from the engine is transferred to the raw water outside the hull. After the coolant has passed through the keel cooler, it reenters the engine through a swing check valve to begin the cooling cycle again.

Engine coolant temperature is regulated by thermostats mounted in the propulsion engines. These thermostats regulate coolant temperature by controlling the flow of coolant through the system. When the coolant is cold, it is recirculated through the engine cooling passages without passing through the keel cooler. When the coolant reaches operating temperature, a portion of the coolant is circulated through the keel cooler for cooling. Flow through the keel cooler will vary depending upon many variables, including coolant temperature, raw water temperature, and engine load conditions.

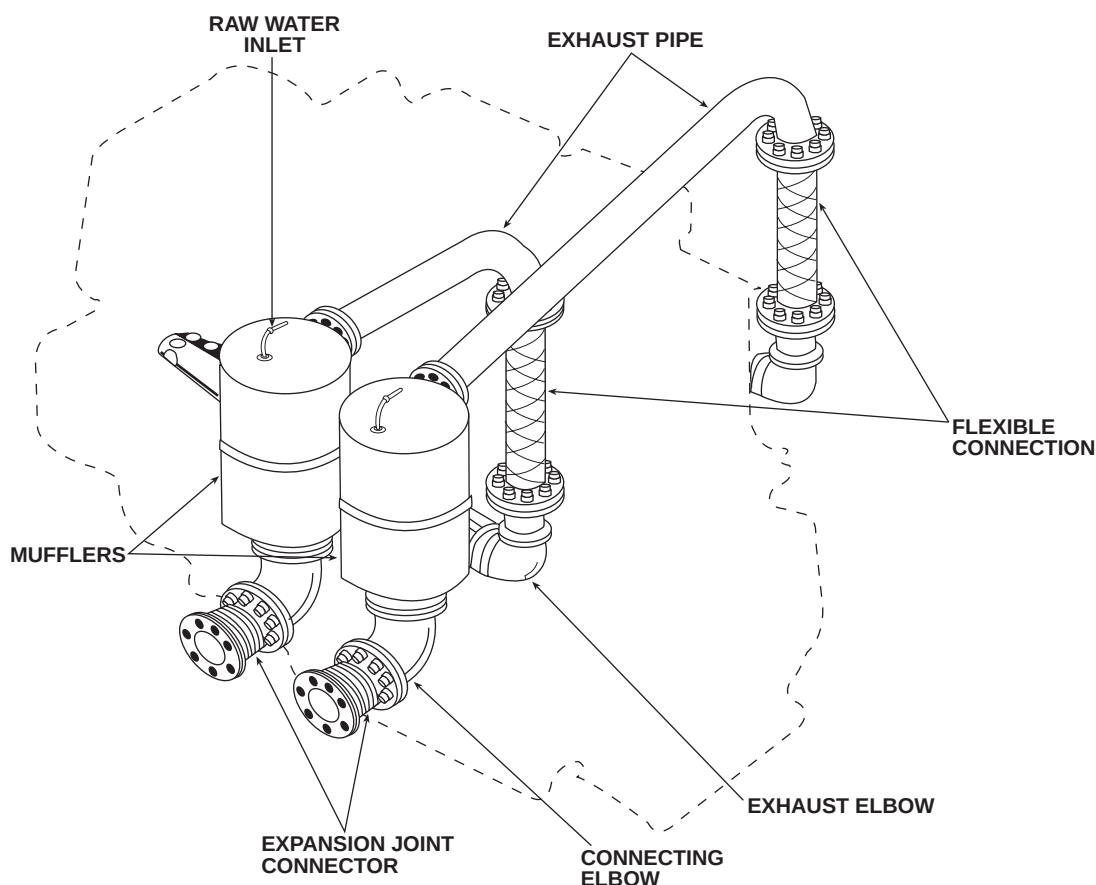
The engine cooling system has an expansion tank mounted on the engine room bulkhead directly forward of the engine. The expansion tank allows coolant expansion and contraction and allows access to the system for filling and/or resupplying the system.

ENGINE EXHAUST SYSTEM

Each propulsion engine has an exhaust system that quiets the exhaust and discharges it to the atmosphere. The exhaust system contains two marine mufflers per engine. The exiting exhaust gases are cooled by raw water injected into the top of the mufflers by an engine-driven raw water pump. As the raw water mixes with the exhaust gases, the exhaust gases are cooled, and contract. This contraction helps to quiet the exhaust. The mufflers discharge overboard through the side of the hull between frames 35 and 37, port and starboard.

Flexible connections at the exhaust manifold and expansion joint connectors at the hull connection isolate the exhaust system from engine vibration and allow expansion and contraction of the system as it heats and cools.

The exhaust piping from the engines to the mufflers is insulated with three inches of thermal glass fiber installed in three, 1" layers in accordance with MIL-I-16411. Type II insulation over the flanges is removable to allow repair of the system.



ENGINE EXHAUST SYSTEM (TYPICAL)

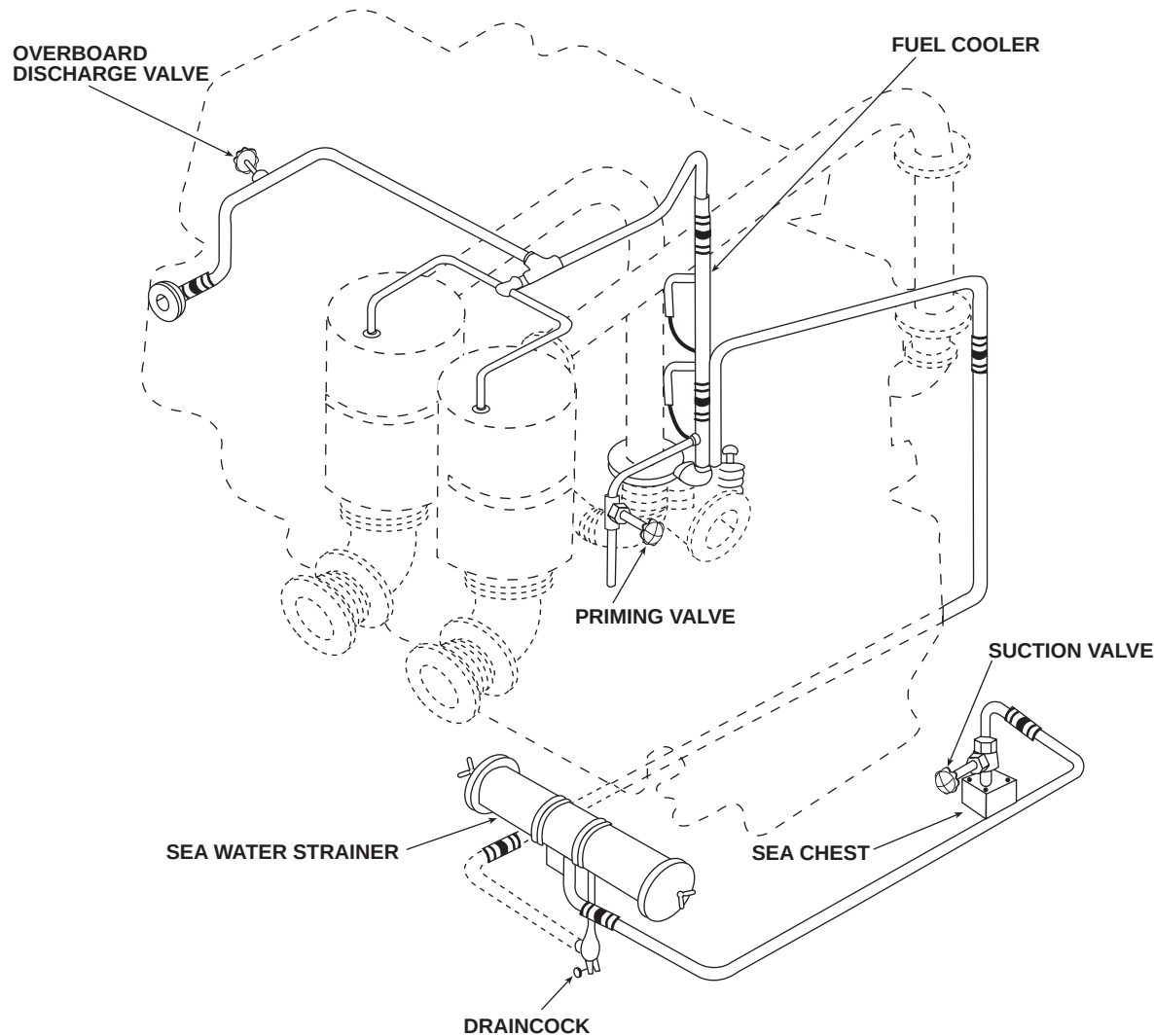
PROPULSION ENGINE RAW WATER COOLING SYSTEM

Raw water is used to cool the propulsion engine exhaust and the diesel fuel exiting the engines (see WP 0004 00). The propulsion engine raw water cooling system also primes the bilge pumps (see WP 0007 00).

Sea chests, located immediately aft of each marine transmission, supply raw water to the system. A suction valve is located at each sea chest to allow the incoming raw water to be secured when necessary.

PROPULSION ENGINE RAW WATER COOLING SYSTEM (continued)

Each propulsion engine has an engine-driven raw water pump. A sea water strainer assembly is located inline between the sea chest and the raw water pump intake to prevent debris from entering the pump. The duplex design of the strainer allows one side of the strainer to be cleaned while the other side of the strainer remains in use.

**RAW WATER COOLING SYSTEM (TYPICAL)**

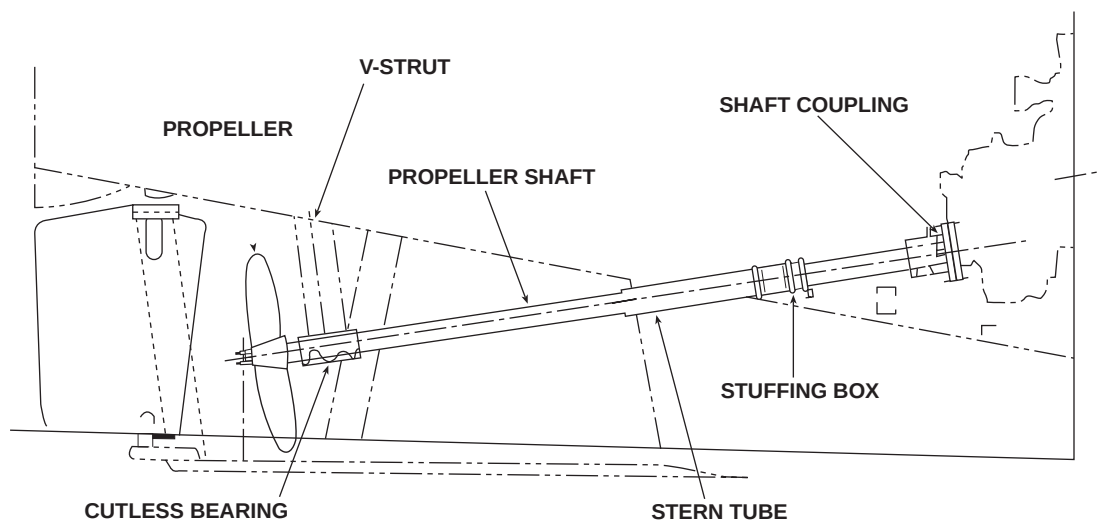
After exiting the raw water pump, the water enters the fuel cooler where it cools the diesel fuel exiting the engine. From the fuel cooler, the water is directed to a “T” fitting where it may travel either to the mufflers or to the overboard discharge valve. The overboard discharge valve is used to control the amount and rate of raw water flow through the fuel coolers and the mufflers. As the overboard discharge valve is opened, raw water flow through the mufflers decreases. As the overboard discharge valve is closed, raw water flow through the mufflers increases. Raw water entering the mufflers is discharged through the exhaust ports with the exhaust gases.

Raw water for priming the bilge pumps is taken from the raw water pump outlet prior to entering the fuel cooler. Flow of water into the bilge pumps is controlled by the priming valve located near the raw water pump.

PROPELLERS AND PROPELLER SHAFTS

Each marine transmission output flange is coupled to a 2-1/2 inch Corrosion Resistant Steel (CRES) propeller shaft. The propeller shafts transmit the rotating energy from the marine transmissions to the propellers.

The propellers exit the hull through stern tubes located between frames 37 and 39, port and starboard. Each stern tube is fitted with a stuffing box that provides a watertight seal for the propeller shaft as it passes through the hull. Heavy duty hose and hose clamps secure the stuffing boxes to the stern tubes.



PROPELLERS AND PROPELLER SHAFTS (TYPICAL)

The propeller shafts are supported by two bearings. The forward section of the propeller shaft is supported by a stern tube bearing located in the stern tube. The aft section of the propeller shaft is supported by a cutless bearing located in a V-strut.

The propellers transform the rotating energy of the propulsion engine and marine transmission into forward or reverse thrust to propel the vessel. The propellers are secured to the trailing ends of the propeller shafts with jam nuts, plain nuts, and cotter pins. The propellers have tapered, keyed bores that are secured to the tapered, keyed propeller shaft ends to prevent the propellers from rotating on the shafts.

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THEORY OF OPERATION
FUEL SYSTEM**

FUEL TANKS

The LCM-8 Mod 2 is equipped with two fuel tanks located in the lazarette, port (1) and starboard (2), aft of bulkhead 39. Each tank has a capacity of 432 gallons (1635.3 liters). The fuel tanks store all of the fuel necessary to operate the propulsion engines and the diesel generator.

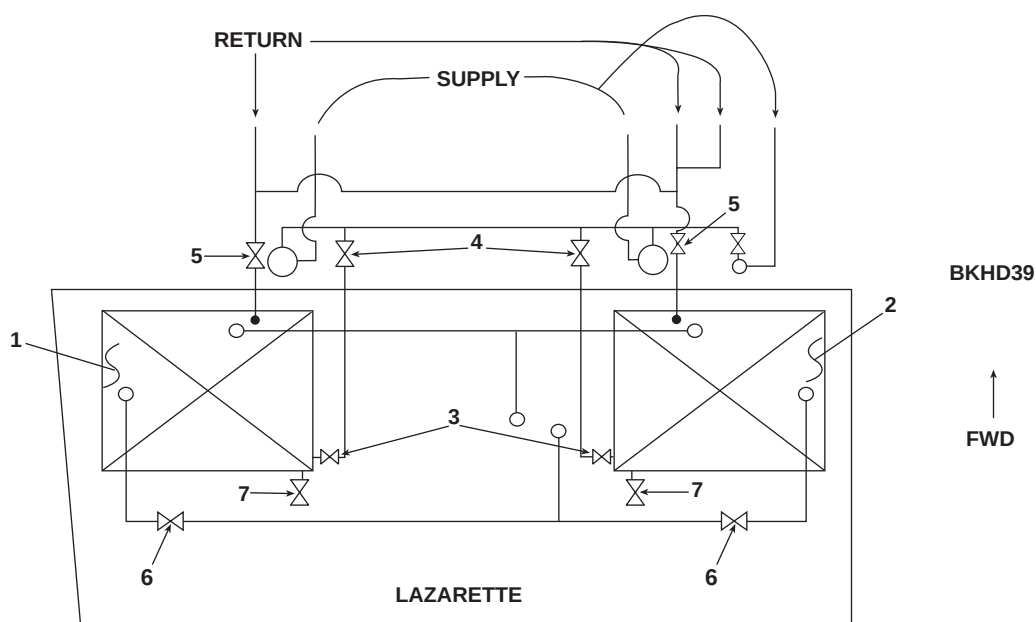
FUEL LINES AND PIPING

Both rigid and flexible fuel lines are used in the LCM-8 Mod 2 fuel system. Rigid lines are used where piping runs are long and where equipment vibration and movement are not a concern. Flexible lines are used in areas where equipment vibration and movement might damage rigid lines.

Four types of lines are used in the LCM-8 Mod 2 fuel system. Fuel fill pipes direct fuel to the proper tank(s) during fueling operations. Fuel vent pipes vent the fuel tanks to allow for varying fuel levels within the fuel tanks. Fuel supply lines carry fuel to the engines. Fuel return lines return unburned fuel back to the tanks.

FUEL VALVES

Several types of valves are contained in the LCM-8 Mod 2 fuel system. Fuel suction valves (3) secure the flow of fuel from the fuel tanks. Fuel supply valves (4) are used to secure the flow of fuel to their respective engines. Return fuel is secured by the fuel return valves (5). Fuel fill valves (6) direct the flow of fuel into the appropriate tank(s) during fueling operations. By properly positioning the fuel valves, the operator can determine which tank(s) supply fuel to the engines, which tank(s) receive return fuel from the engines, and which tank(s) are filled. Fuel drain valves (7) allow draining of the fuel tanks when necessary.



FUEL FILLS, VENTS, AND SOUNDINGS

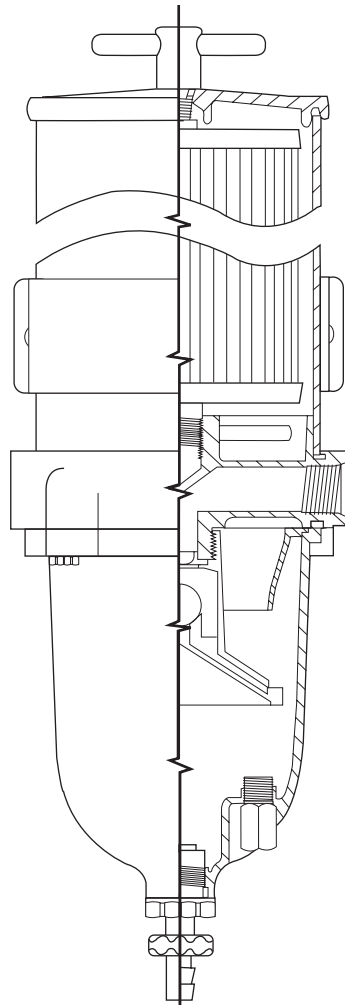
The fuel tanks are filled through a fuel fill fitting located on the aft deck, starboard, at frame 40. The fuel tanks are both vented through a shared vent located adjacent to the fuel fill. Fuel tank sounding accesses are located outboard at frame 40 port and starboard. Fuel tank sounding accesses may be used for unpressurized fuel tank filling.

FUEL FILTERS AND SEPARATORS

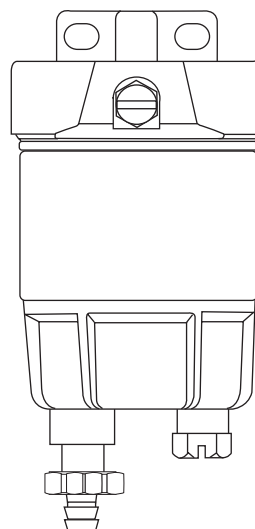
All fuel exiting the fuel tanks is purified by fuel filters and fuel filter/water separators. The engine-mounted fuel filters are covered in TM 5-2815-231-14.

Each engine is provided with a Racor 1000 FG fuel filter/water separator assembly. This assembly separates water from the diesel fuel and performs primary filtration. The Racor 1000 FG fuel filter/water separators use separation, coalescing, and filtration to remove water and contaminants. The fuel filter/water separator contains a turbine centrifuge that separates solids and “free” water from the fuel through centrifugal separation. After separation, smaller water droplets and solids coalesce on the fuel filter/water separator’s conical baffle and fall to the collection bowl. After coalescing, the fuel passes through a filter before exiting the fuel filter/water separator. The filter’s water repelling media removes nearly 100% of the water from the fuel and removes particles as small as 2 microns.

The generator engine is provided with a Racor 120 fuel filter/water separator. The unit has a spin-on filter element and a reusable collection bowl. The filter element is a water repelling media that removes nearly 100% of the water from the fuel and removes particles as small as 30 microns.



RACOR 1000



RACOR 120

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THEORY OF OPERATION
ELECTRICAL SYSTEM**

GENERAL

The LCM-8 Mod 2 has two alternating current electrical systems (110 Vac and 220 Vac) and two direct current electrical systems (12 Vdc and 24 Vdc). The electrical systems supply all of the electrical needs of the LCM-8 Mod 2.

The alternating current electrical systems are both single phase systems. The 220 Vac (Volts alternating current) system has two power sources. Power may be derived from the diesel generator or from an outside power source via the shore power receptacle and the shore power cable. The 110 Vac system receives its power from the diesel generator and from transformers powered by the 220 Vac system.

The direct current electrical systems are two-wire isolated ground systems. A 24 Vdc (Volts direct current) system supplies many of the lighting, communication, and accessory systems on board the LCM-8 Mod 2. This power is supplied by dedicated battery banks, by a battery charger, and by propulsion engine-driven alternators depending upon the operating conditions. Certain communication systems require 12 Vdc power. These systems are supplied by 24 Vdc to 12 Vdc transformers. The generator starting system also requires 12 Vdc power. This power is supplied by a dedicated battery that is recharged by an alternator mounted on the diesel generator.

Foldout sheets FO-1, FO-2, FO-3, and FO-4 contain wiring diagrams for the LCM-8 Mod 2 electrical system.

ALTERNATING CURRENT POWER SUPPLY

Diesel Generator

A Northern Lights M-844L diesel generator supplies power to the 220 Vac and 110 Vac electrical systems when the vessel is underway or when shore power is otherwise unavailable. Both 220 Vac and 110 Vac outputs are available directly from the diesel generator. With the diesel generator running, the LCM-8 Mod 2 is completely self-sufficient with respect to electrical power even with both propulsion engines secured.

Shore Power

The LCM-8 Mod 2 is provided with a shore power receptacle and shore power cable that provide a 220 Vac single-phase power supply to the vessel from a pierside power supply or from another vessel. When connected to shore power, the LCM-8 Mod 2 is completely self-sufficient with respect to electrical power, even with both propulsion engines and the diesel generator secured.

Alternating Current Transformers

The LCM-8 Mod 2 is provided with two alternating current transformers that transform 220 Vac to 110 Vac. The first transformer, located near the communications rack, supplies power to the data terminal, the parallel port printer, and the serial port printer. A second transformer, located in the engine room, powers the microwave oven and the 110 Vac receptacles located in the galley area.

DIRECT CURRENT POWER SUPPLY

Battery Charger

When the diesel generator is running, or the vessel is connected to shore power, 24 Vdc power is supplied to the vessel's systems by the battery charger. The battery charger transforms 220 Vac to 24 Vdc. The battery charger has a maximum output of 100 amps and can charge the battery bank and power vessel systems simultaneously. When the vessel load is less than 100 amps, the remaining charger capacity is available for battery charging.

Propulsion Engine-Driven Alternators

When the propulsion engines are running, 24 Vdc power is available from the propulsion engine-driven alternators. Each propulsion engine has one alternator rated at 110 amps maximum output. Because the propulsion engines are started hydraulically, the full output of these alternators is available for vessel service loads. When the propulsion engines are running, and 220 Vac power is available, 24 Vdc power is supplied by both the propulsion engine-driven alternators and by the battery charger.

24 Vdc Battery Bank

Under unusual conditions, 24 Vdc power is supplied by two dedicated battery banks located in the starboard wing wall outboard of the accommodation module entry ladder. Each battery bank consists of two 12 Vdc, 8D batteries connected in series to supply 24 Vdc power. These battery banks provide power to the vessel's 24 Vdc electrical systems under the following conditions:

1. When the propulsion diesel engines are secured (no engine-driven alternator output) and no 220 Vac power supply is available (no battery charger output).
2. When system load temporarily exceeds the capacity of the battery charger and/or engine-driven alternators.

12 Vdc Battery

A single 12 Vdc battery supplies power to the starting and operating systems of the diesel generator. This battery is recharged by a generator engine-driven alternator.

Generator Engine-Driven Alternator

A single 12 Vdc alternator is mounted on the diesel generator. This alternator supplies power to charge the generator engine's 12 Vdc starting battery and to operate the generator's systems and accessories while the generator is operating.

ELECTRICAL DISTRIBUTION COMPONENTS—ALTERNATING CURRENT AND DIRECT CURRENT

All of the LCM-8 Mod 2's electrical systems contain one or more of the following components.

Circuit Breakers

Circuit breakers provide protection against overload on electrical circuits. When the load on a circuit exceeds the circuit breaker's rating, the circuit breaker "trips," causing an interruption of service for that circuit. This interruption of service ceases all electrical flow in the circuit and prevents fire or other damage associated with an overload condition. All of the circuit breakers on the LCM-8 Mod 2 are manual-resetting, meaning that the circuit breaker remains in the "tripped" condition until it is manually reset. Circuit breakers may also be used both to secure electrical circuits for service and during normal operation.

Fuses

Fuses provide protection against overload on electrical circuits. When the load on a circuit exceeds the fuse's rating, the fuse "blows," causing an interruption of service for that circuit. This interruption of service ceases all electrical flow in the circuit and prevents fire or other damage associated with an overload condition. Once a fuse "blows," it must be replaced before the flow can be restored to the circuit. A fuse may also be removed to secure an electrical circuit for service.

Switches

Many of the LCM-8 Mod 2's electrical systems are controlled by switches. When in the closed, or ON, position, the switch permits current to flow in the circuit, activating the switched device. When the switch is in the open, or OFF, position, the switch interrupts current flow in the circuit, deactivating the switched device.

Distribution Box

Distribution boxes are located throughout the vessel. The distribution boxes house the circuit breakers and fuses that control and protect the circuits throughout the vessel.

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THEORY OF OPERATION
HYDRAULIC SYSTEM**

GENERAL

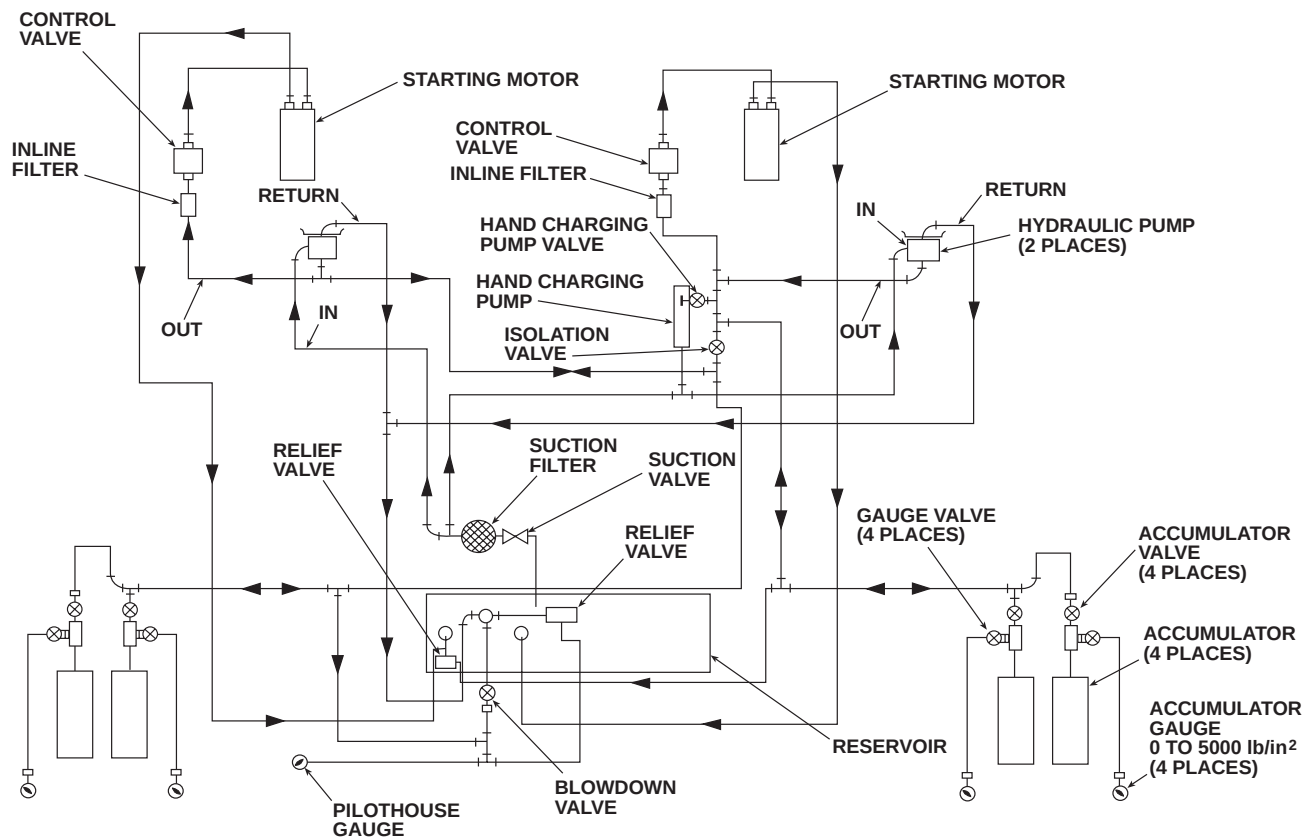
The LCM-8 Mod 2 is provided with three separate hydraulic systems. One system operates the starting system for the propulsion engines, another operates the steering system, and the last operates the bilge pumps, bow ramp, and crane.

Each system has its own pumps, filters, piping, and controls. The hydraulic steering system has its own reservoir, while the starting system shares a partitioned reservoir with the bilge/ramp/crane system.

PROPULSION ENGINE HYDRAULIC STARTING SYSTEM

General

This system's sole purpose is to start the propulsion engines. The system consists of a reservoir, two engine-driven pumps, one hand pump, two pairs of accumulators, two control valves, two starting motors, and several valves, filters, and gauges.



PROPULSION ENGINE HYDRAULIC STARTING SYSTEM SCHEMATIC

Reservoir

The propulsion engine hydraulic starting system shares a partitioned reservoir with the bilge/ramp/crane system mounted on bulkhead 39, centerline, in the engine room. The propulsion engine hydraulic starting system uses the port side of the reservoir, which is completely isolated from the starboard side of the reservoir. There is no intermingling of hydraulic oil within the reservoir. Each side of the reservoir has its own fill and its own level indicator.

The reservoir is used to store hydraulic oil for use in the propulsion engine starting system. A sufficient volume of oil is stored to allow normal operation of the system. In addition, the oil volume is large enough to allow the oil to remain in the reservoir, where it may be cooled by ambient air circulation.

Engine-Driven Hydraulic Pump

Each propulsion engine is equipped with a hydraulic pump that runs continuously during engine operation. The pumps automatically recharge the accumulators. When the required pressure is attained in the accumulators, a valve within the pump body opens, and the hydraulic oil is circulated back to the reservoir. Depending upon the position of the isolation valve, a single pump can charge one or both pairs of accumulators.

Hand Charging Pump

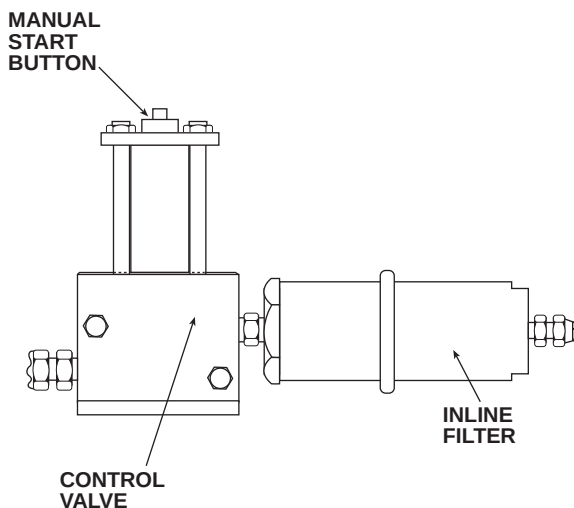
A hand charging pump is provided to permit charging of the hydraulic accumulators when the propulsion engines are not running. This pump is used when the accumulators have been blown down for service, when repeated failed starting attempts leave the accumulators depleted, or when the accumulators have otherwise lost their charge.

Accumulators

Two pairs of hydraulic accumulators store hydraulic pressure for later use. The accumulators are mounted on bulkhead 39, one pair on each side of the reservoir. The accumulators use dry nitrogen gas to maintain the charge pressure. They may be recharged with either the engine-driven hydraulic pump(s) or with the hand charging pump. Under normal operating conditions, the starboard accumulators power the starboard starting motor, and the port accumulators power the port starting motor. System operating pressure is 3250 lb/in² (221.0 bar)

Control Valve

Each propulsion engine has a solenoid-actuated control valve that controls the flow of hydraulic oil to the hydraulic starting motors. The valve is closed in its resting state. When actuated, the control valve allows hydraulic oil under pressure to flow to the hydraulic starting motor. Under normal conditions, the control valve is actuated when the operator presses the pushbutton engine starting switch in the pilothouse. Under unusual conditions, the control valve may be manually actuated by pressing the manual start button on the valve.



Starting Motor

Each propulsion engine has a hydraulic starting motor. The starting motor rotates the engine until the engine starts. The starting motor is equipped with a retractable starter drive that extends to engage the flywheel when the starter is engaged, and retracts from the flywheel when the starter is disengaged.

Blowdown Valve

A blowdown valve is mounted on top of the reservoir. This valve allows the pressure to be relieved from the accumulators for service. When the blowdown valve is opened, the hydraulic pressure that is stored in the accumulators is allowed to vent harmlessly to the reservoir.

Relief Valve

Two relief valves are installed in the hydraulic starting system. The valves are both mounted on top of the reservoir and protect the system from damage caused by overpressurization. The relief valve setting is 3400 lb/in² (234.4 bar). When system pressure exceeds the relief valve setting, the excess pressure is vented harmlessly to the reservoir.

Isolation Valve

An isolation valve, located near the hand pump, isolates the two sides of the hydraulic starting system. When the isolation valve is closed, the port and starboard hydraulic starting systems operate independently from one another. In this configuration, the port engine-driven pump charges only the port accumulators, and the port accumulators power only the port starter motor. The same is true for the starboard side of the system. When the isolation valve is open, both sides of the hydraulic starting system work together. In this configuration, either engine-driven pump may charge either pair of accumulators and either pair of accumulators may power the starter motor for either engine.

Hand Charging Pump Valve

The hand charging pump valve, located on top of the hand charging pump, isolates the hand charging pump from the propulsion engine hydraulic starting system to protect it from damage. Under normal conditions, the valve is in the closed position, isolating the hand pump from the system. The valve is open when the hand pump is in use.

Accumulator Valve

Each accumulator is equipped with a valve, allowing the accumulator to be isolated from the hydraulic starting system. When the valve is closed, no hydraulic pressure is available from the accumulator to the system. When the valve is open, hydraulic pressure is available.

Suction Valve

A single suction valve, located at the bottom of the reservoir secures the flow of hydraulic oil from the reservoir to the hydraulic pumps. The valve is closed only for service. At all other times, it must remain open to prevent damage to the pumps.

Gauge Valve

Each of the four accumulator gauges has a gauge valve to isolate the gauge from the system. The valve may be open or closed, depending upon the operating condition. When the valve is open, the gauge reads accumulator pressure. When the valve is closed, the gauge reads the pressure last seen before closing the valve.

Inline Filter

A high pressure, inline filter is mounted directly to each control valve. This filter removes contaminants from the hydraulic oil before the oil enters the control valve and starting motor.

Suction Filter

A suction filter, mounted at the bottom of the reservoir near the suction valve, provides initial filtration for the propulsion engine hydraulic starting system.

Accumulator Gauges

Four accumulator gauges, one for each accumulator, monitor hydraulic pressure within the accumulators. The gauges are connected to the accumulator piping by flexible hoses and may be isolated from the system by closing the gauge valves. A gauge mounted in the pilothouse console near the rudder angle indicator allows the operator to monitor starting system pressure. When the isolation valve, located near the hand pump, is closed, the pilothouse gauge reads the pressure present in the port side of the system. When the isolation valve is open, the pressure equalizes across both sides of the system, and the pilothouse gauge reads this pressure.

HYDRAULIC STEERING SYSTEM

General

The LCM-8 Mod 2 uses a hydraulic steering system to actuate the rudders, which in turn steer the vessel. The system consists of two engine-driven hydraulic pumps, a flow divider, a helm unit, two steering cylinders, a relief valve, three check valves, two counterbalance valves, two isolation valves, two bypass valves, two suction valves, two suction strainers, a drain valve, a return filter, a reservoir, and a pilothouse gauge.

Engine-Driven Hydraulic Pump

Two engine-driven hydraulic pumps provide the hydraulic power necessary to operate the hydraulic steering system. Each propulsion engine has a separate pump allowing full operation of the hydraulic steering system even with only one propulsion engine running. Each engine-driven hydraulic pump has a flow rate of 1.5 gal/min (5.7 L/min).

Flow Divider

All discharge flow from the engine-driven hydraulic pumps is routed through a flow divider which is set at 1050 lb/in² (72.4 bar). The flow divider supplies 2 gal/min (7.6 L/min) of hydraulic oil to the helm unit throughout a wide range of pump speeds. This constant oil flow rate permits consistent helm operation at all engine speeds. All excess flow reaching the flow divider is returned to the reservoir through the return filter.

Helm Unit

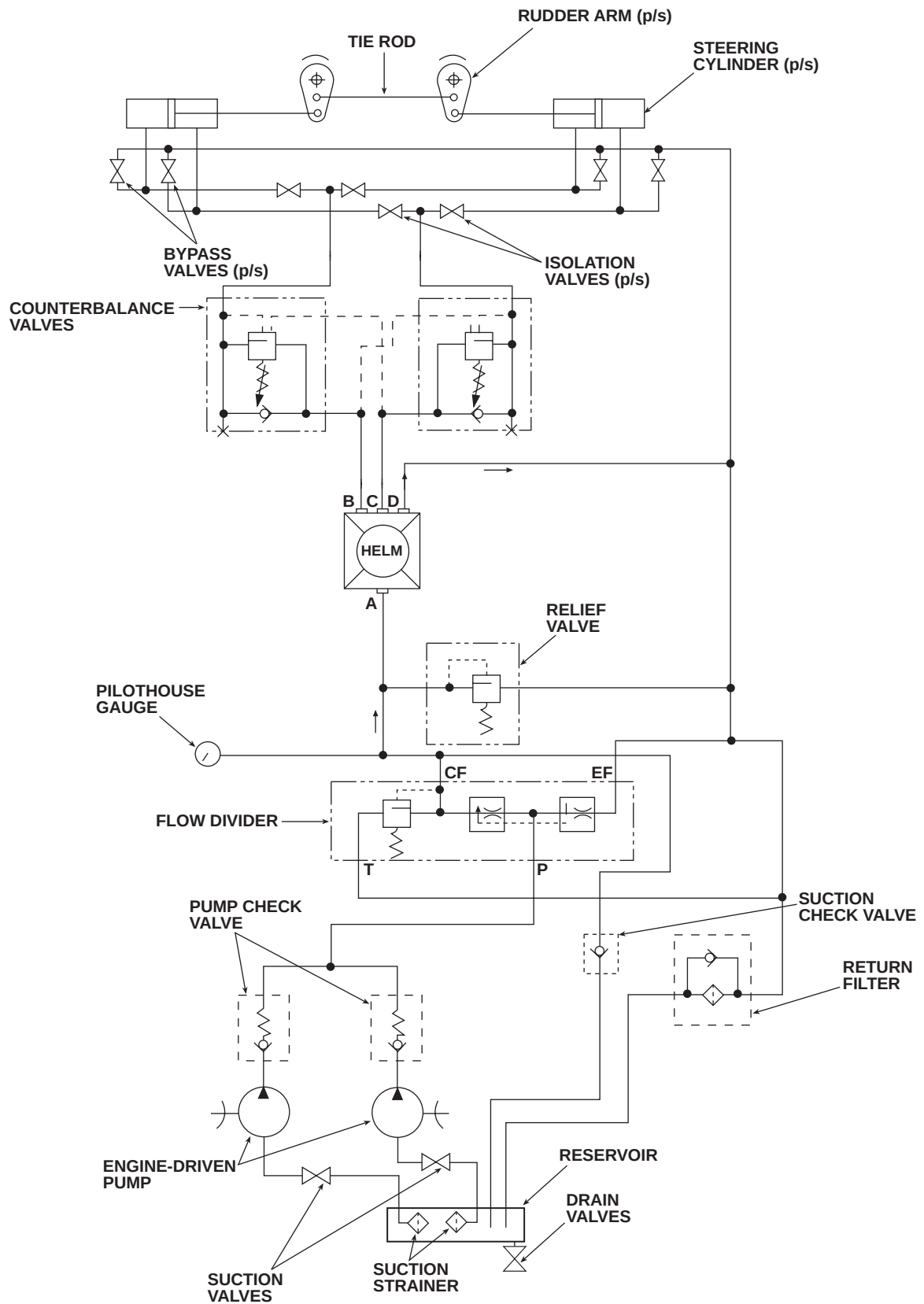
The helm unit receives hydraulic oil from the engine-driven hydraulic pumps and directs the oil as needed to position the rudders. When the wheel is stationary, all the hydraulic oil supplied to the helm unit is returned to the reservoir through the return filter, and the rudders remain stationary. When the wheel is turned, the oil is discharged from the helm unit through the counterbalance valves and isolation valve to the hydraulic cylinders, which turn the rudders. Direction of hydraulic oil flow is determined by the direction of wheel rotation. In the event of failure of both engine-driven hydraulic pumps, the helm unit is capable of acting as a pump to allow continued operation of the steering system.

Steering Cylinder

Two steering cylinders are used to turn the rudders. The cylinders are mounted outboard and aft of the rudder stocks, port and starboard. The rudders and steering cylinders are synchronized by a tie rod connecting the two rudder arms.

Relief Valve

A relief valve, mounted in the line between the engine-driven hydraulic pump and the helm unit, prevents system damage caused by overpressurization. The relief valve is set at 1000 lb/in² (68.9 bar). Once the system pressure exceeds the relief valve setting, all excess pressure is returned to the hydraulic reservoir through the return filter.



HYDRAULIC STEERING SYSTEM SCHEMATIC

Pump Check Valve

Each engine-driven hydraulic pump has a pump check valve installed in its discharge piping. This pump check valve prevents one pump from backfeeding into the other during conditions of pump imbalance. This unbalanced condition occurs when only one propulsion engine is running or when the propulsion engines are operating at greatly different speeds.

Suction Check Valve

The suction check valve permits the helm unit to draw hydraulic oil directly from the reservoir when the engine-driven hydraulic pumps are not operating. Under this condition the helm unit acts as a pump. When acting as a pump, the helm unit uses port A (normally supplied by the engine-driven hydraulic pump) as the suction port and draws hydraulic oil from the reservoir through the suction check valve. When the engine-driven hydraulic pumps are supplying pressure to port A, the suction check valve prevents pump flow from returning to the reservoir (bypassing the helm unit).

Counterbalance Valve

Under most conditions the steering cylinders act to initiate rudder movement. But under certain conditions, such as when the rudder is returning to midship following a turn, the steering cylinders must halt or slow rudder movement. Without counterbalance valves in the system, the steering cylinders would have a tendency to move uncontrollably when halting or slowing rudder movement. The counterbalance valves prevent this uncontrolled movement by permitting cylinder movement only when pressure is present on the return side of the cylinder. This return side pressure prevents uncontrolled cylinder movement and maintains helm control under all conditions.

Isolation Valve

Four isolation valves, two port and two starboard, are installed in the hydraulic steering system to permit isolation of a damaged steering cylinder. The isolation valves are open during normal operation. By properly positioning the isolation valves and the bypass valves, the LCM-8 Mod 2 may be steered in emergency conditions. Positioning of the valves for this use is discussed in WP 0030 00. The isolation valves may also be used to isolate a cylinder for service.

Bypass Valve

Four bypass valves, two port and two starboard, are installed in the hydraulic steering system to permit emergency steering. The bypass valves are closed during normal operation. By properly positioning the bypass valves, the LCM-8 Mod 2 may be steered in emergency conditions with the emergency tiller. Positioning of the valves for this use is discussed in WP 0030 00.

Suction Valve

Two suction valves, one for each pump, are mounted directly below the hydraulic reservoir. The suction valves may be closed to allow servicing of the engine-driven pumps. At all other times the suction valves must remain open.

Drain Valve

A drain valve is located in the bottom of the reservoir. This valve permits draining of the reservoir for service. This valve is closed and its outlet plugged during normal operation.

Return Filter

A single, 10-micron return filter is installed in the oil return line. This filter removes particulate contaminants from the system's return oil before it enters the reservoir. The filter is of the disposable, spin-on type.

Suction Strainer

Each suction valve, one per engine-driven hydraulic pump, is fitted with a suction strainer. These strainers, mounted inside the reservoir, remove large particulate contamination from the hydraulic oil before it enters the engine-driven hydraulic pumps.

Reservoir

A single reservoir stores the hydraulic oil necessary to operate the steering hydraulic system. The reservoir is large enough to allow ambient air cooling of the hydraulic oil as it rests in the reservoir.

Pilothouse Gauge

A single gauge, mounted in the pilothouse console, monitors pressure in the hydraulic steering system.

BILGE/RAMP/CRANE HYDRAULIC SYSTEM

General

The bilge/ramp/crane hydraulic system powers the bilge pumps, the bow ramp winch and latches, and the crane. The bilge/ramp/crane hydraulic system is made up of three separate hydraulic circuits that share certain common components. These common components are the hydraulic pumps, the hydraulic diverter valves, the return filters, the suction strainers, the pilothouse gauge, and the reservoir.

Common Components

Hydraulic Pump

Two hydraulic pumps power the bilge/ramp/crane hydraulic system. The hydraulic pumps are driven by Power Take-Off (PTO) from the marine transmissions, port and starboard. The hydraulic pumps operate whenever the appropriate propulsion engine is running and the PTO is engaged. All systems are capable of operation with only one hydraulic pump engaged, although under certain conditions, operation of both hydraulic pumps will yield better system operation.

Diverter Valve

Each hydraulic pump discharges through a diverter valve. The diverter valve allows the operator to direct flow to the bow ramp circuit or to the bilge pump circuit. Depending upon conditions, the operator may select both hydraulic pumps to the bow ramp, both hydraulic pumps to the bilge pumps, or one hydraulic pump to each circuit. The crane is powered only by the starboard hydraulic pump and only with the diverter valve in the RAMP position.

Return Filter

The return oil from all circuits flows back to the reservoir through duplex return filters. The filters remove particulate contamination from the hydraulic oil before it enters the reservoir. The return filters are mounted directly above the hydraulic reservoir and use disposable cartridge type elements.

Suction Strainer

Two suction strainers, one for each hydraulic pump, are mounted inside the reservoir. The suction strainers remove large particulate contamination from the hydraulic oil before it enters the hydraulic pumps.

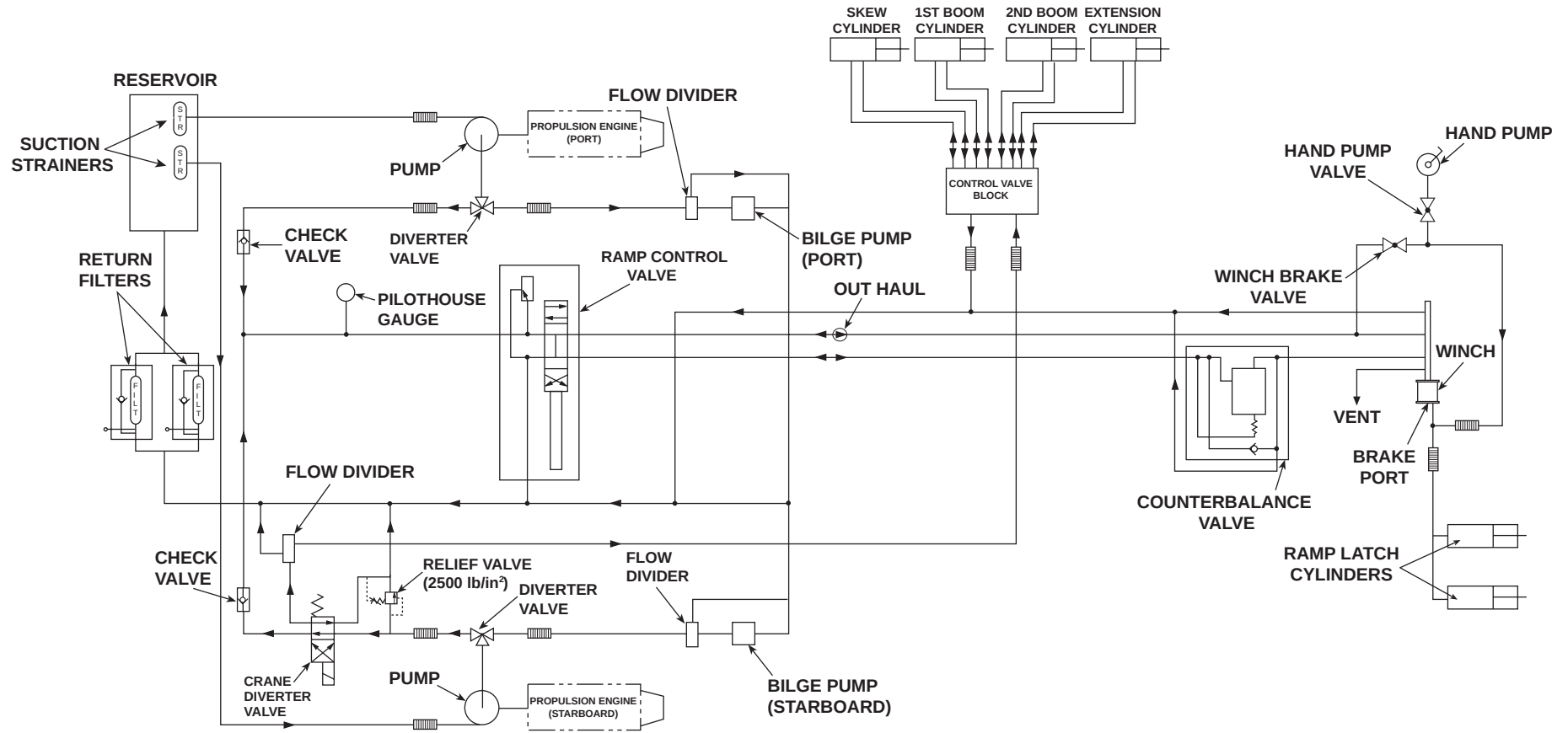
Reservoir

A partitioned reservoir is mounted on bulkhead 39, centerline, in the engine room. This reservoir serves both the starting and the bilge/ramp/crane hydraulic systems. The bilge/ramp/crane portion of the reservoir has a capacity of 75 gallons (284 liters).

Bow Ramp Circuit

General

In addition to the common components above, the bow ramp circuit consists of a pilothouse gauge, a ramp control valve, a counterbalance valve, a hand pump, a hydraulically-powered winch, and two ramp latch cylinders.



BILGE/RAMP/CRANE HYDRAULIC SCHEMATIC

Pilothouse Gauge

A single gauge, mounted in the pilothouse console, monitors pressure in the bow ramp circuit. The pressure in the bilge pump and crane circuits is unmonitored.

Ramp Control Valve

A three-position, four-way valve controls the bow ramp circuit. The valve is actuated by the bow ramp handle in the pilothouse. When the valve is in the NEUTRAL position, oil from the hydraulic pump is routed directly back to the reservoir. When the valve is in the RAMP UP position, oil from the hydraulic pump is directed to the hydraulically powered winch, rotating it in the inhaul direction. When the valve is in the RAMP DOWN position, oil from the hydraulic pump is directed to the hydraulically powered winch, to the winch brake, and to the ramp latch cylinders. In this configuration, the hydraulic pressure extends (unlatches) the ramp latch cylinders, releases the winch brake, and rotates the winch in the outhaul direction.

The ramp control valve has an internal relief valve to protect the circuit from damage caused by overpressurization. The relief valve is set at 2100 lb/in² (144.8 bar).

Counterbalance Valve

A counterbalance valve, located inline between the ramp control valve and the hydraulically powered winch, prevents the winch from overspeeding or “freespooling” during ramp lowering operation.

Hand Pump

A hand pump is installed in the circuit to permit emergency lowering of the ramp. The hand pump provides hydraulic pressure to release the ramp latch cylinders and the winch brake when both hydraulic pumps are inoperative or in use for bilge pumping.

Hydraulically Powered Winch

A hydraulically powered winch handles the cable that raises and lowers the bow ramp. The hydraulically powered winch is rotated in the inhaul and outhaul directions by a hydraulic motor. The hydraulically powered winch also contains a spring applied, hydraulically released brake assembly that prevents the winch from freewheeling.

Ramp Latch Cylinders

Two ramp latch cylinders, one on each side of the bow ramp, latch the ramp in the closed position. The cylinders are opened with hydraulic pressure and closed by internal spring pressure. Hydraulic pressure, required to move the cylinders to the unlatched position, is supplied from the ramp control valve when it is moved into the RAMP DOWN position.

Hand Pump Valve

A hand pump valve, installed in the piping between the hand pump and the brake release line, isolates the hand pump from the rest of the hydraulic circuit. The valve is closed during normal operation and open only when the hand pump is used to lower the bow ramp.

Winch Brake Valve

The winch brake valve, installed in the winch brake release line, isolates the winch brake line from the rest of the hydraulic circuit. The valve prevents hand pump pressure from backfeeding into the rest of the bow ramp circuit when the hand pump is used to lower the bow ramp. The winch brake valve is open during normal operation and closed only when the hand pump is used to lower the bow ramp.

Bilge Pump Circuit

General

The bilge pump circuit consists of the common components discussed above as well as a two flow dividers and two hydraulic pumps, which drive the bilge pumps. The port circuit may only be powered by the port hydraulic pump and the starboard circuit by the starboard hydraulic pump.

Flow Divider

A flow divider, mounted on top of each hydraulic pump, controls the flow of hydraulic oil to the bilge pumps. The flow divider provides a flow of 10 gal/min (37.9 L/min) to the bilge pumps. The flow control valves also contain a relief valve, set at 1500 lb/in² (103.4 bar), which protects the circuit from damage caused by overpressurization.

Hydraulic Pump

Two hydraulic pumps, one port and one starboard, power the bilge pumps. The bilge pumps receive hydraulic oil from the hydraulic pumps via the flow divider and return their oil to the reservoir.

Crane Circuit

General

The crane circuit is powered from the ramp circuit of the starboard hydraulic pump. The crane circuit consists of the common components listed above, as well as a relief valve, a crane diverter valve, a flow divider, a control valve block, and the crane's operating cylinders (skew, lift, jib, and extension).

Relief Valve

The relief valve, mounted on bulkhead 39, aft of the starboard marine transmission, protects the circuit from damage caused by overpressurization. The relief valve is set at 2500 lb/in² (172.4 bar). When circuit pressure exceeds the relief valve setting, the excess pressure is relieved and routed back to the reservoir.

Crane Diverter Valve

The crane diverter valve allows the operator to select between the ramp circuit and the crane circuit for the starboard hydraulic pump. The valve is solenoid-actuated and controlled by a switch in the pilothouse console. When the solenoid is energized, the crane diverter valve routes the hydraulic flow to the crane circuit. When the solenoid is deenergized, the hydraulic flow is routed to the ramp circuit.

Flow Divider

The flow divider valve delivers a constant flow of 12 L/min (3.2 gal/min) to the crane circuit. All flow in excess of this rate is returned to the reservoir. This constant flow rate provides the optimum flow for efficient crane operation. If the flow is too slow, efficiency is lost. If the flow is too fast, equipment can be damaged.

Control Valve Block

The control valve block is a bank of four three-position, four-way valves that control all of the operations of the crane. One valve is provided for each of the crane's four operating cylinders. The valves are infinitely positionable and spring-returned. When a valve is in the neutral position, hydraulic oil passes straight through the valve without being directed to the appropriate operating cylinder. When the valve is shifted away from neutral, hydraulic oil flows to the appropriate operating cylinder. Direction of valve shift determines the direction of operating cylinder motion. Because the valves are infinitely positionable, cylinder speed increases as valve shift increases.

Operating Cylinders

Four operating cylinders control the movement of the crane. The skewing cylinder controls skewing (turning) of the crane. The first boom cylinder raises and lowers the crane's first boom (the section closest to the base). The second boom cylinder raises and lowers the second boom (pivoting section furthest from the base). The extension cylinder extends and retracts the boom extension.

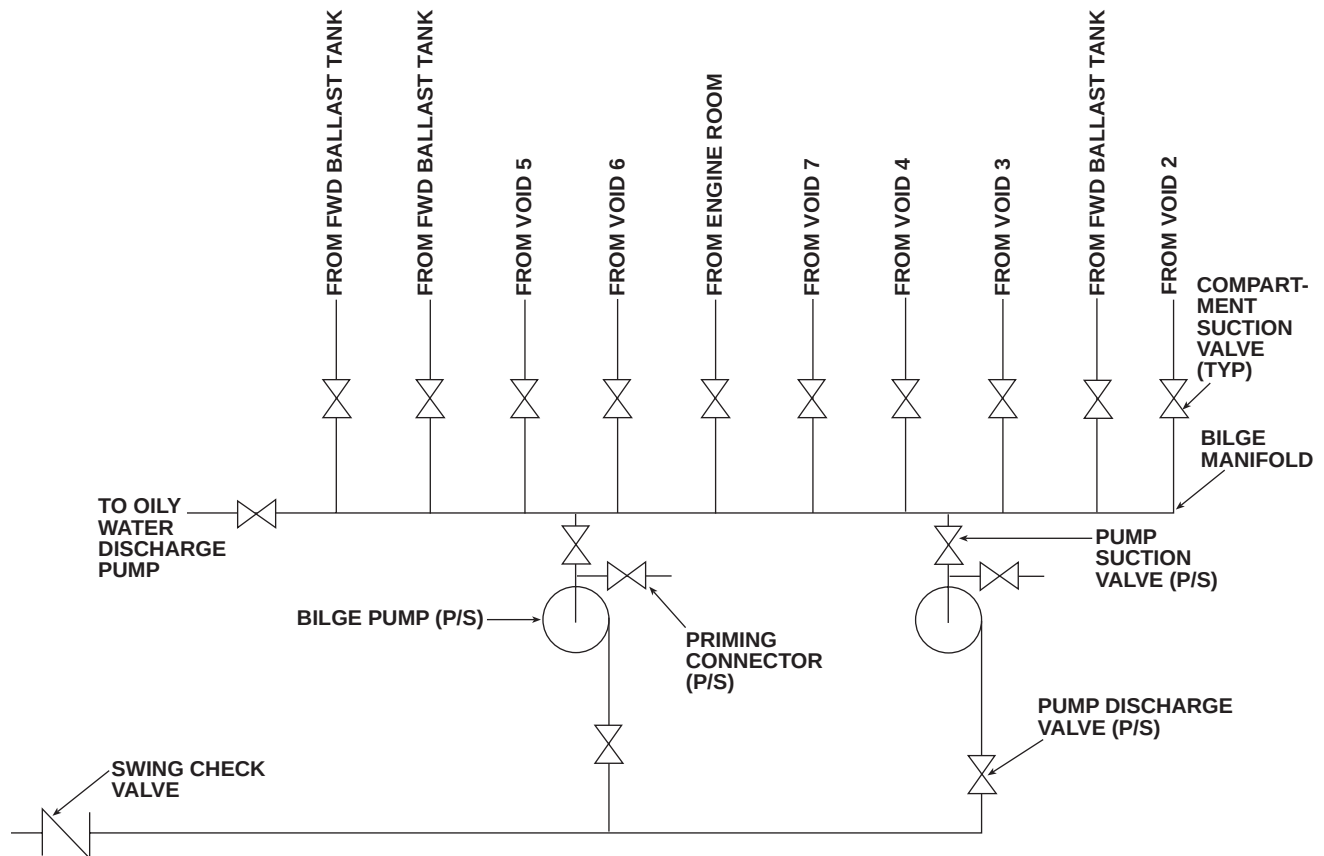
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**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THEORY OF OPERATION
BILGE, OILY WATER, AND FIRE PUMP SYSTEMS**

BILGE PUMPING SYSTEM

General

The bilge system provides the primary means for removing water from the watertight voids and spaces when flooding is imminent aboard the LCM-8 Mod 2. Each watertight compartment aboard the LCM-8 Mod 2 has at least one bilge pump suction point. The system consists of two hydraulically-driven bilge pumps, a bilge manifold, discharge valves, compartment suction valves, pump suction valves, swing check valve, bilge strainers, and priming connectors. Discharge for this system is directly overboard through the port side hull, aft of bulkhead 31.



BILGE PUMPING SCHEMATIC

Bilge Pump

Two hydraulically-driven centrifugal bilge pumps, one port and one starboard, provide emergency bilge pumping capability for the LCM-8 Mod 2. Both pumps are located in the engine room at frame 32 port and starboard of centerline. The pumps are powered by hydraulic pumps contained in the bilge/ramp/crane hydraulic system. Operation of this hydraulic system is detailed in WP 0006 00.

Bilge Manifold

A single bilge manifold, located aft of bulkhead 31 centerline, is used to connect the bilge pumps with the various bilge strainers. By properly aligning the valves at the bilge manifold, the operator can pump bilge from any of the watertight compartments.

Discharge Valve

Two discharge valves, one above each pump, are installed in the system. The discharge valves prevent an operating pump's discharge flow from backfeeding into an idle pump. When only one pump is operating, the discharge valve on the operating pump is open, and the discharge valve on the idle pump is closed.

Compartment Suction Valve

Ten compartment suction valves are connected to the bilge manifold. These valves allow the operator to select which compartment(s) will be pumped. Each of the six watertight voids has a valve, as does the engine room. The bow ballast tank has three suction pipes, and thus three valves, to allow for rapid dewatering of this tank. During pumping operations, the valves for "wet" compartments are opened and the valves for "dry" compartments remain closed.

Pump Suction Valve

Two pump suction valves, one below each pump, are installed in the system. The pump suction valves prevent an operating pump's suction from drawing through an idle pump. When only one pump is operating, the pump suction valve is open for the operating pump and closed for the idle pump.

Swing Check Valve

A single swing check valve is installed near the pumps' overboard discharge fitting aft of bulkhead 31, port. The swing check valve permits free discharge flow, while preventing raw water from entering the vessel through the overboard discharge fitting.

Bilge Strainer

Each of the six watertight voids and the engine room has a bilge strainer installed at the end of the bilge pump suction piping. The bilge strainers prevent debris from being drawn into the suction piping where it might foul the piping or damage the bilge pumps.

Priming Connection

Each bilge pump has a priming connection hard piped into its suction side piping. This priming connection allows the bilge pump system to be primed by the propulsion engine's raw water pump. A valve, inline between the raw water pump and the priming connection, controls the flow of raw water into the priming connection. When the pump is being primed, this valve is open. When the system has been primed and pumping is underway, the valve is closed.

OILY WATER COLLECTION AND PUMPING SYSTEM

General

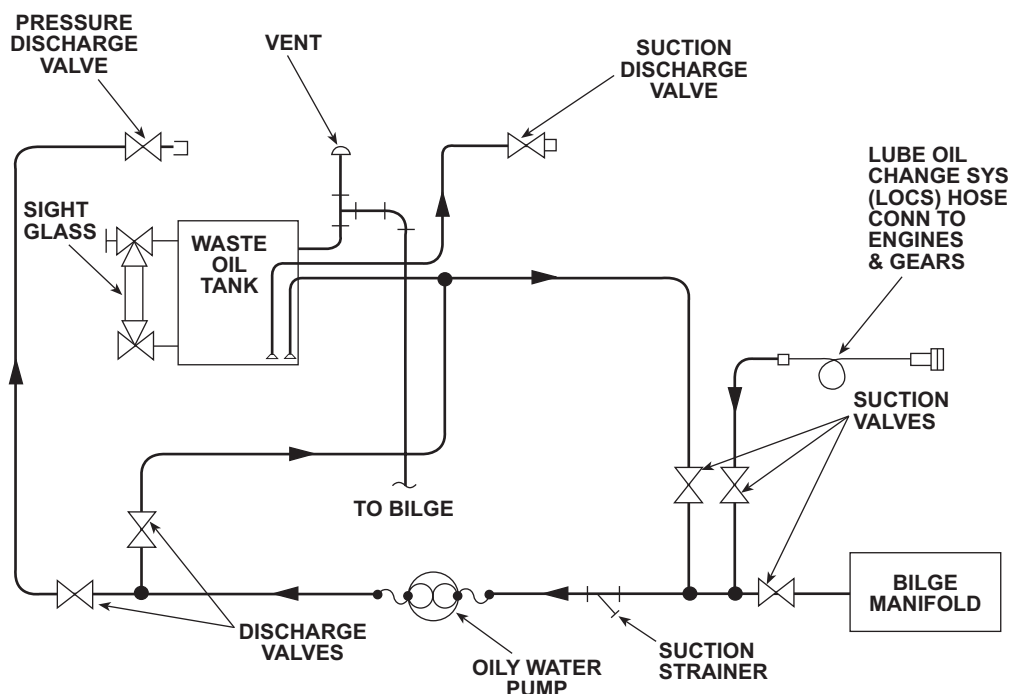
The LCM-8 Mod 2 is equipped with an oily water collection and pumping system. The system is used for pumping oily water from the bilge spaces, for changing lube oil in the engines, and for drawing oily waste from buckets. The oily waste collected by this system is stored in a holding tank until it can be safely discharged to an appropriate treatment facility. The system is composed of a waste oil pump, a waste oil tank, suction strainer, suction valves, discharge valves, a sight glass, and a vent.

Waste Oil Pump

The waste oil pump is used to pump oil and oily waste within the oily water collection and pumping system. Depending upon the alignment of the various suction and discharge valves, the waste oil pump can draw oil or oily water from the bilges, from the engines and transmissions, from buckets, and from the waste oil tank. The waste oil pump can discharge to the waste oil tank or to an appropriate treatment facility.

Waste Oil Tank

A 150-gallon waste oil tanks holds waste oil and oily water until it can be discharged to an appropriate treatment facility. The tank is filled by the waste oil pump and is equipped with two removable cleanout plates and a sight glass.

OILY WATER COLLECTION AND PUMPING SYSTEM (continued)**OILY WATER COLLECTION AND PUMPING SCHEMATIC****Suction Strainer**

A suction strainer, mounted in the suction piping between the waste oil pump and the suction valves, removes particulate contamination from the oil or oily water before it enters the pump. The strainer is a “Y” strainer type and has an element which may be removed for cleaning.

Suction Valve

Three suction valves are installed in the suction piping. These valves permit the operator to choose the source of suction. Suction may be drawn from the bilge manifold; from the engines, transmissions and buckets via flexible hose; or from the waste oil tank.

Discharge Valve

Three discharge valves are installed in the discharge piping. These valves permit the operator to choose the outlet for the oil or oily water. The oil or oily water may be discharged to the waste oil tank or to a deck fitting by the waste oil pump. The piping between the pump and the deck fitting is provided with two valves to allow discharge flow to be controlled from the pump area or from the discharge fitting area. A fourth discharge valve, located in the suction discharge piping, controls discharge flow when the waste oil tank is being drained by a pump from an outside facility.

Sight Glass

A sight glass is provided on the side of the waste oil tank to permit the operator to monitor the waste oil tank level. The sight gauge is fitted with two valves, one top and one bottom, which allow the monitoring hose to be replaced when it becomes unreadable.

Vent

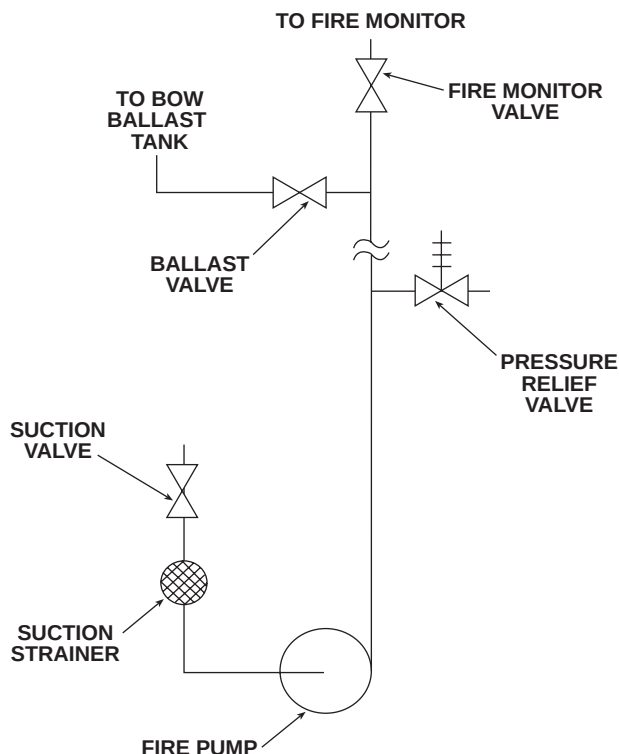
The waste oil tank is provided with a vent. The vent discharges topside and the vent piping contains a “T” fitting that allows oil and oily water to flow back to the bilge should the tank become overfilled.

FIRE PUMP SYSTEM

General

The LCM-8 Mod 2 is provided with a centrifugal fire pump that supplies raw water to a fire monitor mounted on the starboard wing wall. The fire pump is also used to fill the bow ballast tank. The pump is driven by the diesel generator through an electric clutch which allows the pump to be disengaged when not in use. Control for the electric clutch is via a switch located in the pilothouse console.

The fire pump system is composed of a fire pump, electric clutch, suction valve, suction strainer, pressure relief valve, ballast valve, fire monitor valve, fire monitor, and nozzle.



FIRE PUMP SYSTEM SCHEMATIC

Fire Pump

A 3-inch horizontal split case centrifugal pump is used to pump water through this system. The pump is driven by the diesel generator engine, draws suction from the sea chest at bulkhead 31 starboard, and discharges to the bow ballast tank or to the fire monitor.

Electric Clutch

An electric clutch is installed in the drive shaft between the diesel generator engine and the fire pump. This clutch allows the pump to be disengaged when not needed. The clutch is controlled by a switch located in the pilothouse console. When the switch is closed (ON), the clutch is engaged, and when the switch is open (OFF), the clutch is disengaged. Because of the horsepower requirements of the fire pump, the diesel generator must be running in a "no-load" condition during pumping operations.

Suction Valve

A suction valve is installed at the sea chest, bulkhead 31, starboard. This valve may be closed to allow servicing of the pump, the suction strainer, or the below-the-waterline piping. During normal operations, the suction valve remains open.

Suction Strainer

A simplex suction strainer is installed inline between the suction valve and the fire pump. The strainer removes particulate contamination from the raw water before it enters the fire pump. Because this is a simplex strainer, the fire pump system must be shut down prior to servicing the strainer.

Pressure Relief Valve

A pressure relief valve is installed between the fire pump and the bow ballast tank and fire monitor valves. This valve opens when system pressure exceeds 85 lb/in² (5.9 bar) to prevent damage to the system from overpressurization.

Ballast Valve

The ballast valve is used to control the flow of raw water into the bow ballast tank. The valve is open during filling of the bow ballast tank and closed at all other times.

Fire Monitor Valve

The fire monitor valve is used to control the flow of raw water to the fire monitor. The valve is open during firefighting operations and closed at all other times.

Fire Monitor

The fire monitor is mounted to a platform mounted on the starboard wing wall. The fire monitor permits 360-degree rotation of the nozzle so that the crew may direct water where it is needed, whether onboard the LCM-8 Mod 2, ashore, or aboard another vessel.

Nozzle

A fire nozzle is mounted at the discharge end of the fire monitor. This nozzle allows the crew to control the stream of water issuing from the fire monitor.

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THEORY OF OPERATION
NAVIGATION AND COMMUNICATION SYSTEMS**

NAVIGATION SYSTEMS

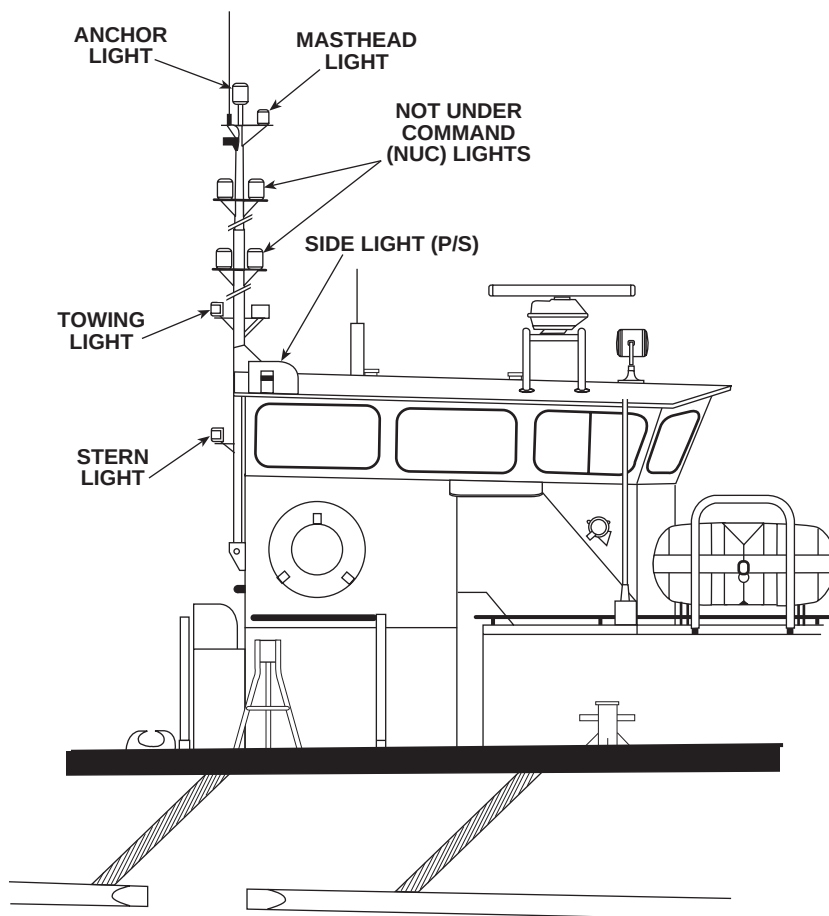
General

The navigation systems on the LCM-8 Mod 2 allow the crew to determine the vessel's position, plot the vessel's course, and make clear the vessel's location to other vessels and shore facilities. The navigation system consists of navigation lights, navigation horn, Global Positioning System (GPS), and radar.

Navigation Lights

General

The LCM-8 Mod 2's navigation lights permit other vessels to see the LCM-8 Mod 2 at night. The lights are controlled by switches mounted in the pilothouse console. By displaying specific arrangement of lights, the operator lets other vessels know the LCM-8 Mod 2's status (e.g. making way, anchored, towing, not under command). Operation of the lights and their specific arrangements are discussed in WP 0014 00.



Anchor Light

The anchor light is an all-around white light, mounted at the very top of the mast.

Masthead Light

The masthead light is a white light, mounted near the top of the mast, but lower than the anchor light. The masthead light shows a 225 degree arc from right ahead, to 22.5 degrees abaft the beam, port and starboard.

Not Under Command (NUC) Light

Two pairs of all-around red lights, mounted one above the other, make up the NUC lights. The lights are configured so that they provide all-around illumination, despite obstruction by the mast.

Towing Light

The towing light is a yellow light, mounted on the mast above the stern light. The light shines through a 135 degree arc extending 67.5 degrees from right aft on each side of the vessel.

Stern Light

The stern light is a white light mounted low on the mast. The light shines through a 135 degree arc extending 67.5 degrees from right aft on each side of the vessel.

Side Light

Two side lights are provided on the vessel. The lights are mounted to the aft corners of the pilothouse top, port and starboard. The port side light is red, the starboard side light is green. The lights shine through a 112.5 degree arc extending from right ahead, to 22.5 degrees abaft the beam, on the respective side.

Navigation Horn

The navigation horn, mounted to the pilothouse bulkhead, starboard, is used to announce the vessel's intentions and to signal during conditions of limited visibility. The horn is powered by the 24 Vdc electrical system and controlled by a pushbutton switch in the pilothouse.

Global Positioning System (GPS)

The global positioning system uses data received from satellites to accurately determine the vessel's position and other navigational data. The GPS is powered by the vessel's 24 Vdc electrical system through the Comms Nav Aids Distribution Box. The GPS is hand held, and when removed from its mount on the pilothouse chart table, is battery powered. When installed into its mount, the GPS receives power from the 24 Vdc electrical system and may be interfaced with the radar, the digital compass, and the Digital Selective Calling (DSC) radios through the interface and switch switchbox.

Radar

The radar system permits the LCM-8 Mod 2 to locate aids to navigation, land masses, other vessels, and other objects even at night or in limited visibility conditions. The radar antenna, located on the pilothouse top, sends and receives radio beams to locate objects, and displays its output on a display monitor located in the pilothouse. The radar may interface with the GPS, magnetic compass, and the DSC radios through the interface and switch switchbox.

Compass

A fluxgate compass provides the coxswain with a readout of the vessel's heading. The sensor for the compass assembly is mounted on the mast, and the display unit is mounted on the pilothouse console. The compass is powered by the 24 Vdc electrical system.

COMMUNICATION SYSTEMS

General

Several communication systems are installed on the LCM-8 Mod 2 that permit both internal, external, and emergency communication. Internal communication, within the LCM-8 Mod 2, is accomplished with a loudhailer system. External communication is accomplished with VHF/FM (very high frequency/frequency modulation) radios, SSB (single sideband) radio, SINCGARS (single channel ground to air radio system) radio, navtex receiver, and by data transmission via modem. Emergency communication is accomplished by the DSC radios, watch receiver, Emergency Position Indicating Radio Beacon (EPIRB), Search and Rescue Transceiver (SART), and survival radio.

Internal Communication

Loudhailer

A Raytheon RAY 430 loudhailer system is installed on the LCM-8 Mod 2. The loudhailer receives 12 Vdc power from a dedicated 24 Vdc to 12 Vdc transformer mounted under the pilothouse chart table. This system permits 2-way communication between the pilothouse, the weather deck, and the accommodation module. The operator may broadcast to either the weather deck or the accommodation module from the pilothouse station and may then choose to listen to those areas. No provision is made for direct communication from the weather deck or the accommodation module back to the pilothouse.

External Communication

VHF/FM Radio

Pilothouse VHF/FM Radio

A Ross DSC 500 VHF/FM radio is installed in the pilothouse console and provides communication between the LCM-8 Mod 2, other vessels, and shore stations. The radio receives 12 Vdc power from a dedicated 24 Vdc to 12 Vdc transformer mounted under the pilothouse chart table. VHF/FM is a "line-of-sight" communication method, and is, therefore, suitable only for short range communication.

The Digital Selective Calling (DSC) feature provides distress alerting and safety calling. With DSC, a distress call can be placed by pressing a single key. This distress call will be received by all DSC-equipped vessels in range and will sound alarms on each one. When interfaced with the GPS, the DSC feature can automatically broadcast the vessel's location along with the distress call, making it easier for other vessels to render assistance.

In addition to its safety features, the DSC feature also permits scrambled communications between two or more DSC units.

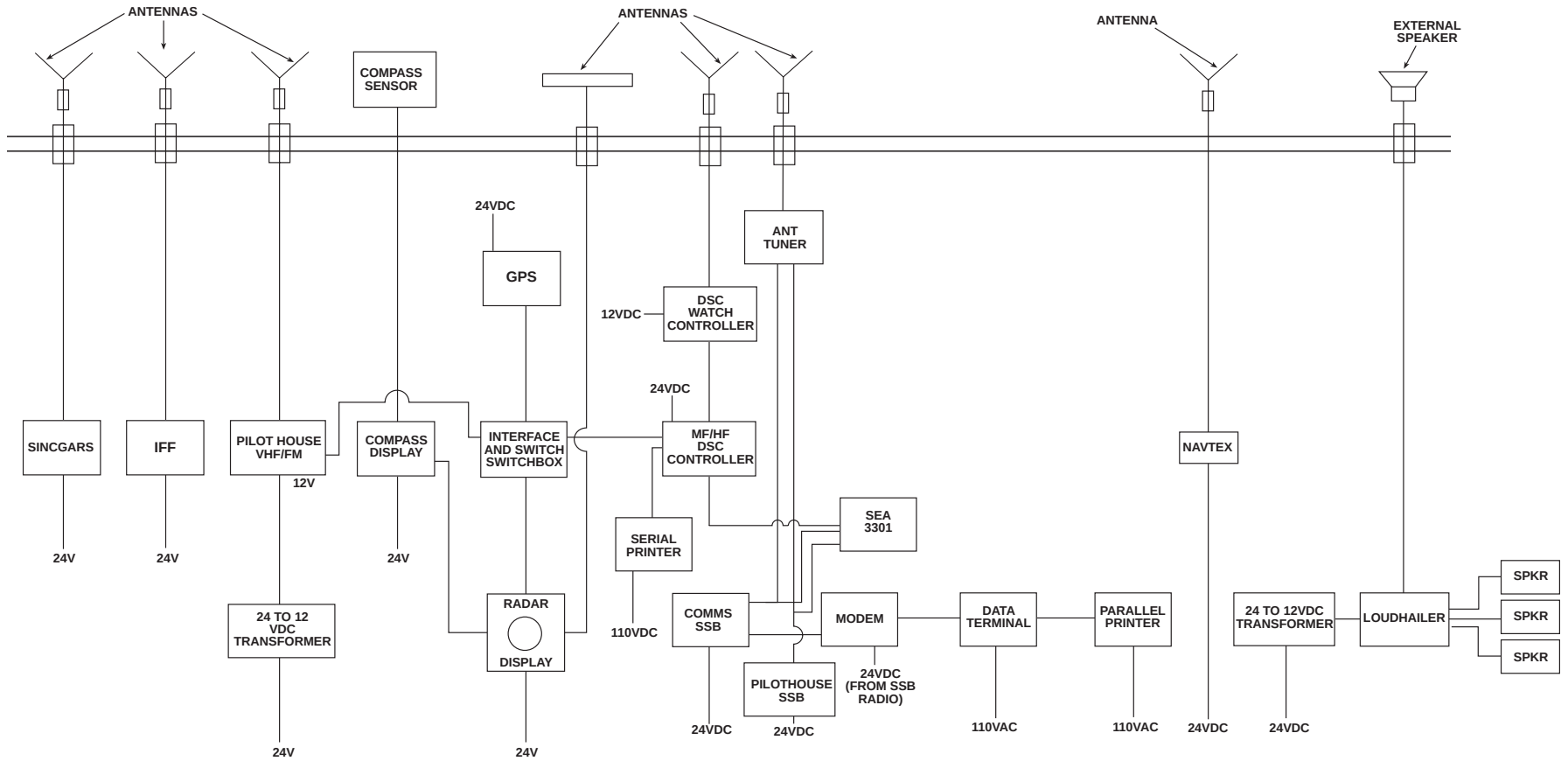
Handheld VHF/FM Radio

Two Standard Horizon HX350S handheld VHF/FM radios are provided with the LCM-8 Mod 2. When not in use, the radios are stored in charger/stands located in the comms rack in the accommodation module. While in their charger/stands, the radios' batteries are recharged. The charger stands receive 110 Vac power from the power strip and the 220 Vac to 110 Vac transformer mounted near the comms rack. The handheld VHF/FM radios do not have DSC capability.

SSB Radio

Two SEA 330 HF/SSB radios are installed on the LCM-8 Mod 2. One unit is installed in the pilothouse, and the other is installed in the comms rack. The radios share a SEA 3301 controller mounted in the comms rack and an antenna coupler/tuner mounted on the forward corner of the accommodation module top, starboard. The radios receive 24 Vdc power from the vessel's 24 Vdc electrical system through the command & control distribution box.

A SEA 7000 MF/HF DSC controller and a SEA 7001 watch receiver are also included in the SSB radio system. The DSC controller adds DSC capability to the SSB radio. The DSC features for the SSB radio are identical to those for the VHF/FM radio. In addition to these features, however, the DSC controller for the SSB system can print its output to a serial printer located on the comms rack. The watch receiver monitors all six SSB distress frequencies and alerts to any distress signals received. The watch receiver makes it possible to monitor distress signals from non-DSC sources.



NAVIGATION AND COMMUNICATION BLOCK DIAGRAM

SINGARS Radio

The SINGARS radio provides jam resistant radio transmissions between the LCM-8 Mod 2 and other SINGARS radios. The SINGARS radio is equipped with an integrated COMSEC program for secure communication. The SINGARS radio is powered by the vessel's 24 Vdc power system through the command and control distribution box, located in the accommodation module.

Data Modem

A SEA 3000 radio telex modem is provided to allow the data terminal to send and receive data via the SSB radio. The modem receives 24 Vdc power from the SSB radio.

EMERGENCY COMMUNICATION SYSTEMS

General

Several communication systems aboard the LCM-8 Mod 2 provide communication capability in various emergency situations. These systems include the DSC radios, watch receiver, EPIRB, SART, and survival radio.

DSC Radios

The DSC feature of the VHF/FM and SSB radios permits the LCM-8 Mod 2 to both send and receive distress signals. This feature is explained in the Pilothouse VHF/FM Radio and SSB radio paragraphs in this work package.

Watch Receiver

The watch receiver can monitor all six SSB distress frequencies looking for a distress signal. Once a signal is received, the receiver sounds an alert and can print a report if desired.

EPIRB

A SATFIND-406 EPIRB is installed on the LCM-8 Mod 2. When activated, the EPIRB sends out a distress signal at 406.025 MHz and at 121.5 MHz. The 406.025 MHz signal is picked up by satellites and relayed to a ground station. By the process of triangulation the EPIRB's position can be positively determined. The 406.025 signal contains, among other coded information, the unique identification number of the EPIRB which allows identification of the vessel. The 121.5 MHz signal is primarily used by SAR (Search and Rescue) forces as a homing signal. The EPIRB also contains a strobe light to aid in visual location of the unit.

The EPIRB is battery operated and mounted in a "float free" mount located on the accommodation ladder bulkhead, starboard. Should the LCM-8 Mod 2 sink, the "float free" mount permits the EPIRB to float free from the vessel. The EPIRB may be activated automatically or manually. Automatic activation occurs when the EPIRB is out of its bracket and afloat in the water. Manual activation is via a switch on the EPIRB.

SART

Two SARTs are installed on the LCM-8 Mod 2. One is located in the pilothouse and the other near the accommodation module door. The SART is designed to be carried off the LCM-8 Mod 2 and onto a life raft in the event of an emergency.

The SART provides location information to marine navigation and search X-band radar in the event of distress. When activated, the transponder maintains "standby" mode until interrogated by radar. Each time the transponder receives a radar pulse, it transmits a series of 12 pulses in response. On search radar, 12 equally spaced arcs are created, lined up behind the original target echo. This clearly differentiates the SART from other targets and sea clutter.

Survival Radio

Two ACR/GMDSS 16/6 survival radios are installed on the LCM-8 Mod 2. One is mounted in the pilothouse and one near the accommodation module door. The radios are intended to be used for emergency communications between survival craft and rescue craft. The radios are battery operated.

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THEORY OF OPERATION
ALARM SYSTEMS**

GENERAL

The LCM-8 Mod 2 is equipped with three alarm systems. The fire alarm system alerts the pilothouse and engine room to the presence of fire in the engine room or smoke in the accommodation module. The general alarm system is used to alert the crew to a general alarm condition. The engine alarm system alerts the operator to dangerous engine conditions.

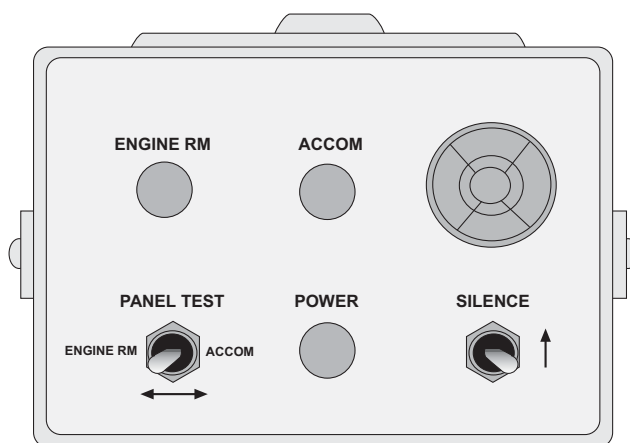
FIRE ALARM SYSTEM

General

The fire alarm system alerts the pilothouse and engine room to the presence of fire in the engine room or smoke in the accommodation module. The system is composed of a remote alarm panel, console indicator lights, smoke detectors, fire detectors, and a horn/strobe unit. The system is powered by 24 Vdc supplied from the control and distribution panel in the pilothouse. Foldout figure FO-4 contains the electrical wiring diagram for this system.

Remote Alarm Panel

The remote alarm panel, mounted on the pilothouse chart table, alerts the pilothouse crew to the presence of fire in the engine room or smoke in the accommodation module. The panel contains an alarm horn that sounds when fire or smoke are present in the monitored spaces. The panel also contains three indicator lights. The ENGINE RM light illuminates when an engine room fire is detected. The ACCOM light illuminates when smoke is detected in the accommodation module. The POWER light is illuminated any time the system is energized. The panel also contains two switches. The SILENCE switch silences the alarm horn after an alarm condition is indicated. The PANEL TEST switch permits testing of the system. When the PANEL TEST switch is moved to the ENGINE RM position, the alarm horn sounds and the ENGINE RM light illuminates. When the PANEL TEST switch is moved to the ACCOM position, the alarm horn sounds, and the ACCOM light illuminates.



Console Indicator Lights

Two console indicator lights warn the coxswain of alarm conditions. The lights are mounted beneath the engine controls. The ENG RM light illuminates to warn of fire in the engine room and the ACCOM light illuminates to warn of smoke in the accommodation module. Illumination of the lights is controlled by the remote alarm panel.

Smoke Detectors

Two smoke detectors are mounted in the accommodation module, overhead. The smoke detectors contain a set of normally open contacts that close when smoke is detected. When closed, the contacts send a signal to the remote alarm panel that sounds the appropriate alarm.

Fire Detectors

Three fire detectors are mounted in the engine room, overhead. The fire detectors send a signal to the remote alarm panel when fire is detected, triggering the appropriate alarm.

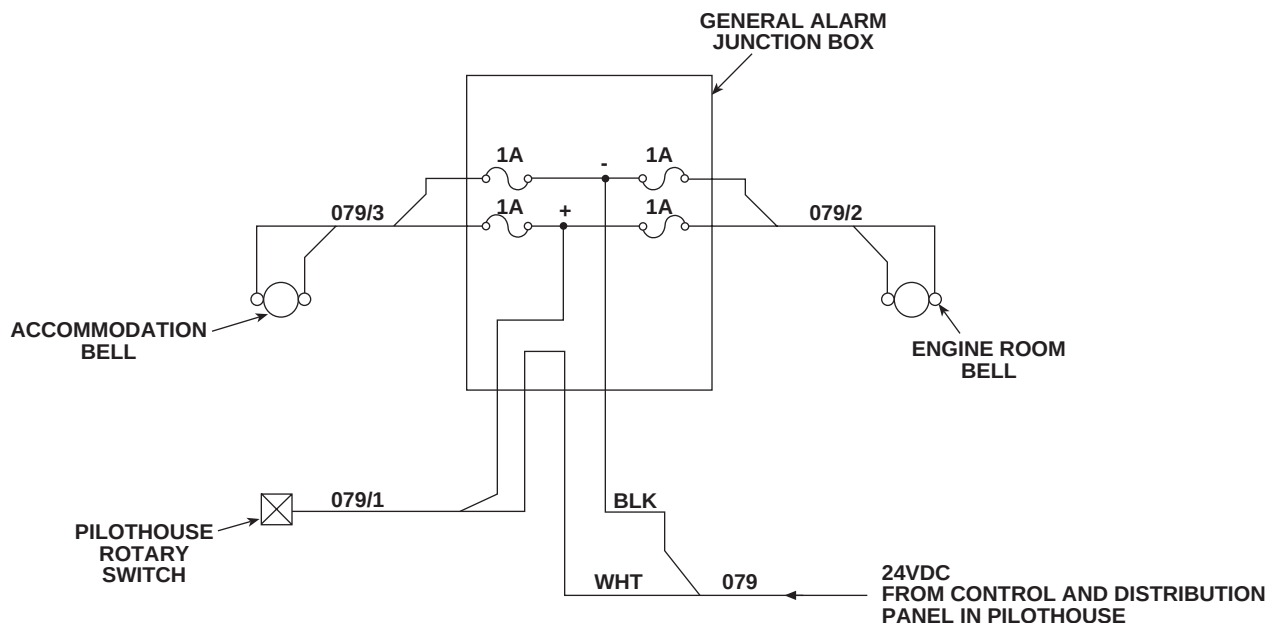
Horn/Strobe Unit

The horn/strobe unit, mounted in the engine room, alerts engine room personnel to the presence of a fire in the engine room or smoke in the accommodation module. The unit is controlled by the remote alarm panel. When fire is detected in the engine room or smoke in the accommodation module, the remote alarm panel causes the horn/strobe unit's horn to sound and its strobe light to flash.

GENERAL ALARM SYSTEM

General

The general alarm system is used to alert the vessel's crew to general alarm conditions. The system is controlled from the pilothouse by a rotary switch. When activated, alarm bells sound in the accommodation module and in the engine room. The system is powered by 24 Vdc from the control and distribution panel in the pilothouse. Additional fuses for the system are contained in the general alarm junction box located on bulkhead 31, port of centerline, in the engine room. Two alarm bells, a rotary switch, and a general alarm junction box make up the system.



GENERAL ALARM SYSTEM SCHEMATIC

Alarm Bells

The general alarm system has two alarm bells. One is located in the accommodation module; the other is located in the engine room. When the pilothouse rotary switch is closed (ON), current flows to the alarm bells and they ring.

Rotary Switch

A rotary switch, located on the pilothouse overhead above the coxswain's seat, controls the general alarm system. When the switch is closed (ON), current flows to the alarm bells and they ring.

General Alarm Junction Box

The general alarm junction box, located on bulkhead 31, port of centerline, in the engine room, connects the rotary switch and the two alarm bells. The junction box also contains four fuses that protect the system from damage due to overload.

ENGINE ALARM SYSTEM

General

The engine alarm system warns the operator of low engine oil pressure and high engine coolant temperature conditions for the propulsion engines. When engine oil pressure falls too low, or coolant temperature rises too high, lights illuminate on the pilothouse console to warn the operator of the condition. The system is powered by 24 Vdc from the control and distribution panel in the pilothouse. The system is composed of Fuel Pressure (FP) switches, Low Oil Pressure (LOP) switches, High Water Temperature (HWT) switches, and alarm lights. The schematic on the following page details system operation.

Fuel Pressure Switch

Two normally-open fuel pressure switches are installed in the system, one for each Low Oil Pressure (LOP) or High Water Temperature (HWT) circuit. These switches arm and disarm the LOP alarm system. When the engine is running, fuel pressure is present, and the fuel pressure switches close, arming the LOP alarm system. When the engine is secured, fuel pressure is absent, and the switches open, disarming the system. This automatic disarming of the alarm system prevents the engine alarms from activating when the engines are secured.

Oil Pressure Switch

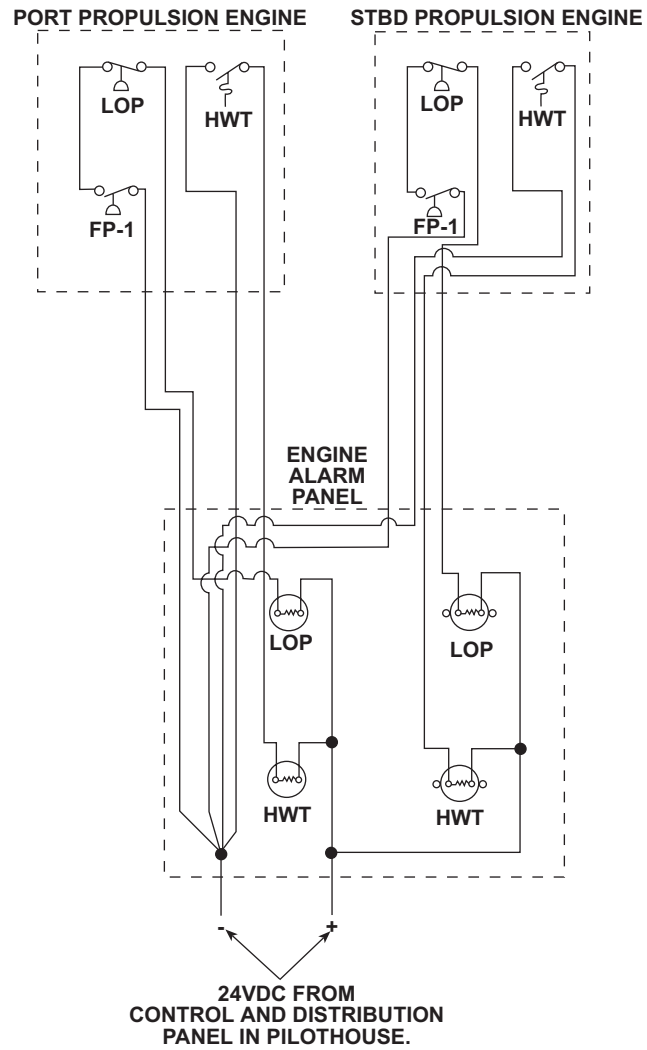
Each propulsion engine has a normally-closed, Low Oil Pressure (LOP) switch for the alarm system. When engine oil pressure is below the switch's closing pressure, the switch closes. If the engine is running (fuel pressure switch closed), the electrical circuit to the alarm light in the pilothouse console is completed, and the light illuminates. Under normal engine operating conditions, the oil pressure switch is open, the fuel pressure switch is closed, and the alarm light is off.

Coolant Temperature Switch

Each propulsion engine has a normally-open, High Water Temperature (HWT) switch for the alarm system. When the engine coolant temperature rises above the switch's closing temperature, the switch closes. With the switch closed, the electrical circuit to the alarm light in the pilothouse console is completed, and the light illuminates. Under normal engine operating conditions, the high water temperature switch is open, and the alarm light is off.

Alarm Light

Four alarm lights, one for each alarm circuit, are installed in the pilothouse console. When the necessary switches in a given alarm circuit are closed, the alarm light's electrical circuit is complete, and the alarm light illuminates.

**ENGINE ALARM SYSTEM SCHEMATIC**

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THEORY OF OPERATION
POTABLE WATER SYSTEM**

GENERAL

The LCM-8 Mod 2 is provided with a potable water system that supplies potable water to the galley sink, the water closet sink, and the windshield washdown system. A hot water heater is installed in the system to provide hot water to the galley sink and the water closet sink. The system is composed of a potable water tank, pressure set, filter, faucets, water heater, windshield washdown pump, deck fill, vent, and tank monitor system.

POTABLE WATER TANK

A 150 gallon (567.8 liter) stainless steel potable water tank is mounted in the watertight void between bulkheads 23 and 27. The tank has fittings for connecting the deck fill and vent piping as well as pickup connections for the pressure set and the windshield washdown pump. The tank is also fitted for the tank watch level indicator.

PRESSURE SET

A pressure set, located under the accommodation module entry ladder, provides pressurized potable water to the galley and water closet compartment. The pressure set is powered by the vessel's 24 Vdc electric system through the control and distribution panel in the pilothouse. The pressure set is a modular unit containing a pump, pressure switch, and accumulator. Together these components deliver an even flow of pressurized water to the sinks. The pump is a positive displacement type with a rubber impeller. The pressure switch is preset to turn the pump on at 8 lb/in² (0.6 bar) and to turn it off at 24 lb/in² (1.7 bar). The accumulator helps to equalize the flow of water by absorbing pressure surges.

FILTER

All potable water delivered to the galley and water closet compartment passes through a filter. The filter contains granulated activated charcoal, which removes many organic and inorganic substances from treated water. The filter also contains Kinetic Degredation Fluxion (KDF), which removes lead and prevents bacteria growth. A one-micron filtration element removes most parasites which would cause stomach discomfort. The filter is designed for use with treated water only.

FAUCET

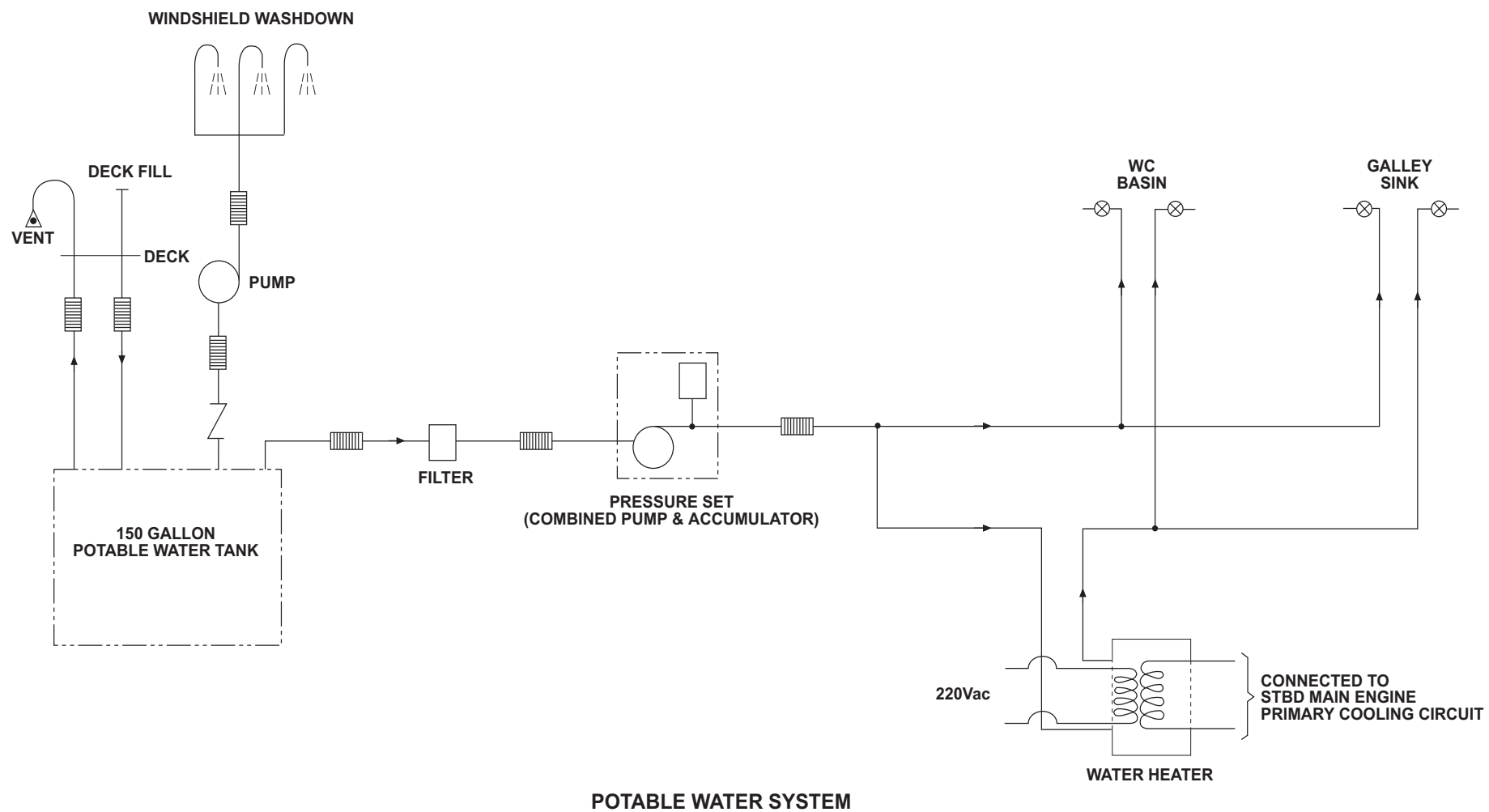
Two faucet assemblies are provided in the potable water system, one in the galley and one in the water closet compartment. The faucets control the flow of both hot and cold potable water into the sinks.

WATER HEATER

A 10 gallon hot water heater is provided to supply hot water to the galley and to the water closet compartment. The hot water heater has two heating elements. The first element is connected to the engine coolant system for the starboard propulsion engine. This element uses the heat of the engine coolant to heat the potable water in the water heater. The second element is an electric element, which uses electric power from the vessel's 220 Vac electrical system to heat the potable water. When the starboard propulsion engine is operating, the hot water is heated primarily by the propulsion engine element.

WINDSHIELD WASHDOWN PUMP

A 2.5 gal/min (9.5 L/min) self-priming pump is installed to supply potable water to the windshield washdown system. This water supply is drawn from a separate pickup in the potable water tank and is neither filtered nor heated. The pump is powered by the vessel's 24 Vdc electrical system through the control and distribution panel in the pilothouse. The pump contains an integral pressure switch, which turns the pump on at 10 lb/in² (0.7 bar) and turns it off at 20 lb/in² (1.4 bar). The pump is controlled by a switch located on the pilothouse console.



DECK FILL

A flush-mounted deck fill fitting is located on the port walkway aft of frame 25. The deck fill allows the potable water tank to be filled from an external source of treated water.

VENT

An inverted check valve vent is located on the starboard walkway aft of frame 25. The vent provides ventilation to the tank as the tank level changes. The inverted check valve opening is protected by a screen to keep insects and other contaminants from entering the system.

TANK MONITOR SYSTEM

A remote tank level monitoring system is installed to allow tank level monitoring from the pilothouse. The tank monitor system consists of a float switch mounted in the potable water tank and a control panel in the pilothouse console. The float switch is actually made up of three microfloat switches, one for each liquid level (empty, mid, full) assembled as a single unit. When the liquid is at or above the level of a microfloat switch, a signal is sent to the control console in the pilothouse. On the control console, a red Light Emitting Diode (LED) is lit when the tank is empty, an amber LED is lit when it is at the mid point, and a green LED is lit when it is full. The system is powered by the vessel's 24 Vdc electrical system through the control and distribution panel in the pilothouse.

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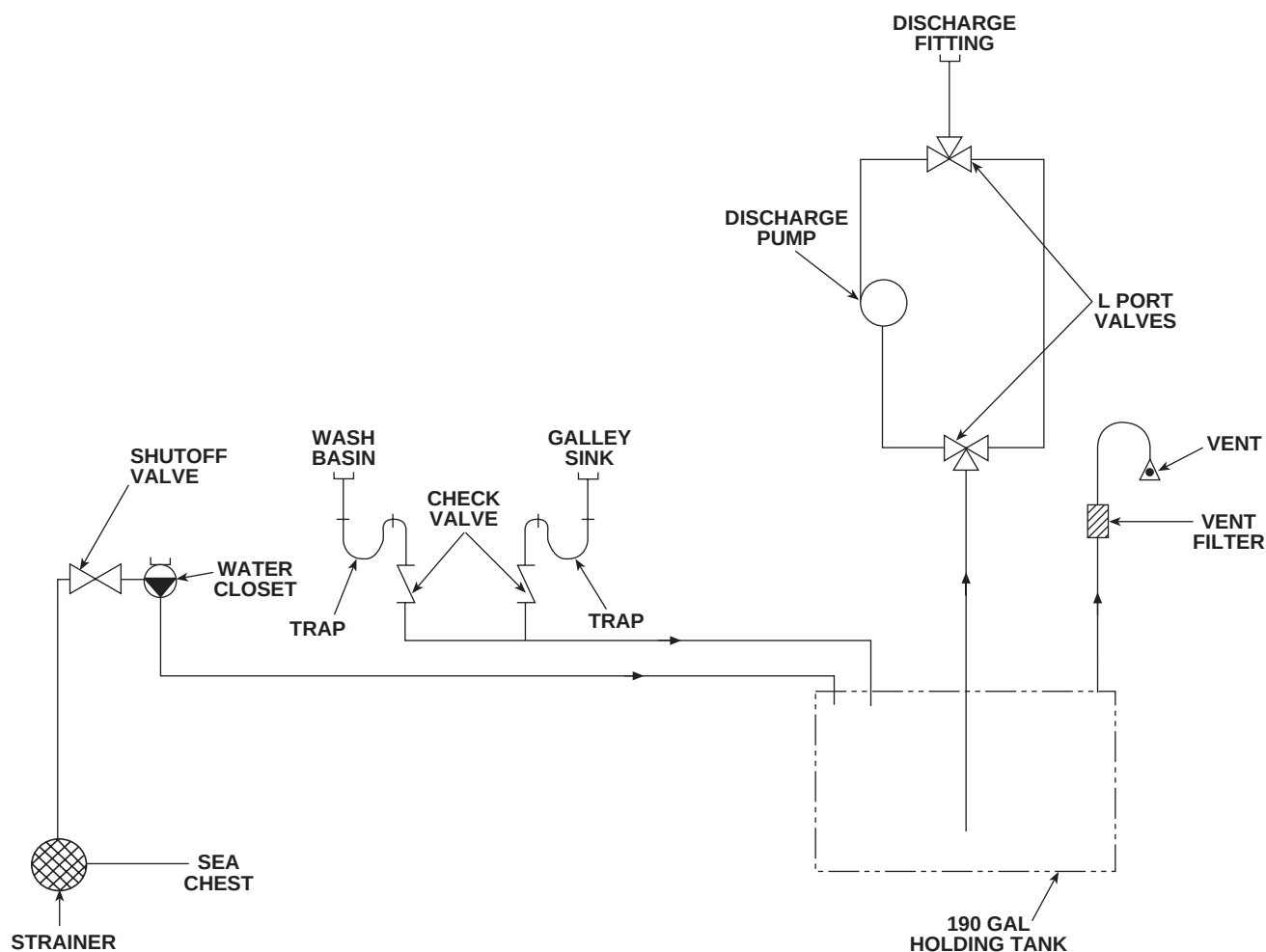
**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THEORY OF OPERATION
BLACK WATER SYSTEM**

GENERAL

The black water system receives, stores, and discharges all black water and sewage generated aboard the LCM-8 Mod 2. No overboard discharge is provided, nor is any treatment provided. The black water and sewage are stored in the black water tank until the tank can be discharged to an appropriate treatment facility. The system is composed of a holding tank, water closet, shutoff valve, strainer, traps, check valves, discharge pump, L port valves, discharge fitting, vent, vent filter, and tank monitor system.

BLACK WATER TANK

A 190 gallon black water tank, located in the watertight void between frames 23 and 27, stores all black water and sewage until it can be discharged to an appropriate treatment facility. The tank has inlet, outlet, and vent fittings as well as a flange mounting for the tank level indicator float switch unit.



BLACK WATER SYSTEM

WATER CLOSET

A water closet assembly, located in the water closet compartment, is used to discharge human waste to the black water tank. The water closet assembly has a self-priming flush pump to draw flushing water into the unit and a discharge macerator pump to chop waste and pump it to the holding tank. The unit is powered by the vessel's 24 Vdc electrical system through the control and distribution panel in the pilothouse. A pushbutton flush switch, mounted on the aft bulkhead of the water closet, controls flushing.

SHUTOFF VALVE

A shutoff valve is installed in the water closet flushing water intake piping. This valve permits the flushing water to be secured for service. The valve is located adjacent to the water closet.

STRAINER

A raw water strainer is located in the water closet flushing water intake piping. This strainer prevents particulate contaminants from entering and damaging the water closet's flushing water pump. Because this is a simplex strainer, the water closet and the sea chest shutoff valve must be secured prior to servicing the filter.

TRAP

The galley sink and the water closet basin have traps installed in their drain piping. These traps prevent sewage gases from exiting the black water tank through the drain piping.

CHECK VALVE

The galley sink and the water closet basin have check valves installed in their drain piping. These check valves prevent black water and sewage from exiting the black water tank through the drain piping, no matter what the vessel's trim angle.

DISCHARGE PUMP

A discharge pump, mounted beneath the galley sink, is provided to discharge the black water tank's contents to an appropriate receiving facility. The pump is powered by the vessel's 24 Vdc electrical system through the control and distribution panel in the pilothouse.

L PORT VALVE

Two L port diverter valves are used to allow the operator to select the method of emptying the black water tank. By properly aligning the valves, the black water tank may be emptied by the discharge pump or by an appropriate discharge facility's pump.

DISCHARGE FITTING

A flush mounted discharge fitting is provided on the starboard walkway, aft of frame 25. This fitting is used to allow connection of a discharge line from an appropriate discharge facility.

VENT

An inverted check valve vent fitting is installed on the starboard walkway, aft of frame 25. This fitting vents the black water tank as the tank level changes. The inverted vent opening is fitted with a screen to prevent contaminants from entering the system.

VENT FILTER

A vent filter is installed in the vent piping between the black water tank and the inverted check valve vent. The filter is located near the galley sink. The filter prevents odors from exiting the black water tank.

TANK MONITOR SYSTEM

A remote tank level monitoring system is installed to allow tank level monitoring from the pilothouse. The tank monitor system consists of a float switch mounted in the black water tank and a control panel in the pilothouse console. The float switch is actually made up of three microfloat switches, one for each liquid level (empty, mid, full) assembled as a single unit. When the liquid is at, or above, the level of a microfloat switch, a signal is sent to the control panel in the pilothouse. On the control panel, a green Light Emitting Diode (LED) is lit when the tank is empty, an amber LED is lit when it is at the mid point, and a red LED is lit when it is full. The system is powered by the vessel's 24 Vdc electrical system through the control and distribution panel in the pilothouse.

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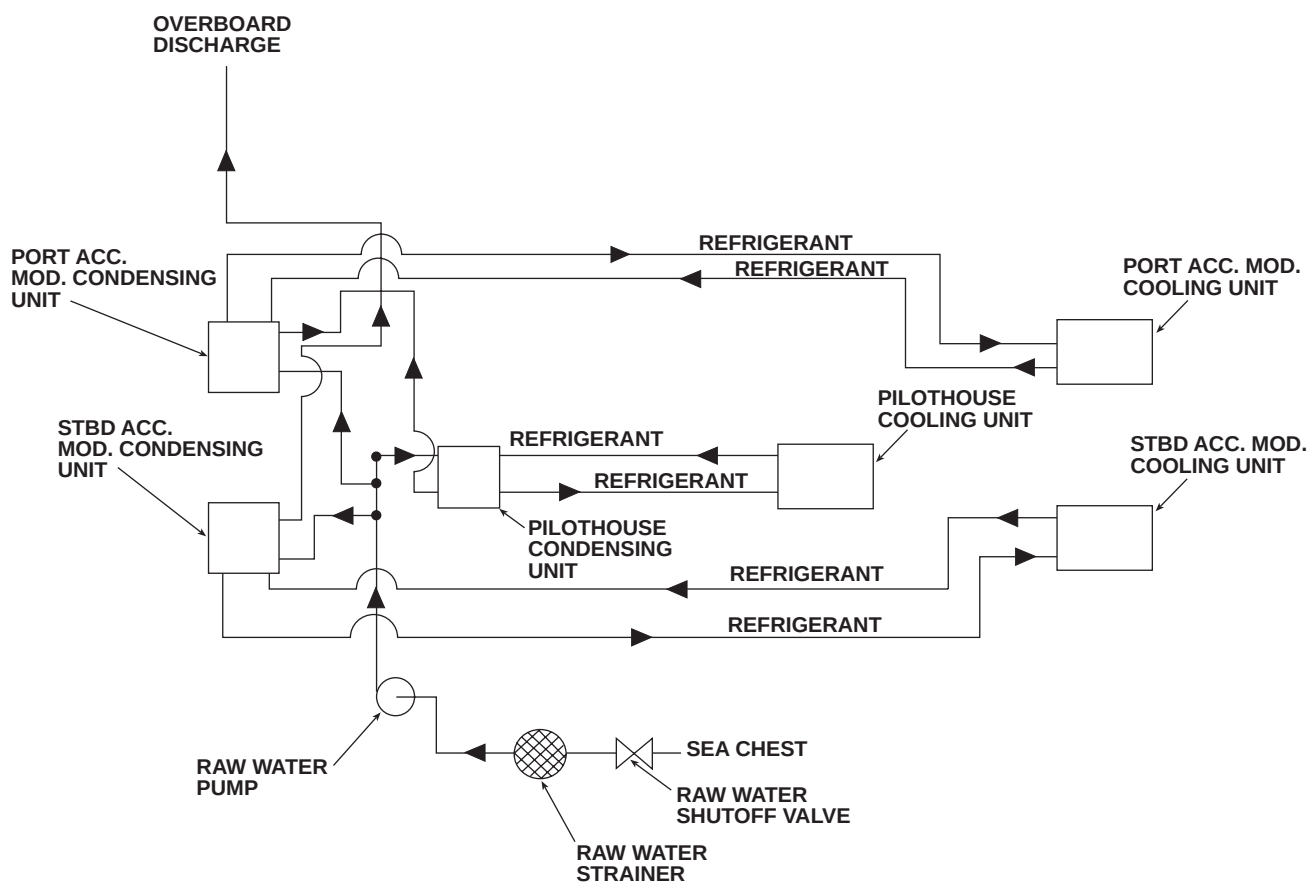
**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THEORY OF OPERATION
HEATING, AIR CONDITIONING, AND VENTILATION SYSTEMS**

GENERAL

The LCM-8 Mod 2 is equipped with heating, air conditioning, and ventilation systems to maintain habitability in the interior living and working spaces. The pilothouse and accommodation module are heated, air conditioned, and ventilated and the engine room is ventilated.

HEATING AND AIR CONDITIONING SYSTEM

Three heat pump units heat and cool the pilothouse and accommodation module. The system consists of condensing units, cooling units, refrigerant, control assemblies, raw water pump, and strainer. The system is powered by the vessel's 220 Vac electrical system through the 220/110 volt distribution box.



Condensing Unit

Three condensing units are installed in the heating and air conditioning system. Two units, one port and one starboard, are dedicated to the accommodation module, and one unit is dedicated to the pilothouse. The units are all mounted in the void beneath the pilothouse deck. The condensing units receive refrigerant from the cooling units, compress and condense the refrigerant, and send the refrigerant back to the cooling units. Compression of the refrigerant is accomplished by an integral compressor. Condensation of the refrigerant is accomplished by passing the compressed refrigerant through a raw water-cooled condenser coil.

Cooling Unit

Three cooling units are installed in the heating and air conditioning system. Two units, one port and one starboard, are located in the wing walls of the accommodation module. The third unit is located under the pilothouse console, starboard. The cooling units receive compressed, condensed refrigerant from the condensing units, allow the refrigerant to evaporate in an evaporator core, and send the evaporated refrigerant back to the condensing units for compression and condensation. The cooling units also contain fans, which draw in compartment air, pass that air over the evaporator core where it is cooled by the evaporating refrigerant, and discharge the cooled air back to the compartment.

Refrigerant

An R-22 refrigerant is used in the system. The refrigerant is a Hydrochloroflourocarbon (HCFC), a Class II Ozone Depleting Substance (ODS), and as such, requires special handling. Special handling instructions are contained in WP 0168 00.

Control Assemblies

Each cooling unit has its own control assembly mounted near the unit's outlet. The control assemblies have three rotary knobs. The top knob controls the mode of operation. When in the OFF position, the unit is off. When in the FAN position, the fan circulates air, but no heating or cooling is provided. When in the RUN position, the unit provides heating or cooling as required. The middle knob controls fan speed. The bottom knob controls temperature. When the selected temperature is lower than the compartment's ambient temperature, the unit enters cooling mode, and when the selected temperature is higher than the compartment's ambient temperature, the unit enters the heating mode.

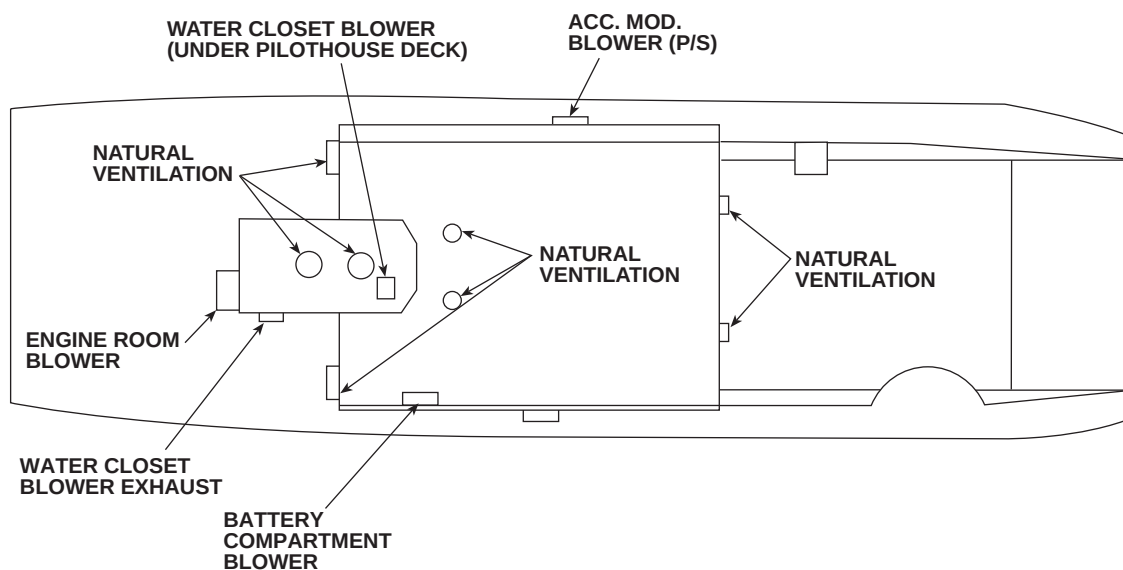
Raw Water Pump

A single raw water pump, mounted in the engine room, centerline, at frame 33 supplies raw water to cool all three condensing units. The raw water pump draws water in from the sea chest at frame 31 starboard through a shutoff valve and a strainer. The raw water pump discharges to a raw water manifold where it is distributed to the three condensing units. After passing through the condensing units, the raw water is discharged overboard through the port side hull aft of frame 37.

VENTILATION SYSTEM

General

Forced air ventilation is provided to the accommodation module, the battery compartment, the water closet compartment, and the engine room. All of these ventilation systems use fans to force air out of the compartments. Fresh air intake is by natural flow.



Accommodation Module Ventilation

Accommodation module ventilation is provided by two blowers mounted in the accommodation module bulkheads aft of frame 23, port and starboard. These blowers force air out of the accommodation module. Natural ventilation is provided by two vents in the overhead, port and starboard, aft of frame 27. Additional natural ventilation is provided by vents located in the forward bulkhead of the accommodation module, port and starboard. All four of these natural vents may be opened and closed as required by conditions. The blowers are powered by the vessel's 24 Vdc electrical system through the control and distribution panel in the pilothouse.

Battery Compartment Ventilation

Battery compartment ventilation is provided by an explosion proof blower mounted in the accommodation module bulkhead aft of frame 30, starboard. The blower draws air out of the battery compartment through a flexible vent hose and exhausts it to the atmosphere outside the accommodation module. Because of the potential for explosive gas generation caused by the charging/discharging of the batteries, this fan normally runs at all times. The blower is powered by the vessel's 24 Vdc electrical system through the control and distribution panel in the pilothouse.

Water Closet Compartment Ventilation

The water closet compartment is ventilated by a blower mounted under the pilothouse deck. The blower's intake draws air through the aft bulkhead of the water closet compartment and exhausts it through a port in the pilothouse base at frame 34, starboard. The blower is powered by the vessel's 24 Vdc electrical system through the control and distribution panel in the pilothouse. Fan operation is controlled by a door switch and timer. When the water closet door is closed, the blower begins to run. After the blower has run for five minutes, the timer shuts it off. The timer resets when the water closet door is opened.

Engine Room Ventilation

The engine room is ventilated by two blowers mounted in the engine room overhead aft of frame 35. These blowers draw air from the engine room. Fresh air is supplied to the engine room through intake ducts located on bulkhead 31, port and starboard. Both the intake and the exhaust ducts have fire flaps to permit the operator to secure all air flow to the engine room in case of fire. The exhaust duct is manually controlled from the aft deck, while the intake ducts are controlled from the pilothouse by means of T-handle controls. Power for the blowers is derived from the vessel's 24 Vdc electrical system through the control and distribution panel in the pilothouse.

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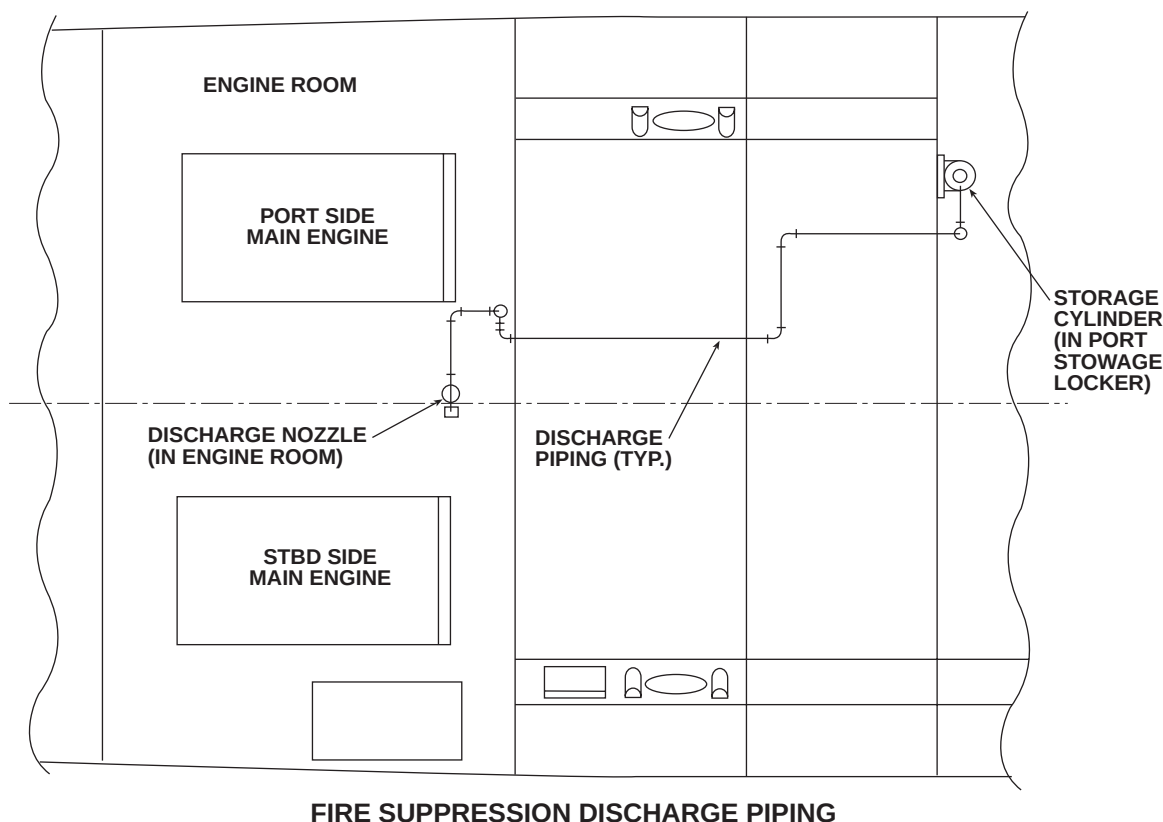
**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THEORY OF OPERATION
FIRE SUPPRESSION SYSTEM**

GENERAL

The LCM-8 Mod 2 is fitted with an engine room fire suppression system. This system is a manually-actuated, stand-alone, total flooding fire suppression system. The system is capable of extinguishing Class A, Class B, and Class C fires when properly deployed. The system consists of a storage cylinder, FM-200 extinguishing agent, control head, discharge nozzle, and pull box.

STORAGE CYLINDER

A steel storage cylinder, mounted in the port stowage locker, stores the FM-200 extinguishing agent until it is needed. The cylinder has a volume of 1.000 ft³ (0.0283 m³) and holds 70 lb (31.8 kg) of liquid FM-200 superpressurized with nitrogen to 360 lb/in² (24.8 bar).



FM-200 EXTINGUISHING AGENT

FM-200 is a colorless, odorless, electrically nonconductive, environmentally friendly gas. It suppresses fire by a combination of chemical and physical mechanisms without affecting the available oxygen, allowing personnel to leave the fire area safely. FM-200 is stored in the storage cylinder as a liquid, superpressurized at 360 lb/in² at 70 °F (24.8 kg at 21.1 °C) by dry nitrogen. The superpressurization improves FM-200's discharge characteristics.

CONTROL HEAD

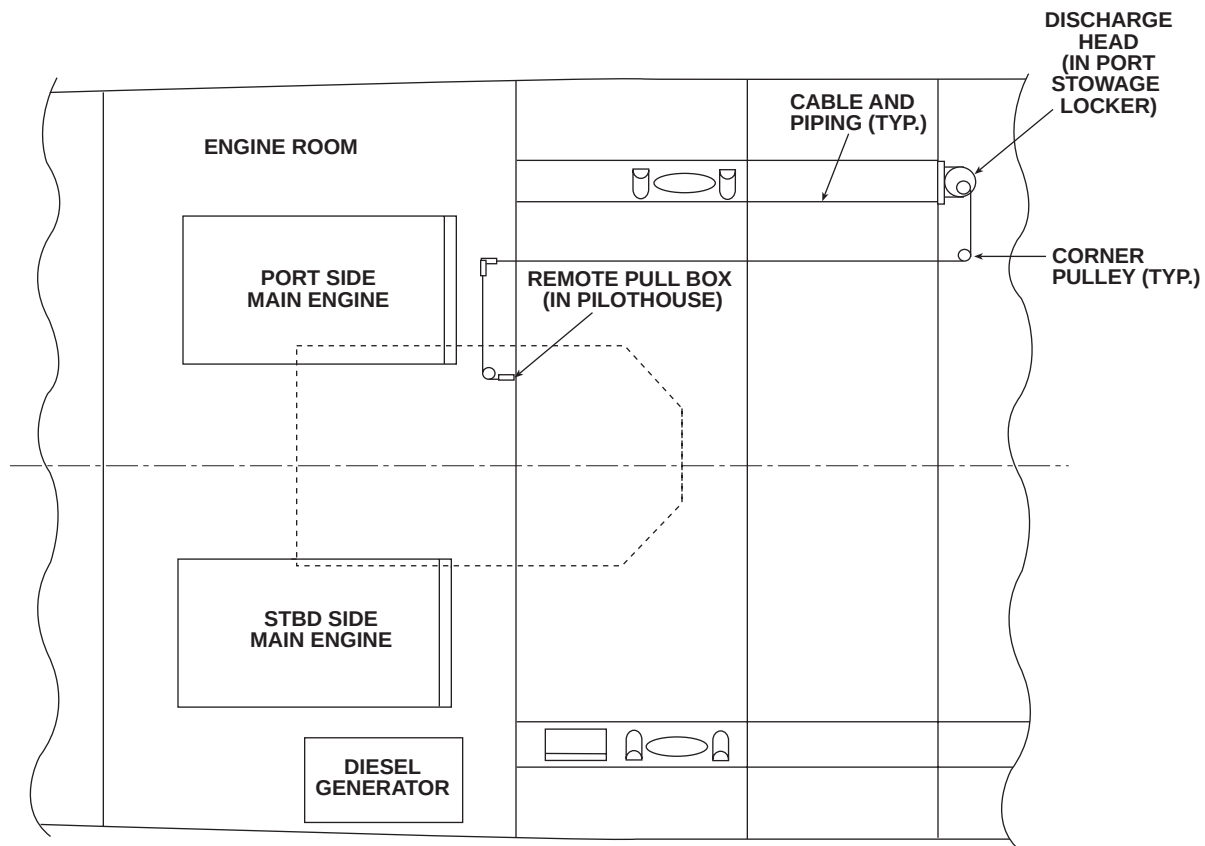
A cable operated control head is installed on the storage cylinder. The control head controls the discharge of FM-200 from the storage cylinder. The control head has two methods of actuation. The primary actuation method is remote actuation via a pull box located in the pilothouse. When the cable is pulled, the control head discharges FM-200 into the piping that leads to the engine room. The secondary actuation method is local actuation via the manual lever mounted on the control head.

DISCHARGE NOZZLE

A 180 degree discharge nozzle, mounted in the engine room, centerline, overhead, discharges FM-200 into the engine room after it is released by the control head. The discharge head ensures that the FM-200 is dispersed evenly throughout the engine room to most effectively extinguish a fire.

PULL BOX

A remote pull box, located in the pilothouse behind the coxswain's seat, serves as the primary method of actuation for the fire suppression system. The pull box is connected to the control head by a cable that is routed through a system of watertight piping and corner pulleys.



FIRE SUPPRESSION PULL BOX, CABLE, AND CONTROL HEAD

END OF WORK PACKAGE

CHAPTER 2

OPERATOR INSTRUCTIONS

FOR

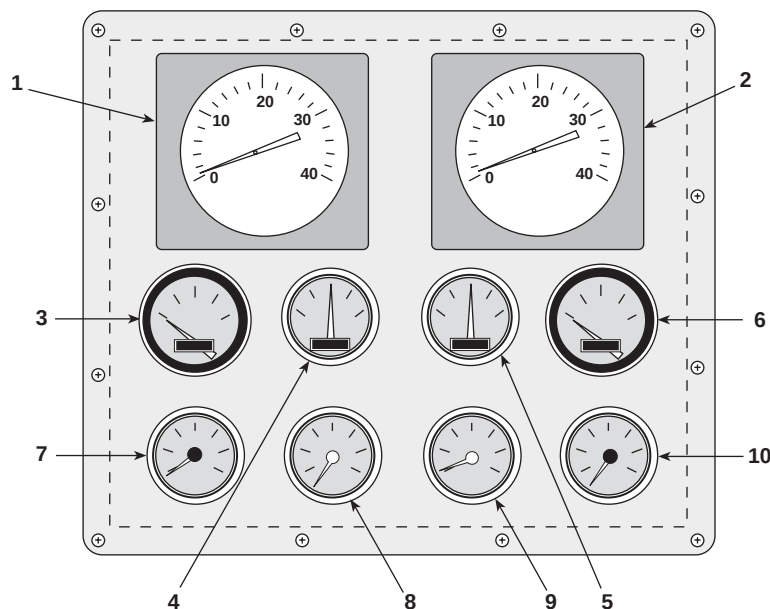
LANDING CRAFT, MECHANIZED (LCM-8)

(ALL VESSELS WITH MOD 2 APPLICATION)

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS
PILOTHOUSE AREA**

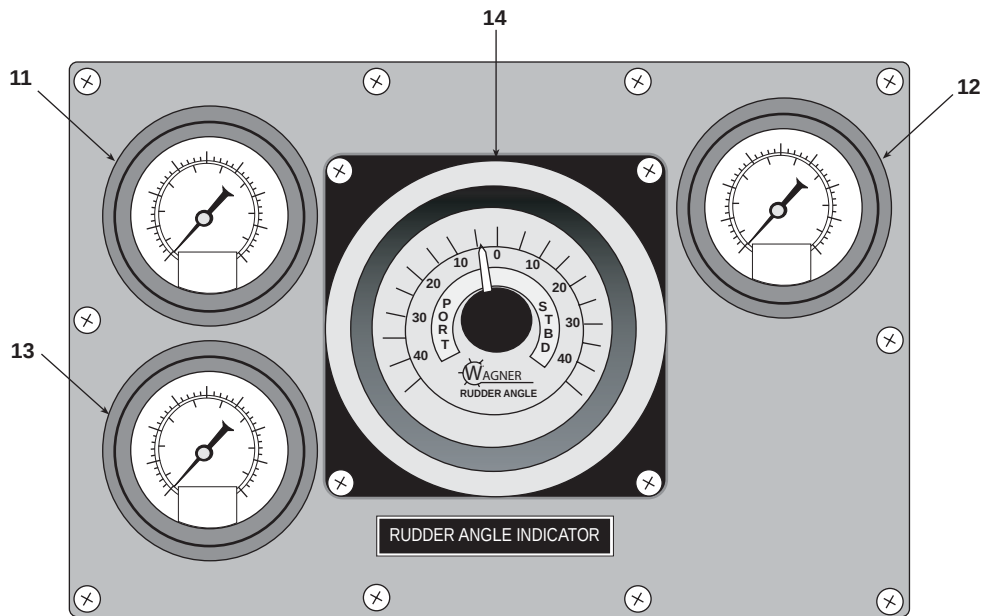
PROPULSION ENGINE INSTRUMENTS

1. Tachometer, Port Engine	Displays the operating speed of the port propulsion engine. Unit of measure is revolutions per minute (r/min).
2. Tachometer, Starboard Engine	Displays the operating speed of the starboard propulsion engine. Unit of measure is revolutions per minute (r/min).
3. PORT ENG TEMP	Displays the engine coolant temperature for the port propulsion engine. Unit of measure is degrees Fahrenheit (°F).
4. PORT AMMETER	Displays the charging or discharging rate of the port alternator. Unit of measure is amperes.
5. STBD AMMETER	Displays the charging or discharging rate of the starboard alternator. Unit of measure is amperes.
6. STBD ENG TEMP	Displays the engine coolant temperature for the starboard propulsion engine. Unit of measure is degrees Fahrenheit (°F).
7. Port Engine Oil Pressure	Displays the engine lube oil pressure for the port propulsion engine. Unit of measure is pounds per square inch (lb/in ²).
8. Port Marine Transmission Pressure	Displays the oil pressure for the port marine transmission. Unit of measure is pounds per square inch (lb/in ²).
9. Stbd Marine Transmission Pressure	Displays the oil pressure for the starboard marine transmission. Unit of measure is pounds per square inch (lb/in ²).
10. Starboard Engine Oil Pressure	Displays the engine lube oil pressure for the starboard propulsion engine. Unit of measure is pounds per square inch (lb/in ²).



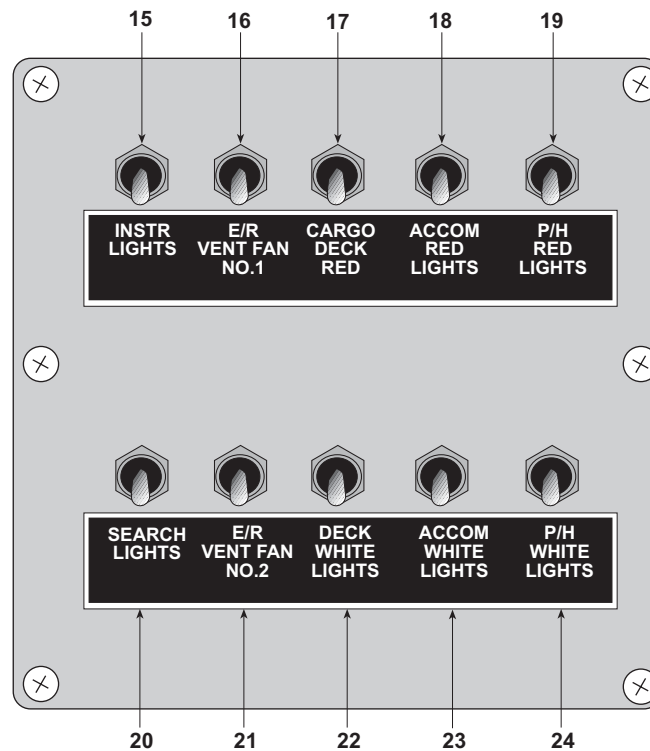
HYDRAULIC GAUGES AND RUDDER ANGLE INDICATOR

11. Hydraulic Pressure Gauge--Steering	Displays hydraulic pressure in steering system. Unit of measure is pounds per square inch (lb/in ²).
12. Hydraulic Pressure Gauge--Ramp	Displays hydraulic pressure in ramp system. Unit of measure is pounds per square inch (lb/in ²).
13. Hydraulic Pressure Gauge--Starting	Displays hydraulic pressure in propulsion engine starting system. Unit of measure is pounds per square inch (lb/in ²).
14. RUDDER ANGLE INDICATOR	Displays the rudder angle. Unit of measure is degrees.



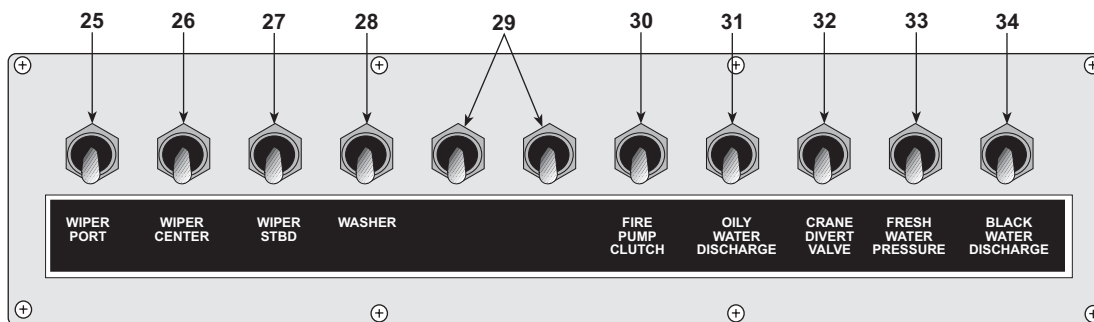
LIGHTING CONTROLS (EXCEPT NAVIGATION LIGHTS)

15. INSTR LIGHTS Switch	Turns instrument lights ON and OFF.
16. E/R VENT FAN No. 1 Switch	Turns engine room vent fan No. 1 ON and OFF.
17. CARGO DECK RED Switch	Turns the red cargo deck lights ON and OFF.
18. ACCOM RED LIGHTS Switch	Turns the accommodation module red lights ON and OFF.
19. P/H RED LIGHTS Switch	Turns the pilothouse red lights ON and OFF.
20. SEARCH LIGHTS Switch	Turns the searchlight ON and OFF.
21. E/R VENT FAN No. 2	Turns engine room vent fan No. 2 ON and OFF.
22. DECK WHITE LIGHTS Switch	Turns the white deck lights ON and OFF.
23. ACCOM WHITE LIGHTS Switch	Turns the white accommodation module lights ON and OFF.
24. P/H WHITE LIGHTS Switch	Turns the white pilothouse lights ON and OFF.



EQUIPMENT SWITCHES

25. WIPER PORT Switch	Turns the port windshield wiper ON and OFF.
26. WIPER CENTER Switch	Turns the center windshield wiper ON and OFF.
27. WIPER STBD Switch	Turns the starboard windshield wiper ON and OFF.
28. WASHER Switch	Momentary switch activates the windshield washdown system.
29. Spare Switches	Spare switches provided for future expansion.
30. FIRE PUMP CLUTCH Switch	Remotely engages and disengages the fire pump clutch.
31. OILY WATER DISCHARGE Switch	Turns the oily water discharge pump ON and OFF.
32. CRANE DIVERT VALVE Switch	Actuates the crane diverter valve to switch between ramp and crane operation. In the OFF position, the diverter valve enables the ramp system. In the ON position, the diverter valve enables the crane system.
33. FRESH WATER PRESSURE Switch	Turns the potable water pressure set ON and OFF.
34. BLACK WATER DISCHARGE Switch	Turns the black water discharge pump ON and OFF.



NAVIGATION LIGHTS AND ENGINE ALARMS

35.

TOWING LIGHT Switch

Turns the towing light ON and OFF.
36.

MASTHEAD/ANCHOR LIGHT

Selects between MASTHEAD LIGHT, ANCHOR LIGHT, and OFF.
37.

Navigation Light Switch

Controls operation of the side, stern, and NUC (Not Under Command) lights.
38.

PORT LOW OIL PRESSURE Light

Lights to warn the operator of a low oil pressure condition in the port propulsion engine.
39.

STBD LOW OIL PRESSURE Light

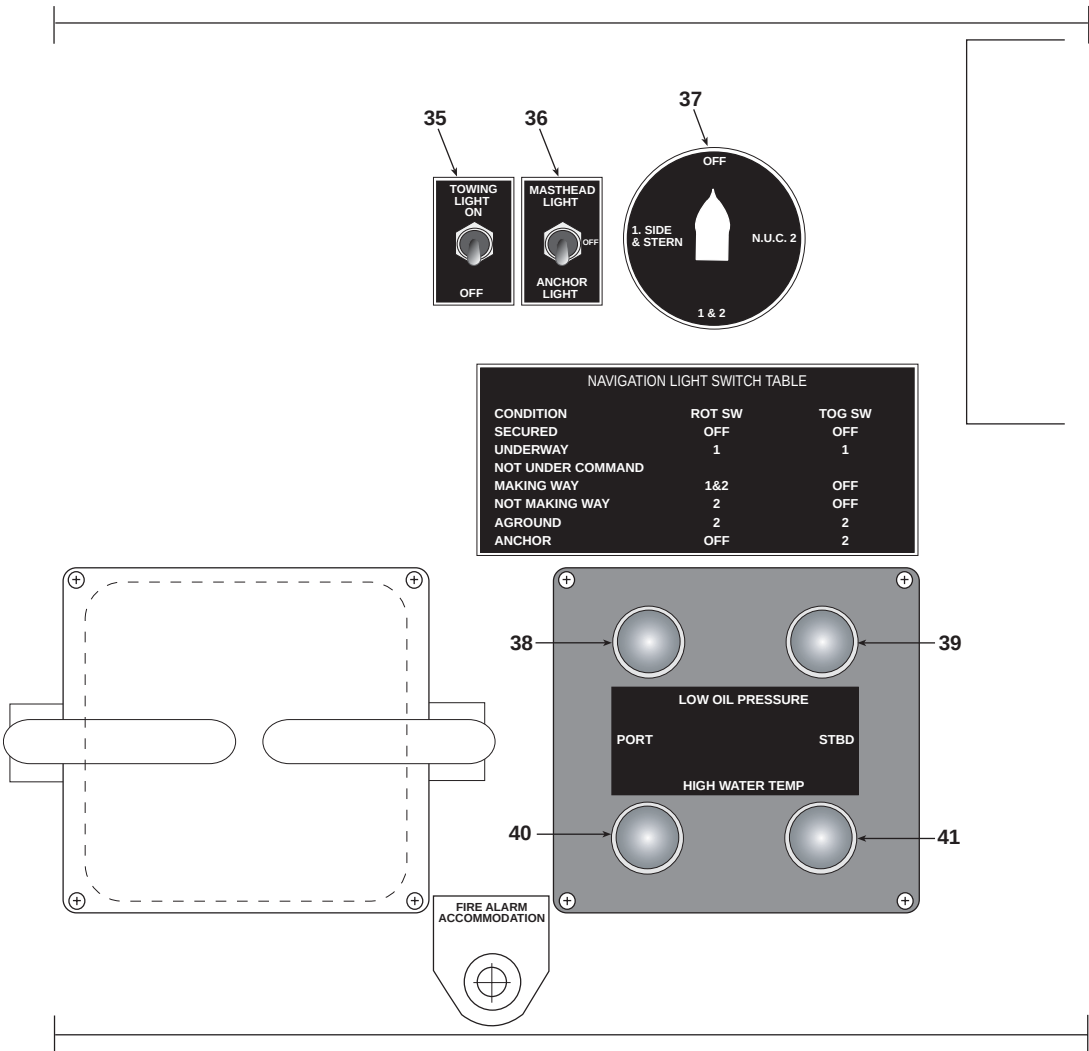
Lights to warn the operator of a low oil pressure condition in the starboard propulsion engine.
40.

PORT HIGH WATER TEMP Light

Lights to warn the operator of a high coolant temperature condition in the port propulsion engine.
41.

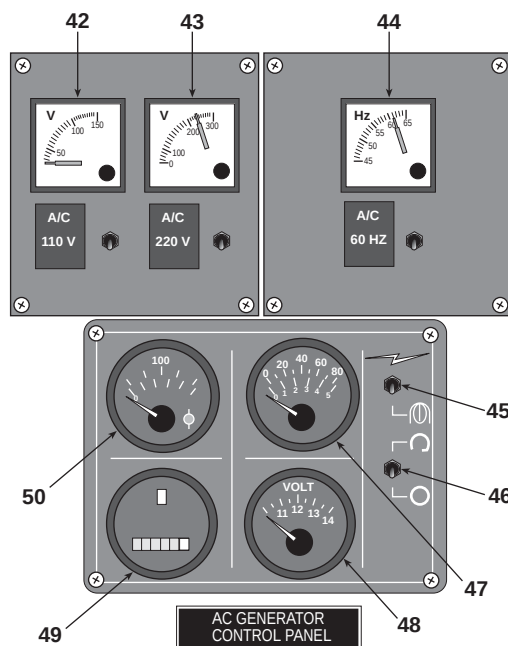
STBD HIGH WATER TEMP Light

Lights to warn the operator of a high coolant temperature condition in the starboard propulsion engine.



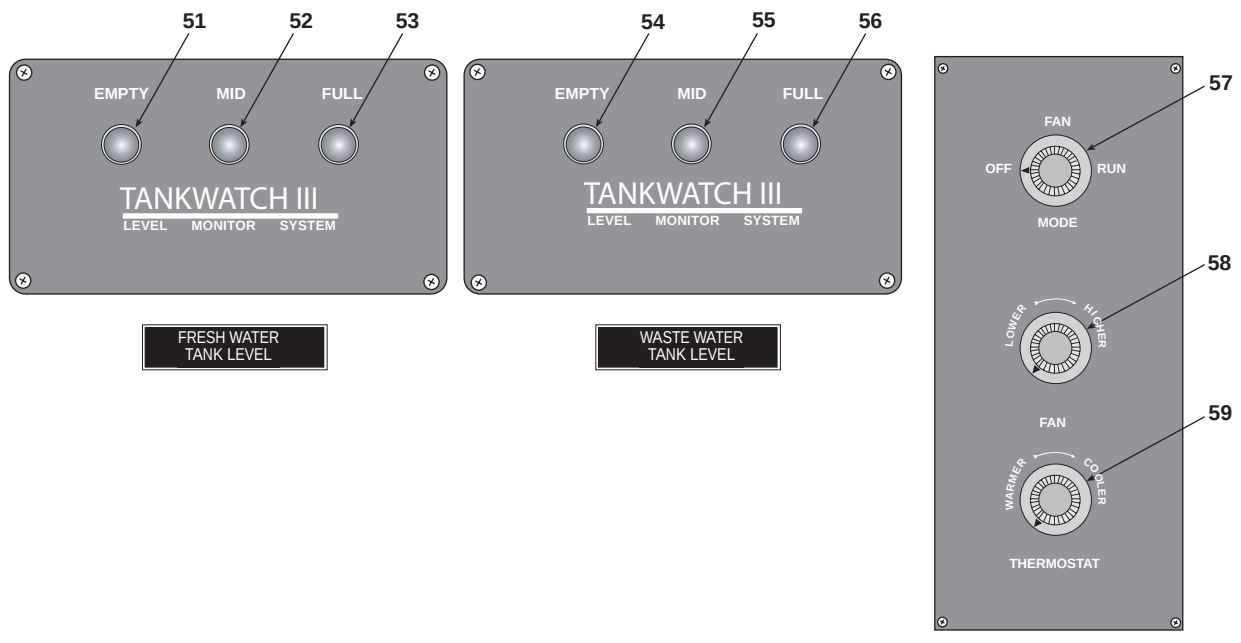
AC GENERATOR CONTROL PANEL

42. Voltmeter--110 Vac	Displays voltage on the 110 Vac distribution system.
43. Voltmeter--220 Vac	Displays voltage on the 220 Vac distribution system.
44. Frequency Meter	Displays ac voltage frequency. Unit of measure is Hertz.
45. Shutdown Bypass-Preheat Switch	Preheats the engine and bypasses the engine safety shutdown circuit to allow for engine starting.
46. Engine Control Switch	Selects between START (up, momentary), RUN (center), and STOP (down) modes for engine operation.
47. Oil Pressure Gauge	Displays the lube oil pressure in the diesel generator engine. Units of measure are pounds per square inch (lb/in ²) and kilograms per square centimeter (kg/cm ²).
48. DC Voltmeter	When the diesel generator engine is stopped, the voltmeter indicates the condition of the starting battery. When the engine is running, it indicates the voltage output of the alternator. Unit of measure is Volts direct current (Vdc).
49. Hour Meter	Indicates the diesel generator engine running time.
50. Engine Temperature Gauge	Displays temperature of the diesel generator engine coolant. Units of measure are degrees Fahrenheit (°F) and degrees Celsius (°C).



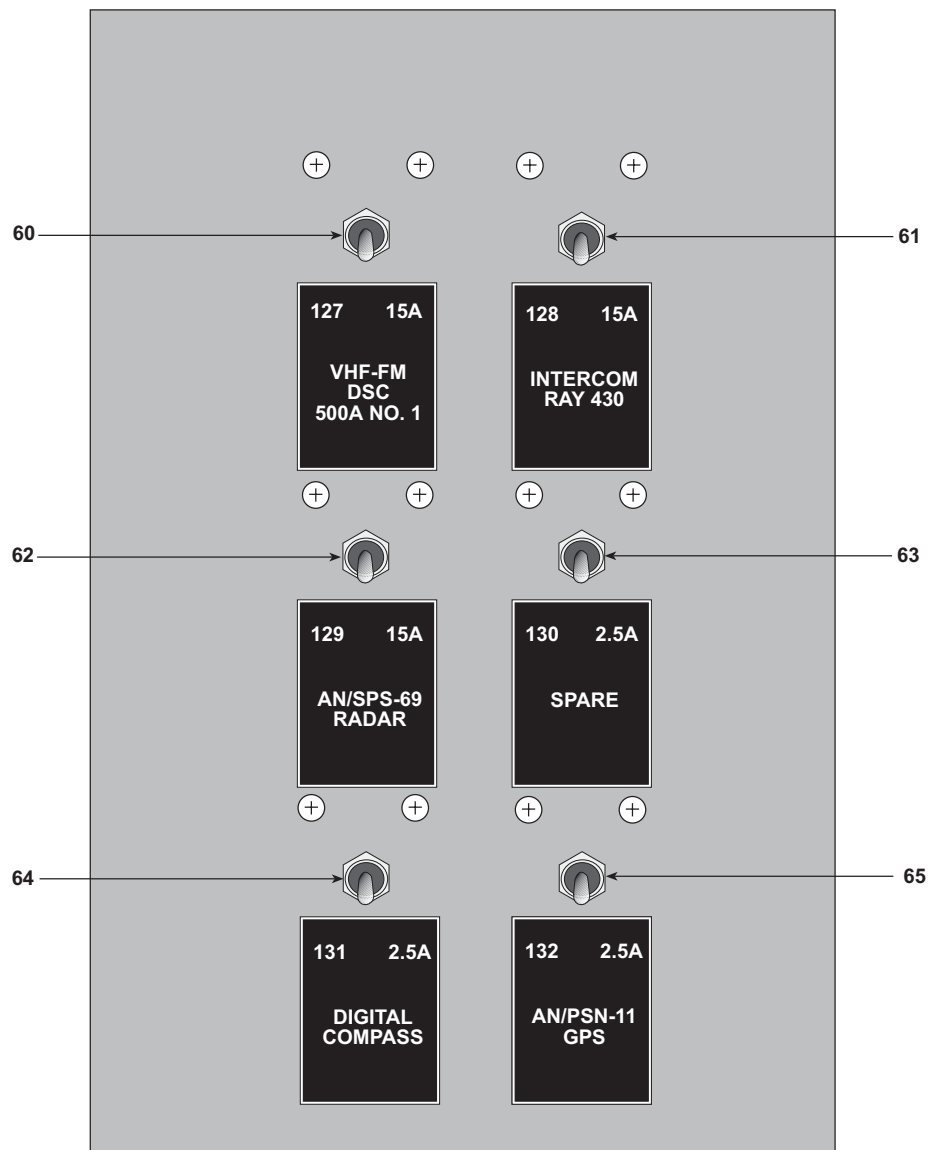
TANK MONITORS AND HEATING/AIR CONDITIONING CONTROLS

51. Fresh Water EMPTY Light	Lights when the potable water tank is empty.
52. Fresh Water MID Light	Lights when the potable water tank is at its mid point.
53. Fresh Water FULL Light	Lights when the potable water tank is full.
54. Black Water EMPTY Light	Lights when the black water tank is empty.
55. Black Water MID Light	Lights when the black water tank is at its mid point.
56. Black Water FULL Light	Lights when the black water tank is full.
57. Heat/A/C MODE Knob	Selects between OFF, FAN, and RUN modes. In OFF, the entire unit is off. In FAN, only the fan operates, no heating or cooling is available. In RUN, heat or cooling is available as desired.
58. Heat/A/C FAN Knob	Controls fan speed.
59. Heat/A/C THERMOSTAT Knob	Permits the operator to set the compartment temperature to the desired level.



COMMS AND NAV AIDS DISTRIBUTION BOX

60. VHF-FM DSC 500A NO.1 Circuit Breaker	Overload protection for the Ross DSC-500 VHF/FM radio. ON/OFF control is provided on the radio.
61. INTERCOM RAY 430 Circuit Breaker	Overload protection for the Raytheon RAY 430 Loudhailer. ON/OFF control is provided on the loudhailer.
62. AN/SPS-69 RADAR Circuit Breaker	Overload protection for the Raytheon R-80 Radar. ON/OFF control is provided on the radar display unit.
63. SPARE Circuit Breaker	Spare circuit breaker provided to allow expansion.
64. DIGITAL COMPASS Circuit Breaker	Overload protection for the KVH MV103AC Digital Compass System. ON/OFF control is provided on the control head.
65. AN/PSN-11 GPS Circuit Breaker	Overload protection for the AN/PSN-11 GPS. ON/OFF control is provided on the GPS.



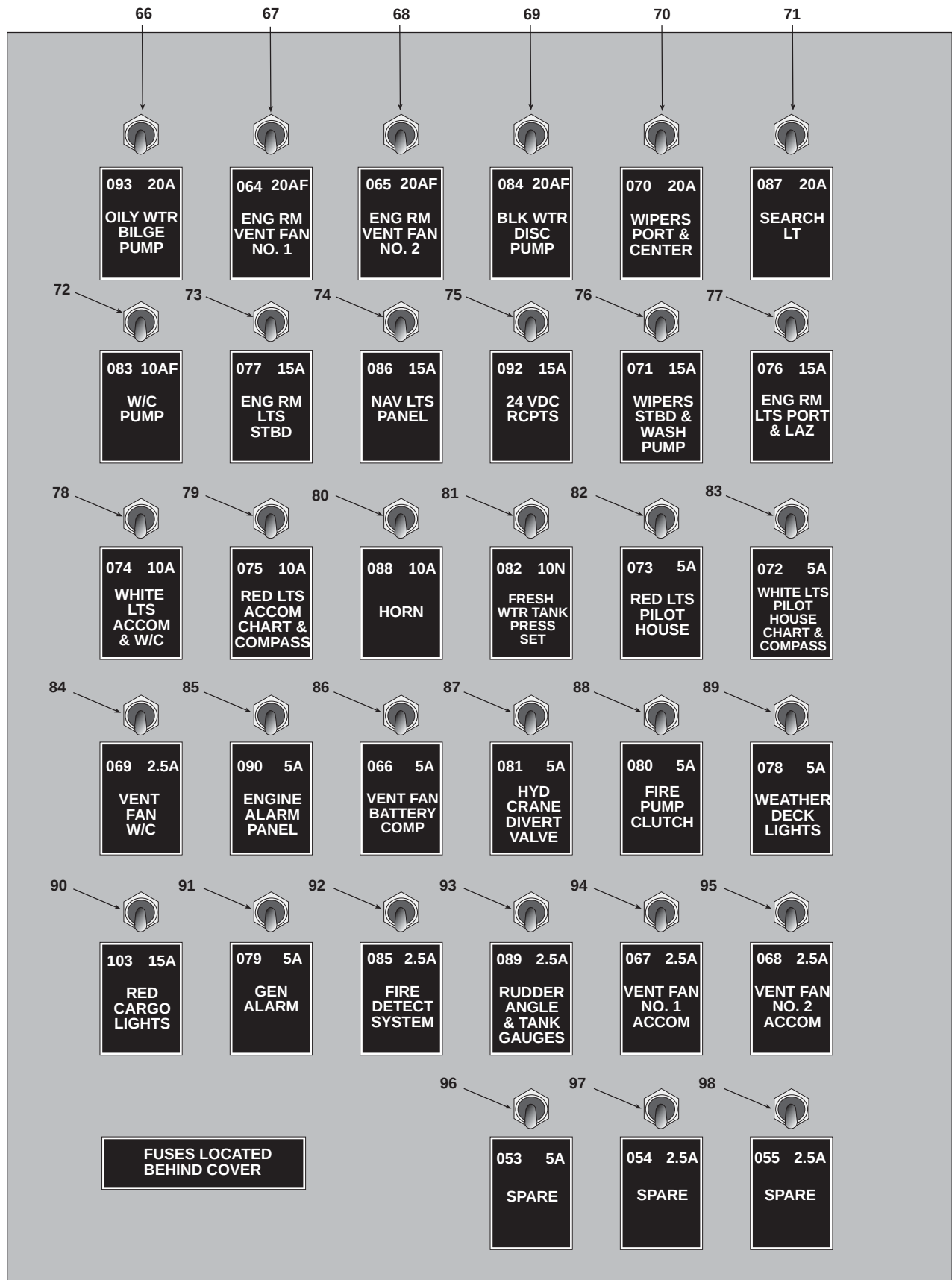
CONTROL AND DISTRIBUTION PANEL

66. OILY WTR BILGE PUMP Circuit Breaker	Overload protection for the oily water collection system pump. ON/OFF is controlled by a switch on the pilothouse console.
67. ENG RM VENT FAN NO. 1 Circuit Breaker	Overload protection for engine room ventilation fan number 1. ON/OFF is controlled by a switch on the pilothouse console.
68. ENG RM VENT FAN NO. 2 Circuit Breaker	Overload protection for engine room ventilation fan number 2. ON/OFF is controlled by a switch on the pilothouse console.
69. BLK WTR DISC PUMP Circuit Breaker	Overload protection for the black water discharge pump. ON/OFF is controlled by a switch on the pilothouse console.
70. WIPERS PORT & CENTER Circuit Breaker	Overload protection for the port and center windshield wiper motors. ON/OFF is controlled by switches on the pilothouse console.
71. SEARCH LTS Circuit Breaker	Overload protection for the searchlight. ON/OFF is controlled by a switch on the pilothouse console.
72. W/C PUMP Circuit Breaker	Overload protection for the electric water closet pump. ON/OFF (flushing) is controlled by a switch on the water closet compartment aft bulkhead.
73. ENG RM LTS STBD Circuit Breaker	Overload protection for the starboard side engine room lights. ON/OFF is controlled by a switch at the head of the engine room ladder.
74. NAV LTS PANEL Circuit Breaker	Overload protection for the navigation light panel. ON/OFF for the individual lights is controlled by switches on the panel.
75. 24 VDC RCPTS Circuit Breaker	Overload protection for the 24 Vdc receptacles located in the pilothouse, the engine room, and the accommodation module.
76. WIPERS STBD & WASH PUMP Circuit Breaker	Overload protection for the starboard windshield wiper motor and the windshield washdown pump. ON/OFF is controlled by switches on the pilothouse console.
77. ENG RM LTS PORT & LAZ Circuit Breaker	Overload protection for the port side engine room lights and for the lazarette lights. ON/OFF for the engine room lights is controlled by a switch at the head of the engine room ladder. ON/OFF for the lazarette lights is controlled by a switch at the head of the lazarette ladder.
78. WHITE LTS ACCOM & W/C Circuit Breaker	Overload protection for the accommodation module and water closet white lights. ON/OFF is controlled by a switch on the pilothouse console.
79. RED LTS ACCOM CHART & COMPASS Circuit Breaker	Overload protection for the accommodation module red lights, the chart lights, and the compass light. ON/OFF for the accommodation module red lights is controlled by a switch on the pilothouse console. ON/OFF for the chart lights and the compass is controlled by switches on the units.
80. HORN Circuit Breaker	Overload protection for the horn. ON/OFF is controlled by a pushbutton switch on the pilothouse console.
81. FRESH WTR TANK PRESS SET Circuit Breaker	Overload protection for the potable water pressure set. ON/OFF is controlled by a switch on the pilothouse console.
82. RED LTS PILOTHOUSE Circuit Breaker	Overload protection for the pilothouse red lights. ON/OFF is controlled by a switch on the pilothouse console.

CONTROL AND DISTRIBUTION PANEL (continued)

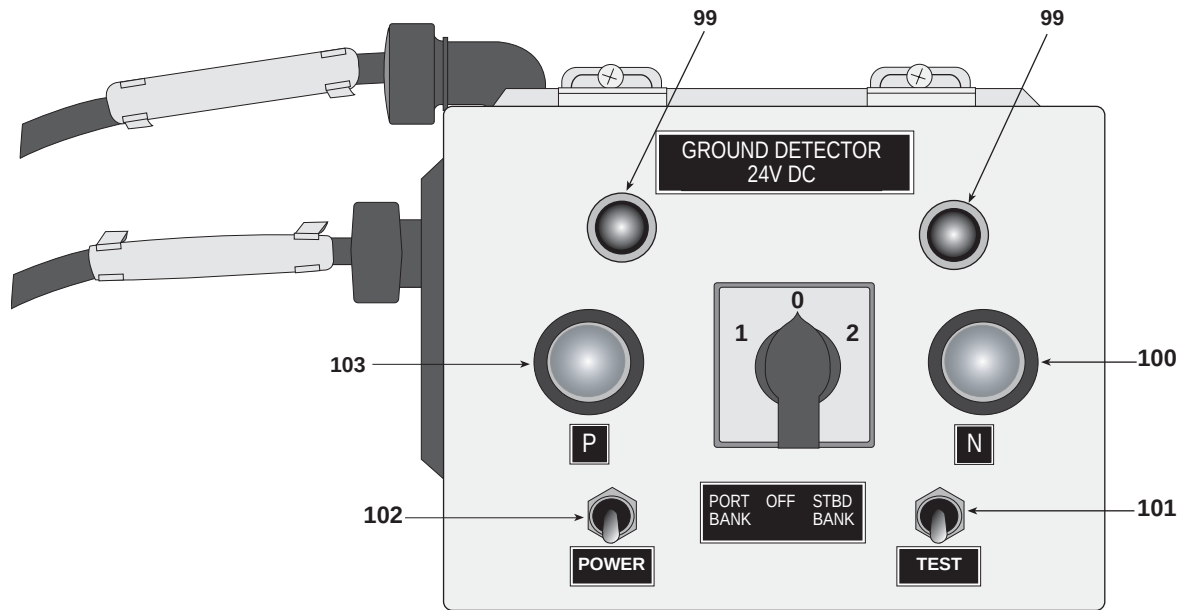
83.	WHITE LTS PILOTHOUSE CHART & COMPASS Circuit Breaker	Overload protection for the pilothouse white lights, chart light, and compass light. ON/OFF for the pilothouse lights is controlled by a switch on the pilothouse console. ON/OFF for the chart light and compass light is controlled by switches on the units.
84.	VENT FAN W/C Circuit Breaker	Overload protection for the water closet compartment ventilation fan. ON/OFF is controlled by a door switch and timer.
85.	ENGINE ALARM PANEL Circuit Breaker	Overload protection for the engine alarm system. ON/OFF is controlled by this breaker and by fuel pressure switches on the engine.
86.	VENT FAN BATTERY COMP Circuit Breaker	Overload protection for the battery compartment ventilation fan. ON/OFF is controlled by this circuit breaker.
87.	HYD CRANE DIVERT VALVE Circuit Breaker	Overload protection for the crane diverter valve. ON/OFF is controlled by a switch located on the pilothouse console.
88.	FIRE PUMP CLUTCH Circuit Breaker	Overload protection for the fire pump clutch. ON/OFF is controlled by a switch on the pilothouse console.
89.	WEATHER DECK LIGHTS Circuit Breaker	Overload protection for the white deck lights. ON/OFF is controlled by a switch on the pilothouse console.
90.	RED CARGO LIGHTS Circuit Breaker	Overload protection for the red cargo lights. ON/OFF is controlled by a switch on the pilothouse console.
91.	GEN ALARM Circuit Breaker	Overload protection for the general alarm system. ON/OFF is controlled by a rotary switch on the pilothouse overhead.
92.	FIRE DETECT SYSTEM Circuit Breaker	Overload protection for the fire detection system. ON/OFF is controlled by a switch on the alarm panel.
93.	RUDDER ANGLE & TANK GAUGES Circuit Breaker	Overload protection for the rudder angle indicator and the tank level gauges. ON/OFF is controlled by this breaker.
94.	VENT FAN NO. 1 ACCOM Circuit Breaker	Overload protection for accommodation module ventilation fan number 1. ON/OFF is controlled by this breaker.
95.	VENT FAN NO. 2 ACCOM Circuit Breaker	Overload protection for accommodation module ventilation fan number 2. ON/OFF is controlled by this breaker.
96.	SPARE Circuit Breaker	Spare circuit breaker provided for expansion.
97.	SPARE Circuit Breaker	Spare circuit breaker provided for expansion.
98.	SPARE Circuit Breaker	Spare circuit breaker provided for expansion.

CONTROL AND DISTRIBUTION PANEL (continued)



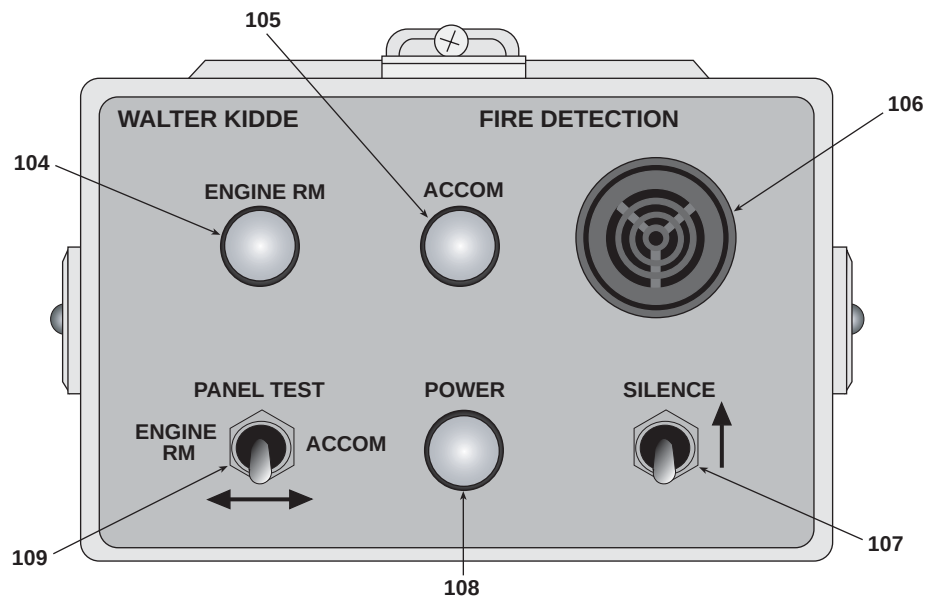
GROUND DETECTOR

99. Fuses	Overload protection for ground detector.
100. N Indicator Light	Negative indicator light. Indicates ground on negative side of system.
101. TEST Switch	Test switch (momentary). ON activates test, OFF deactivates test.
102. POWER Switch	Turns ground detector ON and OFF.
103. P Indicator Light	Positive indicator light. Indicates ground on positive side of system.



FIRE DETECTION ALARM PANEL

104. ENGINE RM	Engine room indicator light. Illuminates to indicate fire in the engine room.
105. ACCOM	Accommodation module indicator light. Illuminates to indicate smoke in the accommodation module.
106. Speaker	Alarm speaker. Gives audible signal when fire is detected in the engine room or smoke is detected in the accommodation module.
107. SILENCE	Silences alarm.
108. POWER Indicator	Illuminates when power is ON.
109. PANEL TEST Switch	In ENGINE RM position, tests the engine room alarm. In ACCOM position, tests the accommodation module alarm.



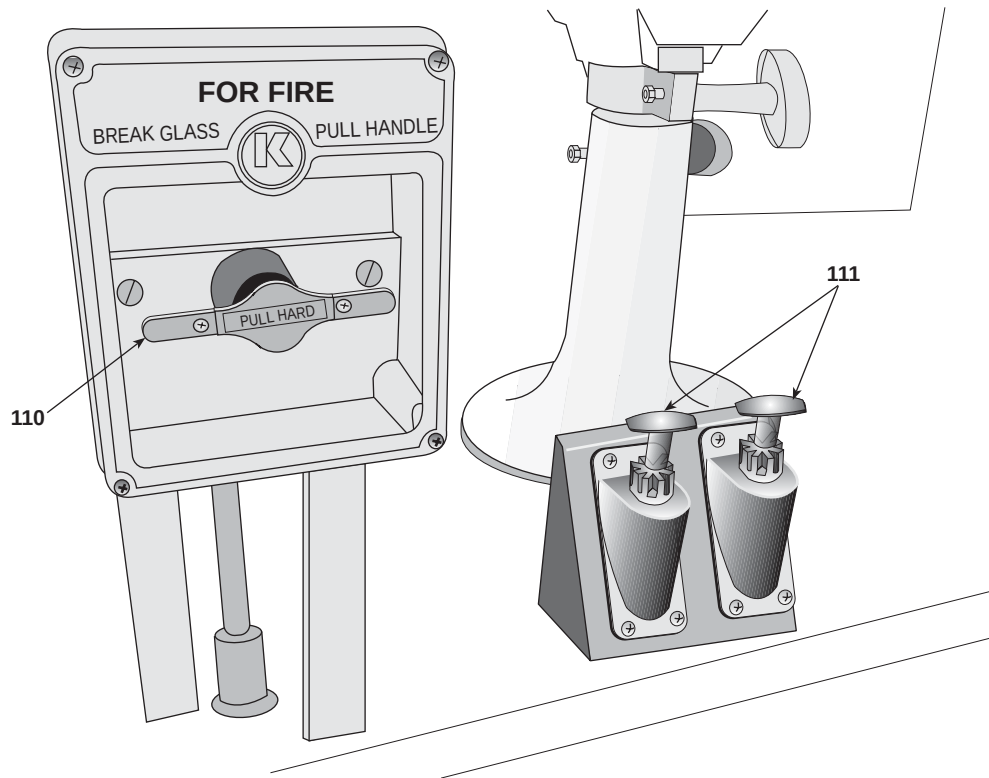
FIRE SUPPRESSION AND ENGINE ROOM VENTILATION

110. Fire Suppression Pull Box

Remote (primary) actuation of the FM-200 fire suppression system for the engine room. Break the glass and pull the handle to operate.

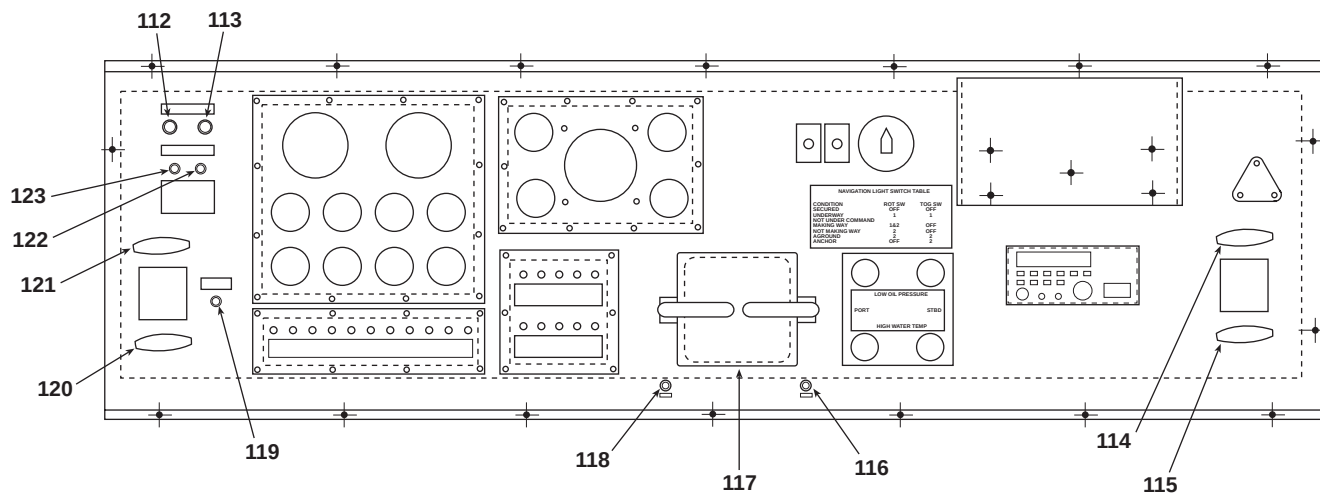
111. Engine Room Ventilation Fire Flap T-Handles

Remote actuation of the engine room intake ventilation fire flaps. Pull the T-handles to close the engine room intake ventilation fire flaps.



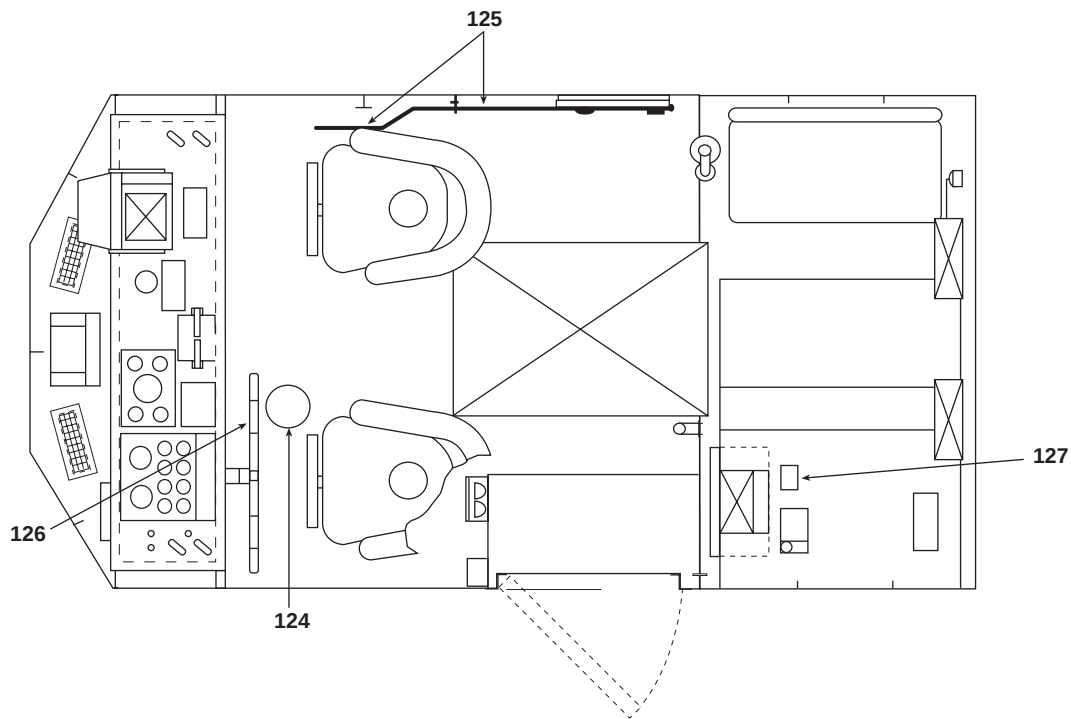
MISCELLANEOUS CONTROLS AND INDICATORS

112. ALT WARNING LIGHT--PORT Alternator warning light for the port propulsion engine alternator. Illuminates to indicate a malfunction in this alternator's charging system.
113. ALT WARNING LIGHT--STBD Alternator warning light for the starboard propulsion engine alternator. Illuminates to indicate a malfunction in this alternator's charging system.
114. ENGINE SHUTDOWN--PORT Normal propulsion engine shutdown T-handle for the port engine. The operator pulls this T-handle to move the fuel rack to the "No Fuel" position, resulting in normal engine shutdown.
115. ENGINE SHUTDOWN--STBD Normal propulsion engine shutdown T-handle for the starboard engine. Operator pulls this T-handle to move fuel rack to "No Fuel" position, resulting in normal engine shutdown.
116. FIRE ALARM--ACCOM Indicator Illuminates to notify the operator of smoke in the accommodation module.
117. Propulsion Controls Twin control head controls propulsion engine speed and marine transmission engagement.
118. FIRE ALARM--ENG RM Indicator Illuminates to notify the operator of fire in the engine room.
119. HORN Button Pushbutton switch controls the navigation horn. Push to sound the horn, release to stop the sounding horn.
120. EMERGENCY ENGINE SHUT-DOWN--STBD Emergency propulsion shutdown T-handle for the starboard engine. Used only in an emergency. The operator pulls the T-handle to secure air flow to the engine, resulting in emergency engine stopping and possible engine damage.
121. EMERGENCY ENGINE SHUT-DOWN--PORT Emergency propulsion shutdown T-handle for the port engine. Used only in an emergency. The operator pulls the T-handle to secure air flow to the engine, resulting in emergency engine stopping and possible engine damage.
122. STBD ENGINE START Switch Start switch for the starboard propulsion engine. The operator pushes the button to actuate the starter hydraulic control valve which, in turn, allows the hydraulic starting system to crank the engine.
123. PORT ENGINE START Switch Start switch for the port propulsion engine. The operator pushes the button to actuate the starter hydraulic control valve which, in turn, allows the hydraulic starting system to crank the engine.



MISCELLANEOUS CONTROLS AND INDICATORS (continued)

124. General Alarm Switch (overhead) Controls operation of the general alarm. When the operator rotates the switch to the ON position, the general alarm sounds in the accommodation module and the engine room.
125. Ramp Control Lever Allows the operator to control the raising and lowering of the bow ramp.
126. Helm Operator turns wheel to turn rudders which, in turn, steer the vessel.
127. Windshield De-Icer Switch allows the operator to turn ON and OFF the windshield de-icer.

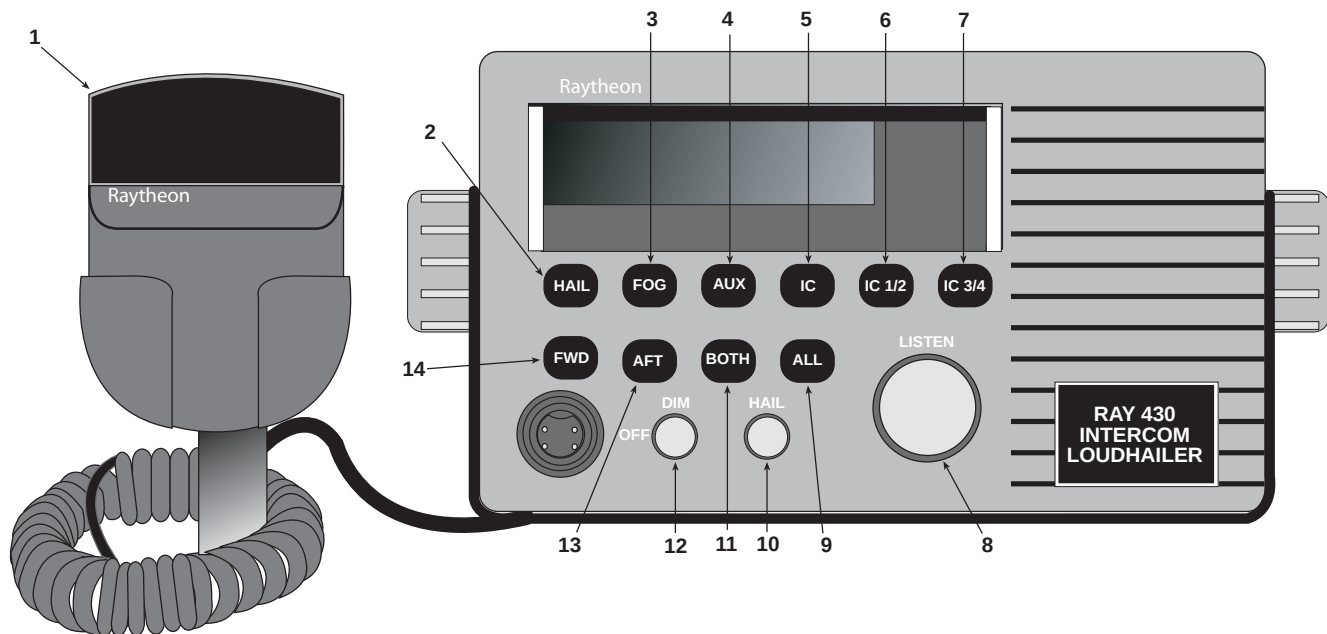
**END OF WORK PACKAGE**

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR INSTRUCTIONS
DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS
COMMUNICATION AND NAVIGATION GEAR**

RAYTHEON RAY 430 LOUDHAILER

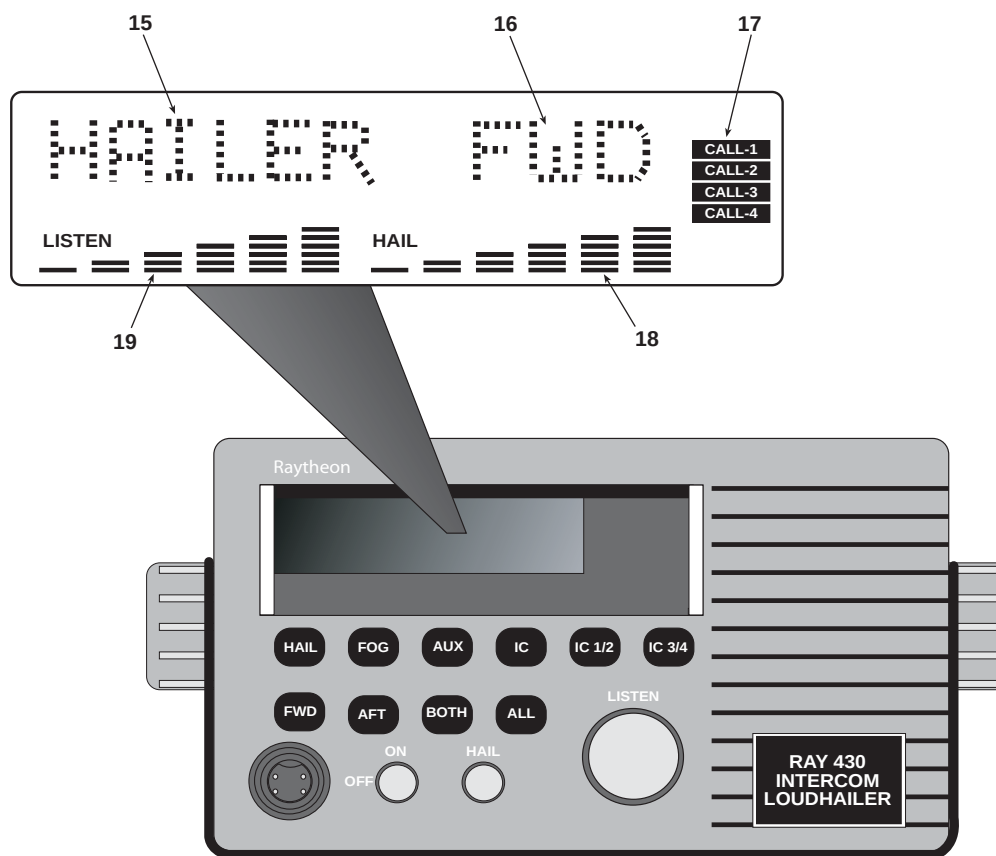
1. Microphone PTT (Push-To-Talk) Switch	Push this switch to activate the microphone.
2. HAIL Key	Press to place the RAY 430 in HAIL mode. HAILER is displayed on the LCD when in this mode.
3. FOG Key	Pressing this key sequentially selects one of the nine different horn or automatic fog signals for use.
4. AUX Key	Enables AUX input from radiotelephone or other input source. Input is amplified and heard at the selected external speaker location(s).
5. IC Key	Intercom key. Pressing this key places the RAY 430 in intercom mode.
6. IC 1/2 Key	Selects between intercom stations 1 or 2.
7. IC 3/4 Key	Selects between intercom stations 3 or 4.
8. LISTEN Control	Rotating the knob clockwise increases listening volume at the internal speaker. Rotating the knob counterclockwise decreases listening volume.
9. ALL Key	Selects all speaker stations for use simultaneously during foghorn, hailer, or public address operations.
10. HAIL Output Control	Rotating the knob clockwise increases the volume going to the hailer horns or intercom speakers. Rotating the knob counterclockwise decreases the volume.
11. BOTH Key	Selects both hailer horns.
12. OFF and DIM	Turns the RAY 430 ON and OFF. Rotating the knob clockwise increases the backlighting level of the LCD display.
13. AFT Key	Selects the aft hailer horn.
14. FWD Key	Selects the forward hailer horn.

RAYTHEON RAY 430 LOUDHAILER (continued)



15. MODE Display	Indicates RAY 430 Mode. HAILER for hailing or public address mode, INTERCOM for intercom operation, AUX for auxiliary audio inputs, and FOG for fog modes.
16. SPEAKER Display	Indicates the location of the speakers selected for use (FWD, AFT, BOTH, ALL). Indicates FOG mode selected when FOG button is pushed. FOG modes are: MANUAL to use as horn signal, UNDRWY fog signal for power boat underway, STOP for fog signal for stopped vessel, SAIL for fog signal for towboat, TOW for fog signal for vessel under tow, ANCHOR for fog signal for vessel at anchor, AGROUND for fog signal for vessel aground, YELP for siren signal, ALARM for burglar alarm signal when activated.
17. Intercom Display	Indicates the intercom stations selected for use.
18. HAIL Volume	Indicates hailer volume level.
19. LISTEN Volume	Indicates listen volume level.

RAYTHEON RAY 430 LOUDHAILER (continued)

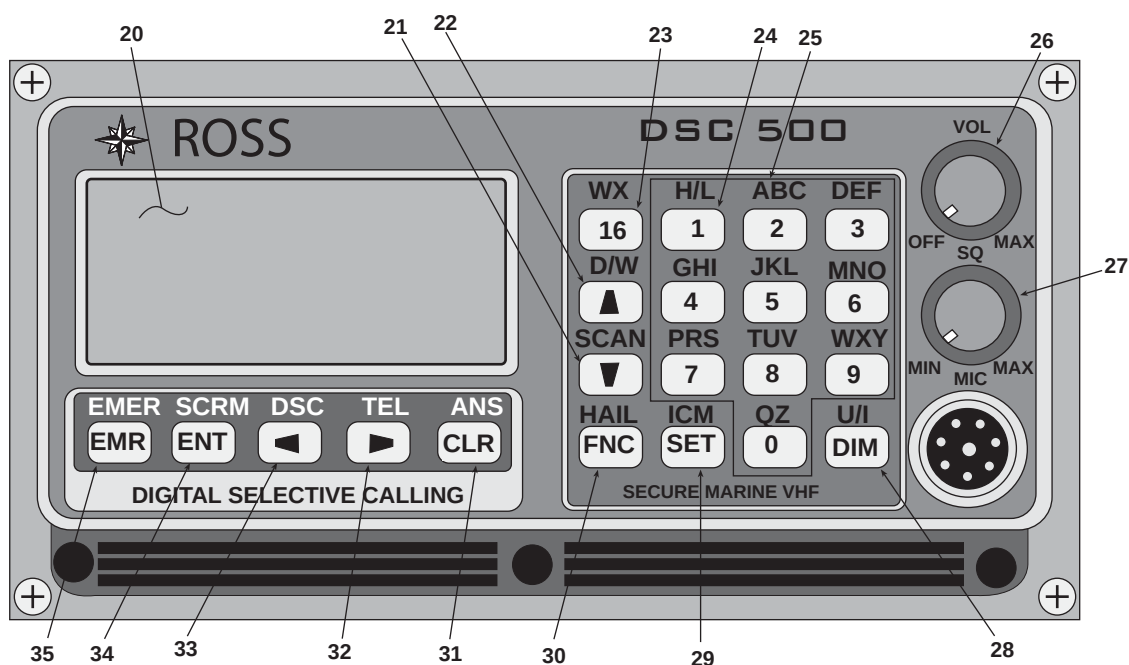


ROSS DSC-500 VHF/FM RADIO

20. Alphanumeric Display	Alphanumeric display presents complete information regarding the active status of the DSC 500 both during normal operation and when other modes are active. Also presents plain language prompts and warnings to aid in the use of advanced features.
21. Down Arrow/SCAN Key	Selects the next lower channel or moves the selection bar downward in menus. FNC + Key displays the scan selection menu. Options are Memory Scan, All Channels, or Scan Review.
22. Up Arrow/D/W Key	Selects the next higher channel or moves the selection bar upward in menus. FNC + Key enables Dual Watch, which allows two channels to be selected and monitored simultaneously.
23. 16/WX	Sets the DSC 500 to transmit and receive on channel 16 and overrides any other function when pressed. FNC + Key allows the 10 weather channels to be selected individually or scanned.
24. 1/H/L	FNC + Key selects high (25 W) or low (2 W) transmit power. Also selects local or distance receive mode.
25. Number Keys 1-9	Used for channel selection and for entry of numeric data.
26. ON/VOL Control	Turns the DSC 500 ON and OFF and adjusts the speaker volume level.

ROSS DSC-500 VHF/FM RADIO (continued)

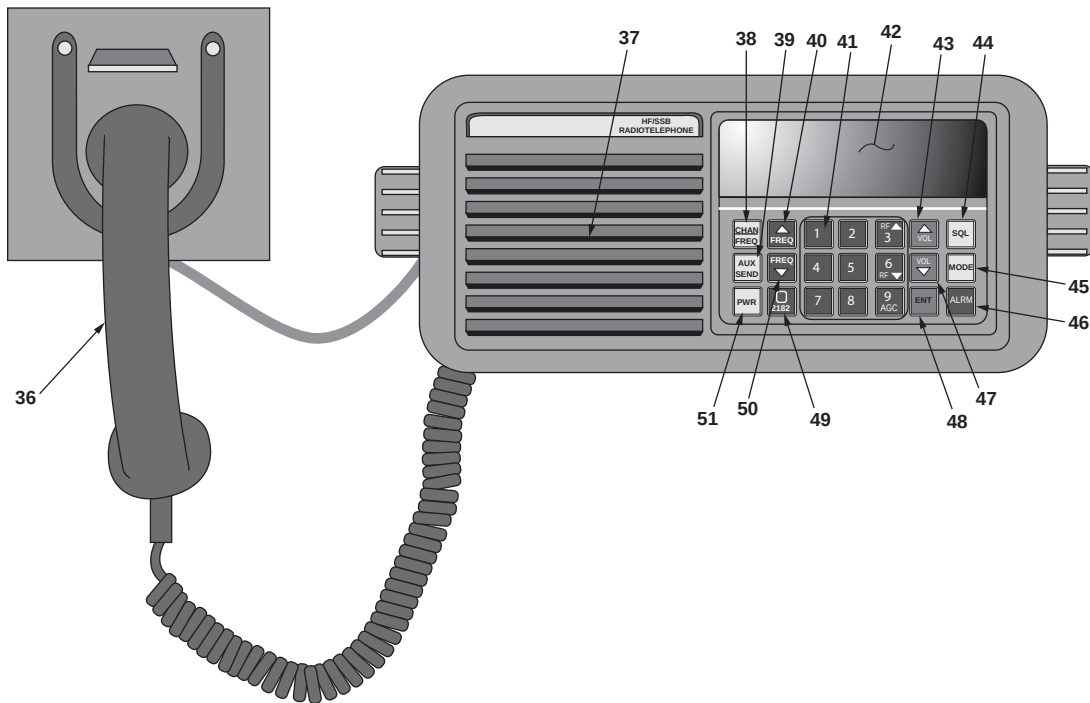
27. SQ Control
 Squelch control sets the threshold level of received signals that will produce audio output from the speaker.
28. DIM/U/I Key
 Selects any of the four backlight levels: Low, Medium, High, and Off. FNC + Key selects USA or international frequency set.
29. SET/ICM Key
 Displays the USER SETUPS menu. Choose from CLOCK, VIEWING ANGLE, USER DSC ID, USER OPTIONS, NMEA POSITION, and SECURITY CODE. FNC + Key activates the intercom (intercom mode is not used on the LCM-8 Mod 2).
30. FNC/HAIL Key
 Function key selects the secondary function for each key. The secondary function is shown above each key. Does not select the letters above the number keys. HAIL is not used on the LCM-8 Mod 2.
31. CLR/ANS Key
 Clear key clears erroneous entries. Clears displayed channel from the Memory Scan memory. Stops call ringing. FNC + Key is ANSWER. Displays the Call Waiting menu.
32. Right Arrow/TEL Key
 Right arrow is used to change pages in multiple page menus and advance the entry position when entering or editing user data. FNC + Key displays the Telephone and Coast Station menus.
33. Left Arrow/DSC Key
 Left arrow is used to change pages in multiple page menus and backspace the entry position when entering or editing user data. FNC + Key displays the DSC menus.
34. ENT/SCRM Key
 Enter key completes selections and terminates multiple key entries. FNC + Key displays the Scrambler menu.
35. EMR/EMER
 Displays the Emergency menu. When held for five seconds, the emergency message is transmitted on the Overhead Channel.



SEA 330 HF/SSB RADIO

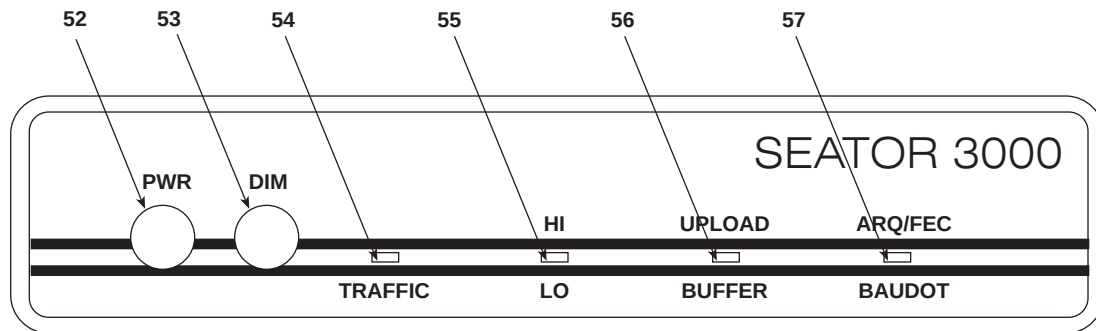
36. Handset	Functions as both a microphone and as a speaker, much like a telephone handset.
37. Speaker	Internal speaker for listening when not using the handset.
38. CHAN/FREQ Key	Toggles LCD numeric display mode (channel or frequency).
39. AUX/SEND Key	Enables special functions. When used with the ALRM key, transmits alarm signal.
40. Up Arrow/FREQ Key	Increases programmed receiver frequency in 10 Hz steps.
41. Number Keys 1-9	Used to enter channel/frequency information and, when used with AUX/SEND key, enable special functions.
42. Display	Displays operating information for the radio set.
43. Up Arrow/VOL Key	Increases the receiver volume level.
44. SQL Key	Toggles squelch ON and OFF.
45. MODE Key	Selects mode of operation: USB, LST, Telex, AME.
46. ALRM Key	Transmits alarm signal when used with AUX/SEND key.
47. Down Arrow/VOL Key	Decreases the receiver volume level.
48. ENT Key	Executes information entered by numeric keys.
49. 2182/0 Key	Selects the emergency channel (2182 kHz).
50. Down Arrow/FREQ	Decreases programmed receiver frequency in 10 Hz steps.
51. PWR	Turns the radio ON and OFF.

SEA 330 HF/SSB RADIO (continued)



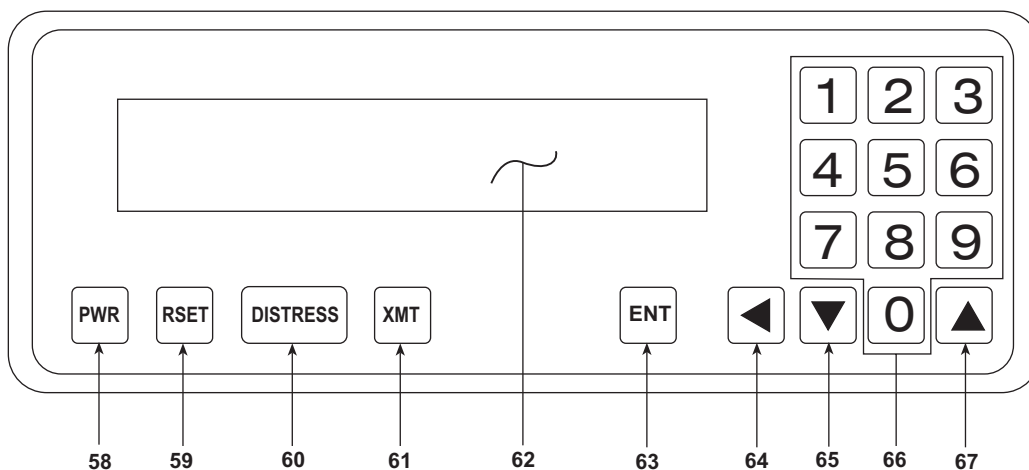
SEATOR 3000 RADIO TELEX MODEM

52. PWR Switch	Toggles the SEATOR 3000 modem ON and OFF.
53. DIM Switch	Toggles all LEDs (Light Emitting Diodes) ON or OFF. Can be used to extinguish LEDs if they interfere with night vision.
54. TRAFFIC Indicator	Green LED indicates a message is being transmitted/received.
55. HI/LO Indicator	Flashing red LED indicates that the frequency of the incoming signal is tuned too high. The faster the LED flashes, the farther off-tune the signal is. When the frequency is too high to be usable, the red LED remains constantly lit. Flashing green LED indicates that the frequency is tuned too low. The faster the LED flashes, the farther off-tune the signal is. When the frequency is too low to be usable, the green LED remains constantly lit.
56. UPLOAD/BUFFER Indicator	Red LED indicates that the message memory is more than 40% full and that messages should be uploaded or deleted to free up buffer space. If any of the messages in the buffer are received messages, the LED flashes. Green LED indicates that at least one message is in the buffer. If any of the messages in the buffer are received messages, the LED flashes.
57. ARQ/FEC/BAUDOT Indicator	Red LED indicates that the SEATOR 3000 is set to receive or is transmitting in ARQ/FEC modes. Green LED indicates that the SEATOR 3000 is set to receive or is transmitting in the Baudot mode.



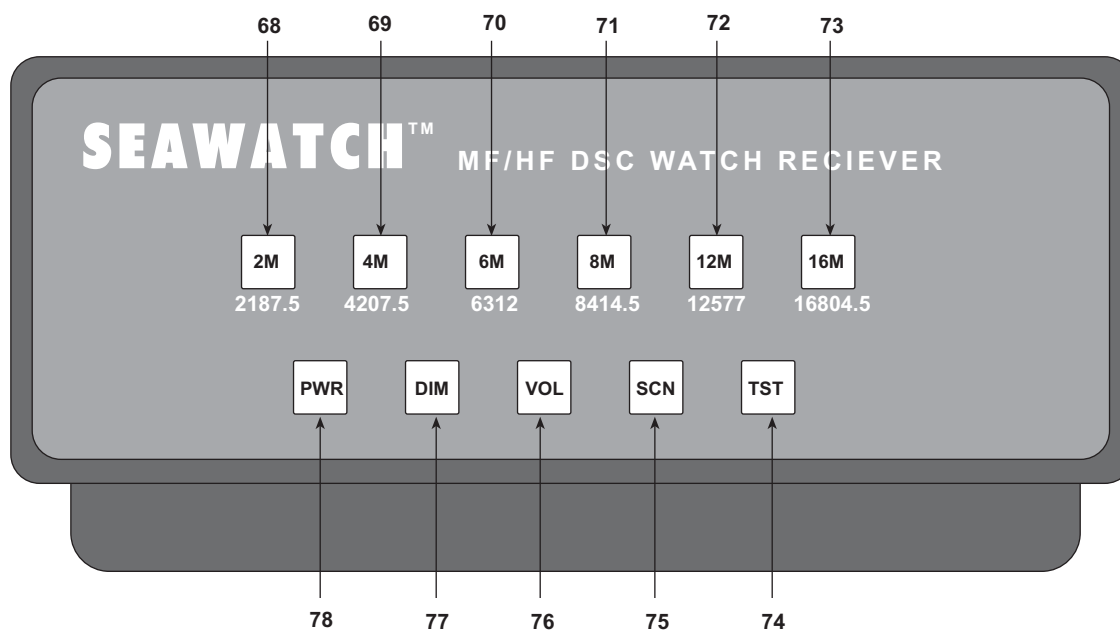
SEACALL 7000G MF/HF DSC CONTROLLER

58.	PWR Switch	Toggles main power ON and OFF.
59.	RSET Switch	Returns SEACALL to its initial powerup state.
60.	DISTRESS Switch	Initiates a DSC distress call.
61.	XMT Switch	Three functions: a. Calls up the transmit menu. b. Initiates transmission once a call is composed. c. Initiates printing in some menus.
62.	LCD Display	Displays prompts and informational messages.
63.	ENT Switch	Lights red when required. Two functions: a. Selects default menu entry. Default values are often shown at the end of a menu. b. Terminates entry of items requiring more than a single digit such as DSC IDs.
64.	Left Arrow	Used as a backspace when entering items requiring more than a single digit.
65.	Down Arrow	Three functions: a. Decreases lighting intensity. b. Displays previous logged call. c. Steps to previous scan channel.
66.	Number Keys 0-9	Three functions: a. Choose menu selections. b. Input numeric entries such as DSC IDs, Necode IDs, frequencies, channel numbers, time, position, etc. c. Input alphabetic entries such as DSC station names.
67.	Up Arrow	Three functions: a. Increases lighting intensity. b. Displays next logged call. c. Steps to next scan channel.



SEA 7001 MF/HF DSC WATCH RECEIVER

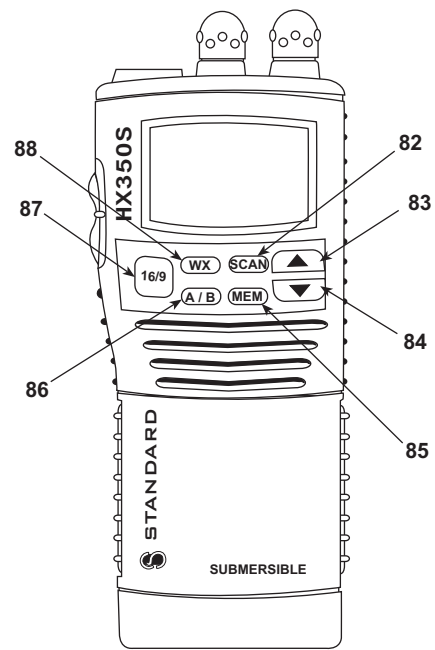
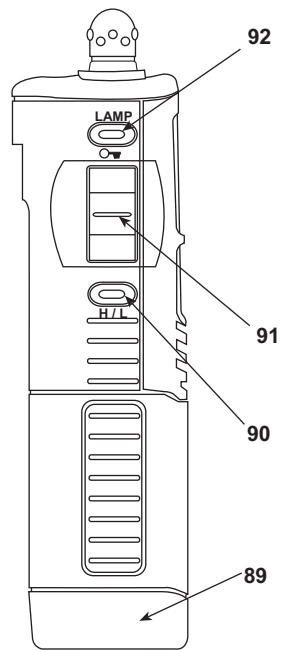
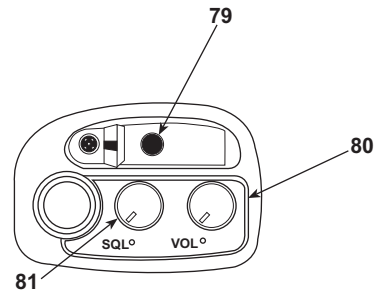
68. 2M/2187.5 kHz Annunciator Light	This is an annunciator light only. GMDSS regulations require full-time scanning of 2187.5 kHz, therefore this channel may not be deselected from scan.
69. 4M/4207.5 kHz Switch	Toggles scan status of 4207.5 kHz. When annunciator is lighted, the channel is currently in the scan list.
70. 6M/6312 kHz Switch	Toggles scan status of 6312 kHz. When annunciator is lighted, the channel is currently in the scan list.
71. 8M/8414.5 kHz Switch	This is an annunciator light only. GMDSS regulations require full-time scanning of 8414.5 kHz, therefore this channel may not be deselected from scan.
72. 12M/12577 kHz Switch	Toggles scan status of 12577 kHz. When annunciator is lighted, the channel is currently in the scan list.
73. 16M/16804.5 kHz Switch	Toggles scan status of 16804.5 kHz. When annunciator is lighted, the channel is currently in the scan list.
74. TST Switch	Initiates TEST mode.
75. SCN Switch	Toggles SCAN status. If receiver is scanning, pressing SCN will cause the receiver to exit the scan mode. A second press will re-initiate the scan.
76. VOL Switch	Controls the volume level of the internal speaker. Four pre-set levels are provided: OFF, LOW, MEDIUM, and HIGH.
77. DIM Switch	Controls illumination level for backlit keys and annunciators. Four pre-set levels are provided: OFF, LOW, MEDIUM, and HIGH.
78. PWR Switch	Toggles power ON and OFF.



STANDARD HORIZON HX350S HANDHELD VHF/FM RADIO

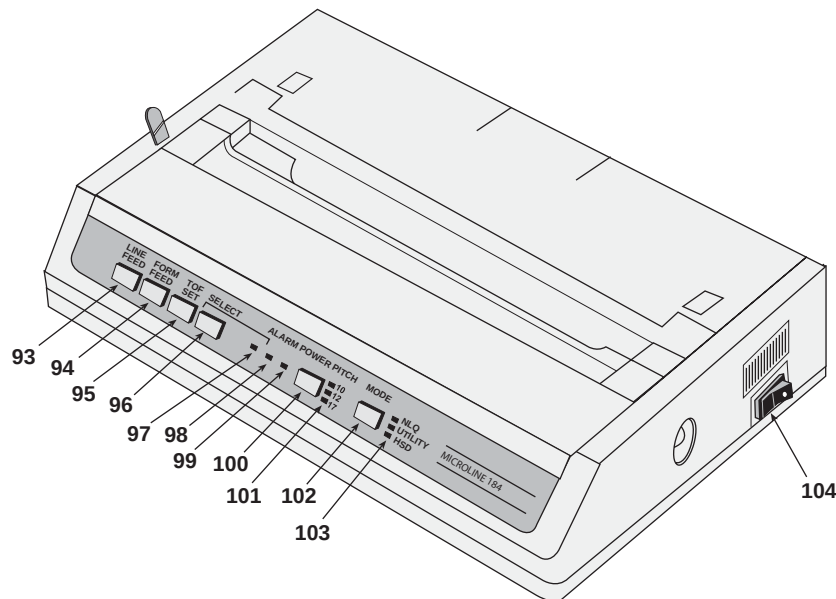
79.	External Speaker/Microphone Jack	Accepts an optional speaker/microphone. When this jack is used, the internal speaker is disabled.
80.	VOL Control and Power Switch	Turns the transceiver ON and OFF and adjusts the volume.
81.	SQL Control	Sets the point at which random noise on the channel does not activate the audio circuits, but a received signal does.
82.	SCAN Key	Starts scanning programmed channels. Press this key for at least one second to toggle priority scan ON and OFF.
83.	Up Arrow Key	Selects the desired channel. Each press increases the channel number. When held down, the channels increase continuously.
84.	Down Arrow Key	Selects the desired channel. Each press decreases the channel number. When held down, the channels decrease continuously.
85.	MEM Key	Memorizes the selected channel. When pressed again, deletes the memorized channel.
86.	A/B Key	Immediately recall two user-assigned channels from any channel.
87.	16/9 Key	Immediately recalls channel 16 from any channel location. Holding down this key recalls channel 9. When the WX key is pressed while holding down this key, the mode toggles between USA, International, and Canadian frequency sets.
88.	WX Key	Immediately recalls a weather channel from any channel location. Recalls the previous channel when the WX key is pressed again.
89.	Battery Pack	Provides direct current power to the transceiver.
90.	H/L Key	Toggles between high and low power.
91.	PUSH-TO-TALK Switch	Activates transmission.
92.	Lamp Key	Illuminates the display.

STANDARD HORIZON HX350S HANDHELD VHF/FM RADIO (continued)



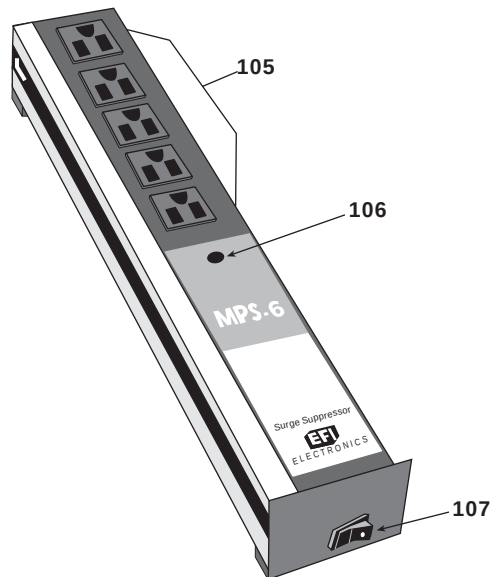
OKIDATA MICROLINE 184 PRINTER

93. LINE FEED Button	Moves the paper up one line at a time.
94. FORM FEED Button	Moves the paper to the top margin of the next page.
95. TOF SET Button	Sets the top margin at the current position--the SELECT light must be OFF.
96. SELECT Button	Selects or deselects the printer.
97. SELECT Indicator	When ON, the printer is ready to receive data (selected). When OFF, the printer is not ready to receive data (deselected).
98. ALARM Indicator	When lit, indicates that the paper is low or out, or that there is an internal printer problem.
99. POWER Indicator	When lit, indicates that the printer is plugged in and turned ON.
100. PITCH Button	Selects the size of the printed characters between 10, 12, and 17 characters per inch.
101. PITCH Indicators	Indicates which pitch is selected.
102. MODE Button	Selects the mode of printing between NLQ (Near Letter Quality), UTILITY (Normal printing), and HSD (High-Speed Draft).
103. MODE Indicators	Indicates which mode is selected.
104. ON/OFF Switch	Turns printer ON and OFF.



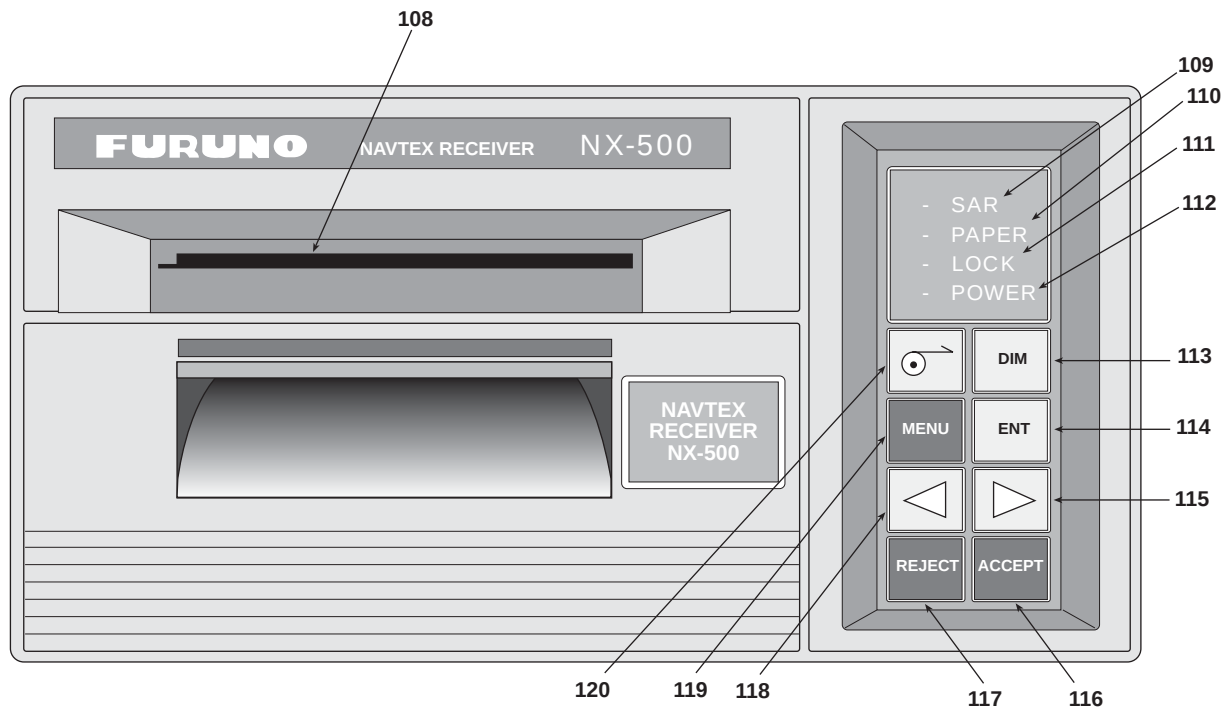
SURGE SUPPRESSOR

105. Outlets	5 power outlet for connecting 110 Vac communication equipment in the comms locker.
106. LED Diagnostic Indicator	When lit, indicates that the unit is ready for use. When unlit, the unit needs to be reset. If the unit does not reset, indicates an internal fault.
107. ON/OFF Switch	Turns the strip ON and OFF. Switch lights when in the ON position.



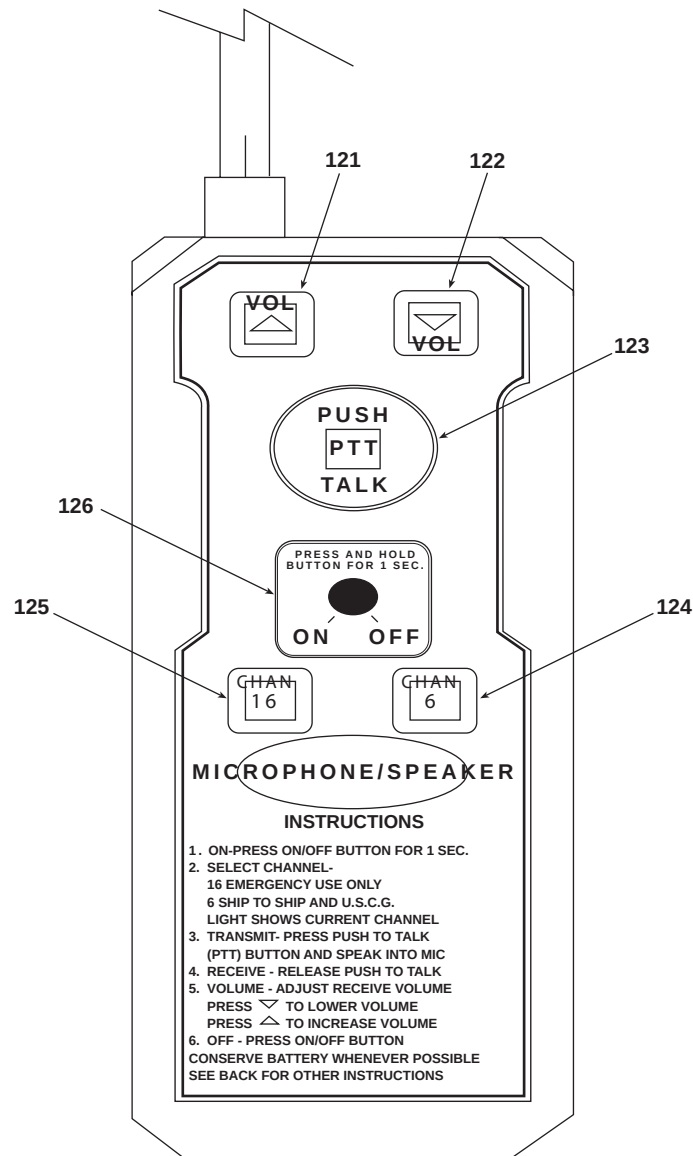
FURUNO NX-500 NAVTEX RECEIVER

108. Printer Output	Printed reports are output through this slot.
109. SAR Indicator	Lights when a SAR message (Category D) is received. An audio alarm is also activated.
110. PAPER Indicator	Lights when the paper is out.
111. LOCK Indicator	Lights when messages are being received.
112. POWER Indicator	Lights when the power is ON.
113. DIM Key	Adjusts the level of illumination.
114. ENT Key	Registers user data.
115. RIGHT Key	Moves the cursor to the right.
116. ACCEPT Key	Used to select stations/messages or to enter upper case characters.
117. REJECT Key	Used to reject stations/messages or to enter lower case characters. Also cuts off signal monitor function.
118. LEFT Key	Moves the cursor to the left
119. MENU Key	Calls up the main menu.
120. FEED Key	Feeds paper.



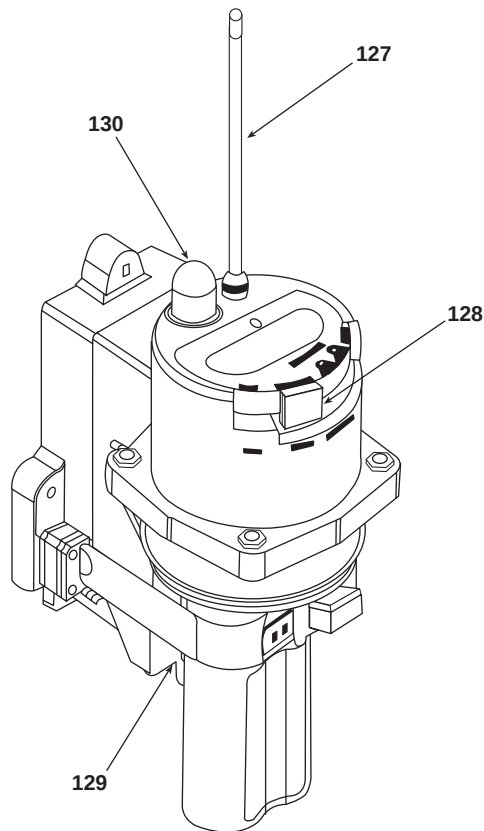
ACR SR-102 SURVIVAL RADIO

121. VOL Up Arrow Button	Increases the audio output level. Button lights up yellow when the radio is transmitting.
122. VOL Down Arrow Button	Decreases audio output level. Button lights up yellow when radio is transmitting.
123. PTT Button	Push-To-Talk activates the transmitter when pressed. When released, the radio returns to receive mode. The button slowly flashes a yellow light to assist the operator in locating the button in the dark.
124. CHAN 6 Button	Selects operation on marine channel 6 (communication/USCG). Button is lit with a green light when the radio is ON and channel 6 is selected.
125. CHAN 16 Button	Selects operation on marine channel 16 (distress/hailing). Button is lit with a red light when the radio is ON and channel 16 is selected.
126. ON/OFF Button	Press for one second to turn ON, and press again to turn OFF.



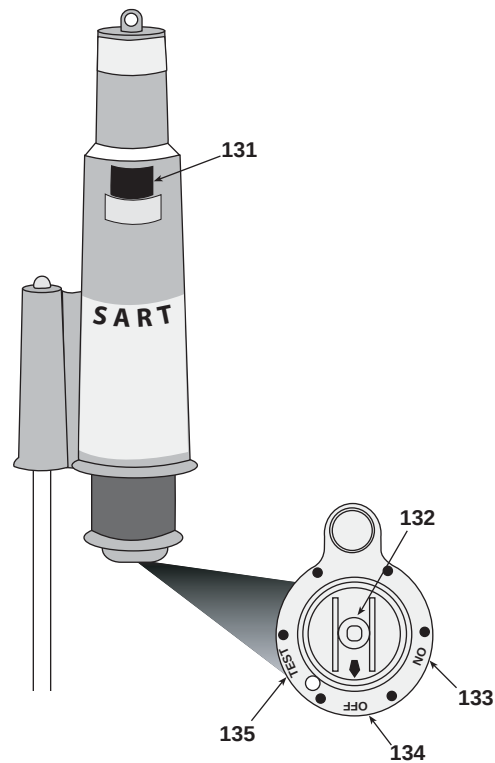
SATFIND 406 EPIRB (EMERGENCY POSITION INDICATING RADIO BEACON)

127. Antenna	Transmits signal when the unit is transmitting.
128. Selector Switch	Selects between TEST, READY, MANUAL-ON, and DISABLE. TEST is used to test the system. READY is the normal position for use (automatic operation). MANUAL-ON is used to activate the unit manually. DISABLE is used as a last resort to stop the unit from transmitting.
129. Water Contacts	Sense when the unit is in the water to enable automatic operation.
130. Strobe Light	Aids in locating the unit in the dark.



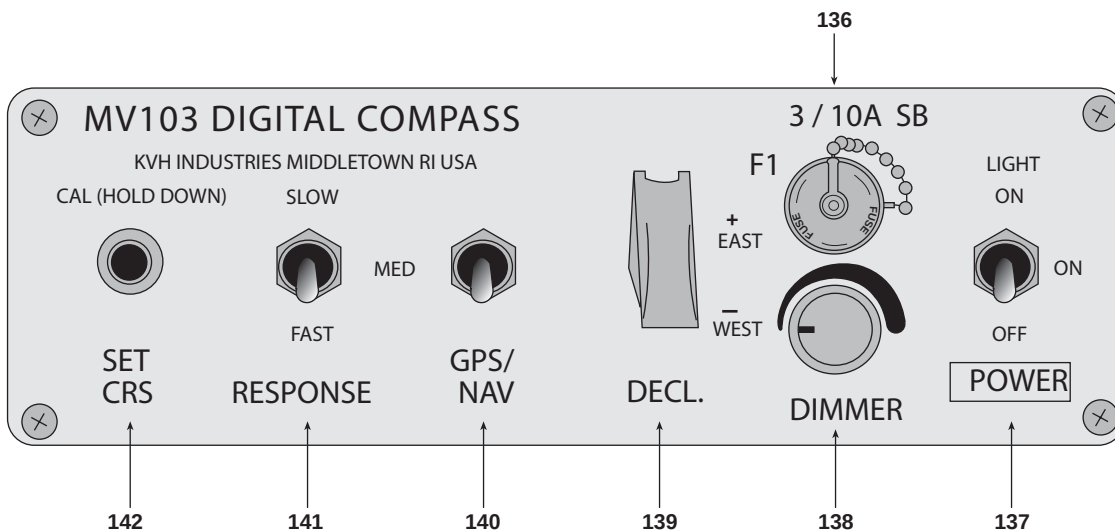
SART (SEARCH AND RESCUE TRANSPONDER)

131. Indicator Lights	Yellow light flashes slowly when in receive mode. Yellow and green lights flash when in reply mode.
132. ON/OFF/TEST Switch	Selects between ON, OFF, and TEST modes. The switch is “push to turn” type.
133. ON Position	Activates the SART and places it in receive mode until the unit is interrogated by a SAR radar. A seal is broken when the unit is switched to ON to indicate that the unit has been operated.
134. OFF Position	Deactivates the unit. This is the normal storage position for the unit when it is not in active use.
135. TEST Position	Used to test the unit. Switch is spring-loaded back to OFF from TEST.



KVH MV103 DIGITAL COMPASS

136. F1 3/10A Fuse under screw-off cap. Fuse protects the compass from short circuits and overloads.
137. POWER Controls power to the compass. OFF, no power applied; ON, applies power to the compass but not to the display lighting; LIGHT ON, applies lighting to the display.
138. DIMMER Controls the display lighting when POWER is at LIGHT ON.
139. DECL. Used to enter declination to convert magnetic to true North and to enter sensor alignment correction factor.
140. GPS/NAV Used to toggle between compass heading and GPS input display modes.
141. RESPONSE Adjusts display response time (damping factor). SLOW, averages value over 17-second period. MED, averages value over a 9-second period. FAST, averages value over a 3-second period.
142. SET CRS Used to enter a reference course or a sensor alignment correction factor. Also used to start calibration.

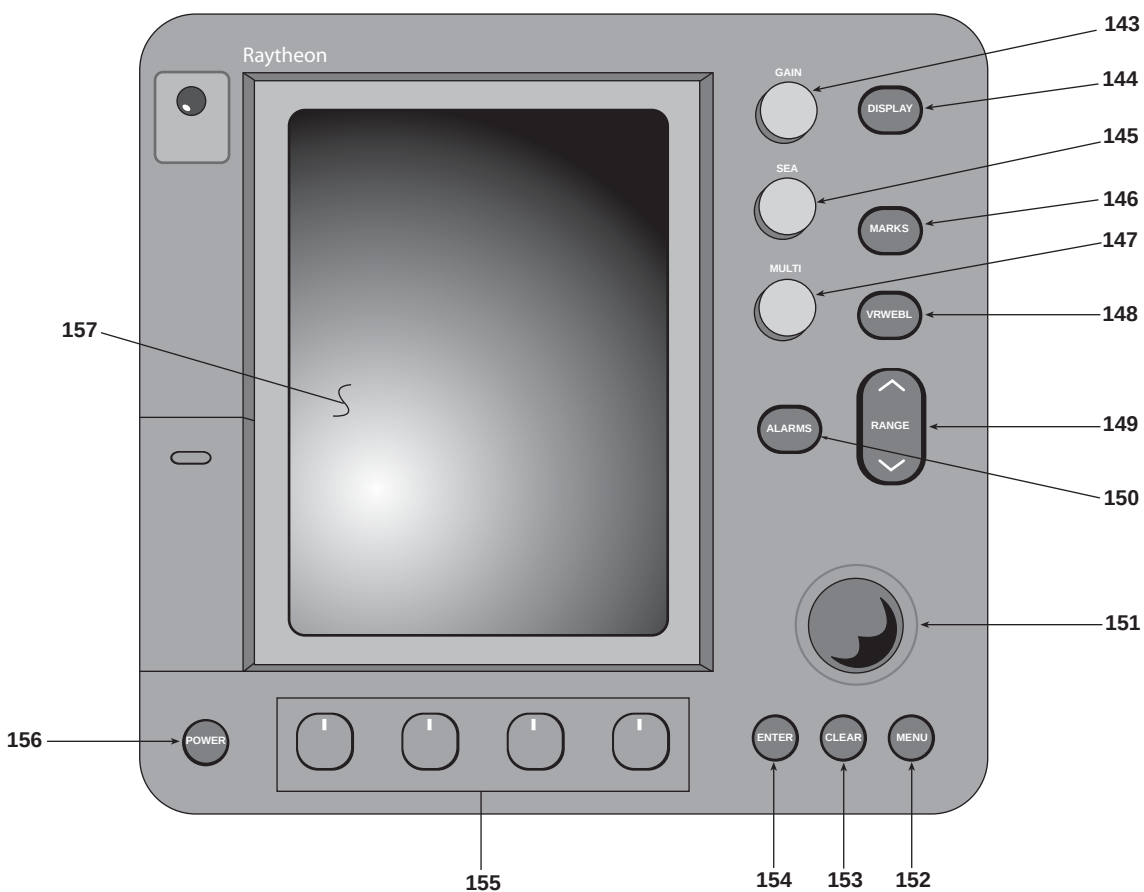


RAYTHEON R 80 RADAR

143. GAIN Controls for background noise (speckle) and sea clutter. Press for soft keys display. In MANual mode, turn the knob to adjust the setting. Press the soft key to toggle between Auto/Man. Turn the knob to adjust the slider, and press ENTER to finish.
144. DISPLAY Controls display mode and windows. Press for display mode and soft keys display. Press again to toggle through display modes, then ENTER. Press and hold for 2 seconds for full page radar display. Press WINDOWS soft key to toggle window on/ off, or return to full screen.
145. SEA Controls for background noise (speckle) and sea clutter. Press for soft keys display. In MANual mode, turn the knob to adjust the setting. Press the soft key to toggle between Auto/Man. Turn the knob to adjust the slider, and press ENTER to finish.
146. MOB/MARKS Changes when a key is pressed. Default soft key labels are shown. Controls placing marks, and Man Overboard function. Press for soft keys display, then press soft key to place mark. Press and hold for 2 seconds to activate or cancel MOB.
147. MULTI Controls display contrast and brilliance, key lighting, rain clutter around the vessel (RAIN), distant rain clutter (FTC), guard zone alarm sensitivity and tuning the receiver. Press to display slider, options and soft keys and use trackball to highlight option in list.
148. VRM/EBL Used to measure range and bearing to/between targets. Press to place VRM/EBL if one not already placed. Adjust position using trackball, and press ENTER to finish. Press to display soft keys if VRM/EBL already placed. Use soft key to toggle VRM/EBL on or off. Press FLOAT to access float options for existing VRM/EBL. Press VRM/EBL DATABOX to toggle data box display off/ on.
149. RANGE Controls range scale. Range scale and range rings are shown in the Status Bar. Press the top of key to increase the range scale. Press the bottom of the key to decrease the range scale. Press and hold to change the scale faster.
150. ALARMS Used to control guard zones. Press soft key to place guard zone if one not already placed. Adjust size/shape using trackball, press ENTER to finish. Press to display soft keys if guard zone already placed.
151. Trackball Controls the cursor position on screen, the sliders, and the setup options.
152. MENU Provides access to setup options. Press to display soft keys. Press soft key to display required setup menu, then use the trackball to select the option and the soft key to change the setting. Press ENTER to close the menu, and CLEAR to finish.
153. CLEAR Cancels the operation in progress and returns to the previous display. Deletes an object/function under cursor control.
154. ENTER Confirms selection and (if appropriate) clears the current soft key labels. It either performs the selected task, accepts changes, or leads to the display of more options. When cursor text is displayed, the cursor takes control of the object. When the arrowhead cursor symbol is displayed, drops the object under cursor control.

RAYTHEON R 80 RADAR (continued)

155. Soft Keys
Press to select option, or highlight option or slider. Labels change when you press soft/ dedicated key. Elipses (...) after the text indicate that pressing soft key leads to a further display of soft key options.
156. POWER
Press and hold until the unit beeps to turn on the display. Press to toggle between Standby and Transmit. Press for 3 seconds to turn off the display.
157. Display
The radar picture provides a map-like presentation of the area in which the radar is operating. Typically, your ship's position is at the centre of the display, and its dead ahead bearing is indicated by a vertical heading line, known as the Ship's Heading Marker (SHM).



END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS
ACCOMMODATION MODULE**

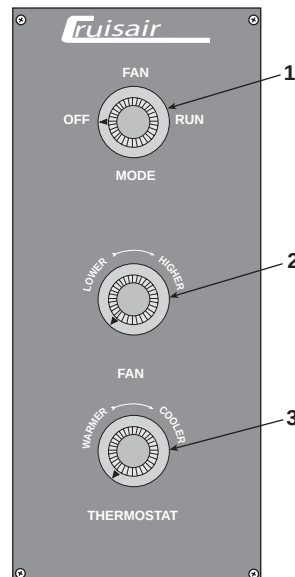
HEATING AND AIR CONDITIONING

1. MODE Control

This knob selects operating mode between OFF, FAN, and RUN. In OFF, the entire unit is OFF. In FAN, the fan blows, but no heating or cooling is provided. In RUN, the fan blows and heating or cooling is provided as necessary.
2. FAN Control

This knob selects fan speed. Rotating the knob clockwise increases fan speed. Rotating the knob counterclockwise decreases fan speed.
3. THERMOSTAT Control

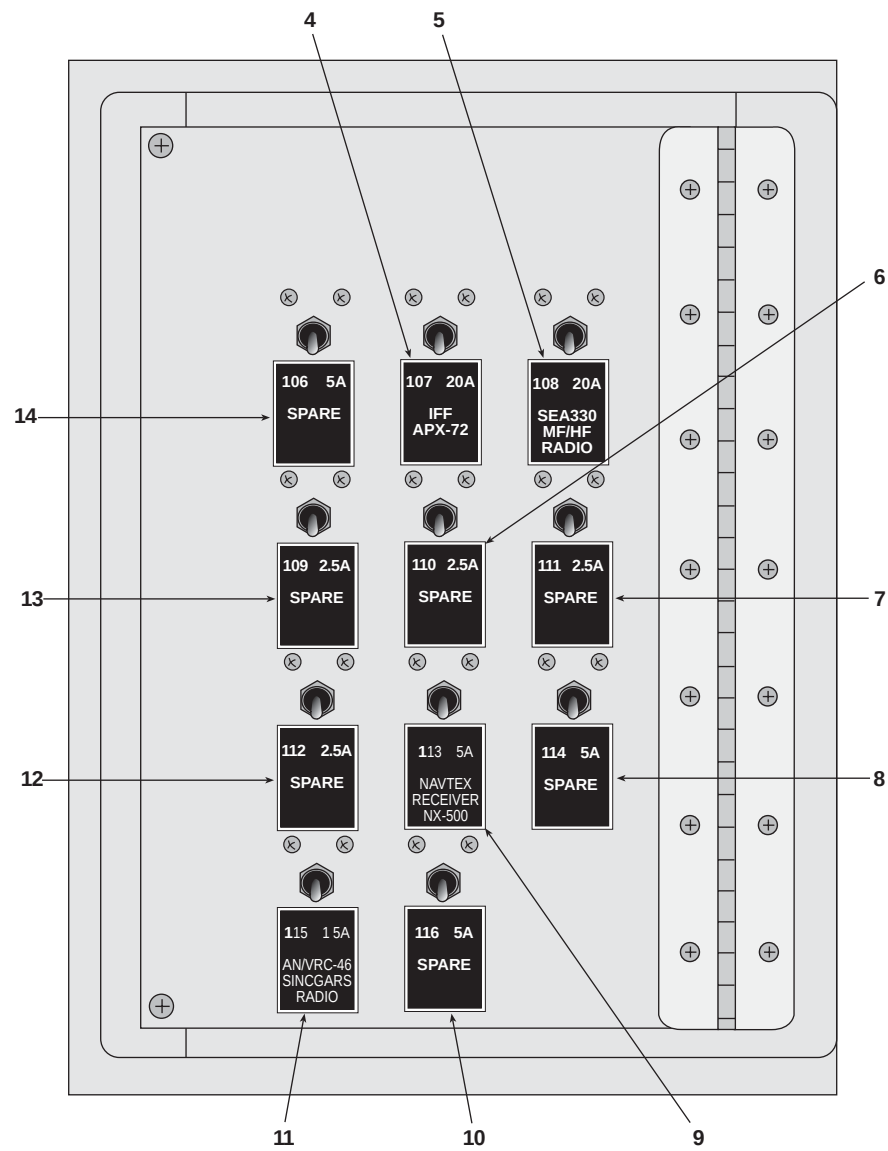
This knob controls heating/cooling temperature. Rotating the knob clockwise lowers the compartment temperature. Rotating the knob counterclockwise raises the compartment temperature.



COMMAND AND CONTROL DISTRIBUTION BOX

4.	IFF APX-72 Circuit Breaker	This breaker protects the IFF APX-72 circuit from damage due to overload. ON/OFF is controlled on the unit.
5.	SEA330 MF/HF RADIO Circuit Breaker	This breaker protects the SEA330 MF/HF radio circuit from damage due to overload. ON/OFF is controlled on the individual unit components.
6.	SPARE Circuit Breaker	This is a spare circuit breaker provided for expansion.
7.	SPARE Circuit Breaker	This is a spare circuit breaker provided for expansion.
8.	SPARE Circuit Breaker	This is a spare circuit breaker provided for expansion.
9.	NAVTEX RECEIVER NX-500 Circuit Breaker	This breaker protects the Navtex NX-500 receiver from damage due to overload. ON/OFF is controlled on the unit.
10.	SPARE Circuit Breaker	This is a spare circuit breaker provided for expansion.
11.	AN/VRC-46 SINCGARS RADIO Circuit Breaker	This breaker protects the SINCGARS radio from damage due to overload. ON/OFF is controlled on the unit.
12.	SPARE Circuit Breaker	This is a spare circuit breaker provided for expansion.
13.	SPARE Circuit Breaker	This is a spare circuit breaker provided for expansion.
14.	SPARE Circuit Breaker	This is a spare circuit breaker provided for expansion.

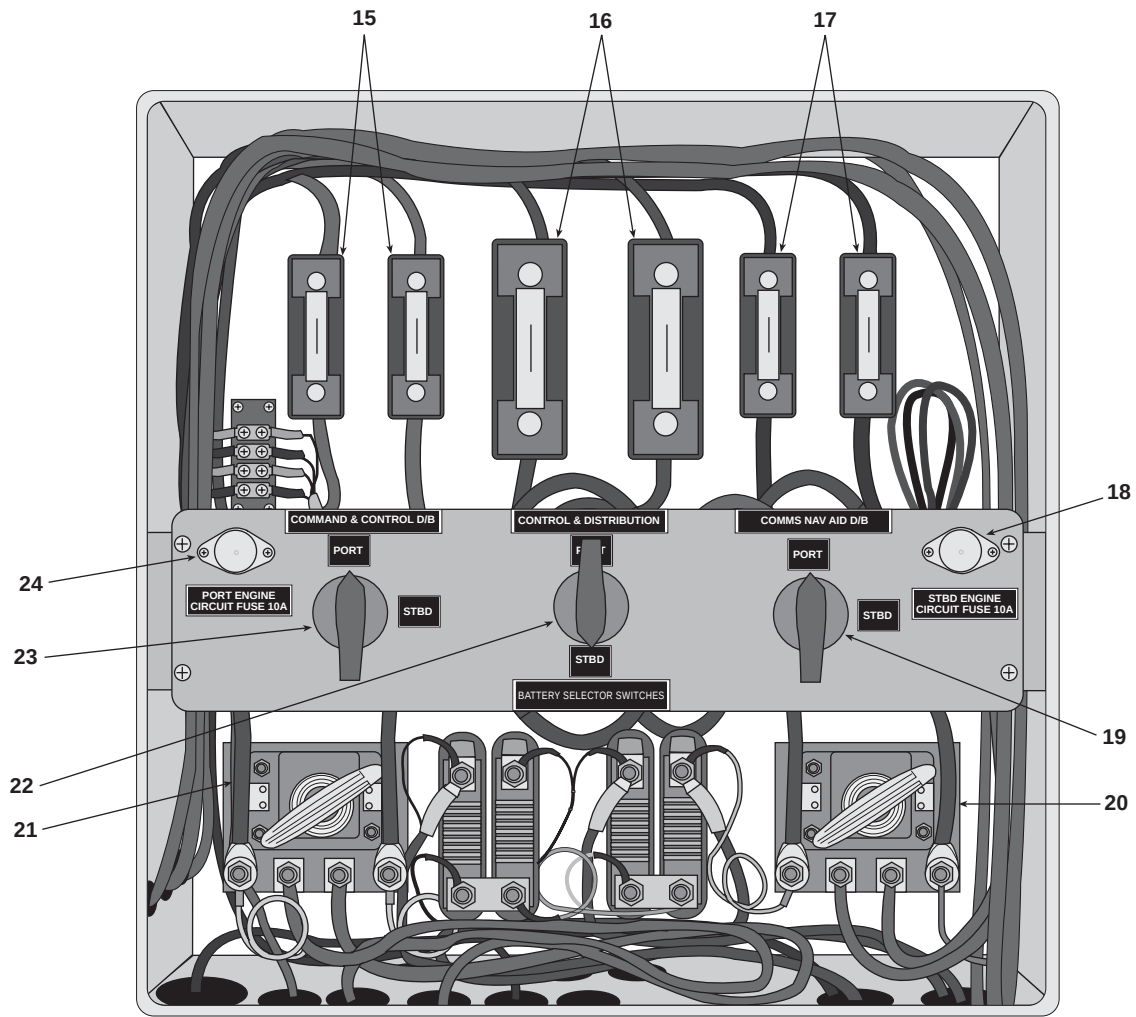
COMMAND AND CONTROL DISTRIBUTION BOX (continued)



24 VDC POWER DISTRIBUTION PANEL

15. COMMAND & CONTROL D/B FUSES 63A	These fuses protect the feed between the 24 Vdc power distribution panel and the command and control distribution box from damage due to overload.
16. CONTROL & DISTRIBUTION FUSES 100A	These fuses protect the feed between the 24 Vdc power distribution panel and the control and distribution panel from damage due to overload.
17. COMMS NAV AID D/B FUSES 63A	These fuses protect the feed between the 24 Vdc power distribution panel and the comms nav aid distribution box from damage due to overload.
18. STBD ENGINE CIRCUIT FUSE 10A	This fuse protects the starboard engine starting and alternator excitation circuits from damage due to overload.
19. COMMS NAV AID D/B BATTERY SELECTOR SWITCH	This switch permits the operator to select which battery bank will supply the comms nav aid distribution box. In the PORT position, the port battery bank is selected. In the STBD position, the starboard battery bank is selected.
20. STBD BATTERY ISOL SWITCH	This switch permits the operator to isolate the starboard battery bank. When ON is selected, the starboard battery bank is available for use. In this position, the battery selector switches (Comms Nav Aid D/B, Control & Distribution, and/or Command & Control D/B) determine which panel or distribution box is supplied by the starboard battery bank. When OFF is selected, the battery bank is isolated and will power nothing.
21. PORT BATTERY ISOL SWITCH	This switch permits the operator to isolate the port battery bank. When ON is selected, the port battery bank is available for use. In this position, the battery selector switches (Comms Nav Aid D/B, Control & Distribution, and/or Command & Control D/B) determine which panel or distribution box is supplied by the port battery bank. When OFF is selected, the battery bank is isolated and will power nothing.
22. CONTROL & DISTRIBUTION BATTERY SELECTOR SWITCH	This switch permits the operator to select which battery bank will feed the control & distribution panel. In the PORT position, the port battery bank is selected. In the STBD position, the starboard battery bank is selected.
23. COMMAND & CONTROL D/B BATTERY SELECTOR SWITCH	This switch permits the operator to select which battery bank will supply the command & control distribution box. In the PORT position, the port battery bank is selected. In the STBD position, the starboard battery bank is selected.
24. PORT ENGINE CIRCUIT FUSE 10A	This fuse protects the port engine starting and alternator excitation circuits from damage due to overload.

24 VDC POWER DISTRIBUTION PANEL (continued)



BATTERY CHARGER

25. DC VOLTS

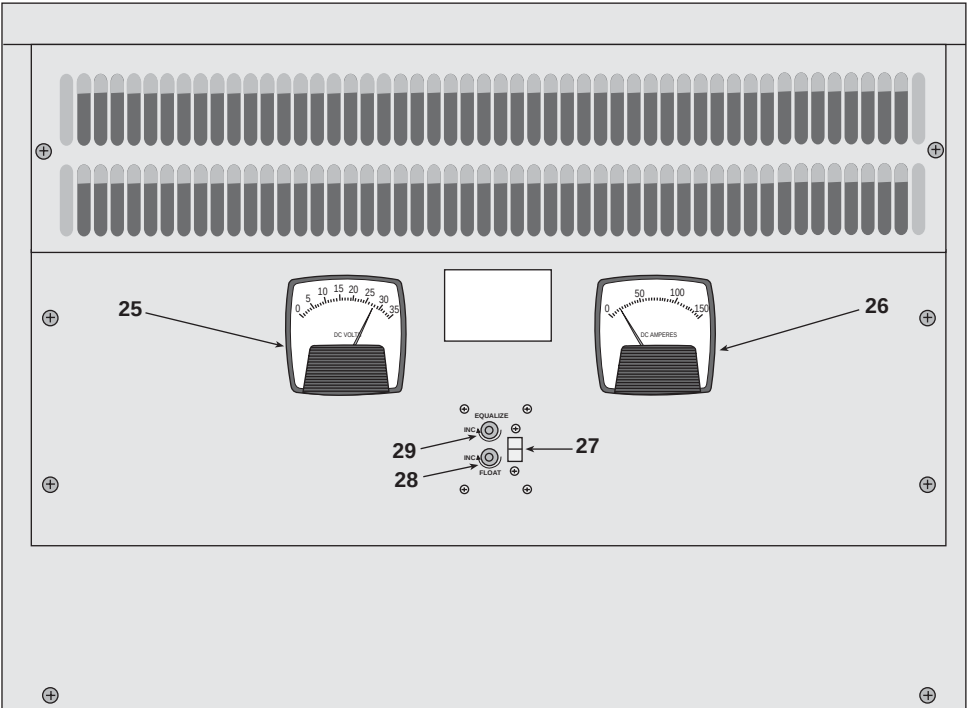
This voltmeter shows voltage output of charger measured in Volts, direct current.
26. DC AMPERES

This ammeter shows the current output of charger measured in amperes.
27. EQUALIZE/FLOAT Switch

This switch permits the operator to select between EQUALIZE and FLOAT modes. When EQUALIZE is selected, the charger operates at a high charging rate to recharge the batteries or to support the load applied to the batteries by the vessel's 24 Vdc systems. When FLOAT is selected, the charger maintains a "trickle" charge to keep the batteries charged during periods of inactivity.
28. FLOAT Potentiometer

This permits adjustment of the FLOAT voltage level.
29. EQUALIZE Potentiometer

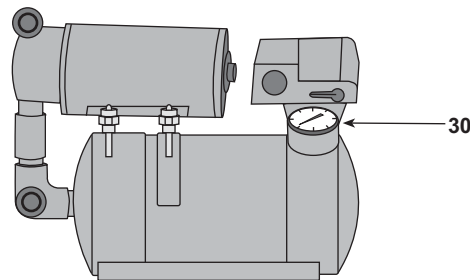
This permits adjustment of the EQUALIZE voltage level.



POTABLE WATER PRESSURE SET

30. Potable Water Pressure Gauge

This gauge indicates the potable water system pressure.

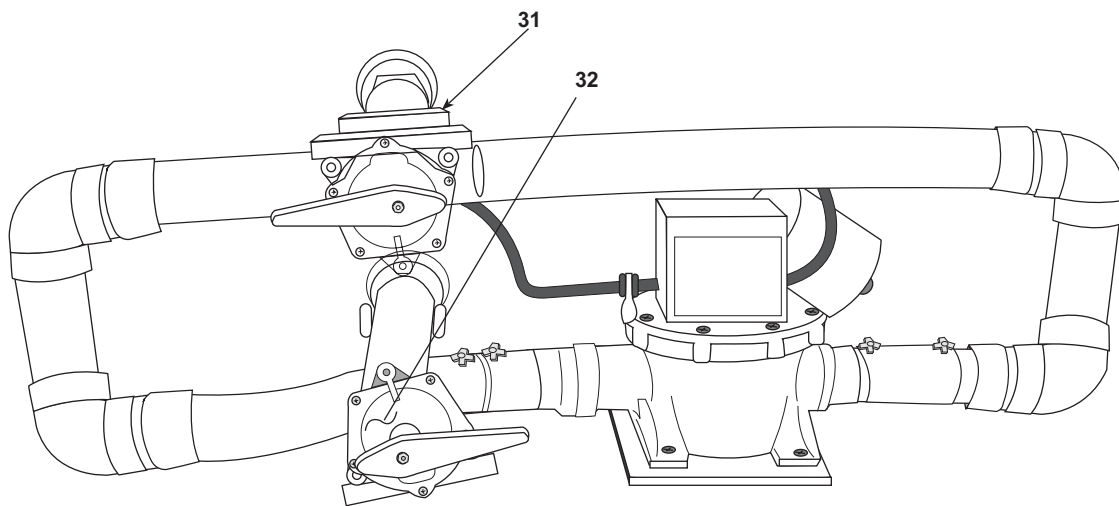
**BLACK WATER DISCHARGE VALVES**

31. Overboard Discharge Valve

This valve selects the source to direct to the discharge fitting. The operator can choose between PUMP and TANK. When in PUMP position, the black water pump's discharge is directed to the discharge fitting. When in TANK position, the discharge fitting is connected to the suction valve, bypassing the black water pump. This position is used when the black water tank is pumped from a shore facility or from another vessel.

32. Suction Valve

This valve selects the suction source for the black water tank. The operator can choose between PUMP and TANK. When in PUMP position, the black water pump's suction is connected to the black water tank. When in TANK position, the suction is directed straight to the black water tank, bypassing the black water pump. This position is used when the black water tank is pumped from a shore facility or from another vessel.

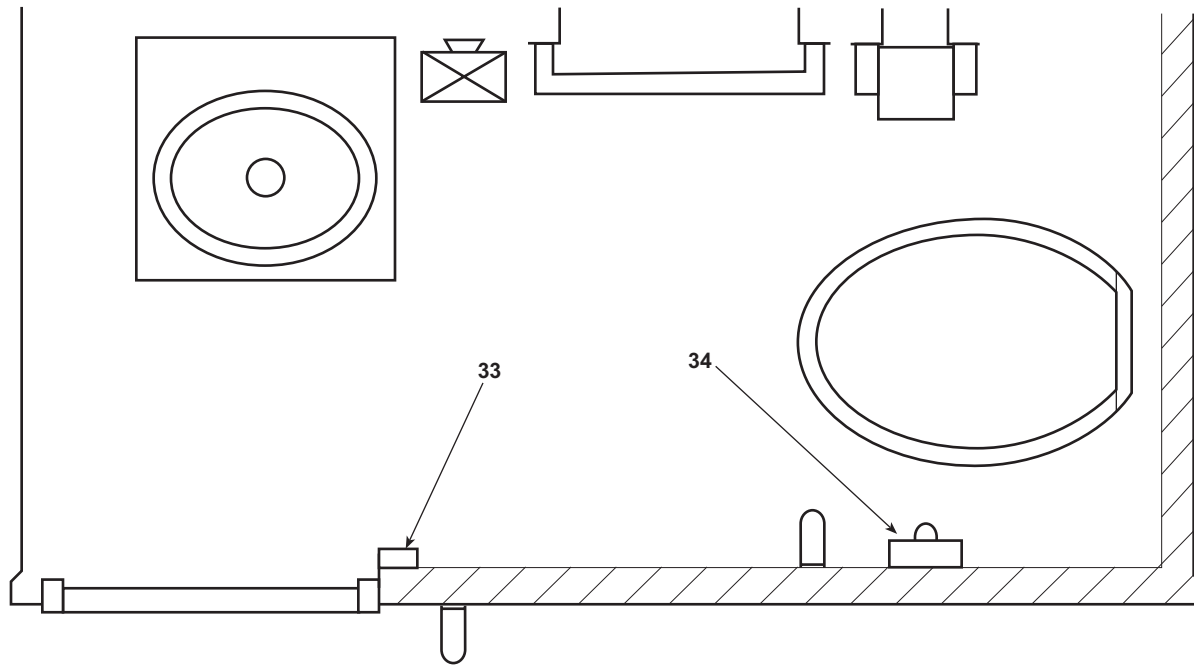


WATER CLOSET COMPARTMENT SWITCHES**33. Door Switch**

This switch turns the ventilation fan ON and OFF. When the door is closed, the fan is ON. A 5-minute timer prevents the fan from running continuously when the door is closed. When the door is open, the fan is OFF.

34. Water Closet Flush Switch

Push the switch to flush the water closet.

**END OF WORK PACKAGE**

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS
CARGO WELL AREA**

CRANE

1. Slewing Control

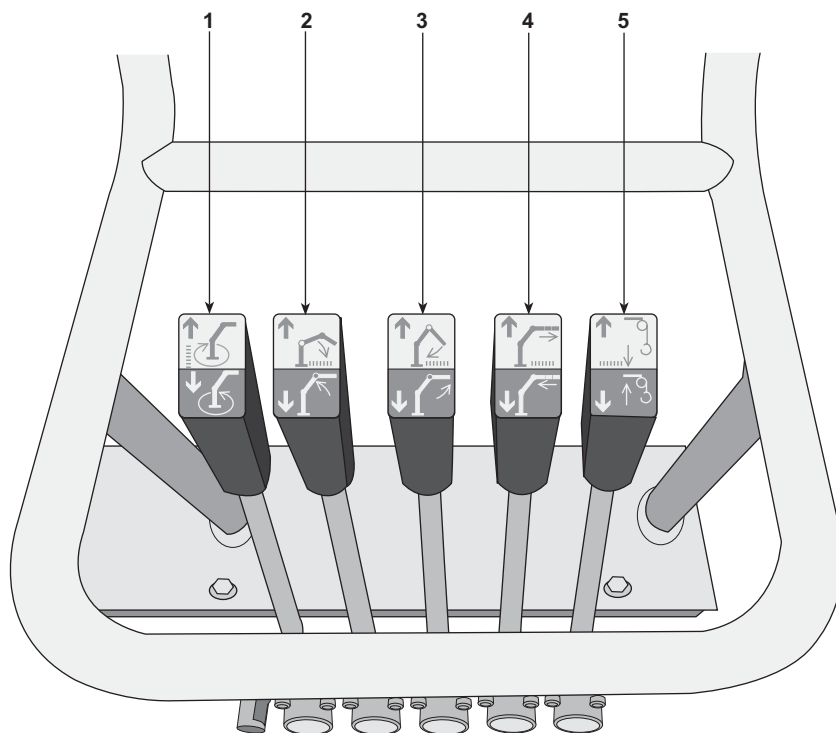
This lever controls slewing (rotation) of the crane base. Pulling the lever toward the operator rotates the base counterclockwise. Pushing the lever away from the operator rotates the base clockwise. The control is proportional, so the further the lever is pushed or pulled, the faster the crane slews.
2. First Boom Control

This lever controls the first boom function of the crane. Pulling the lever toward the operator retracts (folds) the first boom section. Pushing the lever away from the operator extends (unfolds) the first boom section. The control is proportional, so the further the lever is pushed or pulled, the faster the first boom extends or retracts.
3. Second Boom Control

This lever controls the second boom function of the crane. Pulling the lever toward the operator retracts (folds) the second boom section. Pushing the lever away from the operator extends (unfolds) the second boom section. The control is proportional, so the further the lever is pushed or pulled, the faster the second boom extends or retracts.
4. Boom Extend Control

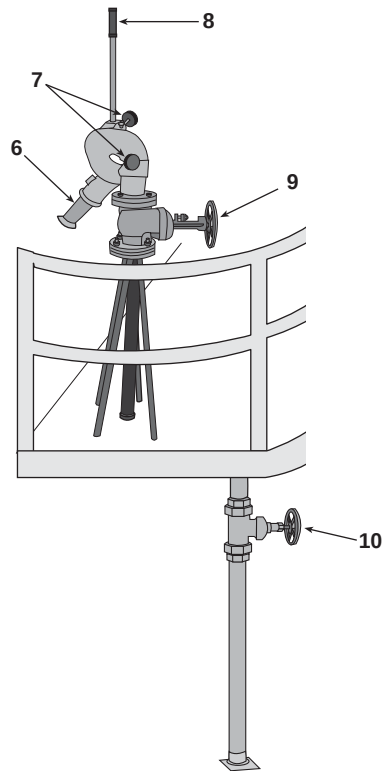
This lever controls the movement of the boom extension. Pulling the lever toward the operator retracts the boom extension. Pushing the lever away from the operator extends the boom extension. The control is proportional, so the further the lever is pushed or pulled, the faster the boom extension extends or retracts.
5. Winch Control

The LCM-8 Mod 2 crane is not equipped with a winch. This lever is provided for expansion and performs no function on this crane.



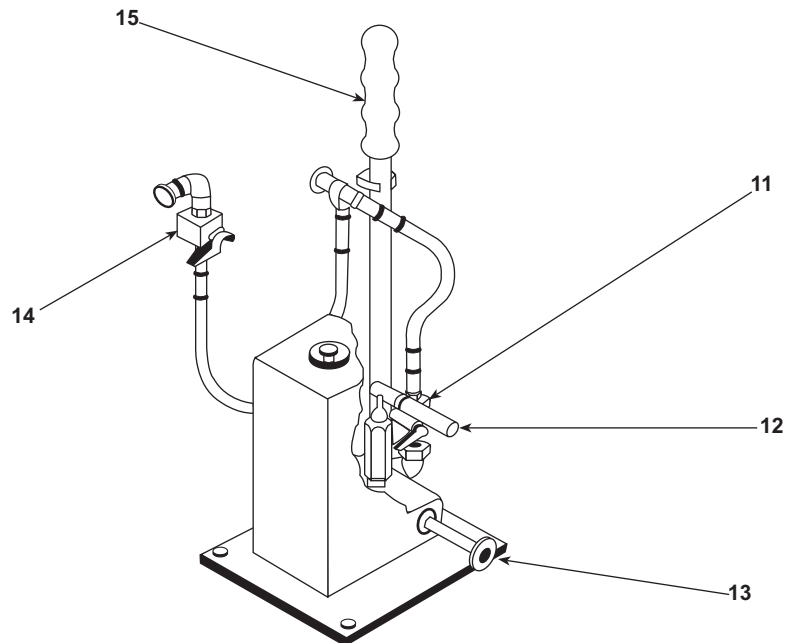
FIRE MONITOR AND FORWARD BALLAST TANK

6.	Nozzle	The nozzle concentrates the fire main flow and directs it where needed.
7.	Friction Locks	Friction locks permit the monitor to be locked into a predetermined position. The knobs are turned clockwise to lock the monitor and counter-clockwise to unlock the monitor.
8.	Handle	The handle permits the operator to direct the flow of water as necessary.
9.	Fire Monitor Valve	The valve controls the flow of water to the fire monitor head. When the valve is OPEN, water from the fire pump is supplied to the fire monitor.
10.	Forward Ballast Valve	The valve controls the flow of water to the forward ballast tank. When the valve is OPEN, water from the fire pump is supplied to fill the forward ballast tank.



BOW RAMP HAND PUMP

11. Lower Hand Pump Shutoff Valve	The valve isolates the hand pump from the winch brake circuit. During normal ramp operation, this valve remains CLOSED. When using the bow ramp hand pump to lower the ramp, the valve is OPEN.
12. Hand Pump Lever	The lever is used to pump the hand pump. When in use, the pump handle (15) is installed over the lever.
13. Hand Pump Bypass Valve	The valve is used to control the manual lowering of the bow ramp. When the ramp is being lowered, the valve is CLOSED. When the operator wants to stop the lowering of the ramp, the valve is OPEN.
14. Upper Hand Pump Shutoff Valve	The valve isolates the ramp hydraulic system from the winch brake circuit. During normal ramp operation, this valve remains OPEN. When using the bow ramp hand pump to lower the ramp, the valve is CLOSED.
15. Hand Pump Handle	The handle is used to pump the hand pump. When in use, the pump handle is installed over the hand pump lever (12). When not in use, the handle is stowed as shown.

**END OF WORK PACKAGE**

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS
AFT DECK AREA**

ENGINE ROOM FIRE FLAPS AND HF SAMPLING PORT

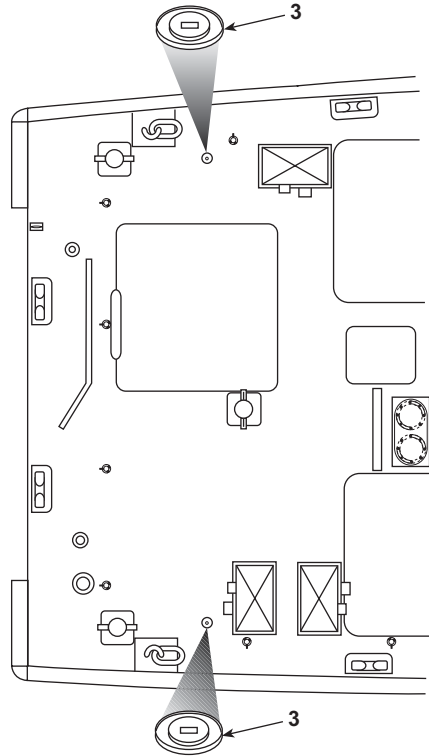
1. Engine Room Exhaust Fire Flap Control Removing the T-handle and rod from the engine room exhaust ventilation housing causes the engine room exhaust fire flaps to close. This secures the ventilation exhaust flow from the engine room in case of fire.
2. Engine Room HF Sampling Port This port allows the operator to sample the engine room for Hydrogen Fluoride (HF) gas after the discharge of the fire suppression system. This sampling is necessary before reentering the space following fire suppression system discharge.



FUEL SOUNDING FITTINGS

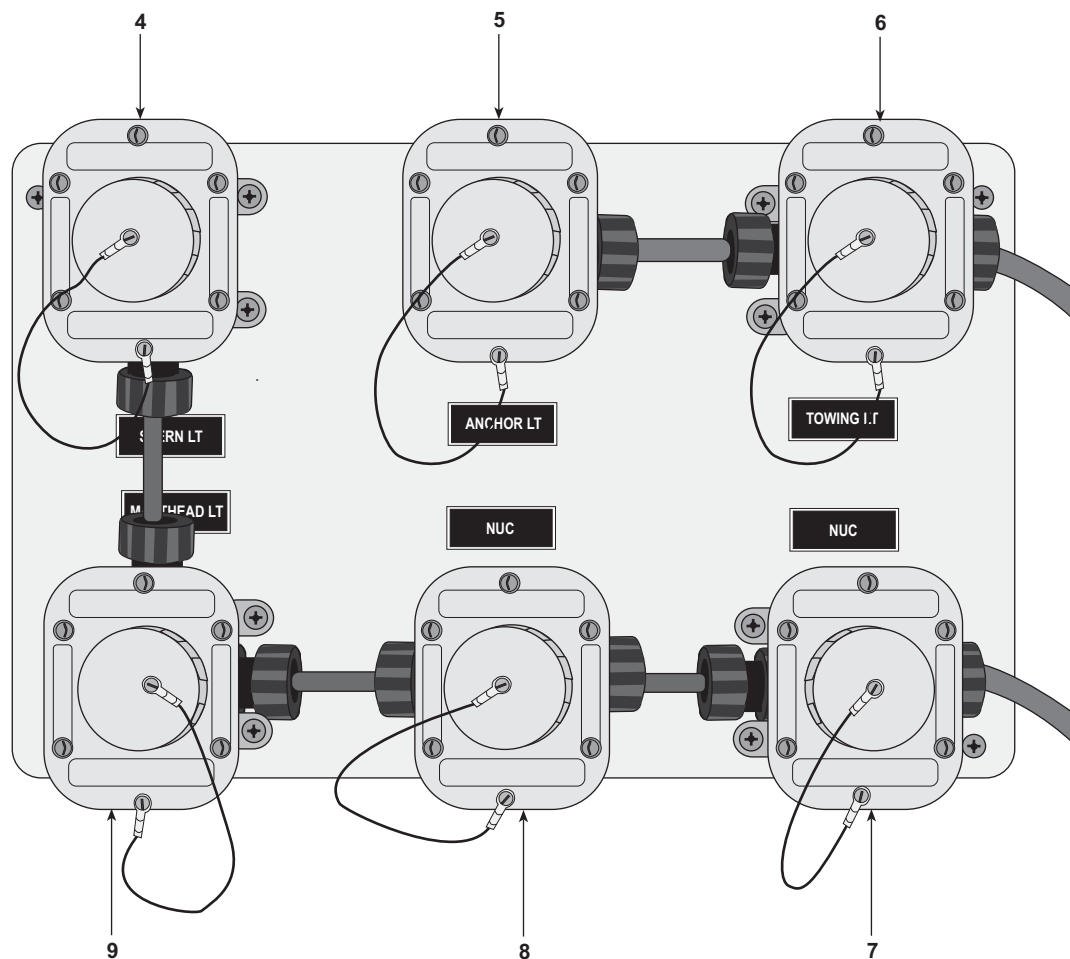
3. Fuel Sounding Fittings (1 Port,
1 Starboard)

Remove the fitting cap to permit operator to sound the fuel tanks. The fuel tanks may also be filled through the fuel tank sounding fittings.



MAST LIGHT CONNECTION BOX

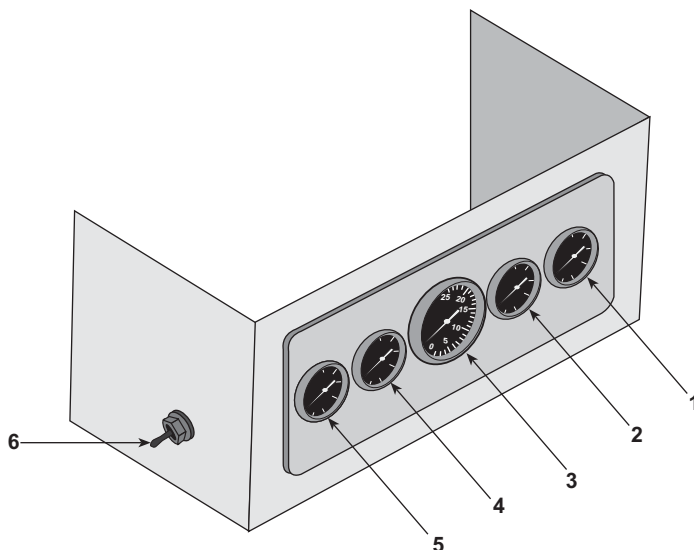
4. STERN LT Connector	This allows connection of the stern light. The stern light may be disconnected for service or to allow lowering/removal of the mast.
5. ANCHOR LT Connector	This allows connection of the anchor light. The anchor light may be disconnected for service or to allow lowering/removal of the mast.
6. TOWING LT Connector	This allows connection of the towing light. The towing light may be disconnected for service or to allow lowering/removal of the mast.
7. NUC Connector	This allows connection of the Not Under Command (NUC) lights. The NUC lights may be disconnected for service or to allow lowering/removal of the mast. The upper and lower NUC lights have separate connectors.
8. NUC Connector	This allows connection of the NUC lights. The NUC lights may be disconnected for service or to allow lowering/removal of the mast. The upper and lower NUC lights have separate connectors.
9. MASTHEAD LT Connector	This allows connection of the masthead light. The masthead light may be disconnected for service or to allow lowering/removal of the mast.

**END OF WORK PACKAGE**

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS
ENGINE ROOM**

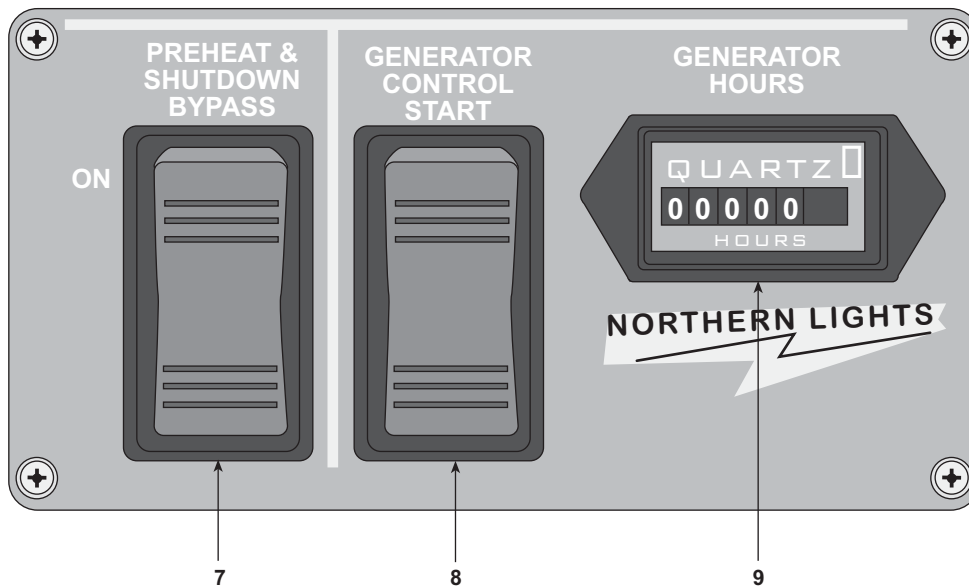
PROPULSION ENGINE LOCAL OPERATING PANEL (LOP)

1. ALTERNATOR Gauge	Indicates the current flow from the alternator.
2. TRANS OIL PRESS Gauge	Indicates the pressure of the oil that lubricates the marine transmission.
3. Tachometer	Indicates the engine speed in r/min (revolutions per minute).
4. ENG OIL PRESS Gauge	Indicates the pressure of the lubricating oil in the propulsion engine.
5. ENG WATER TEMP Gauge	Indicates the temperature of the engine coolant in the propulsion engine cooling system.
6. REMOTE/LOCAL ENGINE START Switch	Used to start the engine locally (from the engine room) or to provide remote start capability from the pilothouse. When in the REMOTE position, the engine may be started from the pilothouse switch. When in the LOCAL position, the engine may be started from the LOP. The LOCAL position is momentary, the switch is spring loaded to the OFF position. In the OFF position, the engine is not started from either location. The OFF position does not shut down the engine.



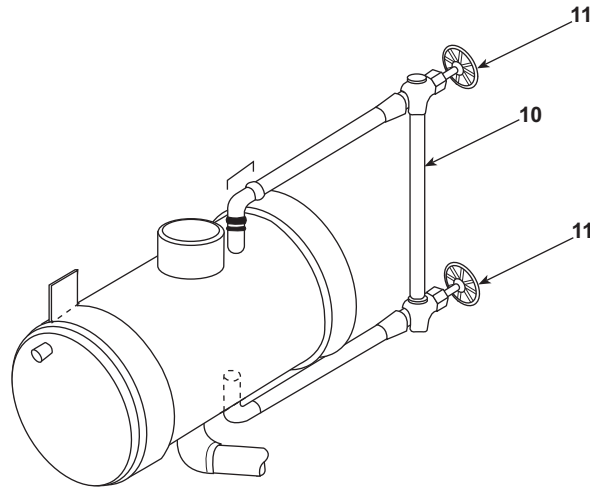
DIESEL GENERATOR LOCAL OPERATING PANEL (LOP)

7. **PREHEAT & SHUTDOWN BYPASS Switch**
Switch
Preheats the engine and bypasses the engine safety shutdown circuit. When in the ON position, the engine heater elements are energized and the engine safety shutdown circuit is bypassed. The ON position is momentary, and the switch is spring loaded to the OFF position. In the OFF position, the engine heater elements are deactivated, and the engine safety shutdown circuit is enabled.
8. **GENERATOR START/STOP Switch**
In the START position, the engine starter is activated, cranking the engine. In the CENTER position, the engine is enabled to run. In the STOP position, the engine is shut down.
9. **GENERATOR HOURS Meter**
Indicates the engine running time measured in hours and tenths.

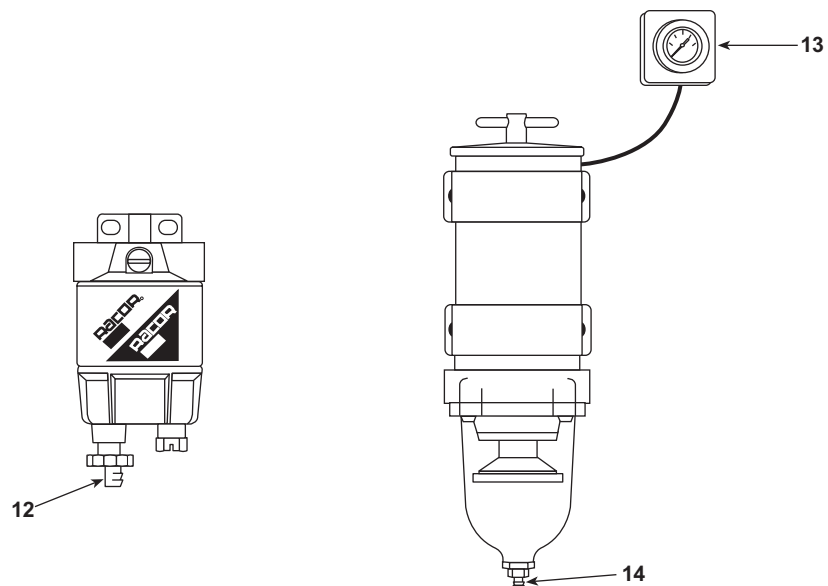


EXPANSION TANK SIGHT GLASS--PROPULSION ENGINE

10. Expansion Tank Sight Glass	Provides visual indication of the amount of engine coolant in the expansion tank.
11. Expansion Tank Sight Glass Shutoff Valves	Allow the sight glass tube to be isolated from the expansion tank for service or replacement.

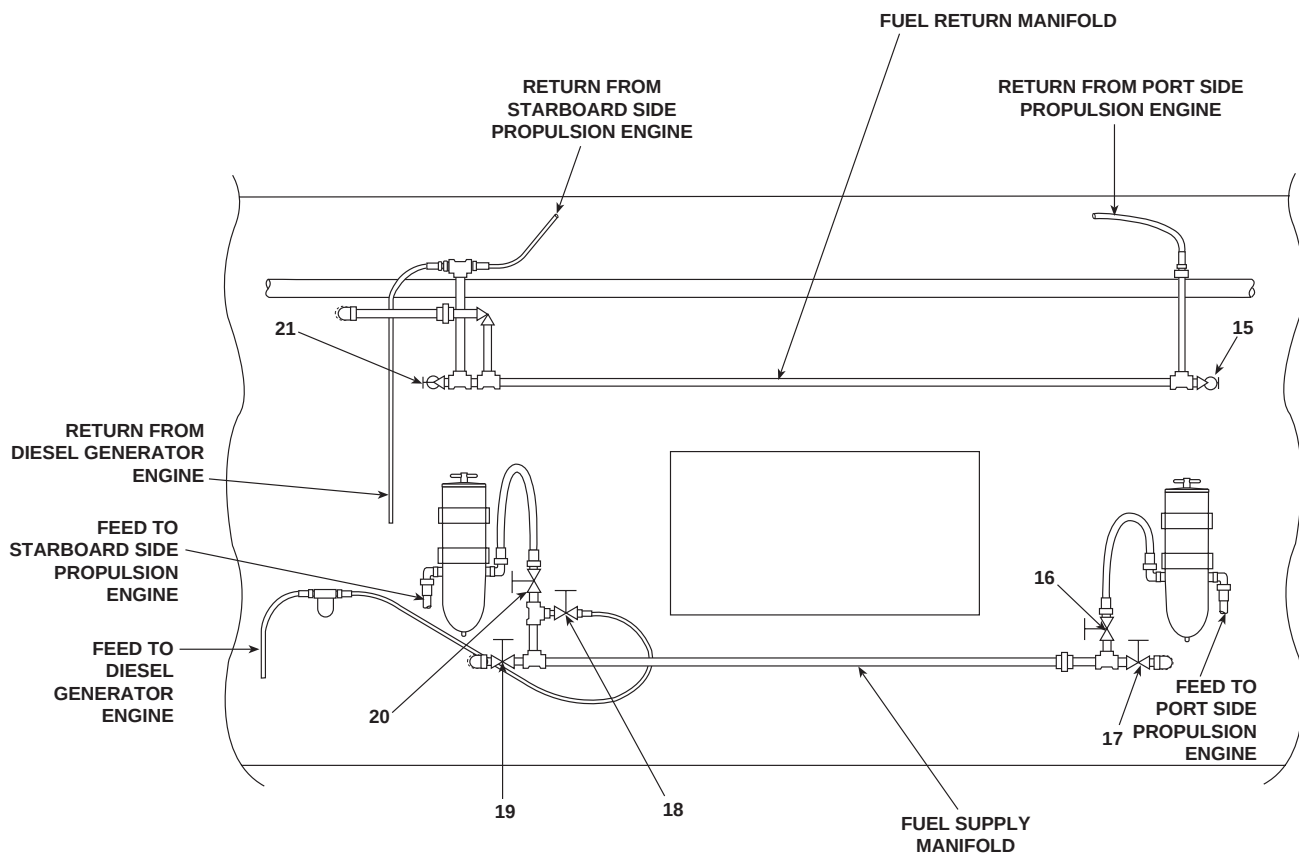
**FUEL FILTER GAUGES AND DRAINS**

12. Drain Valve-- Diesel Generator Fuel Filter/Water Separator	Permits water to be drained from the bottom of the fuel filter/water separator.
13. Vacuum Gauge--Propulsion Engine Fuel Filter/Water Separator	Indicates the amount of vacuum present on the outlet side of the filter. This indication aids in determining the need for filter replacement.
14. Drain Valve--Propulsion Engine Fuel Filter/Water Separator	Permits water to be drained from the bottom of the fuel filter/water separator.



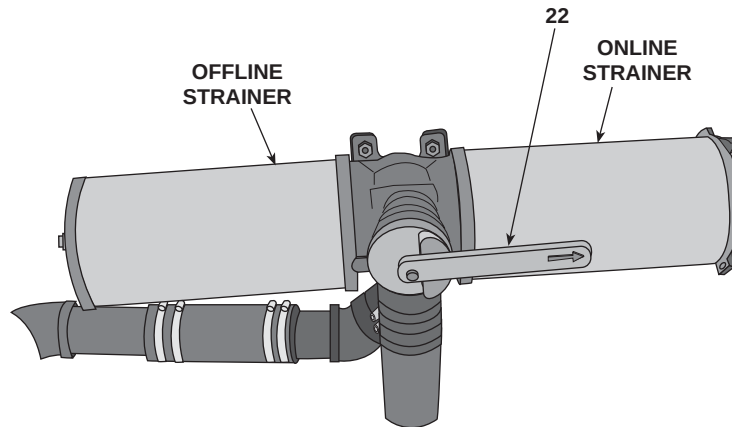
FUEL VALVES

15. Port Fuel Return Valve	Controls return flow to the port fuel tank. When the valve is OPEN, fuel is returned to the tank. When the valve is CLOSED, no fuel is returned to the tank.
16. Port Propulsion Engine Fuel Supply Valve	Controls fuel supply to the port propulsion engine. When the valve is OPEN, the port propulsion engine is supplied with fuel. When the valve is CLOSED, the fuel supply to the port propulsion engine is secured. The valve is closed only to service the port propulsion engine fuel system or for damage control.
17. Port Fuel Supply Valve	Controls fuel supply from the port fuel tank. When the valve is OPEN, fuel is supplied from the port tank. When the valve is CLOSED, no fuel is supplied from the port fuel tank.
18. Diesel Generator Fuel Supply Valve	Controls fuel supply to the diesel generator engine. When the valve is OPEN, the diesel generator engine is supplied with fuel. When the valve is CLOSED, the fuel supply to the diesel generator engine is secured. The valve is closed only to service the diesel generator engine fuel system or for damage control.
19. Starboard Fuel Supply Valve	Controls fuel supply from the starboard fuel tank. When the valve is OPEN, fuel is supplied from the starboard tank. When the valve is CLOSED, no fuel is supplied from the starboard fuel tank.
20. Starboard Propulsion Engine Fuel Supply Valve	Controls fuel supply to the starboard propulsion engine. When the valve is OPEN, the starboard propulsion engine is supplied with fuel. When the valve is CLOSED, the fuel supply to the starboard propulsion engine is secured. The valve is closed only to service the starboard propulsion engine fuel system or for damage control.
21. Starboard Fuel Return Valve	Controls return flow to the starboard fuel tank. When the valve is OPEN, fuel is returned to the tank. When the valve is CLOSED, no fuel is returned to the tank.

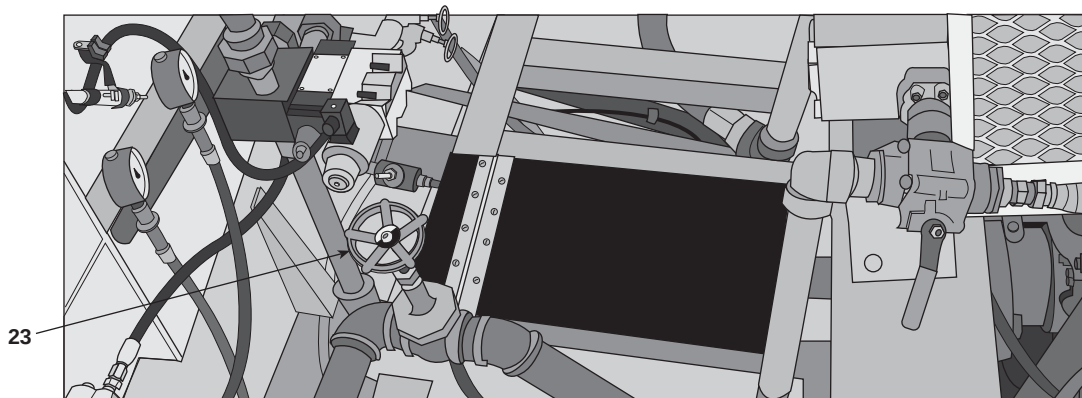


PROPULSION ENGINE RAW WATER STRAINER**22. Strainer Selector Valve**

Used to select the online strainer. The online strainer strains the raw water used to cool the propulsion engine fuel and the exhaust. The offline strainer is available for service or to serve as a standby. The strainer valve handle is positioned to face the online strainer.

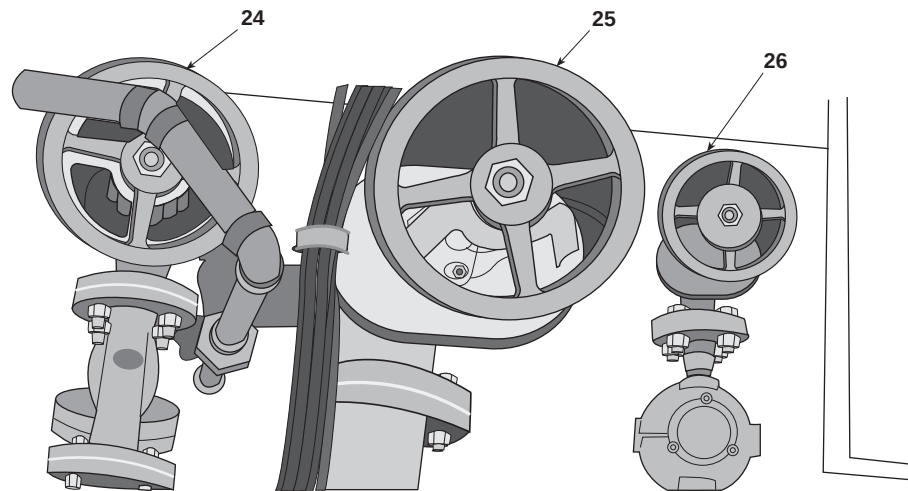
**PROPULSION ENGINE RAW WATER SEACOCK****23. Propulsion Engine Raw Water Seacock**

Secures the raw water flow to the propulsion engine raw water cooling system. One seacock is provided for each propulsion engine. When the seacock is OPEN, raw water is supplied to the raw water strainer, raw water pump, and other raw water cooling components. When the seacock is CLOSED, the raw water supply is secured.

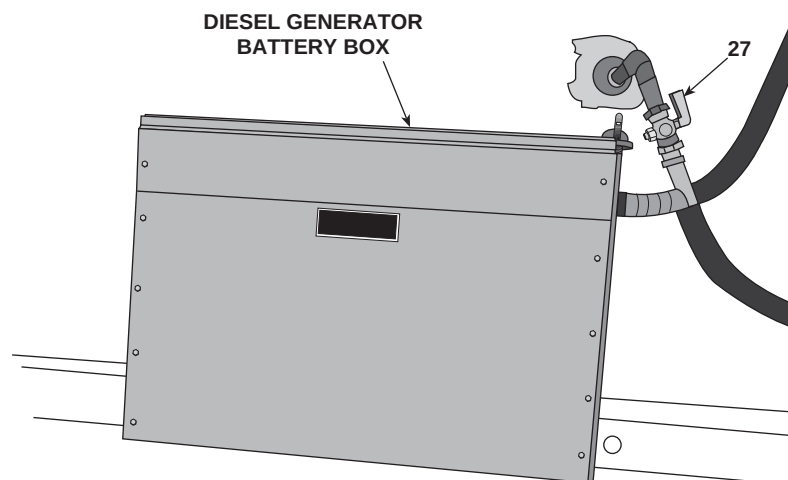


STARBOARD SEA CHEST SEACOCKS

24. Air Conditioning Raw Water Cooling Seacock	Secures the raw water supply to the air conditioning raw water strainer and raw water pump. When the seacock is OPEN, raw water is allowed to supply the strainer and pump. When the seacock is CLOSED, raw water is secured to the system.
25. Fire and Ballast Pump Raw Water Seacock	Secures the raw water supply to the fire and ballast pump. When the valve is OPEN, the pump is supplied with raw water through a strainer. When the valve is CLOSED, raw water is secured to the system.
26. Diesel Generator Raw Water Cooling Seacock	Secures the raw water supply to the diesel generator raw water cooling system. When the valve is OPEN, raw water is allowed to supply the system's strainer and raw water pump. When the valve is CLOSED, the raw water supply is secured.

**DIESEL GENERATOR SIPHON BREAK OVERBOARD DISCHARGE VALVE**

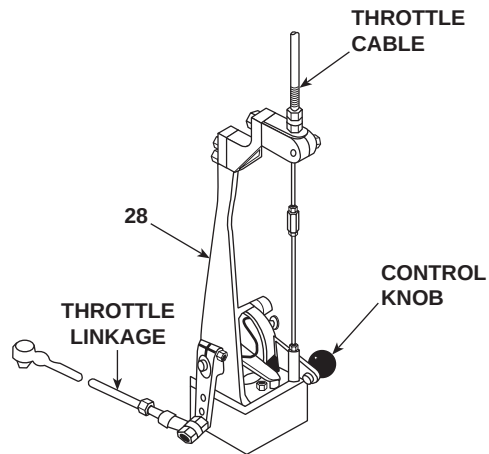
27. Diesel Generator Siphon Break Overboard Discharge Valve	Controls venting of the diesel generator siphon break. When the valve is OPEN, the siphon break is permitted to vent and the siphon break operates. When the valve is CLOSED, the siphon break is deactivated. The siphon break valve should remain OPEN except during damage control operations.



THROTTLE CONTROL UNIT

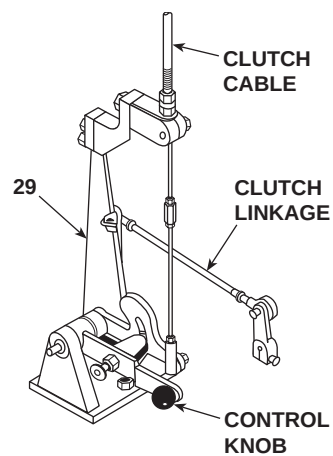
28. Throttle Control Unit

Connects the throttle cable to the throttle linkage and permits control of the engine throttle from the engine room.

**CLUTCH CONTROL UNIT**

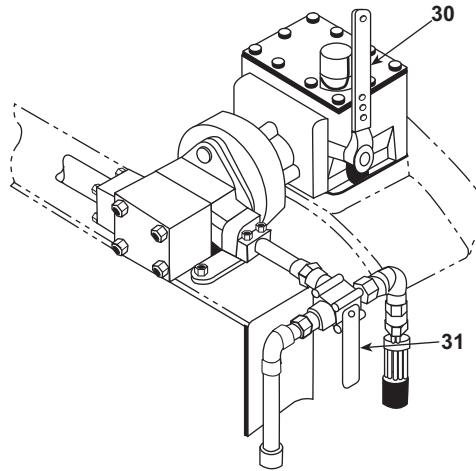
29. Clutch Control Unit

Connects the clutch cable to the clutch linkage and permits control of the marine transmission clutch from the engine room.



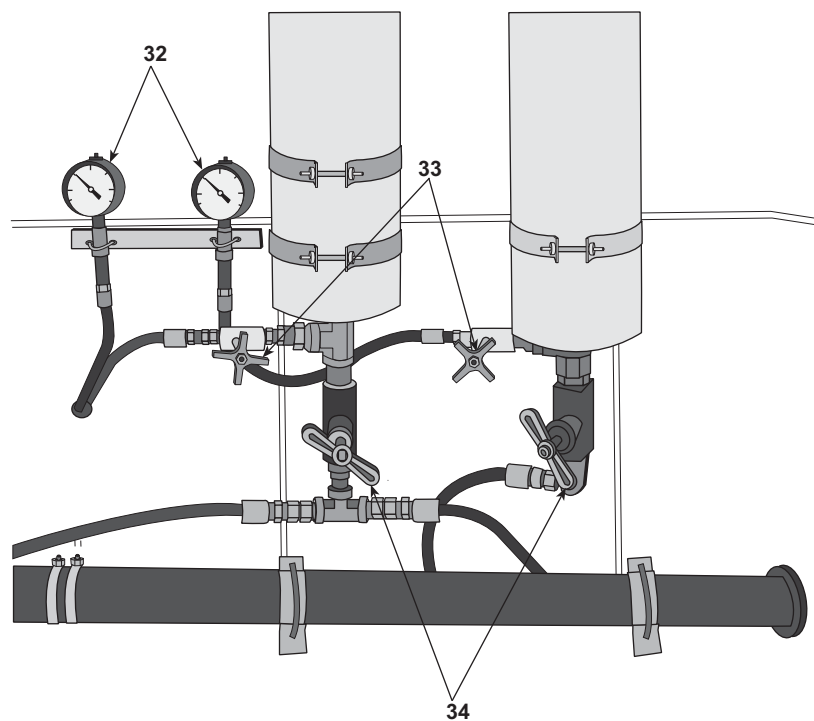
PTO CLUTCH LEVER AND HYDRAULIC DIVERTER VALVE

30. PTO Clutch Lever Used to engage and disengage the ramp hydraulic system pump. Moving the lever aft ENGAGES the pump. Moving the lever forward DISENGAGES the pump.
31. Hydraulic Diverter Valve Used to divert hydraulic fluid flow to either the ramp hydraulic system or the bilge pump hydraulic system. When the valve handle is in line with the piping, the flow is directed to the ramp hydraulic system. When the valve is UP (port) or DOWN (starboard), the flow is directed to the bilge pump hydraulic system.



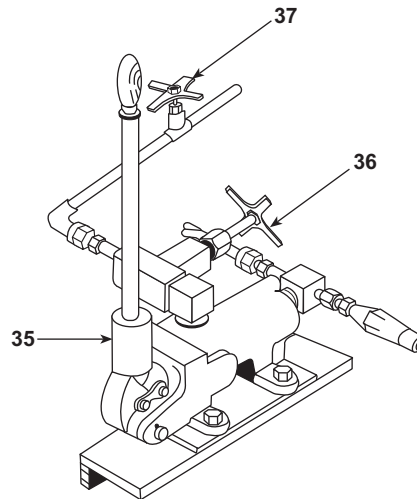
HYDRAULIC ACCUMULATORS

32. Accumulator Gauges Each accumulator, two port and two starboard, has a gauge to indicate the pressure present in the accumulator.
33. Accumulator Gauge Shutoff Valves Valves allow the accumulator gauges to be isolated from the accumulators for service. During normal operation, the valves are OPEN, allowing the gauges to indicate the pressure present in the accumulators. When the valves are CLOSED, the accumulator gauges are isolated from the system.
34. Accumulator Shutoff Valves Valves allow the accumulators to be isolated from the starting system. During normal operation, the valves are OPEN, making the accumulator pressure available to the starting system. When the valves are CLOSED, the accumulators are isolated from the system.



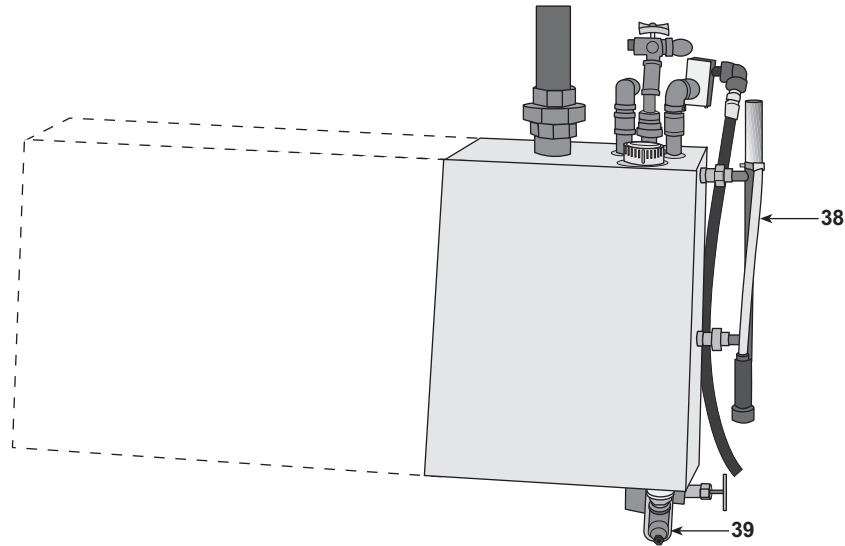
HAND CHARGING PUMP AND VALVES

35. Hand Charging Pump Handle	Inserted in this opening to allow the operator to stroke the pump.
36. Hand Charging Pump Valve	Used to secure the hydraulic fluid supply to and from the pump. During normal operation, the valve is CLOSED. The valve is OPEN when the hand charging pump is being used to charge the accumulators.
37. Hand Charging Pump Isolation Valve	Isolates the two sides of the hydraulic starting system. When the isolation valve is CLOSED, the port and starboard hydraulic starting systems operate independently from one another. In this configuration, the port engine-driven pump charges only the port accumulators and the port accumulators power only the port starter motor. The same is true for the starboard side of the system. When the isolation valve is OPEN, both sides of the hydraulic starting system work together. In this configuration, either engine-driven pump may charge either pair of accumulators and either pair of accumulators may power the starter for either engine.

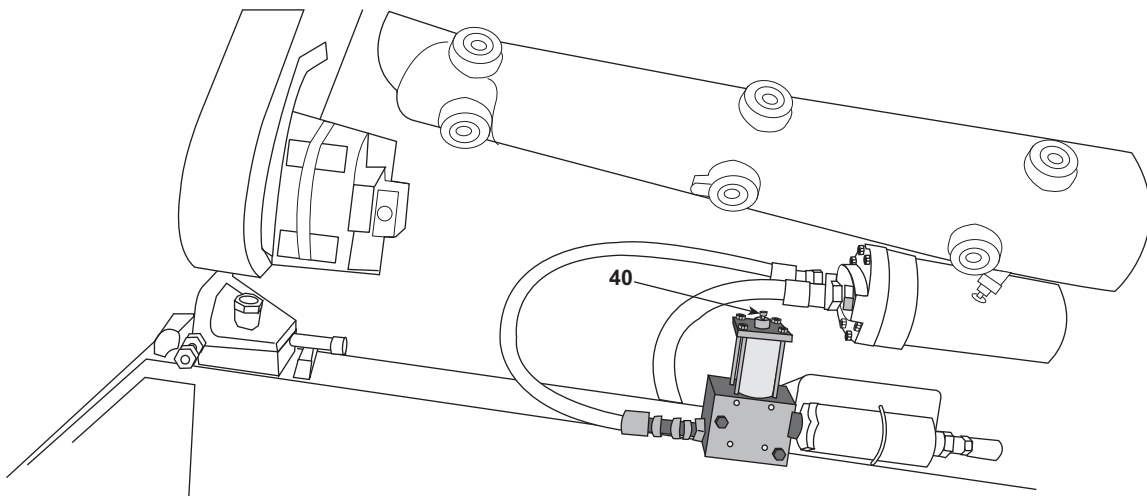


STARTING SYSTEM HYDRAULIC TANK

38. Starting System Hydraulic Tank Sight Gauge Indicates the level of hydraulic fluid present in the hydraulic tank.
39. Starting System Hydraulic Tank Drain Valve Permits draining of the starting system hydraulic tank for service. During normal operation, the valve remains CLOSED. The valve is OPEN for draining the tank.

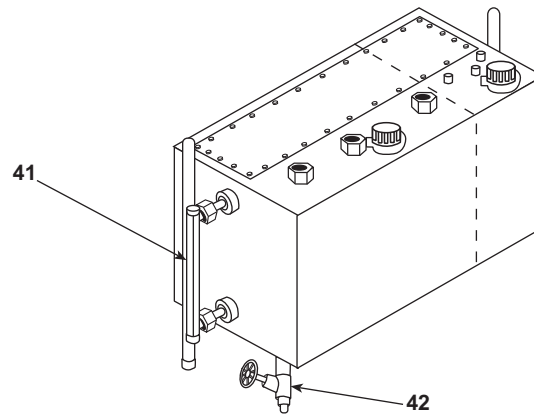
**STARTER CONTROL VALVE MANUAL PUSHBUTTON**

40. Starter Control Valve Manual Pushbutton Serves as a manual override for the propulsion engine starting system. When the pushbutton is pushed, hydraulic pressure is allowed to flow from the accumulators to the starter.

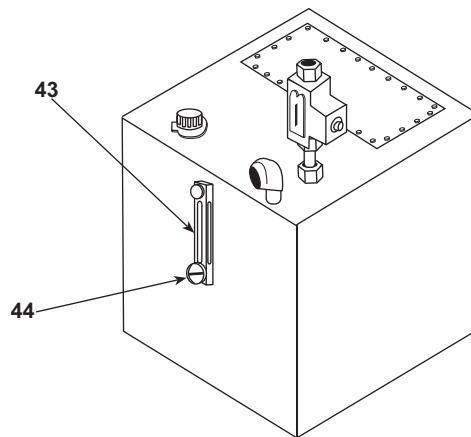


RAMP HYDRAULIC SYSTEM TANK

41. Ramp System Hydraulic Tank Sight Gauge	Indicates the level of hydraulic fluid present in the hydraulic tank.
42. Ramp System Hydraulic Tank Drain Valve	Permits draining of the ramp system hydraulic tank for service. During normal operation, the valve remains CLOSED. The valve is OPEN for draining the tank.

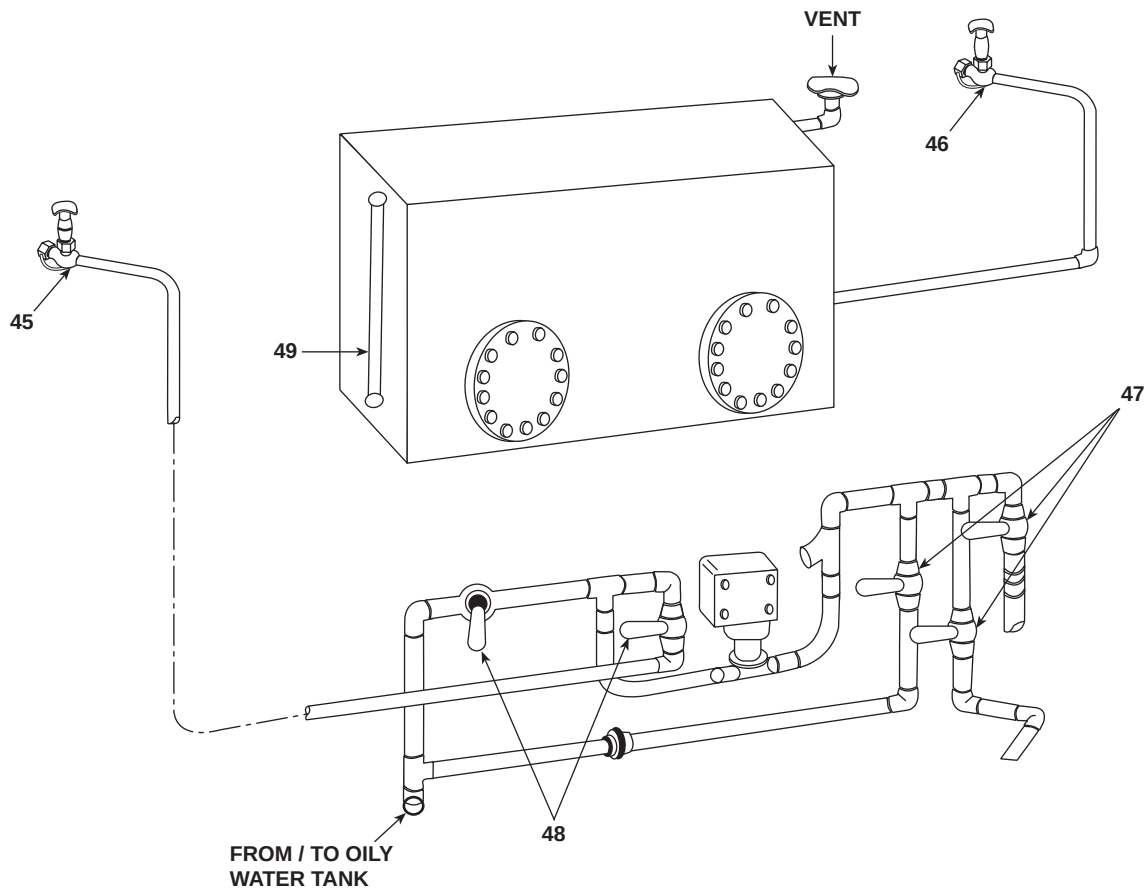
**STEERING HYDRAULIC SYSTEM TANK**

43. Steering Hydraulic Tank Sight Glass	Indicates the level of hydraulic fluid present in the steering system hydraulic tank.
44. Steering Hydraulic Tank Temperature Gauge	Indicates the temperature of the hydraulic fluid in the steering system hydraulic tank.



OILY WATER PUMPING AND COLLECTION SYSTEM CONTROLS

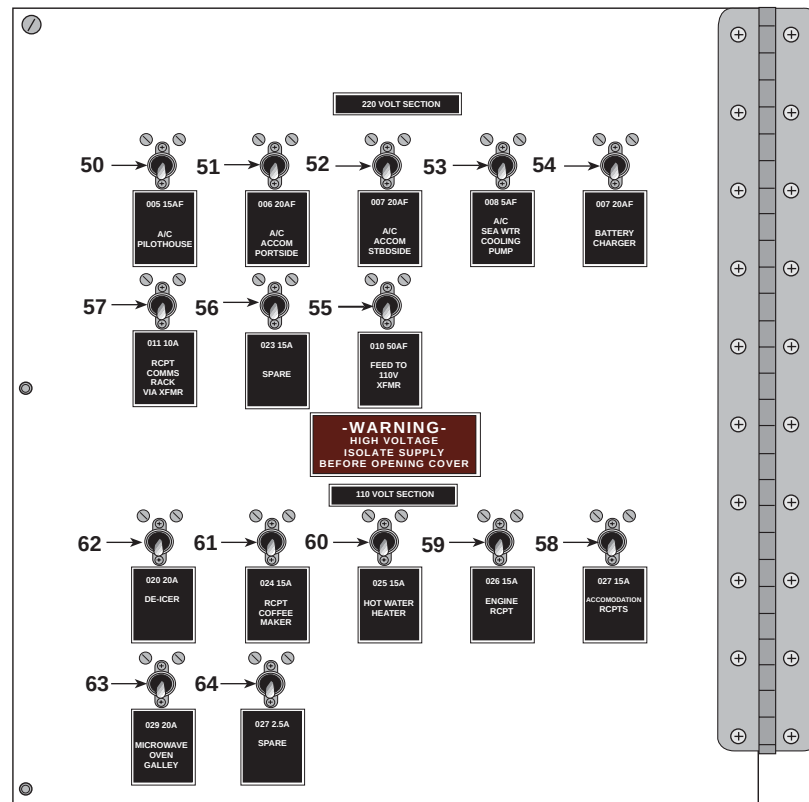
45. Oily Water Pressure Discharge Valve Controls the flow of oily water at the pressure discharge fitting. This valve is fed by the oily water pump. When the valve is OPEN, oily water may be discharged at the pressure discharge fitting. When the valve is CLOSED, oily water flow is secured. The valve is OPEN only when using the oily water pump to discharge bilge and/or oily water to an approved facility.
46. Oily Water Suction Discharge Valve Controls the flow of oily water at the suction discharge fitting. This valve is used when the oily water tank is drained by a shore facility's pumping unit. When the valve is OPEN, oily water may be drawn from the oil water tank. When the valve is CLOSED, oily water flow is secured. The valve is OPEN only when the oily water tank is being drained by a shore facility's pump.
47. Oily Water Suction Valves Selects the suction source for the oily water pump. Depending upon the alignment of the valves, oily water may be drawn from the bilge manifold, from the oily water tank, or from the engine, transmissions, or buckets via a suction hose. Operation of the system is described in WP 0026 00.
48. Oily Water Discharge Valves Selects the discharge route for the oily water pump. Depending upon the alignment of the valves, oily water may be discharged to the oily water tank or to the pressure discharge fitting.
49. Oily Water Discharge Tank Sight Gauge Indicates level of oily water present in the tank.



110/220 VAC DISTRIBUTION PANEL

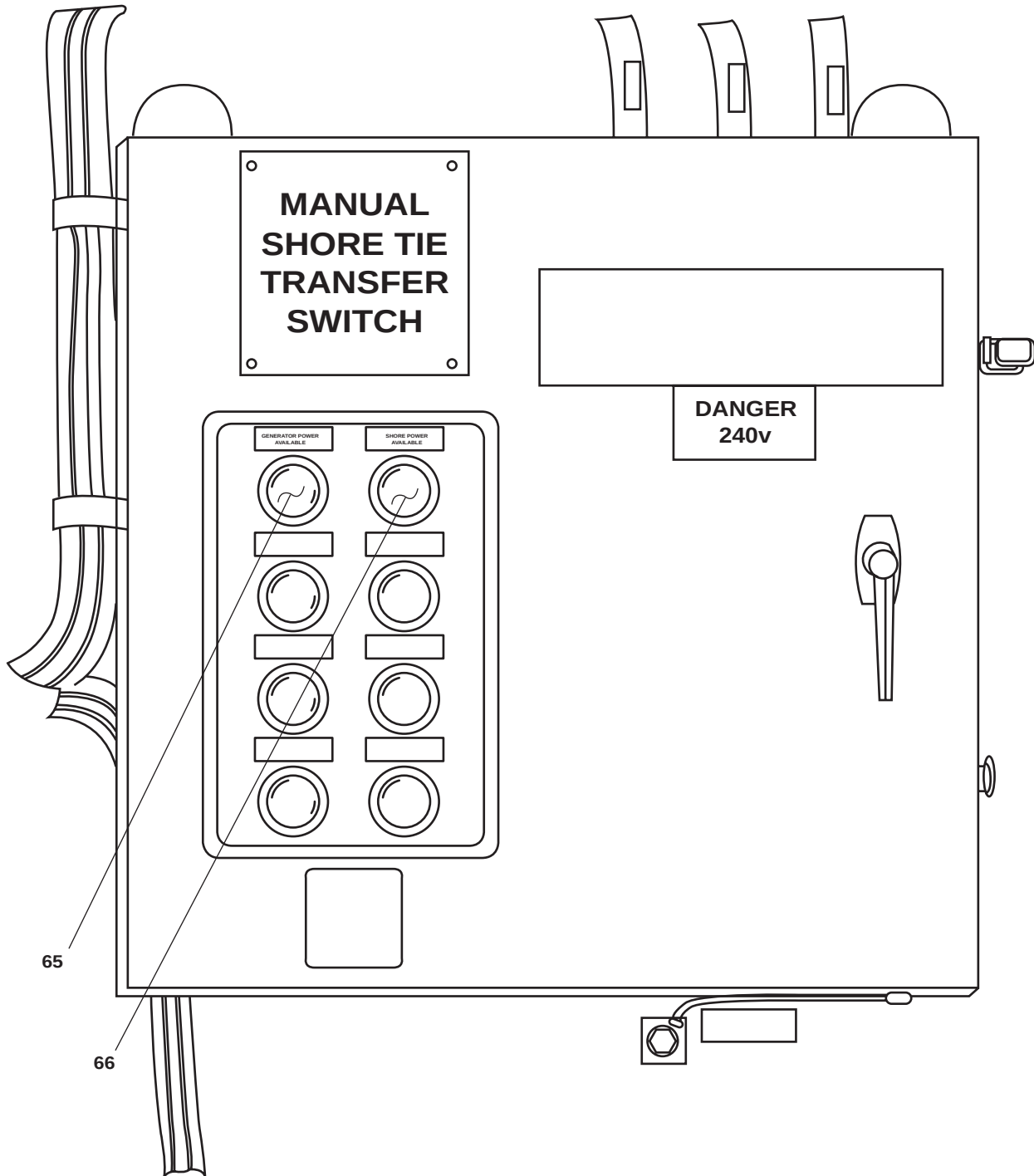
50. A/C PILOTHOUSE Breaker	Provides overload protection for the air conditioning unit in the pilot-house. The unit is controlled by the control assembly located in the pilothouse console.
51. A/C ACCOM PORT SIDE Breaker	Provides overload protection for the air conditioning unit on the port side of the accommodation module. The unit is controlled by the control assembly located in the bulkhead near the inlet and outlet louvers.
52. A/C ACCOM STBD SIDE Breaker	Provides overload protection for the air conditioning unit on the starboard side of the accommodation module. The unit is controlled by the control assembly located in the bulkhead near the inlet and outlet louvers.
53. A/C SEA WTR COOLING PUMP Breaker	Provides overload protection for the air conditioning sea water cooling pump. Control of the unit is by a relay that is controlled by the control assemblies for the individual units.
54. BATTERY CHARGER Breaker	Provides overload protection for the battery charger.
55. FEED TO 110V XFMR	Provides overload protection to the 110V transformer in the engine room.
56. SPARE Breaker	Provided for expansion.
57. RCPT COMMS BACK VIA XFMR Breaker	Provides overload protection for comms rack receptacles through transformer.
58. ACCOMODATION RCPTS Breaker	Provides overload protection for 110V receptacles in accomodation module.
59. ENGINE RCPT Breaker	Provides overload protection for 110V receptacles in the engine room.
60. HOT WATER HEATER Breaker	Provides overload protection for the hot water heater's electric element.
61. RCPT COFFEE MAKER Breaker	Provides overload protection for the coffee maker receptacle.
62. DE-ICER Breaker	Provides overload protection for the pilothouse windshield de-icer.
63. MICROWAVE OVEN GALLEY Breaker	Provides overload protection for microwave receptacles located in the accomodation module.
64. SPARE Breaker	Provided for expansion.

110/220 VAC DISTRIBUTION PANEL (continued)



SHORE POWER TRANSFER STATION

65. GENERATOR POWER AVAILABLE Indicator	Illuminates to indicate that generator power is available to the shore power transfer station.
66. SHORE POWER AVAILABLE Indicator	Illuminates to indicate that shore power is available to the shore power transfer station.

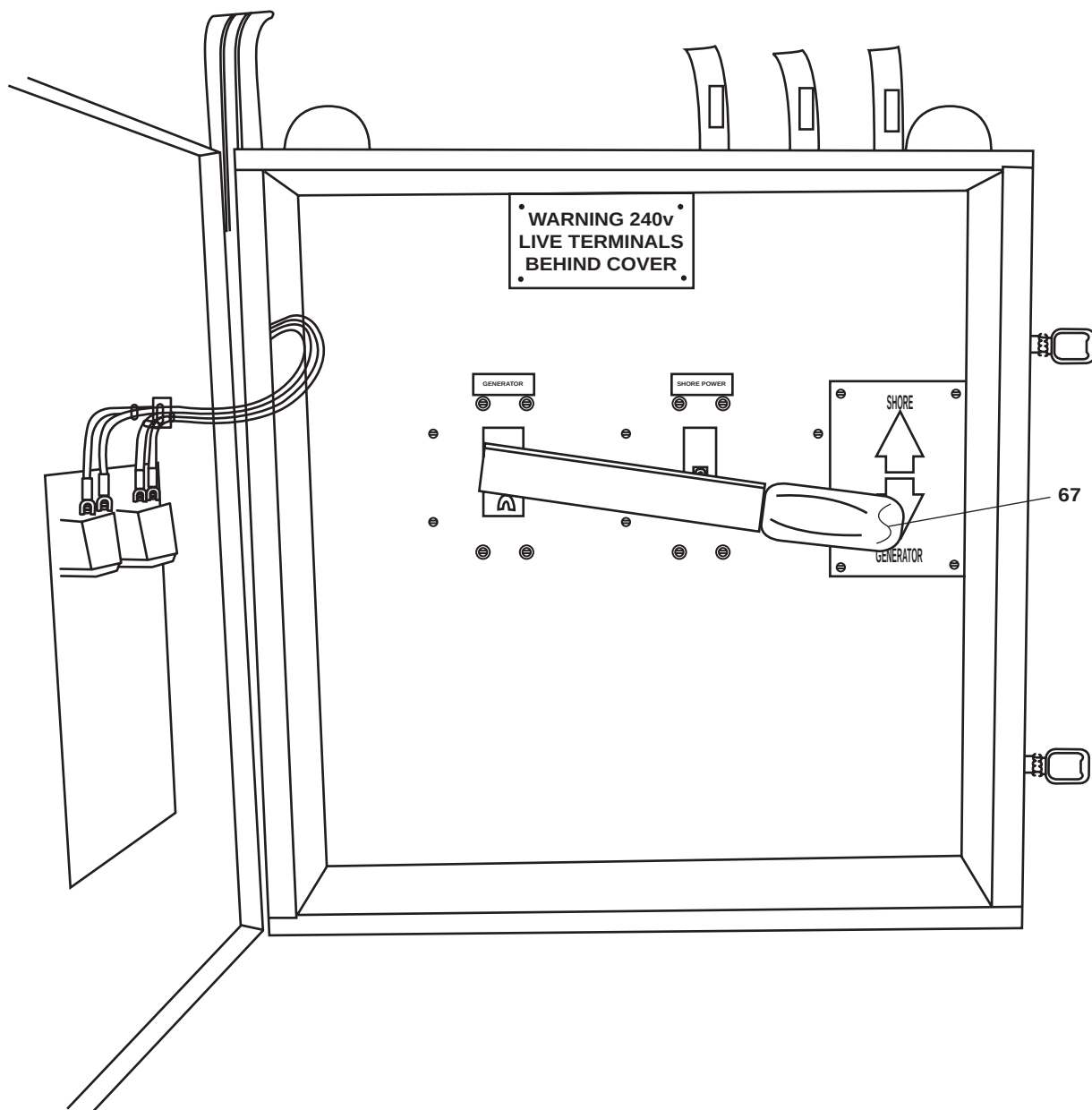


SHORE POWER TRANSFER STATION (continued)

67. Shore Power Transfer Switch

Move this handle UP to select SHORE power.

Move this handle DOWN to select generator power.

**END OF WORK PACKAGE**

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS
LAZARETTE**

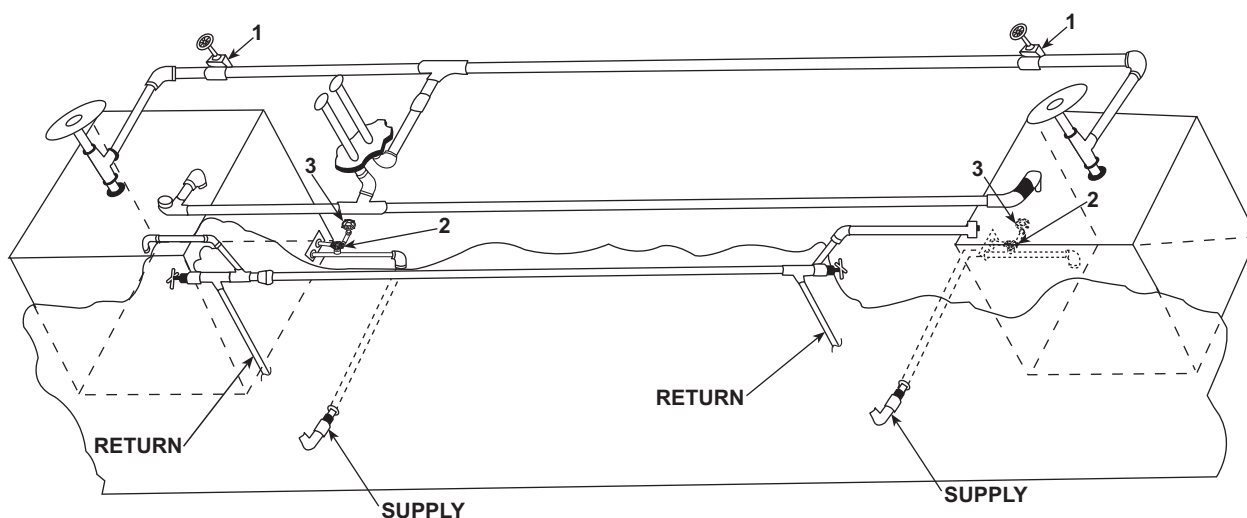
FUEL TANK VALVES

1. Fuel Fill Valves

These valves (1 port, 1 starboard) determine which fuel tank(s) are filled via the fuel fill fitting. When the starboard valve is OPEN, fuel from the fuel fill fitting fills the starboard tank. When the port valve is OPEN, fuel from the fuel fill fitting fills the port tank. When CLOSED, the valve(s) allow no fuel to flow from the fuel fill fitting to the selected tank.
2. Fuel Supply Valves

These valves (1 port, 1 starboard) allow the operator to secure the fuel supply line from the lazarette. When OPEN the valve(s) permit fuel to flow from the fuel tank(s) to the fuel supply manifold in the engine room. When CLOSED, no fuel flows from the selected tank(s) to the fuel supply manifold.
3. Fuel Drain Valves

These valves (1 port, 1 starboard) allow draining of fuel from the fuel tanks into an appropriate collection device.

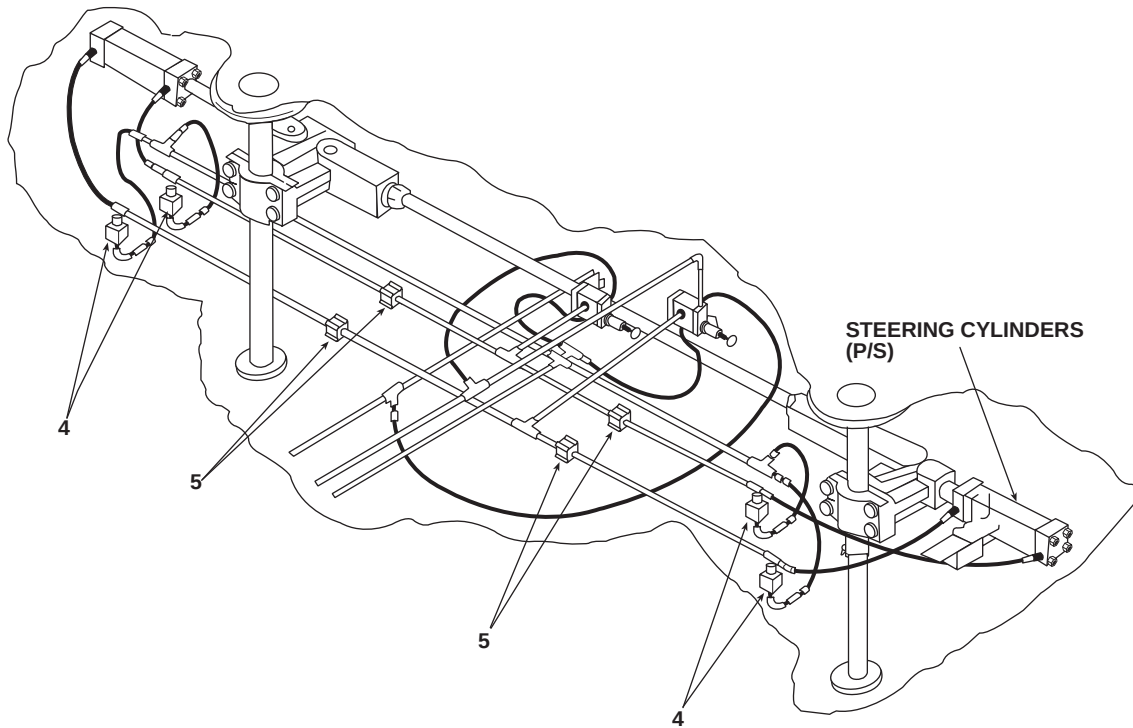


STEERING VALVES**4. Bypass Valve**

Four bypass valves, two port and two starboard, permit the hydraulic steering system to be bypassed when the emergency tiller is in use. During normal operation, all four valves are CLOSED. When the emergency tiller is used, all four valves are OPEN.

5. Isolation Valve

Four isolation valves, two port and two starboard, permit isolation of a steering hydraulic cylinder should a cylinder failure occur. During normal operation, the valves remain OPEN.

**END OF WORK PACKAGE**

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATION UNDER USUAL CONDITIONS
GENERAL INFORMATION**

This work package contains siting requirements; shelter requirements; assembly and preparation for use information; and initial adjustments, before use, and self-test information.

SITING REQUIREMENTS

Location

The primary mission of the LCM-8 Mod 2 is personnel transfer, light salvage, and Command and Control (C2). It will be used in coastal, harbor, and inland waterways, and is able to work in shallow inlets, rivers, and on unimproved beaches. The LCM-8 Mod 2, therefore, may be located along any waterway sufficiently deep to support the vessel. The facilities on board the LCM-8 Mod 2 are sufficient to support its crew of three for only short durations.

Proximity to Power Sources

The LCM-8 Mod 2 is completely self-sufficient with regard to electrical power. A diesel generator, two engine-driven alternators, and a battery charger supply all of the electrical needs of the vessel. The vessel's electrical needs may also be supplied by a shore power connection to a shore facility or to another vessel. The shore supply source must be 220 Vac (Volts alternating current), single phase. The LCM-8 Mod 2 is outfitted with a shore power cable to make this connection.

SHELTER REQUIREMENTS

The LCM-8 Mod 2 requires no shelter. When not in use, the LCM-8 Mod 2 is moored alongside a pier, alongside another vessel, or is anchored.

ASSEMBLY AND PREPARATION FOR USE

No assembly is required for the LCM-8 Mod 2. Preparations for use are contained in WP 0022 00.

INITIAL ADJUSTMENTS, BEFORE USE, AND SELF-TEST

All necessary initial adjustments, before use, and self-tests are contained in WP 0022 00.

END OF WORK PACKAGE

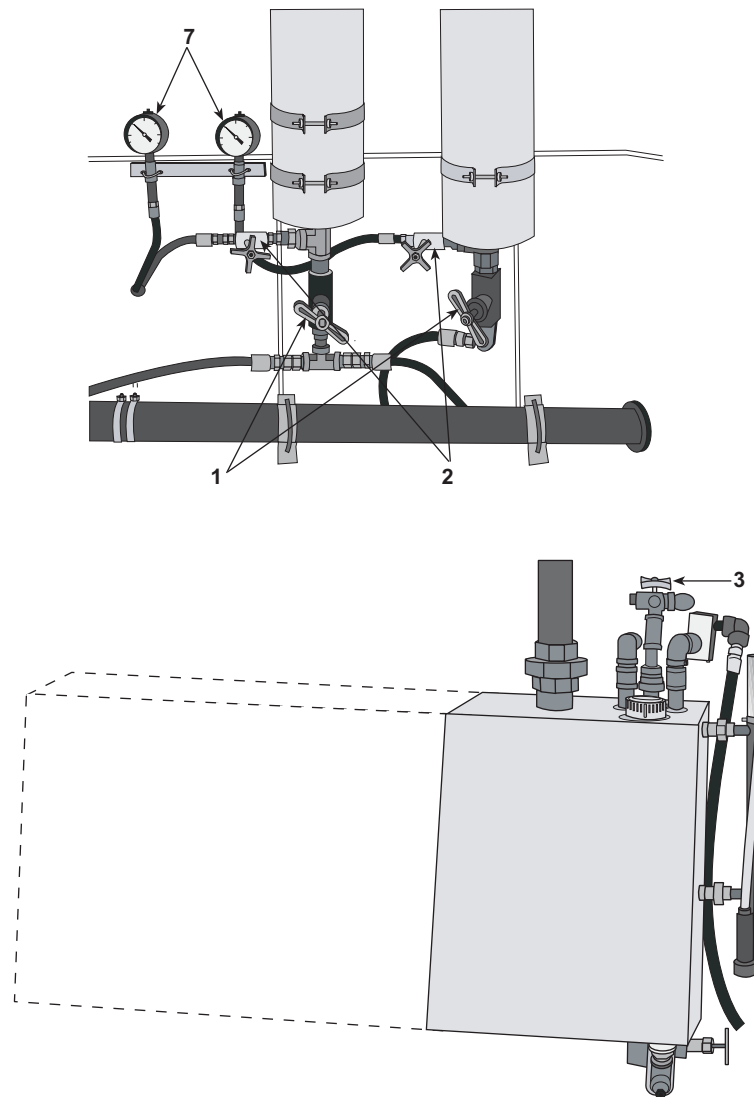
**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATION UNDER USUAL CONDITIONS
PREOPERATING PROCEDURES**

ACCUMULATORS

Check Precharge Pressure

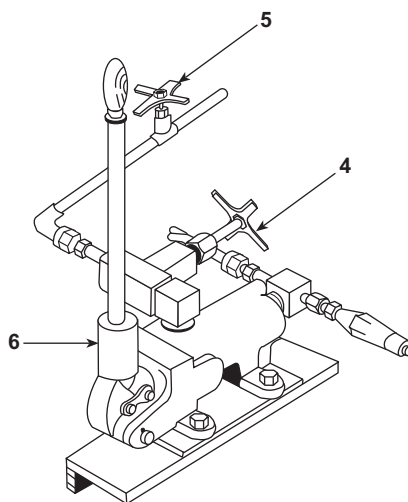
The precharge pressure of the accumulators is the pressure of the nitrogen gas with which the accumulators are initially charged. This pressure must be checked before the system pressure is raised for the initial engine start. To check the precharge pressure, proceed as follows:

1. Ensure that all of the accumulator shutoff valves (1) are CLOSED and all of the accumulator gauge valves (2) are OPEN.
2. OPEN the accumulator blowdown valve (3) on the starting system side of the ramp/steering hydraulic tank.



ACCUMULATORS (continued)

3. OPEN the hand charge pump valve (4) and the isolation valve (5) at the hand charge pump (6).



4. OPEN the accumulator shutoff valve (1) for one accumulator and observe the accumulator's gauge (7) reading. The gauge reading should fall to zero.
5. CLOSE the accumulator blowdown valve (3) and leave all of the other valves as found at the end of step 4.
6. Pump several strokes on the hand charge pump (6) while observing the accumulator gauge (7). The pressure should rise quickly, and then stabilize. Once stabilized, the pressure will rise only very slowly with additional pump strokes. This stabilized pressure is the accumulator precharge pressure.
7. Log the accumulator precharge pressure. 1250 lb/in² (86.2 bar) is normal.

Pressurize Accumulators**NOTE**

When the ambient temperature is above 40 °F (4.4 °C), an accumulator pressure of 1500 lb/in² (103.4 bar) will provide adequate cranking to start the engine. Between 40 °F (4.4 °C) and 0 °F (-17.8 °C), 2500 lb/in² (172.4 bar) should be sufficient. Below 0 °F (-17.8 °C), the accumulators should be charged to 3250 lb/in² (224.1 bar). For ambient temperatures below 40 °F (4.4 °C), a starting aid should be used.

8. Use the hand charge pump (6) to raise the accumulator to the appropriate starting pressure as determined by the ambient temperature.
9. Repeat steps 1-8 for each of the three remaining accumulators.

PMCS

Perform all preoperation PMCS for the vessel. Refer to WP 0053 00 and WP 0054 00 for PMCS procedures.

FUEL SYSTEM**WARNING**

Fuel vapors are explosive. Fuel is flammable. Before conducting fuel operations, ensure that firefighting equipment is immediately available for use in case of fire emergency. Do not smoke or allow smoking or any other open flame in the vicinity of fueling operations. Wipe clean any fuel spillage and dispose of spilled fuel and fuel-soaked rags in accordance with the appropriate local regulations. A fueling watch supervisor shall be stationed by the coxswain to ensure compliance with fueling safety procedures. Failure to comply can result in damaged equipment and serious injury or death to personnel.

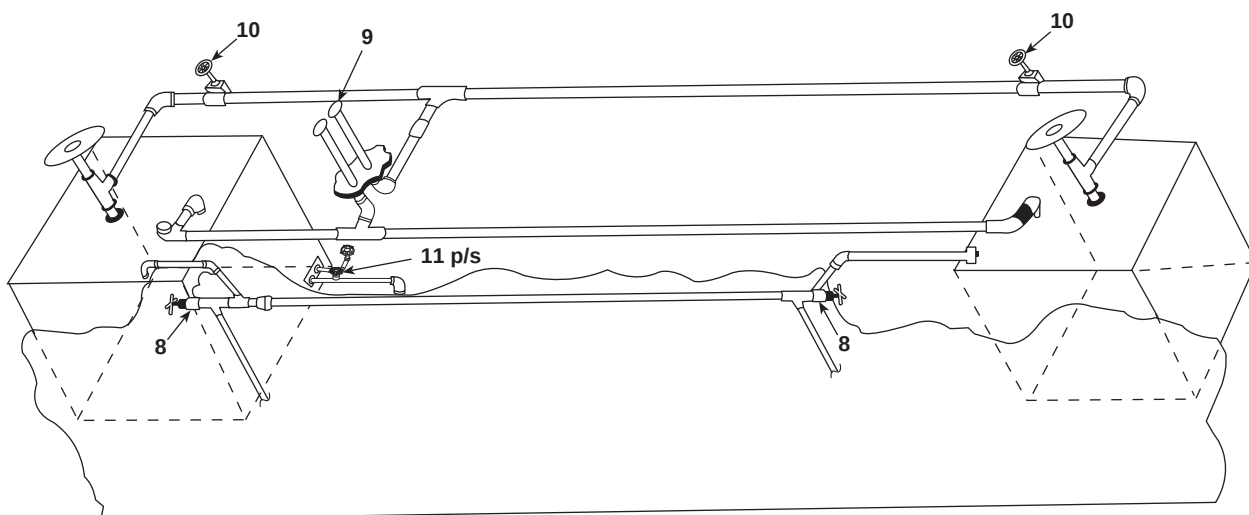
Fuel Sounding

Remove the fuel sounding caps and sound both fuel tanks to determine the level of fuel oil. If necessary, replenish the fuel tanks according to the Fill Fuel Tanks procedure in this work package.

Fill Fuel Tanks

Fill the fuel tanks according to the following procedure:

1. CLOSE the fuel return valves (8), located in the engine room on bulkhead 39, to ensure that the tanks will be fully replenished.
2. Remove the fuel fill cap (9) from the fuel fill pipe.
3. OPEN the fuel fill valve (10) for the tank to be filled.



FUEL SYSTEM (continued)**⚠ CAUTION**

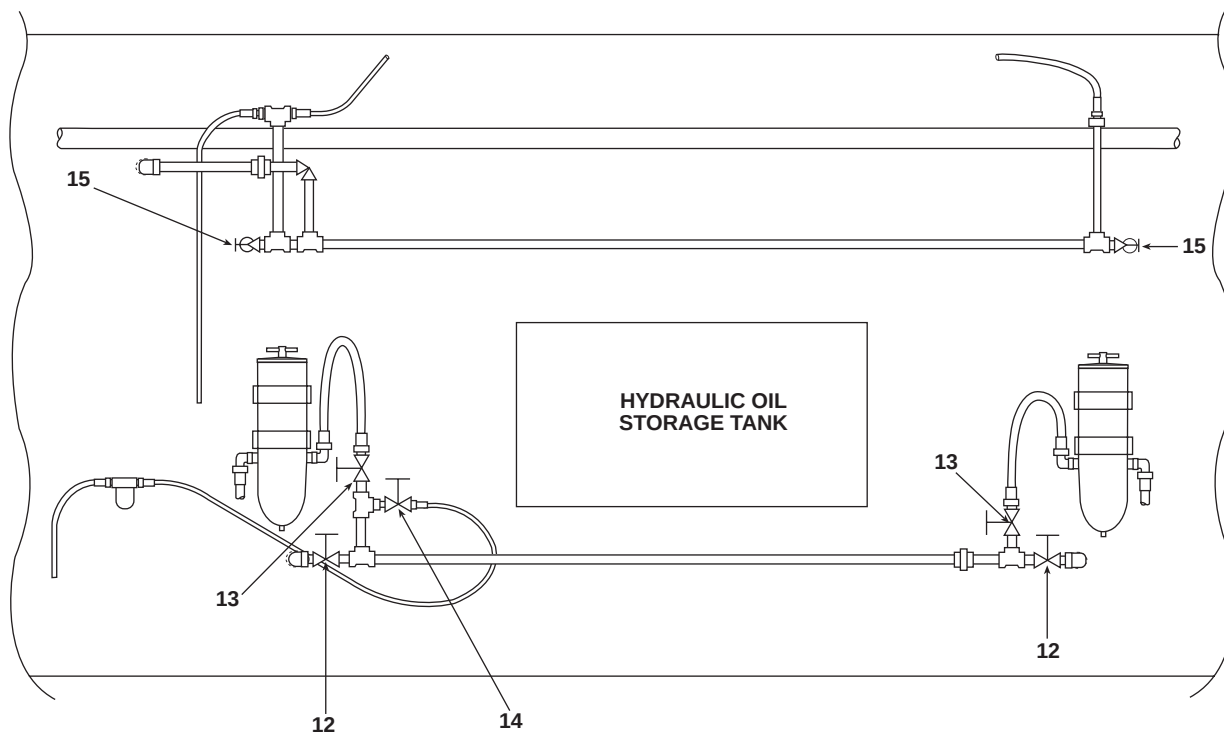
Do not fill the fuel tank beyond 95 % capacity. Overfilling the fuel tank can cause fuel to overflow when the fuel expands in the heat of the lazarette.

4. Fill the fuel tank to 95 % capacity with clean diesel fuel.
5. CLOSE the fuel fill valve (10).
6. Secure the fuel sounding cap if not done already.
7. Repeat steps 3-6 for the other fuel tank, if necessary.
8. After both tanks are fueled, OPEN the fuel return valves (8) in the engine room.
9. Secure the fuel fill cap (9).

Fuel Valve Alignment

Align the fuel system valves as follows:

1. OPEN both fuel supply valves (11) in the lazarette.
2. OPEN both fuel supply valves (12), both propulsion engine supply valves (13), and the diesel generator supply valve (14) in the engine room.
3. Ensure that both return valves (15) are OPEN.

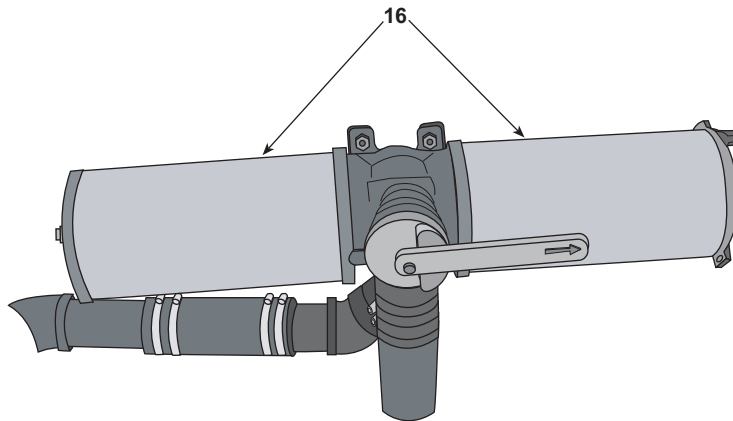


RAW WATER COOLING SYSTEM

Prepare the raw water cooling system as follows:

1. Ensure that the following strainers are clean and intact:

- a. Propulsion engine (16).



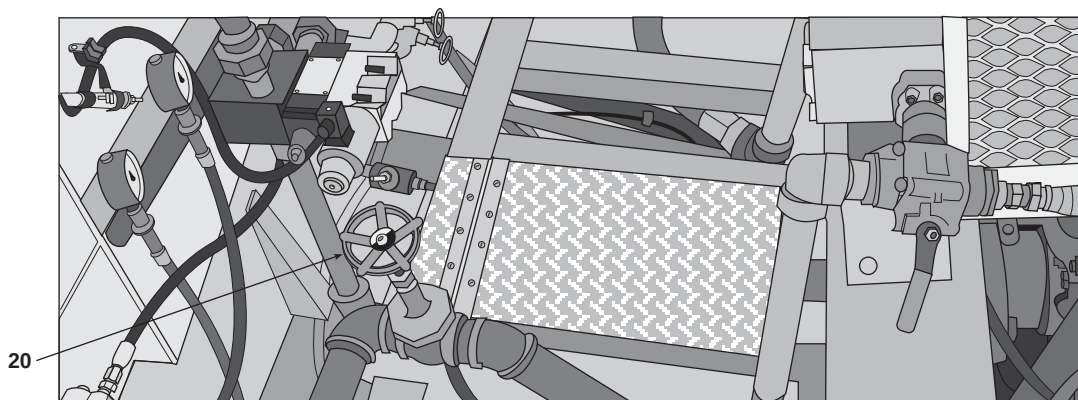
- b. Air conditioning/heating (17).

- c. Fire pump (18).

- d. Generator engine (19).

2. OPEN the following seacocks:

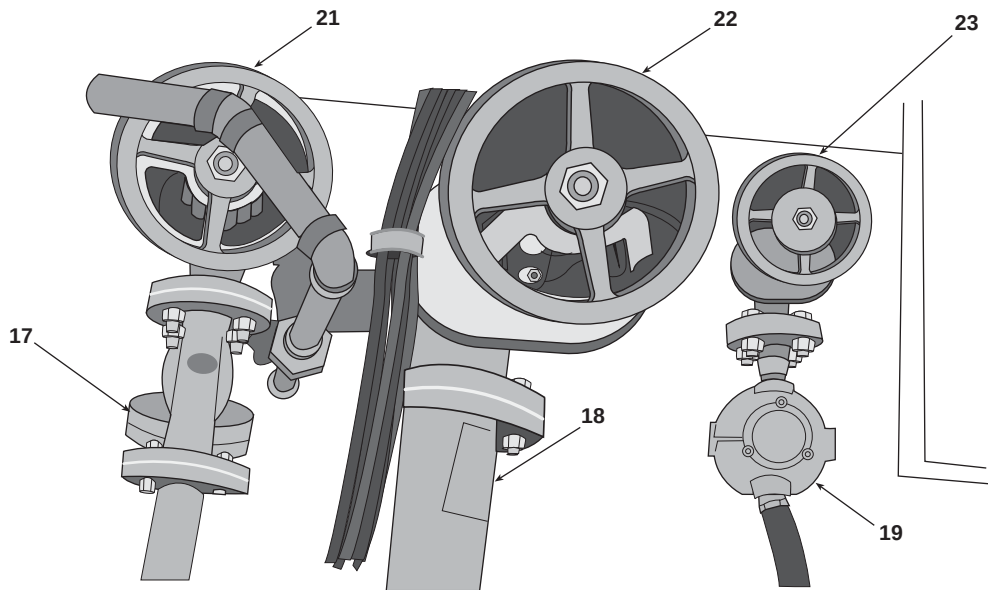
- a. Propulsion engine (20).



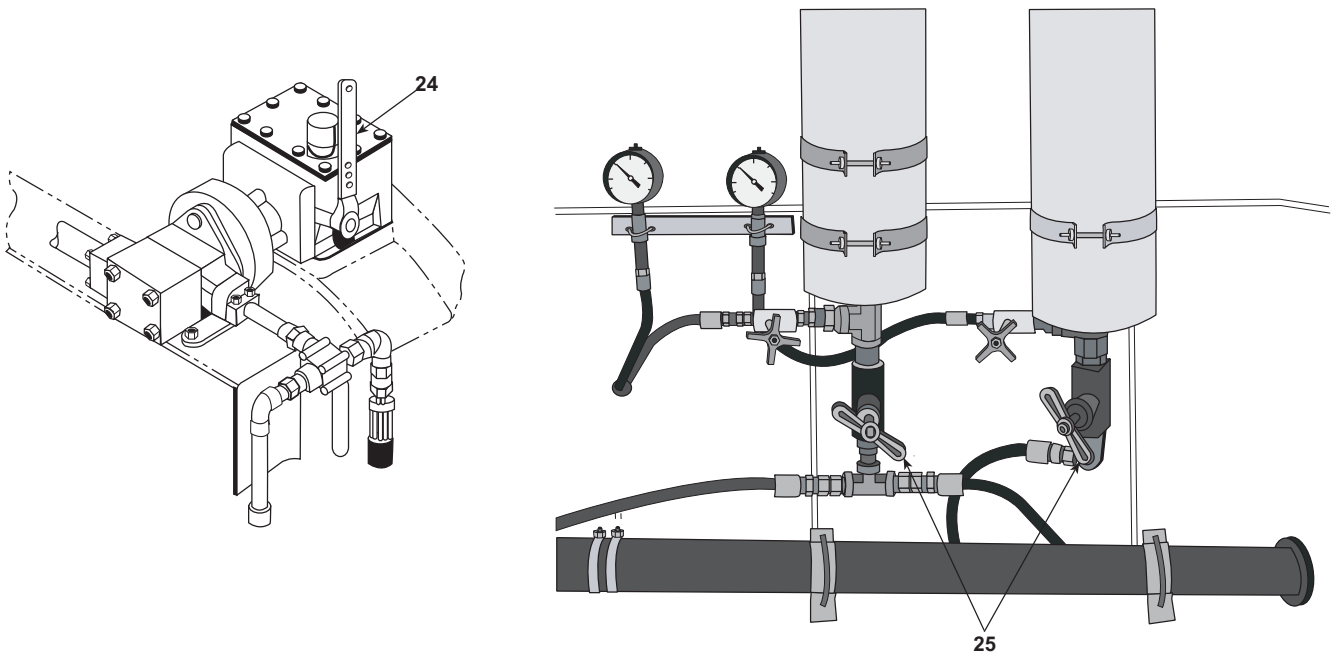
- b. Air conditioning (21).

- c. Fire pump (22).

- d. Generator engine (23).

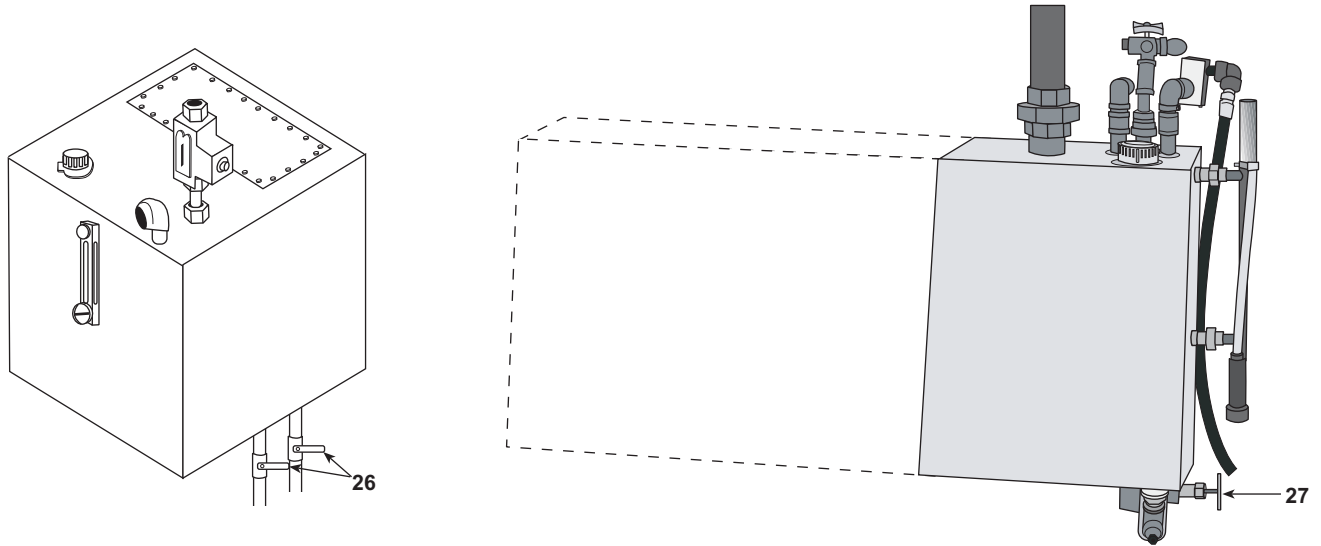
RAW WATER COOLING SYSTEM (continued)**HYDRAULIC SYSTEM**

1. Ensure that both of the PTO clutch levers (24) are DISENGAGED (levers shifted forward).
2. OPEN one accumulator shutoff valve (25) for each engine. Leave the other accumulator valves CLOSED to serve as a standby.



HYDRAULIC SYSTEM (continued)

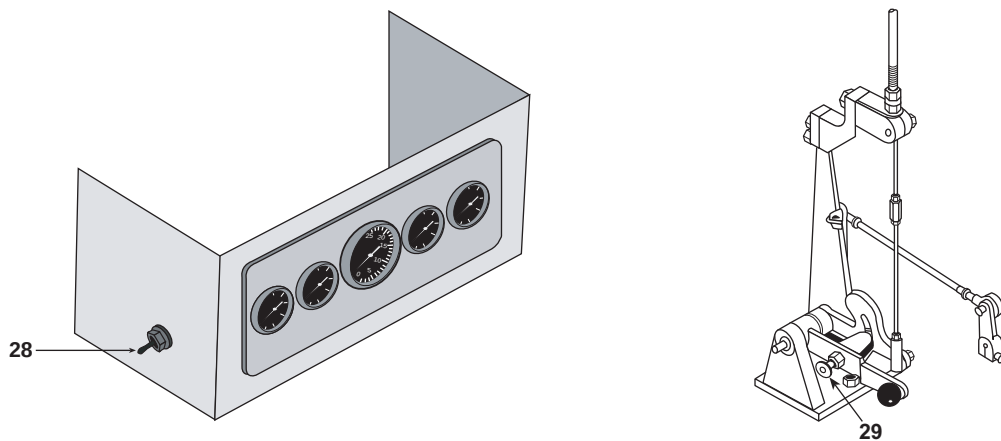
3. OPEN both steering hydraulic reservoir suction valves (26).
4. Ensure that the starting hydraulic system suction valve (27) is OPEN.

**ELECTRICAL**

Place the local start toggle switch (28) in the REMOTE position.

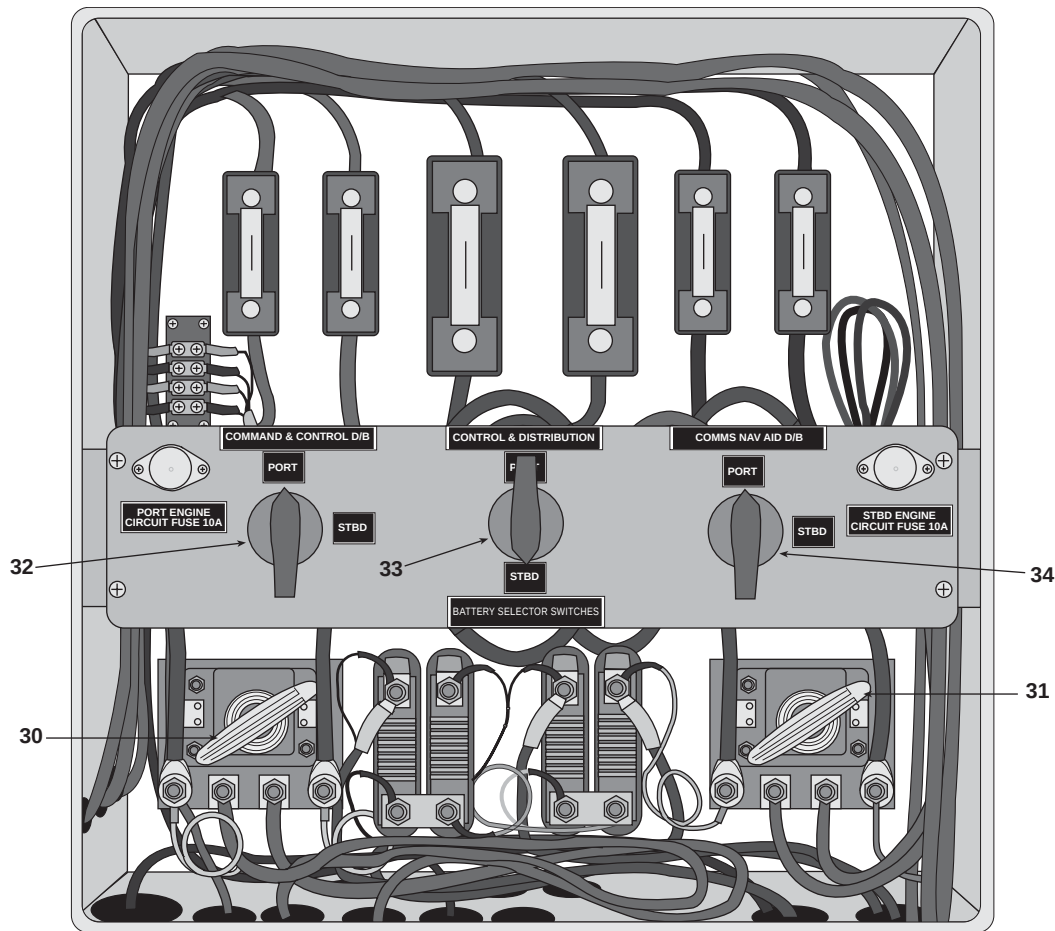
MECHANICAL

Ensure that the engine throttle control pin (29) on each throttle control unit and clutch control unit are engaged for remote control.



ELECTRICAL

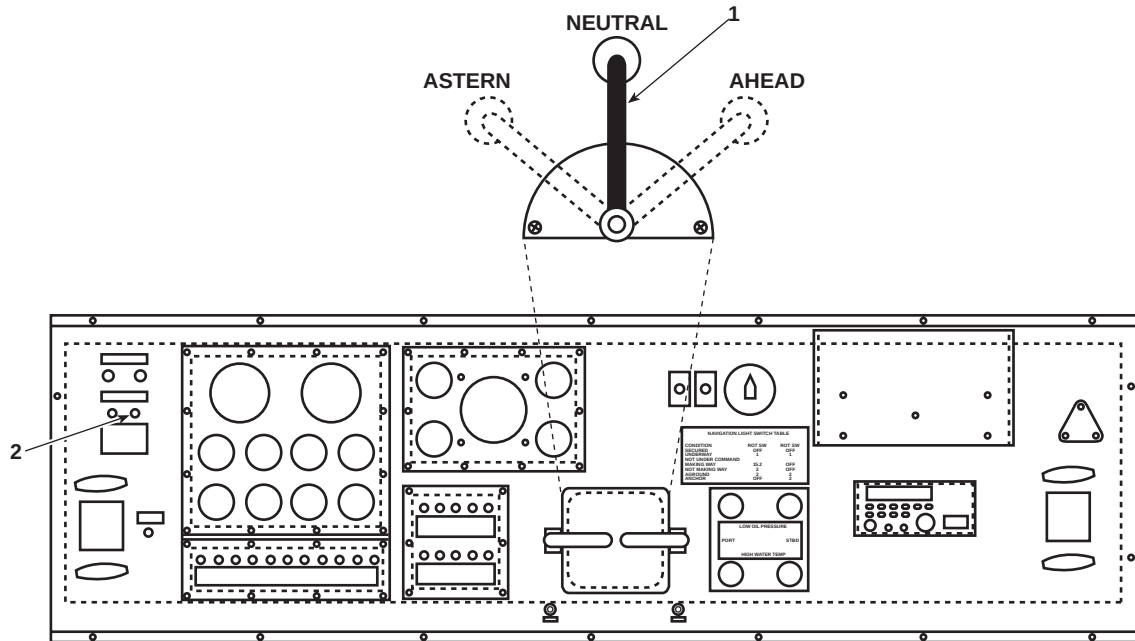
1. Place the PORT BATTERY ISOL SWITCH (30) in the ON position.
2. Place the STBD BATTERY ISOL SWITCH (31) in the ON position.
3. Determine which battery bank(s) (PORT or STBD) will power which distribution box(es) (COMMAND & CONTROL, CONTROL & DISTRIBUTION, COMMS NAV AID D/B) and position the BATTERY SELECTOR SWITCHES (32, 33, 34) as necessary (PORT or STBD) to accomplish this.

**END OF WORK PACKAGE**

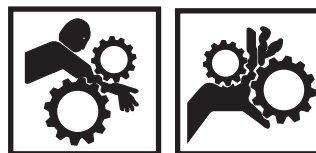
**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATION UNDER USUAL CONDITIONS
OPERATING PROCEDURE**

PROPULSION ENGINE STARTUP

1. Cycle the starboard propulsion control (1) from full speed ASTERN to full speed AHEAD to ensure unrestricted operation through the control's entire range of motion. Return the starboard propulsion control to NEUTRAL after cycling.



WARNING



Ensure that all personnel are clear of rotating components. Use extreme caution when working around rotating components. Do not allow hands or tools to come in contact with rotating components. Do not wear loose clothing, jewelry, or anything else that might become entangled in rotating components. Failure to comply can result in damaged equipment and serious injury or death to personnel.

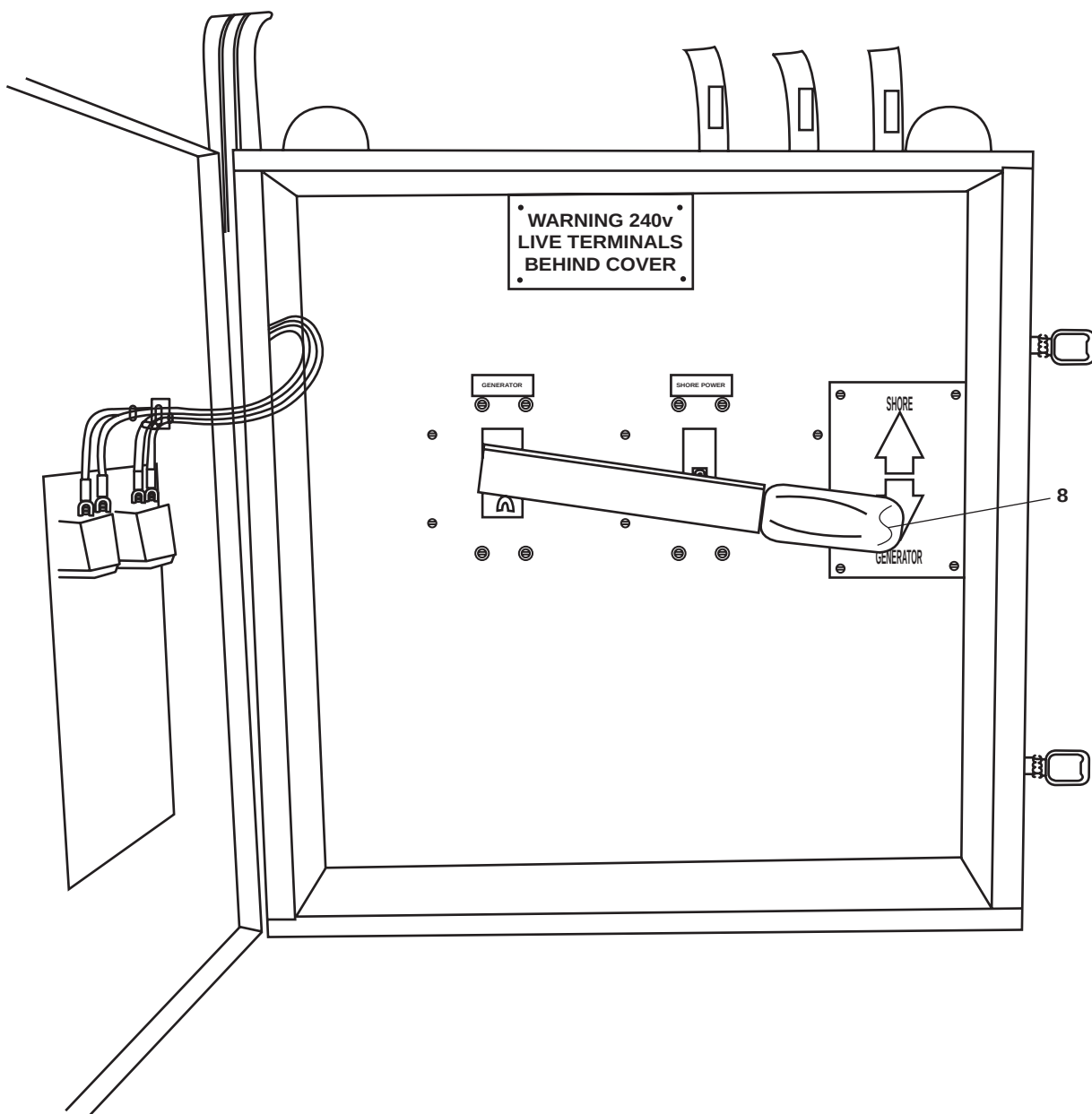
2. From the neutral position, pull the starboard propulsion control (1) away from the dome approximately 1/4 inch (6 mm). This movement enables the operator to control engine speed while leaving the marine transmission in NEUTRAL. Open the throttle approximately 1/4 way by moving the starboard propulsion control forward.
3. Press the pushbutton (2) labelled STBD ENGINE START on the pilothouse console. Release the pushbutton promptly when the engine starts.
4. If the cranking of the engine depletes the accumulator pressure before starting, CLOSE the accumulator shutoff valve on the accumulator in use and OPEN the accumulator shutoff valve on the standby accumulator (refer to WP 0022 00).

ELECTRICAL SYSTEM STARTUP

1. Turn ON the circuit breakers in the control and distribution panel as necessary for operating conditions.
2. Turn ON the circuit breakers in the comms nav aids distribution box as necessary for operating conditions.
3. Turn ON the circuit breakers in the command and control distribution box as necessary for operating conditions.
4. Turn ON the compartment lights and navigation lights as necessary.

DIESEL GENERATOR STARTUP

1. Ensure that shore power transfer switch (8) is in the SHORE position.



DIESEL GENERATOR STARTUP (continued)**! CAUTION**

Holding the shutdown bypass-preheat switch in the ON position for too long can burn out the glow plugs.

2. If the engine is cold, hold the shutdown bypass-preheat switch (9) in the ON position for 10 to 20 seconds before starting the engine. Do not hold the switch in the ON position for over 30 seconds. Holding the switch ON for too long can burn out the glow plugs.

! CAUTION

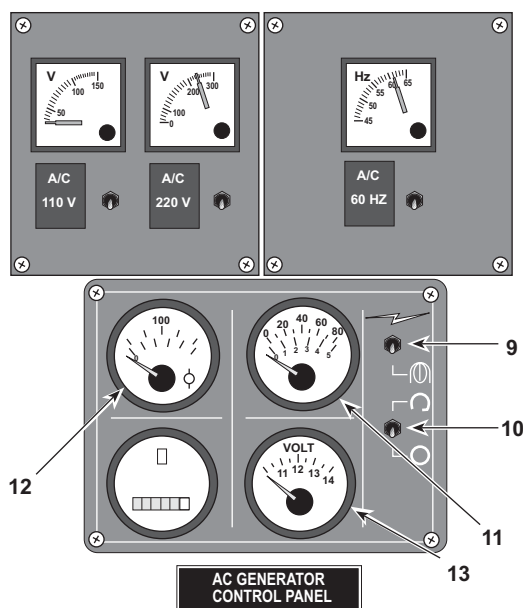
Do not crank the engine for more than 20 seconds at a time. Allow the starter to cool for at least 60 seconds after each 20-second starting attempt. Failure to follow this procedure can result in starter damage.

3. While holding the shutdown bypass-preheat switch (9) in the ON position, push the engine control switch (10) to the START position. Do not crank the engine for more than 20 seconds; starter damage can result. If the engine fails to start after 20 seconds, allow the starter to cool for 60 seconds before cranking again.

! CAUTION

Excessive cranking of the starter can cause engine damage. If the engine does not start after three 20-second cranks, remove the impeller from the seawater pump. This will prevent the muffler from filling with water and backfilling the exhaust line and engine. Once the engine starts, shut it off immediately and reinstall the impeller. Restart and check the exhaust overboard outlet for water discharge.

4. If the engine fails to start after three 20-second starting attempts, follow this procedure (refer to the diesel generator manuals identified in WP 0225 00):
 - a. Remove the impeller from the seawater pump. This will prevent the muffler from filling with water and backfilling the exhaust line and engine.



DIESEL GENERATOR STARTUP (continued)

- b. Once the engine starts, shut it off immediately and reinstall the impeller.
 - c. After installing the impeller, restart the engine and check the exhaust overboard outlet for the presence of sufficient water flow.
5. Release both switches (9 and 10) as soon as the engine starts.
6. Allow the engine to run at no load for 5 minutes to warm up. As the engine is warming up, observe the following gauges:
 - a. Oil pressure (11): should be above 15 lb/in² (1 bar). If the oil pressure falls below this value, stop the generator engine by referring to the Generator Engine Shutdown procedure in this work package and refer to the troubleshooting section in the diesel generator service manual identified in WP 0225 00.
 - b. Engine coolant temperature (12): must be below 200 °F (93.3 °C). If the engine coolant temperature exceeds this value, stop the generator engine by referring to the Generator Engine Shutdown procedure in this work package and refer to the troubleshooting section in the diesel generator service manual identified in WP 0225 00.
 - c. DC Voltmeter (13): Should read between 11 and 15 volts at 80 °F (26.7 °C). If the charging rate falls outside these values, stop the generator engine by referring to the Generator Engine Shutdown procedure in this work package and refer to the troubleshooting section in the diesel generator service manual identified in WP 0225 00.
7. After allowing the engine to warm up, place the diesel generator online by following these steps:
 - a. Ensure that all of the circuit breakers in the 220/110 V distribution box are in the OFF position.
 - b. Place the shore power transfer switch (8) in the GENERATOR position.
 - c. Set to ON the circuit breakers in the 220/110 V distribution box as necessary for the operating condition.

MANEUVERING

1. Release and cast off all mooring lines between the LCM-8 Mod 2 and the pier. Stow all mooring lines.
2. Marine transmission gear engagement is controlled by the propulsion controls (14). Shift the propulsion controls (14) into AHEAD or ASTERN by moving the appropriate propulsion control forward or aft, respectively. AHEAD and ASTERN are identified by a detent feel at approximately 30 degrees from the vertical.
3. Engine speed is controlled by the propulsion controls (14). The farther the propulsion control is moved away from vertical, the higher the engine speed.
4. When the LCM-8 Mod 2 is operating in open water without obstruction, steering is accomplished by turning the helm (15).

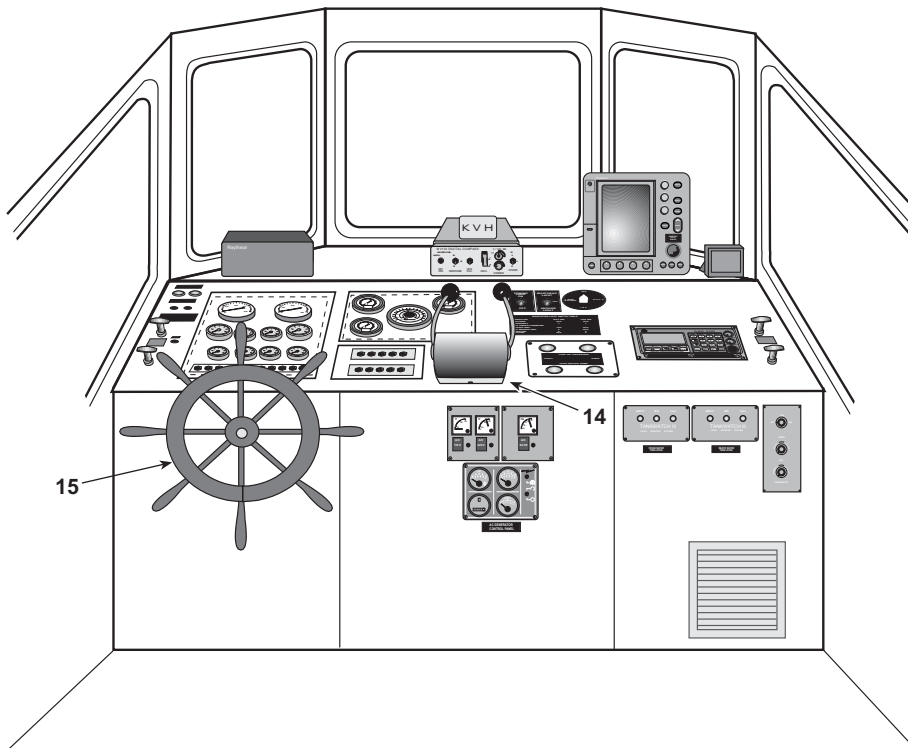
 CAUTION

Do not shift the propulsion controls from AHEAD through NEUTRAL to ASTERN or vice versa at engine speeds over 800 r/min. Shifting through NEUTRAL at high engine speeds can damage the marine transmissions and the rest of the propulsion system. Allow engine speed to fall below 800 r/min before shifting from NEUTRAL into another mode.

5. When operating in close quarters, such as when maneuvering near a pier, near another vessel, or in a narrow waterway, the LCM-8 Mod 2 may be most effectively steered by utilizing the marine transmissions via the propulsion controls (14). To steer with the marine transmissions:
 - a. To turn the bow to port, position the starboard propulsion control AHEAD and the port propulsion control ASTERN.
 - b. To turn the bow to starboard, position the starboard propulsion control ASTERN and the port propulsion control AHEAD.

MANEUVERING (continued)

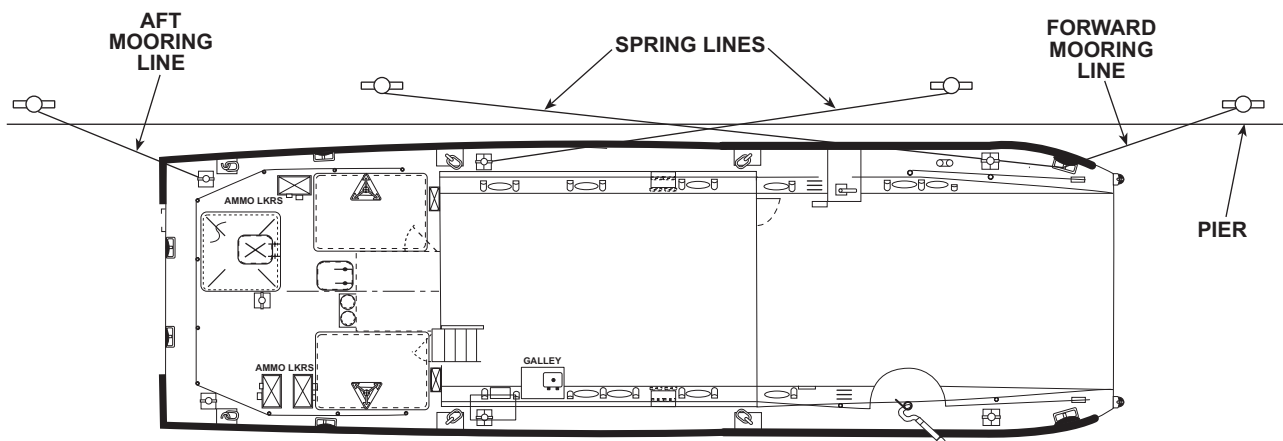
- c. The rate of turn can be adjusted by adjusting the propulsion engine speed.

**MOORING**

⚠ CAUTION

Secure mooring lines only to mooring bitts. Never secure mooring lines to handrails or other deck hardware not intended for mooring purposes. Failure to comply may result in damage to the vessel.

1. Ensure that all mooring lines are in good repair and secured to the mooring bitts at the appropriate deck stations before approaching a mooring.



MOORING (continued)

2. Cautiously maneuver the LCM-8 Mod 2 to the desired location alongside the pier or vessel.
3. Cast the forward and aft mooring lines to assisting personnel on the pier or other vessel.
4. Take up slack and secure the mooring lines to mooring cleats or bitts on the pier or other vessel. Make sure that the mooring lines have enough slack to allow for the rise and fall of the tide.

NOTE

Under normal conditions, one forward mooring line, one aft mooring line, and two spring lines are sufficient to moor the LCM-8 Mod 2. In high wind or strong current conditions, additional lines will be required to moor the vessel.

5. Secure the spring lines to mooring cleats or bitts on the pier or other vessel.

ANCHORING

1. Wearing gloves, assemble the LCM-8 Mod 2 ground tackle by connecting the anchor to the anchor chain and line.
2. Head the vessel into the wind or seas at the location where the anchor is to be dropped.
3. Run the vessel slow ahead until it is keeping station into the wind or seas.

WARNING

An anchoring supervisor shall be stationed to ensure that personnel do not become entangled in the anchor line while it is paying out. Do not allow the anchor to freefall. The anchor line must be paid out under control at all times. Failure to comply can result in damaged equipment and serious injury or death to personnel.

Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

4. Lower the anchor from the bow into the water, maintaining control of the anchor line at all times. Pay out the anchor line under control until the anchor reaches the bottom.
5. Allow the vessel to drift astern with the wind or seas until a scope of 5 to 7 times the water depth is paid out.
6. Lay the anchor line in a bow chock and secure it to a mooring bitt. When the anchor line becomes taut, set the anchor by backing the vessel with the engines at IDLE speed.
7. When a strain on the anchor line is achieved, indicating that the anchor is set, return the propulsion control levers to the NEUTRAL position. The LCM-8 Mod 2 is now anchored.

HOISTING ANCHOR

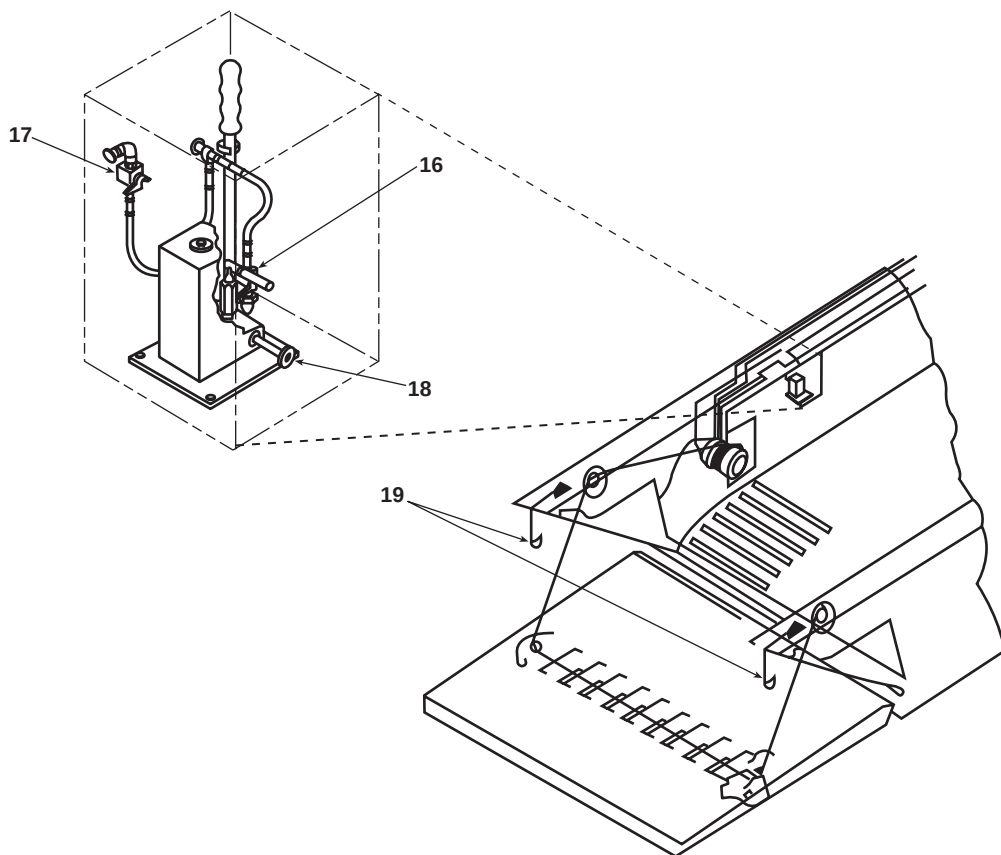
1. The propulsion engines should be running and warmed up as described in the Propulsion Engine Startup procedure in this work package.
2. Start the vessel moving slowly toward the anchor to take strain off the line.
3. As the vessel moves closer to the anchor, take in the anchor line.
4. When the anchor line is vertical, stop the vessel and hoist the anchor aboard.
5. Disassemble the ground tackle and stow the anchor, anchor chain, and line as directed by the coxswain.

LOWERING THE BOW RAMP

WARNING

Do not lower the ramp when the LCM-8 Mod 2 is underway. The ramp should be operated only after the vessel has been beached, moored, or anchored. Operating the ramp while the vessel is underway may sink the vessel, leading to serious injury or death of personnel.

1. Ensure that the lower hand pump shutoff valve (16) is CLOSED.
2. Ensure that the upper hand pump shutoff valve (17) is OPEN.



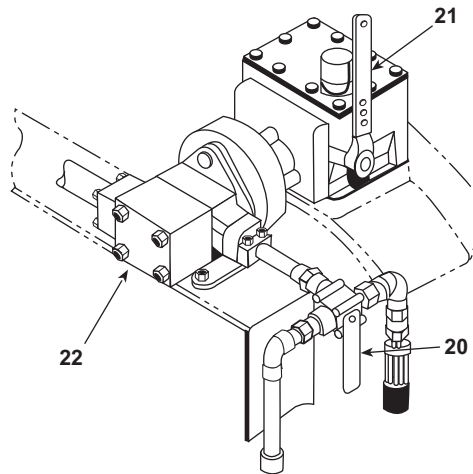
LOWERING THE BOW RAMP (continued)

3. Ensure that the hand pump bypass valve (18) is OPEN.
4. Remove the load binders (19), one port and one starboard, from the ramp.
5. Position the hydraulic diverter valve (20) for RAMP operation (valve handle in line with piping).

NOTE

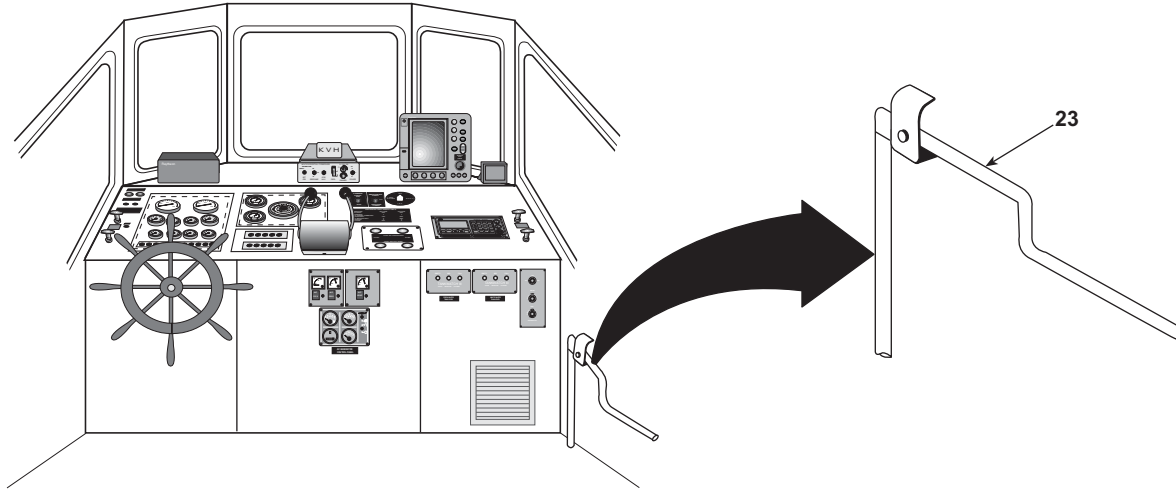
Ramp operation may be accomplished using one or both propulsion engines and ramp pumps. Fastest ramp operation is obtained with both ramp pumps directed toward the ramp. The ramp may be operated on only one pump when the other pump is needed for bilge pump or crane operation.

6. With the propulsion engine(s) running between 1200 to 1500 r/min, engage the PTO clutch lever (21) (shift lever aft) to start the ramp pump (22).

**⚠ CAUTION**

If the ramp control lever is not returned to NEUTRAL after operating the ramp, damage to the hydraulic ramp machinery will result.

7. To lower the ramp, move the ramp control lever (23) to RAMP DOWN position. When the ramp is lowered to the desired level, move the ramp control lever (23) back to the NEUTRAL position.

LOWERING THE BOW RAMP (continued)**RAISING THE BOW RAMP**

1. Perform steps 1-6 in the Lowering the Bow Ramp procedure in this work package.

⚠ CAUTION

If the ramp control lever is not returned to NEUTRAL after operating the ramp, damage to the hydraulic ramp machinery will result.

2. To raise the ramp, move the ramp control lever (23) to the RAMP UP position. Refer to the figure in the Lowering the Bow Ramp procedure in this work package.
3. When the ramp is raised to the desired level, return the ramp control lever (23) to the NEUTRAL position.
4. If the ramp is fully raised, secure the ramp with load binders (19), port and starboard. Refer to the figure in the Lowering the Bow Ramp procedure in this work package.
5. If no other ramp, crane, or bilge pump activity is necessary, disengage the PTO clutch lever(s) (21) (shift the lever forward) after securing the ramp. Refer to the figure in the Lowering the Bow Ramp procedure in this work package.

PROPULSION ENGINE SHUTDOWN

1. Before shutting down the propulsion engines, allow them to run unloaded at 1000 to 1200 r/min for at least five minutes. This allows time for the engine's internal components to cool prior to shutdown.

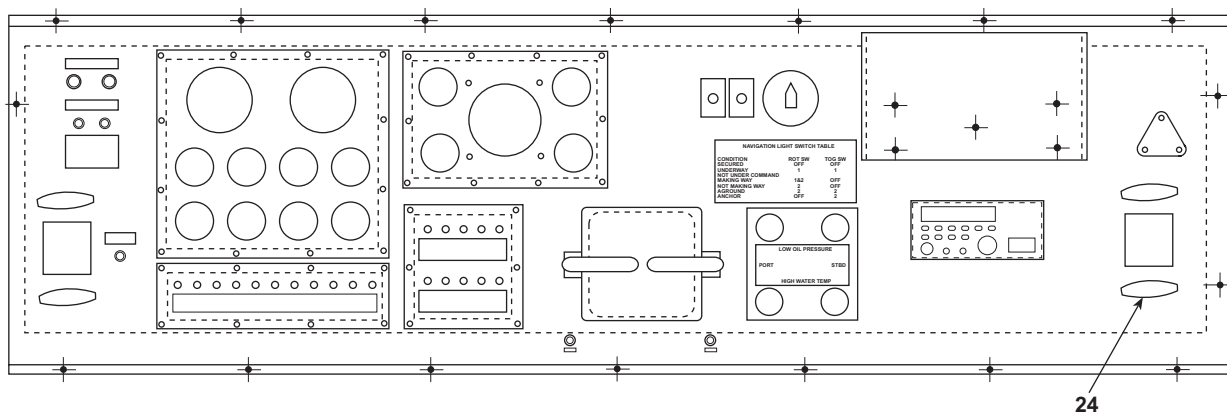
⚠ CAUTION

Using an emergency engine shutdown control to stop the engines may cause damage to the engine oil seals. The emergency engine shutdown control should be used in the event of engine room fire or runaway engine emergencies only.

2. Pull the STBD ENGINE SHUTDOWN handle (24) out the full length of its travel and hold it out until the engine stops.

PROPULSION ENGINE SHUTDOWN (continued)

- Repeat steps 1 and 2 for the port propulsion engine.

**DIESEL GENERATOR SHUTDOWN**

- Set to OFF all of the breakers in the 220/110 Volt distribution box.
- Set to the SHORE position the shore power transfer switch (8).
- Allow the generator to run for 5 minutes, unloaded, to allow time for the internal engine parts to cool.
- Set to the STOP position the engine control switch (10) and hold it in this position until the engine stops.
- If connection to shore power is desired, follow the procedure contained in WP 0026 00.

END OF WORK PACKAGE

RAW WATER COOLING SYSTEM

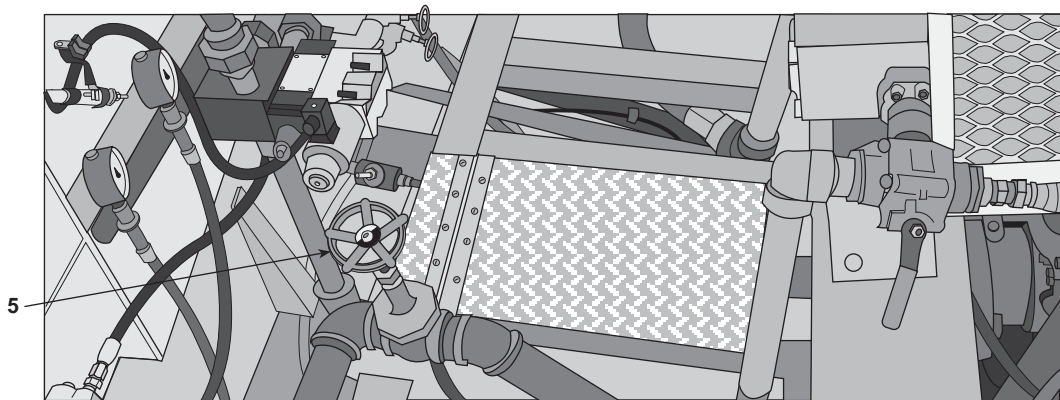
1. Ensure that the following strainers are clean and intact:

-
- Technical drawing of the fire extinguisher assembly with numbered callouts:
- 1: Points to the main body of the extinguisher.
 - 2: Points to the mounting bracket.
 - 3: Points to the mounting plate.
 - 4: Points to the hose connection.
 - 5: Points to the nozzle.
 - 6: Points to the handle.
 - 7: Points to the trigger gun.
 - 8: Points to the mounting plate.

RAW WATER COOLING SYSTEM (continued)

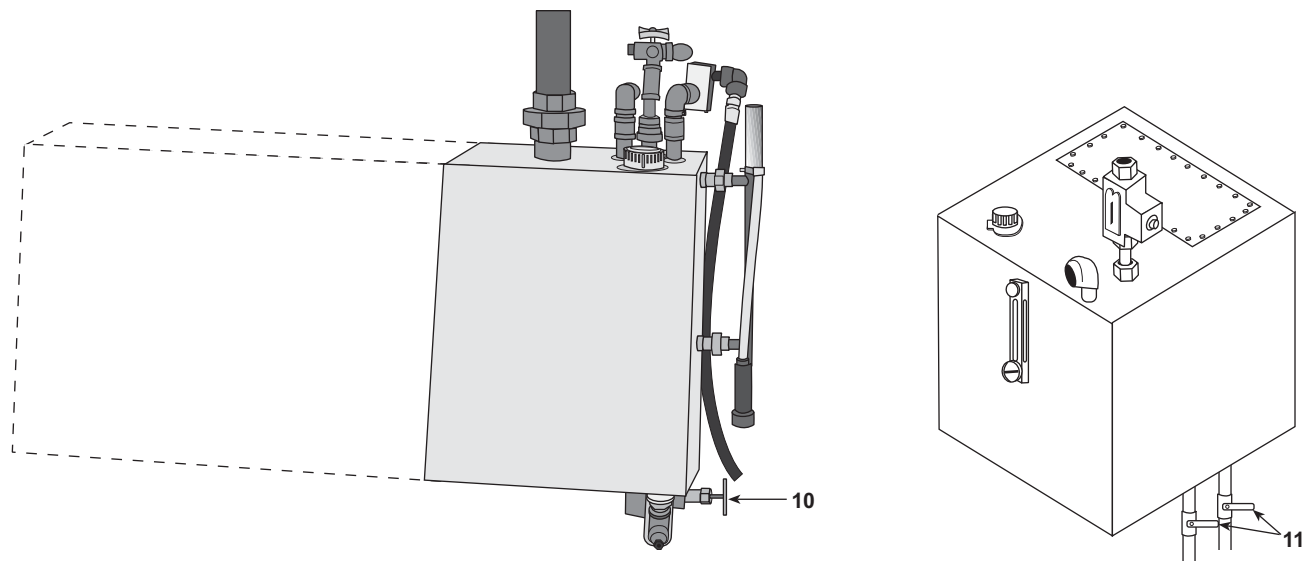
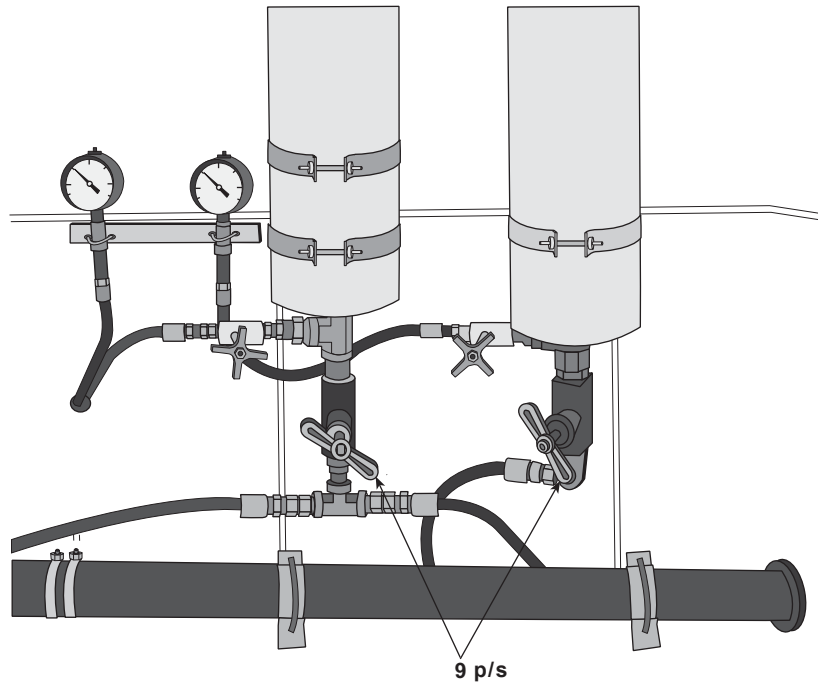
2. CLOSE the following seacocks:

- a. Propulsion engine (5).
- b. Air conditioning (6).
- c. Fire pump (7).
- d. Generator engine (8).



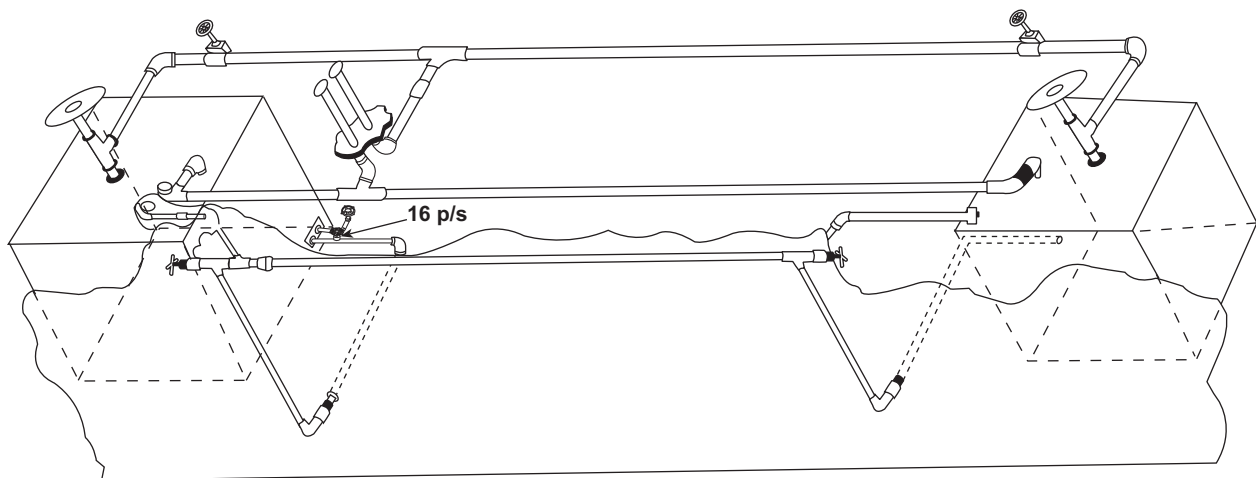
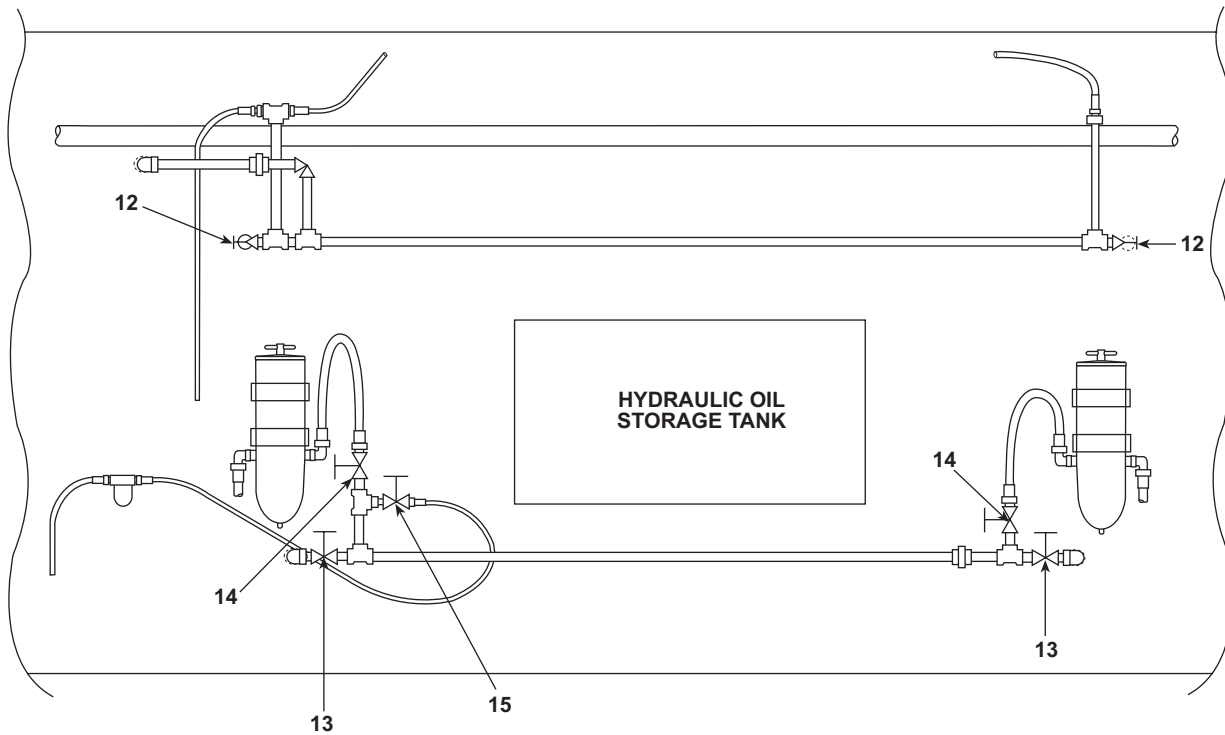
HYDRAULIC SYSTEM

1. CLOSE all four accumulator shutoff valves (2 port and 2 starboard) (9).
2. CLOSE the starting hydraulic system suction valve (10).
3. CLOSE both steering system suction valves (11).



FUEL SYSTEM

1. CLOSE the fuel return valves (12).
2. CLOSE both fuel supply valves (13)
3. CLOSE both propulsion engine supply valves (14).
4. CLOSE the diesel generator supply valve (15).
5. CLOSE both fuel supply valves (16) in the lazarette.

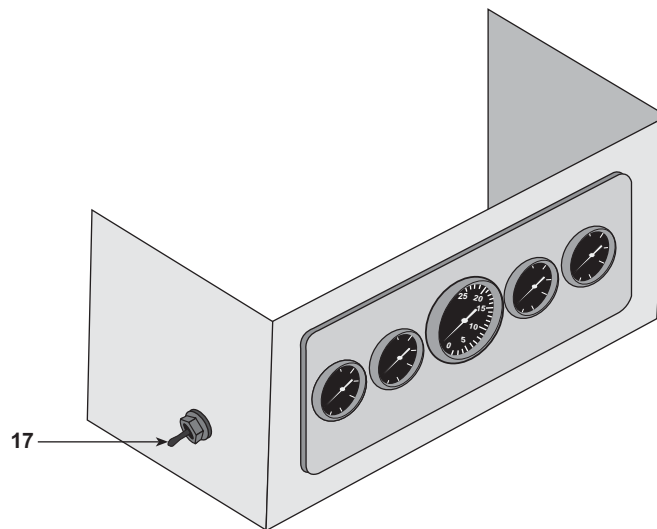


ELECTRICAL SYSTEM

1. Place the local start toggle switch (17) in the OFF position.
2. Turn OFF the circuit breakers in the control and distribution panel that are unnecessary for operating conditions.
3. Turn OFF the circuit breakers in the comms nav aids distribution box that are unnecessary for operating conditions.
4. Turn OFF the circuit breakers in the command and control distribution box that are unnecessary for operating conditions.
5. Turn OFF the circuit breakers in the 220/110 volt distribution box that are unnecessary for operating conditions.
6. Turn OFF the compartment lights in compartments no longer in use.
7. Turn OFF the navigation lights as necessary.

PMCS

Perform all post-operation PMCS for the vessel.



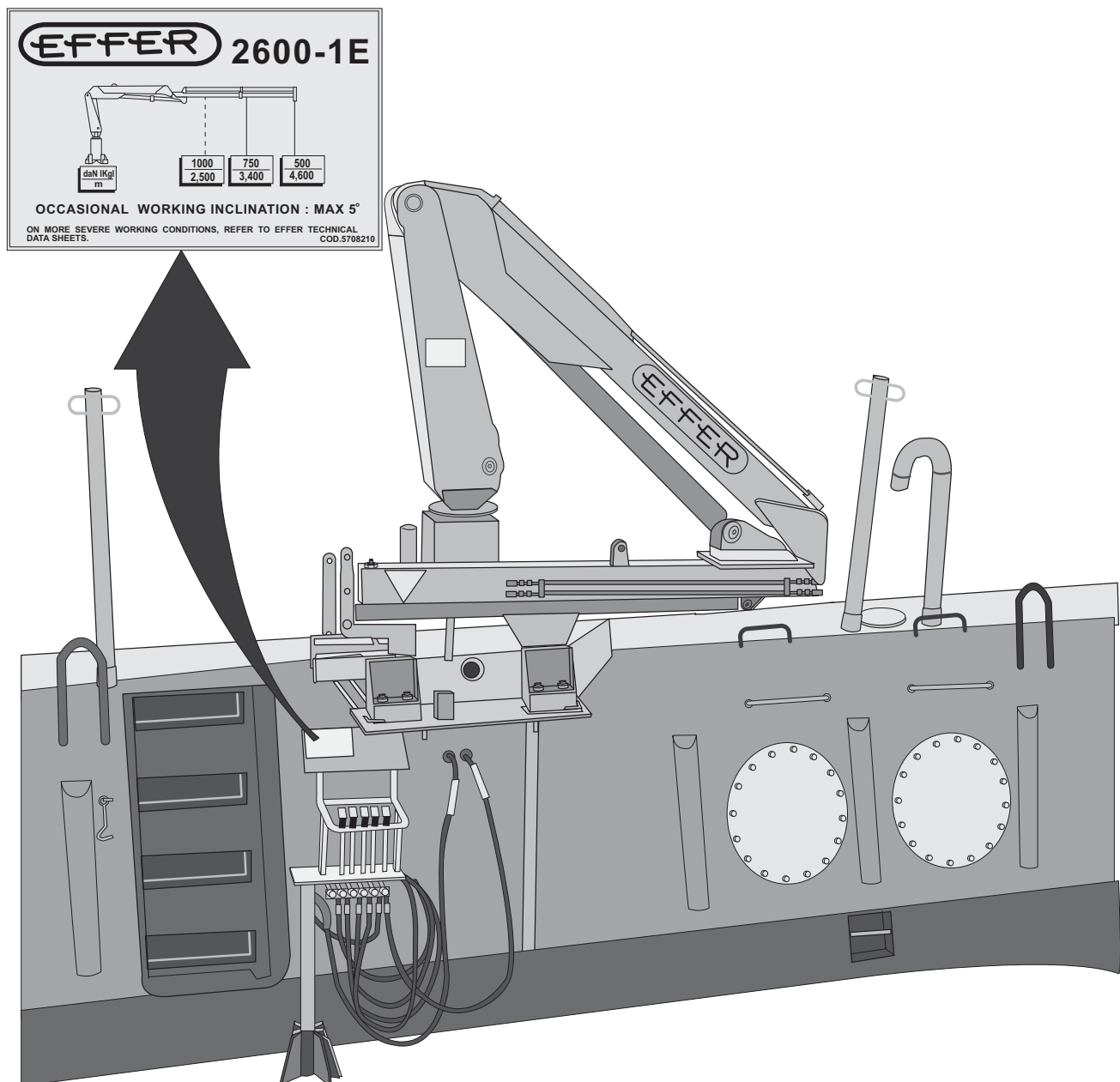
END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATION UNDER USUAL CONDITIONS
DECALS AND INSTRUCTION PLATES**

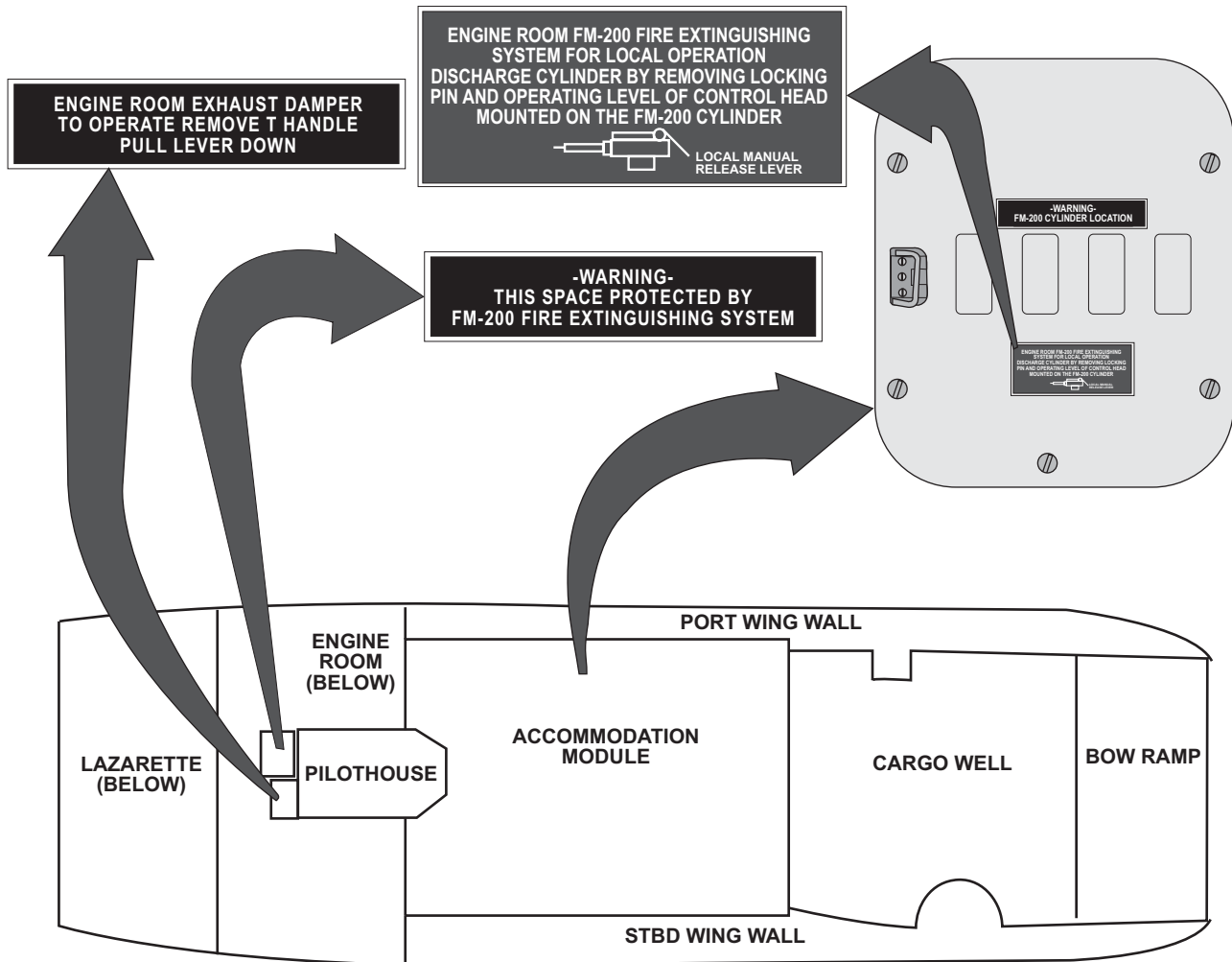
This work package illustrates all decals and operating instruction plates located on the equipment that are essential for operation. Related warning and caution decals are also included. Illustrations show the location of all applicable decals and plates.

CRANE

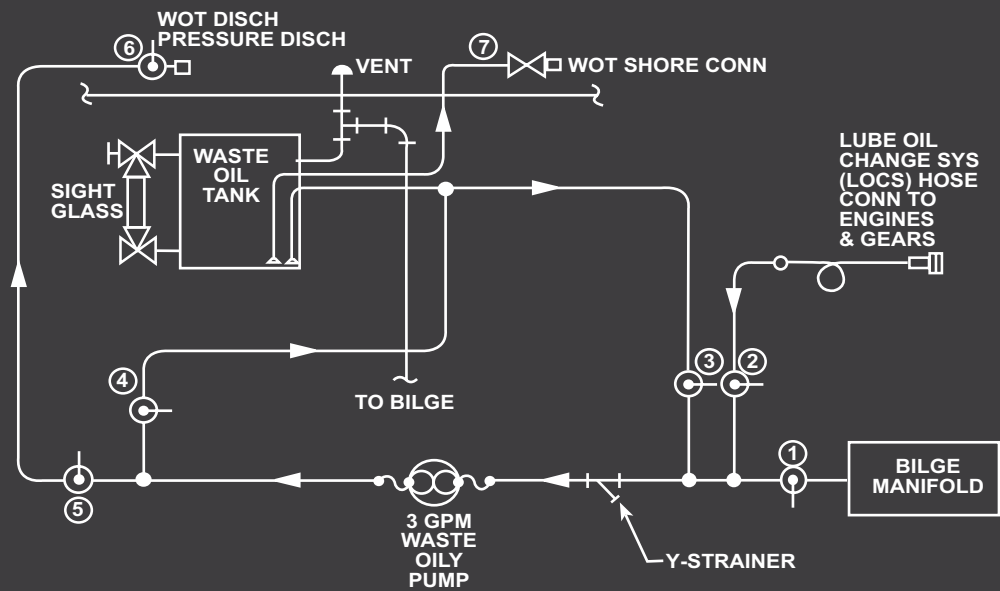
Load Chart



ENGINE ROOM FIRE SUPPRESSION SYSTEM



OILY WATER COLLECTION SYSTEM



**SYSTEM DIAGRAM
OILY WATER COLLECTION SYSTEM**

OPERATING MODE	VALVE ALIGNMENT						
	1	2	3	4	5	6	7
DRAIN BILGE TO TANK	OPEN	SHUT	SHUT	OPEN	SHUT	SHUT	SHUT
DRAIN BILGE TO DK CONN	OPEN	SHUT	SHUT	SHUT	OPEN	OPEN	SHUT
DRAIN ENG & GEAR TO TANK	SHUT	OPEN	SHUT	OPEN	SHUT	SHUT	SHUT
DRAIN ENG & GEAR TO DK CONN	SHUT	OPEN	SHUT	SHUT	OPEN	OPEN	SHUT
EMPTY WASTE OIL TANK	SHUT	SHUT	OPEN	SHUT	OPEN	OPEN	SHUT
PUMP OUT TANK FROM SHORE CONN	SHUT	SHUT	SHUT	SHUT	SHUT	SHUT	OPEN
(MAXIMUM SYSTEM PRESSURE IS 60 PSI)							

END OF WORK PACKAGE

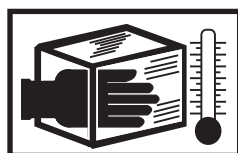
**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATION UNDER USUAL CONDITIONS
OPERATING AUXILIARY EQUIPMENT**

FIRE EXTINGUISHERS

The LCM-8 Mod 2 is outfitted with both Carbon Dioxide (CO₂) and dry chemical portable hand held fire extinguishers. Operation of both fire extinguisher types is similar and is described below.

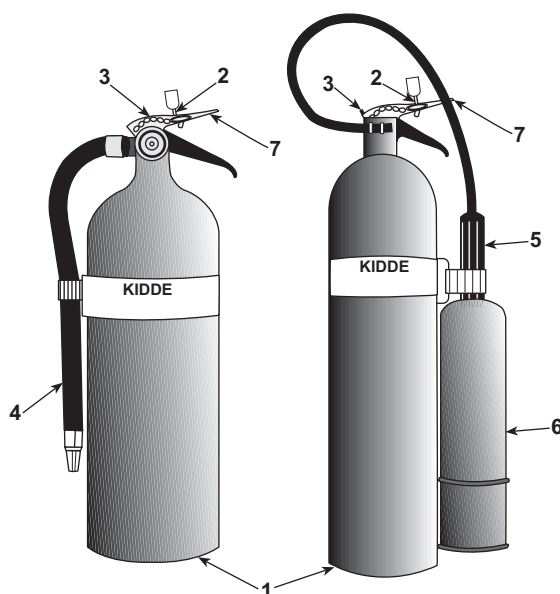
1. Carry the fire extinguisher (1) in an upright position and approach the fire as closely as the heat permits.
2. Remove the locking pin (2) from the valve (3).

WARNING



Carbon dioxide released by the carbon dioxide fire extinguisher is very cold. Do not allow unprotected body parts to come in contact with the extinguisher's horn during discharge. Failure to comply could result in frostbite, serious injury, or death.

3. Grasp the hose (4) on the dry chemical extinguisher or the handle (5) on the CO₂ extinguisher. Unprotected body parts must not come in contact with the CO₂ horn (6) during discharge.
4. Squeeze the release lever (7), and at the same time, direct the flow of dry chemical or CO₂ toward the base of the flame with a sweeping motion.
5. After use, the fire extinguisher must be replaced or serviced. Do not place a partially discharged fire extinguisher back in service.

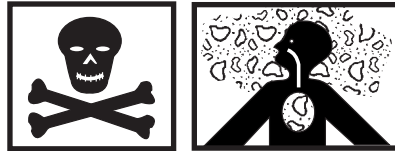


ENGINE ROOM FIRE SUPPRESSION SYSTEM

The engine room fire suppression system may be activated from the pilothouse or from the port stowage locker. Procedures for activating the engine room fire suppression follow. These procedures are for activation of the fire suppression system only. Additional procedures must be followed to fight an engine room fire. For full firefighting procedures, refer to WP 0030 00.

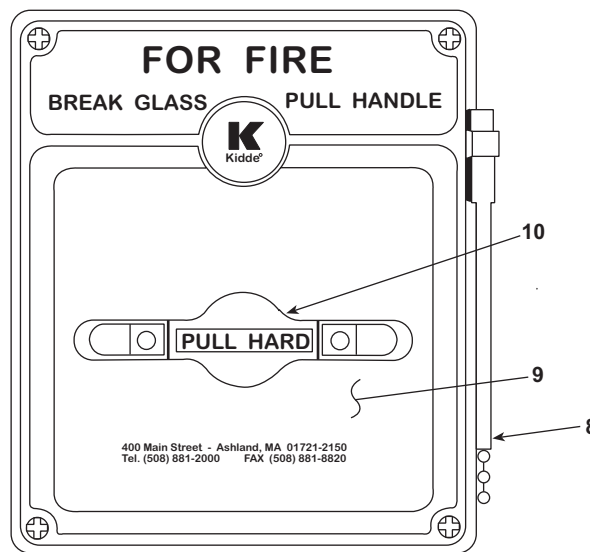
Operation from the Pilothouse

WARNING



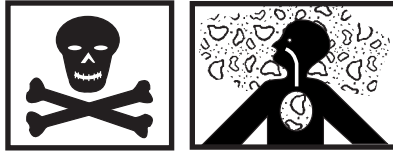
Although the FM-200 agent used in the fire suppression system is considered non-toxic to humans in concentrations necessary to extinguish most fires, personnel should not be unnecessarily exposed to the agent. When FM-200 is exposed to temperatures over approximately 1300 °F (704 °C), Hydrogen Fluoride (HF) gas is formed. This HF gas is toxic to humans. Do not allow FM-200 agent or its byproducts to come in contact with personnel. Failure to comply could result in serious injury or death.

1. Ensure that no personnel are present in the engine room.
2. Use the attached hammer (8) to break the glass (9) on the pull box mounted behind the coxswain's seat.
3. Pull hard on the handle (10) to release the FM-200 agent.



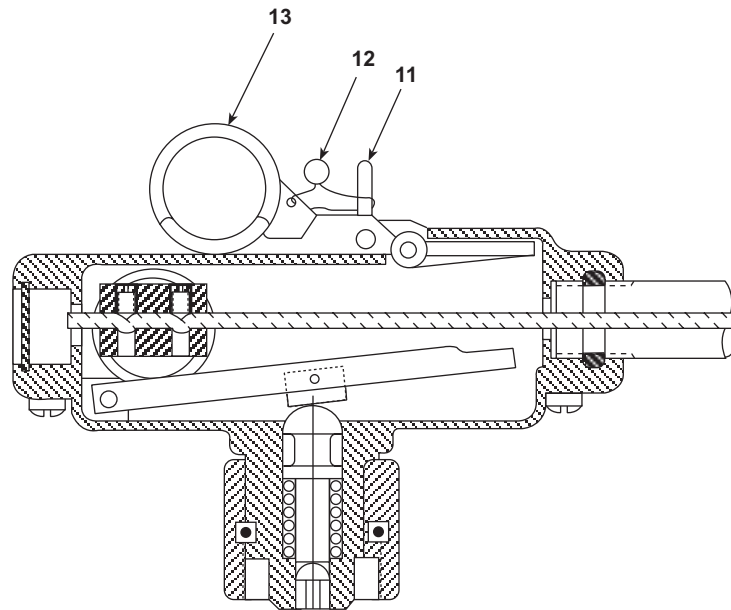
Operation from the Port Stowage Locker

WARNING



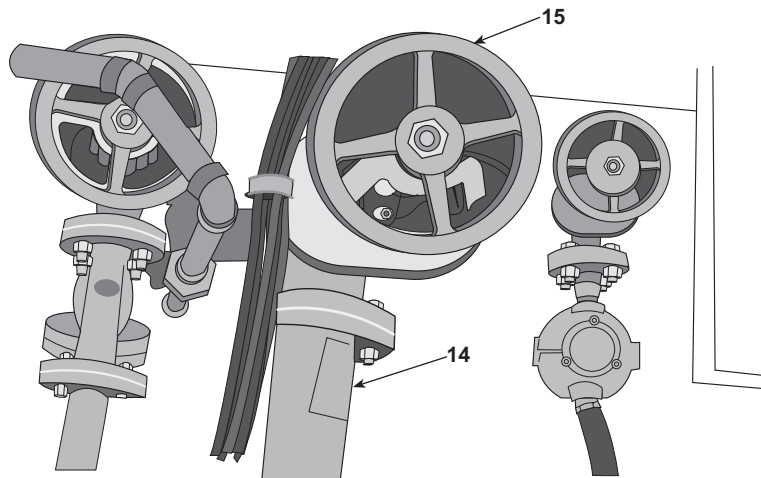
Although the FM-200 agent used in the fire suppression system is considered non-toxic to humans in concentrations necessary to extinguish most fires, personnel should not be unnecessarily exposed to the agent. When FM-200 is exposed to temperatures over approximately 1300 °F (704.4 °C), Hydrogen Fluoride (HF) gas is formed. This HF gas is toxic to humans. Do not allow FM-200 agent or its byproducts to come in contact with personnel. Failure to comply could result in serious injury or death.

1. Ensure that no personnel are present in the engine room.
2. Remove the locking pin (11). This will break the seal wire (12).
3. Pull the local manual release lever (13). The fire suppression agent is now discharged into the engine room.



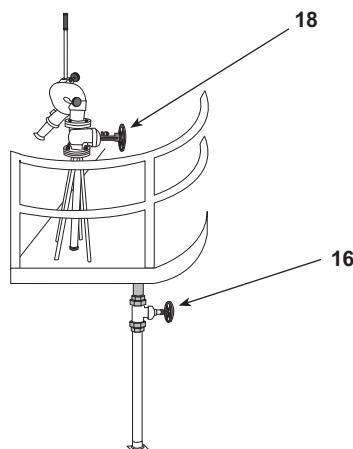
FIRE MONITOR

1. If not already running, start and warm up the diesel generator as described in the Diesel Generator Startup procedure in WP 0023 00.
2. Ensure that the fire pump strainer (14) is clean and the fire pump seacock (15) is OPEN.

**NOTE**

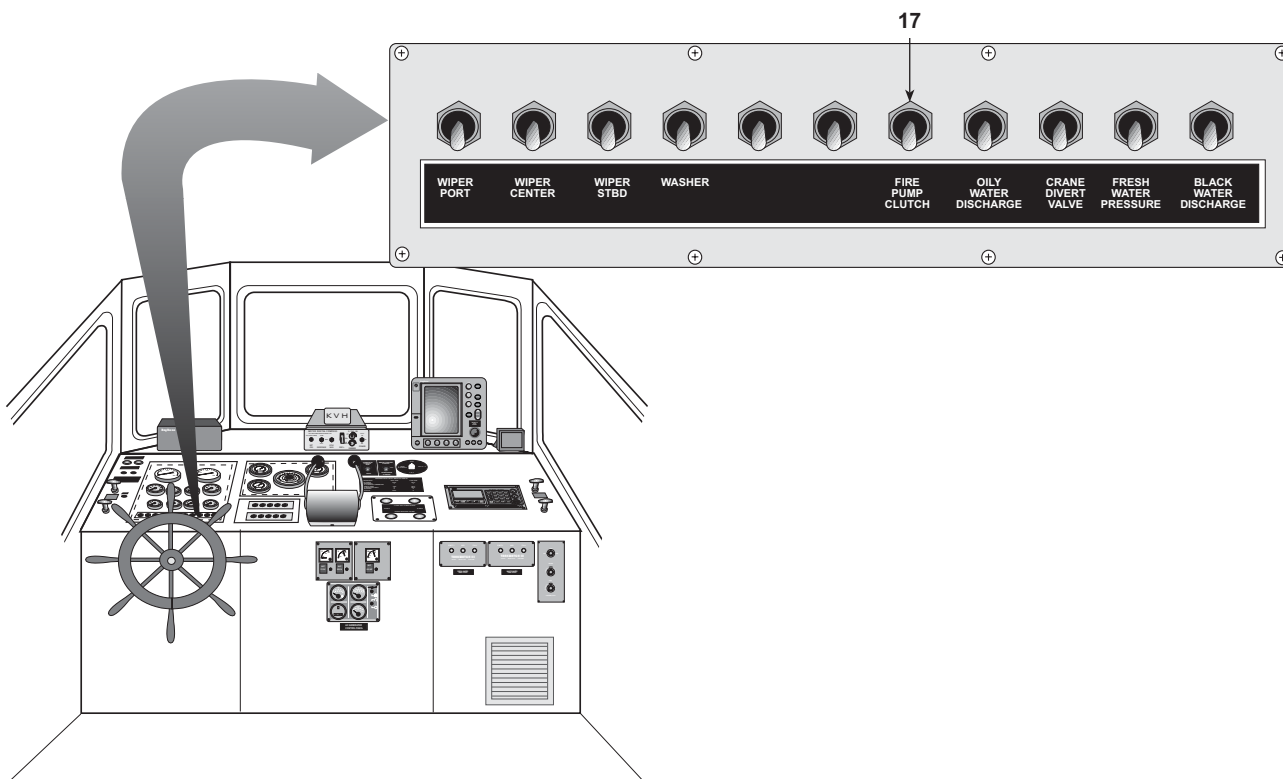
All electrical load must be removed from the diesel generator before engaging the fire pump clutch. Failure to do so may overload and stall the diesel generator engine.

3. Remove all electrical load from the diesel generator by setting to OFF the circuit breakers in the 220/110 Volt distribution box.
4. Ensure that the forward ballast tank filling valve (16) is CLOSED.



FIRE MONITOR (continued)

5. To engage the fire pump clutch, set to ON the FIRE PUMP CLUTCH switch (17).

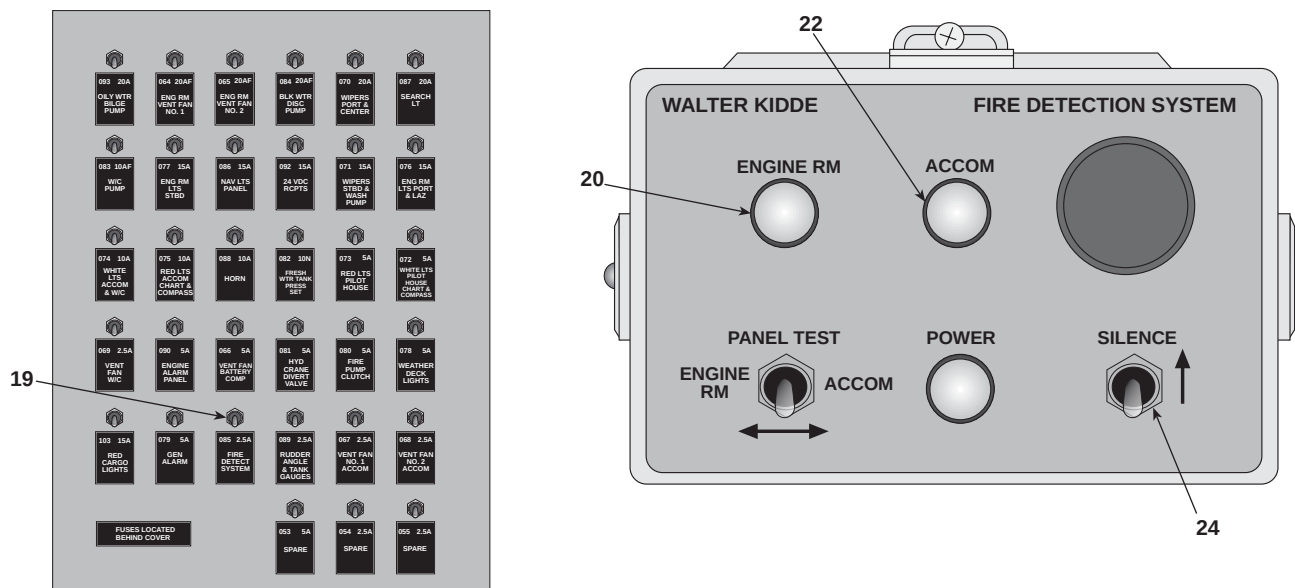


6. OPEN the fire monitor supply valve (18).
7. Direct the fire monitor's flow at the desired target.
8. When finished using the fire monitor, CLOSE the fire monitor supply valve (18).
9. To disengage the fire pump clutch, set to OFF the FIRE PUMP CLUTCH switch (17).
10. If 220/110 Volt electric power is still required aboard the vessel, set to ON the appropriate circuit breakers in the 220/110 Volt distribution box.
11. If 220/110 Volt electric power is no longer needed, shut down the diesel generator by following the Diesel Generator Shutdown procedure in WP 0023 00.

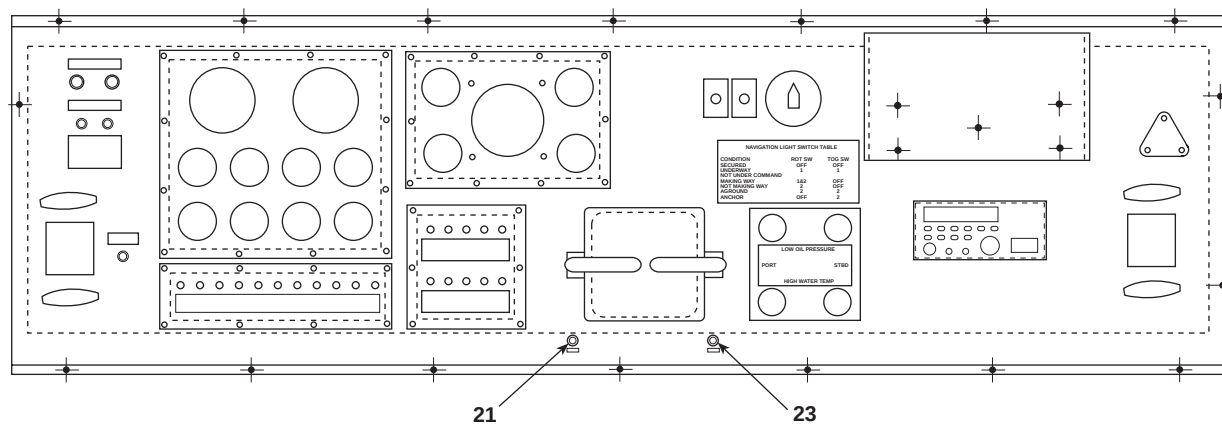
FIRE DETECTION SYSTEM

1. To enable the fire detection system:
 - a. Set to ON the FIRE DETECT SYSTEM circuit breaker (19), located in the control and distribution panel.
 - b. Once the FIRE DETECT SYSTEM circuit breaker (19) is ON, the system is enabled and actively monitoring.

FIRE DETECTION SYSTEM (continued)



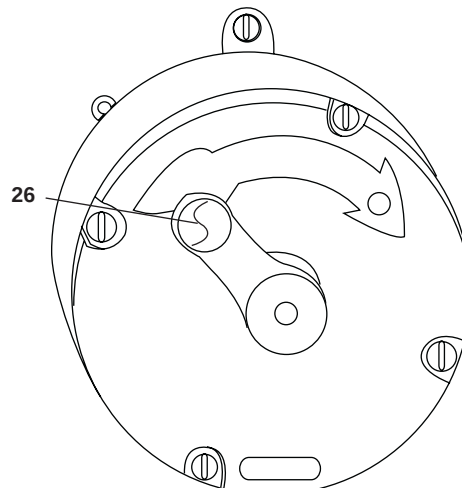
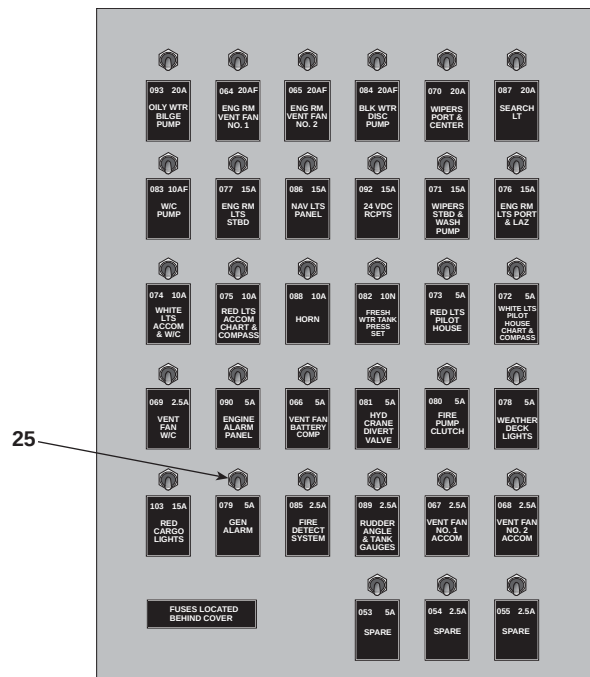
- When a fire is detected in the engine room or smoke is detected in the accommodation module, the fire detection system sounds an audible alarm in the pilothouse and in the engine room. In the pilothouse, lights on the alarm panel and on the console illuminate to indicate which area has triggered the alarm. The ENGINE RM light (20 alarm panel, 21 console) indicates a fire in the engine room while the ACCOM light (22 alarm panel, 23 console) indicates smoke in the accommodation module. A strobe light also flashes in the engine room when an alarm is triggered. The flashing strobe does not indicate which compartment has triggered the alarm.



- To silence the alarm, press the SILENCE switch (24) upward. This will silence the audible alarm, but the visual alarms will remain illuminated.
- To shut down the fire detection system, set to OFF the FIRE DETECT SYSTEM circuit breaker (19).

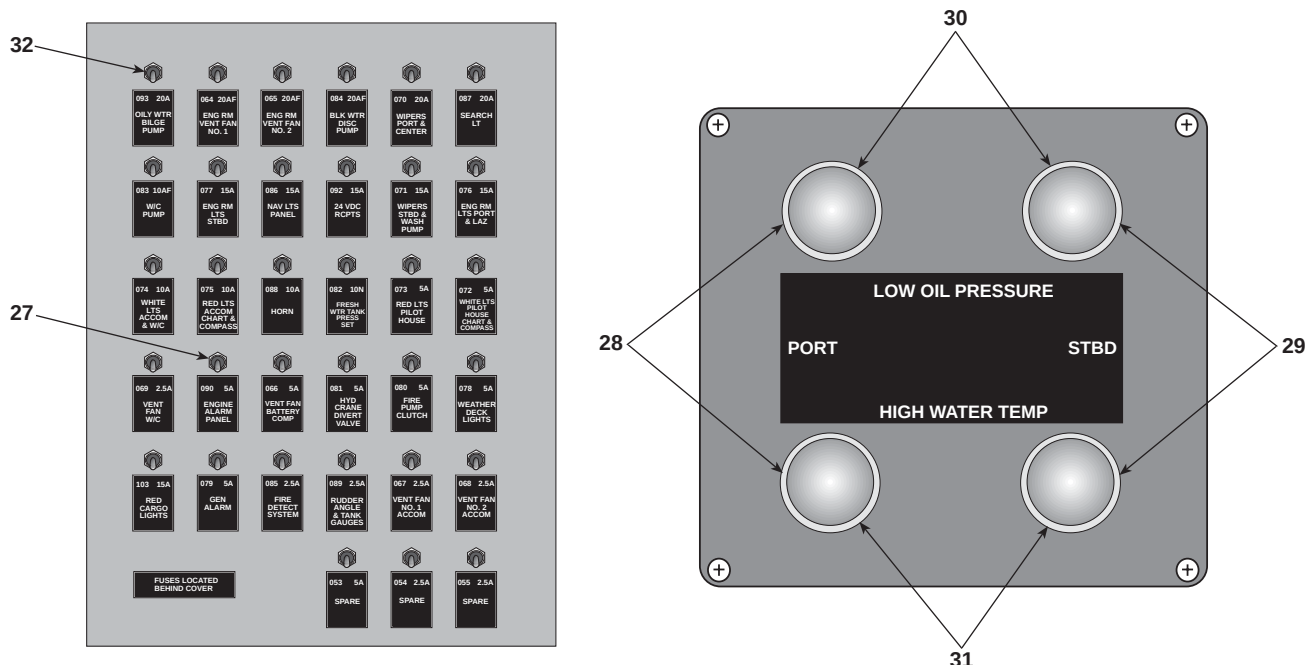
GENERAL ALARM

1. To enable the general alarm system, set to ON the GEN ALARM circuit breaker (25), located in the control and distribution panel.
2. To activate the general alarm system, rotate to ON the general alarm switch (26), located in the pilothouse overhead, above the coxswain's seat.
3. To silence the general alarm system, rotate to OFF the general alarm switch (26).
4. To shut down the general alarm system, set to OFF the GEN ALARM circuit breaker (25).



ENGINE ALARMS

1. To activate the engine alarms, set to ON the ENGINE ALARM PANEL circuit breaker (27), located in the control and distribution panel.
2. When low oil pressure or high coolant temperature is detected in the main propulsion engines, lights on the pilothouse console indicate which engine (port (28) or starboard (29)) is exhibiting which condition (low oil pressure (30) or high coolant temperature (31)).
3. To shut down the engine alarms, set to OFF the ENGINE ALARM PANEL circuit breaker (27).



OILY WATER COLLECTION SYSTEM

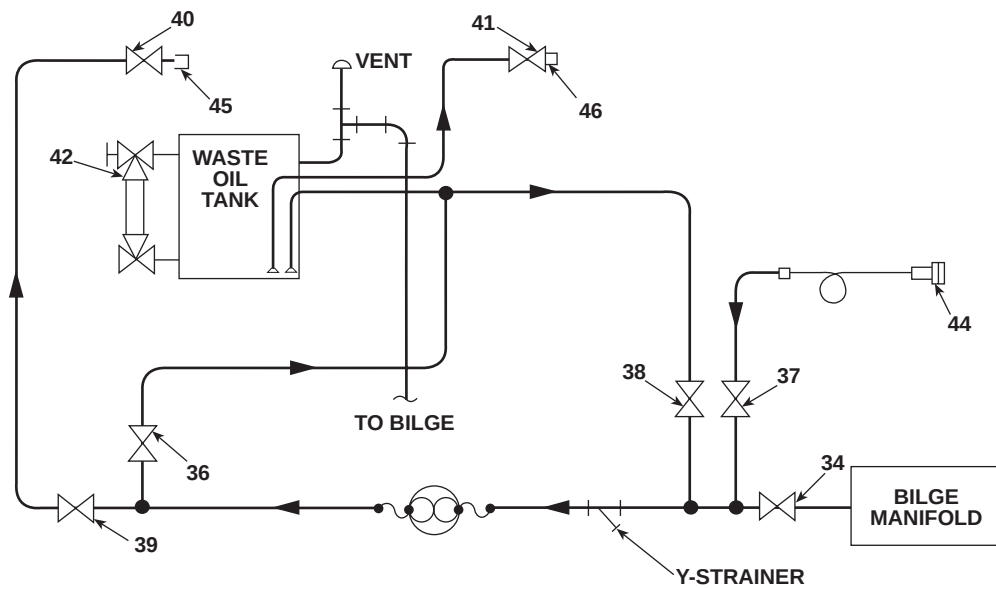
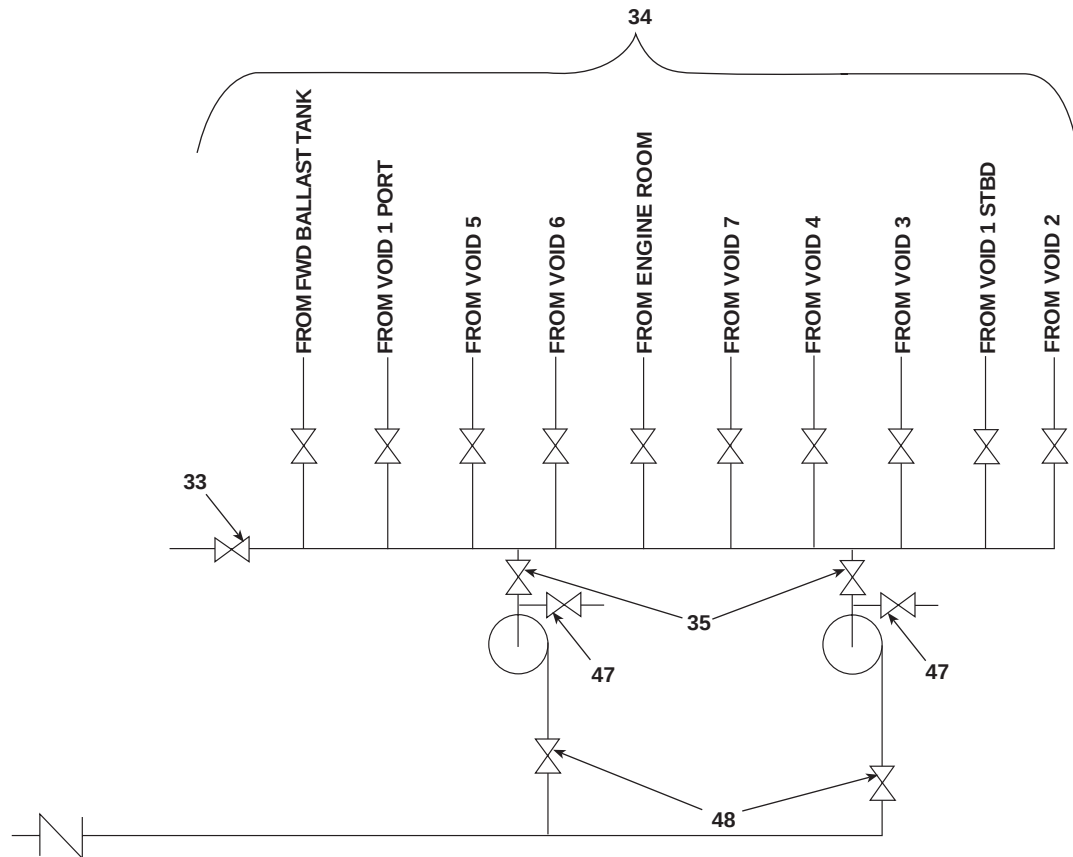
The oily water collection system can be used to pump oily water from the bilges, to drain lube oil from the engines and marine transmissions, and to pump oily water or oil from buckets. The oil is stored in a dedicated oily water collection tank in the engine room. The system can also pump the oily water discharge tank contents to an approved shore station.

Pump Oily Water from Bilges

1. Set to ON the OILY WTR BILGE PUMP circuit breaker (32), located in the control and distribution panel.
2. OPEN the oily water collection pump suction valve (33) at the bilge manifold.
3. OPEN the compartment suction valves (34) for the compartment to be drained.
4. Ensure that the bilge pump suction valves (35) are CLOSED.
5. OPEN the oily water pump to tank valve (36).
6. Ensure that valves 37, 38, 39, 40, and 41 are CLOSED.

Pump Oily Water from Bilges (continued)

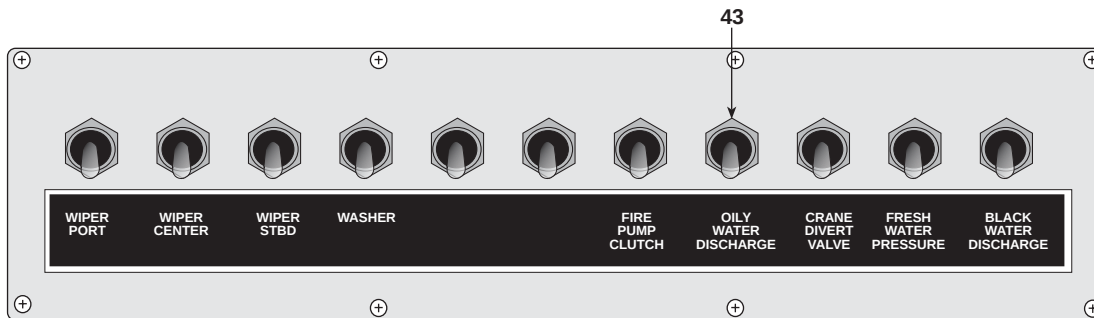
7. Check the oily water tank level at the sight glass (42) to ensure that the tank has adequate capacity to contain the oily water in the selected compartment.
8. To begin pumping, set to ON the OILY WATER DISCHARGE switch (43).



Pump Oily Water from Bilges (continued) **CAUTION**

Do not overfill the oily water discharge tank. Overfilling the tank can force oily water out the tank vent.

9. Continue to monitor the level of the oily water collection tank as the pumping proceeds. Do not overfill the tank. Overfilling the tank can force oily water out the tank vent.
10. When pumping is completed, secure the pump by setting to OFF the OILY WATER DISCHARGE switch (43).
11. CLOSE valves 33, 36, and all compartment suction valves (34).
12. If no further pumping is necessary, set to OFF the OILY WTR BILGE PUMP circuit breaker (32).

**Pump Lube Oil from Engines and Marine Transmissions**

Refer to illustrations in Pump Oily Water from Bilges procedure in this work package.

1. Set to ON the OILY WTR BILGE PUMP circuit breaker (32), located in the control and distribution panel.
2. OPEN the oily water collection pump lube oil suction valve (37).
3. OPEN the oily water pump to tank valve (36).
4. Ensure that valves 33, 38, 39, 40, and 41 are CLOSED.
5. Connect the lube oil change system hose (44) to the desired engine or marine transmission.
6. Check the oily water tank level at the sight glass (42) to ensure that the tank has adequate capacity to contain the lube oil in the selected component.
7. Begin pumping by setting to ON the OILY WATER DISCHARGE switch (43).

Pump Lube Oil from Engines and Marine Transmissions (continued)**CAUTION**

Do not overfill the oily water discharge tank. Overfilling the tank can force oily water out the tank vent.

8. Continue to monitor the level of the oily water collection tank as the pumping proceeds. Do not overfill the tank. Overfilling the tank can force oily water out the tank vent.
9. When pumping is completed, secure the pump by setting to OFF the OILY WATER DISCHARGE switch (43).
10. CLOSE valves 36 and 37.
11. If no further pumping is necessary, set to OFF the OILY WTR BILGE PUMP circuit breaker (32).

Pump Lube Oil or Oily Water from Buckets

Refer to illustrations in Pump Oily Water from Bilges procedure in this work package.

1. Set to ON the OILY WTR BILGE PUMP circuit breaker (32), located in the control and distribution panel.
2. OPEN the oily water collection pump lube oil suction valve (37).
3. OPEN the oily water pump to tank valve (36).
4. Ensure that valves 33, 38, 39, 40, and 41 are CLOSED.
5. Connect the lube oil change system hose (44) to the bucket pumping adapter.
6. Check the oily water tank level at the sight glass (42) to ensure that the tank has adequate capacity to contain the lube oil in the selected component.
7. Begin pumping by setting to ON the OILY WATER DISCHARGE switch (43).

**CAUTION**

Do not overfill the oily water discharge tank. Overfilling the tank can force oily water out the tank vent.

8. Continue to monitor the level of the oily water collection tank as the pumping proceeds. Do not overfill the tank. Overfilling the tank can force oily water out the tank vent.
9. When pumping is completed, secure the pump by setting to OFF the OILY WATER DISCHARGE switch (43).
10. CLOSE valves 36 and 37.
11. If no further pumping is necessary, set to OFF the OILY WTR BILGE PUMP circuit breaker (32).

Pump Oily Water Collection Tank Contents to Shore Facility using Oily Water Collection Pump

Refer to illustrations in Pump Oily Water from Bilges procedure in this work package.

1. Set to ON the OILY WTR BILGE PUMP circuit breaker (32), located in the control and distribution panel.

Pump Oily Water Collection Tank Contents to Shore Facility using Oily Water Collection Pump (continued)

2. OPEN the oily water collection tank suction valve (38).
3. Connect the hose from the shore facility to the pressure discharge fitting (45).
3. OPEN the pressure discharge valves (39 and 40).
4. Ensure that valves 33, 36, 37, and 41 are CLOSED.
5. Begin pumping by setting to ON the OILY WATER DISCHARGE switch (43).
6. When pumping is completed, secure the pump by setting to OFF the OILY WATER DISCHARGE switch (43).
7. CLOSE valves 38, 39, and 40.
8. If no further pumping is necessary, set to OFF the OILY WTR BILGE PUMP circuit breaker (32).

Pump Oily Water Collection Tank Contents to Shore Facility using Shore Facility's Pump

Refer to illustrations in Pump Oily Water from Bilges procedure in this work package.

1. Set to ON the OILY WTR BILGE PUMP circuit breaker (32), located in the control and distribution panel.
2. Connect the hose from the shore facility to the shore connection fitting (46).
3. OPEN the shore connection valve (41).
4. Ensure that valves 33, 36, 37, 38, 39, and 40 are CLOSED.
5. Pumping is started by the shore facility.
6. When pumping is completed, CLOSE shore connection valve 41.

Pump Oily Water from Bilges, Engines, Transmissions, and Buckets Directly to a Shore Facility

Refer to illustrations in Pump Oily Water from Bilges procedure in this work package.

1. Follow the directions in paragraphs Pump Oily Water from Bilges, Pump Lube Oil from Engines and Marine Transmissions, Pump Lube Oil or Oily Water from Buckets with the following exceptions:
 - a. Ensure that the oily water to tank valve (36) is CLOSED.
 - b. Connect the hose from the shore facility to the pressure discharge fitting (45).
 - c. OPEN valves 39 and 40.
2. When pumping is completed, CLOSE all valves.

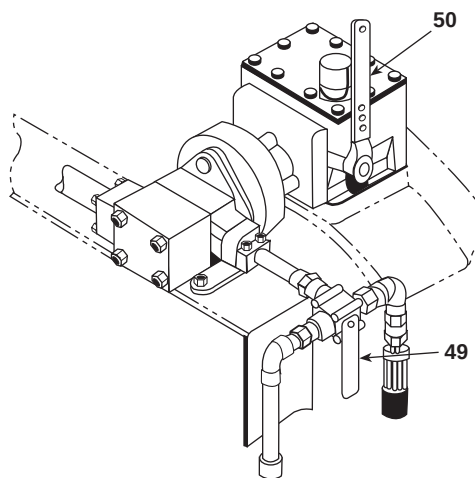
BILGE PUMPING

1. Ensure that the propulsion engine(s) for the desired pump(s) are running. The port propulsion engine powers the port bilge pump and the starboard propulsion engine powers the starboard bilge pump.

CAUTION

The bilge pumping system pumps untreated water directly overboard. Do not pump oily or otherwise contaminated water with the bilge pumping system.

2. OPEN the appropriate compartment suction valve(s) (34).
3. OPEN the priming valve(s) (47) for each pump in use.
4. OPEN the bilge pump suction valve(s) (35) for each pump in use.
5. Ensure that the oily water collection pump suction valve (33) is CLOSED.
6. OPEN the bilge pump discharge valve(s) (48) for each pump in use.
7. Set the handle on the hydraulic diverter valve (49) in the BILGE position (UP on the port engine, DOWN on the starboard engine).
8. Start the ramp hydraulic pump by engaging the PTO lever (50) (shift the lever aft).
9. When finished pumping, disengage the PTO by shifting the PTO lever (50) forward.
10. CLOSE the valves opened in steps 2, 3, 4, and 6 above.



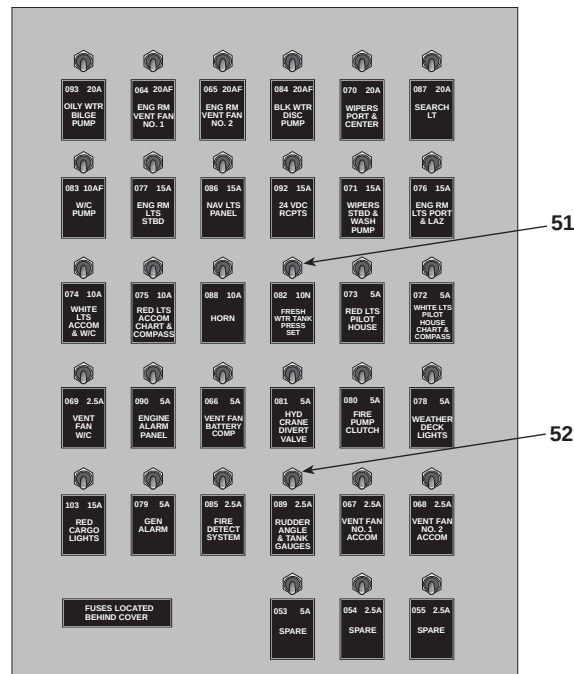
POTABLE WATER SYSTEM

Pressurize the Potable Water System

1. To activate the potable water pressure set that provides pressure for the potable water system, set to ON the FRESH WTR TANK PRESS SET circuit breaker (51), located in the control and distribution panel.

Pressurize the Potable Water System (continued)

- The pressure set is self-regulating and will maintain the potable water system pressure without operator attention.
- To shut down the potable water pressure set, set to OFF the FRESH WTR TANK PRESS SET circuit breaker (51).



Monitor Potable Water Tank Level

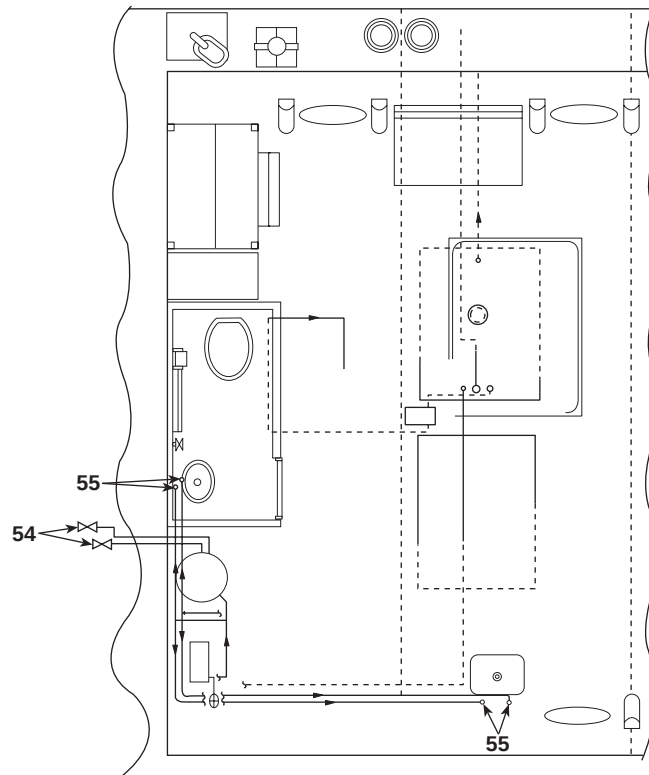
- To activate the potable water tank monitoring system, set to ON the RUDDER ANGLE & TANK GAUGES circuit breaker (52), located in the control and distribution panel.
- To read the tank level, observe the potable tank level indicator (53) in the pilothouse. A green LED indicates a full tank, a yellow LED indicates the tank at MID level, and a red LED indicates an empty tank.
- To shut down the potable water tank monitoring system, set to OFF the RUDDER ANGLE & TANK GAUGES circuit breaker (52).



Hot Water Heater

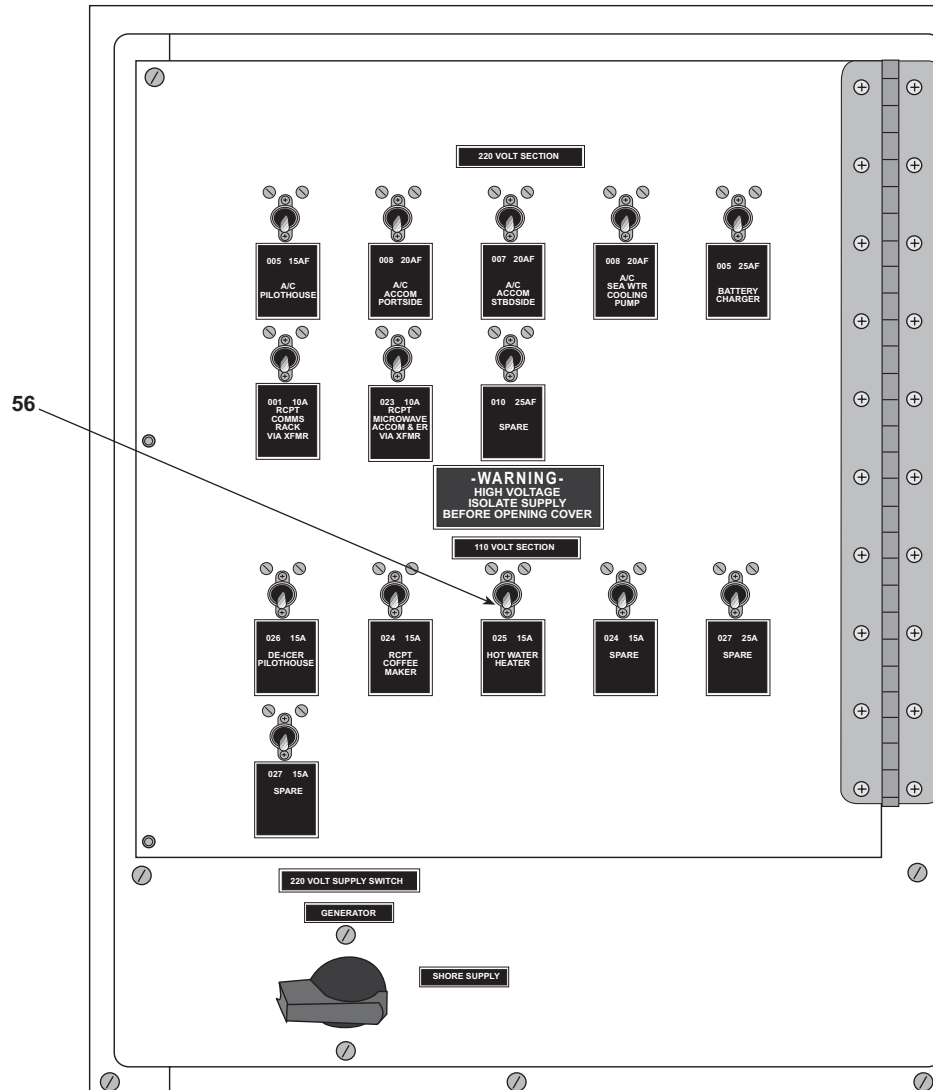
The hot water heater has two heating elements. One element uses a heat exchanger to transfer heat from the starboard propulsion engine's engine coolant to the potable water. The other element is a 220 Vac electric element powered from the vessel's 220 Vac electric system. These elements may be used together or separately to heat the potable water.

1. To activate the hot water heater using the propulsion engine heat exchanger:
 - a. Ensure that the starboard propulsion engine is running.
 - b. OPEN the heat exchanger valves (54) located on the outboard side of the starboard propulsion engine, forward.
 - c. Ensure that the potable water valves (55) are CLOSED.
2. To shut down the hot water heater using the propulsion engine heat exchanger, CLOSE the heat exchanger valves (54). The hot water heater is now shut down even if the propulsion engine remains running.



Hot Water Heater (continued)

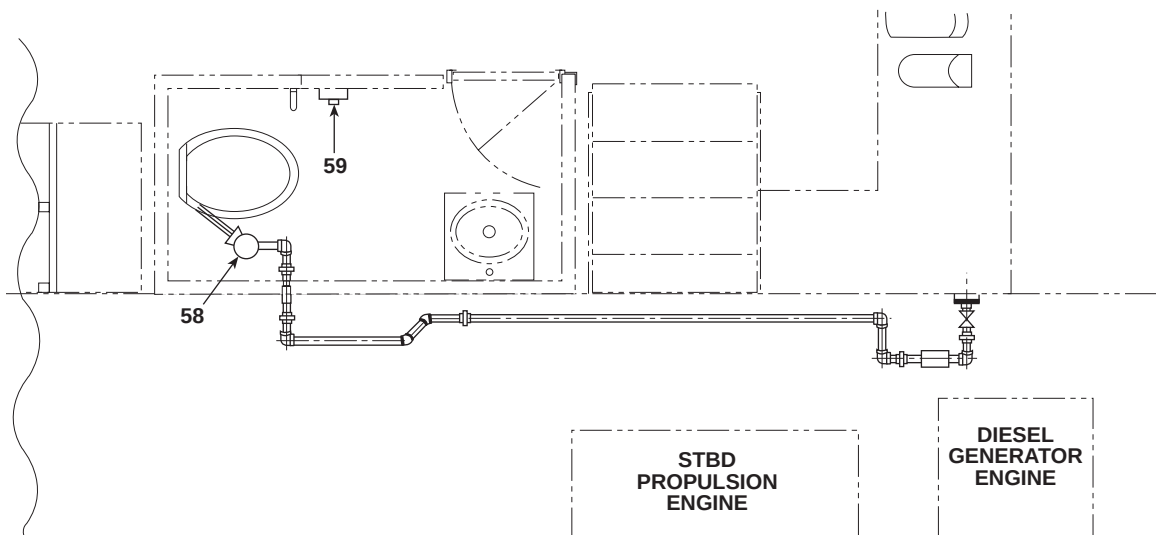
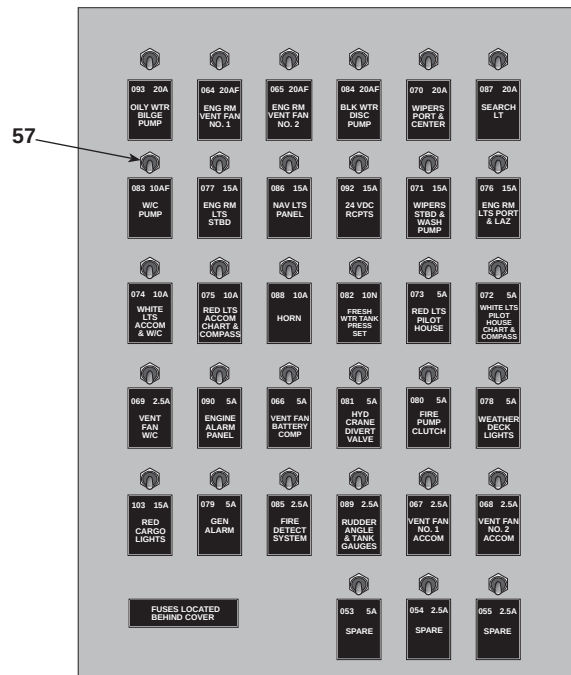
3. To activate the hot water heater using the electric element:
 - a. The diesel generator must be running, or the vessel must be connected to shore power.
 - b. Set to ON the HOT WATER HEATER circuit breaker (56), located in the 220/110 V distribution box.
4. To shut down the hot water heater using the electric element, set to OFF the HOT WATER HEATER circuit breaker (56).



WATER CLOSET

The water closet uses raw water, drawn from the starboard sea chest for flushing. All effluent is collected in the black water tank. To flush the water closet:

1. Set to ON the W/C PUMP circuit breaker (57) in the control and distribution panel.
2. OPEN the water closet supply valve (58).
3. Press the flushing button (59).
4. To shut down the water closet, CLOSE the water closet supply valve (58) and set to OFF the W/C PUMP circuit breaker (57).



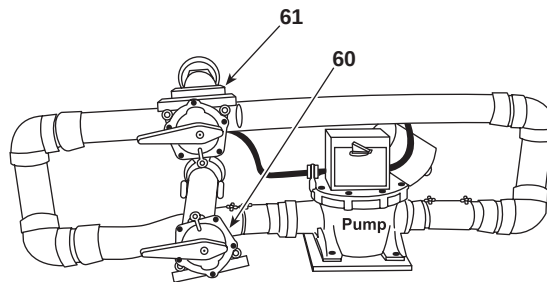
BLACK WATER SYSTEM

Monitoring Black Water Tank Level

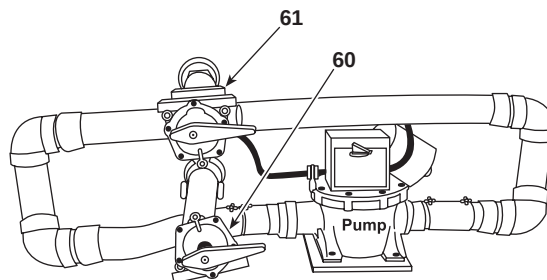
1. To activate the black water tank monitoring system, set to ON the RUDDER ANGLE & TANK GAUGES circuit breaker (52), located in the control and distribution panel.
2. To read the tank level, observe the black water tank level indicator (53) in the pilothouse. A red LED indicates a full tank, a yellow LED indicates the tank at MID level, and a green LED indicates an empty tank.
3. To shut down the black water tank monitoring system, set to OFF the RUDDER ANGLE & TANK GAUGES circuit breaker (52).

Pumping Black Water Tank

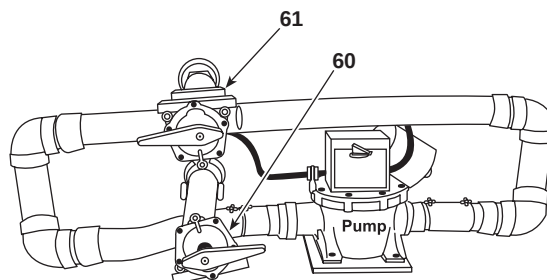
1. Connect a discharge hose from a suitable shore facility to the black water discharge fitting on the starboard side walkway aft of frame 25.
2. If the black water pump will be used to pump the black water tank, perform the following procedure:
 - a. Align the suction diverter valve (60) and discharge diverter valve (61) as shown in the Pumping Using the Black Water Discharge Pump section of the Discharge Valve Alignment illustration.



Pumping Using a Shore Facility



Pumping Using the Black Water Discharge Pump

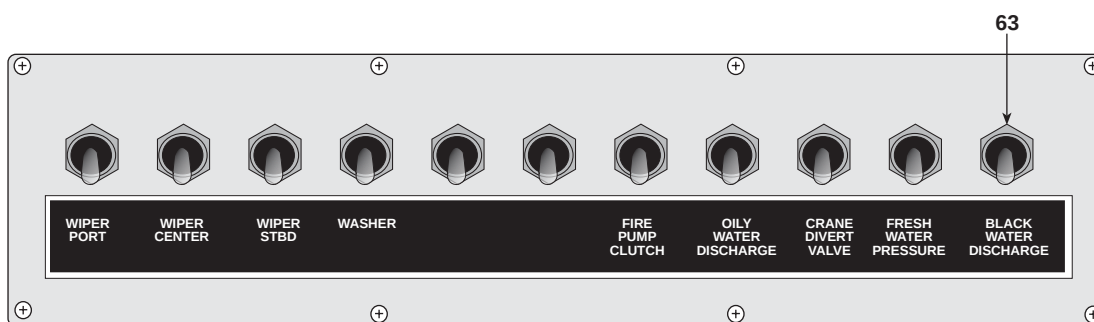


Discharge Port Secured

DISCHARGE VALVE ALIGNMENT

Pumping Black Water Tank (continue)

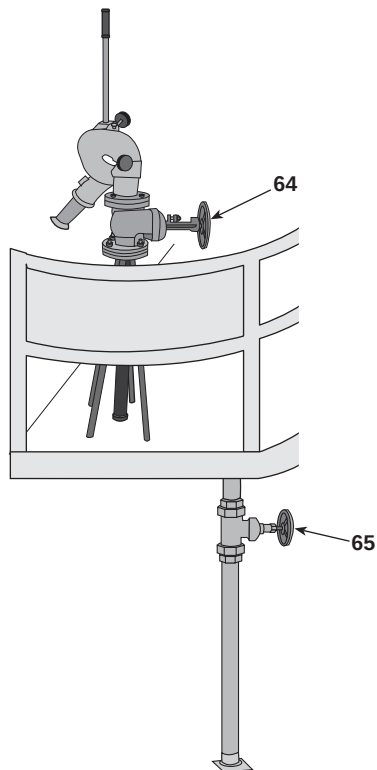
- b. Set to ON the BLACK WTR DISC PUMP circuit breaker (62), located in the control and distribution panel.
- c. To begin pumping, set to ON the BLACK WATER DISCHARGE switch (63), located on the pilothouse console.
- d. When pumping is completed, set to OFF the BLACK WATER DISCHARGE switch (63) and the BLACK WTR DISC PUMP circuit breaker (62).



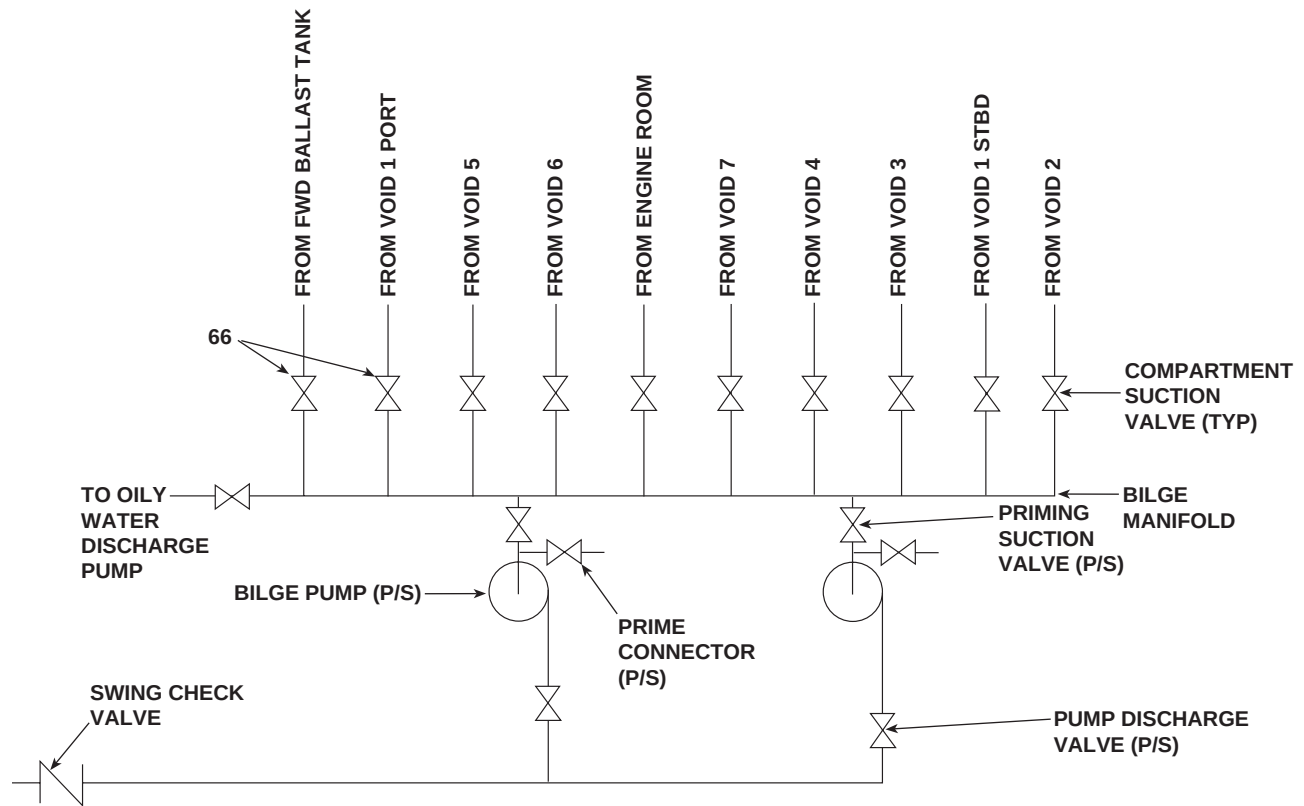
3. If a shore facility will be used to pump the black water tank, follow this procedure:
 - a. Align the suction diverter valve (60) and discharge diverter valve (61) as shown in the Pumping Using a Shore Facility section of the Discharge Valve Alignment illustration.
 - b. The shore facility may now begin pumping.
4. When pumping is complete, using either pumping method, align the discharge diverter valve (61) and the suction diverter valve (60) as shown in the Discharge Port Secured section of the Discharge Valve Alignment illustration.
5. Disconnect the discharge hose and install the discharge deck fitting.

FORWARD BALLAST TANK

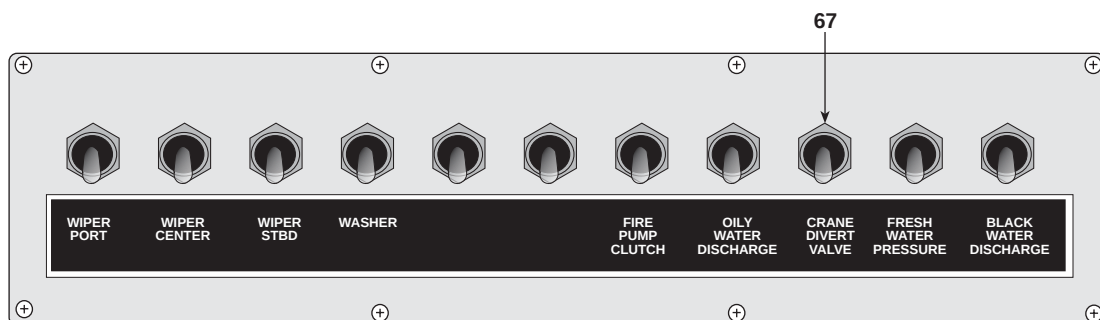
1. To fill the forward ballast tank:
 - a. Start the diesel generator engine and engage the fire pump clutch as described in steps 1-5 of the Fire Monitor procedure in this work package.
 - b. Ensure that the fire monitor valve (64) is CLOSED.
 - c. OPEN the forward ballast tank fill valve (65).
 - d. When the forward ballast tank is filled to the desired level, CLOSE the forward ballast tank valve (65).
 - e. If no further filling of the forward ballast tank is needed, secure the fire pump as described in steps 9-11 of the Fire Monitor procedure in this work package.



2. To drain the forward ballast tank:
 - a. Prepare the bilge pump(s) for use as described in steps 1-7 of the Bilge Pumping procedure in this work package. During step 2 of the Bilge Pumping procedure, OPEN the forward ballast tank compartment suction valves (66).
 - b. When ready to pump, start the ramp hydraulic pump by engaging the PTO lever (50) (shift the lever aft).
 - c. When the forward ballast tank has been drained to the desired level, disengage the PTO by shifting the PTO lever (50) forward.
 - d. If pumping is complete, CLOSE all valves opened in the earlier steps.

FORWARD BALLAST TANK (continued)**CRANE**

1. To prepare the crane for operation:
 - a. Perform all preoperation PMCS services to the crane and to the ramp hydraulic system found in WP 0053 00 and WP 0054 00. Ensure that all inspections have been carried out in accordance with TB 43-0142.
 - b. The starboard propulsion engine must be running.
 - c. Set to the RAMP position the hydraulic diverter valve (49) (handle in line with the piping).
 - d. Engage the PTO lever (50) (shift lever aft).
 - e. Set to ON the CRANE DIVERT VALVE switch (67).



CRANE (continued)

2. The following precautions must be taken whenever operating the crane:



All personnel in the vicinity of lifting operations should wear appropriate safety equipment including gloves, hard hat, and safety shoes. Failure to comply can result in serious injury or death.

Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

 CAUTION

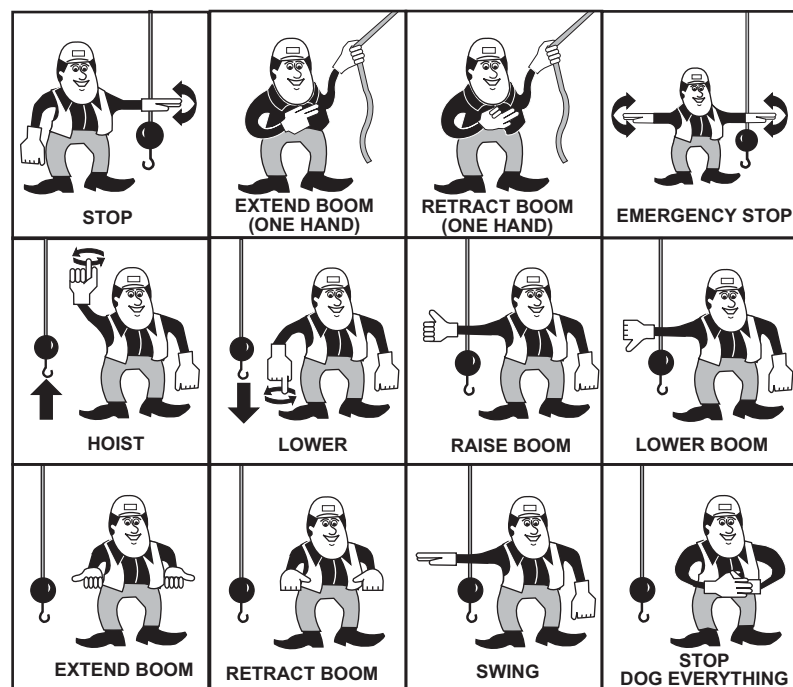
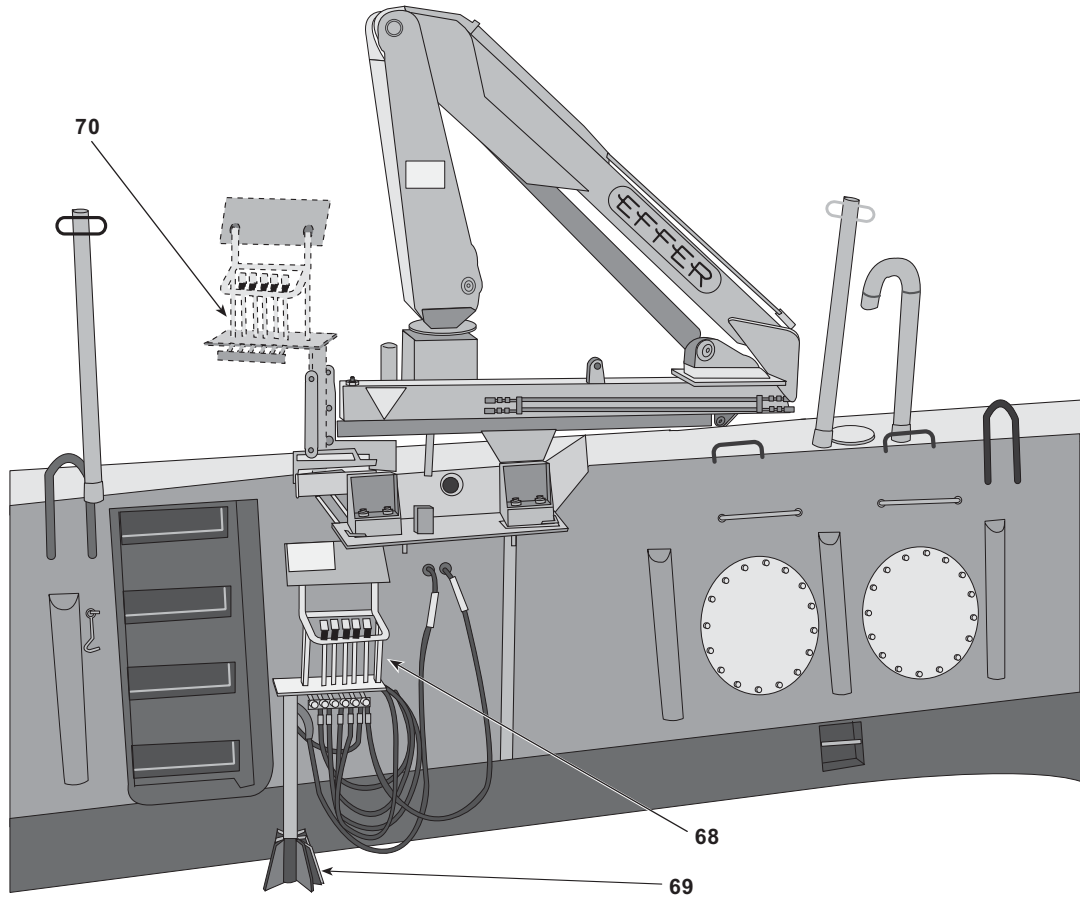
Make sure that the load lifted does not exceed the load chart ratings. The crane load chart must be constantly referred to, especially in cases where the load is to be moved farther away from the crane's pivot point. Overloading can lead to serious damage to the crane.

Avoid making sudden starting or stopping movements with the crane. Sudden starting and stopping can lead to serious damage to the crane.

Never drag loads along the deck or the ground. Slew only with the load raised off the deck or ground. Dragging loads can result in serious damage to the crane and to the load.

3. Move the crane's operating control stand (68) from its stowed position (69) to its operating position (70).
4. Ensure that the crane operator has an unobstructed view of the working area. If the operator's view is obstructed for any reason, a signalman may be used to assist the operator. If a signalman is used, he shall communicate with the operator using a predetermined set of signals such as those shown in this work package. If at any time the operator is unsure of the signal, he shall not operate the crane until he is clear of the signal.

CRANE (continued)

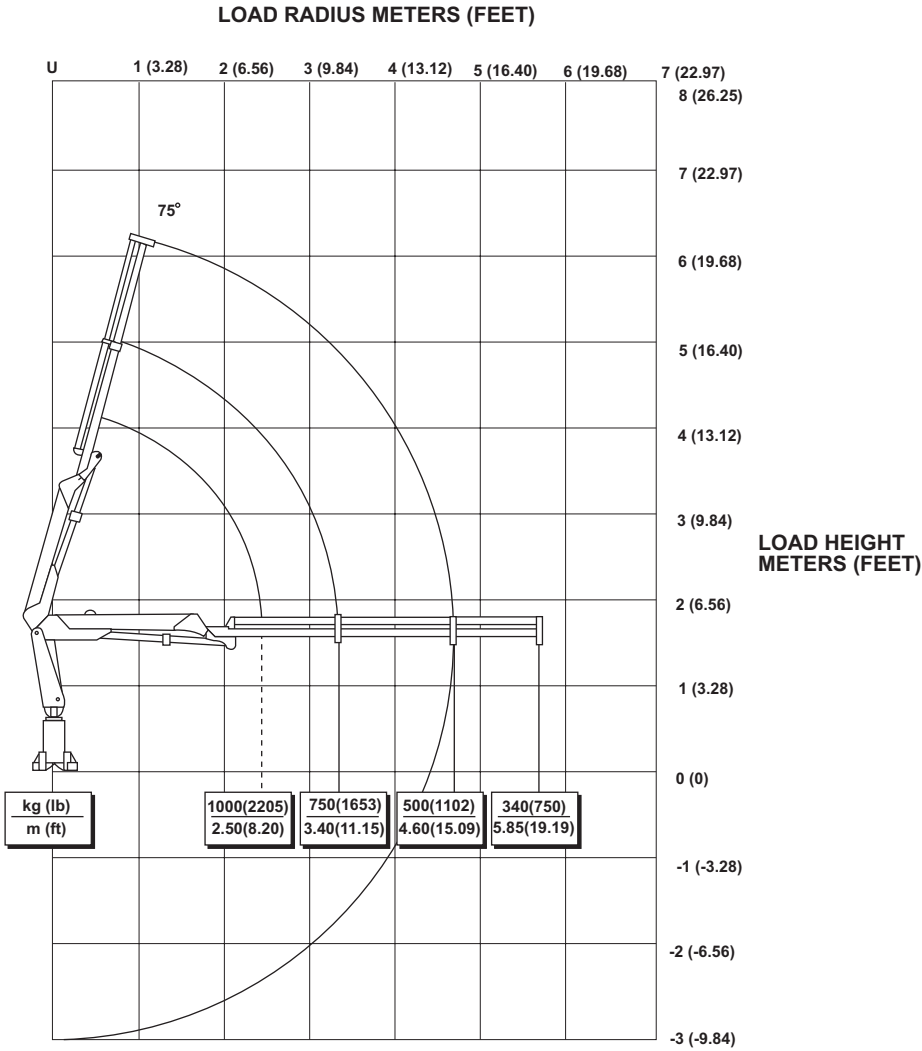


CRANE (continued)



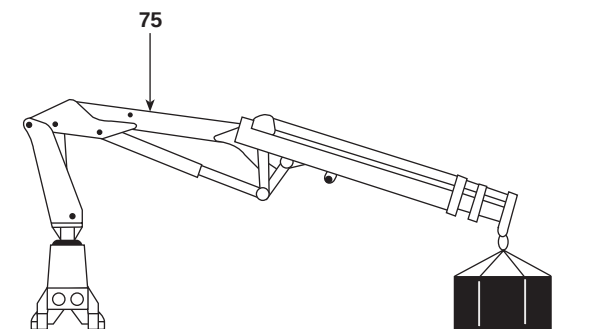
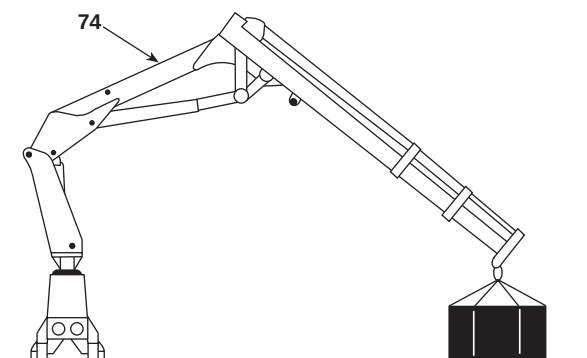
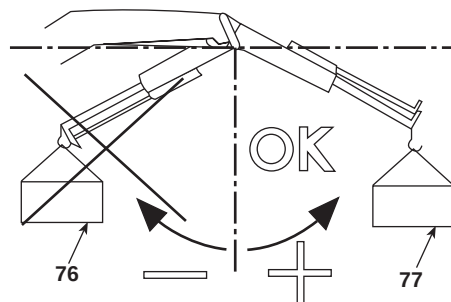
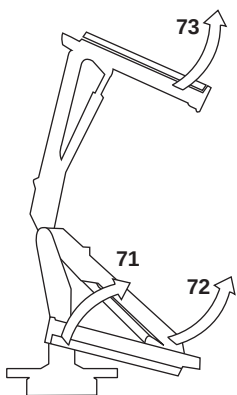
Make sure that the load lifted does not exceed the load chart ratings. The crane load chart must be constantly referred to, especially in cases where the load is to be moved farther away from the crane’s pivot point. Overloading can lead to serious damage to the crane.

- 5. Determine the weight of the item to be lifted, the load radius (distance from the center of the crane’s rotation to the center of the load) at the beginning of the lift, and the most extreme load radius expected during the lift. Consult the load chart to ensure that the load does not exceed the crane’s capacity at any point during the lift.
- 6. Ensure that all unnecessary personnel are clear of the crane’s working area.



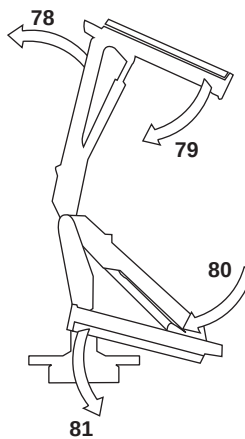
CRANE (continued)

7. To unstow the crane:
 - a. BOOM DOWN the second boom section (71) until it is clear of the boom rest.
 - b. BOOM UP the first boom section (72) to a near-vertical position.
 - c. BOOM UP the second boom section (73) to the desired working position.
8. To lift a load:
 - a. Manipulate the crane controls until the hook is over the center of the load.
 - b. During all lifting operations, the first boom section must remain above horizontal (74). Lifting with the first boom section below horizontal (75) greatly reduces the crane's lifting power and should be avoided whenever possible.
 - c. At no time should the crane be used to lift a load when the second boom is in the "negative" position (76). The second boom should only be used to lift loads when in the "positive" position (77).
 - d. Attach the crane hook to the load's lifting eye or lifting rigging.
 - e. Lift the load, avoiding sudden, jerky movements.
 - f. Manipulate the crane controls until the load reaches the desired location.



CRANE (continued)

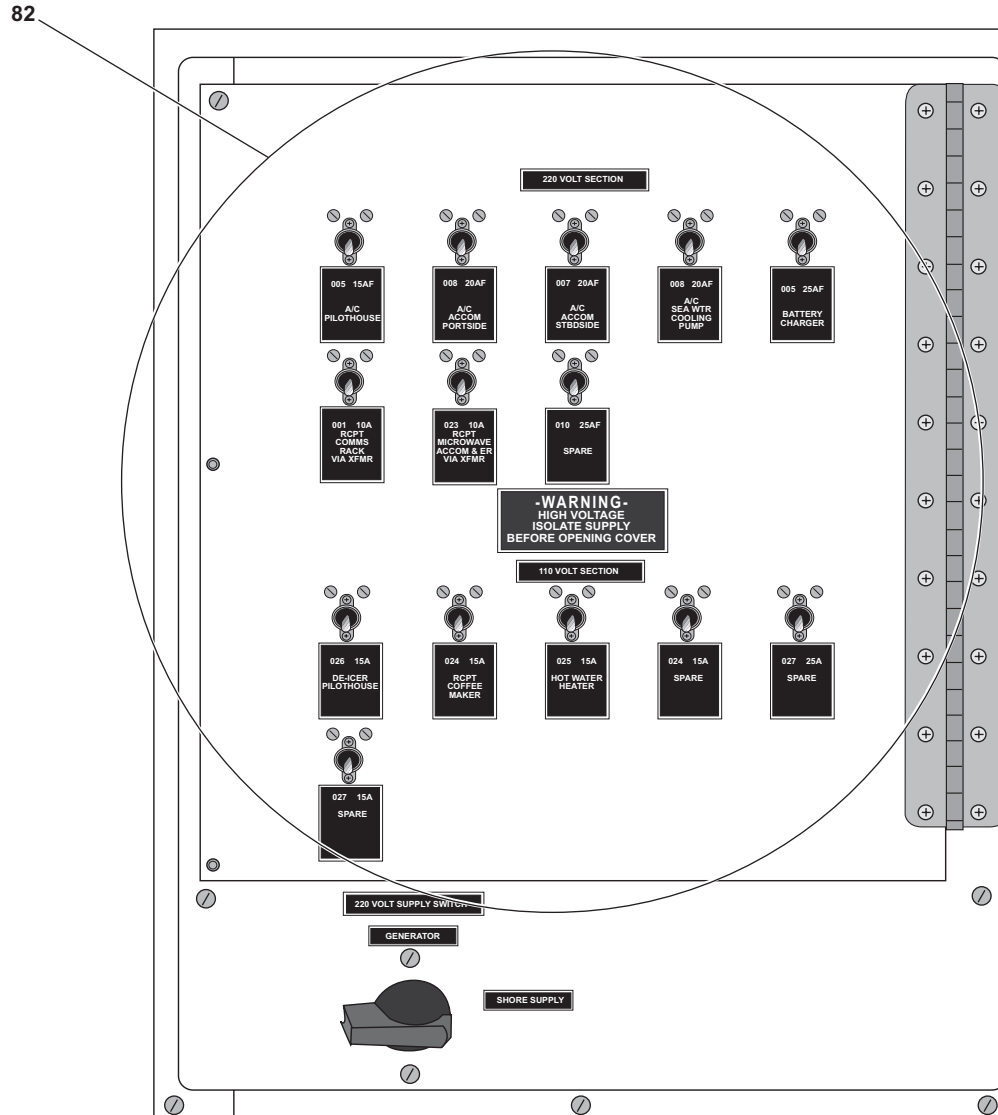
9. To stow the crane:
 - a. Rotate the crane until the boom is facing forward.
 - b. BOOM UP the first boom section (78) to a near-vertical position.
 - c. BOOM DOWN the second boom section (79) to its full BOOM DOWN position.
 - d. BOOM DOWN the first boom section (80) to its full BOOM DOWN position.
 - e. BOOM UP the second boom section (81) until it rests on the boom rest.
10. To secure the crane:
 - a. Stow the crane as described in step 9 of the To Stow the Crane procedure in this work package.
 - b. Secure the hydraulic system by reversing the procedures contained in steps 1.c-1.e of this procedure.

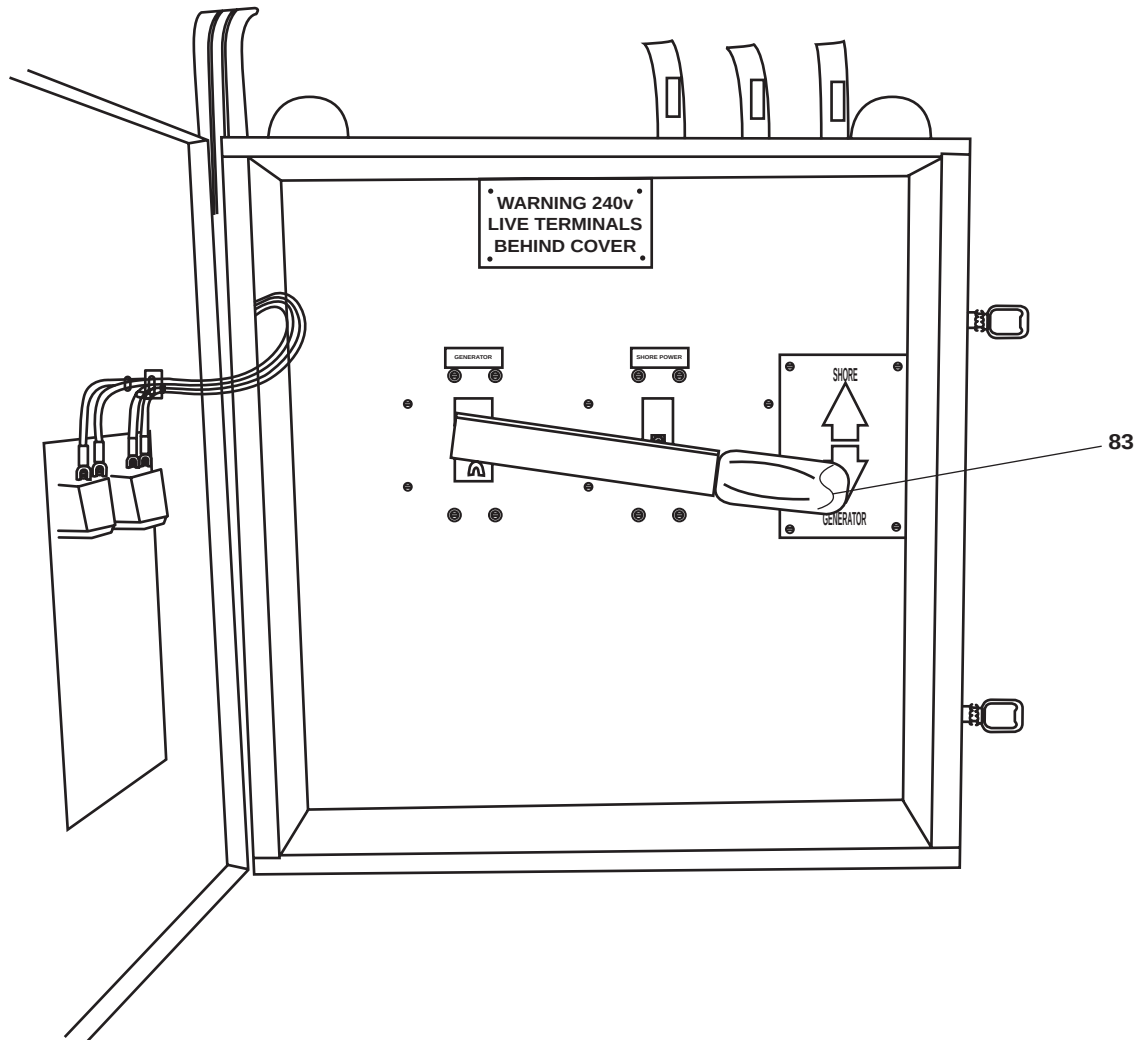


SHORE POWER

Connect to Shore Power

1. Unstow the shore power cable and inspect it for defects or damage.
2. Set to OFF all circuit breakers (82) in the 220/110 Volt distribution box.
3. Set to the GENERATOR position the shore power transfer switch (83).



Connect to Shore Power (continued)**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

4. Ensure that the shore power source is secured at its breaker or disconnect. Use a multimeter to check for available voltage prior to connecting the shore power cable. If the source is energized, secure, lockout, and tagout the source before continuing with this procedure.

Connect to Shore Power (continued)**WARNING**

The shore power cable is configured with a pigtail on the shore end of the cable. Ensure that the pigtail is wired to the shore source in accordance with the CFR and with all applicable local codes and regulations. Failure to properly wire the pigtail can result in equipment damage, serious injury, or death.

! CAUTION

The LCM-8 Mod 2 shore power system is designed to operate on 220 Volt, 60 Hz, single phase power only. Ensure that this power standard is available prior to connecting the shore power cable. Failure to comply can result in equipment damage.

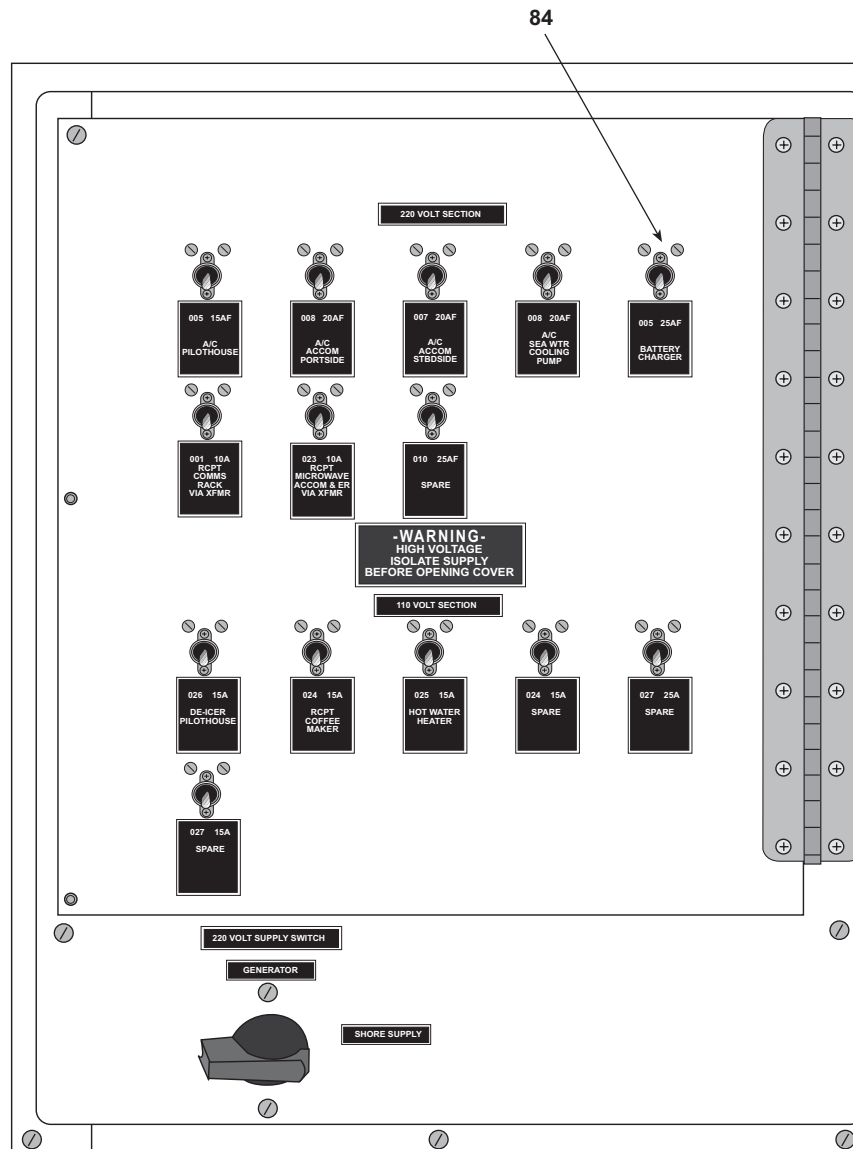
5. Connect the pigtail end of the shore power cable to a 220 Vac, 60 Hz, single phase shore power source. When connecting the shore power cable pigtail, ensure that the wires are connected green-to-green, black-to-black, and white-to-white. If the source wires are not colored green, black, and white, consult the custodian of the shore power source to determine the proper wiring scheme. On the LCM-8 Mod 2 shore power pigtail, the following color scheme applies:
 - a. Green—ground
 - b. Black—neutral
 - c. White—hot
6. Connect the vessel end of the shore power cord to the LCM-8 Mod 2's shore power plug.
7. Set to ON the shore power at its source.
8. Observe that the SHORE POWER indicator light is illuminated on the shore power transfer panel.
9. Set to the SHORE POWER position the shore power transfer switch (83).
10. Set to ON the 220 Volt and 110 Volt circuit breakers (82) as required by operating conditions.

DISCONNECT SHORE POWER

1. Set to OFF all of the circuit breakers (82) in the 220/110 Volt distribution box.
2. Set to OFF the shore power at its source.
3. Set to the GENERATOR position the shore power transfer switch (83).
4. Disconnect the shore power cable from the vessel's shore power plug.
5. Disconnect the shore power cord from the shore power source.
6. Stow the shore power cord.

BATTERY CHARGER

1. A 220 Vac power supply must be available via shore power or the diesel generator set. Refer to Diesel Generator Startup procedure in WP 0023 00 or the Shore Power procedure in this work package to supply the vessel with 220 Vac power.
2. Set to ON the BATTERY CHARGER circuit breaker (84), in the 220/110 Volt distribution box.
3. To secure the battery charger, set to OFF the BATTERY CHARGER circuit breaker (84).

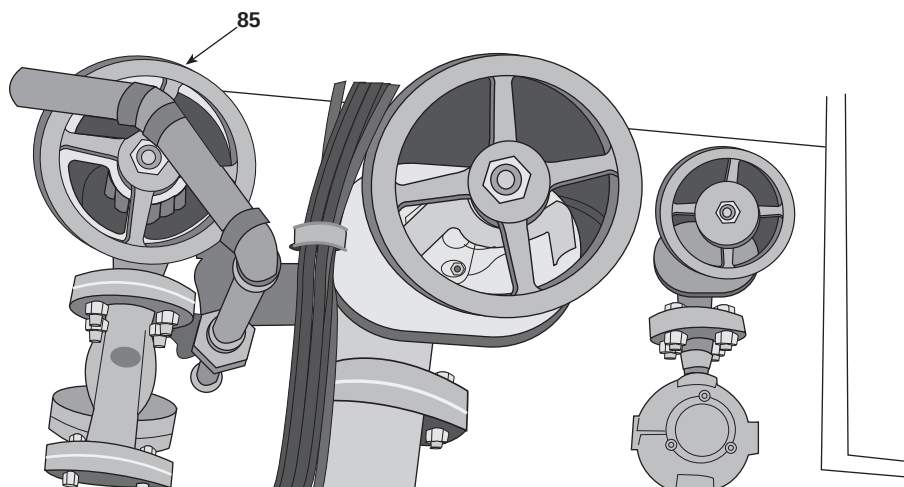


COMMUNICATION AND NAVIGATION EQUIPMENT

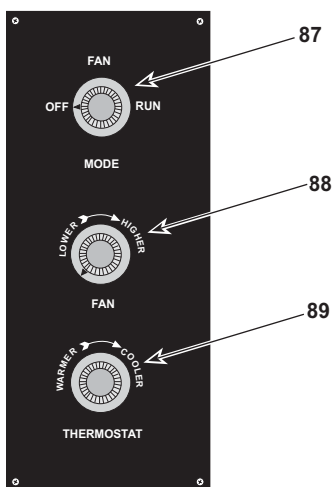
Operating instructions for the communication and navigation equipment are covered in the pertinent technical manuals listed in WP 0225 00.

HEATING AND AIR CONDITIONING

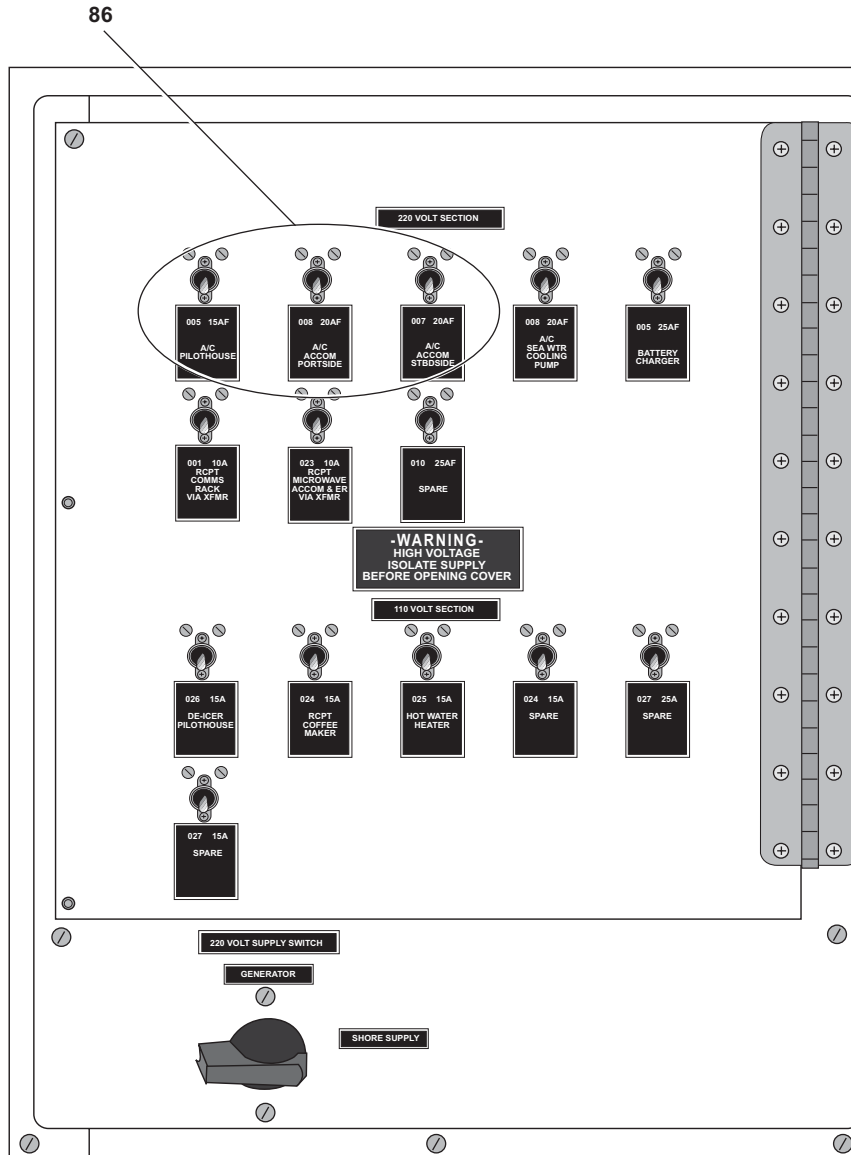
1. A 220 Vac power supply must be available via shore power or the diesel generator set. Refer to DIESEL GENERATOR STARTUP in WP 0023 00 or SHORE POWER in this work package to supply the vessel with 220 Vac power.
2. OPEN the heating/air conditioning raw water pump seacock (85).



3. Set to ON the appropriate circuit breaker(s) (86) for the desired heating/cooling unit(s).
4. Set the MODE knob (87) to the desired mode. In OFF, the unit is OFF. In FAN, only the fan blows, no heating or cooling takes place. In RUN, output temperature is controlled by the thermostat.
5. Set the FAN knob (88) to the desired fan speed.
6. Set the THERMOSTAT knob (89) to the desired temperature.
7. To secure the heating and air conditioning units, set to OFF the appropriate circuit breakers (86) for the desired heating/cooling unit(s), and CLOSE the heating/air conditioning raw water pump seacock (85).



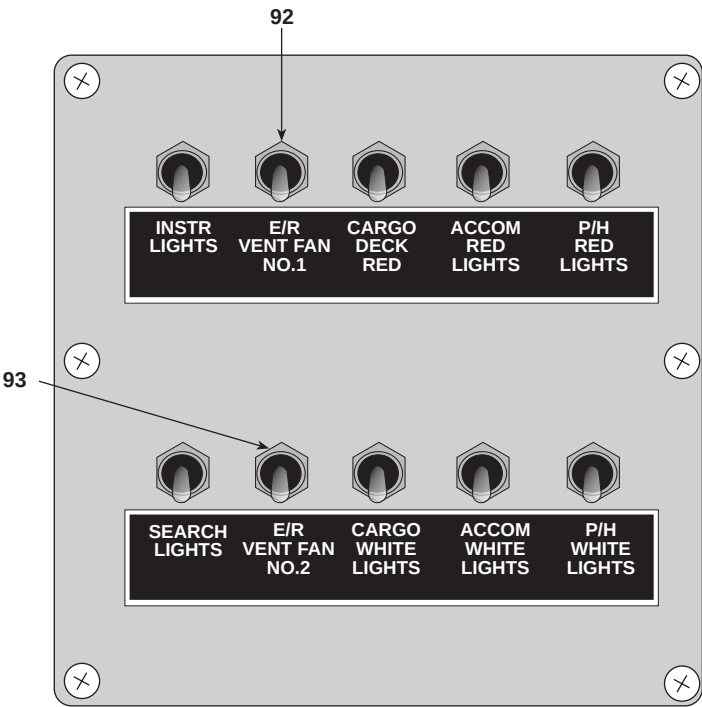
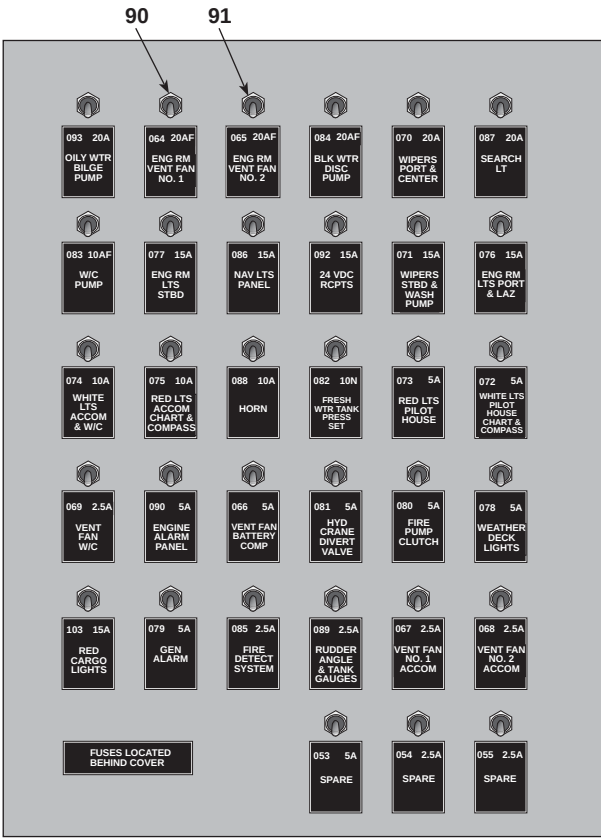
HEATING AND AIR CONDITIONING (continued)



ENGINE ROOM VENTILATION

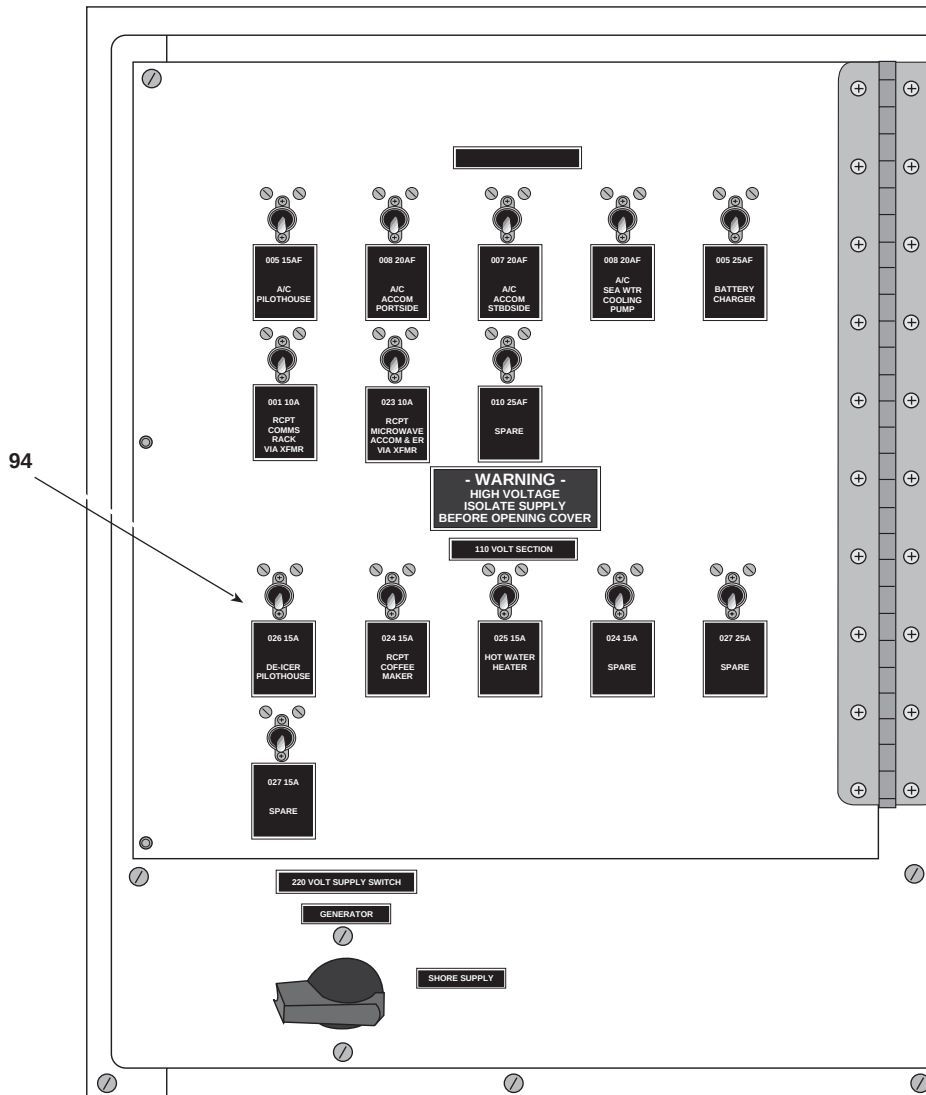
1. Ensure that the engine room ventilation intake and exhaust fire flaps are OPEN.
2. Set to ON the ENG RM VENT FAN NO. 1 (90) and ENG RM VENT FAN NO. 2 (91) circuit breakers.
3. Set to ON the E/R VENT FAN NO.1 (92) and E/R VENT FAN NO. 2 (93) switches.
4. To secure the engine room ventilation, set to OFF the E/R VENT FAN NO.1 (92) and E/R VENT FAN NO. 2 (93) switches, then set to OFF the ENG RM VENT FAN NO. 1 (90) and ENG RM VENT FAN NO. 2 (91) circuit breakers.

ENGINE ROOM VENTILATION (continued)

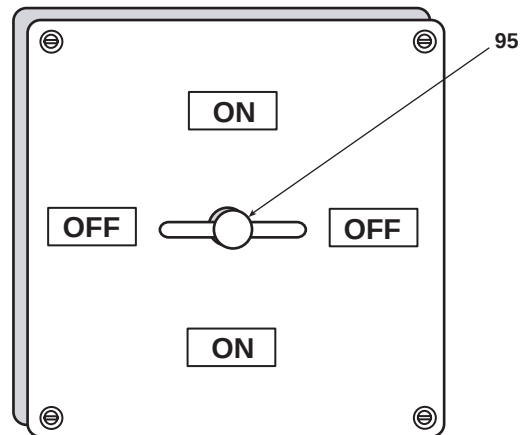


DE-ICER OPERATION

1. Ensure that the vessel is operating on shore power or on diesel generator power. 220 Vac power is required for de-icer operation.
2. Set to ON the DE-ICER PILOTHOUSE circuit breaker (94) located in the 220/110 Volt distribution box.



3. Set to ON the de-icer control switch (95) located in the pilothouse, just aft of the fire alarm display panel.
4. When de-icer operation is complete, set to OFF the de-icer control switch (95) and the DE-ICER PILOTHOUSE circuit breaker (94).

DE-ICER OPERATION (continued)**END OF WORK PACKAGE**

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATION UNDER USUAL CONDITIONS
PREPARATION FOR MOVEMENT**

The LCM-8 Mod 2 is capable of being transported as deck cargo aboard a transport ship. Prior to transporting the vessel as deck cargo, the following services must be performed. If the vessel will be out of service for an extended period of time, preserve the vessel according to the instructions found in TB 740-93-4.

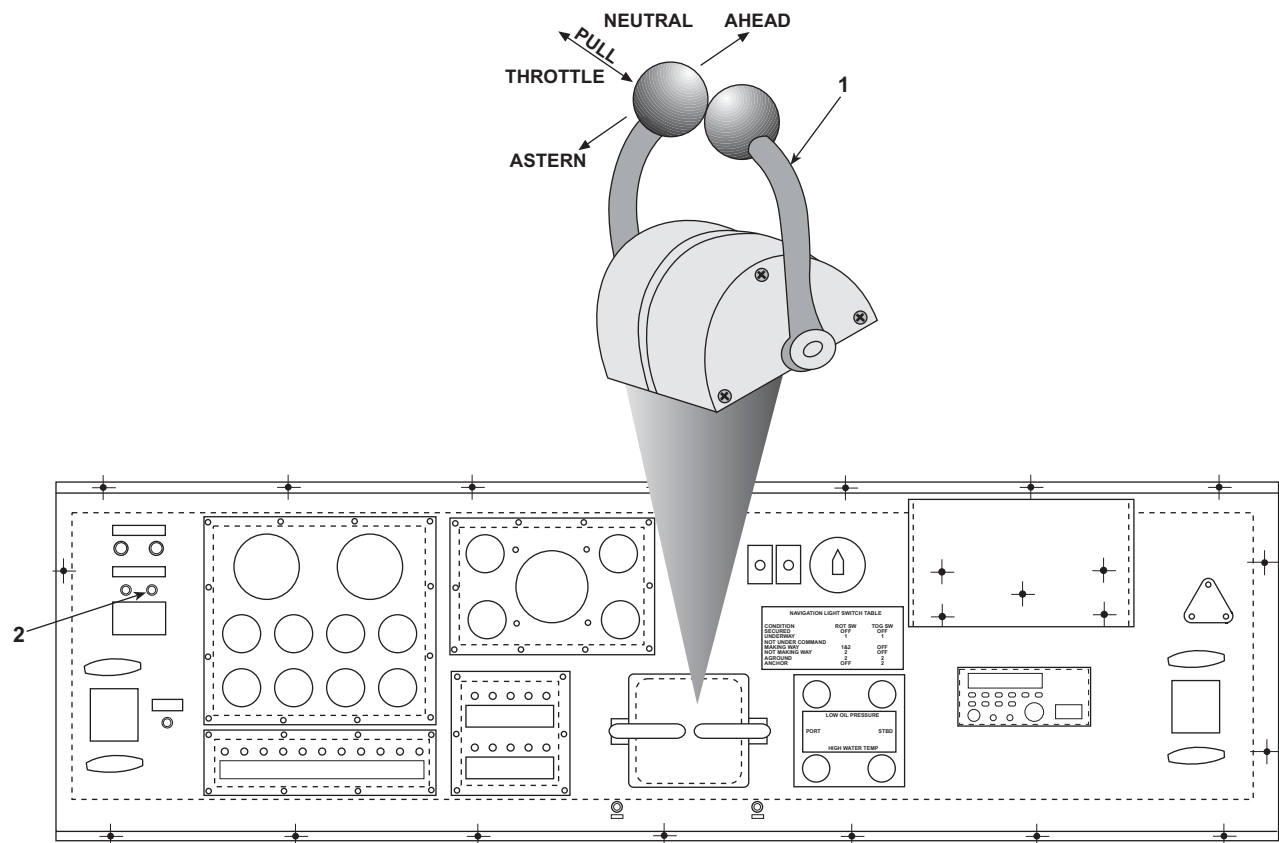
1. Both fuel tanks must be pumped dry. This should be accomplished by pumping the fuel to another vessel or to a suitable shore facility.
2. The potable water tank must be pumped dry.
3. The black water tank must be pumped dry.
4. All voids and bilge spaces must be pumped dry.
5. The following equipment and fittings should be removed as necessary and stowed in the lazarette:
 - a. Navigation lights (see WP 0065 00).
 - b. Stanchions, lifelines, and fittings (see WP 0162 00).
 - c. Horn (see WP 0126 00).
 - d. Emergency tiller.
6. Remove the mast (see WP 0075 00) and stow it in the engine room.
7. Mark and disconnect the battery cables from the batteries (see WP 0092 00).
8. Close and dog shut all hatches.
9. Reactivation of the vessel after movement is detailed in TB 740-93-4.
10. Depreservation of the vessel after preservation is detailed in TB 740-93-4.

END OF WORK PACKAGE

COLD WEATHER OPERATION

When ambient temperatures are below 40 °F (4.4 °C), the propulsion engines may require the use of a starting fluid. To start the propulsion engines using a starting fluid, follow this procedure:

1. Prepare the engine for starting as described in WP 0023 00.
2. Cycle the starboard propulsion control (1) from full speed ASTERN to full speed AHEAD to ensure unrestricted operation through the control's entire range of motion. Return the propulsion control to NEUTRAL after cycling.



Propulsion Engine Starting (continued)**WARNING**

Ensure all personnel are clear of moving components. Use extreme caution when working around rotating components. Do not allow hands or tools to come in contact rotating components. Do not wear loose clothing, jewelry, or anything else that might become entangled with rotating components. Failure to comply can result in damaged equipment and serious injury or death to personnel.

3. From the neutral position, pull the starboard propulsion control (1) away from the dome approximately 1/4 inch (6 mm). This movement enables the operator to control engine speed while leaving the marine transmission in NEUTRAL. Open the throttle approximately 1/4 way by moving the starboard propulsion control forward.

WARNING

Starting fluid presents an extreme fire hazard. Liquid very quickly evaporates, even at low temperatures, and forms vapor (fumes) which can catch fire and burn with explosive violence. Invisible vapor spreads easily and can be set on fire by many sources such as open flame, welding equipment, and electric motors and switches. Do not use starting fluid near heat, sparks, or open flames. Failure to comply could result in injury or death.

Starting fluid is toxic if inhaled in large doses and is an irritant to eyes and skin. Do not breathe vapor or fumes. Do not taste or swallow. Ensure that starting fluid is used only in spaces with sufficient ventilation. Do not get in eyes, on skin, or on clothing. Failure to comply could result in injury or death.

⚠ CAUTION

Do not overuse starting fluid. Overloading the engine with starting fluid or using starting fluid with a warm engine can cause serious internal engine damage.

4. Signal the coxswain to start the engine from the pilothouse by pushing the START button (2) on the console.
5. Spray a 1 to 2-second burst of starting fluid into the engine air intake while the engine is cranking.
6. Follow the remainder of the propulsion engine starting procedure detailed in steps 4-6 of Propulsion Engine Starting procedure in WP 0023 00. If repeated starting attempts are necessary, repeat steps 4 and 5 above.

Diesel Generator Starting



Do not use starting fluid with the diesel generator engine. The diesel generator engine uses preheat elements to assist with cold weather starting. Use of starting fluid in conjunction with these preheat elements will cause serious internal engine damage.

No special cold weather starting procedures are required for starting the diesel generator engine. The starting procedures contained in WP 0023 00 apply to all weather conditions. Do not use starting fluid with the diesel generator engine. The diesel engine uses preheat elements to assist with cold weather starting. Use of starting fluid in conjunction with these preheat elements will cause serious internal engine damage.

Propulsion Engine and Diesel Generator Engine Lubricating Systems

Consult O203 03/97 for special lubrication requirements for the diesel generator engines.
Consult TM 5-2815-231-14 for special lubrication requirements for the propulsion engines.

Cooling Systems

Proper antifreeze level must be maintained in all engine cooling systems. Consult the PMCS contained in WP 0053 00 and WP 0054 00 for cooling system maintenance and inspection procedures.

Raw Water Systems

If the temperature in the engine room can be maintained above freezing by occasional operation of the propulsion engine or by operation of the diesel generator, no precautions are necessary for the raw water systems. If the engine room temperature can not be maintained above freezing, preserve the raw water systems as described in TB 740-97-4.

Batteries

A fully charged battery will not freeze until its temperatures reaches -75 °F (-59.4 °C). A battery with a 50% charge will freeze at 5 °F (-15.0 °C). It is important to keep the batteries charged in order to prevent freezing. If 220 Vac power is available via the diesel generator or shore power, the main batteries may be kept charged with the battery charger. The diesel generator starting battery is not charged by the battery charger. This battery must be kept charged by occasional operation of the diesel generator engine.

Hydraulic Systems

During cold weather, allow all hydraulic systems to run unloaded for at least 15 minutes. This will allow time for the oil to warm up and will prevent damage to hydraulic components due to lack of lubrication.

Potable Water System

If the vessel has 220 Vac power available via the diesel generator or shore power, the heat/air conditioning systems may be operated to warm the accommodation module. This will prevent freezing of the potable water system. If 220 Vac power is not available, if the heat/air conditioning system is inoperative, or if the heat/air conditioning units are unable to maintain the accommodation module at a temperature above freezing, preserve the potable water system as described in TB 740-97-4.

Black Water System

If the vessel has 220 Vac power available via the diesel generator or shore power, the heat/air conditioning systems may be operated to warm the accommodation module. This will prevent freezing of the black water system. If 220 Vac power is not available, if the heat/air conditioning system is inoperative, or if the heat/air conditioning units are unable to maintain the accommodation module at a temperature above freezing, preserve the black water system as described in TB 740-97-4.

Steering System

Before getting underway, test the steering system by moving the wheel from full port to full starboard. Observe the rudder angle indicator during this operation to make sure that the rudder moves through its full range of motion. Turn the wheel slowly at first to free the rudder from any ice which may have formed between the hull and the rudders at the waterline.

Hull and Fittings

1. Keep the caps installed on all hose and fill connections, except when filling.

WARNING

Ice buildup on ladders and walkways can make climbing and walking hazardous. Do not allow ice to build up on ladders and walkways. Failure to comply could result in injury or death.

2. Remove any ice buildup from ladders and walkways on the main deck.

HOT WEATHER OPERATION**Propulsion Engines**

Check engine temperature gauges often. Engine temperature should not rise above 195 °F (90.6 °C). If the engine temperature exceeds this limit, refer to the troubleshooting guide in TM 5-2815-231-14.

Diesel Generator

Check engine temperature gauges often. Engine temperature should not rise above 195 °F (90.6 °C). If the engine temperature exceeds this limit, refer to the troubleshooting guide in the diesel generator operator's and service manuals referenced in WP 0225 00.

Engine Lubricating Oil

1. Check the lubricating oil pressure gauges often. The lubricating oil pressure will drop slightly as the engine coolant temperature increases.
2. Refer to the PMCS contained in WP 0053 00 and WP 0054 00 for lubricating oil specifications for hot weather.

FOUL WEATHER OPERATION

1. Ensure that all gear, equipment, and cargo are properly stowed and secured.
2. Reduce propulsion engine speed as necessary to prevent the engines from surging as the stern lifts with the seaway.

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATION UNDER UNUSUAL CONDITIONS
FORDING, SWIMMING, AND DECONTAMINATION**

FORDING AND SWIMMING

Not applicable.

NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) CONTAMINATION

The LCM-8 Mod 2 is not equipped for protection against nuclear, chemical, or biological fallout. However, the vessel may be operated in an NBC contaminated environment provided the passengers and crew utilize proper NBC protective procedures (i.e. MOPP IV clothing) as defined in U.S. Army Training Manual, STP21-1-SMCT.

The LCM-8 Mod 2 is designed to accommodate performance of the daily maintenance inspections, safety checks, and operations by personnel dressed in MOPP IV protective clothing.

All exterior components, equipment, and machinery are capable of withstanding a seawater washdown. This washdown may be accomplished, in part, by the LCM-8 Mod 2's fire pump and fire monitor. Additional washdown may be accomplished by attending vessels, shore facilities, and/or portable fire pumps and hoses.

Further guidance on NBC contamination can be found in U.S. Army regulation AR 70-75.

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATION UNDER UNUSUAL CONDITIONS
EMERGENCY PROCEDURES**

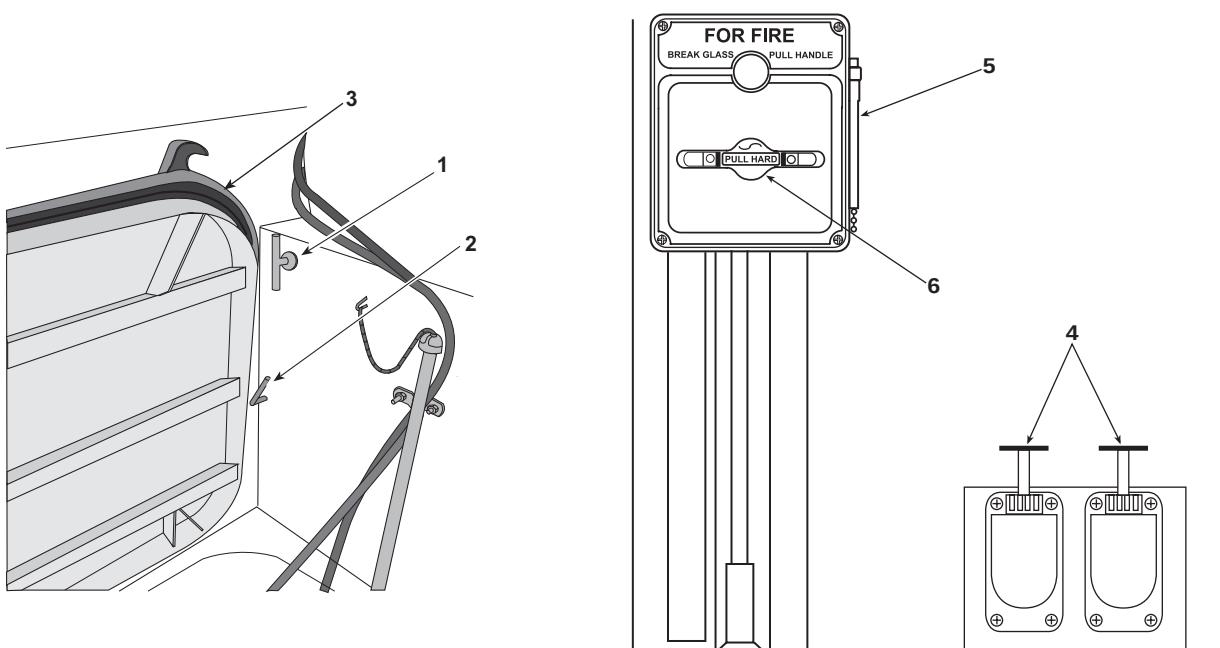
FIRE**Engine Room Fire Suppression System Activation**

1. Ensure that all personnel are out of the engine room.
2. Secure both propulsion engines and the diesel generator.
3. Secure both engine room ventilation fans.
4. CLOSE the engine room exhaust fire flaps by:
 - a. Pulling the T-bar lock bar (1) completely out of the housing.
 - b. Twisting the actuator handle (2) down (clockwise).
5. CLOSE the engine room access hatch (3).
6. CLOSE the engine room intake fire flaps by pulling the T-handles (4) located behind the coxswain's seat.

NOTE

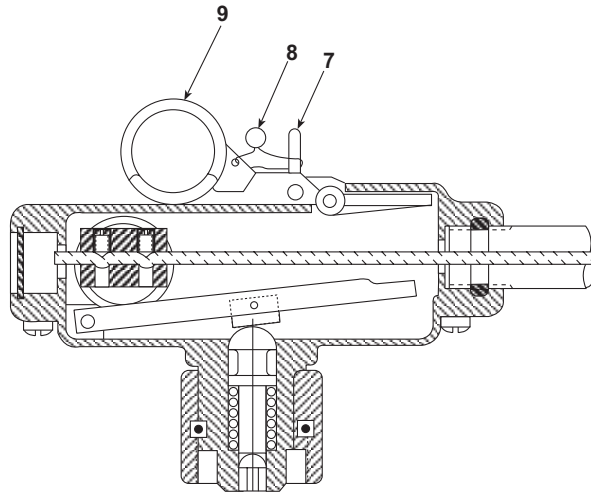
The engine room fire suppression system is not fitted with a time delay. Upon actuation of the system, FM-200 will be released immediately.

7. Use the hammer (5) to break the glass on the remote pull station, and firmly pull OUT on the T-handle (6).
8. The engine room fire suppression system should now actuate, and the engine room will fill with FM-200 agent.



Engine Room Fire Suppression System Activation (continued)

9. If the fire suppression system did not actuate when the T-handle (6) was pulled, actuate the system locally as follows:
 - a. Enter the port stowage locker through the accommodation module.
 - b. Remove the locking pin (7), breaking the seal wire (8).
 - c. Pull the local manual release lever (9).
 - d. Ensure that the engine room fills with extinguishing agent.

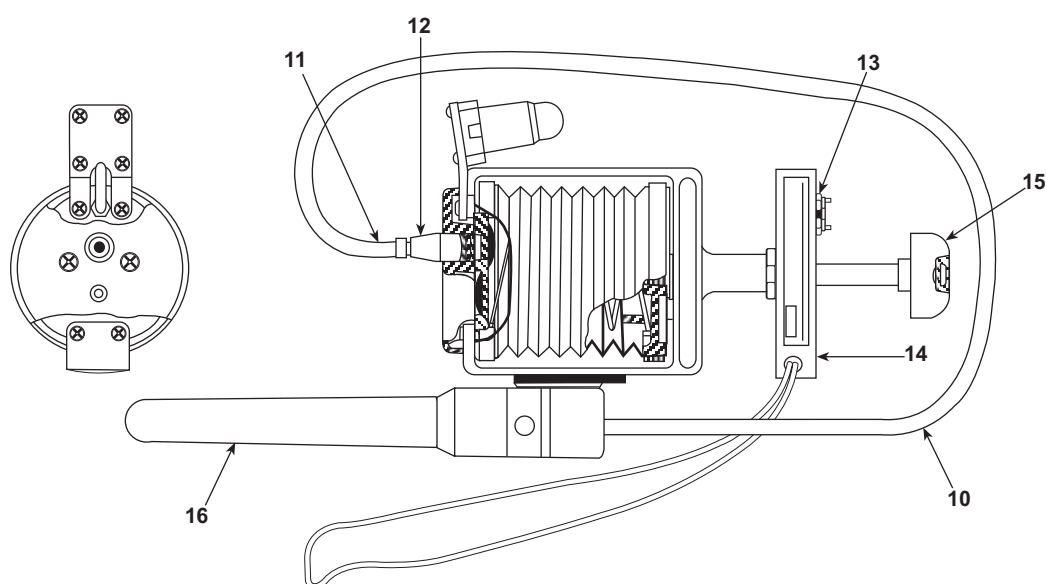
**Post Fire Reentry Procedure****WARNING**

Following a fire and actuation of the engine room fire suppression system, the engine room may contain a level of Hydrogen Fluoride (HF) gas that is dangerous to humans. Do not reenter the engine room until the post fire reentry procedure has been performed. Death or serious injury can result from unprotected entry into this space prior to completion of the post fire reentry procedure.

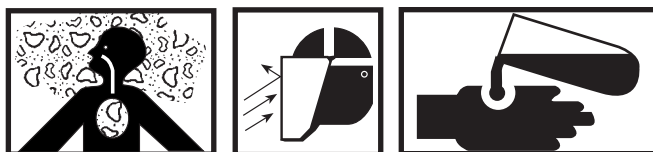
1. Wait at least 15 minutes after extinguishing the fire before performing this procedure. The natural decay rate for HF gas is approximately 15 minutes after a fire is extinguished.
2. Perform HF gas sampling as follows:
 - a. Remove the cap from the HF sampling port located immediately starboard of the engine room access hatch.
 - b. Install the detector tube assembly (10) to the pump by sliding the end of the detector tube rubber hose (11) over the tube holder (12).

Post Fire Reentry Procedure (continued)

- c. Zero the stroke counter (13).
- d. With all four fingers on the handle (14), fully press the knob (15) with the palm of the hand.
- e. Wait 30 seconds to allow the bellows to draw its full sample volume through the detector tube assembly (10).
- f. Compare the color of the detector element (16) to the scale printed on the element.
- g. Record the reading.
- h. Wait two minutes and repeat steps a-g.
- i. When three consecutive readings of 3 Parts Per Million (PPM) are obtained, the engine room is safe for reentry.



WARNING



Residue from FM-200 fire suppression is a minor irritant to the skin, the eyes, and the respiratory tract. All personnel who may come in contact with this residue must wear Personal Protective Equipment (PPE) that prevents the FM-200 residue from contacting the skin, eyes, and/or respiratory tract. Failure to comply could result in serious injury or death.

- A crewmember must don full firefighter ensemble, including Oxygen Breathing Apparatus (OBA), and enter the engine room to ensure that no reflash risks exist.

Post Fire Reentry Procedure (continued)

4. After ensuring that no reflash risks exist, the engine room must be ventilated in accordance with the following procedure:
 - a. The crewmember who checked for reflash risks should reset the engine room intake fire flaps while in the engine room and should remain in the engine room during ventilation to continue monitoring for reflash risks.
 - b. OPEN the engine room exhaust fire flaps.
 - c. Turn ON both engine room ventilation fans.
 - d. Ventilate the engine room for at least 15 minutes before proceeding to the cleanup phase.
5. After the engine room has been ventilated and has cooled down, clean up the engine room as follows:
 - a. The cleanup crew must don rain gear, NBC gloves, paper respirators (dust masks), chemical protective goggles, and face shields.
 - b. Wash down the engine room interior and all equipment with fresh water.

NOTE

Bilge water that has been exposed to FM-200 fire extinguishing agent in extinguishing a fire shall be classified and treated as hazardous waste.

- c. Use the oily water collection system to remove all contaminated bilge water from the engine room. Discharge this contaminated water only to a suitable treatment facility.

Fire in Spaces Other Than the Engine Room

Fires in spaces other than the engine room may be extinguished using standard established firefighting procedures.

Fire on a Weather Deck or on Another Vessel

In addition to the standard, established firefighting procedures mentioned above, fires on a weather deck or on another vessel may be controlled with the fire monitor. Operation of the fire monitor is detailed in the Fire Monitor section of WP 0026 00.

FLOODING

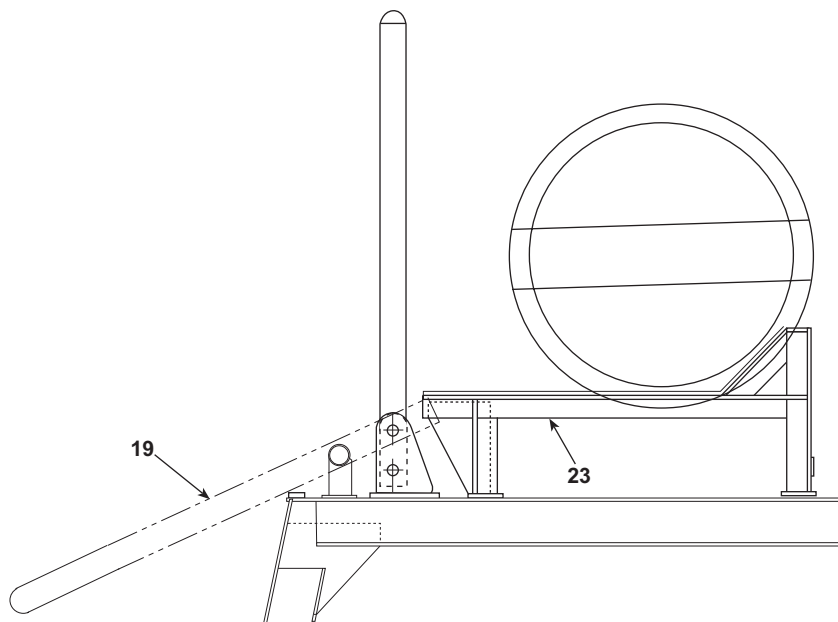
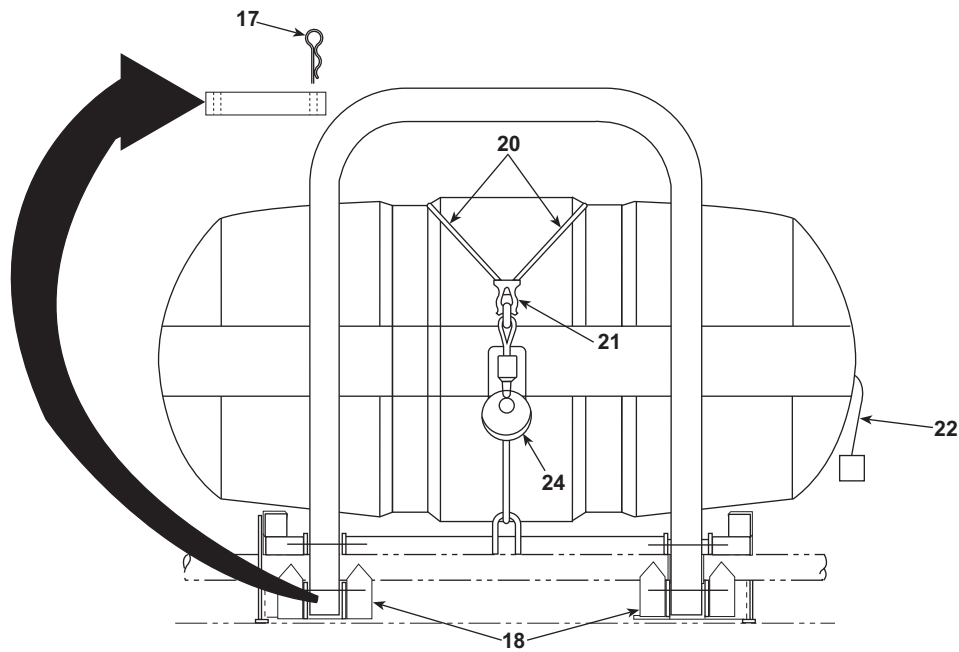
Most flooding is caused by structural damage below the waterline or by damaged raw water piping. Should flooding occur, the crew should:

1. Slow or halt the flow of incoming water by whatever means are available. If the water is entering through a hole in the hull, the hole must be temporarily repaired. There are two general methods of temporarily repairing a hole: either put something into it or put something over it. In either case, try to reduce the area through which water can enter the vessel or an area through which it can pass from one compartment to another.
2. Activate the bilge pumps as described in WP 0026 00. Operate the bilge pumps until the flooded compartment is pumped dry. If the flow of water into the compartment cannot be completely stopped, continue pumping as necessary in order to control the flooding in the affected space.

LIFE RAFT DEPLOYMENT

Manual Life Raft Deployment

1. Remove the hairpin retaining clips (17) from the lower retaining pins (18).
2. Remove the lower retaining pins (18) and lower the life raft rail (19).
3. Release the cradle retaining strap (20) by unlatching the strap's pelican hook (21).
4. Pull some of the 100 foot (30.5 m) operating cord (22) from the canister and attach it to a cleat.



Manual Life Raft Deployment (continued)

5. Roll the life raft from its rack (23) and allow it to roll over the life raft rail (19) on its way overboard.
6. Once the raft is in the water, pull in the operating cord (22) until it is taut. Once the operating cord is taut, pull hard on the cord to activate the raft's CO₂ inflating system. Pressure from this system will break the two canister retaining straps, separate the canister from the raft, and inflate the raft. The raft can be boarded in 30 seconds.
7. Pull the life raft alongside the parent vessel, and board the life raft one at a time. Ensure that one Search and Rescue Transponder (SART) is placed in each life raft, and that the Emergency Position Indicating Radio Beacon (EPIRB) is deployed. Operation of the SART and EPIRB are described in the SART/EPIRB OPERATION section of this work package.
8. Once all personnel are onboard the life raft, cut the operating cord (22) to allow the life raft to move away from the parent vessel.

Automatic Life Raft Deployment

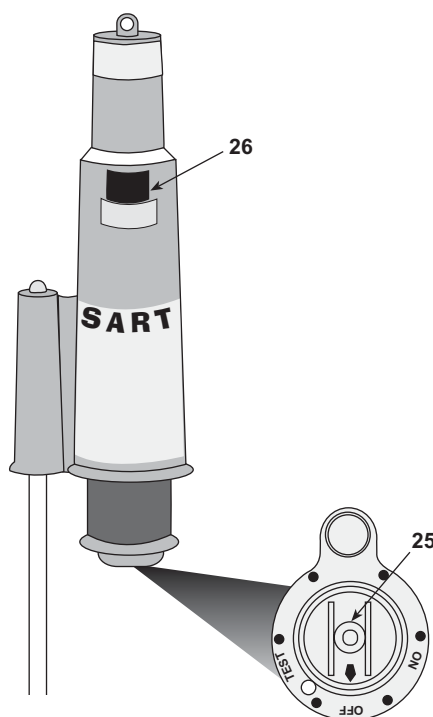
1. The life raft automatically deploys once the parent vessel has sunk. When the raft is submerged approximately 10 feet (3.1 m), a hydrostatic release device (24) automatically releases the cradle restraining strap, which allows the raft to float free of the cradle and parent vessel.
2. The 100 foot (30.5 m) operating cord (22) connects the life raft to the parent vessel. When the parent vessel sinks beyond the length of this cord, the raft's CO₂ inflating system is activated.
3. Pressure from the life raft's CO₂ system will break the two canister retaining straps, separate the canister from the raft, and inflate the raft.
4. The buoyancy of the inflated raft will break the weak link connection on the operating cord (22) automatically, freeing the raft from the parent vessel. The operating cord may also be cut to free the life raft.

SART/EPIRB OPERATION**SART**

The SART provides location information to search radars operating in the X-band. Once activated, the SART detects the radar signal of the search craft and sends a series of response pulses to the search radar of the search craft that causes a series of 12 equally spaced arcs to appear on the radar display.

To operate the SART:

1. Position the SART as high as possible in the life raft. The SART's range increases with its mounting height.
2. Set to ON the ON/OFF/TEST switch (25).
3. When the ON/OFF/TEST switch (25) is ON, the SART immediately enters the Test Mode. In this mode, both yellow and green lights (26) and the buzzer are tested. After approximately 1 second, the SART enters Receive Mode.
4. In Receive Mode, the yellow light (26) flashes slowly. The SART remains in Receive Mode until it receives a pulse from a search radar.
5. When a radar pulse is received, the SART switches to Reply Mode and transmits a series of pulses that appear on the search radar display as a series of arcs leading away from the SART's position. Reply Mode is indicated by rapid flashing of the red and yellow lights (26).
6. With a fully charged battery pack, the SART will operate in Receive Mode for a minimum of 96 hours. After this time period, it will still respond to normal interrogations for an additional 8 hours.

SART (continued)**EPIRB**

When activated, the EPIRB transmits a distress signal that is received by a system of orbiting satellites. The signal is relayed by the satellite to a Local User Terminal (LUT) where the location of the transmitting beacon is determined. This information is then relayed to a Mission Control Center, where rescue efforts by the appropriate Search and Rescue (SAR) forces are initialized.

The EPIRB transmits at 406.025 MHz and at 121.5 MHz. The 406.025 MHz signal contains, among other coded information, the unique identification number of the EPIRB, which allows identification of the specific vessel to which the EPIRB is assigned. The 121.5 MHz signal is primarily used by SAR forces as a homing signal during rescue operations. A strobe light assists in the visual location of the EPIRB.

To operate the EPIRB:

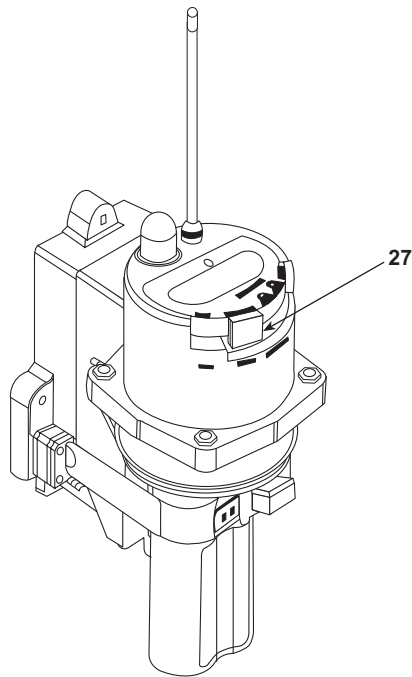
1. The EPIRB is normally left in its mounting bracket with the switch (27) in the READY position. With the switch (27) in the READY position, the EPIRB will only activate if it is removed from its mounting bracket and is placed in water.

NOTE

With the switch (27) in the READY position, the EPIRB will only transmit when it is in the water. If EPIRB transmission is desired, ensure that the EPIRB remains in the water, or move the switch to the ON position.

2. If the EPIRB will be placed in the water following an emergency, the switch (27) may remain in the READY position and the EPIRB will activate. When in the READY position, the EPIRB will only transmit while it is in the water.
3. If the EPIRB will be carried into a life raft, or if it will remain aboard the LCM-8 Mod 2 during transmission, set to ON the switch (27). In this position, the EPIRB will remain activated until the switch (27) is returned to the READY position.

EPIRB (continued)



EMERGENCY PROPULSION ENGINE SHUTDOWN

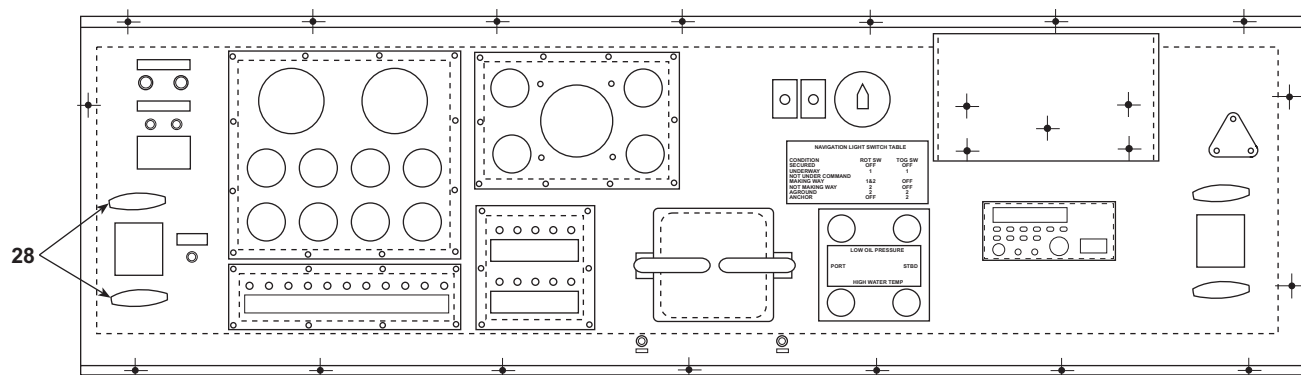
⚠ CAUTION

Using the emergency engine shutdown control to stop an engine may cause serious damage to the engine. The emergency engine shutdowns should only be used in a genuine emergency such as an engine room fire or a runaway engine.

The emergency engine shutdown controls, when pulled, will trip the air shutdown flaps located between the air inlet housing and the blower. When these flaps are closed, the air supply to the engines is secured. This lack of air will immediately shut down the engines. This procedure should be used to shut down the engines only in a genuine emergency such as an engine room fire or a runaway engine.

To shut down the engines in an emergency:

1. Pull the applicable emergency engine shutdown control (28) on the control console.



EMERGENCY PROPULSION ENGINE SHUTDOWN (continued)

2. After the engine stops, push the emergency engine control (28) all the way in.
3. The emergency engine shutdown can only be reset from the engine room. The reset procedure is described in TM 5-2815-231-14.

PROPULSION ENGINE FAILURE**One Engine Failure**

In the event that one propulsion engine fails, proceed to safe moorage under the power of one engine as follows:

1. Shut down the malfunctioning engine.
2. Steer the vessel to compensate for the loss of the engine.
3. If the vessel must be operated for more than 8 hours with an inoperative engine, follow the Transmission Backdriving instructions in this work package.

Two Engine Failure **CAUTION**

Secure towing lines only to mooring or towing bitts. Never secure towing lines to lifelines, handrails, or other deck hardware not intended for mooring or towing purposes. Failure to comply may result in damage to the vessel.

In the event that both propulsion engines fail, the LCM-8 Mod 2 will have to be towed. Towing arrangements shall be at the discretion of the coxswain. It may be necessary to anchor to prevent the vessel from drifting while awaiting a tow. Anchoring procedures are contained in WP 0023 00.

Transmission Backdriving

The marine transmission can be backdriven (propeller windmilling with the engine secured) provided that the vessel speed during the backdriving procedure does not exceed the normal propulsion speed of the vessel. To backdrive the marine transmission:

 CAUTION

The marine transmission must be lubricated at least every 8 hours during backdriving. Failure to comply will result in serious internal damage to the marine transmission.

1. Start the engine and operate the marine transmission in neutral for a minimum of 5 minutes to lubricate the internal transmission components. Do this once every 8 hours when the transmission is being backdriven.
2. Maintain the marine transmission oil level at the FULL mark on the dipstick.
3. If the propulsion engine is entirely inoperative and cannot be lubricated as described in step 1, perform the following lubrication procedure:
 - a. Plug the dipstick tube and fill the transmission completely full of oil.
 - b. Before backdriving, drain the oil down to the full level on the dipstick.

Transmission Backdriving (continued)

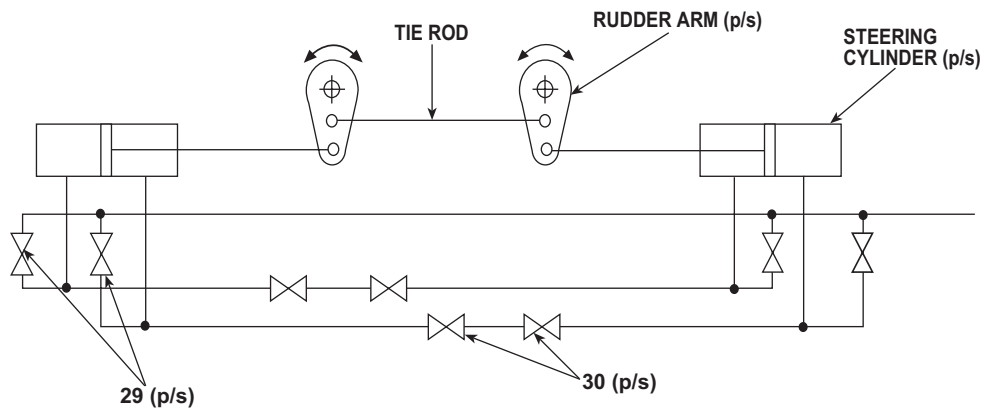
- c. Repeat this process every 8 hours when the transmission is being backdriven.

STEERING FAILURE

If one steering pump or one propulsion engine fails, the steering system will continue to operate using the remaining pump or engine. If both steering pumps fail, steering can still be accomplished by turning the helm. With both steering pumps inoperative, the helm unit acts as its own hydraulic pump. Should the hydraulic steering system fail completely, the vessel can be steered with the emergency tiller or by varying engine speed.

Steering With the Emergency Tiller

1. OPEN the bypass valves (29), two port and two starboard, in the lazarette to permit manual steering. Leave the four isolation valves (30) OPEN.



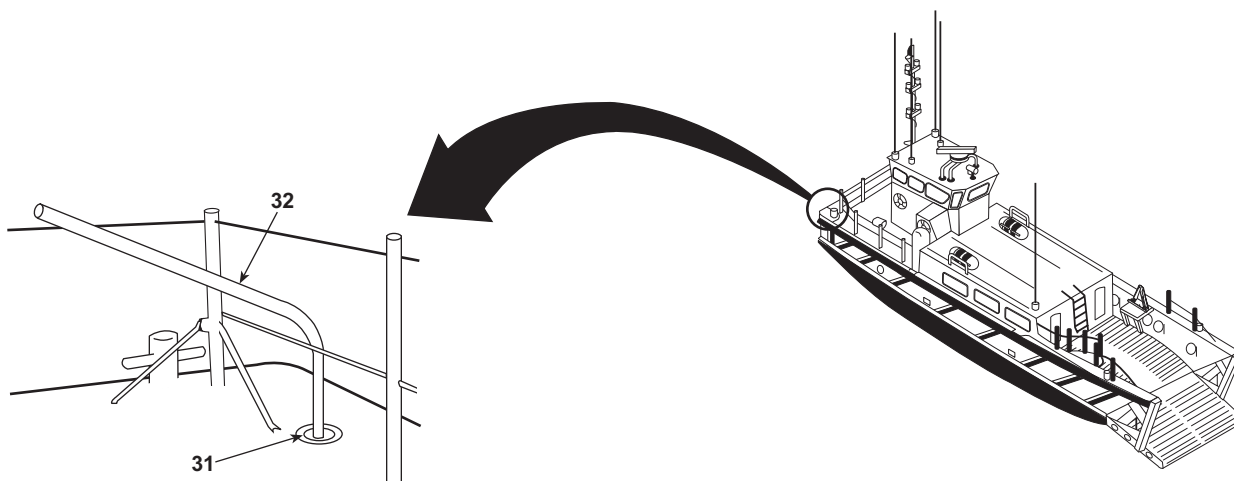
2. Remove the deck plate (31) over the port or starboard rudder stock in the main deck.
3. Remove the emergency tiller (32) from its stowage brackets on the main deck, aft.
4. Insert the emergency tiller (32) over the upper square rudder stock.

WARNING

Steering the LCM-8 Mod 2 with the emergency tiller must be accomplished at engine speeds below 1500 r/min. Steering by the emergency tiller at speeds over 1500 r/min may endanger the tiller operator and cause loss of steering control. Failure to comply could result in serious injury or death to personnel.

5. Steer the vessel by operating the emergency tiller. To turn the vessel to starboard, the emergency tiller must be moved port. To turn the vessel to port, the emergency tiller must be moved starboard.

Steering With the Emergency Tiller (continued)



Steering With the Engines and Marine Transmissions

1. To steer the vessel with the engines while underway:
 - a. To turn the vessel to port, decrease the port engine speed while maintaining the starboard engine speed. The turning rate will vary according to the difference in speed between the two engines. The greater the difference in engine speed, the greater the turning rate. When the turn is completed, increase the speed of the port engine to that of the starboard engine.
 - b. To turn the vessel to starboard, decrease the starboard engine speed while maintaining the port engine speed. The turning rate will vary according to the difference in speed between the two engines. The greater the difference in engine speed, the greater the turning rate. When the turn is completed, increase the speed of the starboard engine to that of the port engine.
2. To steer with the marine transmissions:

CAUTION

Always allow the engine speed to return to IDLE before shifting the marine transmissions between AHEAD and ASTERN. Shifting the marine transmissions between AHEAD and ASTERN at high engine speeds will cause serious internal damage to the marine transmissions and can produce damaging shock loads to the other propulsion machinery.

NOTE

If possible, the rudder should be positioned amidship when steering with the marine transmissions.

- a. To turn the vessel to port, place the starboard propulsion control lever in the AHEAD position and the port propulsion control lever in the ASTERN position. Engine speed can be varied to influence the turning rate, but the engines must be permitted to return to IDLE before shifting the marine transmissions between AHEAD and ASTERN. When the turn is complete, return both propulsion control levers to the NEUTRAL position and proceed with underway operations.
- b. To turn the vessel to starboard, place the port propulsion control lever in the AHEAD position and the starboard propulsion control lever in the ASTERN position. Engine speed can be varied to influence the turning rate, but the engines must be permitted to return to IDLE before shifting the marine transmissions between AHEAD and ASTERN. When the turn is complete, return both propulsion control levers to the NEUTRAL position and proceed with underway operations.

EMERGENCY STOPPING

If the LCM-8 Mod 2 is travelling forward at cruising speed, emergency stopping can be accomplished as follows:



Warn the passengers and crew as early as possible before initiating an EMERGENCY STOP procedure. Failure to comply could result in serious injury or death to personnel due to shifting cargo and lost footing.

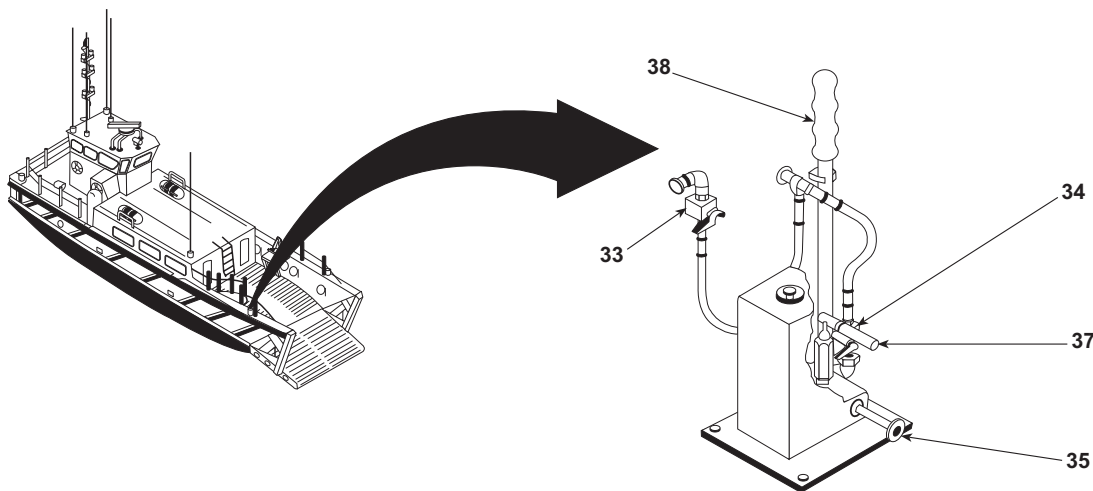
1. Place both propulsion control levers in the NEUTRAL position until the engines have returned to IDLE speed.
2. Shift both propulsion engine control levers into the ASTERN position.
3. Increase the speed of both engines to full speed ASTERN.
4. When the vessel stops, return both propulsion control levers to the NEUTRAL position.

EMERGENCY RAMP OPERATION

Lower the Ramp

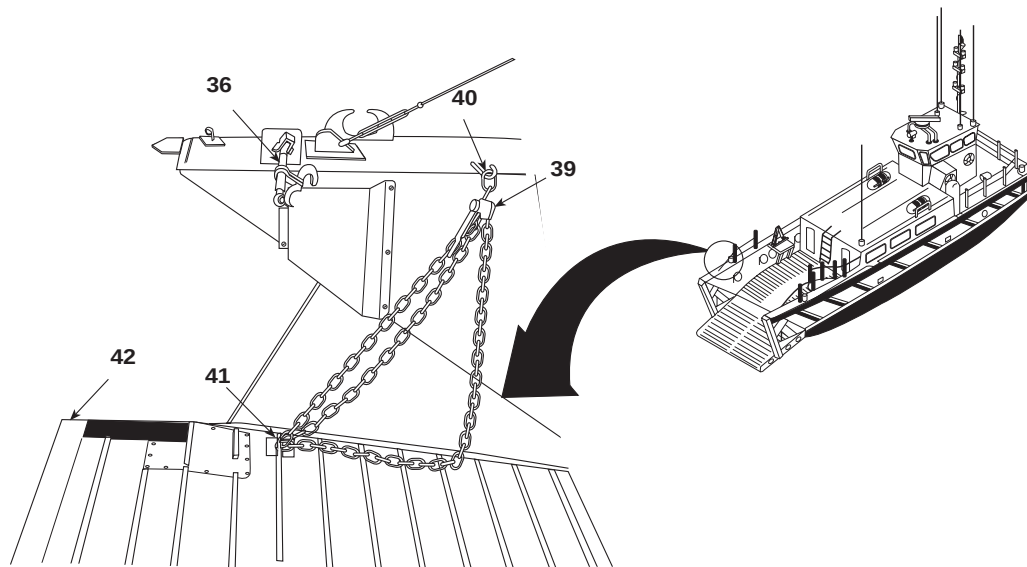
When the propulsion engines cannot be operated, or when a malfunction of the ramp hydraulic system is encountered, the bow ramp can be lowered by the following procedure:

1. Disengage both PTO clutch levers to stop the ramp hydraulic pumps. Refer to the Lowering the Bow Ramp procedure in WP 0023 00 for PTO clutch lever operating instructions.
2. Remove the cover from the hand pump compartment.
3. CLOSE the upper shutoff valve (33) in the hand pump compartment.



Lower the Ramp (continued)

4. OPEN the lower shutoff valve (34) in the hand pump compartment.
5. CLOSE the hand pump bypass valve (35).
6. Remove the port and starboard load binders (36).
7. Operate the hand pump (37) with the handle (38) until the winch brake releases and the ramp starts lowering.
8. Stop ramp lowering by opening the hand pump bypass valve (35).

**Raise the Ramp**

When the propulsion engines cannot be operated, or when a malfunction of the ramp hydraulic system is encountered, the bow ramp can be raised by the following procedure:

1. Connect the 3-ton chain falls (39) to the port and starboard hoisting padeyes (40) on the wing walls and to the attachment points in the ramp deck (41).
2. Operate the 3-ton chain falls (39) in unison until the ramp (42) is fully raised.
3. Secure the ramp (42) with the port and starboard load binders (36).
4. Remove the 3-ton chain falls (39) and stow them in the lazarette.

END OF WORK PACKAGE

CHAPTER 3

OPERATOR TROUBLESHOOTING PROCEDURES

FOR

LANDING CRAFT, MECHANIZED (LCM-8)

(ALL VESSELS WITH MOD 2 APPLICATION)

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR MASTER MALFUNCTION/SYMPTOM INDEX**

The work packages listed below provide information useful in diagnosing and correcting unsatisfactory operation or failure of LCM-8 Mod 2 systems and equipment. Troubleshooting procedures in these work packages are limited to the basic craft. Refer to the manuals listed in WP 0225 00 for troubleshooting procedures for the engines, marine transmissions, diesel generator, communication and navigation electronics, and the life rafts. Before using the troubleshooting procedures, ensure that all applicable operating procedures have been performed.

NOTE

The work packages below list the common malfunctions that you may find during the operation or maintenance of the equipment. You should perform tests/inspections and corrective actions in the order listed.

This manual cannot list all malfunctions that may occur, nor can it list all tests, inspections, and corrective actions. If a malfunction is not listed or is not corrected by the listed corrective actions, notify your supervisor.

<u>Malfunction/Symptom</u>	<u>Troubleshooting Procedure</u>
Accommodation module ventilation fans do not run	WP 0036 00
Accumulator pressure low	WP 0038 00
Air conditioner raw water pump inoperative	WP 0034 00
Air conditioning/heating compressor cycles on and off rapidly	WP 0036 00
Air conditioning/heating raw water pump does not pump or has low flow	WP 0036 00
Air conditioning/heating unit drips water into accommodation module or pilothouse	WP 0036 00
Air conditioning/heating unit fan blows, but will not heat or cool	WP 0036 00
Air conditioning/heating unit will not run	WP 0036 00
Alternator noisy	WP 0033 00
Alternator not charging	WP 0033 00
Alternator output low or unsteady	WP 0033 00
Batteries will not hold a charge	WP 0033 00
Battery compartment ventilation fan does not run	WP 0036 00
Bilge area drains slowly; very little overboard discharge	WP 0043 00
Bilge pump does not pump water	WP 0043 00
Black water pump stops pumping before the tank is empty	WP 0047 00
Black water pump runs, but will not pump	WP 0047 00
Black water pump will not run	WP 0047 00
Crane control lever does not return to its central position	WP 0041 00
Crane hydraulic pump noisy	WP 0041 00
Crane leaks hydraulic oil at its base	WP 0041 00
Crane motion is slow (one function only)	WP 0041 00
Crane moves jerkily	WP 0041 00
Crane will not operate in any mode	WP 0041 00
Electric toilet will not flush	WP 0048 00
Engine alarm alerts when no problem exists	WP 0035 00
Engine alarm system is inoperative	WP 0035 00
Engine room ventilation fans do not circulate air	WP 0036 00
Engine room ventilation fans do not run	WP 0036 00
Engine shutdown controls inoperative	WP 0037 00
Engine START button does not crank engine	WP 0033 00
Exhaust system is too hot	WP 0037 00
Exhaust system is too noisy	WP 0037 00
Fire detection system alerts when no problem exists	WP 0035 00
Fire detection system is inoperative	WP 0035 00

<u>Malfunction/Symptom</u>	<u>Troubleshooting Procedure</u>
Fire pump does not pump	WP 0044 00
Fire pump flow is low	WP 0044 00
Fire pump is noisy	WP 0044 00
Fire pump pressure is low	WP 0044 00
Fire pump pumps for a while and then quits	WP 0044 00
Fire pump stalls the generator engine	WP 0044 00
Fire pump vibrates excessively	WP 0044 00
Fuel supply to the engines is insufficient	WP 0039 00
General alarm system is inoperative	WP 0035 00
Horn will not sound	WP 0032 00
Hydraulic starting hand pump fails to charge the system	WP 0038 00
Lights do not light up	WP 0033 00
Navigation lights will not light up	WP 0032 00
Oily water collection pump will not pump water	WP 0045 00
Oily water collection pump will not run	WP 0045 00
Potable water pump cuts off while operating	WP 0046 00
Potable water pump runs when the faucets are closed	WP 0046 00
Potable water pump will not prime	WP 0046 00
Potable water pump will not shut off	WP 0046 00
Potable water pump will not pump water	WP 0046 00
Potable water tank level gauge inoperative	WP 0046 00
Propulsion controls do not effect a clutch or throttle change	WP 0037 00
Propulsion engine cranking speed is too slow	WP 0038 00
Propulsion engine fails to crank from the manual override	WP 0038 00
Propulsion engine fails to crank from the pilothouse switch	WP 0038 00
Propulsion system vibrates	WP 0037 00
Ramp continues to lower with control in NEUTRAL	WP 0040 00
Ramp control valve moves, but the winch cable does not	WP 0040 00
Ramp hand pump does not develop pressure	WP 0040 00
Ramp hydraulic pump is noisy	WP 0040 00
Ramp operation is slow	WP 0040 00
Recharging pump fails to raise the accumulator pressure	WP 0038 00
Rudder angle indicator does not respond	WP 0042 00
Shore power does not power the vessel	WP 0034 00
Steering hydraulic pump is noisy	WP 0042 00
Steering hydraulic pump pressure is low	WP 0042 00
Steering wheel is hard to turn	WP 0042 00
Steering wheel turns, but the rudder does not	WP 0042 00
Stuffing box excessively hot	WP 0037 00
Stuffing box leaks excessively	WP 0037 00
Water closet ventilation fan does not run	WP 0036 00
Water heater does not heat water	WP 0034 00

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
NAVIGATIONAL AIDS**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

References:

WP 0065 00

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Navigation lights will not light up.	1. Check to see if the main switch is OFF on the console. 2. Check to see if the circuit breaker is OFF in the control and distribution panel in the pilothouse. 3. Check to see if the bulb is defective. 4. Check for any obvious damage to the wiring, fixtures, and switches.	Turn ON the switch. Set to ON the circuit breaker. Replace the bulb (WP 0065 00). Notify unit maintenance.
2. Horn will not sound.	1. Check to see if the circuit breaker is OFF in the control and distribution panel in the pilothouse. 2. Check for any obvious damage to the wiring, fixtures, and switches.	Set to ON the circuit breaker. Notify unit maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
24 VDC ELECTRICAL SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

References:

WP 0038 00

WP 0059 00

WP 0060 00

WP 0063 00

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Alternator not charging.	1. Check to see if the drive belts are loose or broken. 2. Check alternator wiring for security and obvious damage. 3. Test alternator (WP 0060 00).	1. If drive belts are loose, tighten as necessary (WP 0060 00). 2. If drive belts are broken, notify unit maintenance for replacement. 1. If alternator wiring is loose, tighten wiring. 2. If alternator wiring is damaged, notify unit maintenance for repair. If alternator is defective, notify unit maintenance for replacement.
2. Alternator output low or unsteady.	1. Check to see if drive belts are loose. 2. Test alternator (WP 0060 00).	If drive belts are loose, tighten as necessary (WP 0060 00). If alternator is defective, notify unit maintenance for replacement.
3. Alternator noisy.	1. Check to see if drive belts are loose. 2. Check for misaligned belts/pulleys. 3. Loosen drive belts (WP 0060 00) and spin alternator drive pulley by hand, listening for noise and feeling for roughness in bearings.	If drive belts are loose, tighten as necessary (WP 0060 00). If belts/pulleys are misaligned, notify unit maintenance for repair. If bearings are noisy or rough, notify unit maintenance for alternator replacement.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. Batteries will not hold a charge.	1. Check batteries and cables (WP 0059 00). 2. Test alternators (WP 0060 00). 3. Check that battery charger is ON. 4. Steps 1-3 above check OK, but batteries will not hold a charge.	Correct as necessary (WP 0059 00). If alternator(s) are defective, notify unit maintenance for replacement. If battery charger is ON, but not charging batteries, notify unit maintenance. Notify unit maintenance to test batteries.
5. ENGINE START button does not crank engine.	1. Attempt to crank the engine with the manual start button located on the control valve. 2. Check the switches and wiring for obvious damage.	1. If the engine does not crank with the manual start button, the problem is hydraulic, not electric. Refer to WP 0038 00 for hydraulic starting system troubleshooting. 2. If the engine cranks with the manual start button, the problem is electrical. Continue with this troubleshooting procedure. If the switches and/or wiring are damaged, notify unit maintenance for repair.
6. Lights do not light up.	1. Check that the circuit breaker for the affected circuit is ON. 2. Check to see if bulb is defective. 3. Check for obvious damage to switches and wiring.	Set to ON the circuit breaker. Replace bulb (WP 0063 00). If damage exists, notify unit maintenance for repair.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
220/110 VAC ELECTRICAL SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

References:

WP 0019 00

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Air conditioner raw water pump is inoperative.	1. Check that the circuit breaker for the pump is ON (refer to WP 0019 00)	Set to ON the circuit breaker.
	2. Check that at least one heating/cooling unit is ON.	Turn ON at least one heating/cooling unit.
2. Shore power does not power the vessel.	1. Ensure that the shore power supply is energized.	Energize the shore power supply.
	2. Ensure that the shore power supply cord is free from obvious damage.	If the cord is damaged, notify unit maintenance for repair.
	3. Ensure that the 220 VOLT SUPPLY SWITCH is in the SHORE SUPPLY position.	Place the 220 VOLT SUPPLY SWITCH in the SHORE SUPPLY position.
3. Water heater does not heat water.	Check that the circuit breaker for the pump is ON.	Set to ON the circuit breaker.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
ALARM SYSTEMS**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Engine alarm system alerts when no problem exists.	1. Ensure that no alarm condition (low lube oil pressure or high coolant temperature) actually exists.	Correct any problems found.
	2. Check wiring and sensors on the engine for any obvious damage.	Notify unit maintenance of any damage found.
2. Engine alarm system is inoperative.	1. Check that circuit breaker is ON.	Set to ON the circuit breaker.
	2. Check that engine is running.	Start engine.
3. Fire detection system alerts when no problem actually exists.	Ensure that no alarm condition (fire in the engine room or smoke in the accommodation module) actually exists.	Correct any problems found.
4. Fire detection system is inoperative.	1. Check that circuit breaker is ON.	Set to ON the circuit breaker.
	2. Ensure that the SILENCE switch is in the down position.	Place SILENCE switch in the down position.
	3. Note whether the POWER light is lit.	If the POWER light is not lit, notify unit maintenance for repair.
5. General alarm system is inoperative.	1. Ensure that the circuit breaker is ON.	Set to ON the circuit breaker.
	2. Check the alarm bells for anything that might obstruct or muffle the bell.	Clear the obstructions from the bell.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
HEATING, VENTILATION, AND AIR CONDITIONING SYSTEMS**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Accommodation module ventilation fans do not run.	Check that circuit breaker is ON.	Set to ON the circuit breaker.
2. Air conditioning/heating compressor cycles on and off rapidly.	1. Check for dirty air filter in the cooling unit. 2. Check for insufficient raw water flow.	Clean or replace the air filter. Troubleshoot raw water flow as detailed in malfunction 5 below.
3. Air conditioning/heating unit drips water into the accommodation module or pilothouse.	Check condensate drain for clogging.	Clear clogging from condensate drain.
4. Air conditioning/heating unit fan blows, but will not heat or cool.	1. Check that the MODE switch is in the RUN position. 2. Check the thermostat setting. 3. Check for dirty air filter in the cooling unit. 4. Check for insufficient raw water flow. 5. Check for evaporator icing (cooling mode only).	Place the MODE switch in the RUN position. Set the thermostat to the desired setting. Clean or replace the air filter. Troubleshoot raw water flow as detailed in malfunction 5 below. Position the thermostat to heat the compartment, run in heat mode for 15 minutes, and then reset to cool mode. Notify direct support maintenance of need for repair.
5. Air conditioning/heating unit raw water pump does not pump or has low flow.	1. Check that the circuit breaker is ON. 2. Check that the seacock is OPEN. 3. Check that the raw water strainer is clean.	Set to ON the circuit breaker. OPEN the seacock. Clean the raw water strainer.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Air conditioning/heating unit will not run.	1. Check that the circuit breaker is ON. 2. Check that the MODE switch is in FAN or RUN.	Set to ON the circuit breaker. Place the MODE switch in the FAN or RUN position as required.
7. Battery compartment ventilation fan does not run.	Check that the circuit breaker is ON.	Set to ON the circuit breaker.
8. Engine room ventilation fans do not circulate air.	1. Check that the circuit breakers are ON. 2. Check that the switches on the console are ON. 3. Check that the intake and exhaust fire flaps are OPEN.	Set to ON the circuit breakers. Turn ON the switches. OPEN the fireflaps.
9. Engine room ventilation fans do not run.	1. Check that the circuit breakers are ON. 2. Check that the switches on the console are ON.	Set to ON the circuit breakers. Turn ON the switches.
10. Water closet ventilation fan does not run.	1. Check that the circuit breakers are ON. 2. Check that the door is CLOSED. 3. Check that the door has not been CLOSED more than 5 minutes.	Set to ON the circuit breakers. CLOSE the door. OPEN the door to reset the timer. CLOSE the door again.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
PROPULSION SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

References:

WP 0066 00

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Engine shutdown controls inoperative.	Check shutdown cable and connections for obvious damage.	Notify unit maintenance.
2. Exhaust system is too hot.	Check mufflers for leakage or damage.	Notify general support maintenance.
3. Exhaust system is too noisy.	1. Check that raw water valve to mufflers is OPEN.	OPEN the raw water valve.
	2. Check that the raw water seacock is OPEN.	OPEN the seacock.
	3. Check the duplex strainer for stoppage.	Service the duplex strainer (WP 0066 00).
4. Propulsion controls do not effect a clutch or throttle change.	1. Check shutdown cable and connections for obvious damage.	Notify unit maintenance.
	2. Check propulsion control head for obvious damage.	Notify unit maintenance.
5. Propulsion system vibrates.	Check propeller shaft and coupling for missing hardware or obvious damage.	Notify unit maintenance.
6. Stuffing box excessively hot.	Check adjustment of stuffing box.	Adjust stuffing box. If leakage persists, notify general support maintenance.
7. Stuffing box leaks excessively.	Check adjustment of stuffing box.	Adjust stuffing box. If leakage persists, notify general support maintenance.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
HYDRAULIC STARTING SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

References:

WP 0024 00

WP 0033 00

WP 0053 00

WP 0054 00

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Accumulator pressure low.	1. Check accumulator precharge pressure (WP 0024 00).	If accumulator precharge pressure is too low, notify unit maintenance.
	2. Check for signs of hydraulic oil leakage.	Repair leakage or notify unit maintenance.
2. Hydraulic starting hand pump fails to charge the system.	1. Check to see if the accumulator valves are CLOSED.	OPEN the accumulator valves.
	2. Check to see if the isolation valve is CLOSED (when trying to charge the port accumulators).	OPEN the isolation valve.
	3. Check to see if the blowdown valve is OPEN.	CLOSE the blowdown valve.
	4. Check the reservoir oil level.	Replenish the reservoir if the level is low.
	5. Check for ruptured/leaking hoses and lines.	Replace the defective hose or line, or notify unit maintenance.
3. Propulsion engine cranking speed is too slow.	1. Check that the proper oil is in use in the engine and in the hydraulic system (refer to WP 0053 00 and WP 0054 00).	Change oil to proper grade.
	2. Check that the inlet line between accumulators and the starter are not kinked or obstructed.	Repair line or notify unit maintenance.
	3. Check accumulator pressure.	Charge accumulators as necessary.
4. Propulsion engine fails to crank from the manual override.	1. Check the accumulator pressure.	Charge accumulators as necessary.
	2. Check that the accumulator valves are OPEN.	OPEN the accumulator valves.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Propulsion engine fails to crank from the pilothouse switch.	1. Troubleshoot the electrical side of the system (WP 0033 00). 2. If the electrical side checks OK, try cranking using the manual override on the control valve.	Repair as indicated. 1. If the engine cranks using the manual override, notify unit maintenance to replace control valve. 2. If the engine does not crank using the manual override, troubleshoot malfunction 4 above.
6. Recharging pump fails to raise the accumulator pressure.	Check the oil level in the reservoir.	Replenish reservoir if necessary.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
FUEL SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

References:

WP 0058 00

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Fuel supply to the engines is insufficient.	1. Check fuel level in both tanks. 2. Check fuel valve lineup. 3. Check the bowl on the fuel filter/water separator for the presence of water. 4. Check the fuel lines and hoses for leakage.	Fill tanks as required. Align fuel valves as required for condition. Normally all supply and return valves are OPEN. If water is present, service the fuel filter/water separator (WP 0058 00). Repair leaks, or notify unit maintenance for repair.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
RAMP SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Ramp continues to lower with the control in NEUTRAL.	Check to see if the hand pump lower shutoff valve is OPEN.	CLOSE the valve.
2. Ramp control valve moves, but the winch cable does not.	1. Check to see if the Power Take-Off (PTO) is engaged. 2. Check to see if the hydraulic diverter valve is in the RAMP position. 3. Check the oil level in the reservoir. 4. Check the hydraulic lines for leakage or damage.	Engage PTO. Place the hydraulic diverter valve in the RAMP position. Replenish the oil as necessary. Repair the leakage or notify unit maintenance.
3. Ramp hand pump does not develop pressure.	Check to see if the hand pump bypass valve is OPEN.	CLOSE the hand pump bypass valve.
4. Ramp hydraulic pump is noisy.	Check pump coupling for misalignment or damage.	Notify direct support maintenance if misalignment or damage is found.
5. Ramp operation is slow.	1. Check to see if lower hand pump shutoff valve is OPEN. 2. Check engine speed. 3. Check that both pumps are engaged.	CLOSE the valve. Increase engine speed if necessary. Engage both pumps.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
CRANE**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Crane control lever does not return to its central position.	Check control for proper lubrication.	Lubricate the control.
2. Crane hydraulic pump noisy.	Check hydraulic oil level in reservoir.	Replenish hydraulic oil as necessary.
3. Crane leaks hydraulic oil at its base.	Check for leaking skewing cylinder seals.	Notify general support maintenance for repair.
4. Crane motion is slow (one function only).	Check that the lever mounting screws are securely fastened.	Tighten the mounting screws as necessary.
5. Crane moves jerkily.	Check hydraulic oil level in reservoir.	Replenish hydraulic oil as necessary.
6. Crane will not operate in any mode.	1. Check that the starboard engine ramp hydraulic Power Take-Off (PTO) is engaged.	Engage the PTO.
	2. Check that the crane diverter valve switch in the pilothouse is ON.	Turn ON the crane diverter valve switch.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
STEERING SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Rudder angle indicator does not respond.	1. Check to see if the RUDDER ANGLE & TANK GAUGES circuit breaker is ON.	Set to ON the RUDDER ANGLE & TANK GAUGES circuit breaker.
	2. Check to see if the transmitter connecting linkage is obstructed.	Remove the obstruction.
2. Steering hydraulic pump pressure is low.	1. Check to see if the suction valves are OPEN.	OPEN the suction valves.
	2. Check the hydraulic oil lever in the reservoir.	Replenish the oil as required.
3. Steering hydraulic pump is noisy.	1. Check the hydraulic oil lever in the reservoir.	Replenish the oil as required.
	2. Check to see if suction valves are OPEN.	OPEN the suction valves.
4. Steering wheel is hard to turn.	1. Check to see if the isolation valves in the lazarette are OPEN.	OPEN the isolation valves.
	2. Check the helm unit for binding.	Notify unit maintenance if binding is found.
	3. Check the rudder for fouling.	Notify general support maintenance if fouling is found.
5. Steering wheel turns, but the rudder does not.	Check for leaking lines.	Tighten leaking lines or notify unit maintenance for repair.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
BILGE SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Bilge area drains slowly; very little overboard discharge.	1. Check to see if any system valve is partially CLOSED. 2. Check the suction strainer(s) for clogging. 3. Check to see if any suction valve is OPEN to a dry compartment.	OPEN the necessary system valve(s). Clear the affected suction strainer(s). CLOSE all suction valves to dry compartments.
2. Bilge pump does not pump water.	1. Check to see if the Power Take-Off (PTO) is engaged. 2. Check to see if the hydraulic diverter valve is in the RAMP position. 3. Check to see if the pump priming valves are CLOSED. 4. Check to see if the bilge pump valves are aligned properly (suction OPEN to wet compartments, suction OPEN to desired pump(s), discharge OPEN from desired pump(s)).	Engage the PTO. Place the hydraulic diverter valve in the BILGE position. OPEN the pump priming valves. Properly align the bilge pump valves.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
FIRE PUMP SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

References:

WP 0068 00

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Fire pump does not pump.	1. Check that fire pump clutch circuit breaker and switch are ON. 2. Check that the generator engine is running. 3. Check that the pump is primed. 4. Check that the seacock is OPEN. 5. Check that the fire pump strainer is clean.	Set to ON the fire pump circuit breaker and switch. Start the generator engine. Prime the pump. OPEN the seacock. Service the fire pump strainer (WP 0068 00).
2. Fire pump flow is low.	1. Check for leaks in suction piping. 2. Check that the seacock is fully OPEN. 3. Check that the fire pump strainer is clean.	Repair leaks as necessary or notify unit maintenance for repair. OPEN the seacock. Service the fire pump strainer (WP 0068 00).
3. Fire pump is noisy.	1. Check for misalignment of pump shaft. 2. Check for loose pump mounting.	Notify unit maintenance for repair. Notify unit maintenance for repair.
4. Fire pump pressure is low.	1. Check that seacock is fully OPEN. 2. Check that the fire pump strainer is clean.	OPEN the seacock. Service the fire pump strainer (WP 0068 00).
5. Fire pump pumps for a while and then quits.	Check for proper priming.	Prime the pump.
6. Fire pump stalls the generator engine.	1. Check that all electrical loads are removed from the diesel generator. 2. Check for misalignment of pump shaft.	Remove the electrical loads from the diesel generator engine by turning OFF all of the 220/110 Volt circuit breakers. Notify unit maintenance for repair.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Fire pump stalls the generator engine. (continued)	3. Check for obvious damage to the pump or pump shaft.	Notify unit maintenance for repair.
7. Fire pump vibrates excessively.	1. Check for misalignment of pump shaft.	Notify unit maintenance for repair.
	2. Check for obvious damage to the pump or pump shaft.	Notify unit maintenance for repair.
	3. Check for loose pump mounting.	Notify unit maintenance for repair.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
OILY WATER COLLECTION SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

References:

WP 0026 00

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Oily water collection pump will not pump water.	1. Check that the valves are aligned properly for the desired operation (WP 0026 00). 2. Check that the oily water suction strainer is clean.	Align valves properly for the desired operation. Clean the strainer.
2. Oily water collection pump will not run.	Check that the switch and the circuit breaker are ON.	Turn ON the switch and circuit breaker.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
POTABLE WATER SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Potable water pump cuts off while operating.	Check motor for overheating.	Ventilate pump area and wait for motor to cool.
2. Potable water pump runs when the faucets are closed.	Check lines for leakage.	Tighten loose connections or notify unit maintenance for repair.
3. Potable water tank level gauge inoperative.	Check that the RUDDER ANGLE & TANK GAUGES circuit breaker is ON.	Set to ON the RUDDER ANGLE & TANK GAUGES circuit breaker.
4. Potable water pump will not prime.	1. Check the water level in the tank. 2. Check the hose connections for tightness and signs of damage.	Replenish the tank as required. Tighten any loose hoses. Notify unit maintenance for repair of hoses.
5. Potable water pump will not pump water.	1. Check that the FRESH WATER PRESSURE switch is ON. 2. Check the water level in the tank.	Turn ON the FRESH WATER PRESSURE switch. Replenish the tank as required.
6. Potable water pump will not shut off.	1. Check for OPEN faucets. 2. Check lines for leakage.	CLOSE unused faucets. Tighten loose connections or notify unit maintenance for repair.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
BLACK WATER SYSTEM**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

References:

WP 0026 00

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Black water pump runs, but will not pump.	1. Check the alignment of the diverter valves (WP 0026 00). 2. Check the suction lines for leakage.	Align the diverter valves as required for the desired operation. Tighten any loose suction lines or notify unit maintenance for repair.
2. Black water pump will not run.	1. Check that BLACK WTR DISC PUMP circuit breaker is set to ON. 2. Check that the BLACK WATER DISCHARGE switch is in the ON position.	Set to ON the BLACK WTR DISC PUMP circuit breaker. Turn ON the BLACK WATER DISCHARGE switch.
3. Black water pump stops pumping before the tank is empty.	Check the black water tank vent for stoppage.	Clear the stoppage.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OPERATOR TROUBLESHOOTING PROCEDURES
ELECTRIC TOILET**

INITIAL SETUP:**Personnel Required:**

One Watercraft Engineer, 88L

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Electric toilet will not flush.	1. Check that the W/C PUMP circuit breaker is ON.	Set to ON the W/C PUMP circuit breaker.
	2. Check that the seacock and flushing valve (aft of the toilet) are OPEN.	OPEN the seacock and flushing valve.

END OF WORK PACKAGE

CHAPTER 4

**UNIT TROUBLESHOOTING
PROCEDURES
FOR
LANDING CRAFT, MECHANIZED (LCM-8)
(ALL VESSELS WITH MOD 2 APPLICATION)**

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
UNIT MASTER MALFUNCTION/SYMPTOM INDEX

The work packages listed below provide information useful in diagnosing and correcting unsatisfactory operation or failure of LCM-8 Mod 2 systems and equipment. Troubleshooting procedures in these work packages are limited to the basic craft. Refer to the manuals listed in WP 0225 00 for troubleshooting procedures for the engines, marine transmissions, diesel generator, communication and navigation electronics, and the life rafts. Before using the troubleshooting procedures, ensure that all applicable operating procedures have been performed.

NOTE

The work packages below list the common malfunctions which you may find during the operation or maintenance of the equipment. You should perform tests/inspections and corrective actions in the order listed.

This manual cannot list all malfunctions that may occur, nor can it list all tests, inspections, and corrective actions. If a malfunction is not listed or is not corrected by the listed corrective actions, notify your supervisor.

<u>Malfunction/Symptom</u>	<u>Troubleshooting Procedure</u>
Accommodation module ventilation fans do not run	WP 0050 00
All three windshield de-icer panels inoperative at the same time	WP 0050 00
Battery compartment ventilation fan does not run	WP 0050 00
Black water pump will not run	WP 0050 00
Black water pump will not pump	WP 0050 00
Black water pump stops pumping before the tank is empty	WP 0050 00
Electric toilet will not flush	WP 0050 00
Engine alarm inoperative	WP 0050 00
Engine alarm alerts when no problem exists	WP 0050 00
ENGINE START button does not crank engine	WP 0050 00
Engine room ventilation fan does not run	WP 0050 00
Fire detection system alerts when no problem exists	WP 0050 00
Navigation lights will not light up	WP 0050 00
One windshield de-icer panel will not operate	WP 0050 00
Potable water pump will not pump water	WP 0050 00
Potable water pump will not prime	WP 0050 00
Potable water pump will not shut off	WP 0050 00
Potable water pump runs when the faucets are closed	WP 0050 00
Potable water pump cuts off while operating	WP 0050 00
Water closet ventilation fan does not run	WP 0050 00

END OF WORK PACKAGE

**UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
UNIT TROUBLESHOOTING PROCEDURES**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts:

As required, consult TM 55-1905-242-24P

References:

FO-1
FO-2
TM 5-2815-231-14
TM 55-1905-242-24P
WP 0033 00
WP 0088 00
WP 0139 00

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	24 VDC ELECTRICAL SYSTEM	
1. ENGINE START button does not crank engine.	1. Use multimeter to check for proper operation of the switch. 2. Use multimeter to check for 24 Vdc at the control valve.	If the switch is defective, replace it. 1. If 24 Vdc is present at the control valve, replace the control valve (WP 0088 00). 2. If 24 Vdc is not present at the control valve, use the wiring diagram in FO-2 to locate the OPEN circuit. Repair the OPEN circuit.
	ALARM SYSTEMS	
1. Engine alarm alerts when no problem exists.	1. With the engine running, remove one lead from the oil pressure switch and observe the alarm lights. 2. With the engine running, remove one lead from the temperature switch and observe the alarm lights.	1. If the alarm ceases, replace the oil pressure switch. Refer to TM 5-2815-231-14. 2. If the alarm light remains lit, reinstall the lead and proceed to test 2 below.
2. Engine alarm inoperative.	1. Use the multimeter to check for 24 Vdc on both sides of the fuel switch.	1. If the alarm ceases, replace the temperature switch. Refer to TM 5-2815-231-14. 2. If the alarm light remains lit, use the wiring diagram in FO-2 to locate the short circuit. Repair the short circuit.
		1. If 24 Vdc is present on only one side of the fuel switch, replace the switch.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
ALARM SYSTEMS (continued)		
2. Engine alarm inoperative (continued).		2. If 24 Vdc is present on both sides of the fuel switch, or on neither side of the fuel switch, use the wiring diagram in FO-2 to locate the OPEN circuit. Repair the OPEN circuit.
3. Fire detection system alerts when no problem exists.	Disconnect the fire and smoke detectors one at a time and observe the alarm signal.	1. If disconnecting a fire and smoke detector causes the alarm to cease, replace that sensor. 2. If disconnecting the fire and smoke detectors does not cause the alarm to cease, use the wiring diagram in FO-2 to locate the OPEN circuit. Repair the OPEN circuit.
BLACK WATER SYSTEM		
1. Black water pump will not pump.	1. Check duckbill valves for obstruction.	Clear obstructions from the duckbill valves.
	2. Check the connection between the motor and the eccentric for any disconnected condition.	Repair the motor/eccentric connection as necessary.
2. Black water pump will not run.	1. Check for any binding at the bellows assembly.	Free the bellows assembly.
	2. Use multimeter to check for available voltage (24 Vdc).	If 24 Vdc is not available, troubleshoot the electrical system (WP 0033 00).
3. Black water pump stops pumping before the tank is empty.	1. Check for any binding in the bellows assembly.	Free the bellows assembly.
	2. Check the duckbill valves for obstruction.	Clear obstructions from the duckbill valves.
	3. Check the connection between the motor and the eccentric for any disconnected condition.	Repair the motor/eccentric connection as necessary.
ELECTRIC TOILET		
1. Electric toilet will not flush.	1. Use multimeter to check for 24 Vdc at the flush switch.	If 24 Vdc is not present, troubleshoot the 24 Vdc electric system (WP 0033 00).
	2. Check for stoppage at impeller or macerator blade.	Clear blockage from impeller or macerator blade.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
HEATING, VENTILATION, AND AIR CONDITIONING SYSTEMS		
1. Accommodation module ventilation fans do not run.	Use multimeter to check for 24 Vdc at the fan.	1. If 24 Vdc is present, replace the fan (WP 0139 00). 2. If 24 Vdc is not present, use the wiring diagram in FO-2 to locate the OPEN circuit. Repair the OPEN circuit.
2. Battery compartment ventilation fan does not run.	Use multimeter to check for 24 Vdc at the fan.	1. If 24 Vdc is present, replace the fan (WP 0139 00). 2. If 24 Vdc is not present, use the wiring diagram in FO-2 to locate the OPEN circuit. Repair the OPEN circuit.
3. Engine room ventilation fan does not run.	Use multimeter to check for 24 Vdc at the fan.	1. If 24 Vdc is present, replace the fan (WP 0139 00). 2. If 24 Vdc is not present, use the wiring diagram in FO-2 to locate the OPEN circuit. Repair the OPEN circuit.
4. Water closet ventilation fan does not run.	1. Use multimeter to check for 24 Vdc at the fan. 2. Use multimeter to check for 24 Vdc on both sides of the door switch with the door CLOSED. (The door must be CLOSED less than 5 minutes to prevent the timer from OPENING the circuit) 3. Use multimeter to check for 24 Vdc on both sides of the timer. (The door must be CLOSED for less than 5 minutes to prevent the timer from OPENING the circuit).	1. If 24 Vdc is present, replace the fan. 2. If 24 Vdc is not present, proceed to test 2. 1. If 24 Vdc is present on the line side of the door switch, but not on the load side, replace the switch. 2. If 24 Vdc is present on both sides of the switch, proceed to test 3. 3. If 24 Vdc is not present on either side of the switch, use the wiring diagram in FO-2 to locate the OPEN circuit between the door switch and the timer. Repair the OPEN circuit. 1. If 24 Vdc is not available on both sides of the timer, replace the timer.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
HEATING, VENTILATION, AND AIR CONDITIONING SYSTEMS (continued)		
4. Water closet ventilation fan does not run (continued).	3. Use multimeter to check for 24 Vdc on both sides of the timer. (The door must be CLOSED for less than 5 minutes to prevent the timer from OPENING the circuit) (continued).	2. If 24 Vdc is available on both sides of the timer, use the wiring diagram in FO-2 to locate the OPEN circuit. Repair the OPEN circuit.
NAVIGATIONAL AIDS		
1. Navigation lights will not light up.	Use multimeter to check that circuit is energized with 24 Vdc.	1. If 24 Vdc is present, replace the light. 2. If 24 Vdc is not present, use the wiring diagram in FO-2 to locate the OPEN circuit. Repair the OPEN circuit.
POTABLE WATER SYSTEM		
1. Potable water pump cuts off while operating.	1. Use multimeter to test pressure switch. The switch should be CLOSED when the potable water pressure is between 11 and 22 lb/in ² (0.8 and 1.5 bar) and open at all other pressures. 2. Use multimeter to test for power and ground at the motor.	Replace the pressure switch if it is defective. If power and ground are present, and motor does not run, replace the motor.
2. Potable water pump runs when the faucets are closed.	1. Check for check ball not seating. 2. Inspect tank and bladder valve for signs of leakage.	Clean any debris from the housing and free check ball. Repair or replace tank or bladder valve as necessary.
3. Potable water pump will not pump water.	Inspect impeller and housing for damage.	Repair or replace impeller or housing as necessary.
4. Potable water pump will not prime.	1. Check for available voltage at pump. Must be at least 21.6 Vdc. 2. Check the check ball for sticking. 3. Check the motor seal for signs of leakage. 4. Check the impeller for damage.	If available voltage is too low, troubleshoot the 24 Vdc electric system (WP 0033 00). Free the check ball. Replace the motor seal if it is leaking. Replace the impeller if it is damaged.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	POTABLE WATER SYSTEM (continued)	
4. Potable water pump will not prime (continued).	5. Check the housing for cracking.	Replace the housing if it is damaged.
5. Potable water pump will not shut off.	1. Check for available voltage at pump. Must be at least 21.6 Vdc.	If available voltage is too low, troubleshoot the 24 Vdc electric system (WP 0033 00).
	2. Check the impeller for damage.	Replace the impeller if it is damaged.
	3. Check pressure switch setting. The setting should not exceed 22 lb/in ² (1.5 bar).	1. Adjust the pressure switch if necessary.
		2. If the switch cannot be adjusted, replace it.
	4. Check the check ball for improper seating.	Clean any debris from the check ball housing.
	WINDSHIELD DE-ICER	
1. One windshield de-icer panel will not operate.	1. Visually inspect the de-icer assembly on the windshield for cracks, cuts, or visible damage.	1. If de-icer assembly is cut or otherwise damaged, replace the de-icer assembly on the windshield.
		2. If de-icer is not cut or otherwise damaged, proceed to the next test/inspection.
	2. Remove the cover from the de-icer unit's control box (on windshield) and check fuse.	1. If fuse is blown, replace fuse and re-check operation.
		2. If fuse blows again, replace the de-icer assembly on the windshield.
		3. If fuse is intact, proceed to the next test/inspection.
	3. Turn ON the de-icer and check the voltage across the black and white terminals in the de-icer unit's control box (on windshield).	1. If 110 Vac is present, replace the de-icer assembly on the windshield.
		2. If 110 Vac is not present, proceed to the next test/inspection.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. All three windshield de-icer panels inoperative at the same time.	WINDSHIELD DE-ICER (continued) 4. Open the junction box at the base of the center windshield and check the inoperative de-icer's wiring connections for 110 VAC, corrosion, or loose connections. 1. Check that the de-icer switch in the pilothouse is in the ON position. 2. Check that shore power is available or that the generator is online. 3. Check that the Feed to 110V XFMR circuit breaker is in the ON position. 4. Check that the De-Icer circuit breaker is in the ON position. 5. Remove the cover from the de-icer switch and check for 110 Vac on both sides of the de-icer switch with de-icer switch in the ON position.	1. If corrosion or loose connections are present, repair the corrosion and/or loose connection. 2. If 110 Vac is present, replace the cable between the junction box and the de-icer unit's control box (on windshield). 1. Connect shore power or bring generator online. 1. Set to ON the Feed to 110V XFMR circuit breaker. 1. Set to ON the De-icer circuit breaker. 1. If 110 Vac is available on both sides of the de-icer switch, remove the cover from the junction box at the base of the windshield and check for 110 Vac at the junction box. a. If 110 Vac is available at the junction box, check the individual de-icer assemblies per the One De-icer Panel Will Not Operate procedure in this work package. b. If 110 Vac is not available at the junction box, use the wiring diagram in FO-1 to locate the OPEN circuit. Repair the OPEN circuit. 2. If 110 Vac is available on the supply side of the de-icer switch, but not on load side of the de-icer switch, replace de-icer switch.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	WINDSHIELD DE-ICER (continued) 6. Open the 220/110 Volt distribution box and check for 110 Vac on both sides of the De-icer circuit breaker. 7. Open the 220/110 Volt distribution box and check for 220 Vac on both sides of the Feed 110V XFMR circuit breaker.	3. If 110 Vac is not available on the supply side of the de-icer switch, proceed to the next test/inspection. 1. If voltage is present on only one side of the De-icer circuit breaker, replace the De-icer circuit breaker. 2. If no voltage is present at the De-icer circuit breaker, proceed to the next test/inspection. 1. If voltage is present on only one side of the Feed 110V XFMR circuit breaker, replace the Feed 110V XFMR circuit breaker. 2. If no voltage is present at the Feed 110V XFMR circuit breaker, contact direct support maintenance.

END OF WORK PACKAGE

CHAPTER 5

MAINTENANCE INSTRUCTIONS
FOR
LANDING CRAFT, MECHANIZED (LCM-8)
(ALL VESSELS WITH MOD 2 APPLICATION)

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
MAINTENANCE INSTRUCTIONS
SERVICE UPON RECEIPT**

SITING REQUIREMENTS

Location

The primary mission of the LCM-8 Mod 2 is personnel transfer, light salvage, and Command and Control (C2). It will be used in coastal, harbor, and inland waterways, and is able to work in shallow inlets, rivers, and on unimproved beaches. The LCM-8 Mod 2, therefore, may be located along any waterway sufficiently deep to support the vessel. Because the facilities on board the LCM-8 Mod 2 are sufficient to support its crew of three for only short durations, consideration must be given to berthing and messing facilities for the crew.

Proximity to Power Sources

The LCM-8 Mod 2 is completely self-sufficient with regard to electrical power. A diesel generator, two engine-driven alternators, and a battery charger supply all of the electrical needs of the vessel. The vessel's electrical needs may also be supplied by a shore power connection to a shore facility or to another vessel. The shore supply source must be 220 Vac (Volts alternating current), single phase. The LCM-8 Mod 2 is outfitted with a shore power cable to make this connection.

SHELTER REQUIREMENTS

The LCM-8 Mod 2 requires no shelter. When not in use, the LCM-8 Mod 2 is moored alongside a pier, alongside another vessel, or is anchored.

SERVICE UPON RECEIPT

General

The services performed upon receipt of a new or used vessel are the responsibility of the receiving organization and will be performed by the crew and the issuing activity.

WARNING



Volatile materials must not be brought aboard, electrical circuits must not be energized, fuel tanks must not be topped off, and engines must not be started before firefighting equipment is available and operative. Failure to comply can result in damaged equipment and serious injury or death to personnel.

Inspecting and Servicing the LCM-8 Mod 2

The crew and issuing activity will conduct a 100 percent inventory of the vessel and required components per WP 0228 00. Any shortages will be listed and reported to the proper authority for corrective action. The crew will perform all of the operator PMCS as listed in WP 0053 00 up to, and including, those done annually. The unit will perform all of the unit PMCS as listed in WP 0054 00 up to, and including, those done annually. All defects and shortages will be recorded on DA Form 2404 as per DA PAM 738-750.

Used Equipment

A vessel received from storage will be inspected as specified in this work package. However, storage personnel will have performed the depreservation operation and outfitted and operated the vessel prior to the arrival of the crew.

INSTALLATION INSTRUCTIONS

If the LCM-8 Mod 2 has been in storage, or has been transported as deck cargo aboard a transport ship, perform the following procedures:

1. If preservation was performed on the vessel, depreservation is detailed in TB 740-97-4.
2. Reactivation of the vessel after movement is detailed in TB 740-97-4.
3. Open the engine room and lazarette hatches to ventilate these spaces.
4. Open the pilothouse windows and door and the accommodation module doors to ventilate these spaces.
5. Connect the battery cables to the batteries (WP 0092 00).
6. Remove the mast from the engine room, and install the mast (WP 0075 00).
7. Remove the following equipment from the lazarette and install/stow it as appropriate:
 - a. Emergency tiller.
 - b. Electric horn (WP 0126 00).
 - c. Stanchions, lifelines, and fittings (WP 0162 00).
 - d. Navigation lights (WP 0065 00).
8. Fill the potable water tank with potable water from an approved source.
9. Fill both fuel tanks with diesel fuel from an approved source.

PRELIMINARY SERVICING OF EQUIPMENT AND PRELIMINARY CHECKS AND ADJUSTMENTS OF EQUIPMENT

Perform all operator and unit PMCS up through, and including, the annual level.

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
MAINTENANCE INSTRUCTIONS
PMCS INTRODUCTION**

GENERAL

Preventive Maintenance Checks and Services (PMCS) are performed to keep the vessel in operating condition. The checks are used to find, correct, or report problems. Crew members are to do the PMCS jobs as shown in WP 0053 00. Unit maintenance members are to do the PMCS as shown in WP 0054 00. PMCS is done every day the vessel is operated, using the appropriate PMCS work packages. Pay attention to WARNING and CAUTION statements. A WARNING means someone could be hurt. A CAUTION means equipment could be damaged.

Before operating vessel equipment, do Before PMCS.

During operation, do During PMCS.

After operation, do After PMCS.

Once a week do Weekly PMCS. If vessel has not been operated in a week, also do Before PMCS at the same time as Weekly PMCS.

Do Monthly PMCS once a month. If vessel has not been operated in a month, also do After PMCS at the same time as Monthly PMCS.

If the vessel is being operated for the first time, do the Weekly and Monthly PMCS at the same time that the Before PMCS is performed.

If a deficiency is noted when performing PMCS, fix it, if possible, using troubleshooting procedures and/or maintenance procedures. If the deficiency cannot be corrected, write up the items not fixed on DA Form 2404 for unit maintenance. For further information on how to use this form, see DA PAM 738-750.

The right hand column of the PMCS table lists 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.

If tools required to perform PMCS are not listed in WP 0227 00, notify unit maintenance.

LEAKAGE DEFINITION**CAUTION**

Equipment operation is allowable with minor leakages (Class I or 11) 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.

When operating with Class I or 11 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 vessel. 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 vessel.

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 vessel. 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, notify unit maintenance.
2. Welds: Many items on the vessel 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 vessel is serviced when it needs it. For the proper lubrication and service intervals, see WP 0053 00 and WP 0054 00. Cleaning/changing intervals for the hydraulic system filters and strainers are contained in table 2, WP 0053 00.

LUBRICATION SERVICE INTERVALS - UNUSUAL CONDITIONS

The vessel will require extra service and care when it is operated under unusual conditions. High or low temperatures, long periods of hard use, or continued use in a dirty environment will break down the lubricant, requiring more frequent service.

LUBRICATION UNIVERSALS

1. Always clean fittings before lubricating them. Failure to do so can force contaminants into the bearing.
2. Always use the PMCS work packages as the guide for lubrication.
3. Never use the wrong type/grade of lubricant.
4. Never use too much lubricant.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
MAINTENANCE INSTRUCTIONS
OPERATOR PMCS INCLUDING LUBRICATION INSTRUCTIONS**

PMCS for generator set and propulsion engines are found in the appropriate Technical Manuals identified in WP 0225 00.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
1			HULL ABOVE WATERLINE Hull and Fittings		
	Before	0.3	a. Hull	Inspect hull for cracks, punctures, rust, or other deterioration which affect the watertight integrity or strength of the hull. Inspect for excessive wear due to rubbing or chafing.	Damage is such as to hinder safe operation of vessel due to a loss in watertight integrity or loss in strength. Vessel will not support a deck load.
	Before	0.1	b. Bitts	Inspect bitts and surrounding deck plating for cracks or breaks. Inspect welds for deterioration (breaks or rust). Keep bitts free of rust or scale.	Cracks or breaks are present. Bitt is loose or missing.
	Before	0.1	c. Tiedowns	Inspect tiedowns for severe bending, cracks or heavy rust.	Tiedowns are severely damaged or missing.
	Before	0.2	d. Chocks	Inspect chocks and surrounding deck plating for cracks or breaks. Inspect welds for deterioration.	Cracks or breaks are present.
	Before	0.2	e. Stanchions	Inspect stanchions and sockets for cracks and deterioration. Ensure that all stanchions are present and fit snugly in the sockets. Ensure that socket pins hold stanchions securely. Check stanchions for lifeline retaining rings. Ensure that safety chain is in good order.	Stanchions and sockets are cracked or broken. Stanchions not secured in sockets. Safety chains are missing or broken.
	Before	0.2	f. Lifelines	Inspect lifelines for wear (deteriorated cable, broken strands). Ensure that lifelines are taut and able to support a man's weight. Ensure that lifelines are properly supported by the stanchions and that the turnbuckles are in good order.	Lifelines are worn or missing. Lifelines are unsupported and unable to withstand a man's weight.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
2	Before	0.2	g. Hatches	Inspect hatch covers and coaming for physical defects. Ensure that hatch cover and gasket provide a watertight seal. Inspect hinges and dogs for freedom of movement and securing capability.	Hatch cover is missing or damaged where it will not form a watertight seal with the coaming.
	Before	0.2	h. Void Covers	Inspect covers for defects, damage, or missing bolts that affect watertight integrity. Inspect gasket for wear and sealing capability.	Void cover damaged or missing affecting watertight integrity.
	FOREDECK				
	Before	0.5	Ramp Hoist Hand Pump	Inspect pump for leaks or improper functioning. Ensure that pump provides pressure to system sufficient to lower the ramp.	Hand pump is inoperative. Class III leakage is noted.
	Before	0.5	Ramp Locking Hydraulic Cylinders	Inspect cylinders for leaks and tighten connections as necessary. Wipe oil and dirt from cylinders using clean rags.	Cylinders do not release latch hooks. Class III leakage is noted.
	Ramp Assembly				
	Before	0.2	a. Latch Mechanism	Inspect latch mechanism for cracks, bends, and rust. Check for proper engagement with U-bolt. Ensure that latch hook moves freely on its hinge.	Latch mechanism will not engage to secure or release.
4	Before	0.2	b. Hinge Assembly	Lower ramp to gain access to hinge assembly. Inspect hinges for cracks, breaks, rust, and wear. Ensure that hinges operate freely and are well lubricated. Inspect hinge pin for wear, signs that pin has shifted, or signs that pin is loose. Check tightness of nuts and bolts on end of hinge pin.	Damage to hinge assembly that renders operation dangerous.
	Before	0.2	c. Seal	Inspect seal for rips, tears, or missing sections. Ensure that seal maintains watertight integrity with ramp in secured position.	Seal does not maintain watertight integrity.
	Ramp Hydraulic System				
5	Before	1.5	a. Valves, Piping, Hoses, Fittings	Inspect pipe joints and hose assemblies for leaks and other damage.	Class III leakage noted.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
6	Before	0.5	b. Hydraulic Pump	Inspect pumps for leaks and proper hydraulic connections. Ensure that pumps operate and provide adequate hydraulic pressure to system.	Class III leakage noted. Pump does not supply sufficient pressure to operate ramp.
	Before	0.5	c. Ramp Hoist Control Valve	Inspect valve for leaks or improper function of valve in all positions (neutral, raise, and lower).	Class III leakage noted. Valve does not operate ramp.
	Before	0.5	d. Ramp Hoist Check Valve	Inspect check valve for leaks.	Class III leakage noted.
	Before	0.5	e. Ramp Reservoir Strainers and Filters	Check level indicator to ensure proper hydraulic fluid level. Replenish fluid as necessary. Check for leaks at filters and strainers.	Class III leakage noted. Reservoir is low or empty.
			Crane		
	Before	0.5	a. Control Bank	Check that the control valve bank levers automatically go back to their original position.	Control bank levers do not return to their original position.
	Before	0.5	b. Boom Assembly	Inspect boom assembly for deformity and obvious damage.	Boom assembly is deformed or damaged.
	Before	1.0		Apply four to six shots of grease to all of the grease fittings on the crane. See table 1.	
	Before	0.5	c. Extension Assembly	Inspect extension assembly for deformity and obvious damage. Extend and retract both sections and check for noise, binding, and jerky operation. See table 1.	Extension assembly is deformed or damaged.
7	Before	1.0		Apply two to three shots of grease to the sliding pads of the telescoping section and run the section in and out to distribute the grease. See table 1.	
	Before	0.5	Fire Monitor	Inspect fire monitor for security of mounting. Ensure that the monitor moves freely through all ranges of motion. Ensure that nozzle is installed and that nozzle controls move freely.	Monitor is loose on mounting. Monitor and nozzle do not move freely.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
8	Before	0.2	AFT DECK		
			Navigation Lights		
			a. Bulbs	Turn ON all navigation lights (WP 0026 00). Visually inspect all navigation lights for proper operation.	Any navigation light is inoperative.
9	Before	0.3	b. Lenses	Inspect all lenses for cracks, watertight integrity, and obstructions.	Watertight integrity of the light is compromised.
			Fuel Tanks, Valves, Piping, Hoses, and Fittings	Sound fuel tanks to determine fuel level. Add fuel as necessary. Record fuel levels in log.	
			Electric Horn	Check operation of horn. Check watertight integrity of horn.	Horn is inoperative.
10	Before	0.2	Searchlight		
			a. Bulb and Reflector Glass	Check searchlight for proper operation (WP 0026 00). Inspect reflector glass for cracks. Clean reflector glass if necessary.	Light is inoperative.
			b. Fixture	Check fixture for free movement and full range of motion. Ensure that fixture is securely mounted.	Fixture is not securely mounted.
11	Before	0.1	Windows	Check all windows for cracks and scratches. Ensure that sliding windows OPEN easily. Clean windows as required.	Windows are broken.
12	Before	0.3	Windshield Wipers, Wiper Motors, and Windshield De-icer	Check each windshield wiper arm to ensure that arm is firmly attached to windshield wiper motor shaft. Check each windshield wiper blade for wear.	Wiper arm is not attached to motor shaft. Wiper blades worn enough to damage windows or obstruct vision.
				Check the operation of each motor through all speed ranges.	Any motor is inoperative.
				Turn ON windshield de-icer (WP 0026 00) and check that the windshields become warm to touch.	Windshield de-icer inoperative in cold weather.
13	Before	0.5	PILOTHOUSE		

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
14	Before	0.1	Control and Distribution Panel	Inspect panel to ensure that all circuit breakers are in place and function properly.	Any circuit breakers are missing or inoperative.
15	Before	0.1	Comm Nav Aids D/B	Inspect panel to ensure that all circuit breakers are in place and function properly.	Any circuit breakers are missing or inoperative.
16	Before	0.5	Propulsion Control Head	Check propulsion controls for full range of motion and proper control of throttle and clutch linkages.	Controls do not effect the desired throttle or clutch action.
17	Before	0.5	Control Console Instrument Lights, and Switches	Inspect control console to ensure that all gauges are present and functioning. Ensure that switches are functioning properly and securely mounted. Ensure that all panel lights are operational.	Gauges and controls are missing or malfunctioning. Switches that control operational facets of the vessel are malfunctioning.
18	Before	1.0	Steering Helm Unit	Inspect unit and connections for leaks or damage. Check that the helm operates freely and controls rudder through its full range of motion.	Helm unit cannot turn rudder through 35° port to 35° starboard (hard over to hard over). Class III leakage noted.
19	Before	0.1	Fire Detection System	Place the PANEL TEST switch in the ENGINE RM position. The alarm should sound and the ENGINE RM light should light. Place the PANEL TEST switch in the ACCOM position. The alarm should sound and the ACCOM light should light.	Alarm does not sound. Light does not light.
20	Before	0.5	Black Water Tank Monitor System	Inspect black water tank monitor system display for security of mounting. Check that all LEDs are intact. Check level indication of tank.	Monitor display not securely mounted. LEDs missing, broken or loose. Black water tank level malfunctioning or inoperative.
21	Before	0.5	Potable Water Tank Monitor System	Inspect potable water tank monitor system display for security of mounting. Check that all LEDs are intact. Check level indication of tank.	Monitor display not securely mounted. LEDs are missing, broken or loose. Potable water tank level indicator malfunctioning or inoperative.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
22	Before	0.2	Cooling Unit	Turn ON cooling unit and check that unit heats and cools. Check that fan blows in all positions.	Cooling unit does not heat or cool. Fan does not operate.
23	Before	0.1	Engine Room Fire Suppression System	Inspect engine room fire suppression system for security of mounting. Ensure that glass is intact on pull box. Ensure that hammer is on chain and properly mounted.	Pull box not securely mounted. Pull box glass broken. Hammer or chain missing.
LAZARETTE					
24	Before	0.5	Steering System Valves, Piping, Hoses, and Fittings	Inspect valves, pipe joints, and hose assemblies for leaks and other damage.	Class III leakage noted.
25	Before	0.5	Steering Cylinders	Inspect cylinders and hydraulic connections for leaks or damage.	Class III leakage noted.
26	Before	0.2	Counterbalance Valve	Inspect counterbalance valve and connections for leaks.	Class III leakage noted.
27	Before	0.3	Fuel Tanks, Piping, Valves, Hoses, and Fittings	Inspect tanks, valves, piping joints, and hose assemblies for leaks or damage. Check fuel tank for water contamination using water indicator paste. Ensure that filler cap, sounding tube cap, and vent cover are in place and seal the fuel oil system.	Class III leakage noted. Fuel tank contaminated with water.
ENGINE ROOM					
28	Before	0.1	Alternator and Belts	Check alternator for proper mounting. Check bolts for tightness. Check belt tension.	Alternator not securely mounted. Belts not properly tensioned.
29	Before	0.1	Lighting Fixtures and Switches	Check for proper operation of lights. Inspect fixtures for secure mounting, cracked, broken, or missing guards, globes and bulbs. Inspect wiring connecting switches and fixtures for wear, fraying, and proper routing.	Lights inoperative.
30	Before	0.1	Throttle Linkage	Inspect throttle linkage ball joints for looseness.	Ball joints loose enough to possibly come off.
31	Before	0.1	Clutch Linkage	Inspect clutch linkage ball joints for looseness.	Ball joints loose enough to possibly come off.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
32	Before	0.5	Steering System a. Steering Pump	Inspect pumps and connecting hose assemblies for leaks. Ensure that pumps are properly mounted.	Class III leakage noted. Both pumps do not operate.
	Before	0.2	b. Hydraulic Reservoir	Check hydraulic fluid level. Check for leakage or damage to reservoir. Replenish fluid as necessary.	Class III leakage noted. Reservoir is low or empty.
33	Before	0.1	Bilge System Bilge Pump	Inspect bilge pumps and hydraulic motors for secure mounting. Check for hydraulic fluid or bilge water leakage.	Class III hydraulic leakage noted. Pump fails to function.
	Before	0.5	Hydraulic Starting System a. Valves, Piping Hoses, and Fittings	Inspect valves, piping joints, and hose assemblies for damage or leakage.	Class III leakage noted.
34	Before	0.5	b. Recharging Pump	Inspect pump for leaks or damage. Check that the pump is mounted securely.	Class III leakage noted.
	Before	0.5	c. Accumulator	Inspect accumulator and gauge connections for leaks or damage.	Class III leakage noted.
	Before	0.1	d. Reservoir and Filters	Check tank level indicator. Replenish fluid as required.	Reservoir is low or empty.
	Before	0.2	e. Control Valve	Check control valves and hydraulic connections for leaks or damage. Ensure that valves function normally in LOCAL, REMOTE, and MANUAL modes.	Class III leakage noted. Valves do not function in all modes.
	Before	0.5	Raw Water System a. Piping, Hoses, and Valves	Inspect piping, especially connecting hoses for cracks, breaks, and leaks.	Class III leakage noted.
35	Before	0.5		Tighten hoses or clamps as necessary.	
	Before	0.2	b. Duplex Strainer	Check strainer for sediment and other foreign matter. Ensure that plastic cylinder and screen are clean.	Strainer clogged with sediment or other foreign matter.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
36	Before	0.1	Fuel Filter/Water	Inspect filter and connections for leaks. Inspect the clear bowl for accumulation of filtered deposits or water.	Class I, II, or III leakage noted. Bowl is cracked or broken.
37	Before	0.2	Fuel Piping, Valves, Hoses, and Fittings	Inspect piping, valves, hoses, and fittings for leaks or damage.	Class I, II, or III leakage noted.
38			Engine Cooling System		
	Before	0.5	a. Piping, Hoses and Valves	Inspect pipe joints and hose connections for cracks or leaks.	Class III leakage noted.
		0.5		Tighten hoses or hose clamps as necessary.	
	Before	0.1	b. Expansion Tank	Inspect sight glass for coolant level (1/2 full when cold). Replenish coolant as necessary. Check tank for cracks, leaks, or corrosion.	Class III leakage noted. Tank is not securely mounted.
39	Before	0.2	220/110 V Wiring	Visually inspect 220/110 V wiring for signs of wear, damaged insulation, and proper routing.	Wiring insulation is missing, exposing bare conductor.
40	Before	0.5	220/110 V Control and Distribution Panel	Inspect panel to ensure that all breakers and switches have full range of motion. Ensure that all breakers and switches are present and function properly.	Switch or breaker will not move. Switch or breaker missing.
41	Before	0.2	Power Transformer 220 to 110 V	Check that transformer is mounted securely. Visually check wiring at transformer for wear, damaged insulation, and proper routing.	Transformer is not mounted securely. Wiring insulation is missing, exposing bare conductor.
42	Before	0.2	Fire Detection System	Ensure that flame detectors are securely mounted and free from obstruction. Check wiring for damage.	Detector obstructed. Wiring damaged.
43	Before	0.5	Air Conditioning Raw Water Piping, Valves, Strainers, Hoses, and Fittings	Inspect air conditioner raw water piping valves, strainers, hoses, and fittings for leakage and damage.	Class III leakage noted.
	Before	2.0		Disassemble and clean the strainer.	
44	Before	0.5	Air Conditioning Raw Water Pump	Inspect pump for secure mounting, leaks, and damage.	Class III leakage noted.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
45	Before	2.0	Oily Water Collection System a. Piping, Valves, Strainers, Hoses, and Fittings	Inspect piping, valves, strainers, hoses and fittings for leakage and damage. Ensure that all valves operate freely through entire range of motion. Ensure that hand pump and discharge hoses are properly stowed. Ensure that tank discharge fittings are capped.	Class III leakage noted. Valves not free.
	Before	1.0	b. Waste Oil Tank	Inspect oily water tank for cracks, leaks, or corrosion. Inspect sight gauge for leakage or damage. Inspect piping connections for tightness.	Class III leakage noted.
46			Firefighting and Ballast System		
	Before	0.2	a. Piping, Valves, Strainers, Hoses, and Fittings	Inspect piping, valves, strainers, hoses, and fittings for leakage and signs of damage.	Class III leakage noted.
	Before	1.0	b. Fire Pump	Inspect fire pump for leakage or damage. Check drive shaft and flanges for loose fasteners. Tighten fasteners as necessary.	Class III leakage noted.
	Before	0.5	c. Electric Clutch	Inspect clutch for loose fasteners or damage. Tighten fasteners as required. Inspect wiring for damage and proper routing.	Wiring damaged.
47	Before	0.2	Hoses, Nozzles, etc.	Inspect hoses and nozzle for secure mounting and damage. Ensure that nozzle is not obstructed.	Hose or nozzle damaged. Nozzle obstructed.
			ACCOMMODATION MODULE		
48	Before	0.1	Batteries and Cables	Check batteries for leaks and corrosion. Check cables for tight, clean connections. Check battery mounting for secure fit.	Battery leaking. Cable or connection badly corroded. Battery loose in mount.
49	Before	0.3	24 V Control and Distribution Panel	Inspect panel to ensure that all breakers and switches have full range of motion. Ensure that all breakers and switches are present and function properly.	Switch or breaker will not move. Switch or breaker missing.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
50	Before	0.2	24 V Wiring	Check 24 V wiring for tightness of connections, corrosion, and damage.	Wiring insulation missing, exposing bare conductor. Wiring connections loose or badly corroded.
51	Before	0.5	Battery Charger	Inspect battery charger for secure mounting. Check wiring connections for damage, looseness, or corrosion. Check housing for cracking or other damage.	Battery charger not securely mounted. Wiring connections loose or badly corroded. Housing cracked or damaged.
52	Before	0.2	Power Transformer 220 to 110 V	Check that transformer is mounted securely. Visually check wiring at transformer for wear, damaged insulation, and proper routing.	Transformer is not mounted securely. Wiring insulation is missing, exposing bare conductor.
53	Before	0.2	Fire Detection System	Inspect smoke detectors for security of mounting. Check wiring connections for security and damage.	Detectors not mounted securely. Wiring loose or damaged.
54			Potable Water System		
	Before	0.5	a. Piping, Hoses, and Valves	Check hoses and connections for leaking. Check faucets for proper operation.	Class III leakage noted. Faucets inoperative.
	Before	0.5	b. Pressure Set	Check pressure set for secure mounting. Check for leaks at connections. Open a faucet. The pressure set should come on. Close the faucet. The pressure pump should shut off within thirty seconds.	Class III leakage noted. Pressure set does not cycle on and off properly.
	Before	0.5	c. Water Heater	Check water heater for secure mounting. Check for leaks all around unit.	Class III leakage noted.
55			Black Water System		
	Before	0.5	a. Piping, Hoses, and Valves	Check hoses and connections for leaking. Check faucets for proper operation.	Class III leakage noted. Faucets inoperative.
	Before	0.2	b. Discharge Pump	Check pump for secure mounting. Check for leaks at connections. Check that Y-valves operate freely through full range of motion.	Class III leakage noted. Valve not free.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
56	Before	0.3	Heating, Ventilation, and Air Conditioning a. Cooling Unit	Turn ON cooling unit and check that unit heats and cools. Check that fan blows in all positions.	Cooling unit does not heat or cool. Fan does not operate.
	Before	0.5	b. Ventilation Fan	Check all ventilation fans for secure mounting. Check for tight connection through bulkhead. Check proper air-flow (out of the compartment).	Fan inoperative.
57	During	1.0	HULL ABOVE WATERLINE Ramp Winch	Inspect winch to ensure that it operates freely with no binding in either direction. Check to see if winch vibrated during operation.	Winch is not capable of operating ramp.
			Winch Assembly		
58	During	0.5	FORE DECK Ramp Hydraulic System	Inspect pumps for leaks and proper hydraulic connections. Ensure that pumps operate and provide adequate hydraulic pressure to system.	Class III leakage noted. Pump does not supply sufficient pressure to operate ramp.
			a. Hydraulic Pump		
59	During	0.5	b. Ramp Hoist Control Valve	Inspect valve for leaks or improper function of valve in all positions (NEUTRAL, RAISE, and LOWER).	Class III leakage noted. Valve does not operate ramp.
			AFT DECK		
60	During	0.1	Fuel Tanks, Piping, Valves, Hoses, and Fittings	Sound fuel tanks to determine fuel level. Add fuel as necessary. Record fuel levels in log.	System not charging properly.
			ENGINE ROOM		
60	During	0.1	Alternator and Belts	Monitor ammeters. Charging rate will vary depending upon load, but should always stay in the charge range.	

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
61	During	0.1	Bilge System Bilge Pump	Inspect bilge pumps and hydraulic motors for secure mounting. Check for hydraulic fluid or bilge water leakage.	Class III hydraulic leakage noted. Pump fails to function.
62	During	0.2	Raw Water System Duplex Strainer	Check strainer for sediment and other foreign matter. Ensure that plastic cylinder and screen are clean.	Strainer clogged with sediment or other foreign matter.
63	During	0.1	Fuel Filter/Water Separator	Inspect filter and connections for leaks. Inspect the clear bowl for accumulation of filtered deposits or water.	Class I, II, or III leakage noted. Bowl is cracked or broken.
64	During	0.5 0.5 0.1	Engine Cooling System a. Piping, Hoses and Valves b. Expansion Tank	Inspect pipe joints and hose connections for cracks or leaks. Tighten hoses or hose clamps as necessary. Inspect sight glass for coolant level (1/2 full when cold). Replenish coolant as necessary. Check tank for cracks, leaks, or corrosion.	Class III leakage noted. Class III leakage noted. Tank is not securely mounted.
65	During	0.1	Exhaust System Mufflers, Piping, and Lagging	Inspect for exhaust leaks, corrosion, or other damage. Inspect for exposed areas from missing lagging.	Exhaust leaks. Missing lagging.
66	During	0.2	Stuffing Box	Inspect stuffing box for condition of packing and amount of leakage (2 to 3 drops per minute). Check gland for excess heat by placing hand on gland. Check flex hose and clamps for proper installation and deterioration.	Excessive leakage.
67	During	0.5	Air Conditioning Raw Water Piping, Valves, Strainers, Hoses, and Fittings	Inspect air conditioning raw water piping valves, strainers, hoses, and fittings for leakage and damage.	Class III leakage noted.
68	During	0.5	Air Conditioning Raw Water Pump	Inspect pump for secure mounting, leaks, and damage.	Class III leakage noted.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
69	During	1.0	Firefighting and Ballast System Fire Pump	Inspect fire pump for leakage or damage. Check drive shaft and flanges for loose fasteners. Tighten fasteners as necessary.	Class III leakage noted.
70	During	0.3	Heating, Ventilation, and Air Conditioning a. Cooling Unit	Turn ON cooling unit and check that unit heats and cools. Check that fan blows in all positions.	Cooling unit does not heat or cool. Fan does not operate.
	During	0.5	b. Ventilation Fan	Check all ventilation fans for secure mounting. Check for tight connection through bulkhead. Check proper air-flow (out of the compartment).	Fan inoperative.
71	During	1.0	PILOTHOUSE Steering Helm Unit	Inspect unit and connections for leaks or damage. Check that the helm operates freely and controls rudder through its full range of motion.	Helm unit cannot turn rudder through 35° port to 35° starboard (hard over to hard over). Class III leakage noted.
72	After	0.1	Engine Cooling System Expansion Tank	Inspect sight glass for coolant level (1/2 full when cold). Replenish coolant as necessary. Check tank for cracks, leaks, or corrosion.	Class III leakage noted. Tank is not securely mounted.
73	After	0.5	AFT DECK Fuel Tanks, Piping, Valves, Hoses, and Fittings	Sound fuel tanks to determine fuel level. Add fuel as necessary. Record fuel levels in log.	
74	Weekly	0.5	FORE DECK Ramp Hoist Hand Pump	Remove fill plug on top of hand pump and fill reservoir approximately 2/3 full with hydraulic oil specified in table 1.	No Fluid. Class I leak at pump.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
75	Weekly	2.0	Ramp Winch	Inspect hydraulic motor for leaks and tighten connections as necessary. Check mounting bolts for security and tighten as necessary.	Class III leakage is noted.
76	Weekly	0.5	AFT DECK Navigation Lights	Check fixtures for secure mounting to mast and pilothouse. Check switches for looseness and malfunction.	Fixtures not securely mounted. Switches malfunction.
77	Weekly	0.2	LAZARETTE Steering Cylinders	Grease steering tie bar pins and steering cylinder pins. See table 1.	
78	Weekly	0.2	Rudder a. Rudder Posts	Apply three shots of grease to each of the 3 fittings on each rudder post. See table 3.	
		1.0	b. Rudder and Tiller	Ensure that tiller is stowed properly. Check tiller sockets for accumulation of foreign matter. Remove foreign matter from tiller sockets. Check rudder shaft packing for leakage.	Class III leakage noted.
79	Weekly	0.3	Fuel Tanks, Piping, Valves, Hoses, and Fittings	Inspect tanks, valves, piping joints, and hose assemblies for leaks or damage. Check fuel tank for water contamination using water indicator paste. Ensure that filler cap, sounding tube cap, and vent cover are in place and seal the fuel oil system.	Class III leakage noted. Fuel tank contaminated with water.
80	Weekly	0.4	ENGINE ROOM Throttle Linkage	Inspect linkage from control head to governor for cable damage. Ensure that linkage is free to move and is not bound at any point.	Linkage is bent, kinked, severed, or loose, affecting throttle control.
81	Weekly	0.4	Clutch Linkage	Inspect linkage from control head to transmission for cable damage. Ensure that linkage is free to move and is not bound at any point.	Linkage is bent, kinked, severed, or loose, affecting clutch control.
82			Steering System		

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
83	Weekly	0.1	Filters and Strainers	Inspect filters and strainers leakage or damage.	Class III leakage noted.
			Hydraulic Starting System		
84	Weekly	0.5	Hand Pump	Inspect hand pump and connections for leaks or damage. Check to make sure that pump will charge accumulators.	Class III leakage noted. Pump will not charge accumulators.
85	Weekly	0.5	Air Conditioning Raw Water Piping, Valves, Strainers, Hoses, and Fittings	Inspect air conditioning raw water piping valves, strainers, hoses, and fittings for leakage and damage.	Class III leakage noted.
86	Weekly	2.0		Disassemble and clean the strainer.	
87	Weekly	0.1	Mufflers, Piping, and Lagging	Inspect for exhaust leaks, corrosion, or other damage. Inspect for exposed areas from missing lagging.	Exhaust leaks. Missing lagging.
			ACCOMMODATION MODULE		
88	Weekly	0.5	Windows and Furnishings	Inspect windows for cracks and leaks. Inspect furnishings for damage, loose fasteners, missing components.	Window cracked or broken.
			HULL ABOVE WATERLINE		
89	Monthly	2.0	Hull and Fittings	Weld or chip as necessary, then prime and paint as per TB 43-0144.	
90			Voids and Compartments		

WARNING

Before entering the voids, ensure that the space has been inspected, an attendant posted, and a Confined Space Entry Permit secured as outlined in FM 55-502 "Watercraft Safety." Only personnel who have current Confined Space Entry training may enter a confined space. Failure to follow these precautions can result in injury or death.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
89	Monthly	4.0	FOREDECK Ramp Winch	Inspect voids for any damage or deterioration (hull pierced, rust, etc.). Check for signs of water, oil, or other signs of leakage into compartments. Check for any unusual signs of stress to the structure.	Voids are not watertight.
	Monthly	8.0		Pump bilges.	
	Monthly	1.0		Winch Assembly	
		0.5		Fill the final drive assembly to the level of the filler plug with lubricant specified in table 1.	
90		0.5	Ramp Assembly	Fill the final drive assembly to the level of the filler plug with lubricant specified in table 1.	Ramp does not provide watertight integrity while underway.
	Monthly	0.3		a. Latch Mechanism	
	Monthly	0.5		b. Hinge Assembly	
	Monthly	0.2		c. Ramp	
	Monthly	1.5		d. Cables and Sheaves	
				Inspect ramp for dents, cracks, rust, or other damage that will inhibit safe functioning of the ramp.	
				Scrape to remove rust, then prime and paint as necessary per TM 43-0144.	
				Inspect cables and sheaves for wear and serviceability. Pay out cable and check for reduction of rope diameter beyond its nominal value; worn or broken outside wires; severe bending, kinking, crushing, caging, or a popped core; or evidence of damage due to welding or other heat sources.	Cable is damaged. Sheaves will not rotate or hold cable to guide it.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
91	Monthly	0.2	e. Cable and Sheaves	Apply four to six shots of grease to the sheave grease fittings. See table 3. WARNING Do not apply grease to the wire rope by hand. Broken strands of wire can cause injury to personnel. Apply grease only with a brush.	
	Monthly	2.5		Using a brush, apply a thin coat of wire rope grease to the full length of the wire rope.	
	Monthly	0.2	f. Chains	Inspect chain stops and load binders for cracks, rust, and other damage. Check chain for missing and weak links. Ensure that chains support ramp equally. Ensure that load binders operate properly.	One or both chains are defective or missing. One or both load binders are defective or missing.
			Crane		
	Monthly	1.0	a. Control Bank	Check all bolts, lines, and fittings for signs of damage. Check that the valves are free of rust and dirt. Ensure that all warning and instruction labels are intact.	Damaged or loose lines or bolts. Missing or illegible labels.
	Monthly	0.5	b. Extension Assembly	Inspect extension assembly for deformity and obvious damage. Extend and retract both sections and check for noise, binding, and jerky operation.	Extension assembly is deformed or damaged.
92	Monthly	1.0	c. Boom Assembly	Apply four to six shots of grease to all of the grease fittings on the crane. See table 1.	
			AFT DECK		
92	Monthly	0.5	Searchlight	Lubricate fixture pivots with lubricant specified in table 1. Work light through full range of motion to distribute lubricant.	
93	Monthly	0.5	Antenna Assemblies	Inspect all antenna assemblies for mounting. Inspect all antenna wiring for damage.	Any antenna is damaged enough to affect operation of its communication system.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
94	Monthly	0.2	Mast	Inspect mast and mast support for cracks, dents, and other major material defects.	Mast is cracked or dented to a degree that will affect its strength.
	Monthly	3.0		Remove rust and paint as necessary in accordance with TB 43-0144.	
95	Monthly	0.5	Fuel Tanks, Piping, Valves, Hoses, and Fittings	Sound fuel tanks to determine fuel level. Add fuel as necessary. Record fuel levels in log.	Class III leakage noted.
			PILOTHOUSE		
96	Monthly	2.0	Propulsion Control Head	Remove dome (cover) from control head and lubricate as necessary.	
97	Monthly	1.0	Control Console Instrument, Lights and Switches	Clean console, including all gauges and switches. Polish all chrome and brass to prevent corrosion.	
98	Monthly	1.5	Steering Helm Unit	Remove access plate in wheel house and check hydraulic hose connections. Tighten hoses as required. Clean dirt and oil from unit with clean rag.	
				 CAUTION The emergency engine shutdown control must only be tested with the engine secured. Serious engine damage can result from activating the emergency engine shutdown with the engine running.	Cables bind such that full range of motion is not attained. Emergency engine shutdowns do not cause the intake air flaps to close.
99	Monthly	0.5	Engine Shutdown Control and Emergency Engine Shutdown Control	With the engines secured, operate the engine shutdown controls and check for any binding or stiffness throughout the entire range of motion. Check the emergency engine shutdown controls for any binding or stiffness throughout the entire range of motion. Ensure that the intake air flaps close when the emergency engine shutdown controls are activated. Reset the intake air flaps as detailed in TM 5-2815-231-14.	
100	Monthly	0.1	24/12 V Converter	Check both converters for security of mounting. Check wiring for tightness and corrosion.	Converter not securely mounted. Wiring loose or corroded.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
101	Monthly	0.5	Condensing Units	Remove access plate from pilothouse deck. Check condensing units for security of mounting and signs of leakage (raw water or refrigerant). Clean any debris that has accumulated around condensing units.	Class III raw water leakage noted.
102	Monthly	0.2	LAZARETTE	Remove grille and clean grille and filter.	
103	Monthly	2.5		Remove rust from outside of tanks, then prime and paint as necessary in accordance with TB 43-01442. Sample fuel from each fuel tank bottom drain valve.	
104					
			ENGINE ROOM		
			Steering System		
	Monthly	0.2	a. Relief Valve	Inspect valve and connections for leaks.	Class III leakage noted.
	Monthly	0.2	b. Flow Divider	Inspect valve and connections for leaks.	Class III leakage noted.
	Monthly	0.3	c. Check Valve	Inspect valve and connections for leaks.	Class III leakage noted.
105			Bilge System		
	Monthly	0.1	Bilge Pump	Tighten mounting hardware as necessary.	
106	Monthly	2.0	Piping, Valves, Hoses, and Fittings	Inspect all bilge piping joints, valves, and hose assemblies for leaks. Inspect valves to ensure that they OPEN and CLOSE completely with no binding.	Class III leakage noted. Valves fail to fully OPEN and CLOSE.
	Monthly	2.0		In each void, check bellmouth strainer for debris and clean as necessary.	
107			Hydraulic Starting System		
	Monthly	0.5	Starting Motor	Inspect motors and connections for leaks or damage.	Class III leakage noted.
	Monthly	0.5		Tighten hose connections and mounting hardware as required.	

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
108	Monthly	0.2	Stuffing Box	Inspect stuffing box for condition of packing and amount of leakage (2 to 3 drops per minute). Check gland for excess heat by placing hand on gland. Check flex hose and clamps for proper installation and deterioration.	Excessive leakage.
109	Monthly	2.0	Oily Water Collection System	Disassemble and clean strainer.	
110	Monthly	1.8	Firefighting and Ballast System	Inspect all piping from pump to fire monitor and forward ballast tank for signs of leaking or damage. Check fire monitor and forward ballast fill valves for free operation through full range of motion.	Class III leakage noted. Valves not free.
111	Monthly	1.0	a. Fire Pump	Apply two to three shots of grease to the single grease fitting on each of the input and output shafts. See table 1.	
112	Monthly	0.5	Potable Water System	Replace potable water filter.	
113	Monthly	0.5	Windshield Washer Pump	Check windshield pump in void above potable water tank for security of mounting. Check for leakage all around unit.	Class III leakage noted.
114			Black Water System		
	Monthly	0.5	Water Closet Flushing System	Inspect all flushing system piping, valves, and fittings from the seacock to the black water tank for leakage or damage.	Class III leakage noted.
115			Heating, Ventilation, and Air Conditioning		
	Monthly	0.3	Cooling Unit	Remove grille and clean grille and filter.	
116	Monthly	1.5	Piping, Valves, Strainers, Hoses, and Fittings	Check all piping, valves, strainers, hoses, and fittings for leakage or damage.	Class III leakage noted.
117			Engine Room Fire Suppression System		
	Monthly	1.8	a. Hoses, Nozzles, etc.	Inspect all hoses, nozzles, fitting, and hardware for signs of damage. Check that cable conduit and fittings are undamaged.	Damage to hoses, nozzles, fittings, hardware, or conduit.

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
118	Monthly	0.5	b. Cylinder Assembly, FM-200	Inspect for secure mounting. Check for damage to cylinder and discharge fittings.	Damage to cylinder or discharge fittings.
	Periodic (50 Hours)	0.5	FOREDECK Ramp Locking Hydraulic Cylinders	Grease 3 grease fittings on each latch assembly. Pump 3 strokes of grease into each fitting. See table 1.	

Table 1. Lubricant Chart

Item to Be Lubricated	Capacity	Lubricant Required		
		-65 °F to 0 °F -54 °C to -18 °C	-10 °F to 40 °F -23 °C to 4 °C	32 °F to 120 °F 0 °C to 49 °C
Steering Hydraulic System	18 gal (68 L)	Fluid, Hydraulic RH (H-544) MIL-H-46170		
Ramp Hydraulic System	90 gal (341 L)	Fluid, Hydraulic RH (H-544) MIL-H-46170		
Starting Hydraulic System	7 gal (27 L)	Fluid, Hydraulic RH (H-544) MIL-H-46170		
Ramp Winch Final Drive	7.5 qt (7.1 L)	Oil, Lubricating GO-75 (0-186)	Oil, Lubricating GO-75 (0-186)	Oil, Lubricating GO-80/90 (0-226) MIL-L-2105
Propulsion Control Head	As Required	Oil, Lubricating OE/HDO-10 (0-237) MIL-L-2104		
Searchlight Fixture	As Required	Oil, Lubricating OE/HDO-10 (0-237) MIL-L-2104		
Ramp Cable	As Required	Grease, Wire Rope GWR MIL-G-18458B		
Ramp Latch Assembly	As Required	Grease, Multipurpose MPG MIL-G-24139		
Ramp Hinge Assembly	As Required	Grease, Multipurpose MPG MIL-G-24139		
Ramp Sheaves	As Required	Grease, Multipurpose MPG MIL-G-24139		
Ramp Locking Cylinders	As Required	Grease, Multipurpose MPG MIL-G-24139		
Steering Cylinder Pins	As Required	Grease, Multipurpose MPG MIL-G-24139		
Steering Tie Rod Pins	As Required	Grease, Multipurpose MPG MIL-G-24139		
Fire Pump Shaft	As Required	Grease, Multipurpose MPG MIL-G-24139		
Crane Boom Extensions	As Required	Grease, Multipurpose MPG MIL-G-24139		
Crane Boom Assembly	As Required	Grease, Multipurpose MPG MIL-G-24139		

Table 2. Clean/Change Intervals

Item	Interval
Ramp Hydraulic Filter	Indicator reads in red.
Ramp Hydraulic Strainers	500 hours
Steering Hydraulic Filters	500 hours
Steering Hydraulic Strainers	500 hours
Hydraulic Start Filters	500 hours
Hydraulic Start Strainers	500 hours

Table 3. Maintenance Schedule for Propulsion Engines, Marine Gear, and Tachometer Drive

Component/Assembly	Schedule/Procedures Reference
Propulsion Engines	See TM 5-2815-231-14
Marine Gear	See TM 5-2815-231-14
Tachometer Drive Gear and Cables	See TM 5-2815-231-14

**UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
MAINTENANCE INSTRUCTIONS
UNIT PMCS INCLUDING LUBRICATION INSTRUCTIONS**

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY/ AVAILABLE IF:
1	Monthly	0.5	Hydraulic Starting Accumulators	Check accumulator for nitrogen precharge (WP 0022 00). Notify direct support maintenance if the accumulator precharge pressure is low.	Low accumulator precharge pressure.
2	Quarterly	0.5	Ramp Winch Hydraulic Motor	Inspect connections for leaks and tighten as necessary. Tighten mounting bolts as necessary.	Class III leakage noted.
3	Quarterly	0.5	Rudder and Tiller	Check security of all nuts and bolts. Tighten as necessary.	
4	Quarterly	0.5	Rudder Angle Indicator	Inspect transmitter for proper functioning. Ensure that rudder moves through full range of motion. Make checks while observing rudder angle indicator.	

END OF WORK PACKAGE

CHAPTER 6

**OPERATOR MAINTENANCE
PROCEDURES
FOR
LANDING CRAFT, MECHANIZED (LCM-8)
(ALL VESSELS WITH MOD 2 APPLICATION)**

OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
HYDRAULIC STARTING SYSTEM RESERVOIR AND FILTERS, SERVICE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Filter Element (p/n 6R020-060, qty 1)
Packing, Preformed (p/n GA 100201, qty 1)

References:

FM 55-502
TM 55-1905-242-24P (WP 0016)

SERVICE**WARNING**

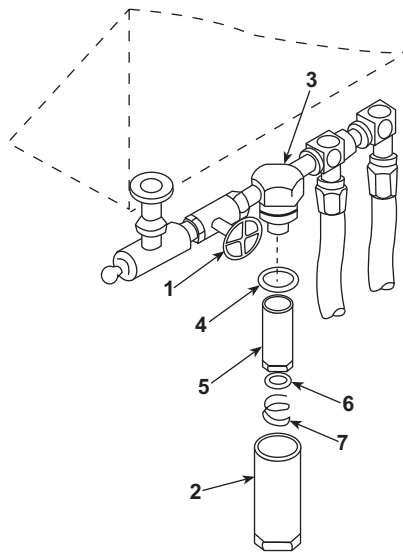
Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow used hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.
2. Close the starting system suction valve (1) located in the suction line from the tank.
3. Position a suitable drain pan beneath the filter housing (2).
4. Unscrew the filter housing (2) from the filter head (3).
5. Remove and discard the preformed packing (4) and the filter element (5).
6. Remove the seat guide (6) and spring (7) from the filter housing (2).

SERVICE (continued)

7. Clean the filter housing (2), seat guide (6), and spring (7) with cleaning solvent.
8. Dry all parts thoroughly with clean wiping rags, or allow them to air dry.
9. Assemble the spring (7), seat guide (6), new filter element (5), and preformed packing (4) into the filter housing (2).
10. Fill the filter housing (2) with clean hydraulic fluid.
11. Install the filter housing (2) onto the filter head (3).
12. Open the starting system suction valve (1).
13. Remove the lockouts and tagouts and check the system operation. Also check for any sign of leakage.
14. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

**END OF WORK PACKAGE**

OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ENGINE COOLING SYSTEM PIPING, HOSES, AND VALVES, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines and diesel generator secured,
locked out and tagged out IAW FM 55-502
Cooling system drained below level of repair

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

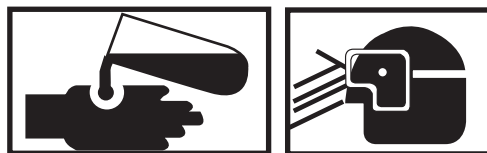
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Antifreeze, Ethylene Glycol Inhibited (Item 6, Table 2,
WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230)

References:

FM 55-502
TM 55-1905-242-24P (WP 0020)

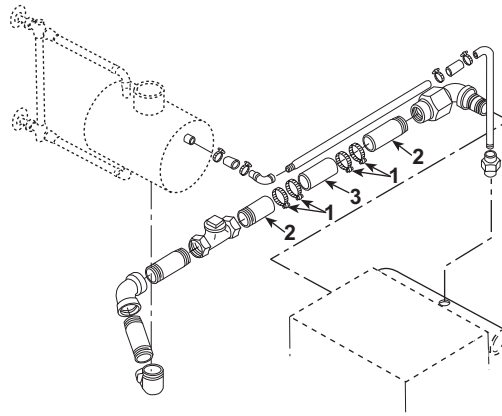
GENERAL

This work package describes the procedure for replacement of the engine coolant hose below the expansion tank. Replacement of other hoses is similar.

REMOVAL**WARNING**

Do not allow used antifreeze to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling antifreeze. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.
2. Position a suitable drain pan below the area of repair.
3. Loosen the hose clamps (1), but do not completely unfasten them.
4. Slide the hose clamps (1) back and allow them to lay on the piping (2).
5. If the hose (3) will be replaced, cut it lengthwise at each end to assist in freeing the hose from the piping (2).
6. Slide the hose (3) off the piping (2).

REMOVAL (continued)**CLEANING**

Clean the piping (2) with a wire brush to ensure good sealing of the new hose.

INSTALLATION

1. If new hose clamps (1) will be installed, slide them over the piping (2).
2. Cut a new hose (3) to the desired length and slide the hose over the piping (2), ensuring that the hose overlaps the piping equally on both sides.
3. Slide hose clamps (1) over the hose (3) and tighten them securely.
4. Refill the cooling system with a 50/50 mixture of ethylene glycol inhibited antifreeze and fresh water.
5. Remove the lockouts and tagouts.
6. Start the engine and allow it to warm up to operating temperature.
7. Check the engine cooling system for leaks.
8. If no leaks are detected, secure the engine and recheck the coolant level.
9. Dispose of used antifreeze in accordance with local regulations.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STUFFING BOX, ADJUST**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L

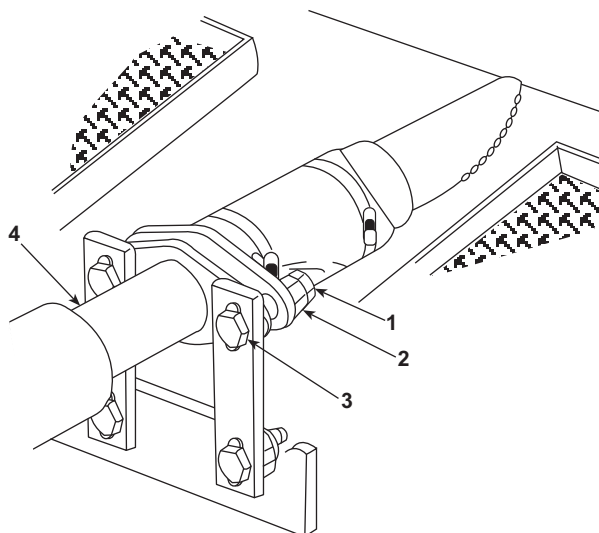
Equipment Condition:

Propulsion engines running
Marine transmissions engaged AHEAD
Deck plates removed above stuffing box

ADJUST**WARNING**

Ensure that all personnel are clear of moving components. Use extreme caution when working around rotating components. Do not allow hands or tools to come in contact with rotating components. Do not wear loose clothing, jewelry, or anything else that might become entangled in rotating components. Failure to comply can result in damaged equipment and serious injury or death to personnel.

1. Loosen the locknuts (1) that are against the adjusting nuts (2).
2. Adjust the adjusting nuts (2) on the bolts (3) alternately while the propeller shaft (4) is turning. Do not turn each nut more than one half turn before turning the other nut.



ADJUST (continued) **CAUTION**

Do not overtighten the adjusting nuts. The shaft packing relies on the flow of water for lubrication. Overtightening the nuts can stop the flow of water, resulting in lack of lubrication, packing failure, and propeller shaft failure.

3. Tighten the adjusting nuts (2) until seepage reaches the rate of two to three drops per minute. Do not stop the seepage of water completely; doing so will result in packing failure and shaft damage.
4. When adjustment is complete, tighten the locknuts (1) against the adjusting nuts (2) to prevent the adjusting nuts from backing off.
5. If adjustment fails to reduce the leakage to an acceptable level, notify general support maintenance for replacement of the packing.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
FUEL FILTER/WATER SEPARATOR, SERVICE/REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
 Suitable Drain Pan

Equipment Condition:

Propulsion engines and diesel generator secured, locked out and tagged out IAW FM 55-502

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts:

Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
 Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)

Materials/Parts (continued):

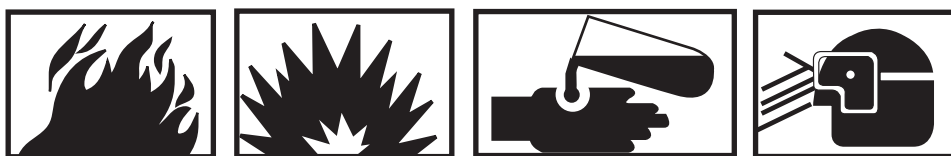
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
 Rag, Wiping (Item 5, Table 2, WP 0230 00)
 Sealant, Tape, Antiseizing (Item 14, Table 2, WP 0230 00)
 Clean Diesel Fuel
 Packing, Preformed (p/n 11350, qty 1)
 Gasket (p/n 11007, qty 2)
 Filter Element (p/n 2020SM, qty 1)
 Filter Element (p/n R12S, qty 1)
 O-Ring (p/n RK11341, qty 1)
 Gasket (p/n RK10012, qty 1)

References:

FM 55-502
 TM 55-1905-242-24P (WP 0026)

SERVICE--PROPULSION ENGINE FUEL FILTER/WATER SEPARATOR

WARNING



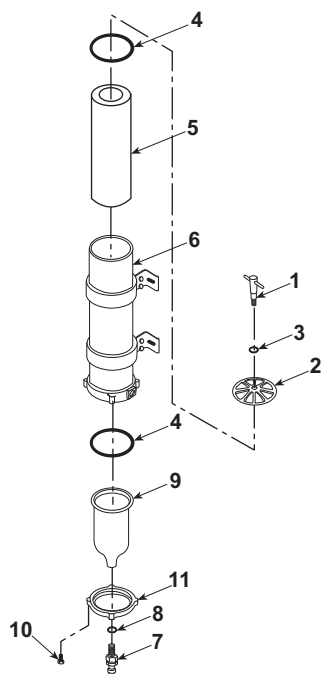
Cleaning solvent and diesel fuel are flammable and their vapors are potentially explosive. Do not use cleaning solvent or diesel fuel in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent or diesel fuel in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow diesel fuel or cleaning solvents to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling diesel fuel and cleaning solvents. Failure to comply can result in illness, serious injury or death.

1. CLOSE the fuel supply valve upstream of the fuel filter/water separator that will be serviced.
2. Don chemical protective gloves and goggles.
3. Position a suitable drain pan beneath the fuel filter/water separator.
4. Remove the "T" handle (1) and the cover (2). Discard the preformed packing (3) and the gasket (4).

SERVICE--PROPULSION ENGINE FUEL FILTER/WATER SEPARATOR (continued)

5. Grasp the molded handle on top of the filter element (5) and remove it from the cylinder (6) by slowly twisting and pulling upward.
6. Remove the drain valve (7) and O-ring (8) from the bowl (9). Discard the O-ring.
7. Flush the cylinder (6) and bowl (9) with clean diesel fuel.
8. If contamination is still present in the bowl (9) after flushing, remove the bowl retaining screws (10) and remove the retaining ring (11) and gasket (4) from the cylinder (6). Discard the gasket.
9. Remove the bowl (9) and clean it with cleaning solvent. Dry the bowl with clean wiping rags.
10. Install a new gasket (4) to the bowl (9) and attach the bowl to the cylinder (6) with the retaining ring (11) and bowl retaining screws (10).



11. Replace the drain valve (7) using a new O-ring (8).
12. Install a new filter element (5) into the cylinder (6) using a twisting, downward motion.
13. Prime the fuel filter/water separator by filling it with clean diesel fuel.
14. Install the cover (2) using a new gasket (4). Secure the cover (2) using the T-handle (1) and new preformed packing (3).
15. OPEN the fuel supply valve CLOSED in step 1 of Service--Propulsion Engine Fuel Filter/Water Separator.
16. Remove the lockouts and tagouts and run the propulsion engine, checking for fuel leaks.
17. If no leakage is detected, secure the engine and dispose of the used diesel fuel, cleaning solvent, and contaminated materials in accordance with local regulations.

PROPULSION ENGINE FUEL FILTER/WATER SEPARATOR REPLACEMENT

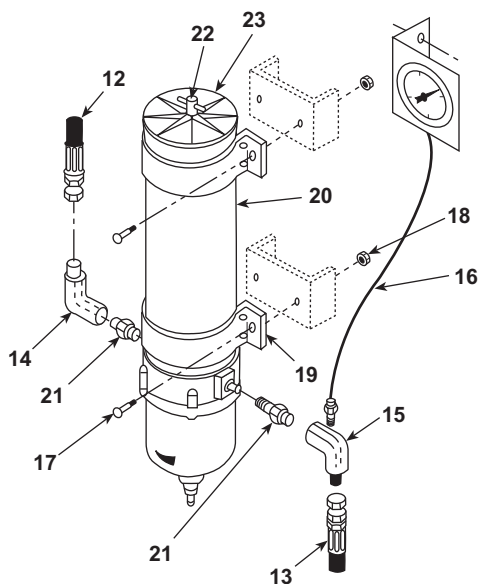
REMOVAL

1. CLOSE the fuel supply valve upstream of the fuel filter/water separator.
2. Don chemical protective gloves and goggles.
3. Position a suitable drain pan beneath the fuel filter/water separator.
4. Label the inlet and outlet hoses (12 and 13) to permit proper installation. Remove the hoses from the inlet and outlet elbows (14 and 15).
5. Remove the indicator line (16) from the outlet elbow (15).

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

6. Remove the four capscrews (17) and self-locking nuts (18) from the bracket clamps (19) and remove the fuel filter/water separator (20). Discard the self-locking nuts.
7. Remove the inlet and outlet elbows (14 and 15) and bushings (21) from the fuel filter/water separator (20).



INSTALLATION

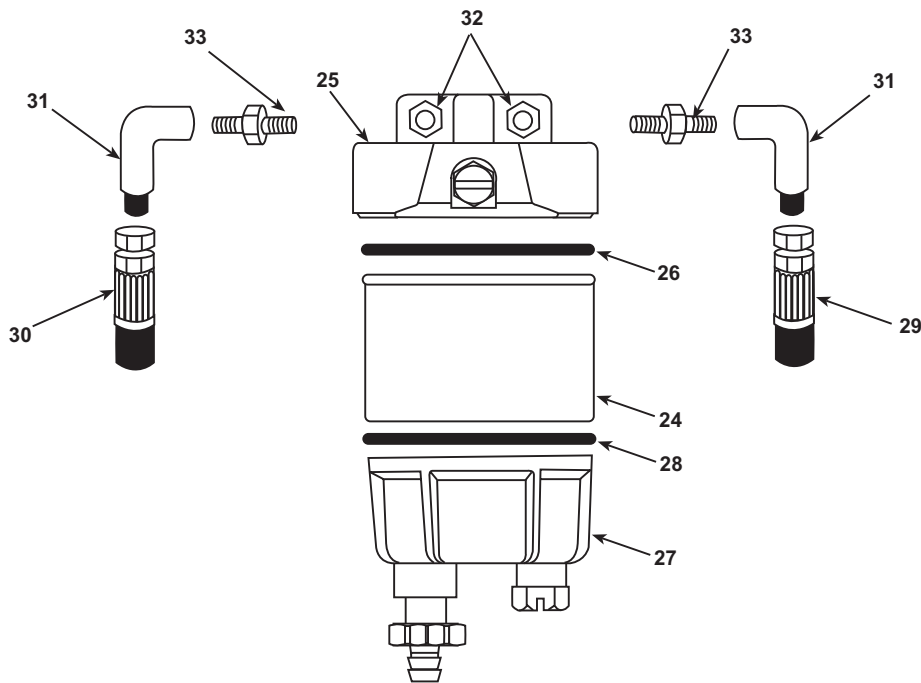
1. Wrap the bushing's (21) threads with antiseizing sealant tape and install the bushings and inlet and outlet elbows (14 and 15) in the inlet and outlet ports of the new fuel filter/water separator (20).
2. Align the mounting holes and secure the bracket clamps (19) with the four capscrews (17) and new self-locking nuts (18).
3. Connect the inlet and outlet hoses (12 and 13) to the inlet and outlet elbows (14 and 15) using the labels from step 4 of Removal--Propulsion Engine Fuel Filter/Water Separator Replacement as a guide.
4. Connect the indicator line (16) to the outlet elbow (15).
5. Remove the T-handle (22) and remove the cover (23).
6. Fill the fuel filter/water separator (20) with clean diesel fuel to prime it.

INSTALLATION (continued)

7. Install the cover (23) and secure it with the T-handle (22).
8. OPEN the fuel supply valve CLOSED in step 1 Removal--Propulsion Engine Fuel Filter/Water Separator Replacement.
9. Remove the lockouts and tagouts and run the propulsion engine, checking for fuel leaks.
10. If no leakage is detected, secure the engine and dispose of used diesel fuel, cleaning solvent, and contaminated materials in accordance with local regulations.

SERVICE--DIESEL GENERATOR FUEL FILTER/WATER SEPARATOR

1. CLOSE the fuel supply valve upstream of the fuel filter/water separator.
2. Don chemical protective gloves and goggles.
3. Position a suitable drain pan beneath the fuel filter/water separator.
4. Unscrew the filter element (24) from the filter base (25). Remove the filter element and O-ring (26).



5. Unscrew the bowl (27) from the filter element (24). Remove the bowl and gasket (28).
6. Clean the bowl (27) with cleaning solvent. Dry the bowl with clean wiping rags.
7. Install a new gasket (28), and attach the bowl (27) to the new filter element (24).
8. Prime the fuel filter/water separator by filling it with clean diesel fuel.
9. Install the filter element (24) and bowl (27) onto the filter base (25) using a new O-ring (26).
10. OPEN the fuel supply valve CLOSED in step 1 of Service--Diesel Generator Fuel Filter/Water Separator.
11. Remove the lockouts and tagouts and run the diesel generator engine, checking for fuel leaks.
12. If no leakage is detected, secure the diesel generator engine and dispose of the used diesel fuel, cleaning solvent, and contaminated materials in accordance with local regulations.

DIESEL GENERATOR FUEL FILTER/WATER SEPARATOR REPLACEMENT**REMOVAL**

1. CLOSE the fuel supply valve upstream of the fuel filter/water separator.
2. Don chemical protective gloves and goggles.
3. Position a suitable drain pan beneath the fuel filter/water separator.
4. Label the inlet and outlet hoses (29 and 30) to permit proper installation. Remove the hoses from the elbows (31).
5. Remove the capscrews (32) that secure the filter base (25) to the bulkhead.
6. Remove the elbows (31) and bushings (33) from the filter base (25).

INSTALLATION

1. Install the bushings (33) and elbows (31) in the inlet and outlet ports of the filter base (25).
2. Align the mounting holes and secure the filter base (25) to the bulkhead with the capscrews (32).
3. Connect the inlet and outlet hoses (29 and 30) to the elbows (31) using the labels from step 4 of Removal--Diesel Generator Fuel Filter/Water Separator Replacement as a guide.
4. Unscrew the filter element (24) and bowl (27) from the filter base (25).
5. Fill the filter element (24) with clean diesel fuel to prime it.
6. Install the filter element (24) and bowl (27) onto the filter base (25).
7. OPEN the fuel supply valve CLOSED in step 1 of Removal--Diesel Generator Fuel Filter/Water Separator Replacement.
8. Remove the lockouts and tagouts and run the diesel generator engine, checking for fuel leaks.
9. If no leakage is detected, secure the diesel generator engine and dispose of used diesel fuel, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BATTERIES AND CABLES, SERVICE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502
Battery isolation switches set to OFF, locked out, and tagged out IAW FM 55-502

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts:

Petrolatum (Item 7, Table 2, WP 0230 00)
Sodium Bicarbonate (Item 8, Table 2, WP 0230 00)
Distilled Water (Item 9, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Face Shield, Industrial, Tilting (Item 10, Table 2, WP 0230 00)
Apron, Chemical Protection (Item 11, Table 2, WP 0230 00)

References:

FM 55-502
TM 55-1905-242-24P (WP 0027)

SERVICE**WARNING**

Batteries produce hydrogen gas. This gas is explosive. Keep the work area free of sparks, open flame, and excessive heat. Take care to prevent conductive metal tools from arcing between the positive and negative terminals. Failure to comply with these precautions can result in serious injury or death.

Batteries are filled with a sulfuric acid-based electrolyte. This electrolyte is extremely corrosive to human tissue and to many other materials. Chemical protective gloves, chemical protective goggles, face shield, and chemical protective apron must be worn at all times when the batteries are being serviced. If electrolyte comes in contact with clothing or other material, wash the affected area with large volumes of fresh water. If electrolyte comes in contact with the skin, flush the area with large volumes of water. If the electrolyte comes in contact with the eyes, flush them with large volumes of water. Continue flushing the affected area until medical assistance arrives. Failure to comply can result in serious injury or death.

NOTE

Whenever working with batteries, the negative cable must be disconnected first, the positive cable next, and the interconnecting cable (if installed) last. When connecting the batteries, the interconnecting cable (if installed) must be connected first, the positive cable next, and the negative cable last.

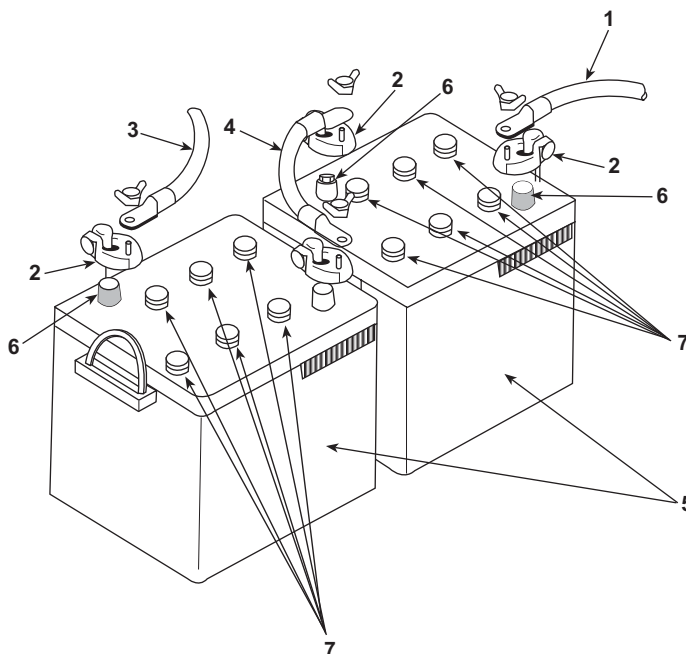
SERVICE (continued)

1. Don chemical protective gloves, safety goggles, face shield, and protective apron.
2. Label and remove the negative battery cables (1) from the battery post connectors (2) on the port and starboard battery banks.
3. Label and remove the positive battery cables (3) from the battery post connectors (2) on the port and starboard battery banks.
4. Label and remove the interconnecting cables (4) from the battery post connectors (2) on the port and starboard battery banks.

⚠ CAUTION

Do not apply any prying or twisting force to the battery posts. Doing so can cause the posts to break internally, permanently disabling the battery. If the battery post connectors are difficult to remove from the battery posts, spread the battery post connectors to loosen them before attempting to remove them from the batteries.

5. Remove the battery post connectors (2) from the batteries (5), taking care not to apply any prying or twisting force to the battery posts (6). If the battery post connectors are difficult to remove from the battery posts, spread the battery post connectors to loosen them before attempting to remove them from the batteries.
6. Use a wire brush to remove all deposits from the battery posts (6), battery post connectors (2), and battery cable (1, 3, and 4) ends.



7. Inspect the battery posts (6), battery post connectors (2), and battery cable (1, 3, and 4) ends for damage. Notify unit maintenance to replace any battery with posts damaged to the extent that the battery post connectors will not fit securely or replace damaged battery post connectors and/or battery cables.
8. Prepare a 50/50 mix of sodium bicarbonate and water. Scrub the battery (5) tops, battery cable (1, 3, and 4) ends, and the battery post connectors (2) with the mixture.
9. Rinse the cleaned areas with fresh water.
10. Remove the battery caps (7) and check the electrolyte level in each cell. The level should be to the bottom of the split ring. If any cells are low, add distilled water to bring the cells to the proper level.

SERVICE (continued)

11. Install the battery caps (7).
12. Install the battery post connectors (2) onto the battery posts (6) and tighten them snugly.
13. Install the interconnecting cables (4) on both batteries (5).
14. Install the positive battery cables (3) on both batteries (5).
15. Install the negative battery cables (1) on both batteries (5).
16. Apply a thin coating of petrolatum to the exposed portions of the battery posts (6), battery post connectors (2), and battery cable (1, 3, and 4) ends.
17. Dispose of batteries in accordance with local regulations.
18. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ALTERNATOR AND BELTS, ADJUST/TEST**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)
Multimeter (Item 2, Table 1, WP0230 00)

Personnel Required:

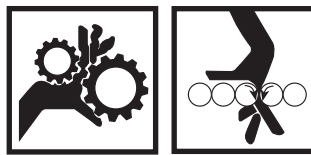
One Watercraft Engineer, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0028)

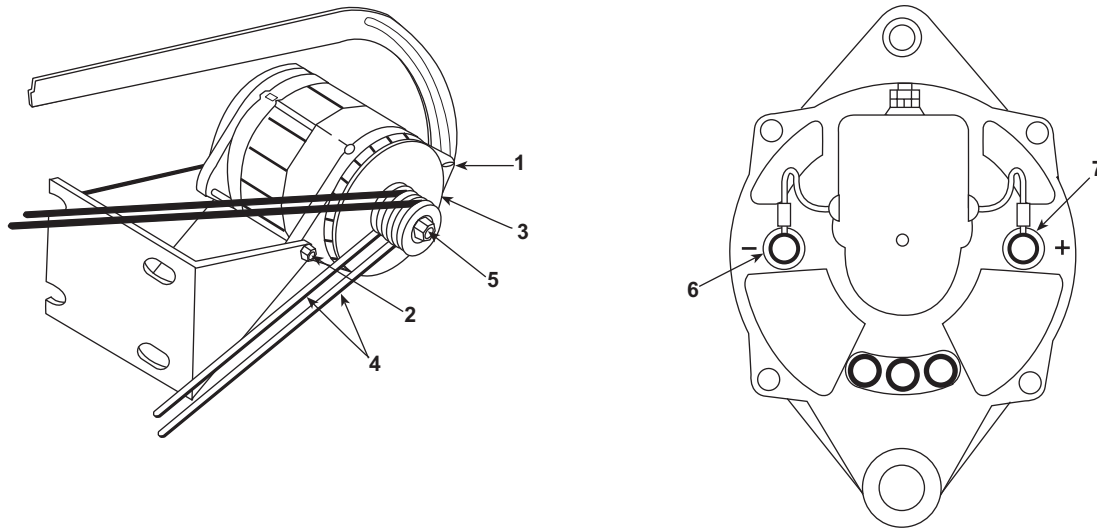
Equipment Condition:

Propulsion engines secured, locked out, and
tagged out IAW FM 55-502
All accumulator valves CLOSED, locked out,
and tagged out IAW FM 55-502

ADJUST**WARNING**

Ensure that all personnel are clear of moving components. Use extreme caution when working around rotating components. Do not allow hands or tools to come in contact with rotating components. Do not wear loose clothing, jewelry, or anything else that might become entangled in rotating components. Failure to comply can result in damaged equipment and serious injury or death to personnel.

1. Loosen, but do not remove, the adjustment strap bolt (1) and the mounting pivot bolt (2).
2. Pull back on the alternator (3) by hand until there is a belt (4) deflection of approximately 1/2 inch measured midway between the alternator pulley (5) and the crankshaft pulley.
3. Tighten the adjustment strap bolt (1) and the mounting pivot bolt (2).
4. Remove the lockouts and tagouts and check the operation of the system.



TEST

NOTE

The alternator belt must be properly adjusted before alternator testing may be performed.

1. Start the starboard propulsion engine and run it at 1500 r/min.
2. Place a load on the 24 Vdc (Volts direct current) electrical system by turning ON as many 24 Vdc systems as practical.
3. Set the multimeter to the Vdc (Volts direct current) setting.
4. Place the negative (-) multimeter lead on the negative output terminal (6) and place the positive (+) multimeter lead on the positive output terminal (7).
5. Observe the multimeter reading. A properly operating alternator should produce 26 to 29 Vdc. If the reading is outside this range, notify unit maintenance for troubleshooting and/or replacement.
6. Repeat steps 1-5 for the port alternator.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
24/12V CONVERTER, TEST**

INITIAL SETUP:**Tools and Special Tools:**

Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

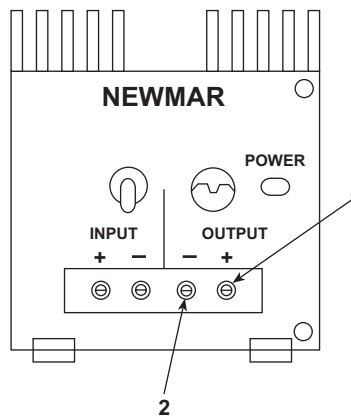
INTERCOM RAY 430 circuit breaker set to ON
VHF-FM DSC500A NO. 1 circuit breaker set to
ON

References:

TM 55-1905-242-24P (WP 0030)

TEST

1. Place the positive (+) multimeter lead on the positive output terminal (1) of the VHF-FM radio 24/12 Vdc converter.
2. Place the negative (-) multimeter lead on the negative output terminal (2) of the VHF-FM radio 24/12 Vdc converter.
3. Observe the multimeter reading. It should read 13.6 Vdc. If the voltage reading is lower than 13.5 Vdc or higher than 13.7 Vdc, notify unit maintenance for replacement of the VHF-FM radio 24/12 Vdc converter.
4. Repeat steps 1-3 for the loudhailer 24/12 Vdc converter.

**END OF WORK PACKAGE**

OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
POWER TRANSFORMERS 220V TO 110V, TEST

INITIAL SETUP:**Tools and Special Tools:**

Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

Circuit breaker ON for affected circuit

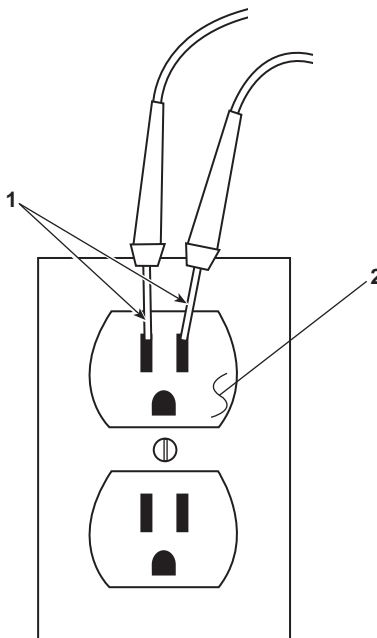
References:

TM 55-1905-242-24P (WP 0035)

TEST**WARNING**

Take great care when working around energized electrical equipment. Contact between unprotected body parts and electrical conductors can cause serious injury or death. Do not wear jewelry or other conductive items while servicing energized electrical equipment. Failure to comply can result in serious injury or death.

1. Set the multimeter to read 250 Vac (Volts alternating current).
2. Insert the multimeter leads (1) into a 110 Vac receptacle (2) as shown below. Observe the voltage reading. The output voltage reading should be 110 Vac. If this reading is not obtained, notify unit maintenance for transformer replacement.

**END OF WORK PACKAGE**

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
LIGHTING FIXTURES AND SWITCHES, REPLACE/REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)
Multimeter (Item 2, Table 1, WP0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0037)

Equipment Condition:

Circuit breaker secured, locked out, and tagged
out for affected circuit IAW FM 55-502

GENERAL

This work package describes the repair and replacement of an engine room light as an example of incandescent lighting fixture repair. Repair of the incandescent lights in the pilothouse and accommodation module is similar.

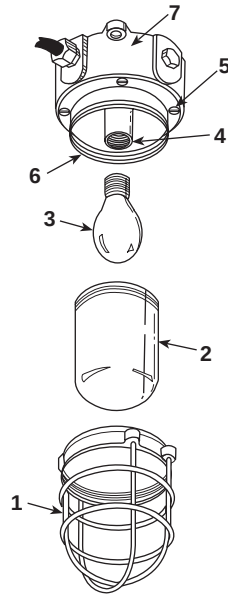
WARNING

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

Certain lighting circuits may have more than one source of power. This is especially true of those lighting fixtures that contain both red and white lights. Always ensure that all power sources are secured, locked out, and tagged out prior to replacing the lighting fixtures. Failure to comply can result in serious injury or death.

REPAIR--LIGHTING FIXTURE, INCANDESCENT

1. Unscrew and remove the guard (1) from the face plate assembly (6).
2. Unscrew and remove the globe (2) from the face plate assembly (6).
3. Unscrew and remove the light bulb (3) from the socket (4).
4. Screw the new light bulb (3) into the socket (4).
5. Screw the globe (2) and the guard (1) onto the face plate assembly (6).
6. Remove the lockouts and tagouts and check the operation of the light.



REPLACE—LIGHTING FIXTURE, INCANDESCENT

REMOVAL

WARNING



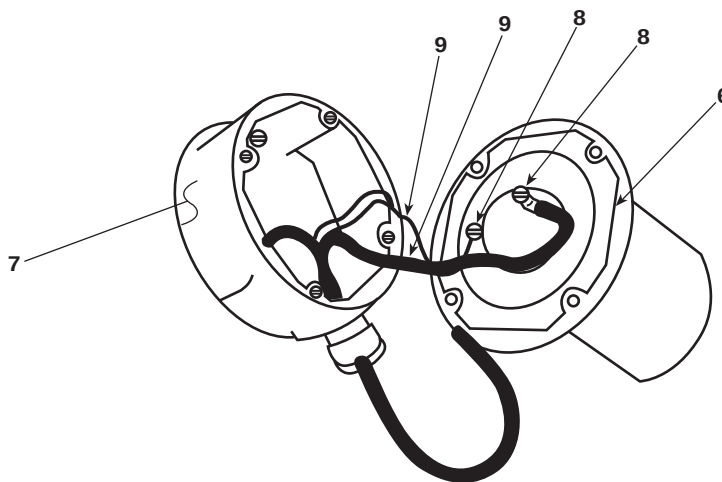
Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Unscrew and remove the guard (1) covering the light from the face plate assembly (6).
2. Unscrew and remove the globe (2) from the face plate assembly (6).
3. Unscrew and remove the light bulb (3) from the socket (4).
4. Set the multimeter to the Vdc (Volts direct current) setting. Place one multimeter lead on the center electrode of the socket (4) and one lead on the internal threads of the socket. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the proper circuit breaker is properly secured.

REMOVAL (continued)**⚠ CAUTION**

Wiring is connected to the rear of the face plate assembly. Take care when removing the face plate assembly. Wiring damage can result from rough handling during removal.

5. Remove the four screws (5) that secure the face plate assembly (6) to the junction box (7). Pull the face plate assembly away from the junction box, taking care not to damage the wiring behind the face plate assembly.
6. Set the multimeter to the Vdc (Volts direct current) setting. Place one multimeter lead on each of the wiring terminals (8) on the rear of the face plate assembly (6). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the proper circuit breaker is properly secured.
7. Label and disconnect the wiring (9) from the terminals (8) on the rear of the face plate assembly (6).

**INSTALLATION**

1. Connect the wiring (9) to the terminals (8) on the rear of the face plate assembly (6) using the labels from step 7 of Removal--Lighting Fixture, Incandescent as a guide.
2. Position the face plate assembly (6) on the junction box (7) and secure it with the four screws (5).
3. Screw the light bulb (3) into the socket (4).
4. Screw the globe (2) onto the face plate assembly (6).
5. Screw the guard (1) onto the face plate assembly (6).
6. Remove the lockouts and tagouts and check the operation of the light.

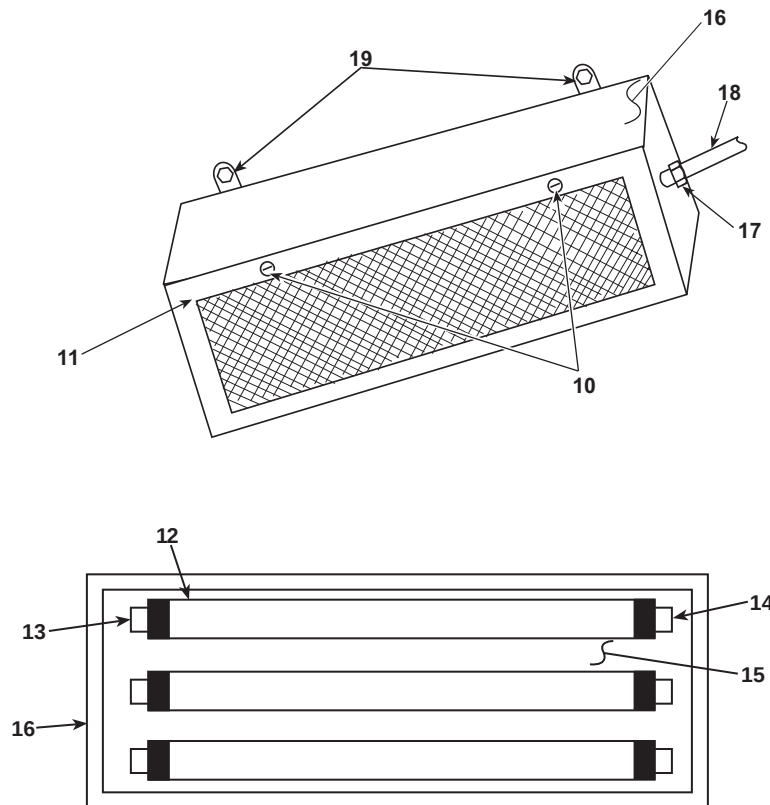
REPAIR--LIGHTING FIXTURE, FLUORESCENT (continued)

1. Unfasten the retaining screws (10) that secure the lens cover (11) and lower the lens cover.

NOTE

Only one bulb socket is spring loaded. If the bulb does not push easily in one direction, try pushing it in the other direction.

2. Push the defective bulb (12) toward the spring loaded socket (13), drop the free end of the bulb, and remove the bulb from the fixture. If the bulb is covered by a red sleeve, remove the red sleeve.
3. Position a new bulb (12) in the spring loaded socket (13), taking care to align the bulb's two pins with the corresponding holes in the socket. If the defective bulb was covered by a red sleeve, slide the red sleeve over the new bulb prior to assembly.
4. Gently push in on the bulb (12) and the spring loaded socket (13) until the free end of the bulb can be aligned with the stationary socket (14). Allow the spring loaded socket to push the bulb into the stationary bulb socket.
5. Remove the lockouts and tagouts and check the operation of the light.
6. Raise the lens cover (11) and fasten it in place with the retaining screws (10).



REPLACE--LIGHTING FIXTURE, FLUORESCENT**REMOVAL**

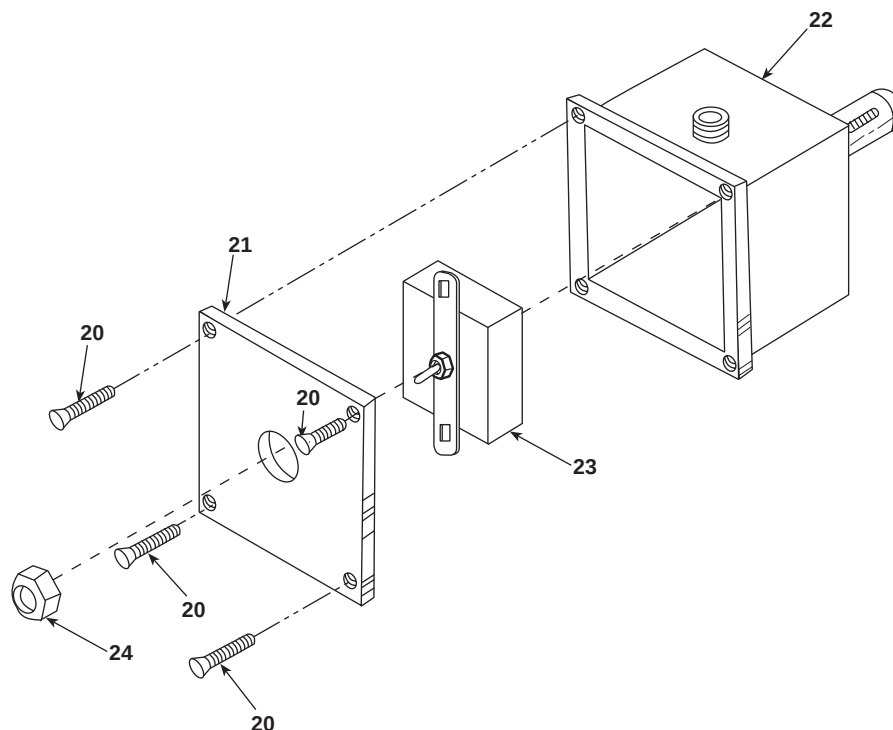
1. Remove the bulbs as described in the Repair Lighting Fixture, Fluorescent procedure in this work package.
2. Remove the fixture's internal panel (15) to expose the wiring connections.
3. Set the multimeter to the Vdc (Volts direct current) setting and check for available voltage at the fixture's wiring connections. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the proper circuit breaker is properly secured. Check both of the fixture's circuits (white and red) before proceeding.
4. Label and disconnect the wiring (18) inside the fixture (16).
5. Loosen the nut (17) that holds the wiring (18) and pull the wiring out of the fixture (16).
6. Remove the bolts (19) that secure the fixture (16) to the overhead. Remove the fixture.

INSTALLATION

1. Position the fixture (16) on the overhead and secure it with the bolts (19).
2. Slide the wiring (18) into the fixture (16) and secure it with the nut (17).
3. Connect the wiring (18) inside the fixture (16) using the labels from step 4 of Removal--Lighting Fixture, Fluorescent as a guide and install the internal panel (15).
4. Install the bulbs as described in the Repair Lighting Fixture, Fluorescent procedure in this work package.
5. Remove the lockouts and tagouts and check the operation of the lights.

REPLACE--SWITCH

1. Remove screws (20) that attach the switch plate (21) to the switch box (22).



REPLACE--SWITCH (continued)

2. Pull the switch plate (21) away from the switch box (22). The switch (23) will remain attached to the switch plate.
3. Set the multimeter to the Vdc (Volts direct current) setting and check for available voltage at the switch's wiring connections. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the proper circuit breaker has been properly secured.
4. Label and disconnect the wiring from the switch (23).
5. Remove the nut (24) that attaches the switch (23) to the switch plate (21), and remove the switch from the switch plate.
6. Install a new switch (23) on the switch plate (21) and secure it with the nut (24).
7. Connect the wiring to the switch's (23) terminals using the labels from step 4 as a guide.
8. Install the switch plate (21) onto the switch box (22), and secure it with the screws (20).
9. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
GENERAL ALARM SYSTEM, TEST**

INITIAL SETUP:**Equipment Condition:**

GEN ALARM circuit breaker ON

Personnel Required:

Two Watercraft Engineers, 88L

References:

TM 55-1905-242-24P (WP 0040)

TEST

1. Position one person in the engine room and one person in the accommodation module to listen for the general alarm.
2. Sound the general alarm, using the switch in the pilothouse.
3. The personnel in the pilothouse should advise whether the general alarm bells sound.
4. If the general alarm bells do not sound, notify unit maintenance for repair.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
NAVIGATION LIGHTS: BULBS AND LENS HOUSING, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

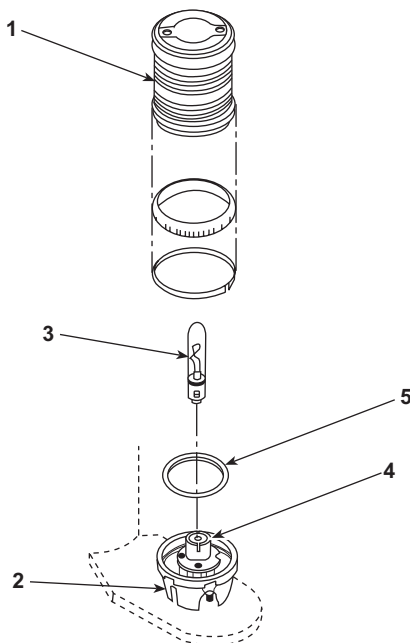
NAV LIGHTS PANEL circuit breaker secured,
locked out, and tagged out IAW FM 55-502
Mast lowered (WP 0075 00)

References:

FM 55-502
WP 0075 00
TM 55-1905-242-24P (WP 0044)

REMOVAL

1. Turn and lift the lens housing (1) free of the lamp base (2).
2. Press in on the bulb (3) and twist it slightly counterclockwise in order to release it. Remove the bulb from the socket (4).

**INSTALLATION**

1. To install the new bulb (3):
 - a. Align the bulb's (3) bayonet pins with the slots in the socket (4).
 - b. Place the bulb (3) into the socket (4).
 - c. Press down on the bulb (3) and turn it slightly clockwise in order to lock it in place.

INSTALLATION (continued)

2. Inspect the gasket (5). If it is cracked, cut, rotted, or otherwise damaged, replace it.
3. Place the new lens housing (1), if required, on the lamp base (2).
4. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

INITIAL SETUP:

Tools and Special Tools:

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP0230 00)

Materials/Parts:

Gasket, Cylinder (p/n 10, qty 4)

References:

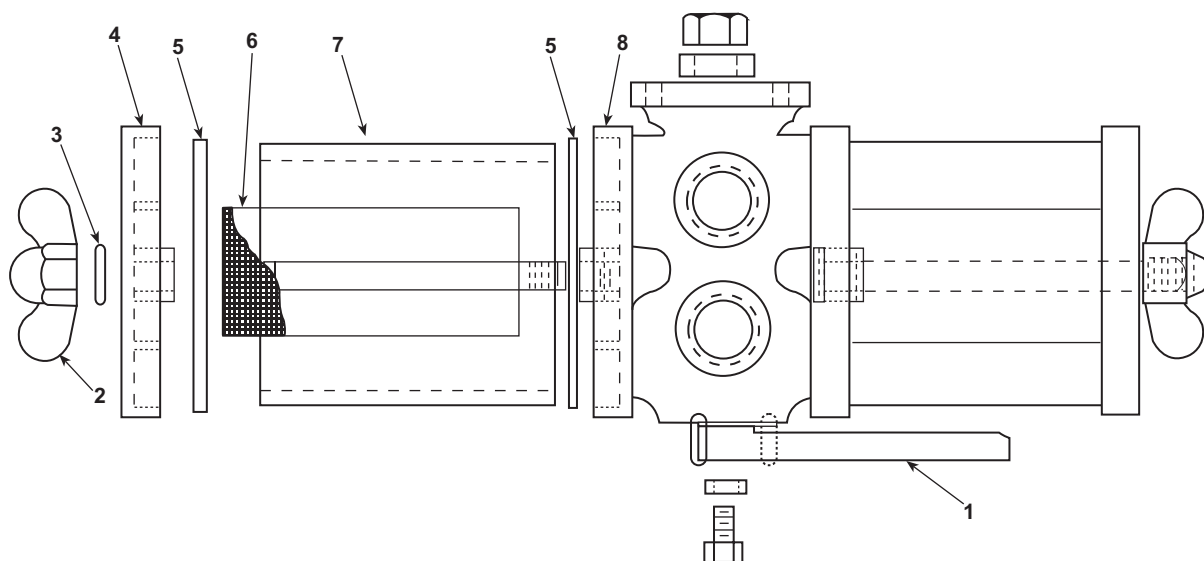
TM 55-1905-242-24P (WP 0049)

Personnel Required:

One Watercraft Engineer, 88L

SERVICE

1. Set the strainer handle (1) toward the strainer in use and away from the strainer to be serviced.
2. Remove the wing nut (2), washer (3), end cap (4), and gasket (5) from the strainer not in use.
3. Remove the screen (6) and cylinder (7) and clean them with fresh water. Use a wire brush, if necessary, to dislodge particles from the screen. If the screen cannot be sufficiently cleaned, replace it with a new one.
4. Install the gasket (5) in the housing (8).
5. Install the cylinder (7), screen (6), gasket (5), and end cap (4) on the strainer not in use. Secure them with the washer (3) and wing nut (2).
6. Set the strainer handle (1) toward the strainer just serviced and check the strainer for leaks.
7. Perform steps 2-6 for the other strainer.



END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
WASTE OIL TANK, SERVICE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)

Equipment Condition:

Waste oil tank pumped empty
OILY WTR BILGE PUMP circuit breaker secured, locked out, and tagged out IAW FM 55-502
All oily water collection system valves CLOSED

Materials/Parts:

Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)

Materials/Parts (continued):

Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0066)

SERVICE

WARNING



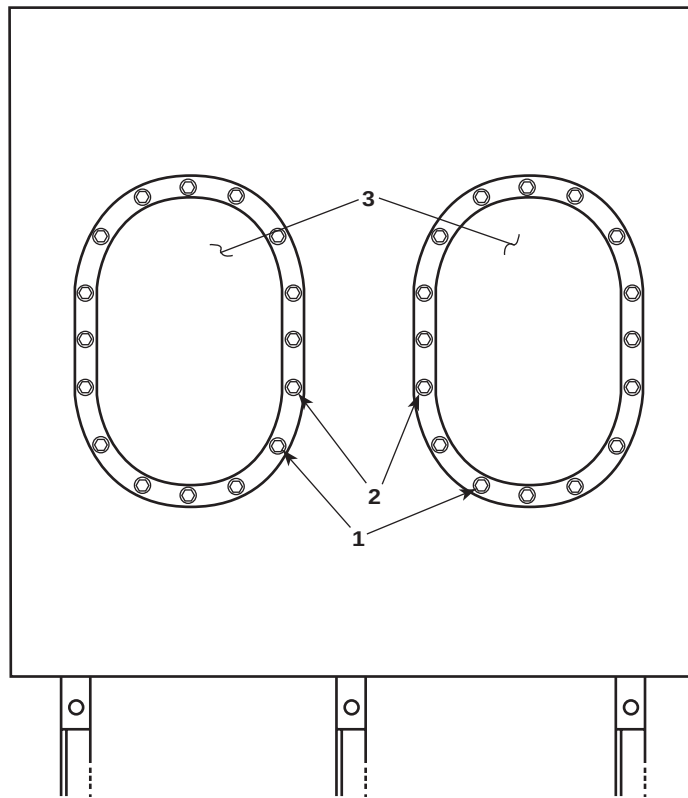
Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Chemical protective gloves and goggles must be worn whenever the waste oil tank contents may come in contact with the skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling cleaning solvent. Failure to comply can cause serious injury or death.

1. Remove the nuts (1) and the washers (2) securing each access plate (3).
2. Remove the access plates (3).
3. Don chemical protective gloves and goggles.
4. Using wiping rags, cleaning solvent, scrapers, and wire brush as required, thoroughly clean the inside of the waste oil tank.
5. Inspect the interior and exterior of the waste oil tank for cracks, broken welds, or other damage that might compromise the integrity of the tank. Report any deficiencies to direct support maintenance for repair.

SERVICE (continued)

6. Inspect the gaskets that seal the access plates (3). If the gaskets are intact and free of cracks or rot, they may be reused. If the gaskets are not intact, or if they exhibit cracks and/or rot, procure new gaskets.
7. Install the gaskets over the access plate (3) openings.
8. Place the access plates (3) over the openings and secure them in place using the nuts (1) and the washers (2).
9. Remove the lockouts and tagouts and check the operation of the system.
10. Dispose of the used cleaning solvent and contaminated materials in accordance with local regulations.

**END OF WORK PACKAGE**

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
FIRE PUMP STRAINER, SERVICE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502

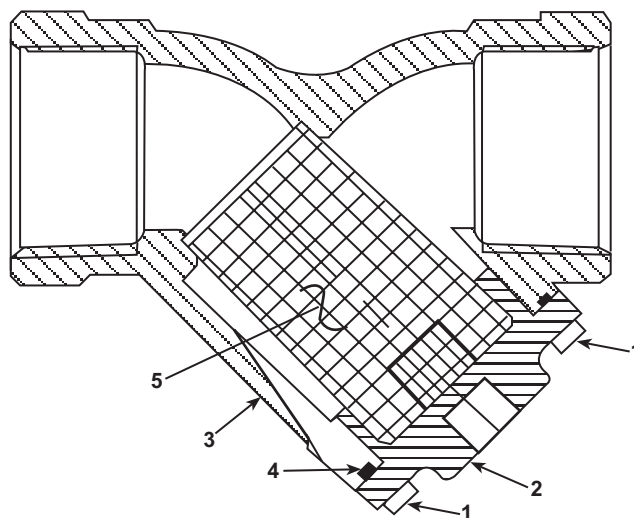
TM 55-1905-242-24P (WP 0070)

Equipment Condition:

Fire pump seacock CLOSED, locked out, and
tagged out IAW FM 55-502

SERVICE

1. Remove the bolts (1) that secure the cover (2) to the strainer body (3).
2. Remove the cover (2) and gasket (4).
3. Remove the strainer screen (5) from the strainer body (3).
4. Clean the strainer screen (5) using fresh water. It may be necessary to use a wire brush to help remove deposits from the strainer screen. If the strainer screen cannot be cleaned satisfactorily, replace it.
5. Inspect the gasket (4). Replace the gasket if it is broken or shows signs of cracking or deterioration.
6. Install the strainer screen (5) into the strainer body (3).
7. Install the gasket (4) into its recess in the strainer body (3).
8. Install the cover (2) onto the strainer body (3) and secure it with the bolts (1).
9. Remove the lockouts and tagouts, OPEN the fire pump seacock, and check for leaks.

**END OF WORK PACKAGE**

OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
FIRE PUMP, SERVICE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts:

Grease (Item 21, Table 2, WP 0230 00)

Equipment Condition:

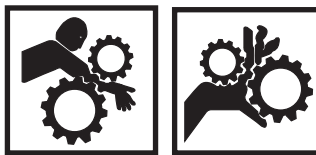
Fire pump engaged and pumping
Fire monitor discharging over side

References:

TM 55-1905-242-24P (WP 0070)

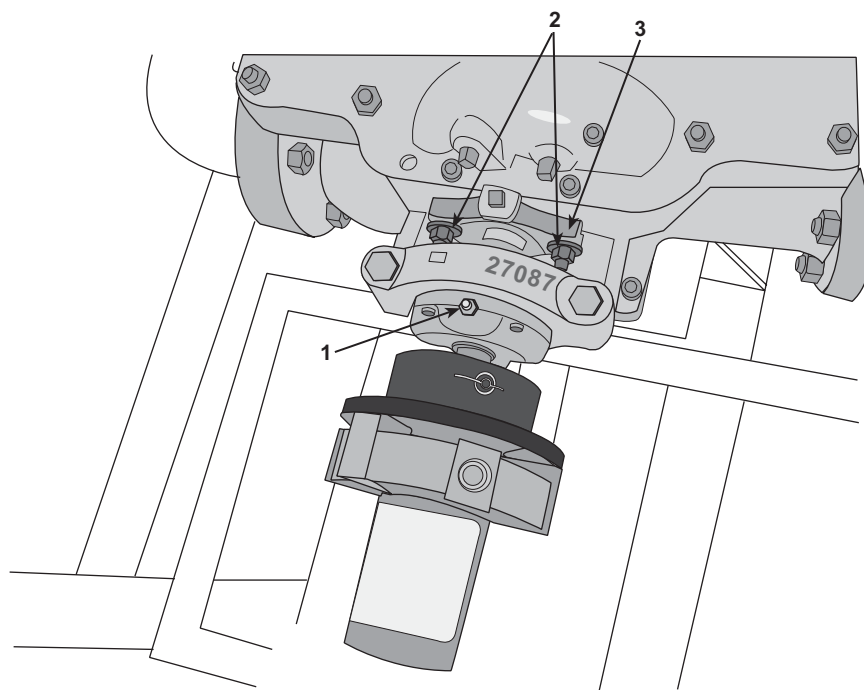
SERVICE

WARNING



Ensure that all personnel are clear of rotating components. Use extreme caution when working around rotating components. Do not allow hands or tools to come in contact with rotating components. Do not wear loose clothing, jewelry, or anything else that might become entangled in rotating components. Failure to comply can result in damaged equipment and serious injury or death to personnel.

1. Remove the pump drive shaft shield.
2. Apply 2 to 3 shots of grease to the grease fittings (1) on the input and output shafts. Each shaft has a single grease fitting.



SERVICE (continued)

3. Check for water leakage at the input and output shafts. Normal leakage is 3 to 4 drops per minute. If leakage exceeds this rate, adjust the shaft packing as follows:
 - a. If leakage exceeds the normal rate, evenly tighten the adjusting nuts (2) until the leakage rate is reduced to normal levels.
 - b. If leakage is lower than the normal rate, evenly loosen the adjusting nuts (2) while gently tapping the gland (3) with a hammer until the leakage rate increases to normal levels.
 - c. If normal leakage levels cannot be obtained, notify direct support maintenance for repair.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
FIRE MONITOR, ADJUST/SERVICE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)

Materials/Parts:

Compound, Antiseize (Item 12, Table 2, WP 0230 00)

References:

FM 55-502

Equipment Condition:

FIRE PUMP CLUTCH circuit breaker set to OFF,
locked out, and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

ADJUST

1. Tighten the fire monitor fixing screws (1) snugly enough to prevent the fire monitor from moving easily.
2. Remove the lockouts and tagouts and check the operation of the system.

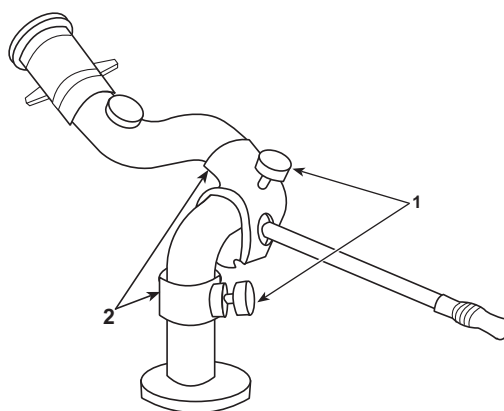
SERVICE

1. Remove the fire monitor fixing screws (1) from the fire monitor swivel joints (2).
2. Use a wire brush to clean any corrosion or deposits from the fire monitor fixing screw (1) threads.
3. Coat the fire monitor fixing screw (1) threads with a light coating of antiseize compound.

⚠ CAUTION

Do not overtighten the fire monitor fixing screws. Overtightening of the screws can cause damage to the fire monitor swivel joints.

4. Install the fire monitor fixing screws (1) into the fire monitor swivel joints (2) and adjust the fire monitor.



END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ENGINE ROOM FIRE SUPPRESSION SYSTEM, TEST**

INITIAL SETUP:**Tools and Special Tools:**

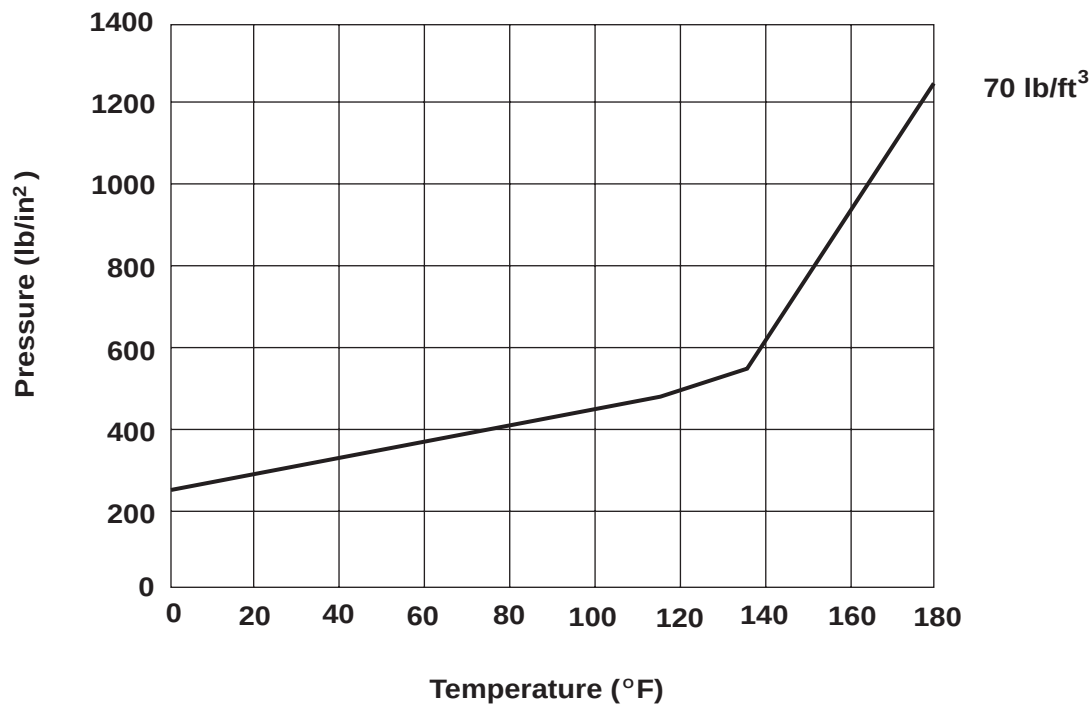
Tool Kit, Service Refrigeration (Item 8, Table 1,
WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L

TEST

1. Observe the pressure indicated on the FM-200 cylinder pressure gauge.
2. Note the ambient temperature and determine the cylinder's expected pressure by using the chart below.
3. Compare the pressure observed in step 1 with the expected pressure determined in step 2. If the cylinder pressure is lower than expected, notify general support maintenance for repair.



FM-200 PRESSURE/TEMPERATURE DIAGRAM

END OF WORK PACKAGE

OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING SYSTEM HYDRAULIC RESERVOIR, FILTER, AND STRAINERS, SERVICE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP0230 00)
 Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
 Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
 Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
 Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
 Rag, Wiping (Item 5, Table 2, WP 0230 00)
 Filter Element (p/n K-22001, qty 1)

References:

FM 55-502
 TM 55-1905-242-24P (WP 0085)

SERVICE--STRAINERS**WARNING**

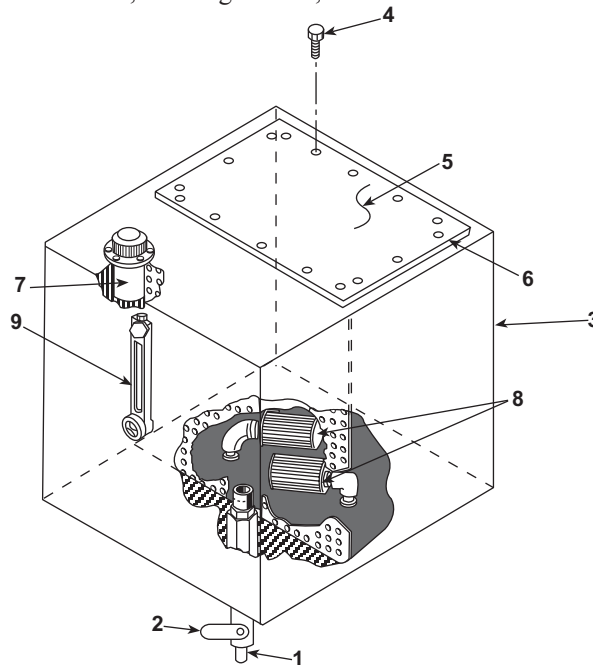
Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury or death.

1. Position a suitable drain pan beneath the reservoir drain fitting (1) and don chemical protective gloves and goggles.
2. Open the drain valve (2) and drain the hydraulic fluid into the drain pan.
3. Clean the top of the reservoir (3) with clean wiping rags in order to prevent contaminants from entering the reservoir.
4. Remove the bolts (4) that secure the tank inspection cover (5) to the reservoir (3).
5. Remove the tank inspection cover (5) and gasket (6).
6. Inspect the gasket (6) for damage, cracking, and deterioration. If the gasket is damaged, replace it .
7. Ensure that the engine room is well ventilated.

SERVICE--STRAINERS (continued)

8. Clean the inside of the reservoir (3) using wiping rags and cleaning solvent. It may be necessary to use a scraper or wire brush to loosen deposits.
9. Remove the filler/breather filter screen (7) and clean it with cleaning solvent. Inspect the screen for clogging or other defects. If the screen is damaged or clogged, replace it.
10. Remove the suction strainers (8) and clean them with cleaning solvent. Inspect the strainers for clogging or other defects. If a strainer is damaged or clogged, replace it.
11. Install the suction strainers (8) and filler/breather filter screen (7).
12. Install the tank inspection cover (5) and gasket (6) onto the reservoir (3).
13. Secure the tank inspection cover (5) to the reservoir (3) using the bolts (4).
14. Close the drain valve (2) and fill the reservoir (3) with new hydraulic fluid to the appropriate level as indicated on the sight gauge (9).
15. If the filter is to be serviced, proceed to the Service--Filter procedure in this work package. If the filter is not to be serviced, follow this procedure:
 - a. Remove the lockouts and tagouts.
 - b. Start the propulsion engines.
 - c. Operate the steering system.
 - d. Check the hydraulic fluid level and replenish as necessary.
 - e. Dispose of the used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.



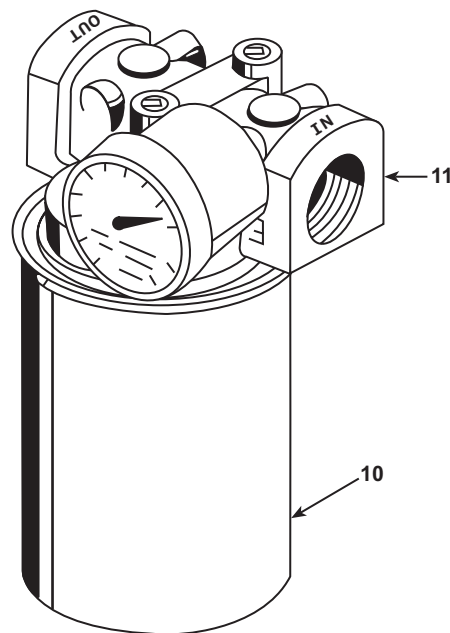
SERVICE—FILTER

1. Position a suitable drain pan beneath the filter (10).
2. Don chemical protective gloves and goggles.
3. Unscrew the filter (10) from the filter head (11).
4. Clean the filter head (11) with cleaning solvent and wiping rags. Inspect the filter head for any damage that would affect the new filter's ability to seal.
5. Apply a film of clean hydraulic fluid to the gasket of the new filter (10).
6. Fill the new filter (10) with clean hydraulic fluid.

 CAUTION

Do not overtighten the hydraulic filter. Overtightening can cause filter damage and/or leakage. Proper tightening is 3/4 turn after the gasket contacts the filter head.

7. Screw the new filter (10) onto the filter head (11) until the gasket lightly contacts the filter head. Tighten the filter another 3/4 turn past this point. Do not overtighten the filter, damage or leakage may result.
8. Remove the lockouts and tagouts.
9. Start the propulsion engines, operate the steering system, and check for leaks.
10. Check the hydraulic fluid level in the reservoir (3) and replenish as required.
11. Dispose of the used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

**END OF WORK PACKAGE**

OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP RESERVOIR, STRAINERS, AND FILTERS, SERVICE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
O-Ring (p/n 1576-001, qty 2)
Seal, Filter Base (p/n 3274-001, qty 4)
Filter Element (p/n 3293, qty 2)
Gasket Center Post (p/n 1575-001, qty 2)

References:

FM 55-502
TM 55-1905-242-24P (WP 0096)

SERVICE**WARNING**

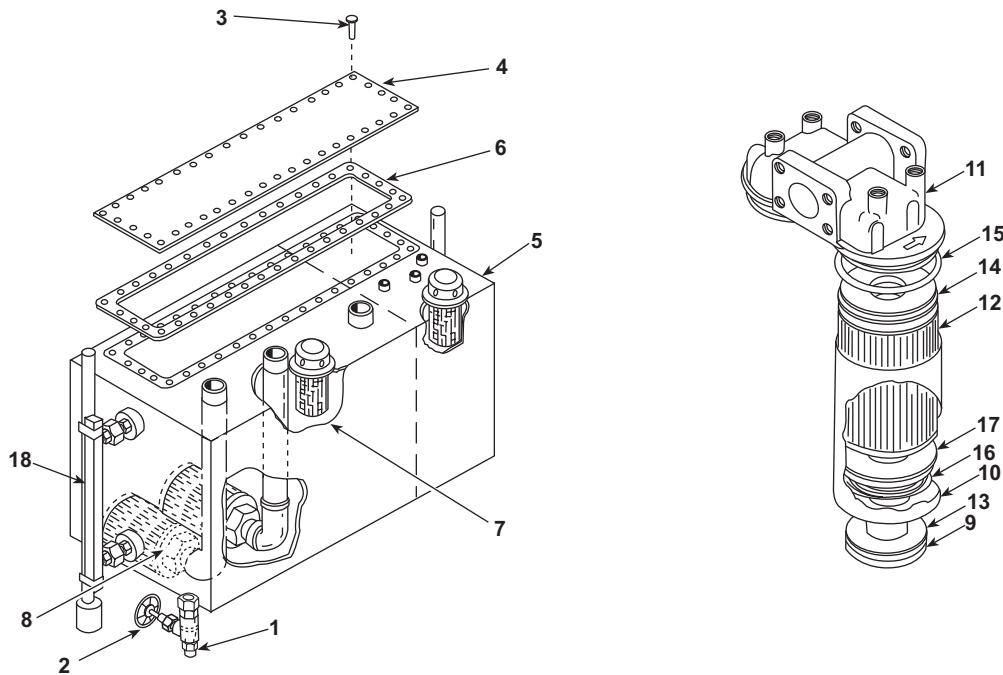
Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow used hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.
2. Place a suitable drain pan under the reservoir drain fitting (1).
3. Open the drain valve (2) and allow the hydraulic fluid to drain into the drain pan.
4. Remove the bolts (3) that secure the inspection cover (4) to the reservoir (5).
5. Remove the inspection cover (4) and the gasket (6). Inspect the gasket for breaks, cracking, and/or deterioration. If the gasket is damaged, obtain a new one.
6. Use wiping rags and cleaning solvent to clean the inside of the reservoir (5). It may be necessary to use a scraper or a wire brush to help remove deposits.

SERVICE (continued)

7. Remove the filler/breather filter screen (7) and clean it with cleaning solvent. Inspect the filler/breather filter screen for clogging and other defects. If the filler/breather filter screen is damaged or clogged, obtain a new one.
8. Remove the suction strainers (8) and clean them with cleaning solvent. Inspect the suction strainers for clogging and other defects. If a suction strainer is damaged or clogged, obtain a new one.



9. Install the suction strainers (8) and filler/breather filter screen (7).
10. Position the inspection cover (4) and gasket (6) onto the reservoir (5).
11. Secure the inspection cover (4) to the reservoir (5) using the bolts (3).
12. Position a suitable drain pan beneath one of the hydraulic filter assemblies.
13. Loosen the center post (9) on the hydraulic filter assembly.
14. Remove the center post (9) and filter housing (10) together from the filter head (11).
15. Remove the filter element (12), center post gasket (13), two filter base seals (14), O-ring (15), conical spring (16), and backup washer (17).
16. Clean all of the removed parts, except the filter element (12), with cleaning solvent and wiping rags.
17. Install a new center post gasket (13) and the filter housing (10) on the center post (9).
18. Install the conical spring (16), backup washer (17), new filter base seals (14), new filter element (12), and a new O-ring (15) into the filter housing (10).
19. Fill the filter housing (10) with clean hydraulic fluid and install the filter assembly onto the filter head (11).

SERVICE (continued)

20. Repeat steps 12-19 for the other filter.
21. Close the drain valve (2).
22. Fill the reservoir with hydraulic fluid to the proper level as indicated by the sight gauge (18).
23. Remove the lockouts and tagouts.
24. Operate the ramp hydraulic system and check for leaks.
25. Check the hydraulic fluid level in the reservoir (5) and replenish as required.
26. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**OPERATOR MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ELECTRIC TOILET, TEST**

INITIAL SETUP:**Equipment Condition:**

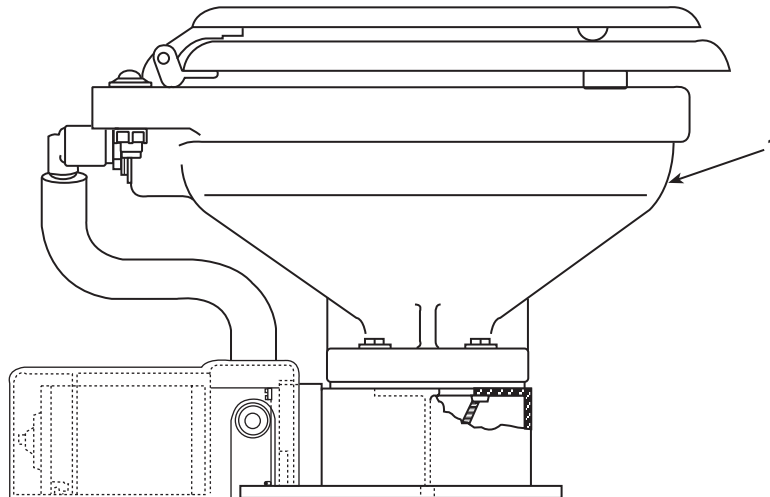
Electric toilet seacock OPEN

Personnel Required:

Two Watercraft Engineers, 88L

TEST

1. Place a small amount of toilet tissue in the bowl (1).
2. Press the flush button mounted on the aft bulkhead of the water closet compartment.
3. As the electric toilet flushes, check all of the plumbing joints for signs of leakage.
4. Ensure that the bowl (1) pumps dry.
5. If leakage is noted, or if the bowl fails to pump dry, notify unit maintenance for repair.

**END OF WORK PACKAGE**

CHAPTER 7

UNIT MAINTENANCE PROCEDURES
FOR
LANDING CRAFT, MECHANIZED (LCM-8)
(ALL VESSELS WITH MOD 2 APPLICATION)

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
MAST, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)
50 feet or more of mooring line

Personnel Required:

One Watercraft Engineer, 88L
Two Additional Crewmembers

Equipment Condition:

NAV LT PANEL, AN/PSN-11 GPS, and DIGITAL
COMPASS circuit breakers locked out and
tagged out IAW FM 55-502

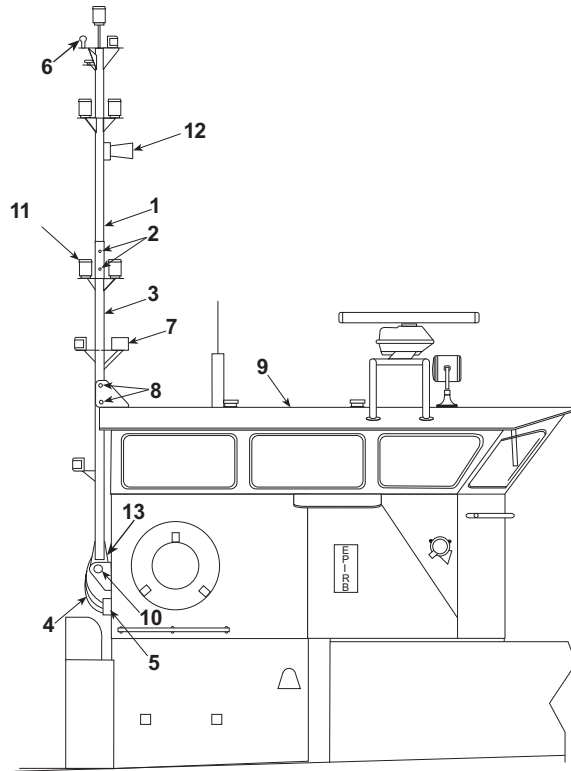
References:

FM 55-502

REMOVAL**WARNING**

Use two crewmembers to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

1. While one person supports the upper mast section (1), remove the two nuts and bolts (2) that secure the upper mast section to the lower mast section (3).
2. Gently lower the upper mast section (1) into the lower mast section (3).
3. Label and disconnect the navigation light wiring (4) from the mastlight connector panel (5).
4. Label and disconnect the leads to the GPS antenna (6) and to the digital compass unit (7).
5. Tie one end of a mooring line around the upper mast section (1) near its junction with the lower mast section (3).
6. Lead the mooring line forward onto the accommodation module top and position two crewmembers to hold the mooring line.
7. With the mooring line holding the mast upright, remove the two bolts and nuts (8) that secure the lower mast section (3) to the pilothouse top (9).
8. Using the mooring line to control its descent, carefully lower the mast aft until it rests on the deck.
9. While two crewmembers hold the lower mast section (3), remove the mast pivot pin (10).
10. Carefully lower the mast the rest of the way to the deck.
11. Remove all navigation lights (11), the GPS antenna (6), the loudhailer speaker (12), the digital compass unit (7), and all the connecting wiring from the old mast.
12. Transfer the navigation lights (11), the GPS antenna (6), the loudhailer speaker (12), the digital compass unit (7), and all the connecting wiring to the new mast.



INSTALLATION

1. Place the lower mast section base (13) into its mount on the aft bulkhead of the pilothouse and attach it using the mast pivot pin (10).
2. Attach a mooring line around the upper mast section (1) near its junction with the lower mast section (3).
3. Lead the mooring line over the pilothouse and forward onto the accommodation module top and position two crewmembers to work the mooring line.
4. Using the mooring line, raise the mast to its upright position and secure it to the pilothouse top (9) using the two bolts and nuts (8).
5. Reconnect the navigation light wiring (4) to the mastlight connector panel (5) using the labels from step 3 of Removal as a guide.
6. Reconnect the leads to the GPS antenna (6) and to the digital compass unit (7) using the labels from step 4 of Removal as a guide.
7. Raise the upper mast section (1) to its full height and secure it with two bolts and nuts (2).
8. Disconnect the mooring line; remove all lockouts and tagouts; energize the navigation lights, GPS, digital compass, and loudhailer; and check the operation of all of these systems.

END OF WORK PACKAGE

**UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
WINDOWS, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Materials/Parts:

Gloves, Anti-Flash (Item 13, Table 2, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

TM 55-1905-242-24P (WP 0004)

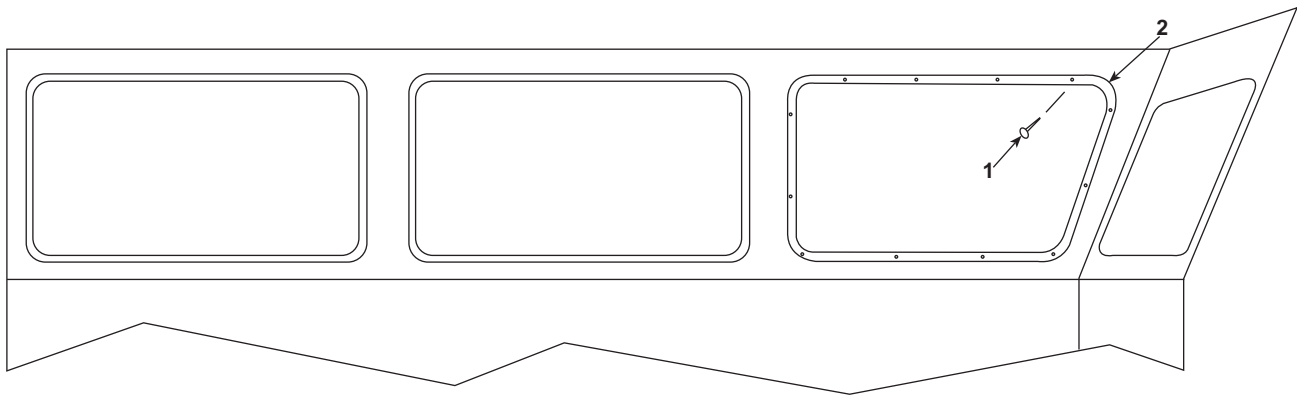
GENERAL

Replacement of a pilothouse window is described. The replacement procedure for all pilothouse windows and all accommodation module windows is identical. Windows in the pilothouse and accommodation module doors are not serviced separately. Should a door window require replacement, replace the entire door assembly.

REMOVAL**WARNING**

Do not apply pressure to the glass when removing the window. Glass breakage could result. Always wear heavy gloves when working with glass. Failure to comply with this warning could result in serious injury or death.

1. Remove the screws (1) that secure the inner window frame to the outer window frame.
2. Don protective leather gloves (both personnel).
3. Remove the inner window frame from the outer window frame.
4. Position one person outside the window to support the window.
5. Position one person inside the compartment to push out the window.
6. When the outside person is ready, the inside person must push out on the window frame (2). Do not push out on the glass. Glass breakage and personnel injury could result. It may be necessary for the outside person to help break the window frame free from the pilothouse by prying between the window frame and the pilothouse structure to break the window's seal on the pilothouse structure.
7. After the window has broken free, carefully remove it from the pilothouse structure.



INSTALLATION

1. Obtain an appropriate window.
2. Carefully place the window into the opening in the pilothouse structure.
3. While one person holds the window in place, the second person must position the inner window frame over the outer window frame and secure it with the screws (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
WIPERS AND WIPER MOTOR, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
 Table 1, WP 0230 00)
 Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Rag, Wiping (Item 5, Table 2, WP 0230 00)

Equipment Condition:

Appropriate windshield wiper circuit breaker
 locked out and tagged out IAW FM 55-502

References:

FM 55-502
 TM 55-1905-242-24P (WP 0005)

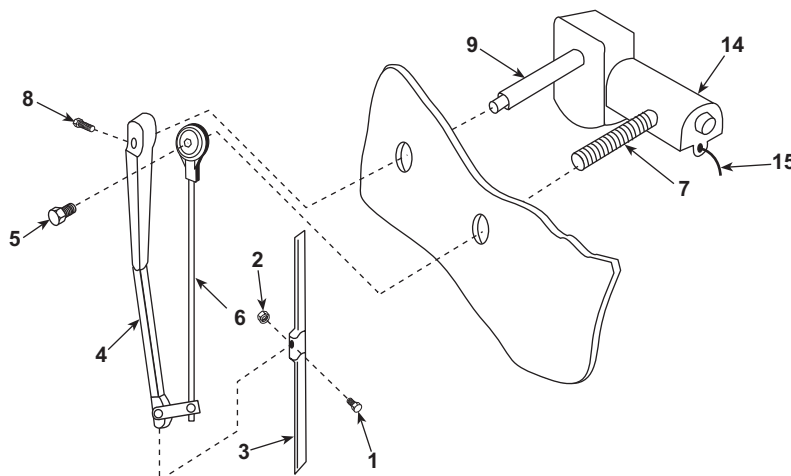
REMOVAL--WIPER BLADE

WARNING



Replace or repair units only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death.

1. Loosen, but do not remove, the bolt (1) and nut (2) that secure the wiper blade (3) to the wiper arm (4).
2. Pull the wiper arm (4) away from the windshield and finish removing the bolt (1) and nut (2).



REMOVAL--WIPER BLADE (continued) **CAUTION**

Do not allow the wiper arm to come in contact with the windshield. Unprotected contact between the wiper arm and the windshield can scratch the windshield.

3. If the wiper arm (4) must be released, place a clean wiping rag between the arm and the windshield to prevent windshield damage.

INSTALLATION--WIPER BLADE

1. Position the wiper blade (3) in its slot on the wiper arm (4) and align the bolt holes.

NOTE

Do not overtighten the wiper blade attaching bolt and nut. The wiper blade must be free to pivot in the wiper arm in order to properly wipe the windshield.

2. Secure the wiper blade (3) to the wiper arm (4) with the bolt (1) and nut (2).

REMOVAL--WIPER ARM**WARNING**

Replace or repair units only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death.

1. Remove the bolt (5) that secures the slave arm (6) to the slave arm shaft (7).
2. Remove the bolt (8) that secures the wiper arm (4) to the wiper motor shaft (9).
3. Pull the slave arm (6) and the wiper arm (4) from their mountings.

INSTALLATION--WIPER ARM

1. Hold the wiper arm (4) in its proper position on the windshield and slide the wiper arm over the wiper motor shaft (9). Secure it in place by tightening the bolt (8).
2. Slide the slave arm (6) over the slave arm shaft (7) and secure it in place with the bolt (5).

REMOVAL--WIPER MOTOR (continued)

5. Label and disconnect the wiper motor wiring (15) from the wiper motor assembly (14).
6. Procure a new wiper motor assembly, wiper arm, and wiper blade as required.
7. Measure and record the distance from the end of the wiper shaft (9) to the spacer plate (16), and from the end of the slave arm shaft (7) to the other spacer plate (16). These dimensions will be required when installing the new wiper motor assembly.
8. Remove the spacer plates (16), wiper shaft inner nut (17), and slave arm shaft inner nut (18) from their respective shafts.

INSTALLATION--WIPER MOTOR

1. Install the wiper shaft inner nut (17), slave arm shaft inner nut (18), and spacer plates (16) onto their respective shafts.
2. Adjust the wiper shaft inner nut (17) and slave arm shaft inner nut (18) to attain the dimensions recorded in step 7 of the Removal--Wiper Motor procedure in this work package.
3. Connect the wiper motor wiring (15) to the new wiper motor assembly (14) using the labels from step 5 of Removal--Wiper Motor as a guide.
4. Slide the wiper motor assembly (14) into place through the pilothouse bulkhead.
5. Secure the wiper motor assembly (14) in place using the outer plate (13), washer (12), outer wiper arm shaft nut (11), and outer slave arm shaft support nut (10).
6. Remove the lockouts and tagouts and turn ON the wiper motor assembly (14) to check for proper operation. Turn OFF the wiper motor assembly when finished.

 CAUTION

Do not clamp the vise grips directly to the wiper arm shaft. Use several folds of a wiping rag between the vise grip jaws and the wiper arm shaft to provide shaft protection. Do not clamp the vise grips too tightly to the wiper arm shaft. Failure to comply with these cautions could result in damage to the shaft.

7. Wrap a clean wiping rag around the blade end of the wiper motor shaft (9) and lightly clamp a pair of vise grips to the shaft end. This will allow judging of wiper shaft position.
8. Turn ON the wiper motor assembly (14) and observe the arc of the vise grips. Turn OFF the wiper motor assembly when the vise grips have reached the end of their arc. It may take several tries to stop the vise grips at the end of their arc.
9. Install the wiper arm as described in the Installation--Wiper Arm procedure in this work package.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
CONTROL CONSOLE, INSTRUMENT LIGHTS AND SWITCHES, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)
Multimeter (Item 2, Table 1, WP0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0006)

Equipment Condition:

Circuit breaker(s) for affected circuit(s) secured,
locked out and tagged out IAW FM 55-502

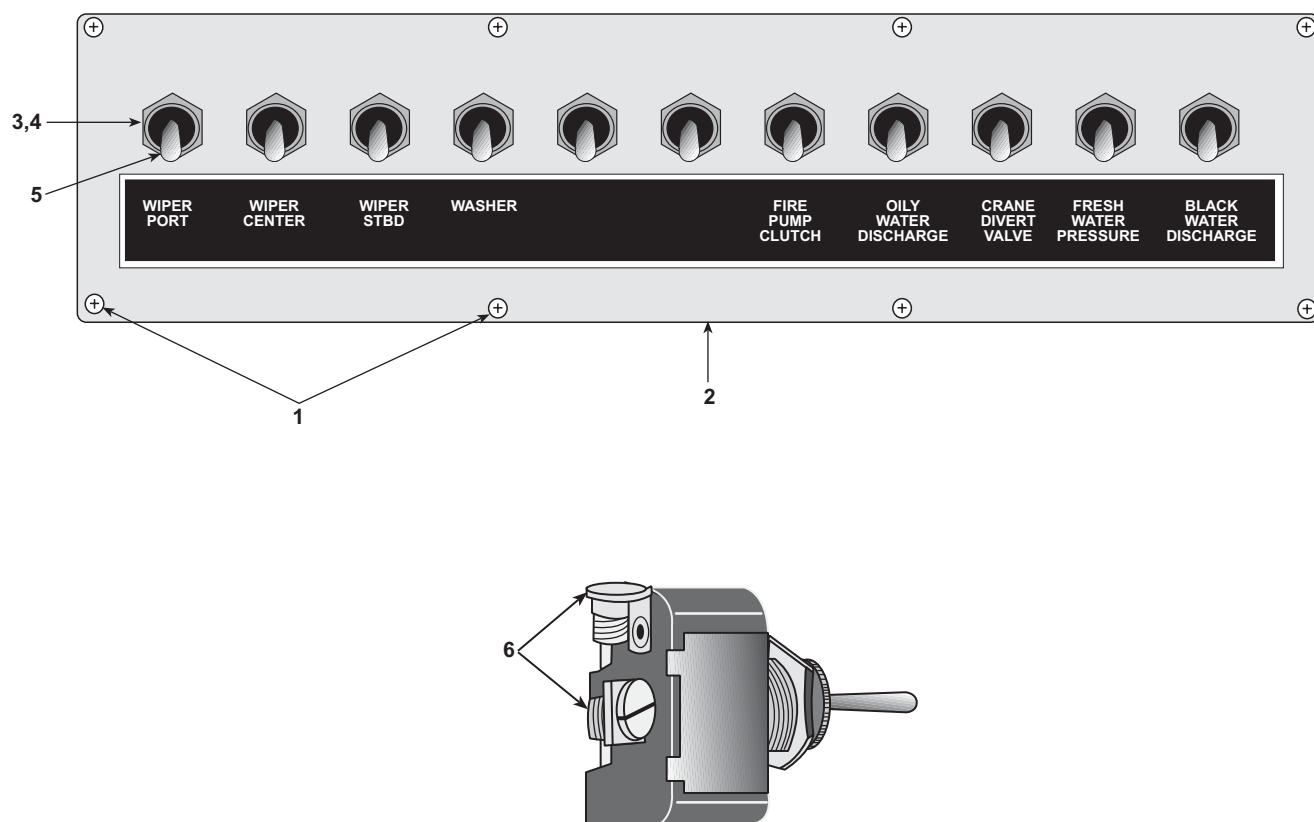
GENERAL

This work package describes the replacement of a single pole, single-throw toggle switch. This is the switch style found in most of the console. The replacement procedure for the other control console and instrument light switches is similar.

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Ensure that all of the circuit breakers that serve switches in the affected switch panel are properly locked out and tagged out in accordance with FM 55-502.
2. Remove the screws (1) that secure the switch panel (2) to the console.
3. Set the multimeter to the Vdc (Volts direct current) setting and check that no voltage is present at any switch (5). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the affected circuit breaker is properly secured.
4. Remove the nut (3) and washer (4) that secure the switch (5) to the switch panel (2).
5. Label and disconnect the wiring from the switch terminals (6).
6. Remove the switch (5) from the switch panel (2).



INSTALLATION

1. Position the new switch (5) into its hole in the switch panel (2).
2. Connect the wiring to the switch terminals (6) using the labels from step 5 of Removal as a guide.
3. Secure the switch (5) to the switch panel (2) using the nut (3) and washer (4).
4. Position the switch panel (2) onto the console and secure it with the screws (1).
5. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ENGINE/TRANSMISSION INSTRUMENTS, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
 Multimeter (Item 2, Table 1, WP 0230 00)

Materials/Parts:

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
 Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
 Rag, Wiping (Item 5, Table 2, WP 0230 00)

Equipment Condition:

ENGINE ALARM PANEL and RUDDER ANGLE & TANK GAUGES circuit breakers locked out and tagged out IAW FM 55-502

References:

FM 55-502
 TM 55-1905-242-24P (WP 0007)

Personnel Required:

Two Watercraft Engineers, 88L

GENERAL

Two primary types of gauges are used on the LCM-8 Mod 2: gauges with electric senders and direct reading gauges. The two types of gauges can be distinguished by observing the back side of the gauge. Gauges with electric senders have only wires connected to their back sides. Direct reading gauges have a hose or line connected to the back side. Direct reading gauges may also have wiring connected to their back sides.

REMOVAL--ALL GAUGES**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

Do not allow hydraulic fluid or engine oil to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling hydraulic fluid and engine oil. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve, if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious injury or death.

1. Remove the screws (1) that secure the gauge panel (2) to the console.
2. Lift the gauge panel (2) away from the console.

REMOVAL--ALL GAUGES (continued)

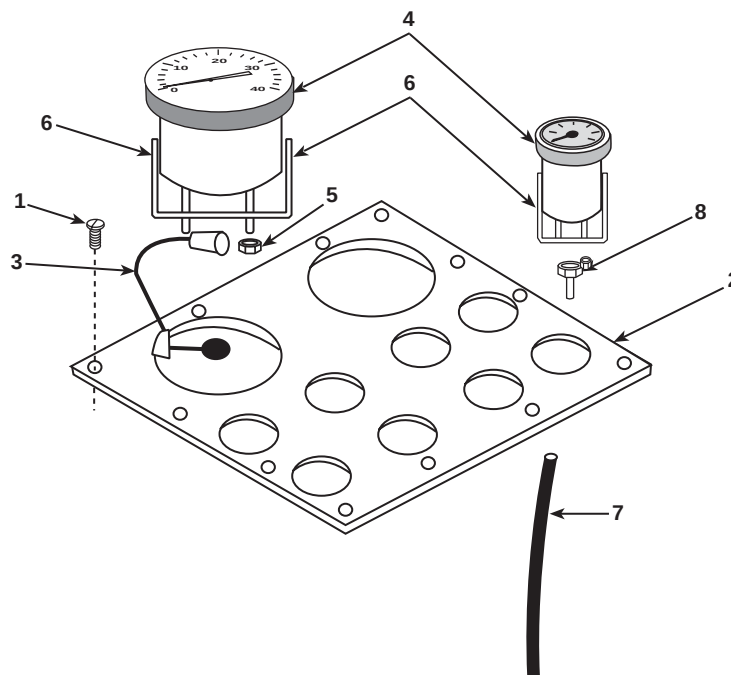
3. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the gauge wiring (3) on all of the gauges. If no voltage is noted, continue with the procedure. If voltage is noted at any of the gauges, check to ensure that the proper circuit breaker is properly secured.
4. Depending upon the gauge type (electric sender or direct reading), proceed to the following paragraphs.

REMOVAL--GAUGES WITH ELECTRIC SENDERS

1. Label and disconnect the gauge wiring (3) from the gauge (4).
2. Remove the nuts (5) that secure the gauge clamp bracket (6) to the back of the gauge (4).
3. Remove the gauge (4) from the gauge panel (2).

REMOVAL--DIRECT-READING GAUGES

1. Don chemical protective gloves and goggles.
2. Label and disconnect the gauge wiring (3), if any, from the gauge (4).
3. Position a clean wiping rag below the gauge to catch any fluid that may leak, and remove the line (7) from the rear of the gauge (4).
4. Remove the nuts (5) that secure the gauge clamp bracket (6) to the back of the gauge (4).
5. Remove the gauge (4) from the gauge panel (2).
6. If any connectors (8) are attached to the back of the gauge (4), remove them.



INSTALLATION--GAUGES WITH ELECTRIC SENDERS

1. Procure a new gauge.
2. Insert the new gauge (4) into its hole in the gauge panel (2).
3. Slide the gauge clamp bracket (6) into place and secure it to the back of the gauge (4) with nuts (5).
4. Install the gauge wiring (3).
5. Proceed to the Installation--All Gauges procedure in this work package.

INSTALLATION--DIRECT-READING GAUGES

1. Procure a new gauge.
2. Insert the new gauge (4) into its hole in the gauge panel (2).
3. Slide the gauge clamp bracket (6) into place and secure it to the back of the gauge (4) with nuts (5).
4. Dispose of used oil and contaminated parts in accordance with local regulations.
5. Attach the connectors (8), if required, and the line (7) to the gauge (4).
6. Install the gauge wiring (3), if any.
7. Proceed to the Installation--All Gauges procedure in this work package.

INSTALLATION--ALL GAUGES

1. Position the gauge panel (2) in place on the console and secure it with screws (1).
2. Remove the lockouts and tagouts and check the operation of the gauge.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
HYDRAULIC GAUGES, RUDDER ANGLE INDICATOR, AND AMMETER, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)
Suitable Drain Pan

Materials/Parts:

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)

Equipment Condition:

Battery isolation switches set to OFF, locked out,
and tagged out IAW FM 55-502

References:

FM 55-502
TM 55-1905-242-24P (WP 0008)

Personnel Required:

Two Watercraft Engineers, 88L

REMOVAL—RUDDER ANGLE INDICATOR**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

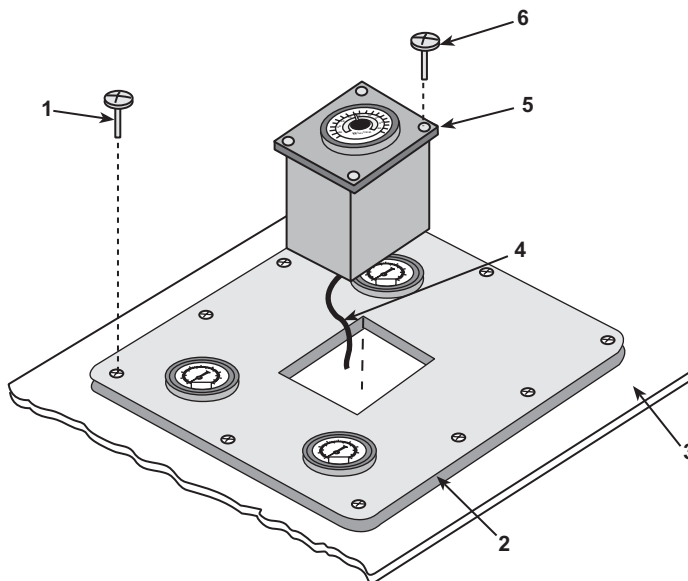
Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly can cause serious injury or death.

1. Remove the screws (1) that attach the gauge panel (2) to the console (3) and lift the gauge panel away from the console.
2. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage on all of the gauges. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the system is properly secured, locked out, and tagged out.
3. Label and disconnect the wiring (4) from the back of the gauge (5).
4. Remove the screws (6) that attach the gauge (5) to the gauge panel (2).

REMOVAL--RUDDER ANGLE INDICATOR (continued)

5. Remove the gauge (5) from the gauge panel (2).

**INSTALLATION--RUDDER ANGLE INDICATOR**

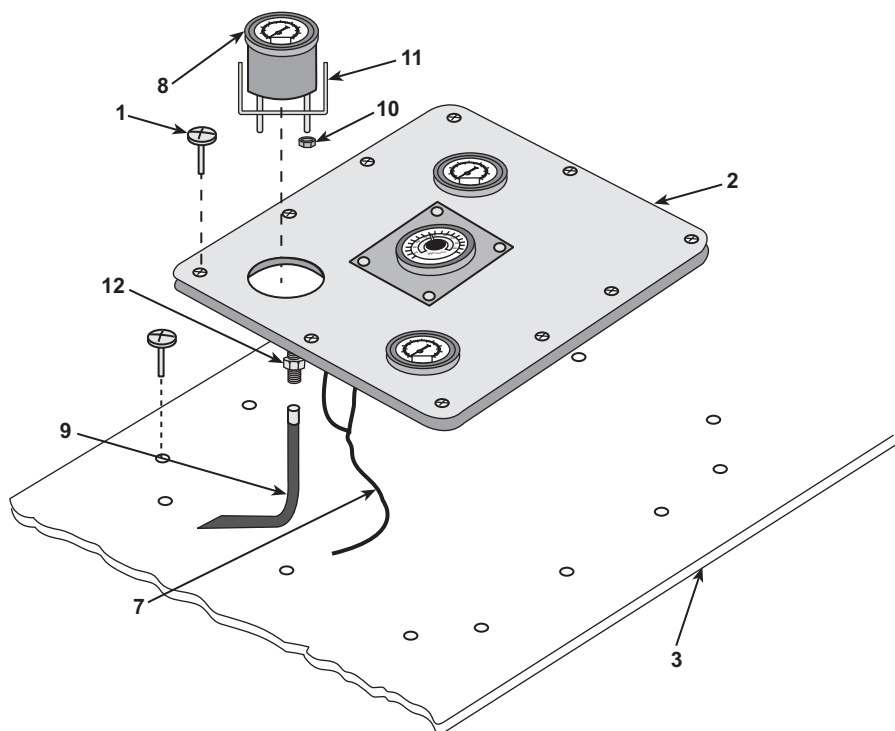
1. Procure a new gauge (5).
2. Insert the gauge (5) into its hole in the gauge panel (2).
3. Secure the gauge (5) to the gauge panel (2) with the screws (6).
4. Install the wiring (4) on the back of the gauge (5) using the labels from step 3 of Removal--Rudder Angle Indicator as a guide.
5. Position the gauge panel (2) on the console (3) and secure it with the screws (1).
6. Remove the lockouts and tagouts and check the operation of the gauge.

REMOVAL--HYDRAULIC GAUGES

1. Remove the screws (1) that attach the gauge panel (2) to the console (3) and lift the gauge panel away from the console.
2. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage on all of the gauges. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the system is properly secured, locked out, and tagged out.
3. Label and remove the wiring (7) from the back of the gauge (8).
4. Don chemical protective gloves and goggles.
5. Place a wiping rag or a suitable drain pan beneath the gauge (8) to catch any fluid that might drip. Remove the line (9) from the back of the gauge (8).
6. Remove the nuts (10) that secure the gauge clamp bracket (11), and slide the bracket off the gauge (8).
7. Remove the gauge (8) from the gauge panel (2).

REMOVAL--HYDRAULIC GAUGES (continued)

8. If any adapters (12) are installed in the gauge (8), remove these adapters.

**INSTALLATION--HYDRAULIC GAUGES**

1. Procure a new gauge.
2. If any adapters (12) were removed from the old gauge (8) during Removal--Hydraulic Gauges, install them on the new gauge.
3. Insert the new gauge (8) into its hole in the gauge panel (2) and secure it with the gauge clamp bracket (11) and nuts (10).
4. Install the line (9) onto the back of the gauge (8).
5. Install the wiring (7) to the back of the gauge (8) using the labels from step 3 of Removal--Hydraulic Gauges as a guide.
6. Position the gauge panel (2) onto the console (3) and secure it with the screws (1).
7. Remove the lockouts and tagouts, test the operation of the gauge, and check for leakage.
8. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ENGINE SHUTDOWN CONTROL AND EMERGENCY ENGINE SHUTDOWN CONTROL, REPLACE

INITIAL SETUP:

Tools and Special Tools:

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

Propulsion engines secured, locked out and
tagged out IAW FM 55-502

References:

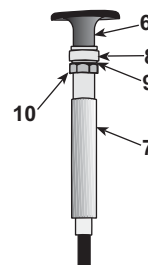
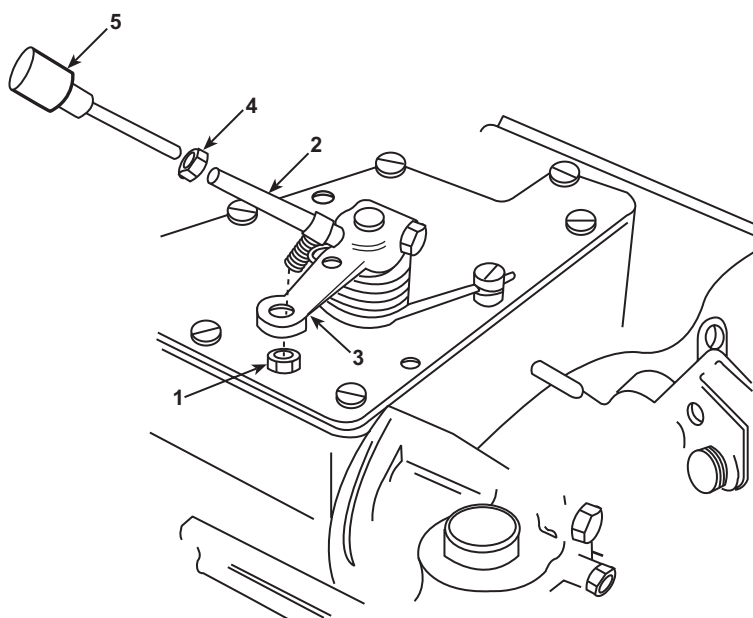
FM 55-502

WP 0053 00

TM 55-1905-242-24P (WP 0009)

REMOVAL--ENGINE SHUTDOWN CONTROL

1. Remove the nut (1) that secures the swivel fitting (2) to the governor shutdown arm (3).
2. Remove the swivel fitting (2) from the governor shutdown arm (3).
3. Loosen the locknut (4) that secures the swivel fitting (2) to the lower end of the cable (5).
4. Remove the swivel fitting (2) from the lower end of the cable (5).
5. Follow the length of the cable and remove any clamps that secure it to the engine or vessel structure.
6. Remove the T-handle (6) from the upper end of the cable (7) located in the pilothouse console.
7. Remove the upper cable nut (8) and washer (9) and pull the upper end of the cable (7) out of the console.

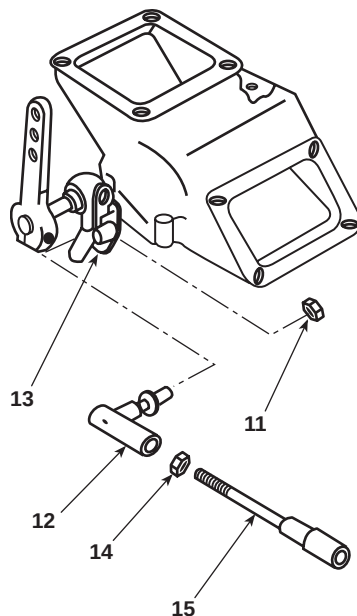


INSTALLATION--ENGINE SHUTDOWN CONTROL

1. Adjust the cable adjusting nut (10) so that the upper end of the cable (7) will slide through the console far enough to permit installation of the upper cable nut (8) and washer (9). Install the upper cable nut hand tight on the cable, and install the T-handle (6).
2. Secure the upper end of the cable (7) to the console by tightening the cable adjusting nut (10).
3. Route the new cable through the vessel, securing it in the same places as the old cable.
4. Push the T-handle (6) all the way down, and then pull it back up approximately 1/4 inch (6 mm).
5. Install the locknut (4) and swivel fitting (2) onto the lower end of the cable (5) and adjust it so that the swivel end stud slips easily through the hole in the governor shutdown arm (3).
6. Secure the swivel fitting (2) to the governor shutdown arm (3) with the nut (1).
7. Remove the lockouts and tagouts, start the engine, and test the operation of the cable.

REMOVAL--EMERGENCY ENGINE SHUTDOWN CONTROL

1. Remove the nut (11) that secures the swivel fitting (12) to the release arm (13).
2. Remove the swivel fitting (12) from the release arm (13).
3. Loosen the locknut (14) that secures the swivel fitting (12) to the lower end of the cable (15).
4. Remove the swivel fitting (12) from the lower end of the cable (15).
5. Follow the length of the lower end of the cable (15) and remove any clamps that secure it to the engine or vessel structure.
6. Remove the T-handle (6) from the upper end of the cable (7) located in the pilothouse console.
7. Remove the upper cable nut (8) and washer (9) and pull the cable out of the console.



INSTALLATION--EMERGENCY ENGINE SHUTDOWN CONTROL

1. Adjust the cable adjusting nut (10) so that the upper end of the cable (7) will slide through the console far enough to permit installation of the upper cable nut (8) and washer (9). Install the upper cable nut hand tight on the cable, and install the T-handle (6).
2. Secure the upper end of the cable (7) to the console by tightening the cable adjusting nut (10).
3. Route the new cable (7) through the vessel, securing it in the same places as the old cable.
4. Push the T-handle (6) all the way down, and then pull it back up approximately 1/4 inch (6 mm).
5. Install the locknut (14) and swivel fitting (12) onto the lower end of the cable (15) and adjust it so that the swivel end stud slips easily through the hole in the release arm (13).
6. Secure the swivel fitting (12) to the release arm (13) with the nut (11).
7. Test the operation of the system as described in WP 0053 00.
8. Remove the lockouts and tagouts, start the engine, and test the operation of the cable.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
PROPULSION CONTROL HEAD, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

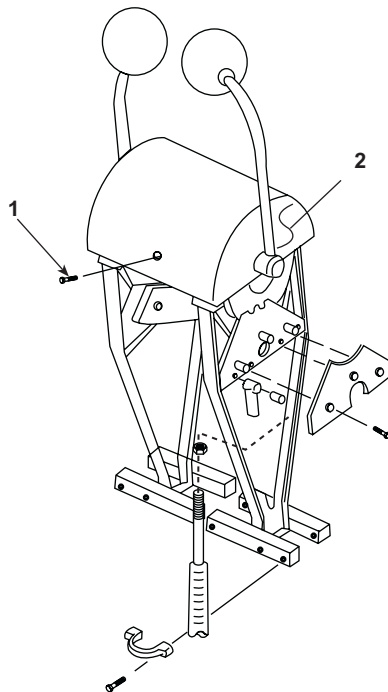
Propulsion engines secured, locked out,
and tagged out IAW FM 55-502

References:

FM 55-502
WP 0083 00
WP 0084 00
TM 55-1905-242-24P (WP 0010)

REMOVAL

1. Remove the center access plate in the pilothouse console.
2. Remove the screws (1) that secure the cover (2), and remove the cover.
3. Remove the throttle cables (WP 0083 00) and clutch cables (WP 0084 00) from the control head as described in the appropriate work packages.
4. Remove the screws that secure the propulsion control head assembly to the console and remove the control head assembly from the console.
5. Procure a new propulsion control head assembly, if required.



INSTALLATION

1. Position the new propulsion control head assembly in the console and secure it to the console with its screws.
2. Install the throttle cables (WP 0083 00) and clutch cables (WP 0084 00) to the control head as described in the appropriate work packages.
3. Position the cover (2) onto the propulsion control head assembly and secure it with its screws (1).
4. Install the center access plate in the pilothouse console.
5. Remove the lockouts and tagouts. Test the operation of the system, ensuring that both marine transmissions engage in forward and reverse, and that the throttles are free to move from idle to wide open throttle.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
THROTTLE LINKAGE, ADJUST/REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

Propulsion engines secured, locked out, and
tagged out IAW FM 55-502

References:

FM 55-502

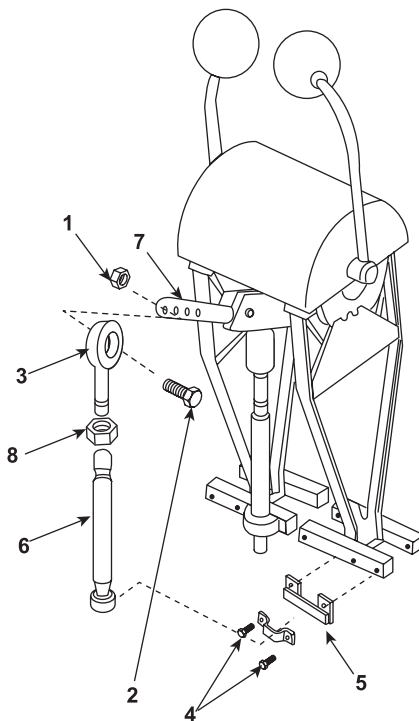
TM 55-1905-242-24P (WP 0011)

GENERAL

The throttle linkage consists of the throttle cable extending from the pilothouse control head to the articulator and the control unit, as well as the control rod assembly connecting the governor.

REMOVAL

1. Disconnect the throttle cable from the control head in the pilothouse by using the following procedure:
 - a. Remove the center access plate in the pilothouse console.
 - b. Remove the nut (1) and bolt (2) from the cable connector (3).
 - c. Remove the screws (4) from the cable clamp (5).
 - d. Remove the throttle cable (6) from the throttle extension (7).
 - e. Loosen the locknut (8) and remove the cable connector (3) from the throttle cable (6).



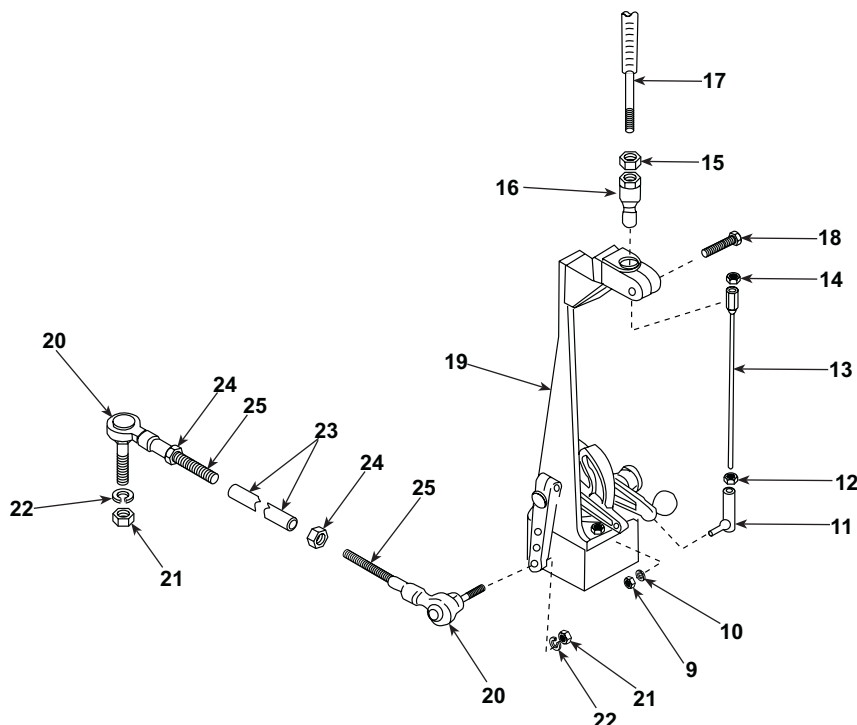
REMOVAL (continued)

2. Disconnect the throttle cable and articulator from the local control unit in the engine room by using the following procedure:
 - a. Remove the nut (9) and washer (10) that secure the cable connector (11). Remove the cable connector from its hole in the local control head.
 - b. Loosen the locknut (12) and remove the cable connector (11) from the articulator (13).
 - c. Remove the clamping screw (18) from the local control unit (19).

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

- d. Loosen the locknuts (14 and 15), and remove the cable adapter bushing (16) from the articulator (13) and throttle cable (17).
 - e. Follow the routing of the throttle cable (17) and disconnect it from any vessel structure that supports it. Pull the cable down.
3. Disconnect the governor control rod assembly from the local control unit by using the following procedure:
 - a. Measure and record the length from center to center of the rod ends (20) before removing the governor control rod.
 - b. Remove the nuts (21) and lockwashers (22) that secure the rod ends (20).
 - c. Remove the rod ends (20) from the local control unit (19) and the governor control rod.



REMOVAL (continued)**NOTE**

Do not further disassemble the governor control rod unless replacement of one or more of its component parts is required.

- d. Hold the coupling tube (23) and loosen the locknuts (24) to permit removal of the connecting rods (25) and the rod ends (20), if required.

INSTALLATION

1. Assemble and install the governor control rod assembly by using the following procedure:
 - a. If the governor control rod assembly was disassembled, assemble the rod ends (20), connecting rods (25), coupling tube (23), and locknuts (24). Adjust the length to the measurement recorded during the Removal procedure in this work package.
 - b. Install the rod ends (20) into the governor control rod and the local control unit (19), and secure them with the lockwashers (22) and nuts (21).
2. Connect the throttle cable to the control head in the pilothouse by using the following procedure:
 - a. Drop the end of the throttle cable (6) into the engine room through the access in the pilothouse.
 - b. Install the cable connector (3) and locknut (8) to the throttle cable (6).
 - c. Install the cable connector (3) onto the throttle extension (7) and secure it with the bolt (2) and nut (1).
 - d. Install the cable clamp (5) and secure it with the screws (4).
 - e. Secure the cable to the vessel structure in the same manner as the old cable.
3. Connect the throttle cable and articulator to the local control unit in the engine room by using the following procedure:
 - a. Install the throttle cable (17) onto the cable adapter bushing (16) and secure it with the locknut (15).
 - b. Pass the cable adapter bushing (16) through the hole in the local control unit (19).
 - c. Tighten the clamping screw (18), ensuring that only the bottom end of the cable adapter bushing (16) is clamped in the local control unit (19).
 - d. Install the locknut (14) and articulator (13) onto the threaded rod end of the cable adapter bushing (16).
 - e. Install the locknut (12) and cable connector (11) on the articulator (13).
 - f. Install the cable connector (11) onto the local control head and secure it with the washer (10) and nut (9).
 - g. Adjust the throttle linkage as described in the Adjust procedure in this work package.

ADJUST

1. Disconnect the rod end (20) from the governor control rod by removing the nut (21) and lockwasher (22).
2. Place the pilothouse control head lever for the desired engine in the full speed ahead position.
3. Hold the governor control rod in the full speed position by hand and try to line up the rod end (20) with its hole in the governor control rod. The rod end should be approximately 1/8 inch (3 mm) beyond its hole in the governor control rod, such that the governor control rod will reach the end of its stroke before the throttle control reaches the end of its stroke.
4. If the adjustment is not correct, loosen the locknut (24) and adjust the length of the governor control rod as necessary to achieve proper adjustment.
5. Return the pilothouse control head rod and the governor control rod to the idle position and attach the rod end (20) to the governor control rod with the nut (21) and lockwasher (22).
6. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
CLUTCH LINKAGE, ADJUST/REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

Propulsion engines secured, locked out,
and tagged out IAW FM 55-502

References:

FM 55-502

TM 55-1905-242-24P (WP 0012)

GENERAL

The clutch linkage consists of the clutch cable extending from the pilothouse control head to the articulator and the control unit, as well as the control rod assembly connecting the governor.

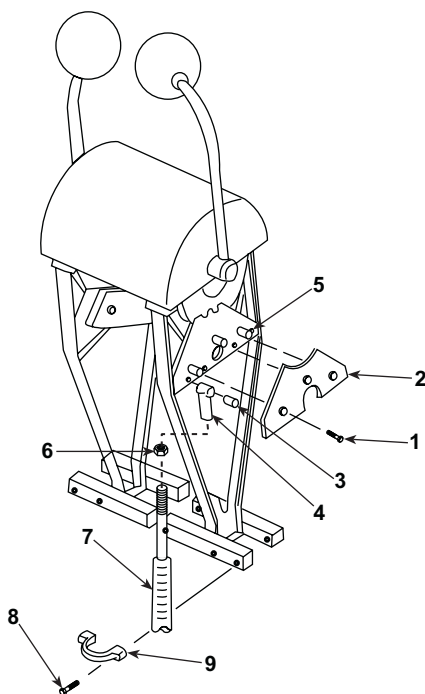
REMOVAL

1. To disconnect the clutch cable from the control head in the pilothouse:
 - a. Remove the center access plate in the pilothouse control console.
 - b. Remove the three screws (1) and the retainer (2).
 - c. Remove the pin (3) from the cable connector (4) and retainer plate (5).

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

- d. Loosen the locknut (6) and remove the clutch cable (7) from the cable connector (4).



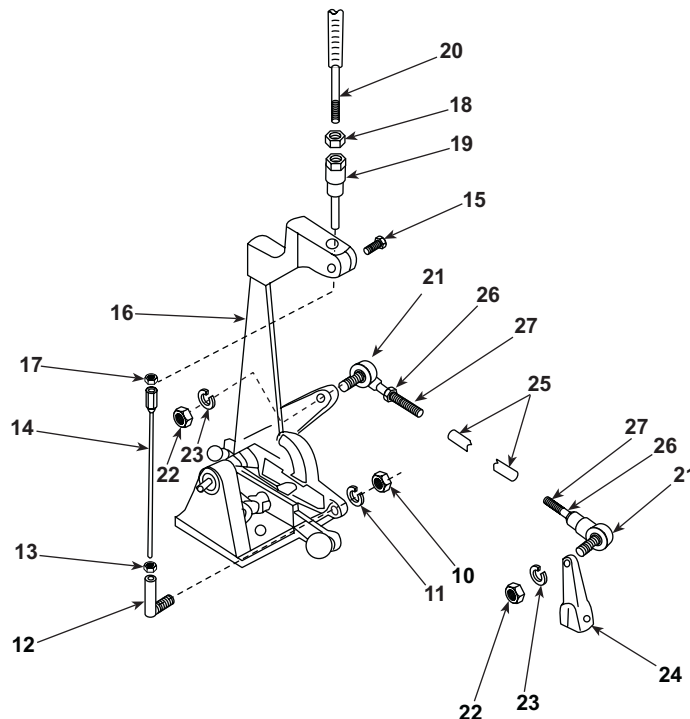
REMOVAL (continued)

2. To disconnect the clutch cable and articulator from the local control unit in the engine room:
 - a. Remove the nut (10) and lockwasher (11) that secure the cable connector (12) to the local control unit (16).
 - b. Loosen the locknut (13) and remove the cable connector (12) from the articulator (14).
 - c. Remove the clamping bolt (15) from the local control unit (16).
 - d. Loosen the locknuts (17 and 18) and remove the cable adapter bushing (19) from the articulator (14) and clutch cable (20).
 - e. Follow the length of the clutch cable (20) and disconnect it from the vessel structure. Pull the cable down from the pilothouse.
3. To disconnect the transmission control rod assembly from the control unit:
 - a. Measure and record the length from center to center of the rod ends (21) before removing the transmission control rod.
 - b. Remove the nuts (22) and lockwashers (23) that secure the rod ends (21).
 - c. Remove the rod ends (21) from the local control unit (16) and the transmission shift lever (24).

NOTE

Do not further disassemble the transmission control rod unless replacement of one or more of its component parts is required.

- d. Hold the coupling tube (25) and loosen the locknuts (26) to permit removal of the connecting rods (27) and rod ends (21), if required.



INSTALLATION

1. To assemble and install the transmission control rod assembly:
 - a. If necessary, assemble the rod ends (21), connecting rods (27), coupling tube (25), and locknuts (26). Adjust the distance between the rod ends (21) to the dimension recorded during step 3a in the Removal procedure.
 - b. Install the rod ends (21) into the transmission shift lever (24) and local control unit (16) and secure them with the nut (22) and lockwasher (23).
2. To connect the clutch cable to the control head in the pilothouse:
 - a. Drop the transmission end of the clutch cable into the engine room through the access in the pilothouse.
 - b. Install the cable connector (4) and locknut (6) to the clutch cable (7).
 - c. Install the cable connector (4) into the retainer plate (5) and secure it with the pin (3).
 - d. Install the retainer (2) and secure it with three screws (1).
 - e. Install the cable clamp (9) and secure it with the two screws (8).
 - f. Secure the cable to the vessel structure in the same manner as the old cable.
3. To connect the clutch cable and articulator to the local control unit in the engine room:
 - a. Install the clutch cable (20) onto the cable adapter bushing (19) and secure it with the locknut (18).
 - b. Pass the cable adapter bushing (19) through the hole in the local control unit (16).
 - c. Tighten the clamping bolt (15), ensuring that only the bottom end of the cable adapter bushing (19) is clamped in the control unit.
 - d. Install the locknut (17) and articulator (14) onto the the threaded rod end of the cable adapter bushing (19).
 - e. Install the locknut (13) and cable connector (12) on the articulator (14).
 - f. Install the cable connector (12) into the local control unit (16) and secure it with the lockwasher (11) and nut (10).
 - g. Adjust the clutch linkage as described below.

ADJUST

1. Disconnect the rod end (21) from the transmission shift lever (24) by removing the nut (22) and lockwasher (23).
2. Place the pilothouse control head lever for the desired engine in the NEUTRAL position.
3. Hold the transmission shift lever (24) in the forward position by hand and try to line up the rod end (21) with its hole in the governor control rod. The rod end should be aligned with its hole in the transmission shift lever (24), such that the transmission shift lever (24) will reach the end of its stroke before the transmission control reaches the end of its stroke.
4. If the adjustment is not correct, loosen the locknut (26) and adjust the length of the transmission rod as necessary to achieve proper adjustment and tighten the locknut (26).
5. Attach the rod end (21) to the transmission shift lever (24) with the nut (22) and lockwasher (23).
6. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STARTING HYDRAULIC SYSTEM VALVES, PIPING, HOSES AND FITTINGS, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out,
and tagged out IAW FM 55-502
All accumulators blown down

Personnel Required:

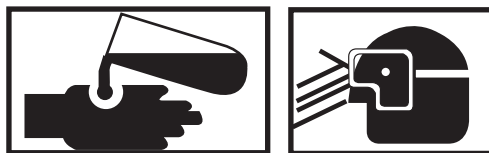
Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)

References:

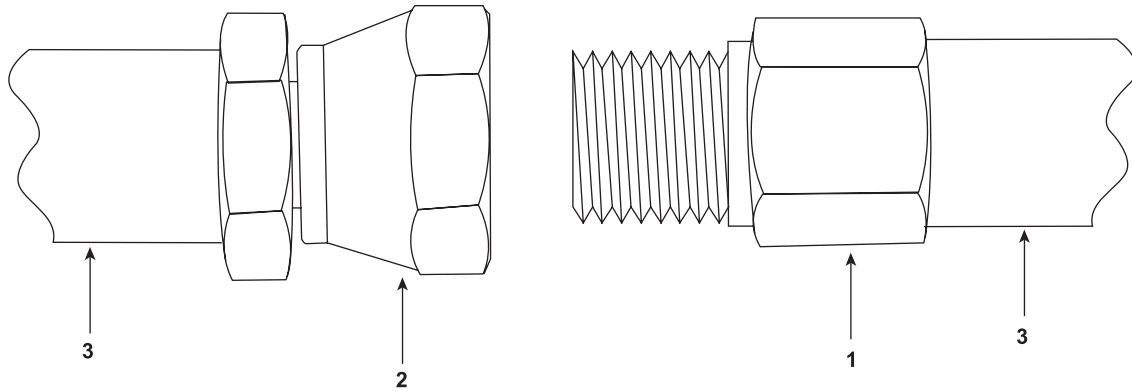
FM 55-502
TM 55-1905-242-24P (WP 0013)

REMOVAL**WARNING**

Do not allow used hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause severe personal injury or death.

1. Don chemical protective gloves and goggles.
2. Place a suitable drain pan under the hose to be replaced.
3. Hold the fixed end of the piping, fitting, or hose (1) with one wrench, while placing a second wrench on the swivel fitting (2).
4. Use the two wrenches to "crack" the swivel fitting (2) loose.
5. Permit any residual hydraulic pressure and hydraulic fluid to drain into the drain pan.
6. After the fluid has stopped leaking from the swivel fitting (2), finish unscrewing the swivel fitting from the fixed end of the piping, fitting, or hose (1).
7. Repeat steps 1-6 for the other end of the piping, fitting, or hose.



INSTALLATION

1. Procure a new hose, fitting, or pipe (3).
2. Thread the swivel fitting (2) onto the fixed end of the piping, fitting, or hose (1).
3. Tighten the fittings by placing one wrench on the swivel fitting (2) and one wrench on the fixed end of the piping, fitting, or hose (1).
4. Repeat steps 2-3 for the other end of the piping, fitting, or hose (1).
5. Use a wiping rag to wipe clean the work area.
6. Remove the lockouts and tagouts, and check the operation of the system.
7. After checking the operation, visually inspect the work area for any signs of leakage and check the hydraulic fluid level in the reservoir; replenish it as required.
8. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STARTING HYDRAULIC SYSTEM RECHARGING PUMP, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502
All accumulators blown down

Materials/Parts:

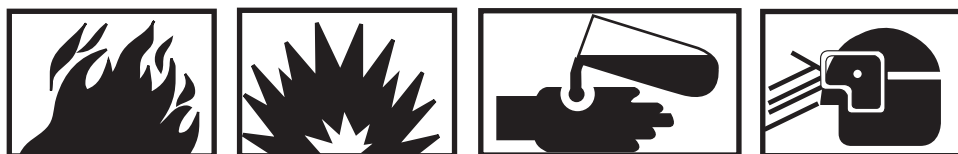
Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Gasket Flange (p/n GA202082, qty 1)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0014)

REMOVAL**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

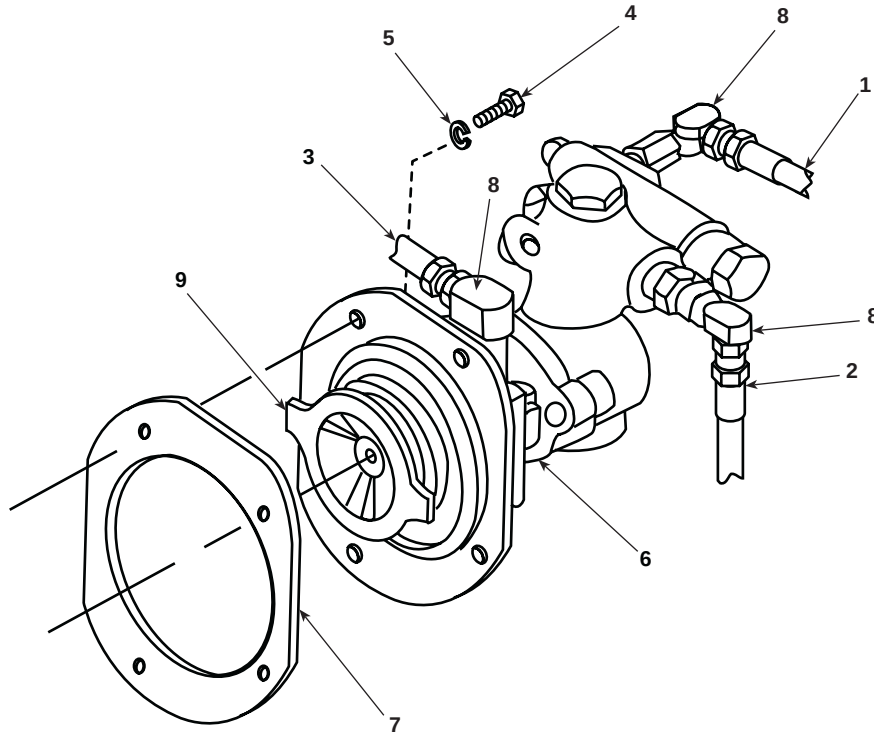
Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious injury or death.

1. Ensure that all hydraulic pressure is released from the hydraulic system before beginning work.
2. Don chemical protective gloves and goggles and use a wiping rag and cleaning solvent to clean all contamination from the work area. This will prevent contamination of the hydraulic system.
3. Position a suitable drain pan beneath the pump (6) and disconnect the outlet hose (1), inlet hose (2), and return hose (3) at the elbows (8).
4. Cap the hoses (1, 2, and 3) to prevent system contamination.

REMOVAL (continued)**NOTE**

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

5. Remove the bolts (4) and lockwashers (5) that secure the pump (6) to the engine.
6. Remove the pump (6) and gasket (7). Discard the gasket.
7. Label and remove all three elbows (8) from the pump (6).
8. Carefully clean any remaining gasket material from the engine mounting surface.

**INSTALLATION**

1. Position the pump (6) and new gasket (7) in place on the engine, ensuring that the pump's drive tangs (9) are aligned with the engine's drive slots.
2. Secure the pump (6) to the engine using the bolts (4) and lockwashers (5).
3. Install the three elbows (8) onto the pump (6) using the labels from step 7 of Removal as a guide.
4. Uncap the hoses (1, 2, and 3) one at a time, and install them on their respective elbows (8).
5. Check the hydraulic fluid level in the reservoir and replenish it as required.
6. Remove the lockouts and tagouts and check the operation of the system. Also check for any leaks.
7. After checking the system operation, secure the engine and recheck the hydraulic fluid level. Replenish it as required.
8. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STARTING HYDRAULIC SYSTEM ACCUMULATOR, SERVICE/REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out,
and tagged out IAW FM 55-502
All accumulators blown down

Personnel Required:

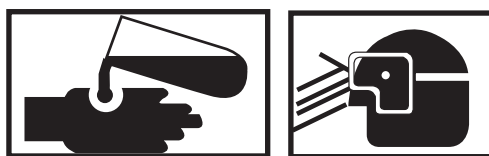
Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

References:

FM 55-502
WP 0022 00
TM 55-1905-242-24P (WP 0015)

REMOVAL**WARNING**

Do not allow used hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious personal injury or death.

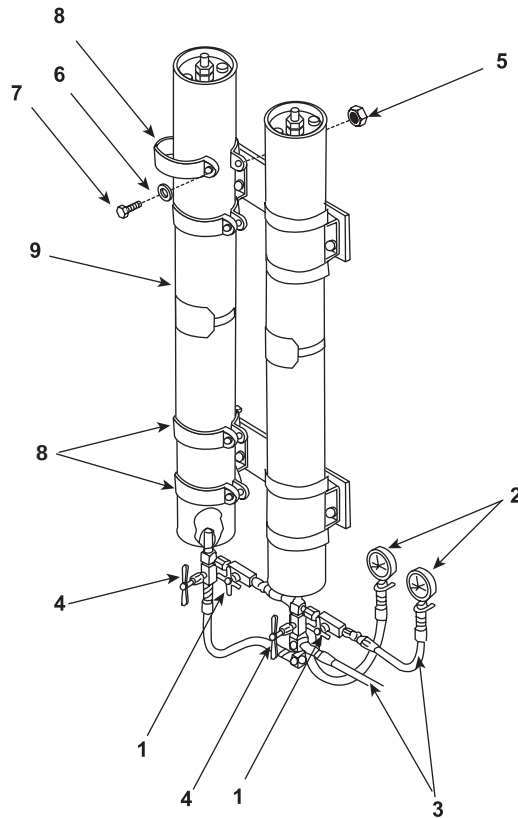
1. Don chemical protective gloves and goggles.
2. Open the accumulator gauge valves (1) and check the gauge (2) readings. The gauges should all read 0 lb/in² (0 bar). If the gauges do not read 0 lb/in² (0 bar), bleed down the accumulators before proceeding with service and replacement.
3. Position a suitable drain pan beneath the accumulator to be replaced.
4. Label and remove the hydraulic lines (3) from the accumulator gauge valves (1) and the accumulator shutoff valves (4).
5. Label and remove the accumulator gauge valves (1) and accumulator shutoff valves (4) from the accumulator (9).

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

REMOVAL (continued)

6. Remove the nuts (5), lockwashers (6), and bolts (7) that secure the mounting brackets (8) to the accumulator (9).
7. Remove the accumulator (9) from the mounting brackets (8).

**INSTALLATION**

1. Position the accumulator (9) on the bulkhead and secure it in place with the mounting brackets (8), bolts (7), lockwashers (6), and nuts (5).
2. Apply antiseizing sealant tape to the male pipe threads, and install the accumulator shutoff valves (4) and accumulator gauge valves (1) into the accumulator (9) using the labels from step 5 of Removal as a guide.
3. Install the hydraulic lines (3) onto their respective valves (1 and 4) using the labels from step 4 of Removal as a guide.
4. Remove the lockouts and tagouts, charge the system, and check the system operation. Also check for any sign of leakage.
5. Check the hydraulic fluid level in the reservoir and replenish it as necessary.
6. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

SERVICE

1. Check the accumulator precharge pressure as described in WP 0022 00.
2. If the accumulator precharge pressure is low, notify direct support maintenance for repair.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STARTING HYDRAULIC SYSTEM CONTROL VALVE, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out,
and tagged out IAW FM 55-502
All accumulators blown down
STBD or PORT ENGINE CIRCUIT FUSE
removed, locked out, and tagged out IAW
FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

References:

FM 55-502
TM 55-1905-242-24P (WP 0017)

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

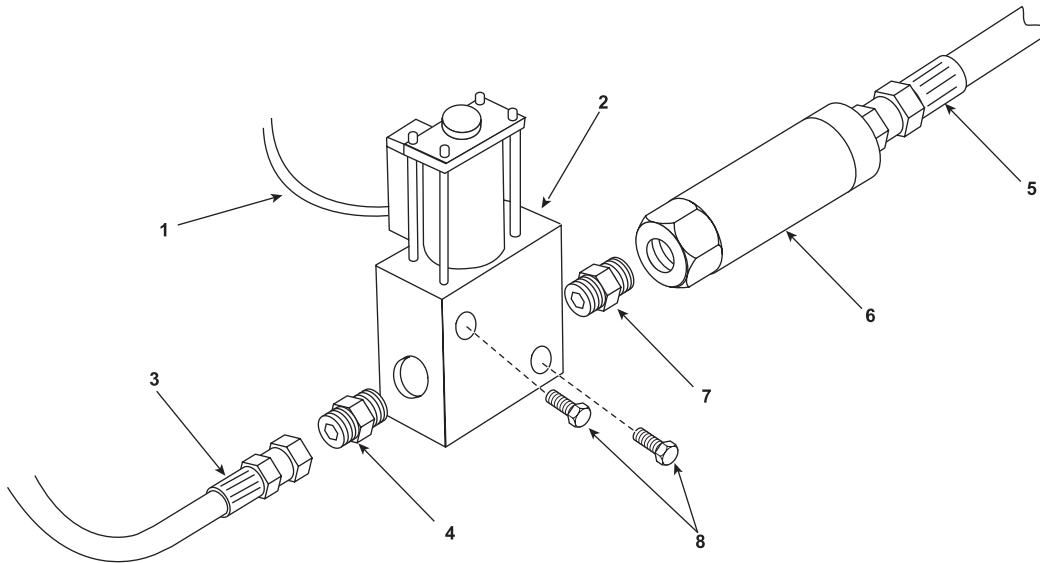
Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly can cause serious injury or death.

1. Set the multimeter to the Vdc (Volts direct current) setting. Check for voltage at the electrical leads (1). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the STBD or PORT ENGINE CIRCUIT FUSE is removed.
2. Label and disconnect the electrical leads (1) at the control valve (2).
3. Don chemical protective gloves and goggles.

REMOVAL (continued)

4. Position a suitable drain pan beneath the control valve (2).
5. Label and remove the outlet hose (3) from the outlet fitting (4). Cap the hose to prevent system contamination.
6. Remove the outlet fitting (4) from the control valve (2).
7. Label and remove the inlet hose (5) from the filter (6). Cap the hose to prevent system contamination.
8. Remove the filter (6) from the inlet fitting (7).
9. Remove the inlet fitting (7) from the control valve (2).
10. Remove the two bolts (8) that secure the control valve (2) to its bracket.

**INSTALLATION**

1. Position the control valve (2) on its bracket and secure it with the two bolts (8).
2. Wrap the male pipe threads with antiseizing sealant tape and install the inlet fitting (7) and the outlet fitting (4) into the control valve (2).
3. Install the filter (6) onto the inlet fitting (7).
4. Install the inlet hose (5) onto the filter (6) using the label from step 7 of Removal as a guide.
5. Install the outlet hose (3) onto the outlet fitting (4) using the label from step 5 of Removal as a guide.
6. Connect the electrical leads (1) to the control valve (2) using the labels from step 2 of Removal as a guide.
7. Remove the lockouts and tagouts, charge the system, and check the system operation. Also check for any sign of leakage.
8. Check the hydraulic fluid level in the reservoir and replenish it as necessary.
9. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STARTING HYDRAULIC SYSTEM MOTOR, REPLACE/REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Vise (Item 3, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out,
and tagged out IAW FM 55-502
All accumulators blown down

Personnel Required:

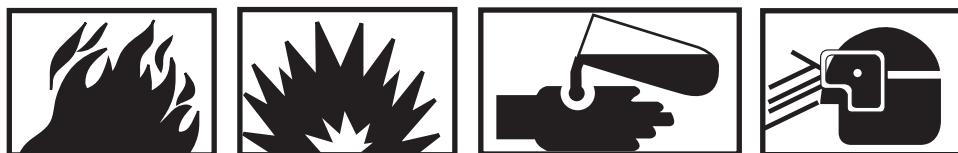
One Watercraft Engineer, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2,
WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)

References:

FM 55-502
TM 55-1905-242-24P (WP 0018)

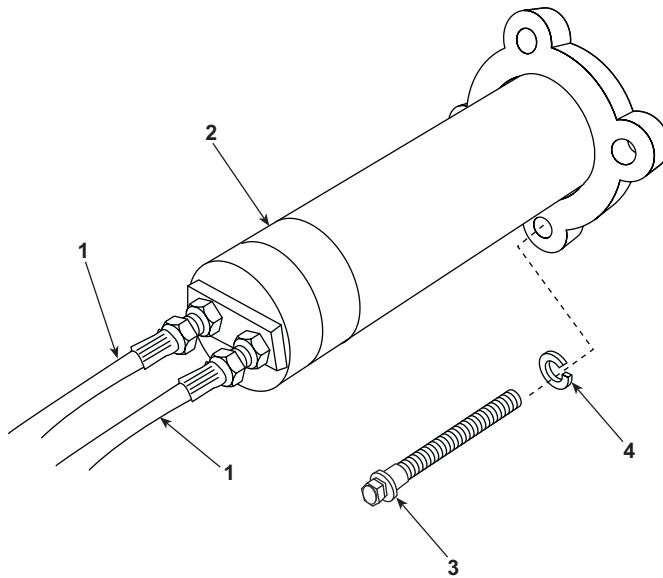
REMOVAL**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow used hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause severe personal injury or death.

1. Don chemical protective gloves and goggles. Use cleaning solvent and wiping rags to clean the work area to prevent hydraulic system contamination.
2. Place a suitable drain pan under the starter.
3. Loosen, but do not remove, the lines (1) from the starting motor (2) to permit any residual hydraulic pressure or fluid to drain from the system.
4. Label and disconnect the lines (1) from the starting motor (2). Cap the lines to prevent hydraulic system contamination.
5. Remove the retaining bolts (3) and lockwashers (4) and lift the starting motor (2) away from the flywheel housing.



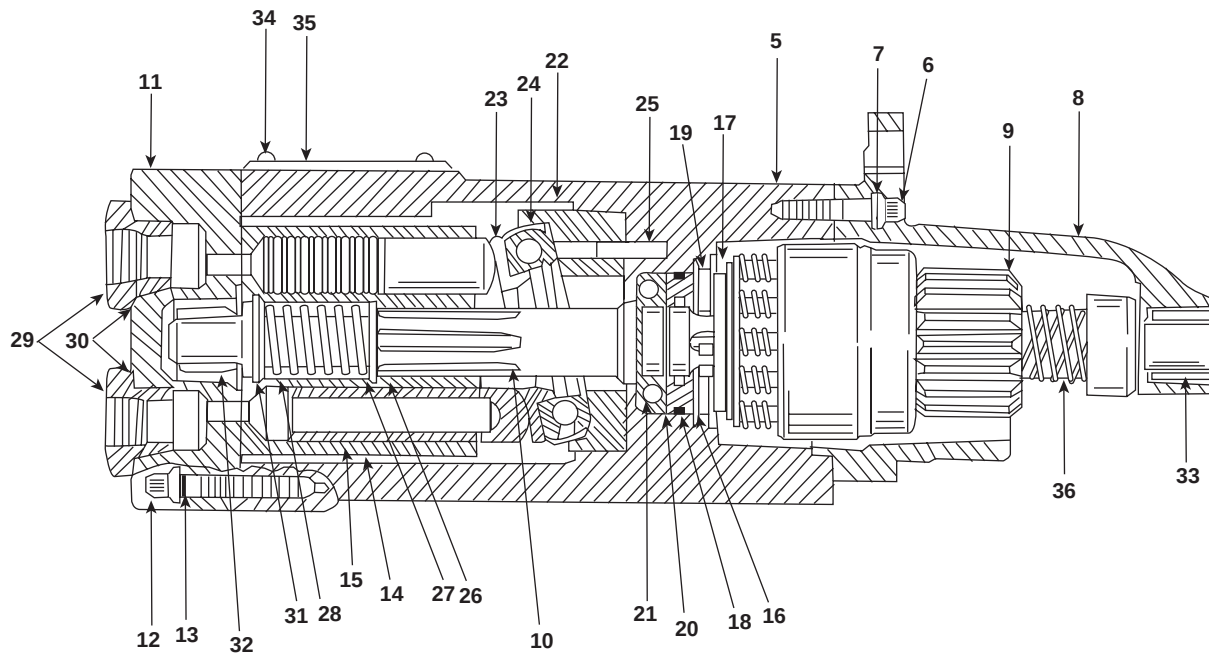
DISASSEMBLY

1. Clamp the starting motor housing (5) in a vise.

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

2. Remove the screws (6) and lockwashers (7) that secure the pinion gear housing (8) to the starting motor housing (5).
3. Remove the pinion gear housing (8) from the starting motor housing (5).
4. Slide the drive assembly pinion gear (9) from the drive shaft (10).



DISASSEMBLY (continued)

5. Scribe an index mark on the port plate (11) and starting motor housing (5). This mark will enable proper positioning of the port plate (11) at assembly.

NOTE

There is a slight spring load on the port plate. Upon loosening the screws, any hydraulic fluid left in the housing will drain out.

6. Remove the port plate screws (12) and lockwashers (13) from the port plate (11), and remove the port plate.
7. Invert the starting motor housing (5), allowing the barrel (14) and pistons (15) to slide off the drive shaft (10).
8. Remove the pistons (15) from the barrel (14).
9. Remove the retaining ring (16) from the drive shaft (10).
10. Press the drive shaft (10) out of the starting motor housing (5) from the port plate (11) end. The inner and outer seals (17 and 18), seal holder (19), retaining ring (20), and shaft ball bearing (21) will come out with the drive shaft.
11. Remove the inner seal (17), outer seal (18), and seal holder (19) from the drive shaft (10).
12. Remove the retaining ring (20) and shaft ball bearing (21) from the drive shaft (10).
13. Press against the thrust bearing housing (22) with a little pressure and remove the thrust bearing assembly.
14. Remove the thrust bearing plate (23).
15. Press out the thrust bearing (24) only if it is damaged or defective.
16. Remove the dowel pin (25), washer (26), spring (27), and washer (28) from the barrel (14).
17. Remove the adapter fittings (29) and O-rings (30) from the port plate (11).
18. Remove the retaining ring (31) and roller bearing (32) from the port plate (11).
19. Press the needle bearing (33) from the pinion gear housing (8).
20. Remove the screws (34) and nameplate (35).

CLEANING

1. If not already on, don chemical protective gloves and goggles.
2. Clean all metal parts thoroughly with cleaning solvent.
3. Dry parts thoroughly with clean wiping rags, or allow them to air dry.

INSPECTION

1. Replace any worn or defective parts found during the inspection.
2. Visually inspect the pinion gear housing (8) for cracks or other damage. Examine the needle bearing (33) for damage or wear.
3. Examine the drive assembly pinion gear (9) to be sure that the teeth are not worn excessively or chipped from interference with the ring gear. Check to ensure that the compressing spring (36) is not damaged or broken.

INSPECTION (continued)

4. Check the port plate (11) face, where the cylinder rides. This face must be absolutely smooth and free of scoring.
5. Examine the roller bearing (32) in the port plate (11) for damage or wear.
6. Examine the ported face of the barrel (14) for scratching or scoring. The bores of the barrel (14) must be smooth and free of scoring.
7. Examine the pistons (15). The outside diameter of the pistons must be smooth and free of scoring. The closed ends of the pistons may show brinelling where they contact the thrust bearing plate (23), but no burrs or flat spots are permissible.
8. Check the ends of the drive shaft (10) for wear or scoring. The splines should be smooth and free of nicks.
9. Check the shaft ball bearing (21) for damage or wear.
10. Examine the starting motor housing (5) for cracks or other damage. Inspect the tapped holes for thread damage.
11. Examine the thrust bearing (24) for damage or wear.

ASSEMBLY

1. Press the thrust bearing (24) into the thrust bearing housing (22). Lubricate the thrust bearing with clean hydraulic fluid.
2. Install the dowel pin (25) into the starting motor housing (5).
3. Align the thrust bearing housing's (22) dowel hole with the dowel pin (25), and press the thrust bearing housing into the starting motor housing (5).
4. Install the thrust bearing plate (23) into the thrust bearing (24).
5. Lubricate with clean hydraulic fluid, install the shaft ball bearing (21) on the drive shaft (10), and secure it with the retaining ring (20).
6. Press the drive shaft (10) with the shaft ball bearing (21) and retaining ring (20) into the starting motor housing (5) from the port plate (11) end.
7. Install the inner seal (17), outer seal (18), and seal holder (19) on the drive shaft (10).
8. Install the spring (27) and washers (26 and 28) over the drive shaft (10).
9. Install the barrel (14) with the pistons (15) on the drive shaft (10).
10. Press the roller bearing (32) into the port plate (11), and secure it with the retaining ring (31).
11. Install the adapter fittings (29) and O-rings (30).
12. Assemble the port plate (11) to the starting motor housing (5), aligning the scribe marks made during the Disassembly procedure. Secure the port plate with the port plate screws (12) and lockwashers (13).
13. Press the needle bearing (33) into the pinion gear housing (8).
14. Install the drive assembly pinion gear (9) onto the drive shaft (10).
15. Position the pinion gear housing (8) onto the starting motor housing (5) and secure it with the screws (6) and lockwashers (7).
16. Install the nameplate (35) and secure it with the screws (34).

INSTALLATION

INSTALLATION **CAUTION**

Do not force the starting motor into its opening in the flywheel housing. When properly aligned, the hydraulic starting motor adapter will enter the flywheel housing easily. Do not use force to align the starting motor. Failure to comply with this caution could result in damage to the starting motor, the flywheel housing, or the flywheel.

1. Insert the starting motor (2) into the flywheel housing opening. When properly aligned, the hydraulic starting motor adapter will enter easily.
2. Rotate the starting motor (2) so that the bolt holes are aligned with the tapped holes in the flywheel housing. Secure the starting motor to the flywheel housing with the retaining bolts (3) and lockwashers (4).
3. Connect the lines (1) to the starting motor (2) using the labels from step 4 of Removal as a guide.
4. Check the hydraulic fluid level in the reservoir and replenish as necessary.
5. Remove the lockouts and tagouts and check the operation of the system. Ensure that the starting motor engages the flywheel, spins the engine, disengages from the flywheel, and does not leak.
6. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STARTING HYDRAULIC SYSTEM HAND PUMP, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out,
and tagged out IAW FM 55-502
All accumulators blown down

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2,
WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0019)

REMOVAL**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

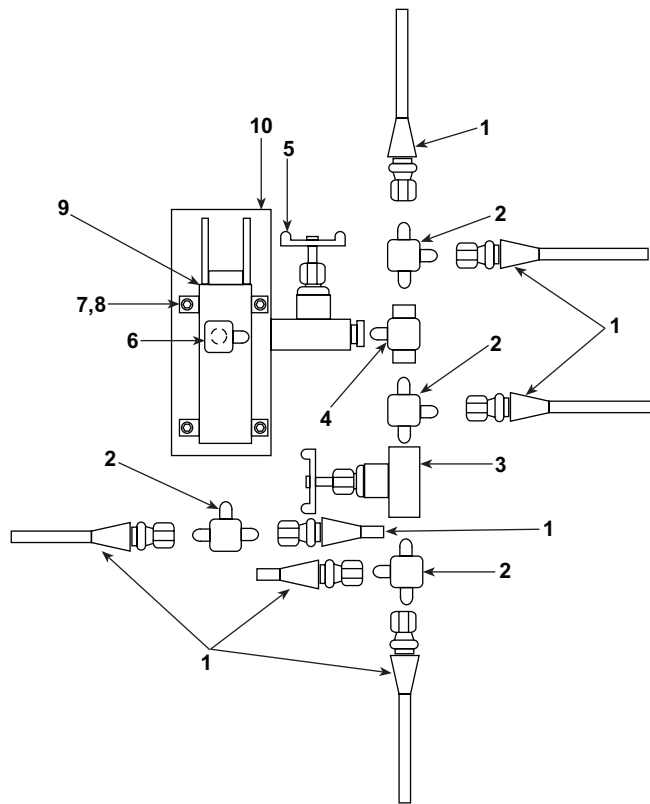
Do not allow used hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve, if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly can cause serious injury or death.

1. Don chemical protective gloves and goggles and position a suitable drain pan under the work area.
2. Loosen, but do not remove, one or more of the hydraulic lines (1) to allow any residual pressure and fluid to drain from the system.
3. Use cleaning solvent and wiping rags to clean all dirt and contamination from the work area. This will prevent contamination of the system when the pump is removed.
4. Label all the hydraulic lines (1) and disconnect them from the tees (2 and 4).

REMOVAL (continued)

5. Label all tees (2 and 4), valves (3 and 5), and elbow (6), and remove them from the pump (9).

**NOTE**

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

6. Remove the bolts (7) and lockwashers (8) that secure the pump (9) to its foundation (10), and lift the pump from its foundation.

INSTALLATION

1. Secure the pump (9) to its foundation (10) using the bolts (7) and lockwashers (8).
2. Install the tees (2 and 4), valves (3 and 5), and elbow (6) to their original configuration using the labels from step 5 of Removal as a guide.
3. Connect the hydraulic lines (1) to their original configuration using the labels from step 4 of Removal as a guide.
4. Remove the lockouts and tagouts and check the operation of the pump, ensuring that it will charge the accumulators and that no leakage is present.
5. Check the level of hydraulic fluid in the reservoir and replenish the hydraulic fluid as required.
6. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
FUEL SYSTEM TANK, PIPING, VALVES, AND FITTINGS, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Materials/Parts:

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)

Equipment Condition:

Propulsion engines secured, locked out,
and tagged out IAW FM 55-502
Valves secured as required (refer to procedure)

References:

FM 55-502
TM 55-1905-242-24P (WP 0025)

Personnel Required:

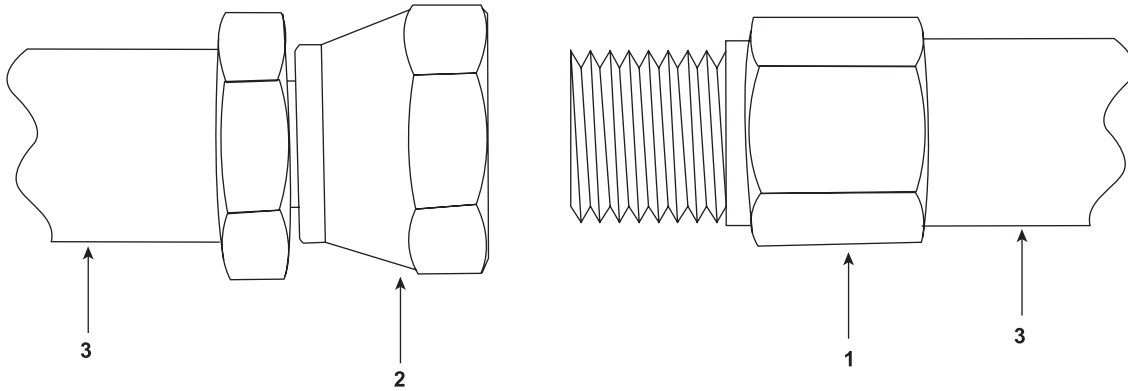
Two Watercraft Engineers, 88L

REMOVAL**WARNING**

Diesel fuel is flammable and its vapor is potentially explosive. Do not use diesel fuel in the vicinity of spark, open flame, or excessive heat. Do not use diesel fuel in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow diesel fuel to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling diesel fuel. Failure to comply can result in illness, serious injury, or death.

1. Close, lock out, and tag out, in accordance with FM 55-502, all valves between the component to be replaced and the fuel tank. If no valves exist between the component and the fuel tank, the fuel tank must be drained.
2. Place a suitable drain pan beneath the work area.
3. Don protective gloves and goggles.
4. Place one wrench on the stationary fitting (1) and one wrench on the swivel fitting (2). Turn the swivel fitting while holding the stationary fitting.
5. Separate the swivel fitting (2) from the stationary fitting (1).
6. Perform steps 4-5 on the other end of the hose, pipe, or fitting (3) to be replaced.
7. If the system will remain open for a prolonged period, cap the open ends of the piping to prevent contamination of the system.



INSTALLATION

1. Procure a new pipe, hose, or fitting (3) as necessary.
2. By hand, thread the stationary fitting (1) and the swivel fitting (2) together.
3. Place one wrench on the stationary fitting (1) and one wrench on the swivel fitting (2). Turn the swivel fitting while holding the stationary fitting to tighten the connection.
4. Perform steps 2-3 on the other end of the new pipe, hose, or fitting (3).
5. Remove the lockouts and tagouts and fill the fuel tank if necessary.
6. Wipe the work area clean with wiping rags and check for leakage.
7. Start the propulsion engines and check the work area for leakage.
8. Dispose of used diesel fuel and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BATTERIES AND CABLES, TEST/REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)
 Tester, Battery (Item 4, Table 1, WP 0230 00)

Equipment Condition:

Propulsion engines secured, locked out, and
 tagged out IAW FM 55-502
 Battery isolation switches set to OFF,
 locked out, and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
 Goggles, Industrial, No Vents (Item 4, Table 2,
 WP 0230 00)
 Distilled Water (Item 9, Table 2, WP 0230 00)
 Face Shield, Industrial, Tilting (Item 10, Table 2,
 WP 0230 00)
 Apron, Chemical Protection (Item 11, Table 2, WP 0230 00)

References:

FM 55-502
 TM 55-1905-242-24P (WP 0027)

TESTING

WARNING



Take great care when working around energized electrical equipment. Contact between unprotected body parts and electrical conductors can cause serious injury or death. Do not wear jewelry or other conductive items while servicing energized electrical equipment. Failure to comply can cause serious injury or death.

Batteries produce hydrogen gas. This gas is explosive. Keep the work area free of sparks, open flame, and excessive heat. Take care to prevent conductive metal tools from arcing between the positive and negative terminals. Failure to comply with these precautions can result in serious injury or death.

Batteries are filled with a sulfuric acid-based electrolyte. This electrolyte is extremely corrosive to human tissue and to many other materials. Chemical protective gloves, chemical protective goggles, face shield, and chemical protective apron must be worn at all times when the batteries are being serviced. If electrolyte comes in contact with clothing or other material, wash the affected area with large volumes of fresh water. If electrolyte comes in contact with the skin, flush the area with large volumes of water. If the electrolyte comes in contact with the eyes, flush them with large volumes of water. Continue flushing the affected area until medical assistance arrives. Failure to comply could result in serious injury or death.

1. Don chemical protective gloves, goggles and/or face shield and chemical protective apron.

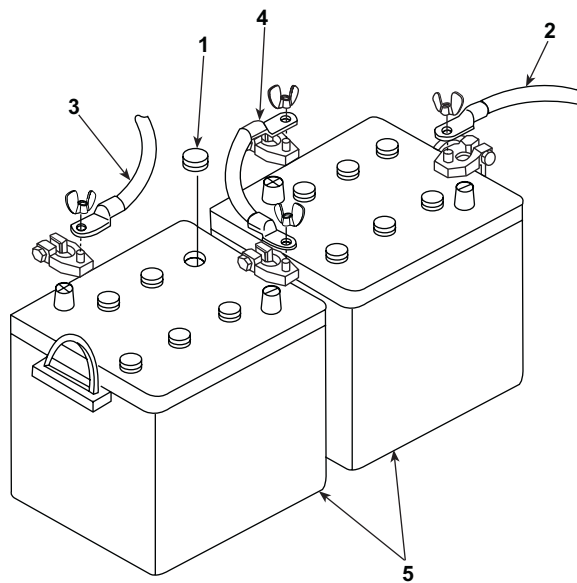
TESTING (continued)

2. Remove the battery filler caps (1) and check the liquid level of each battery cell. The liquid level should be at the bottom of the split ring on each cell.

NOTE

To get an accurate reading, the liquid of the battery cell should be at normal height when the battery is tested. Any water added to the battery should be thoroughly mixed with the electrolyte by charging the battery before testing. If the battery is dry, and a field charge is not permitted, replace defective battery.

3. If necessary, add distilled water to the battery and bring it to its normal level.
4. Charge the battery to mix the water with the existing electrolyte.
5. Insert the tip of the tester into a cell and draw enough electrolyte to float the glass hydrometer in the barrel of the tester.
6. Take and record the electrolyte specific gravity reading.
7. Check the tester thermometer. Record the thermometer reading along with the specific gravity reading.



8. Return the electrolyte to the battery cell and install the battery caps (1).
9. Repeat steps 5-8 for all the other battery cells.
10. If the temperature of the electrolyte is above or below 80 degrees Fahrenheit, the specific gravity reading must be adjusted as follows:
 - a. For every 10 degrees Fahrenheit below 80 degrees Fahrenheit, subtract four specific gravity units (0.004) from the electrolyte reading taken.
 - b. For every 10 degrees above 80 degrees Fahrenheit, add four specific gravity units (0.004) to the electrolyte reading taken (refer to the examples in this work package).

TESTING (continued)**EXAMPLE 1**

The battery electrolyte temperature reading is 60 degrees Fahrenheit and the hydrometer shows a specific gravity of 1.240. Since 60 degrees is two 10's below 80 degrees Fahrenheit, you must subtract two 4's or eight specific gravity units (0.008) from the hydrometer reading. This leaves a corrected specific gravity reading of 1.232.

EXAMPLE 2

The battery electrolyte temperature is down to 20 degrees Fahrenheit and the hydrometer shows a specific gravity of 1.256. Subtract 20 from 80 to get 6 10's difference, therefore, 6 4's (0.024) must be subtracted from 1.256. This gives a corrected specific gravity of 1.232.

EXAMPLE 3

The battery electrolyte temperature reading is 100 degrees Fahrenheit and the hydrometer specific gravity reading is 1.224. The electrolyte temperature is two 10's above 80 degrees Fahrenheit. You must add two 4's or eight specific gravity units (0.008) to the original float reading to get a corrected specific gravity reading of 1.232.

11. A fully charged battery should have a specific gravity (adjusted to 80 degrees Fahrenheit) of 1.260 to 1.270. If the adjusted specific gravity is below 1.225, charge the battery.
12. After charging, again check each cell of the battery as described above. Each cell must be within 0.025 specific gravity of all the other cells. If a greater difference exists between any two cells, the battery is defective. Replace the battery.
13. After using tester, flush it with clean, clear water.
14. Install the battery caps (1).

REMOVAL**WARNING**

Take great care when working around energized electrical equipment. Contact between unprotected body parts and electrical conductors can cause serious injury or death. Do not wear jewelry or other conductive items while servicing energized electrical equipment. Failure to comply can cause serious injury or death.

1. If not already on, don chemical protective gloves, apron and goggles.
2. Disconnect and remove the negative lead (2) from one battery bank.
3. Disconnect and remove the positive lead (3) from the same battery bank.
4. Disconnect and remove the connector cable (4) from the same battery bank.

REMOVAL (continued)

5. Remove the batteries (5) from the compartment.
6. Repeat steps 2-5 for the other battery bank, if required.

INSTALLATION

1. Place the new batteries (5) into the battery compartment.
2. Connect the connector cable (4) to the two batteries (5) in one battery bank.
3. Connect the positive lead (3) to the positive battery terminal.
4. Connect the negative lead (2) to the negative battery terminal.
5. Repeat steps 1-4 for the other battery bank, if required.
6. Remove the lockouts and tagouts, and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ALTERNATOR AND BELTS, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)
 Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
 WP 0060 00
 TM 55-1905-242-24P (WP 0028)

Equipment Condition:

Propulsion engines secured, locked out, and
 tagged out IAW FM 55-502
 Battery isolation switches set to OFF, locked
 out, and tagged out IAW FM 55-502

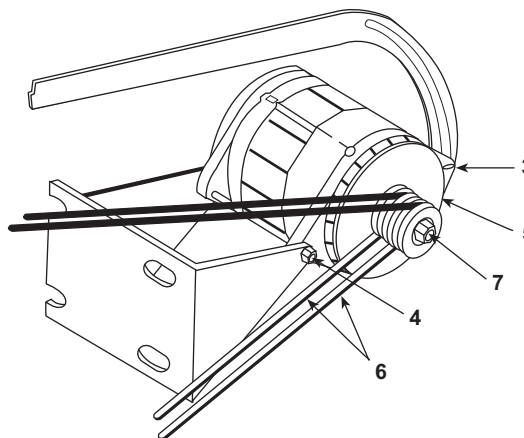
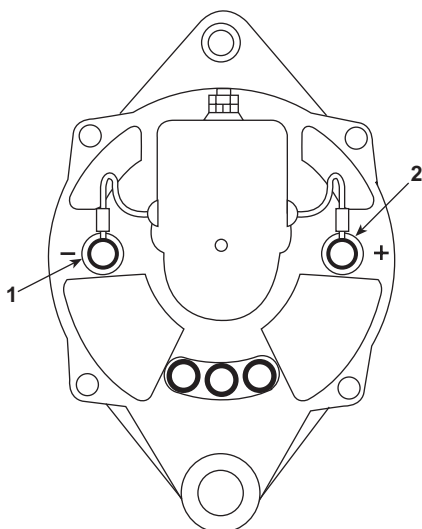
REMOVAL

WARNING



Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Set the multimeter to the Vdc (Volts direct current) setting and connect the multimeter leads to the negative (1) and positive (2) alternator terminals. Note the reading. If no voltage is noted, proceed with the next step. If voltage is noted, check that the battery isolation switches are properly secured.



REMOVAL (continued)

2. Label and disconnect the wiring connected to the negative (1) and positive (2) alternator terminals.
3. Loosen the adjusting strap bolt (3) and the pivot bolt (4).
4. Move the alternator (5) as necessary, and remove the drive belts (6).
5. Remove the adjusting strap bolt (3).
6. Remove the pivot bolt (4) and the alternator (5).

INSTALLATION

1. Position the alternator (5) in place and install the pivot bolt (4). Do not tighten the pivot bolt (4) yet.
2. Install the adjusting strap bolt (3) loosely.
3. Position the alternator (5) so that the drive belts (6) may be placed over the alternator drive pulley (7).
4. Move the alternator (5) to adjust the drive belts (6) until there is a belt deflection of approximately 1/2 inch (13 mm) measured midway between the alternator drive pulley (7) and the crankshaft pulley.
5. Tighten the adjusting strap bolt (3) and recheck the belt tension. If the tension is acceptable, proceed to the next step. If the tension is not acceptable, loosen the adjusting strap bolt (3) and readjust the belt's tension.
6. Tighten the pivot bolt (4).
7. Connect the wiring to the positive (2) and negative (1) alternator terminals using the labels from step 2 of Removal as a guide.
8. Remove the lockouts and tagouts, set to ON the battery isolation switches, and test the alternator as described in WP 0060 00.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
24/12V CONVERTER, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
WP 0061 00
TM 55-1905-242-24P (WP 0030)

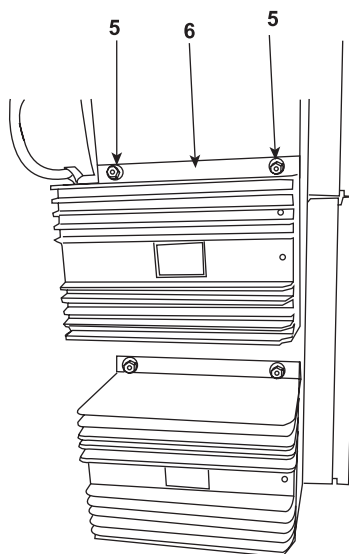
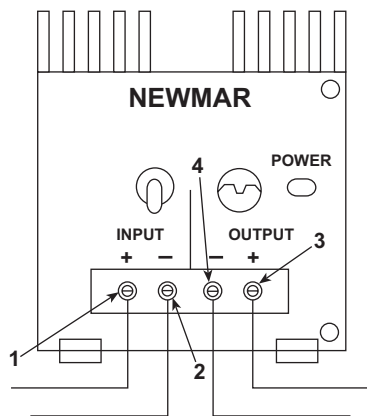
Equipment Condition:

Battery isolation switches set to OFF, locked out
and tagged IAW FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Set the multimeter to the Vdc (Volts, direct current) setting and connect its leads to the converter's input (1 and 2) and output (3 and 4) leads. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the battery isolation switches are properly secured.
2. Label and disconnect the converter's input (1 and 2) and output (3 and 4) leads.
3. Remove the four bolts (5) that secure the converter (6) to the bulkhead and remove the converter.



INSTALLATION

1. Position the converter (6) on the bulkhead and secure it with the four bolts (5).
2. Connect the converter's input (1 and 2) and output (3 and 4) leads using the labels from step 2 of Removal as a guide.
3. Remove the lockouts and tagouts and test the operation of the system (WP 0061 00).

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
24 VOLT WIRING, REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
FM 55-509-1

Equipment Condition:

Battery isolation switches set to OFF,
locked out, and tagged out IAW FM 55-502

REPAIR

1. Proper repair of 24 Volt wiring consists of replacement of the damaged wiring. When electrical casualty requires expedient repairs, repair may be made by splicing. Splicing is authorized for repair of damaged cables if the remainder of the cable is in good mechanical and electrical condition. The cable must be replaced in its entirety at the most opportune time. For proper splicing methods, refer to FM 55-509-1.
2. To replace 24 Volt wiring:

WARNING

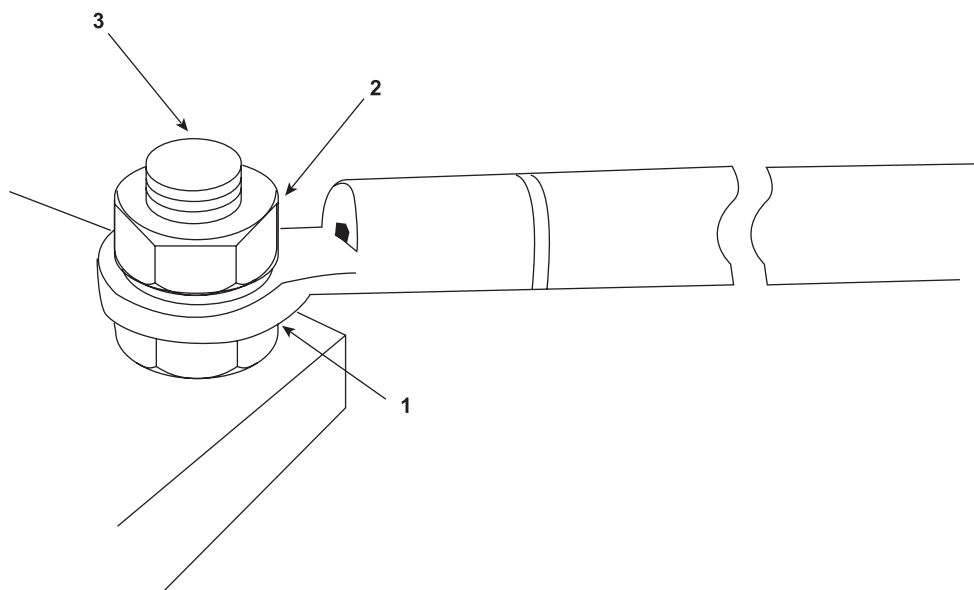


Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

- a. Remove any interference or covers that restrict access to the end of the wiring assembly.
- b. Set the multimeter to the Vdc (Volts direct current) setting and check the voltage at the wiring's terminals (1). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the battery isolation switches are properly secured.
- c. Label the wiring near the wiring's terminals (1), or make a sketch of the work area to permit proper assembly.
- d. Remove the nuts (2) that secure the wiring's terminals (1) to the studs (3) and remove the wiring's terminals from the studs.
- e. Follow the wiring to its other end, freeing it from the vessel's structure as required.
- f. Perform steps c-d on the other end of the wiring.
- g. Procure a new wiring assembly.
- h. Determine which wiring's terminals (1) connect to which studs (3) using the labels or the sketch from step c as a guide.

REPAIR (continued)

- i. Connect the wiring's terminals (1) to the studs (3), securing them with the nuts (2).
- j. Route the new wiring assembly along the same path as the old assembly, securing it to the vessel's structure in the same manner as the old wiring assembly.
- k. Follow the procedure outlined in steps h-i to connect the other end of the wiring assembly.
- l. Install any covering or interference removed, remove the lockouts and tagouts, and check the operation of the system.

**END OF WORK PACKAGE**

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
24 VOLT CONTROL AND DISTRIBUTION PANELS, TEST/REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0031)

TESTING**WARNING**

Take great care when working around energized electrical equipment. Contact between unprotected body parts and electrical conductors can cause serious injury or death. Do not wear jewelry or other conductive items while servicing energized electrical equipment. Failure to comply can cause serious injury or death.

1. Operate each circuit breaker in the given panel and ensure that it controls its device. If any circuit breaker fails to control its device, test the circuit breaker:
 - a. Set the multimeter to the Vdc (Volts direct current) setting.
 - b. Place one voltmeter lead on each of the circuit breaker terminals (1) and note the voltage. With the circuit breaker in the OFF position, the multimeter should read 24 Vdc. With the circuit breaker in the ON position, the multimeter should read 0 Vdc. If these readings cannot be obtained, the circuit breaker is defective. If these readings are obtained, the circuit breaker is operating normally.
2. If any circuit breaker is found to be defective, replace it.

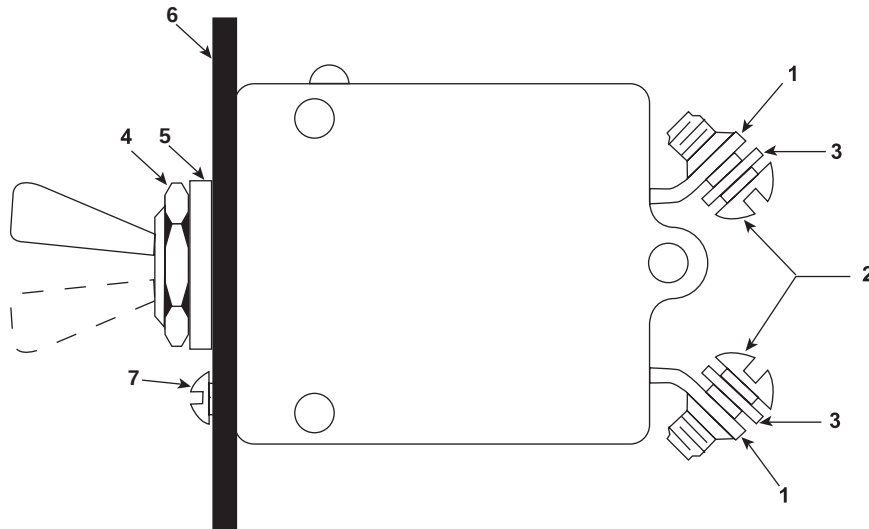
REPAIR

Repair of the 24 Volt control and distribution panels is accomplished by the replacement of defective circuit breakers. The procedure for circuit breaker replacement appears in the Removal and Installation procedures in this work package.

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Set to OFF, lock out, and tag out the battery isolation switches in accordance with FM 55-502.
2. Set the multimeter to the Vdc setting and place its leads on the circuit breaker's terminals (1). If 0 Vdc is noted, proceed to the next step. If voltage is noted, ensure that the battery isolation switches are properly secured.
3. Label the wiring connected to the circuit breaker's terminals (1).
4. Remove the screws (2) and lockwashers (3) that secure the wiring to the circuit breaker's terminals (1).
5. Remove the nut (4) and flat washer (5) that secure the circuit breaker to the panel (6).
6. Remove the screws (7) that secure the circuit breaker to the panel (6).
7. Remove the circuit breaker from the panel (6).



INSTALLATION

1. Procure a new circuit breaker.
2. Position the circuit breaker in the panel (6) and secure it with the screws (7), nut (4), and flat washer (5).
3. Connect the wiring to the circuit breaker's terminals (1) using the labels from step 3 of Removal as a guide and secure it with the screws (2) and lockwashers (3).
4. Remove the lockouts and tagouts, set to ON the battery disconnect switches, and check the operation of the circuit.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
GROUND DETECTOR, REPLACE/REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0032)

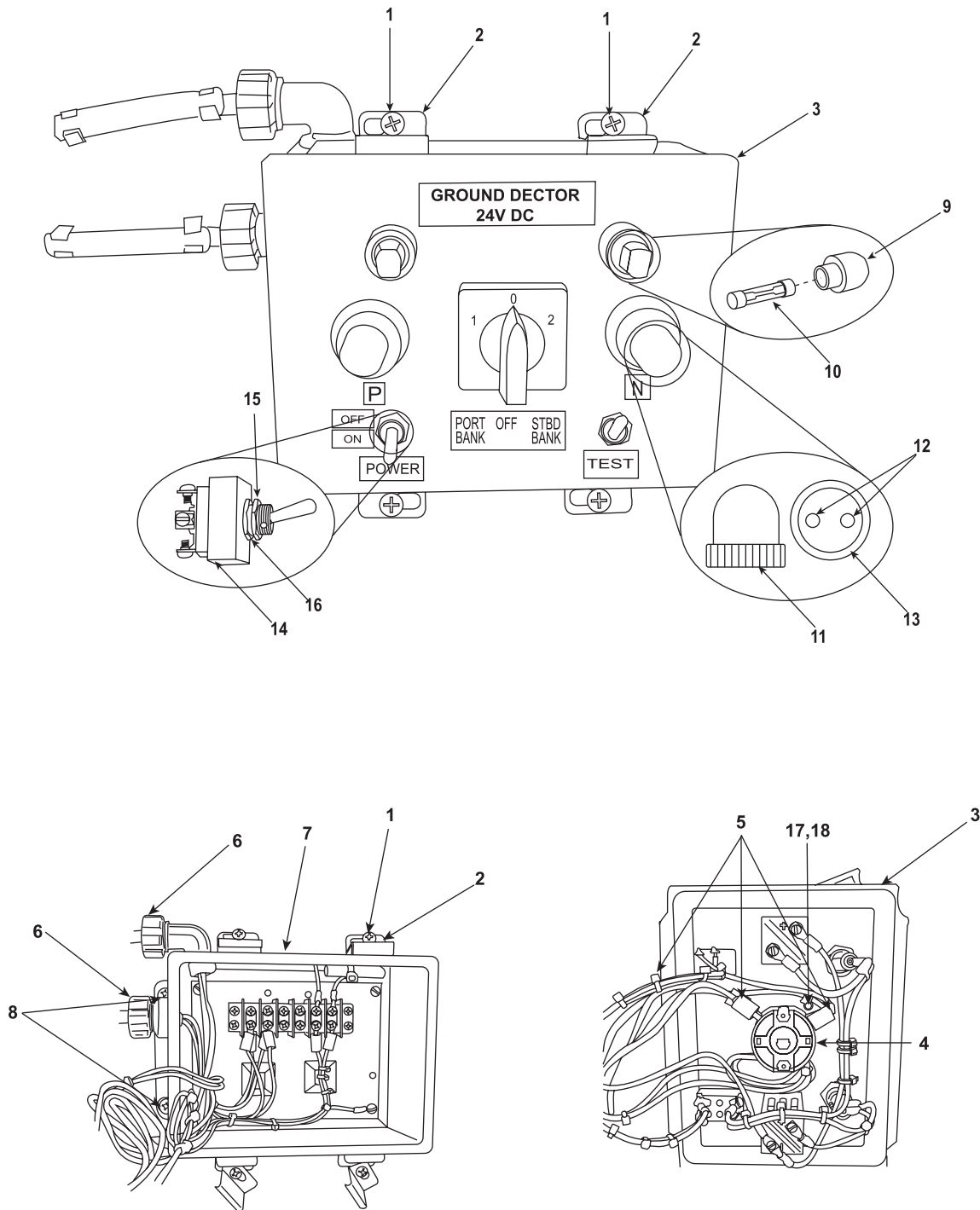
Equipment Condition:

PORT BATTERY ISOLATION SWITCH and
STARBOARD BATTERY ISOLATION
SWITCH set to OFF, locked out, and tagged
out IAW FM 55-502

GROUND DETECTOR--REPLACE**REMOVAL****WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Loosen the screws (1) that secure the cover clamps (2). Swing the cover clamps clear and remove the ground detector cover (3).
2. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the terminals on the selector switch (4). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the port and starboard battery isolation switches are set to OFF.
3. Label and disconnect the wiring (5) from the selector switch (4).
4. Unscrew the strain relief nuts (6).
5. Label and remove the wiring from the ground detector box (7).
6. Remove the screws (8) that secure the ground detector box (7) to the bulkhead. Remove the ground detector box and ground detector cover (3).



INSTALLATION

1. Position the ground detector box (7) on the bulkhead and secure it with the screws (8).
2. Feed the wiring through the strain reliefs and secure them with the strain relief nuts (6).
3. Connect the wiring to the ground detector box (7) using the labels from step 5 of Removal as a guide.
4. Connect the wiring (5) to the selector switch (4) using the labels from step 3 of Removal as a guide.

INSTALLATION (continued)

5. Position the ground detector cover (3) on the ground detector box (7) and secure it with the cover clamps (2) and screws (1).
6. If no further repairs will be made, remove the lockouts and tagouts and check the operation of the system.

GROUND DETECTOR--REPAIR

Repair of the ground detector is accomplished by the replacement of the fuses, bulbs, and switches.

REPLACE--FUSE

1. Turn the fuse holder (9) 1/4 turn counterclockwise.
2. Pull the fuse holder (9) from the ground detector cover (3).
3. Pull the fuse (10) from the fuse holder (9).
4. Insert a new fuse (10) into the fuse holder (9).
5. Insert the fuse holder (9) into the ground detector cover (3) and turn it clockwise until it "drops" into its slot. After it "drops," push it in and turn it an additional 1/4 turn clockwise to lock it in place.
6. If no further repairs will be made, remove the lockouts and tagouts and check the operation of the system.

REPLACE--BULB

1. Unscrew the bulb cover (11).
2. Unscrew the defective bulb (12) from the base (13).
3. Screw in a new bulb (12).
4. Screw on the bulb cover (11).
5. If no further repairs will be made, remove the lockouts and tagouts and check the operation of the system.

REPLACE--TOGGLE SWITCH (POWER AND TEST)

1. Loosen the screws (1) that secure the cover clamps (2). Swing the cover clamps (2) clear and remove the ground detector cover (3).
2. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the terminals on the appropriate toggle switch (14). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the port and starboard battery isolation switches are set to OFF.
3. Label and disconnect the wiring from the toggle switch (14).
4. Remove the nut (15) and washer (16) that secure the toggle switch (14) to the ground detector cover (3). Remove the toggle switch (14) from the ground detector cover.
5. Position the new toggle switch (14) in the ground detector cover (3) and secure it with the nut (15) and washer (16).
6. Connect the wiring to the toggle switch (14) using the labels from step 3 as a guide.
7. Position the ground detector cover (3) on the ground detector box (7) and secure it with the cover clamps (2) and screws (1).

REPLACE--TOGGLE SWITCH (POWER AND TEST) (continued)

8. If no further repairs will be made, remove the lockouts and tagouts and check the operation of the system.

REPLACE--SELECTOR SWITCH

1. Loosen the screws (1) that secure the cover clamps (2). Swing the cover clamps clear and remove the ground detector cover (3).
2. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the terminals on the selector switch (4). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the port and starboard battery isolation switches are set to OFF.
3. Label and disconnect the wiring (5) from the selector switch (4).
4. Remove the nut (17) and washer (18) that secure the selector switch (4) to the ground detector cover (3). Remove the selector switch (4) from the ground detector cover.
5. Position the new selector switch (4) in the ground detector cover (3) and secure it with the nut (17) and washer (18).
6. Connect the wiring (5) to the selector switch (4) using the labels from step 3 as a guide.
7. Position the ground detector cover (3) on the ground detector box (7) and secure it with the cover clamps (2) and screws (1).
8. If no further repairs will be made, remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

**UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BATTERY CHARGER, TEST**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

TESTING

1. Set to ON the battery charger circuit breaker in the 220/110 Volt distribution box.
2. Set the multimeter to the Vdc (Volts direct current) setting and check the battery voltage on both battery banks. The voltage should be 27 Vdc to 29 Vdc on both battery banks. If either battery bank shows a lower charging voltage, notify general support maintenance for repair.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
220V/110V VOLT WIRING, REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
FM 55-509-1

Equipment Condition:

Shore power and diesel generator secured,
locked out, and tagged out IAW FM 55-502

REPAIR

1. Proper repair of 220/110 Volt wiring consists of replacement of the damaged wiring. When electrical casualty requires expedient repairs, repair may be made by splicing. Splicing is authorized for repair of damaged cables if the remainder of the cable is in good mechanical and electrical condition. The cable must be replaced in its entirety at the most opportune time. For proper splicing methods, refer to FM 55-509-1.
2. To replace 220/110 Volt wiring:

WARNING

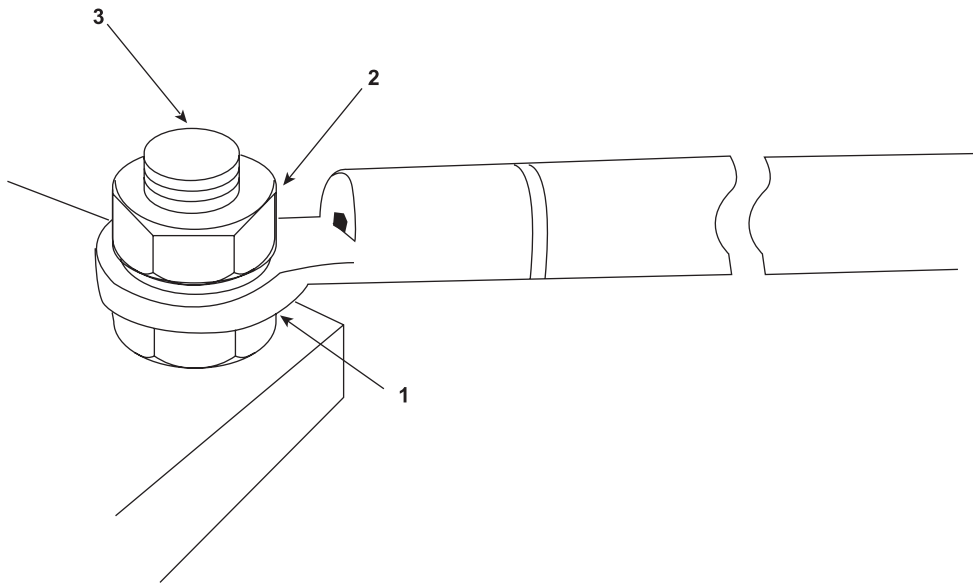


Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

- a. Remove any interference or covers that restrict access to the end of the wiring assembly.
- b. Set the multimeter to the Vac (Volts alternating current) setting and check the voltage at the wiring's terminals (1). If no voltage is noted, proceed to the next step. If voltage is noted, check that the shore power and diesel generator are properly secured.
- c. Label the wiring near the wiring's terminal (1) or make a sketch of the work area to permit proper reassembly.
- d. Remove the nut (2) that secures the wiring's terminal (1) to the stud and remove the wiring terminal from the stud.
- e. Follow the wiring to its other end, freeing it from the vessel's structure as required.
- f. Perform steps c-d on the other end of the wiring.
- g. Procure a new wiring assembly.

REPAIR (continued)

- h. Determine which wiring's terminal (1) connects to which stud (3) by referring to the labels or the sketch from step c as a guide.
- i. Connect the wiring's terminal (1) to the stud (3), securing it with the nut (2).
- j. Route the new wiring assembly along the same path as the old wiring assembly, securing it to the vessel's structure in the same manner as the old wiring assembly.
- k. Follow the procedure outlined in steps h-i to connect the other end of the wiring assembly.
- l. Install any covering or interference removed, remove the lockouts and tagouts, and check the operation of the system.

**END OF WORK PACKAGE**

UNIT MAINTENANCE
FOR FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
220V/110V CONTROL AND DISTRIBUTION PANELS, TEST/REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

References:

FM 55-502
TM 55-1905-242-24P (WP 0034)

Personnel Required:

Two Watercraft Engineers, 88L

TESTING**WARNING**

Take great care when working around energized electrical equipment. Contact between unprotected body parts and electrical conductors can cause serious injury or death. Do not wear jewelry or other conductive items while servicing energized electrical equipment. Failure to comply can cause serious injury or death.

1. Operate each circuit breaker in the panel and ensure that it controls its device. If any circuit breaker fails to control its device, test the circuit breaker by the following the procedure below:
 - a. Set the multimeter to the Vac (Volts alternating current) setting.
 - b. Place the multimeter leads on both circuit breaker's wiring (1) terminals and note the voltage. With the circuit breaker in the OFF position, the multimeter should read either 220 Vac or 110 Vac, depending upon the circuit. With the circuit breaker in the ON position, the multimeter should read 0 Vac. If these readings cannot be obtained, the circuit breaker is defective. If these readings are obtained, the circuit breaker is operating normally.
2. If any circuit breaker is found to be defective, replace it.

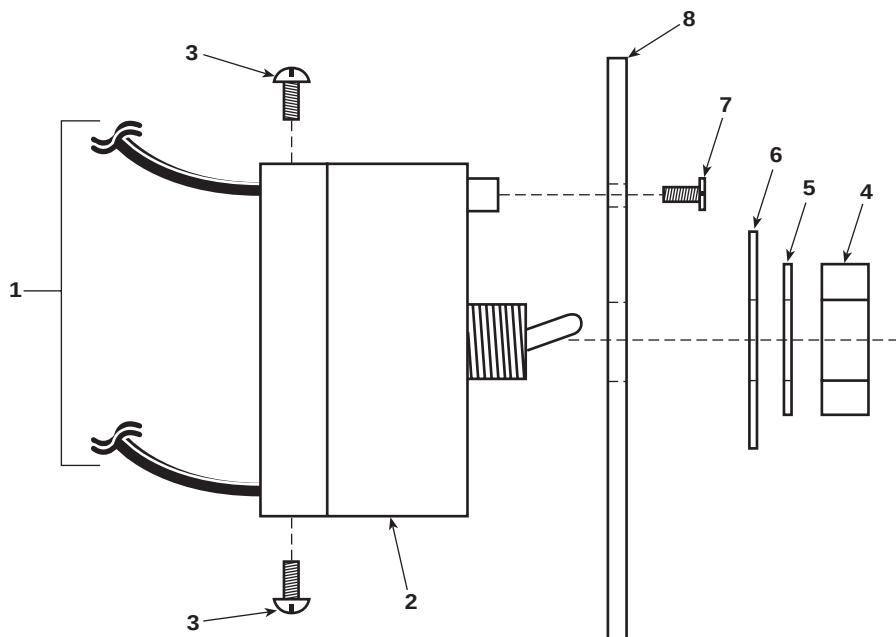
REPAIR**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

Repair of the 220V/110V control and distribution panel is accomplished by the replacement of defective circuit breakers. The procedure for circuit breaker replacement appears in the Removal and Installation procedures in this work package.

REMOVAL

1. Turn OFF, lock out, and tag out the diesel generator and shore power in accordance with FM 55-502.
2. Set the multimeter to the Vac (Volts alternating current) setting and place its leads on the circuit breaker's wiring terminals (1) at the back of the circuit breaker (2). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the diesel generator and shore power are properly secured.
3. Label the wiring (1) connected to the circuit breaker's (2) terminals.
4. Loosen the four screws (two on each side, top and bottom) (3) that secure the wiring (1) in the circuit breaker (2) and remove the wiring from the circuit breaker.
5. Remove the nut (4), flat washer (5), and ON/OFF indicator plate (6) from the circuit breaker (2).
6. Remove the two screws (7) securing the circuit breaker (2) to the panel (8) and remove the circuit breaker.



INSTALLATION

1. Procure a new circuit breaker (2).
2. Position the circuit breaker (2) in the panel (8) and secure it with the two screws (7).
3. Install the ON/OFF indicator plate (6), flat washer (5), and nut (4) on the circuit breaker (2).
4. Connect the wiring (1) to the rear of the circuit breaker (2) using the labels from step 3 of Removal as a guide and secure it by tightening the four screws (3).
5. Remove the lockouts and tagouts and check the operation of the affected circuit.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
POWER TRANSFORMERS 220V TO 110V, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0035)

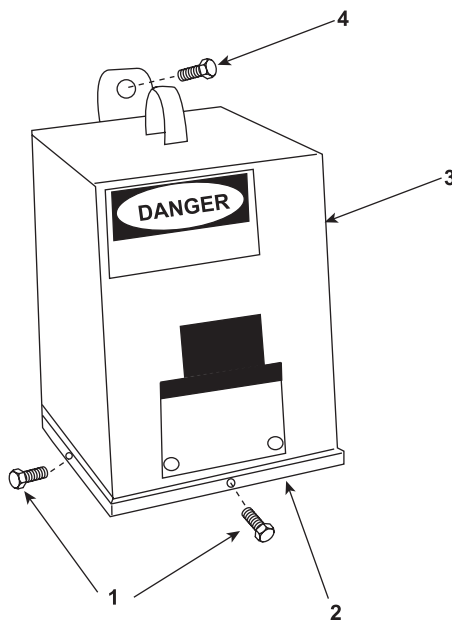
Equipment Condition:

Diesel generator and shore power secured,
locked out, and tagged out IAW FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the screws (1) that secure the access cover (2) to the transformer body (3) and remove the access cover.
2. Set the multimeter to the Vac (Volts alternating current) setting and check the input and output terminals for voltage. If no voltage is noted, proceed to the next step. If voltage is noted, check that the diesel generator and shore power are properly secured.



REMOVAL (continued)

3. Label and disconnect the wiring from the input and output terminals.
4. Remove the mounting bolt (4) and remove the transformer body (3) from the bulkhead.

INSTALLATION

1. Position the transformer body (3) on the bulkhead and secure it with the mounting bolt (4).
2. Connect the wiring to the input and output terminals using the labels from step 3 of Removal as a guide.
3. Install the access cover (2) and secure it with the screws (1).
4. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
DIESEL GENERATOR, SERVICE/TEST

INITIAL SETUP:**Personnel Required:**

Two Watercraft Engineers, 88L

References:

WP 0023 00

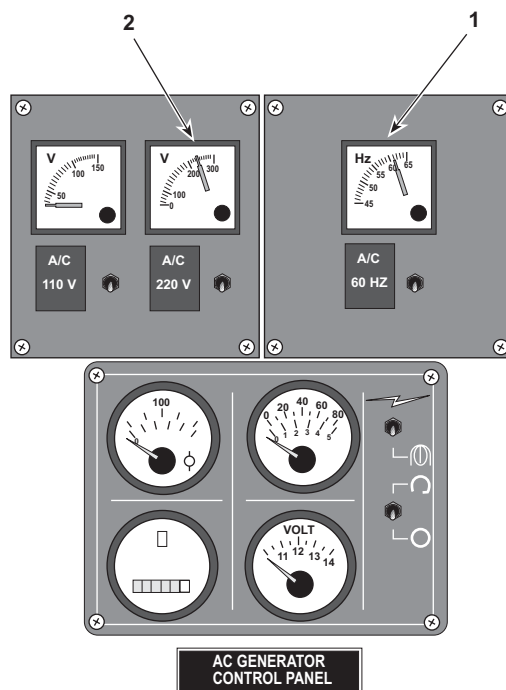
WP 0225 00

SERVICE

Service procedures for the diesel generator are contained in the manuals identified in WP 0225 00.

TEST

1. Start the diesel generator, warm it up, and place it online (WP 0023 00).
2. Turn ON all three air conditioning units, the battery charger, and the microwave in order to place a load on the generator. Observe the frequency (1) and 220 V voltage (2) gauges. The frequency should read between 58 and 62 Hertz (Hz) and the voltage should read 220 Vac.
3. Turn OFF all electrical loads on the diesel generator and record the same readings recorded in step 2. The readings should be in the same limits.
4. If the frequency and voltage readings are not within the specified limits, refer to the manuals identified in WP 0225 00 for troubleshooting and repair procedures.

**END OF WORK PACKAGE**

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
AN/PSN-11 GPS (GPS 9801), REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502

TM 55-1905-242-24P (WP 0038)

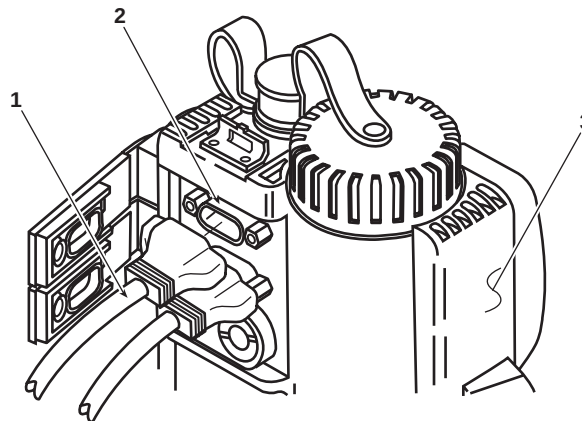
Equipment Condition:

AN/PSN-11 GPS circuit breaker set
to OFF, locked out, and tagged out
IAW FM 55-502

REMOVAL**WARNING**

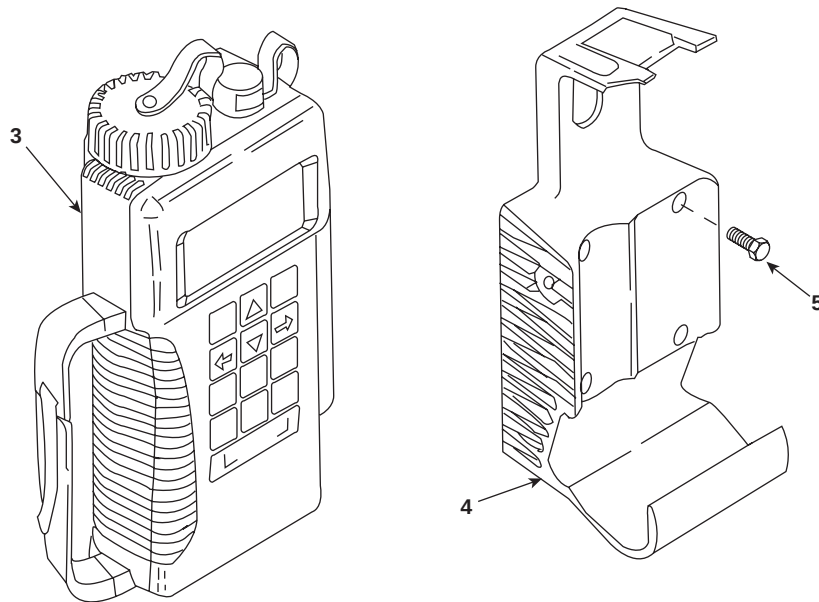
Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Disconnect the cables (1) from their sockets (2) on the GPS unit (3).
2. Remove the GPS unit (3) from the mount (4).
3. Remove the four screws (5) that secure the mount (4) to its bracket.



INSTALLATION

1. Position the mount (4) on its bracket and secure it with the four screws (5).
2. Place the GPS unit (3) into the mount (4).
3. Connect the cables (1) to their sockets (2) on the GPS unit (3).
4. Remove the lockouts and tagouts and check the operation of the system.

**END OF WORK PACKAGE**

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
AN/PSN-11(V) INTFCE & SWBOX 9801, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502

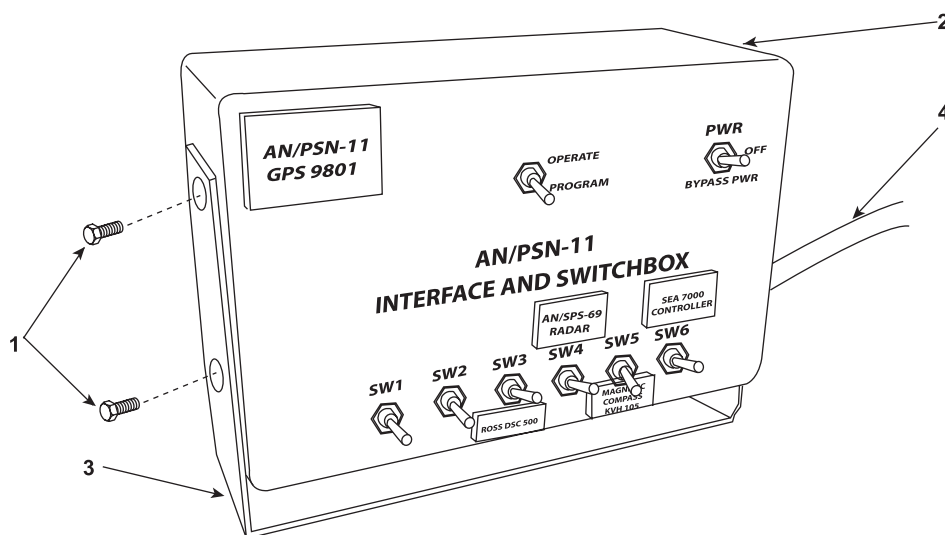
TM 55-1905-242-24P (WP 0038)

Equipment Condition:

VHF-FM DSC 500A NO. 1, AN/SPS-69 RADAR,
 DIGITAL COMPASS, and SEA 330 MF/HF
 RADIO circuit breakers set to OFF,
 locked out, and tagged out IAW FM 55-502

REMOVAL

1. Remove the bolts (1) that secure the AN/PSN-11 INTERFACE AND SWITCHBOX (2) to its mounting bracket (3).
2. Remove the AN/PSN-11 INTERFACE AND SWITCHBOX (2) from its mounting bracket (3) and place it face down on the chart table.
3. Label and remove the wiring (4) from the back of the AN/PSN-11 INTERFACE AND SWITCHBOX (2) by disconnecting the quick connectors.

**INSTALLATION**

1. Connect the wiring (4) to its quick connect terminals on the back of the AN/PSN-11 INTERFACE AND SWITCHBOX (2).
2. Position the AN/PSN-11 INTERFACE AND SWITCHBOX (2) into its mounting bracket (3) and secure it with the bolts (1).
3. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
DIGITAL COMPASS SYSTEM (KVH MV103C), REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Materials/Parts:

Sealing Compound, Loctite 242 (Item 16, Table 2,
WP 0230 00)
Tape, Insulation, Electrical (Item 17, Table 2, WP 0230 00)
Tape, Silicone (Item 18, Table 2, WP 0230 00)

Equipment Condition:

DIGITAL COMPASS circuit breaker set to OFF,
locked out, and tagged out IAW FM 55-502

References:

FM 55-502
TM 55-1905-242-24P (WP 0039)

Personnel Required:

Two Watercraft Engineers, 88L
One Watercraft Operator, 88K

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

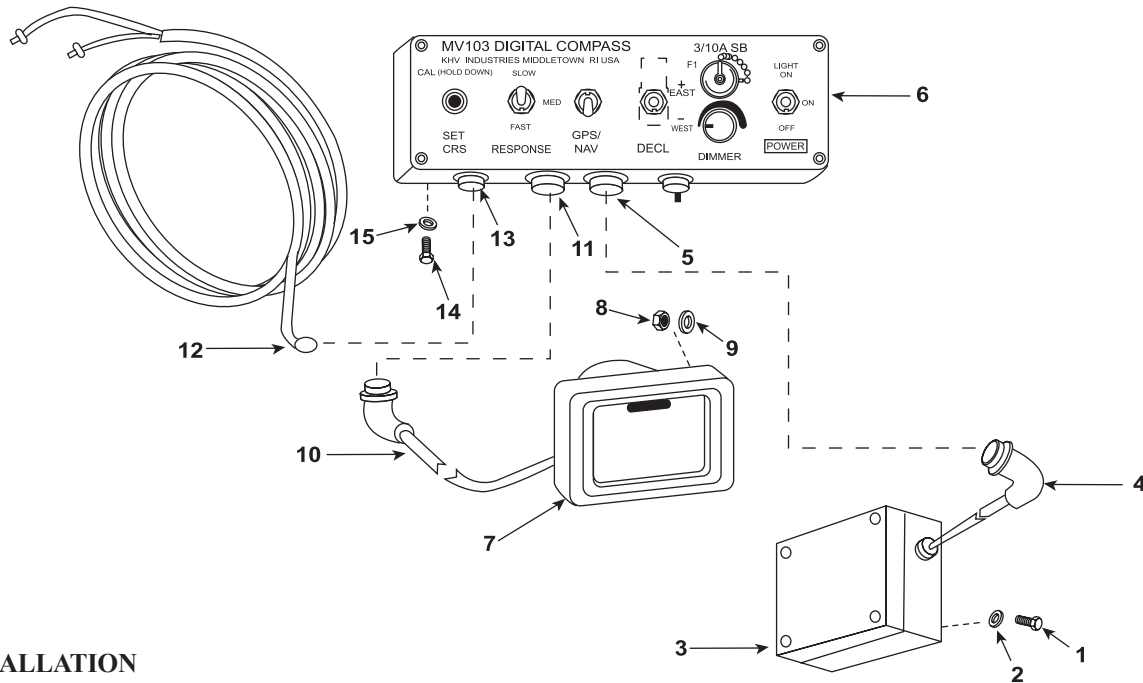
NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

1. To remove the processor unit:
 - a. Remove the bolts (1) and lockwashers (2) that secure the processor unit (3) to its mount on the mast.
 - b. Follow the processor unit cable (4) down the mast and through the bulkhead into the pilothouse, freeing it from its mounts as the work proceeds.
 - c. Disconnect the processor unit cable (4) from its socket (5) on the junction box (6).
2. To remove the remote display unit:
 - a. Remove the nuts (8) and washers (9) from the studs that secure the remote display unit (7) to the console.
 - b. Follow the remote display unit cable (10) to the junction box (6), freeing it from its mounts as the work proceeds.
 - c. Disconnect the remote display unit cable (10) from its socket (11) on the junction box (6).

REMOVAL (continued)

3. To remove the junction box:
 - a. Disconnect the power cable (12) from its socket (13) on the junction box (6).
 - b. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the power cable (12). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
 - c. If not already disconnected, disconnect the remote display unit cable (10) and the processor unit cable (4) from their sockets (11 and 5) on the junction box (6).
 - d. Remove the screws (14) and washers (15) that secure the junction box (6) to the console.

**INSTALLATION**

1. To install the processor unit:
 - a. Position the processor unit (3) on its mount so the arrow index is pointing forward and secure it with the bolts (1) and lockwashers (2).
 - b. If the processor unit cable (4) was removed from the processor unit (3), attach the cable to the processor unit, leaving a strain relief loop of approximately 8" (203 mm). Securely wrap the connection with silicone tape to prevent corrosion. Overwrap the silicone tape with three layers of electrical insulation tape.
 - c. Route the processor unit cable (4) down the mast, through the bulkhead, and into the pilothouse securing it in the same manner as the old cable.
 - d. Connect the processor unit cable (4) to its socket (5) on the junction box (6).
2. To install the remote display unit:
 - a. Connect the remote display unit cable (10) to its socket (11) on the junction box (6).
 - b. Route and secure the remote display unit cable (10) in the same manner as the old cable.
 - c. Position the remote display unit (7) on the console.

INSTALLATION (continued)

CAUTION

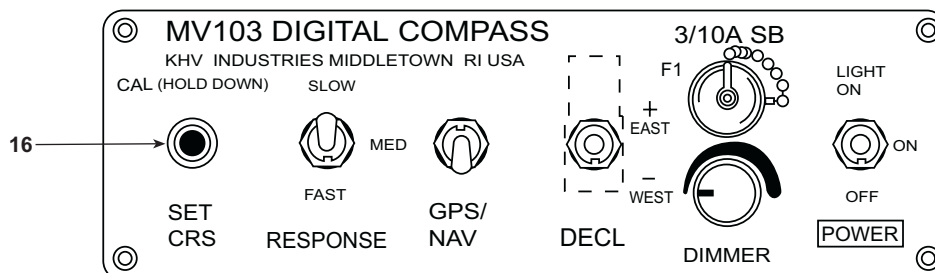
Do not overtighten the nuts that secure the remote display to the console. Overtightening the nuts can distort the remote display causing damage to the unit. Sealing compound should be used during installation to prevent future loosening of the nuts.

- d. Apply a small amount of sealing compound (Loctite 242) to the studs and install the nuts (8) and washers (9). Tighten the nuts only lightly to prevent distortion of the remote display unit (7).
3. To install the junction box:
 - a. Position the junction box (6) on the console and secure it with the screws (14) and washers (15).
 - b. Connect the remote display unit cable (10), the processor unit cable (4), and the power cable (12) to their sockets (11, 5, and 13) on the junction box (6).
4. After installing all of the components, clear the lockouts and tagouts and test the operation of the system as follows:
 - a. Set to ON the POWER toggle switch and observe the remote display unit (7). The remote display should show the default declination value (00°) for two seconds, and then change to Compass Heading mode.
 - b. Set to the LIGHT ON position the POWER toggle switch. Rotate the DIMMER control and observe that the lighting varies between OFF and full brightness.
 - c. Proceed to the Calibration procedure in this work package and calibrate the unit.

CALIBRATION

During calibration, the vessel is steered through two slow, continuous circles while the digital compass conducts its calibration routine. As the vessel turns through the circles, the remote display unit shows sequential displays of "CAL," the present heading, and a three digit calibration score. The three digit score indicates the quality of the calibration (on a scale of 1 to 9, with 1 being the worst and 9 being the best), the quality of the local magnetic environment (using the same scoring method), and the number of calibrations conducted (the third digit is a rollover counter that increments by one with each calibration). To calibrate the unit:

1. Position the vessel in an area large enough to conduct two large, slow circles over a period of several minutes. Each full circle requires at least two minutes to complete (i.e. the turn rate should not exceed three degrees per second). The starting heading is not important, nor is the direction of the turn.
2. Set to ON the POWER toggle switch and allow the digital compass to go through its self-test routine.
3. When ready to begin calibration, steady on any heading, then press and hold down the SET CRS pushbutton (16) for approximately eight seconds, or until the remote display unit shows "CAL." Release the SET CRS pushbutton.



CALIBRATION (continued)**NOTE**

Calibration will not be effective if the vessel is turned too quickly. The vessel's rate of turn must not exceed three degrees per second.

4. Put the helm over in the direction to be steered and set the rudder angle so that the vessel's turn rate does not exceed approximately three degrees per second. Maintain speed and rudder angle until two full circles have been executed.
5. As the vessel is turning, note that the remote display unit cycles through CAL, a three digit heading, and a three digit calibration score. In a few rare instances, the latest calibration score digit may change in as little as 36°. This is not indicative of a faulty calibration. Sometimes the last digit may change before the circle is completed. Rapid rollover of the final digit indicates that the sensor is receiving incrementally better data and is updating memory "on the fly."
6. Upon completion of the second circle, note the three digit calibration score. The score might read "96x." This means that the quality of the calibration is superior and the local magnetic environment is relatively benign; the "x" represents the last calibration and may be any value between 1 and 9. The goal is to have the first and second digits as close to 9 as possible. Proper location of the processor unit, free from strong local magnetic disturbances, quite often yields a score of "88x" or better on the first calibration.
7. Leave the calibration mode by briefly pressing and releasing the SET CRS pushbutton (16). The digital compass will return to the compass heading display mode.

NOTE

The digital compass must be left ON for at least ten seconds after leaving the calibration mode. If the unit is turned OFF before ten seconds have elapsed, the calibration factors will not be stored in memory.

8. Leave the digital compass ON for at least ten seconds after leaving the calibration mode in order to store the calibration factors in the memory.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
GENERAL ALARM SYSTEM, REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0040)

Equipment Condition:

GEN ALARM circuit breaker set to OFF, locked
out and tagged out IAW FM 55-502

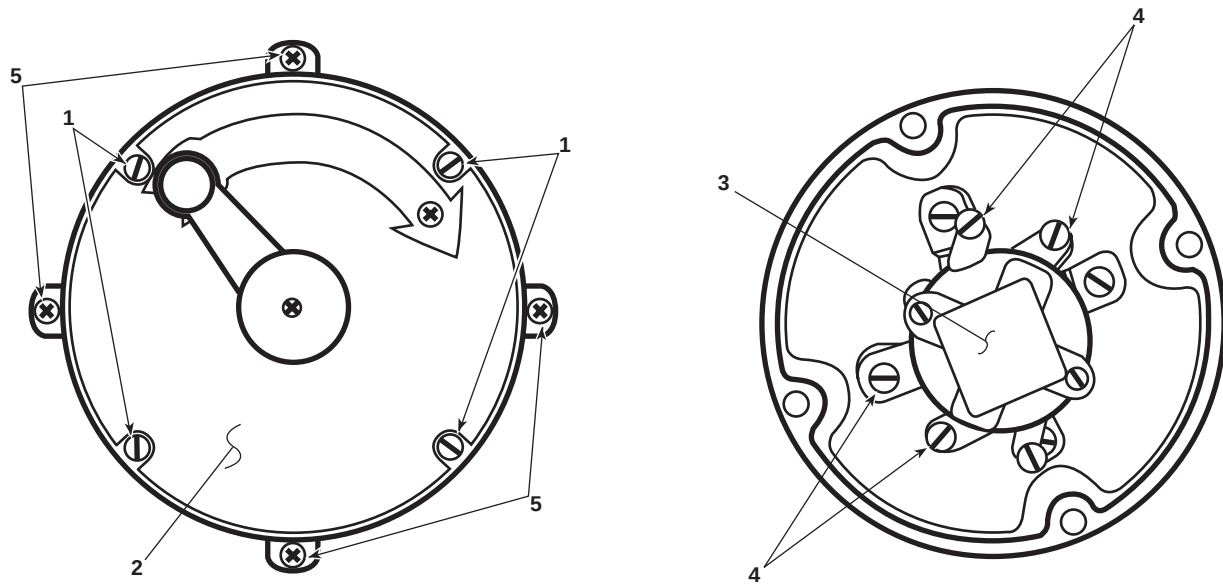
REPAIR

Repair of the general alarm system is accomplished by replacement of its components. Procedures to accomplish this replacement are below.

CONTACTOR SWITCH ASSEMBLY REPLACEMENT**REMOVAL****WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Loosen and remove the four screws (1) that secure the contactor switch cover (2) in place.
2. Remove the contactor switch cover (2) and turn it over to reveal the internal electrical components of the contactor switch (3).
3. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the connection points of the terminals (4) to ground. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the affected circuit breaker is properly secured.
4. Label and remove the electrical wiring from the terminals (4) on the contactor switch (3).
5. Loosen and remove the four screws (5) that secure the contactor switch assembly, and remove it from the mounting bracket.



INSTALLATION

1. Align the contactor switch assembly to the mounting bracket, and secure it in place with the four screws (5).
2. Connect the electrical wiring to the terminals (4) on the contactor switch (3) using the labels from step 4 of Removal-- Contactor Switch Assembly as a guide.
3. Install the contactor switch cover (2) and secure it in place with the four screws (1).
4. Remove the lockouts and tagouts and check the operation of the system.

ALARM BELL REPLACEMENT

REMOVAL

WARNING

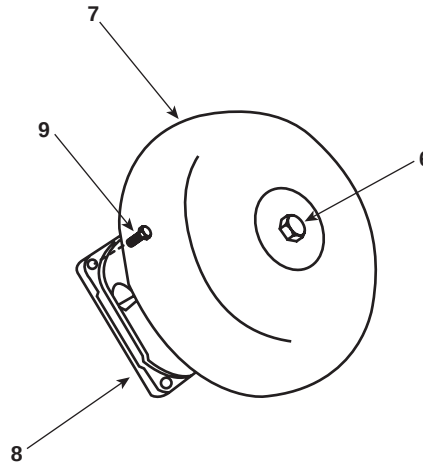


Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the bolt (6) that secures the gong (7) to the base (8), and remove the gong.
2. Remove the bolts (behind the gong) that secure the cover to the base (8).

REMOVAL(continued)

3. Set the multimeter to the Vdc (Volts direct current) setting. Take voltage readings at the terminals, inside the base (8), to ground to ensure that the electrical circuits are deenergized. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the affected circuit breaker is properly secured.
4. Label and remove the wiring from the terminals inside the base (8).
5. Remove the four bolts (9) that secure the base (8) to the bulkhead.

**INSTALLATION**

1. Position the base (8) against the bulkhead and secure it with four bolts (9).
2. Connect the wiring inside the base (8) using the labels from step 4 of Removal--Alarm Bell Replacement as a guide.
3. Attach the cover to the base (8) with its bolts.
4. Secure the gong (7) to the base (8) with the bolt (6).
5. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
FIRE DETECTION SYSTEM, TEST/REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)
Multimeter (Item 2, Table 1, WP0230 00)

Materials/Parts:

Candle, Illuminating (Item 19, Table 2, WP0230 00)
Smoke (Aerosol) (Item 20, Table 2, WP 0230 00)

Personnel Required:

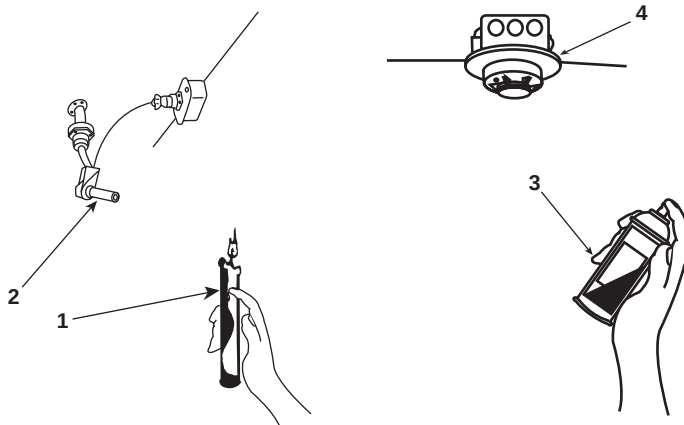
Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0041)

TEST

1. Set to ON the Fire Detection System and position one crewmember in the pilothouse to observe the alarms.
2. Light a candle (1) and hold the lighted candle 24 inches (610 mm) in front of one flame detector (2) in the engine room.
3. Observe that the audible alarm sounds in the alarm panel and that the engine room lights illuminate in both the alarm panel and the console.
4. Activate the SILENCE switch on the alarm panel and observe that the audible alarm silences.
5. Extinguish the candle (1) and observe that the engine room lights extinguish on both the alarm panel and on the console.
6. Repeat steps 2-5 for the remaining two flame detectors.
7. Discharge a 1 to 2-second blast of smoke (3) at one of the smoke detectors (4) in the accommodation module.
8. Observe that the audible alarm sounds in the alarm panel and that the accommodation module lights illuminate in both the alarm panel and on the console.
9. Activate the SILENCE switch on the alarm panel and observe that the audible alarm silences.
10. Observe that the accommodation module lights extinguish on both the alarm panel and on the console as the smoke dissipates.
11. Repeat steps 7-10 for the remaining smoke detectors.

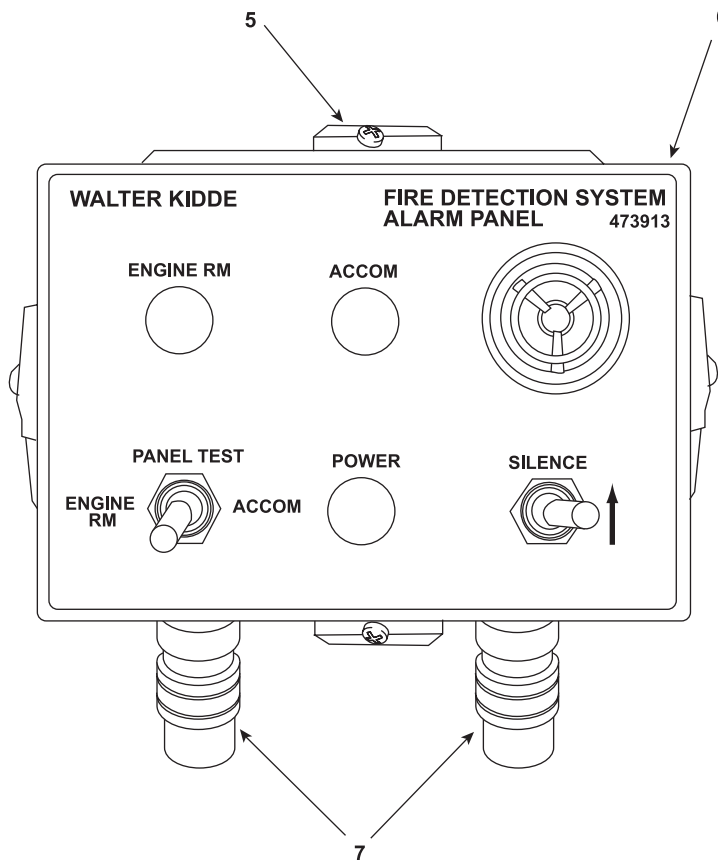


REPAIR**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

Repair of the fire detection system is accomplished by replacement of its component parts.

1. To replace the alarm panel:
 - a. At the control and distribution panel, set to OFF, lock out, and tag out the FIRE DETECT SYSTEM circuit breaker in accordance with FM 55-502.
 - b. Remove the four screws (5) that secure the alarm panel cover (6).



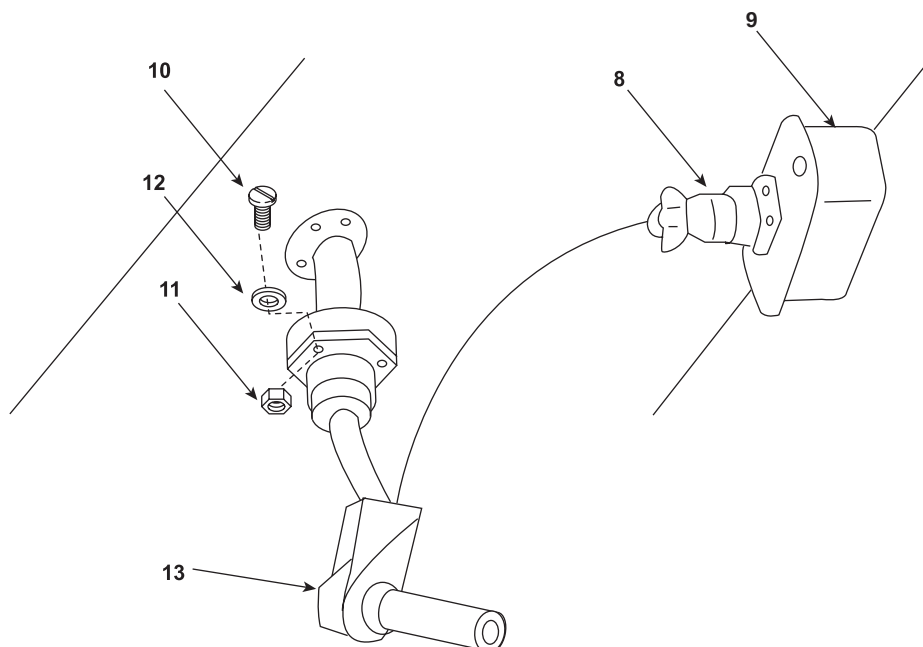
REPAIR (continued)

- c. Remove the bolts, nuts, and washers that connect the alarm panel to its mount.
 - d. Label and disconnect the wiring (7) from the alarm panel.
 - e. Procure a new alarm panel.
 - f. Connect the wiring (7) to the alarm panel using the labels from step d as a guide.
 - g. Position the alarm panel on its mount and secure it with its nuts, bolts, and washers.
 - h. Position the alarm panel cover (6) on the alarm panel and secure it with the four screws (5).
2. To replace the flame detector:
- a. Disconnect the flame detector wiring (8) from the junction box (9).

NOTE

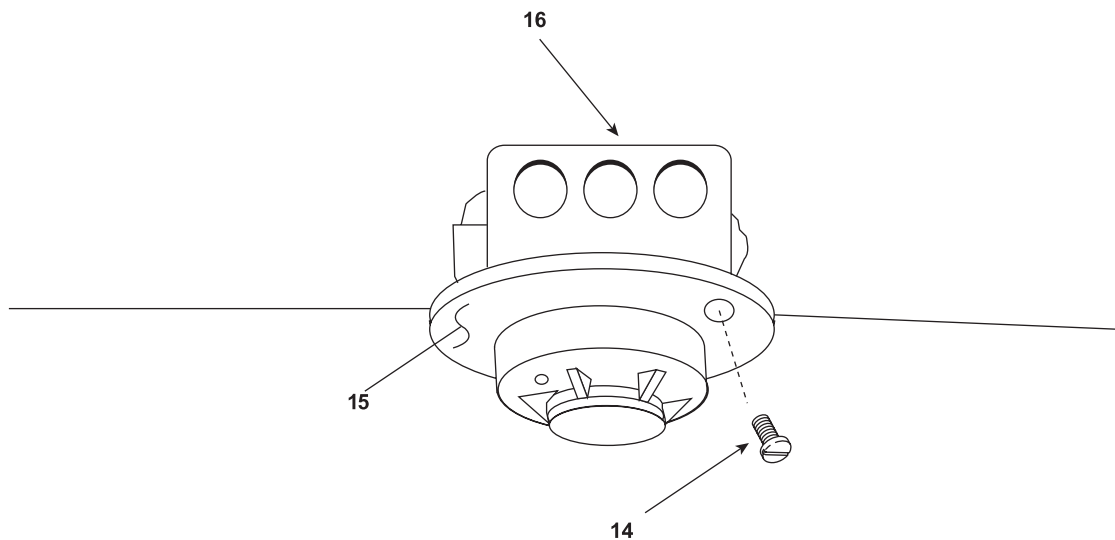
Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

- b. Remove the bolts (10), nuts (11), and lockwashers (12) that secure the flame detector (13) to its mount.
- c. Procure a new flame detector (13).
- d. Position the flame detector (13) on its mount and secure it with bolts (10), nuts (11), and lockwashers (12).
- e. Connect the flame detector wiring (8) to the junction box (9).



REPAIR (continued)

3. To replace the smoke detector (15):
 - a. Remove the screws (14) that secure the smoke detector (15) to the junction box (16).
 - b. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the smoke detector's (15) terminals. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
 - c. Label and remove the wiring that connects the smoke detector (15) to the junction box (16).
 - d. Procure a new smoke detector.
 - e. Connect the smoke detector (15) wiring using the labels from step c as a guide.
 - f. Position the smoke detector (15) on the junction box (16) and secure it with the screws (14).
4. Remove the lockouts and tagouts, and check the operation of the system.

**END OF WORK PACKAGE**

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RADIO SET AN/VRC-90A, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0042)

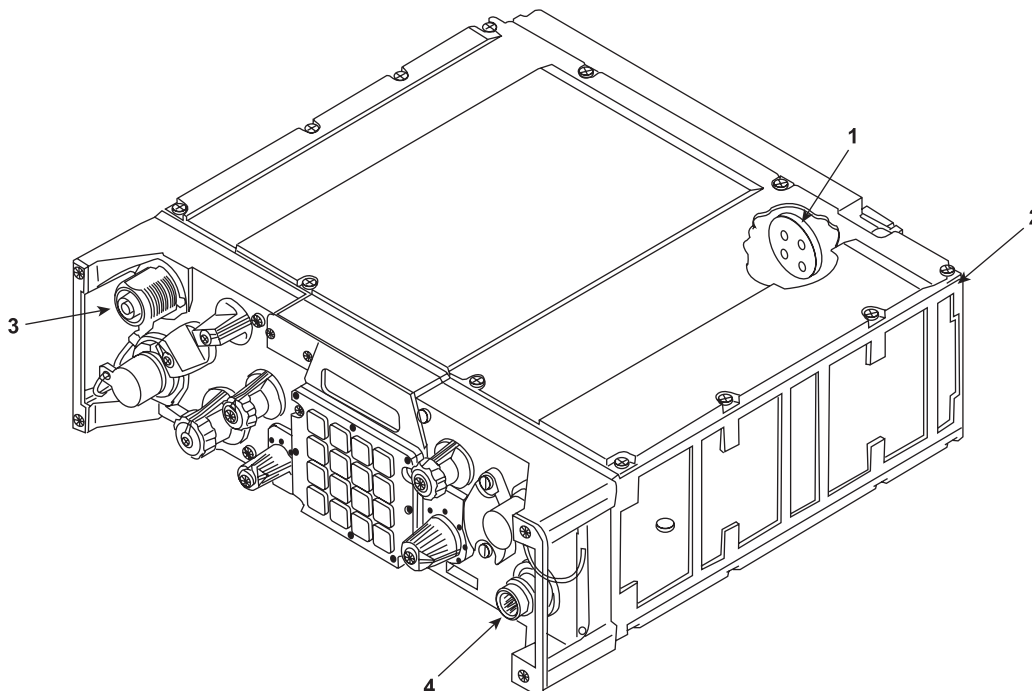
Equipment Condition:

AN/VRC-46 SINCGARS RADIO circuit breaker
set to OFF, locked out, and tagged out IAW
FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Disconnect the system connector (1) from the radio (2). Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the connector. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.



REMOVAL (continued)

2. Disconnect the antenna connector (3) from the radio (2).
3. Disconnect the data connector (4) from the radio (2).
4. Remove the radio (2) from its mount.

INSTALLATION

1. Position the radio (2) in its mount.
2. Connect the data connector (4) to the radio (2).
3. Connect the antenna connector (3) to the radio (2).
4. Connect the system connector (1) to the radio (2).
5. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
VHF-FM DSC 500A, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0042)

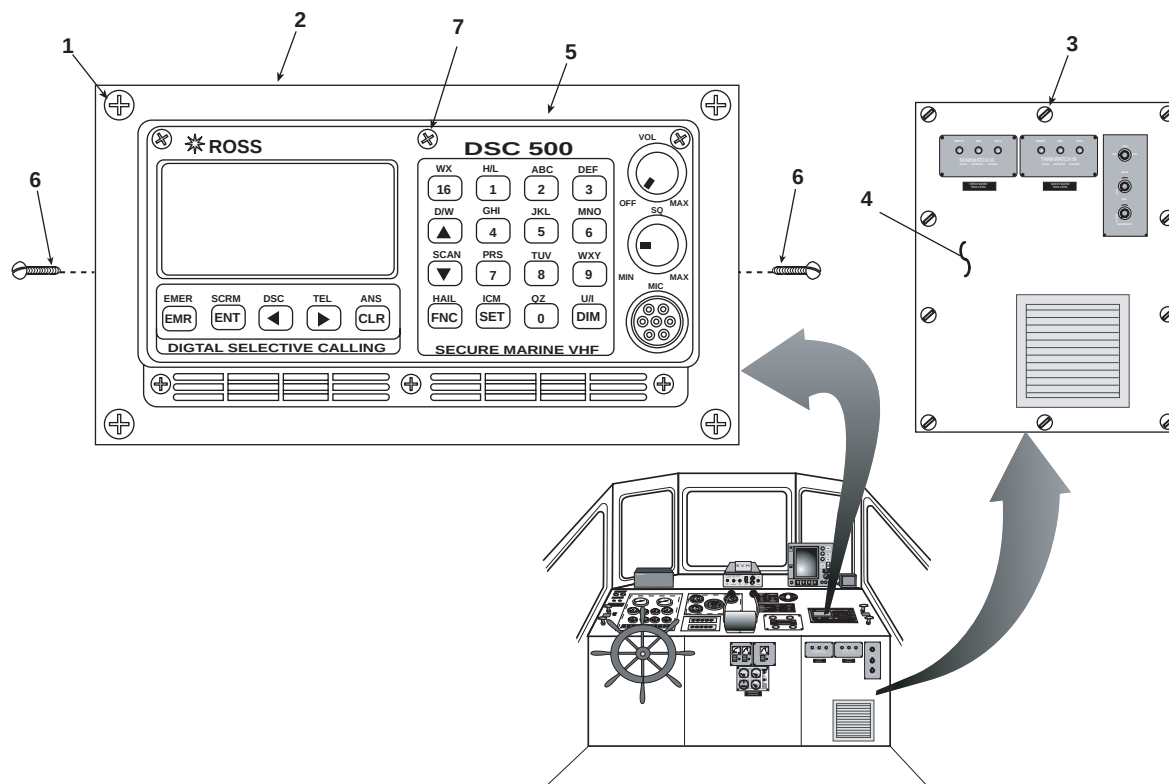
Equipment Condition:

VHF-FM DSC 500A NO. 1 circuit breaker set
to OFF, locked out, and tagged out IAW
FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the four screws (1) that attach the radio mounting plate (2) to the console.
2. Remove the ten screws (3) on the console panel (4) below the radio (5) and remove the console panel.
3. Remove the two mounting screws (6) on the side of the radio (5).
4. Lift the radio (5) out of the console panel.
5. Use the multimeter to check for voltage at the wiring connectors. If no voltage is present, proceed to the next step. If voltage is present, ensure that the circuit breaker is properly secured.
6. Label and disconnect the wiring from the rear of the radio (5).
7. Remove the screws (7) that secure the radio mounting plate (2) to the radio (5) and remove the radio mounting plate.



INSTALLATION

1. Place the radio mounting plate (2) onto the radio (5) and secure it with the screws (7).
2. Connect the wiring to the rear of the radio (5) using the labels from step 6 of Removal as a guide.
3. Position the radio (5) and the radio mounting plate (2) in the console and secure it with four screws (1).
4. Screw the two mounting screws (6) onto the radio (5).
5. Position the console panel (4) in place and secure it with ten screws (3).
6. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
SEATOR SEA 3000 MODEM, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0042)

Equipment Condition:

SEA 330 MF/HF RADIO circuit breaker set to OFF,
locked out, and tagged out IAW FM 55-502

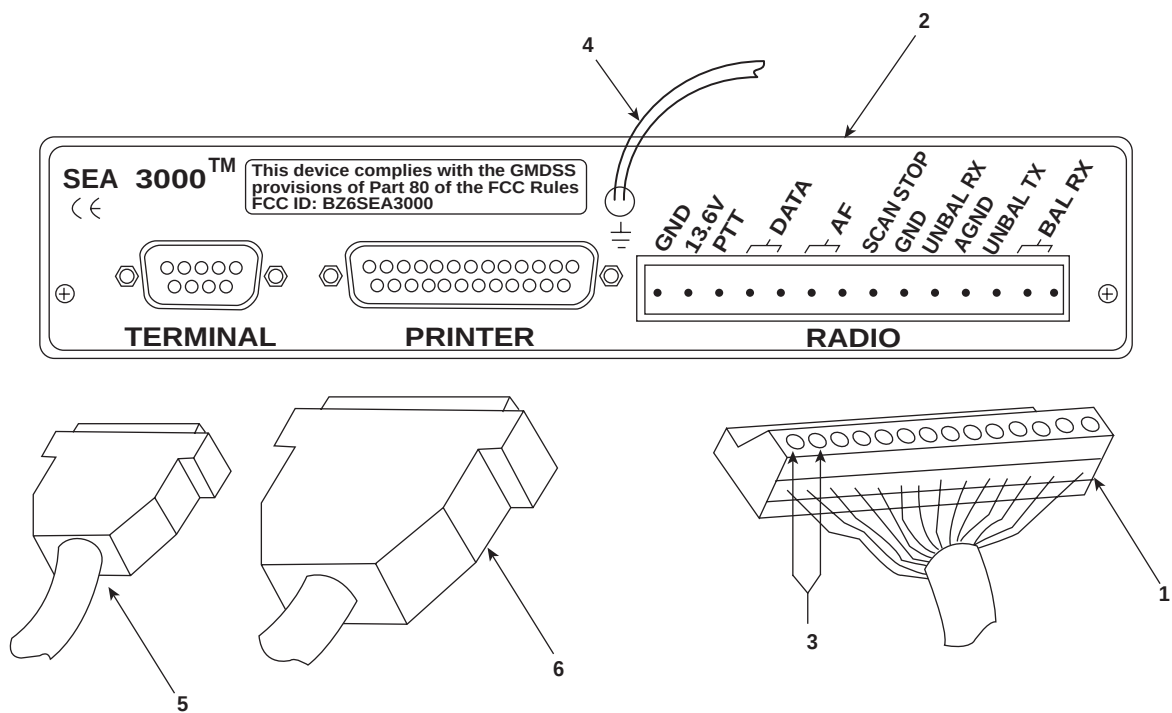
REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the modem from the top of the watch receiver. The modem is held in place by Velcro on its bottom.
2. Disconnect the radio connector (1) from the rear of the modem (2). Set the multimeter to the Vdc (Volts direct current) setting. Place the multimeter leads on the pins (3) to check for voltage. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
3. Disconnect the ground wire (4).
4. Disconnect the terminal connector (5) from the rear of the modem (2).
5. Disconnect the printer connector (6) from the rear of the modem (2).

INSTALLATION

1. Connect the terminal connector (5) to the rear of the modem (2).
2. Connect the printer connector (6) to the rear of the modem (2).
3. Connect the ground wire (4).
4. Connect the radio connector (1) to the rear of the modem (2).
5. Position the modem back on top of the watch receiver and ensure that its Velcro fasteners secure it tightly.
6. Remove the lockouts and tagouts and check the operation of the system.



END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
MF/HF DSC WATCH RECEIVER, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0042)

Equipment Condition:

SEA 330 MF/HF RADIO circuit breaker set to OFF,
locked out, and tagged out IAW FM 55-502

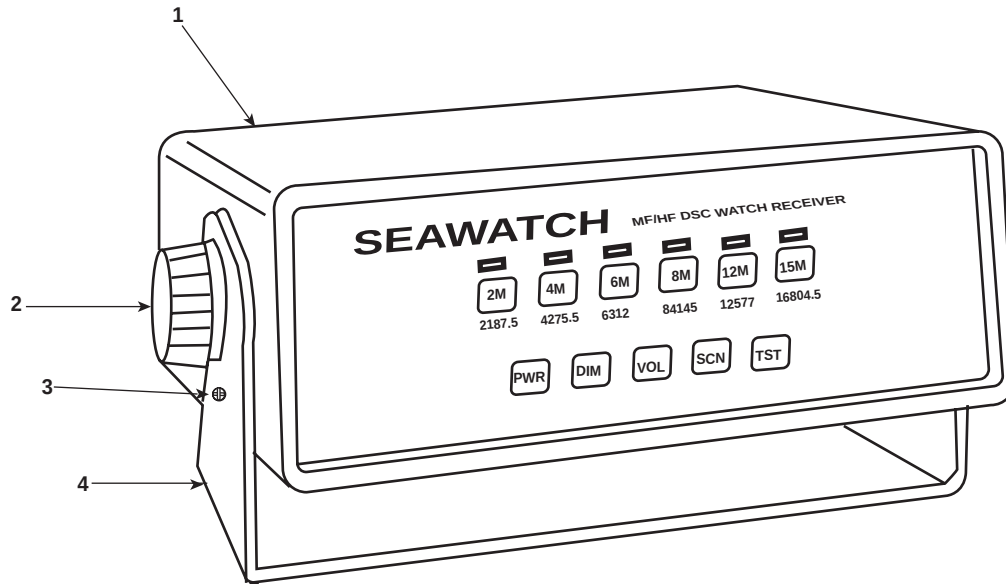
REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

CAUTION

Take great care when handling the wiring in the receiver unit. The internal wiring is fragile and can be easily damaged.

1. Grasp the watch receiver (1) firmly and remove the two knobs (2) and two screws (3) (one on either side) that secure the watch receiver to its mount (4).
2. Label and disconnect the wiring from the rear of the watch receiver (1). Set the multimeter to the Vdc (Volts direct current) setting and check for voltage. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.



INSTALLATION

1. Connect the wiring to the rear of the watch receiver (1) using the labels from step 2 of Removal as a guide.
2. Position the watch receiver (1) in its mount (4) and secure it with the two knobs (2) and two screws (3) (one on either side).
3. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
SEACALL 7000 MF/HF DSC CONTROLLER, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0042)

Equipment Condition:

SEA 330 MF/HF RADIO circuit breaker set to OFF,
locked out, and tagged out IAW FM 55-502

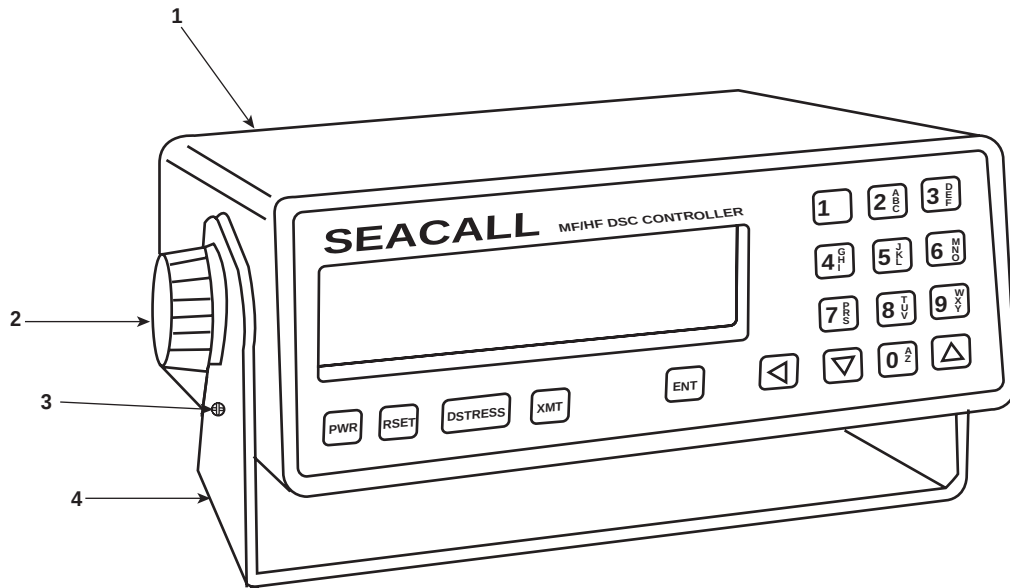
REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

⚠ CAUTION

Take great care when handling the wiring in the controller unit. The internal wiring is fragile and can be easily damaged.

1. Grasp the controller (1) firmly and remove the two knobs (2) and two screws (3) (one on either side) that secure the controller to its mount (4).
2. Label and disconnect the wiring from the rear of the controller (1). Set the multimeter to the Vdc (Volts direct current) setting and check for voltage. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.



INSTALLATION

1. Connect the wiring to the rear of the controller (1) using the labels from step 2 of Removal as a guide.
2. Position the controller (1) in its mount (4) and secure it with the two knobs (2) and two screws (3) (one on either side).
3. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
HF/SSB RADIO TELEPHONE SEA330 CONTROLLER, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0042)

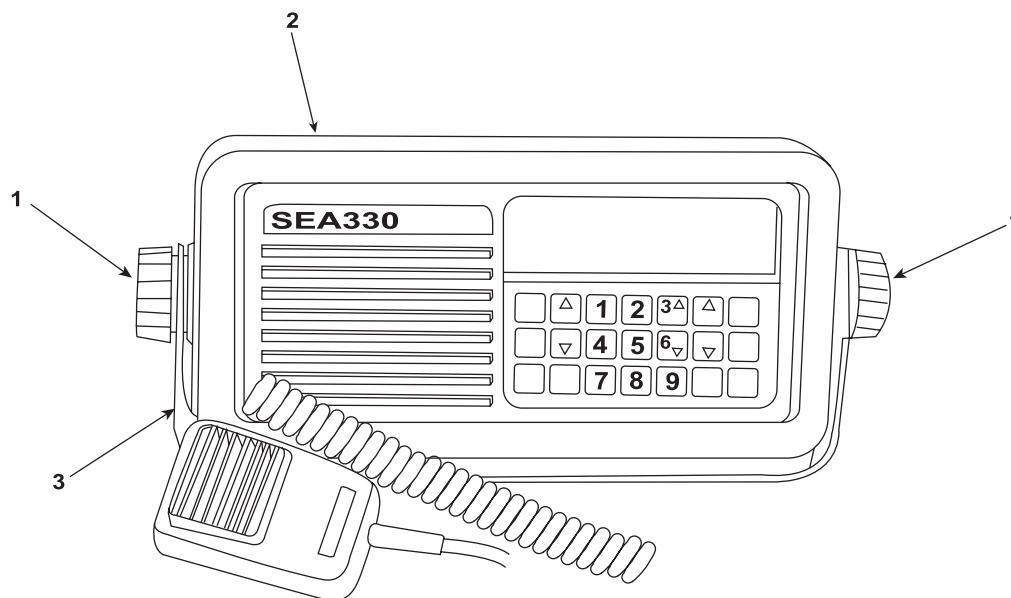
Equipment Condition:

SEA 330 MF/HF RADIO circuit breaker set to OFF,
locked out, and tagged out IAW FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the two knobs (1) that secure the radio telephone controller (2) to its mount (3).
2. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
3. Label and disconnect the wiring from the rear of the radio telephone controller (2).



INSTALLATION

1. Connect the wiring to the rear of the radio telephone controller (2) using the labels from step 3 of Removal as a guide.
2. Position the radio telephone controller (2) in its mount (3) and secure it with the two knobs (1).
3. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
MF/HF TRANSCEIVER RF SEA 3301, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0042)

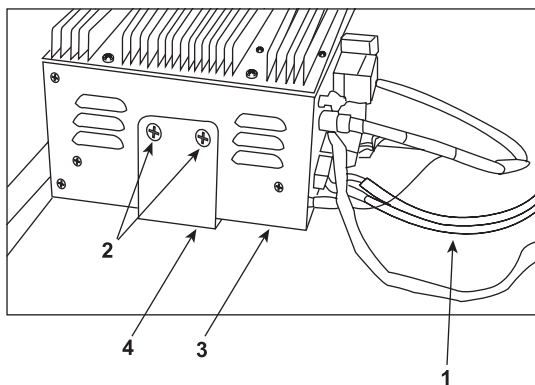
Equipment Condition:

SEA 330 MF/HF RADIO circuit breaker set
to OFF, locked out and tagged out IAW
FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
2. Label and disconnect the wiring (1) from the rear of the transceiver (3)
3. Remove the four screws (2) (two on each side) that secure the transceiver (3) to its mount (4).



INSTALLATION

1. Position the transceiver (3) in its mount (4) and secure it with the four screws (2) (two on each side).
2. Connect the wiring (1) to the rear of the transceiver (3) using the labels from step 2 of Removal as a guide.
3. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RF SEA 1630 COUPLER, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0042)

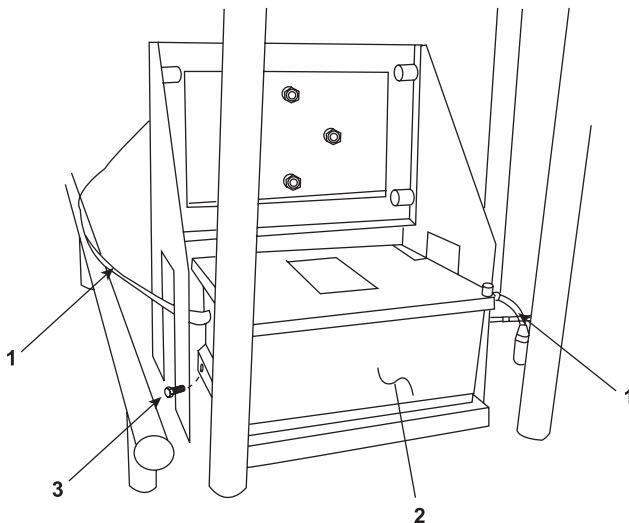
Equipment Condition:

SEA 330 MF/HF RADIO circuit breaker set
to OFF, locked out and tagged out IAW
FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the coupler (2) terminals. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
2. Label and disconnect the wiring (1) from the coupler (2).
3. Remove the bolts (3) that secure the coupler (2) to the accommodation module top.



INSTALLATION

1. Position the coupler (2) on the accommodation module top and secure it with the bolts (3).
2. Connect the wiring (1) to the coupler (2) using the labels from step 2 of Removal as a guide.
3. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
PRINTERS, ML 184T-S, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L

Equipment Condition:

Printer unplugged, locked out, and tagged
out IAW FM 55-502

References:

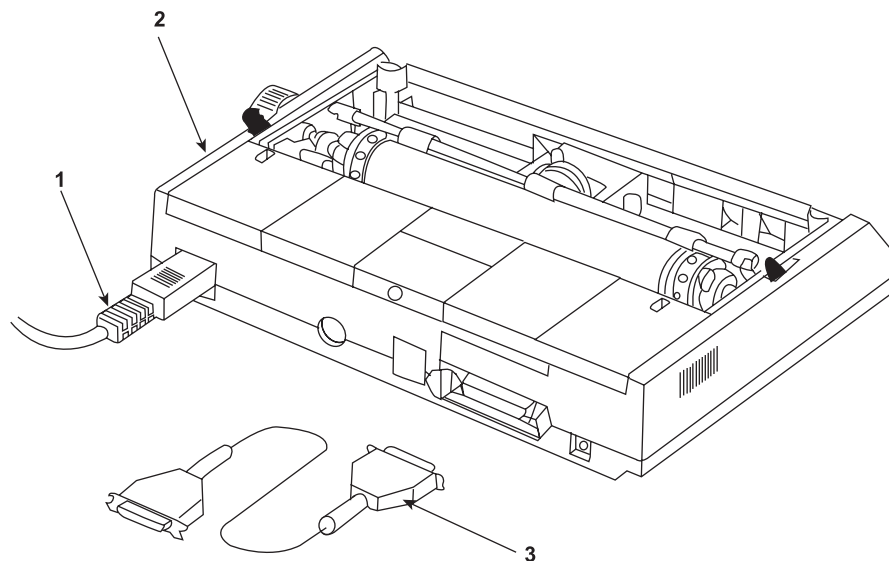
FM 55-502

TM 55-1905-242-24P (WP 0042)

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Disconnect the power cord (1) from the printer (2).
2. Disconnect the printer cable (3) from the printer (2).
3. Remove the printer (2) from its shelf.



INSTALLATION

1. Place the printer (2) on its shelf.
2. Connect the printer cable (3) to the printer (2).
3. Connect the power cable (1) to the printer (2).
4. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
VHF FM HANDHELDS HX350SAS1SL, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L

References:

FM 55-502

TM 55-1905-242-24P (WP 0042)

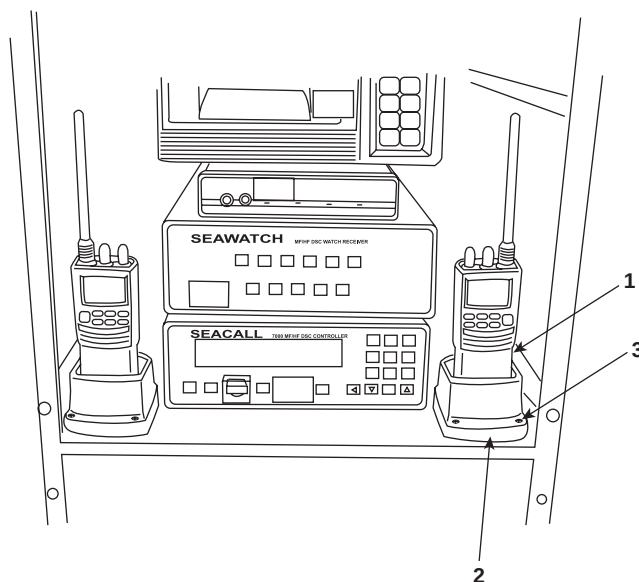
Equipment Condition:

110 Vac power strip locked out and tagged out
IAW FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Disconnect the power cord from the power strip in the communications cabinet.
2. Remove the radio (1) from its charger stand (2).
3. Remove the screws (3) that secure the charger stand (2) to the shelf and remove the charger stand.



INSTALLATION

1. Position the charger stand (2) on the shelf and secure it with the screws (3).
2. Place the radio (1) in the charger stand (2).
3. Connect the power cord to the power strip located in the communication cabinet.
4. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAY 430 LOUDHAILER, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)
 Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
 TM 55-1905-242-24P (WP 0042)

Equipment Condition:

INTERCOM RAY 430 circuit breaker set
 to OFF, locked out, and tagged out
 IAW FM 55-502

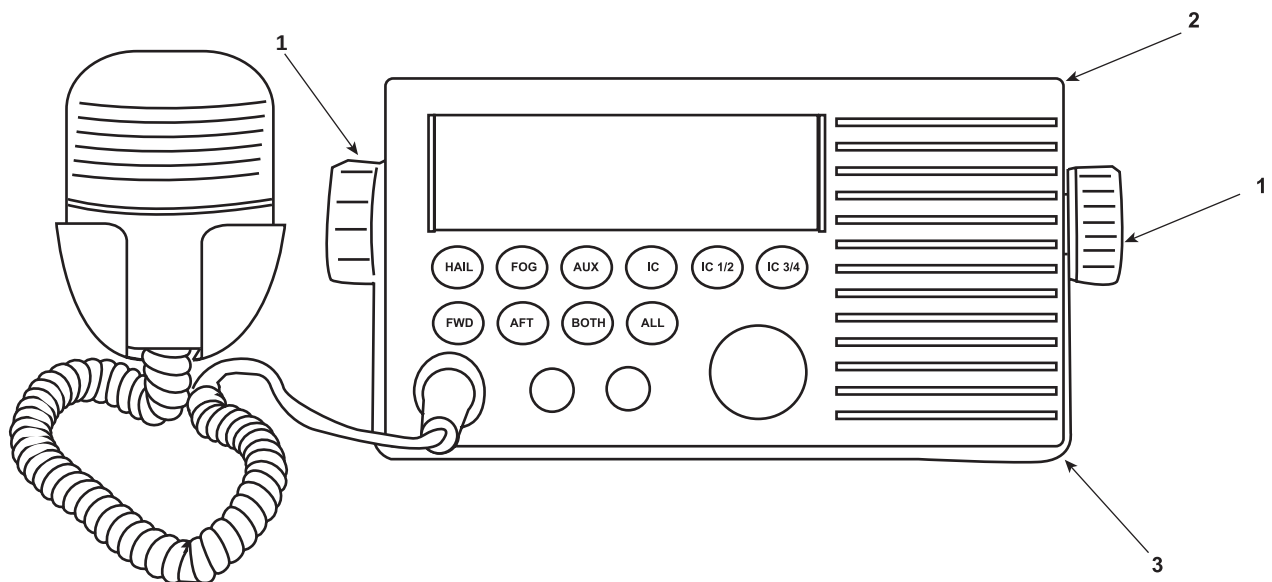
REMOVAL

WARNING



Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the two knobs (1) that secure the loudhailer (2) to its mount (3).



REMOVAL (continued)

2. Remove the loudhailer (2) from its mount (3). Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the 13.6V + and - terminals. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
3. Label and disconnect the wiring from the back of the loudhailer (2).

INSTALLATION

1. Connect the wiring to the back of the loudhailer (2) using the labels from step 3 of Removal as a guide.
2. Position the loudhailer (2) in its mount (3) and secure it with the two knobs (1).
3. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
NAVTEX RECEIVER NX-500, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)
 Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
 TM 55-1905-242-24P (WP 0042)

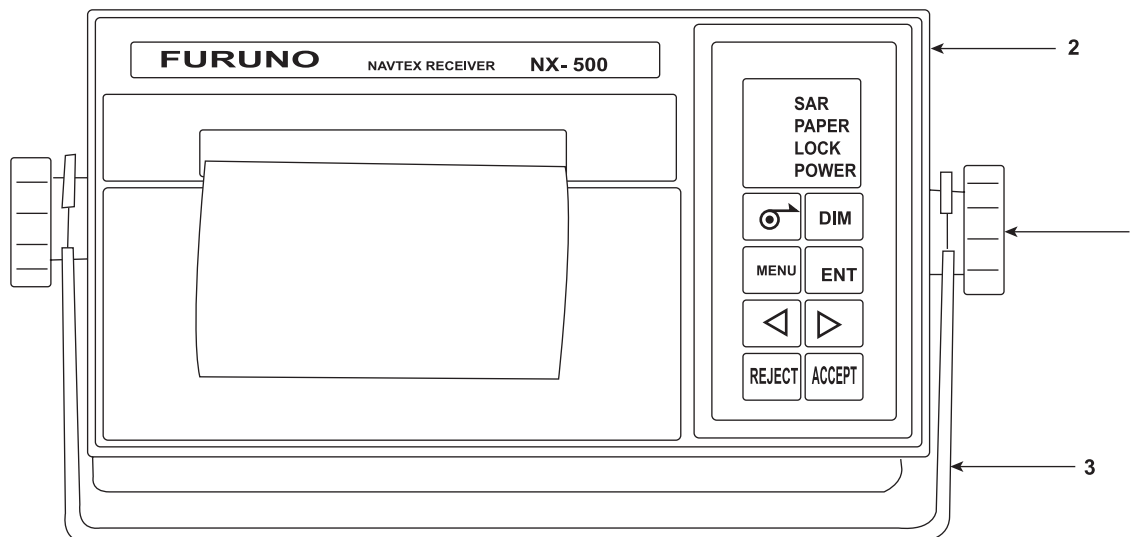
Equipment Condition:

NAVTEX RECEIVER NX-500 circuit breaker
 set to OFF, locked out, and tagged out
 IAW FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the two knobs (1) that secure the receiver (2) to its mount (3).
2. Remove the receiver (2) from its mount (3). Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the power terminals. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
3. Label and disconnect the wiring from the back of the receiver (2).



INSTALLATION

1. Connect the wiring to the back of the receiver (2) using the labels from step 3 of Removal as a guide.
2. Position the receiver (2) in its mount (3) and secure it with the two knobs (1).
3. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
AN/APX-72 TRANSPONDER, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0042)

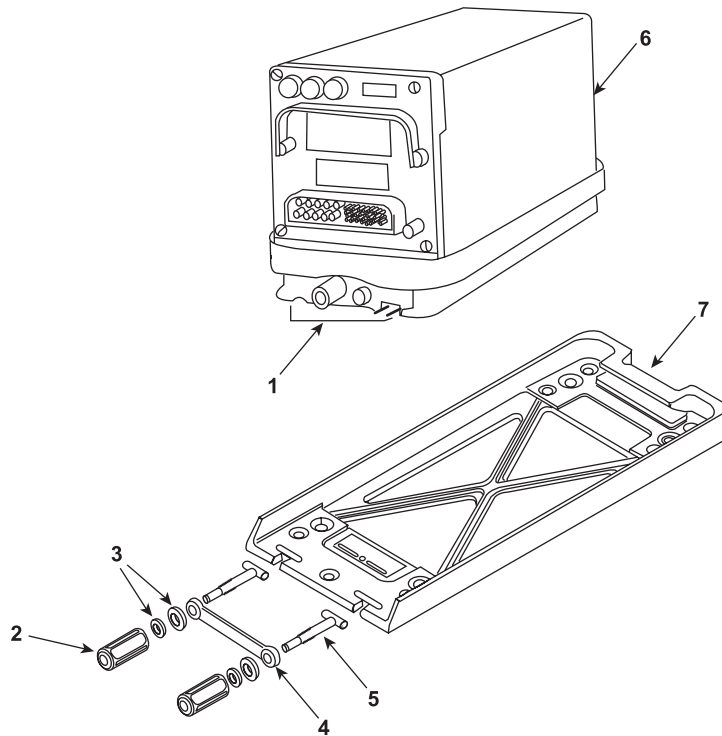
Equipment Condition:

IFF APX-72 circuit breaker set to OFF, locked
out, and tagged out IAW FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Label and disconnect the wiring from the transponder terminals (1). Set the multimeter to the Vdc (Volts direct current) setting and check for voltage at the transponder terminals. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
2. Loosen, but do not remove, the nuts (2) and washers (3) that secure the brace (4) to the T-bolts (5). Loosen the nuts and washers until the T-bolts and brace can be tilted forward to free the transponder (6).
3. Lift the transponder (6) free of its mount (7).



INSTALLATION

1. Place the transponder (6) in its mount (7) so that the rear of the transponder locks into the lip at the rear of the mount.
2. Swing the T-bolts (5) and brace (4) into place and tighten the nuts (2) until the transponder (6) is held firmly in place.
3. Connect the wiring to the terminals (1) using the labels from step 1 of Removal as a guide.
4. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
AN/SPS-69 RADAR, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0042)

Equipment Condition:

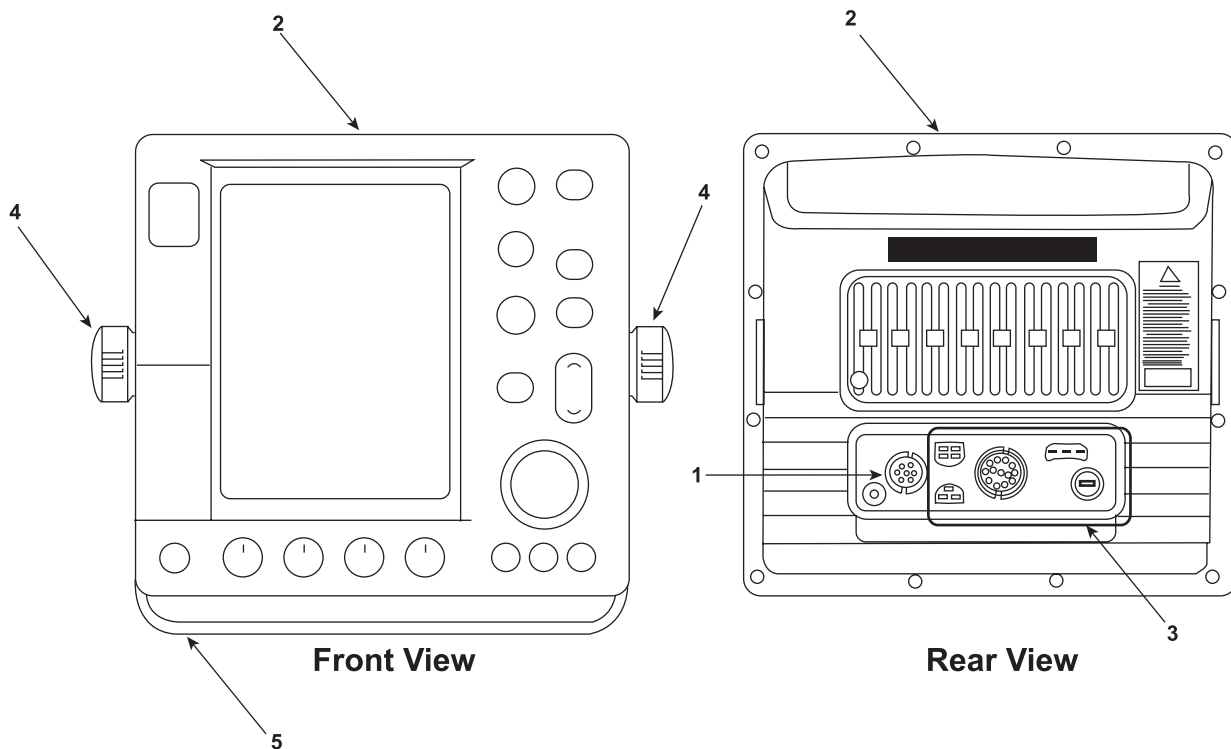
AN/SPS-69 RADAR circuit breaker set
to OFF, locked out, and tagged out
IAW FM 55-502

RADAR--REPLACE**REMOVAL--DISPLAY****WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

Use two crewmembers to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

1. Label and disconnect the power cable from the power terminal (1) on the rear of the display (2) and use the multimeter to check for voltage at the power sockets (the two large sockets in the power cable). If no voltage is observed, proceed to the next step. If voltage is observed, ensure that the circuit breaker is properly secured.
2. Label and disconnect the remaining wiring from the terminal (3) at the rear of the display (2).
3. Remove the two knobs (4) that secure the display (2) to its mount (5) and remove the display from its mount.



INSTALLATION--DISPLAY

1. Place the display (2) in its mount (5) and secure it with the two knobs (4).
2. Connect the wiring to the terminals (1 and 3) at the rear of the display (2) using the labels from steps 1 and 2 of Removal--Display as a guide.
3. Remove the lockouts and tagouts and check the operation of the system.

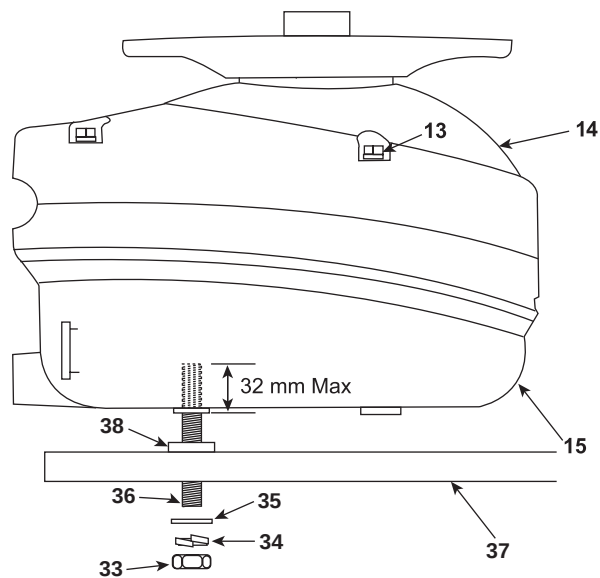
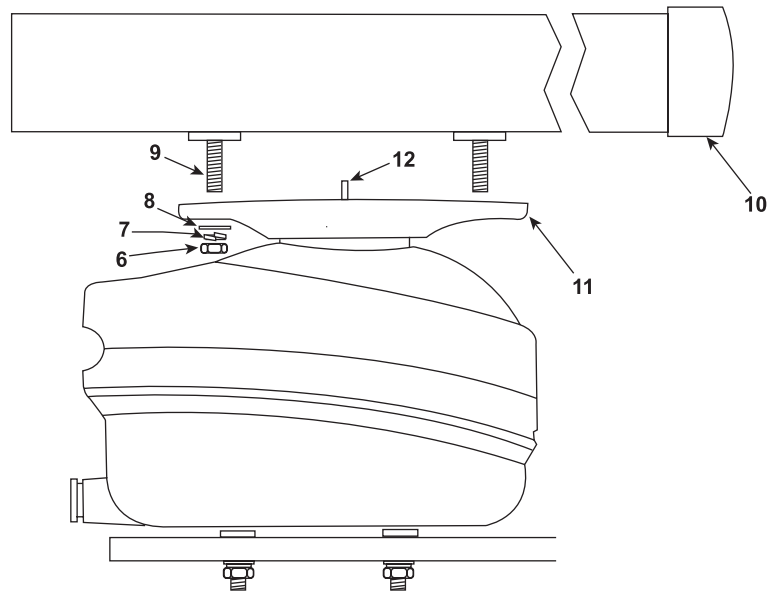
REMOVAL--ARRAY ASSEMBLY

NOTE

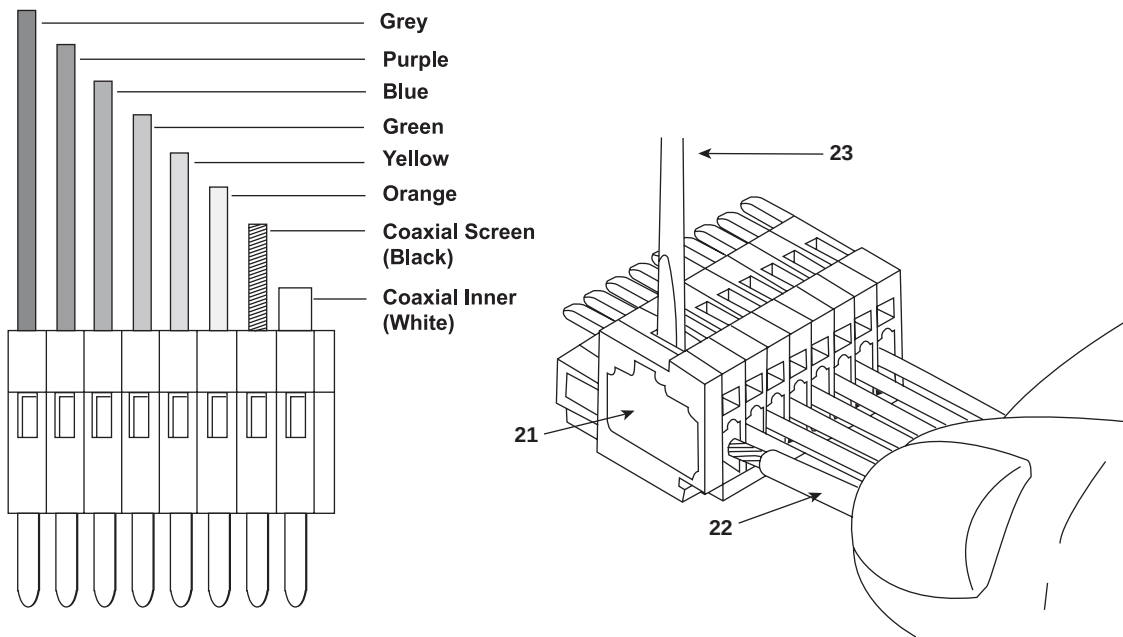
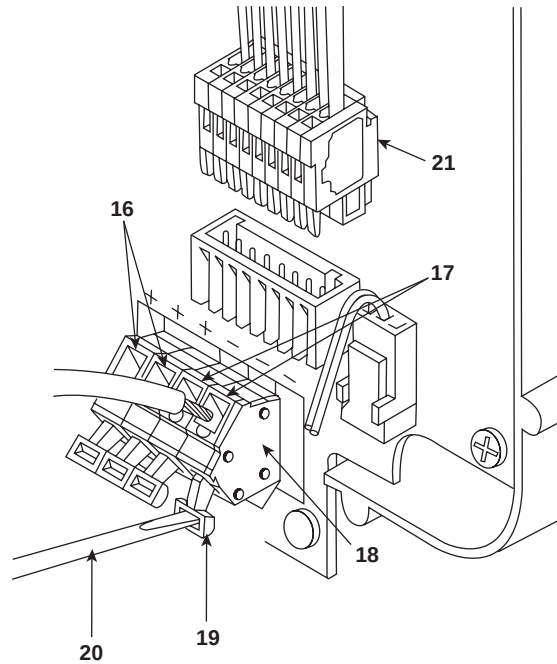
Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

1. Remove the nuts (6), lockwashers (7), and flat washers (8) from the studs (9) that secure the array (10) to the pedestal (11).
2. Carefully lift the array (10) straight up and away from the pedestal (11), taking care that the coaxial mounting pin (12) is not damaged during removal.
3. Loosen the four self-retaining bolts (13) securing the pedestal lid (14) to the pedestal base (15). Pull each self-retaining bolt up and turn it counterclockwise to lock it in the upright position.
4. Open the pedestal lid (14), ensuring that the securing stay has automatically locked into position.
5. Set the multimeter to the Vdc (Volts direct current) setting, and check for voltage across the positive (16) and negative (17) terminals of the power connector (18). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
6. Label and disconnect the wiring from the positive (16) and negative (17) terminals of the power connector (18). Disconnection is accomplished by pressing the locking tabs (19) with a screwdriver (20) to free the connection.
7. Disconnect the signal connector (21).

REMOVAL--ARRAY ASSEMBLY (continued)

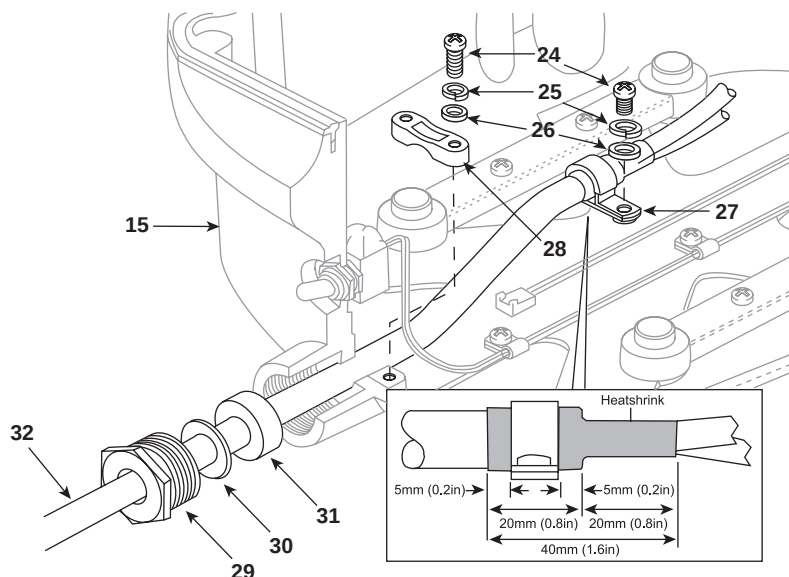


8. Label and disconnect the signal connector wiring (22) from the signal connector (21). Disconnection is accomplished by pressing the internal locking tab with a small screwdriver (23).
9. Remove the screws (24), lockwashers (25), and flat washers (26) that secure the cable clamps (27 and 28) to the pedestal base (15).
10. Remove the gland nut (29), washer (30), and grommet (31) from the pedestal base (15) and pull the wiring assembly (32) free from the pedestal base.

REMOVAL--ARRAY ASSEMBLY (continued)

11. Lower the pedestal lid (14) and secure it to the pedestal base (15) with the four self-retaining bolts (13).
12. Remove the four nuts (33), lockwashers (34), and flat washers (35) from the studs (36) that secure the pedestal base (15) to its mount (37). The bitumen washers (38) should remain with the mount.
13. Using two crewmembers, carefully lift the pedestal unit (14 and 15) from its mount (37).

INSTALLATION--ARRAY ASSEMBLY



1. Ensure that the bitumen washers (38) are in place on the mount (37).
2. Using two crewmembers, carefully lift the pedestal unit (14 and 15) into position on its mount (37).
3. Secure the pedestal base (15) to the mount (37) with the studs (36), flat washers (35), lockwashers (34), and four nuts (33).
4. Loosen the four self-retaining bolts (13) securing the pedestal lid (14) to the pedestal base (15). Pull each self-retaining bolt up and turn it counterclockwise to lock them in the upright position.
5. Open the pedestal lid (14), ensuring that the securing stay has automatically locked into position.
6. Slide the wiring assembly (32) into the pedestal base (15) and secure it with the cable clamps (27 and 28), screws (24), lockwashers (25), and flat washers (26).
7. Slide the grommet (31) and washer (30) into the pedestal base (15) and secure them with the gland nut (29).
8. Install the signal connector wiring (22) into the signal connector (21) using the labels from step 8 of Removal--Array Assembly as a guide. Installation is accomplished by pressing the internal lock tab with a small screwdriver (23) while inserting the appropriate wire.
9. Install the wiring into the positive (16) and negative (17) terminals of the power connector (18) using the labels from step 6 of Removal--Array Assembly as a guide. Installation is accomplished by pressing the locking tabs (19) with a screwdriver (20) while inserting the wire.
10. Close the pedestal lid (14) and secure it with the four self-retaining bolts (13).
11. Carefully lower the array (10) into position on the pedestal (11), taking care not to damage the coaxial mounting pin (12).
12. Secure the array (10) to the pedestal (11) with the studs (9), flat washers (8), lockwashers (7), and nuts (6).
13. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
COMSEC KY-99, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

COMSEC KY-99 circuit breaker set to OFF,
 locked out, tagged out IAW FM 55-502

References:

FM 55-502
 TM 55-1905-242-24P

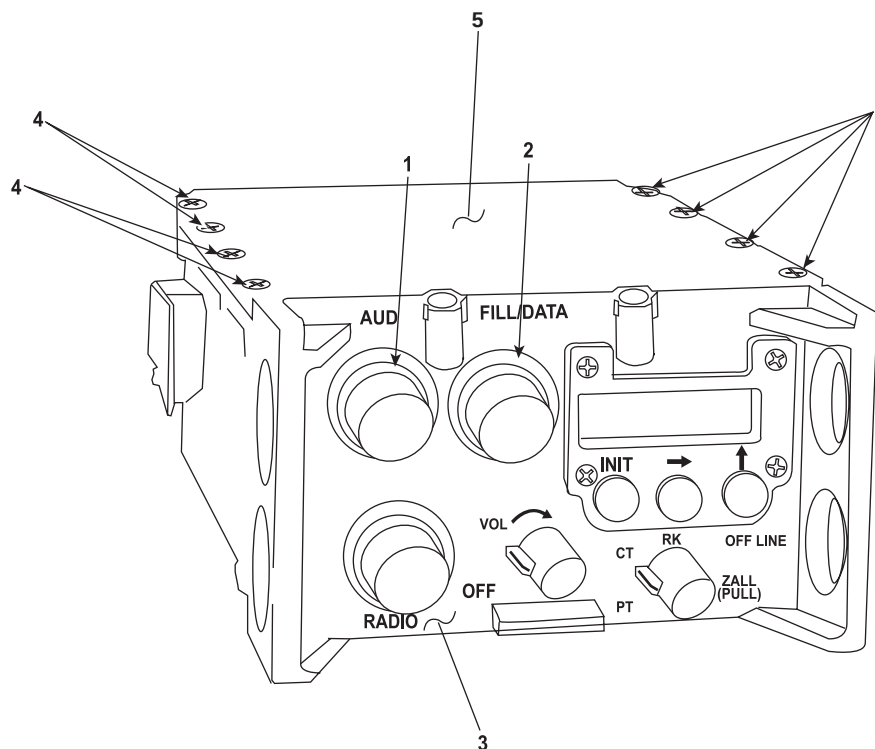
REMOVAL

WARNING



Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Label and disconnect the wiring from the AUD (1), FILL/DATA (2), and RADIO (3) connectors.
2. Remove the screws (4) that secure the COMSEC unit (5) to its mount and remove the COMSEC unit.



INSTALLATION

1. Position the COMSEC unit (5) on its mount and secure it with the screws (4).
2. Connect the AUD, FILL/DATA, and RADIO wiring to their respective connectors (1, 2, and 3) using the labels from step 1 of Removal as a guide.
3. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ANTENNA ASSEMBLIES, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502

TM 55-1905-242-24P (WP 0043)

Equipment Condition:

NAVTEX RECEIVER NX-500 circuit breaker set
to OFF, locked out, and tagged out IAW
FM 55-502

GENERAL

Replacement of the NAVTEX NX-500 antenna is detailed in this procedure. Although the precise configuration of the various antennas may vary, this procedure applies to all antennas on the vessel.

REMOVAL**WARNING**

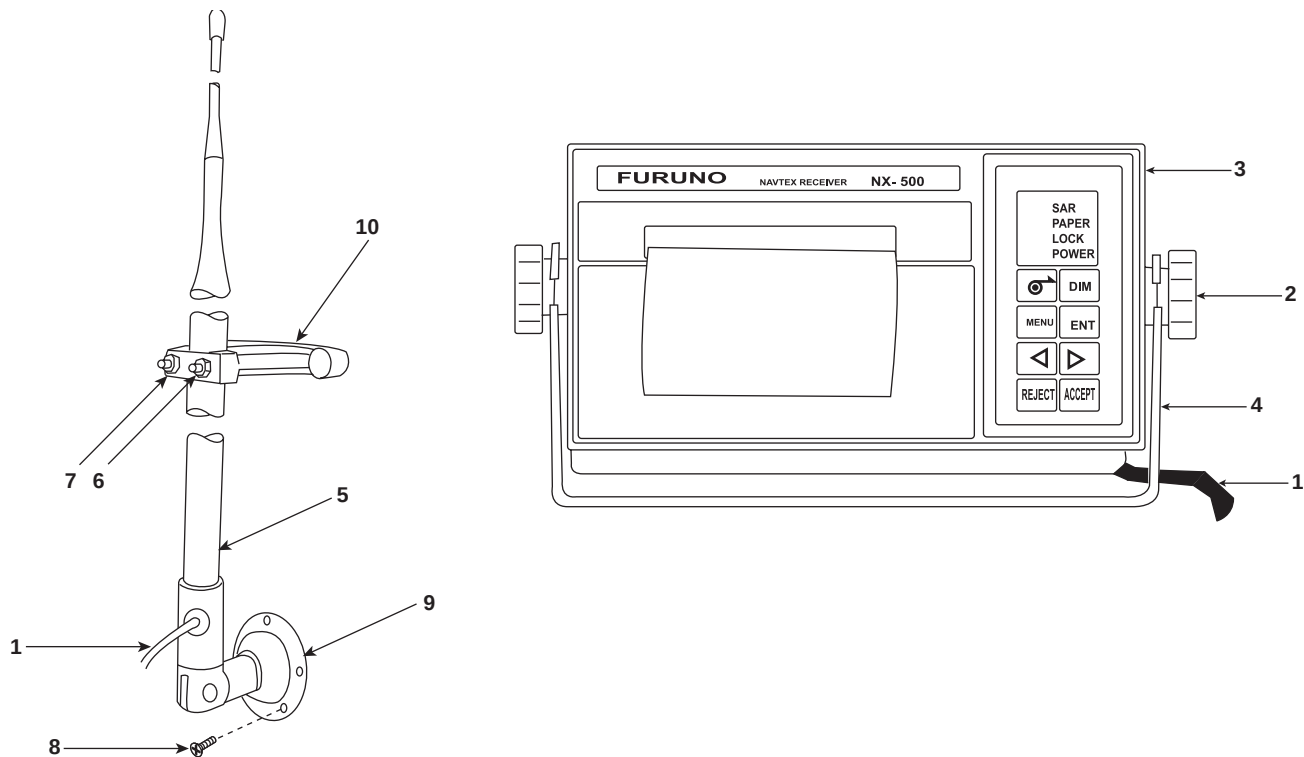
Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Follow the antenna cable (1) to its radio connection, freeing it from the vessel's structure as you progress.
2. Unscrew the side mounting knobs (2) and remove the NAVTEX NX-500 (3) from its mount (4) to access the antenna cable (1) connection.
3. Disconnect the antenna cable (1) from its radio at the back of its unit.

NOTE

Not all antennas utilize an upper mount. If the antenna to be replaced does not utilize an upper mount, disregard step 4 and proceed to step 5.

4. While one person holds the antenna (5), remove the nuts (6) that secure the upper bracket clamp (7).
5. Remove the screws (8) that secure the antenna mount (9) to the vessel's structure. Remove the antenna (5).



INSTALLATION

1. While one person holds the antenna mount (9) in position on the vessel's structure, secure it with the screws (8).

NOTE

Not all antennas utilize an upper mount. If the antenna to be replaced does not utilize an upper mount, disregard step 2 and proceed to step 3.

2. Position the antenna (5) in the upper mount (10) and secure it with the upper bracket clamp (7) and nuts (6).
3. Route the antenna cable (1) back to the radio, securing it to the vessel's structure in the same manner as the old cable.
4. Connect the antenna cable (1) to its radio.
5. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
NAVIGATION LIGHTS, FIXTURES, AND SWITCHES, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0044)

Equipment Condition:

Appropriate circuit breaker(s) set to OFF,
locked out, and tagged out IAW
FM 55-502

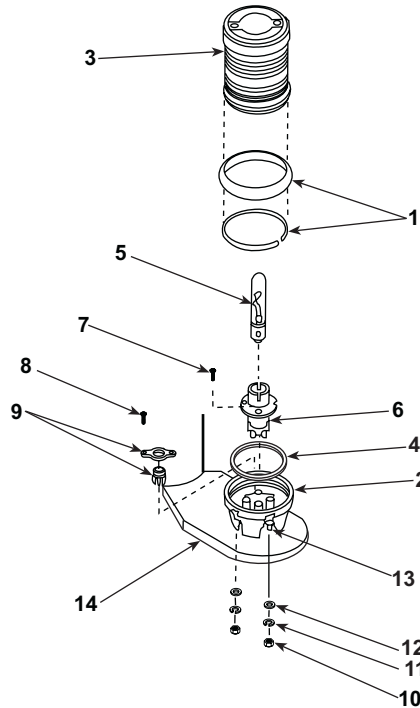
REMOVAL--MASTHEAD/SIDE/NOT-UNDER-COMMAND LIGHT FIXTURE

WARNING



Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Unlock the locking ring assembly (1) from the base (2).
2. Lift off the lens housing (3), locking ring assembly (1), and gasket (4).
3. Remove the bulb (5) from the bulb holder (6).
4. Set the multimeter to the Vdc (Volts direct current) setting. Place the positive multimeter lead on the center electrode of the bulb holder (6) and the negative lead on the outer edge of the bulb holder and observe the voltage. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
5. Remove the two screws (7) that secure the bulb holder (6) to the base (2) and remove the bulb holder (6) from the base.
6. Label and disconnect the wiring from the bulb holder (6).
7. Remove the two screws (8) that secure the cable clamp assembly (9) to the base (2) and remove the wiring.



NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

8. Remove the three nuts (10), lockwashers (11), flat washers (12), and three bolts (13) that secure the base (2) to the mount (14) and remove the base from the mount.

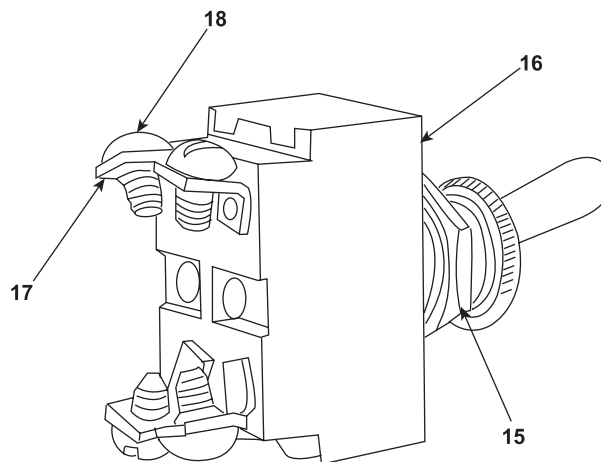
INSTALLATION--MASTHEAD/SIDE/NOT-UNDER-COMMAND LIGHT FIXTURE

1. Position the base (2) on the mount (14) and secure it with three bolts (13), flat washers (12), lockwashers (11), and three nuts (10).
2. Install the wiring in the cable clamp assembly (9) and secure the cable clamp assembly to the base (2) with two screws (8).
3. Connect the wiring to the bulb holder (6) using the labels from step 6 of Removal--Masthead/Side/Not-Under-Command Light Fixture as a guide.
4. Position the bulb holder (6) in the base (2) and secure it with the two screws (7).
5. Install the bulb (5) into the bulb holder (6).
6. Position the gasket (4) into the base (2), and then place the lens housing (3) into the base and secure it with the locking ring assembly (1).
7. Remove the lockouts and tagouts and check the operation of the system.

REMOVAL--SWITCHES**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the nut (15) that secures the switch (16) to the console. Pull the switch from the console.
2. Set the multimeter to the Vdc (Volts direct current) setting. Connect the negative multimeter lead to a known good ground and contact each of the switch's terminals (17) with the positive multimeter lead. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
3. Label the wiring, loosen the screws (18), and disconnect the wiring from the switch.

**INSTALLATION--SWITCHES**

1. Connect the wiring to the switch's terminals (17) using the labels from step 3 of Removal--Switches as a guide and secure it with the screws (18).
2. Position the switch (16) in the console and secure it with the nut (15).
3. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
SEARCHLIGHT, REPAIR/REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0046)

Equipment Condition:

SEARCH LT circuit breaker set to OFF,
locked out, and tagged out IAW
FM 55-502

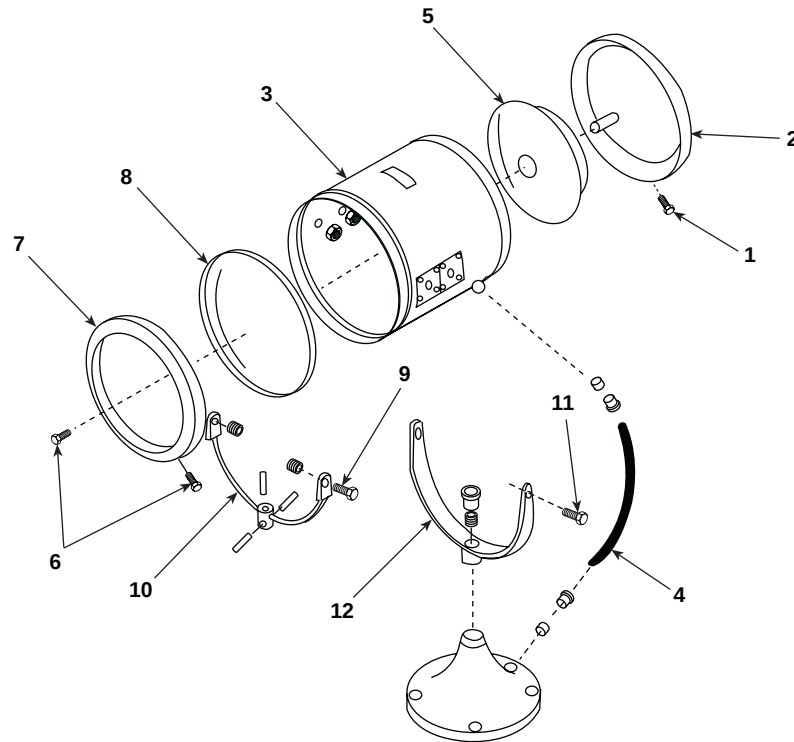
REPAIR

Repair of the searchlight is accomplished by replacement of its component parts. Replacement of these component parts is detailed as a part of the replacement procedure.

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the three screws (1) that secure the rear cover (2) to the searchlight body (3). Remove the rear cover.
2. Set the multimeter to the Vdc (Volts direct current) setting and place one multimeter lead on each of the searchlight's two terminals. Note the voltage. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
3. Disconnect the power cable (4) from the searchlight assembly.
4. Remove the sealed beam (5) from the searchlight body (3).
5. Remove the screws and nuts (6) that secure the retaining ring (7) to the searchlight body (3).
6. Remove the retaining ring (7) and the lens glass (8) from the front of the searchlight.
7. Remove the bolts (9) that attach the control yoke (10) to the searchlight body (3).
8. Remove the screws (11) that attach the searchlight body (3) to the main yoke (12).
9. Remove the searchlight assembly.



INSTALLATION

1. Position the searchlight body (3) into the main yoke (12) and secure it with the screws (11).
2. Attach the control yoke (10) to the searchlight body (3) with the bolts (9).
3. Install the lens glass (8) and secure it with the retaining ring (7), screws and nuts (6).
4. Install the sealed beam (5) into the rear of the searchlight body (3).
5. Connect the power cable (4) to the searchlight assembly.
6. Secure the sealed beam (5) with the rear cover (2) and three screws (1).
7. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ELECTRIC HORN, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0047)

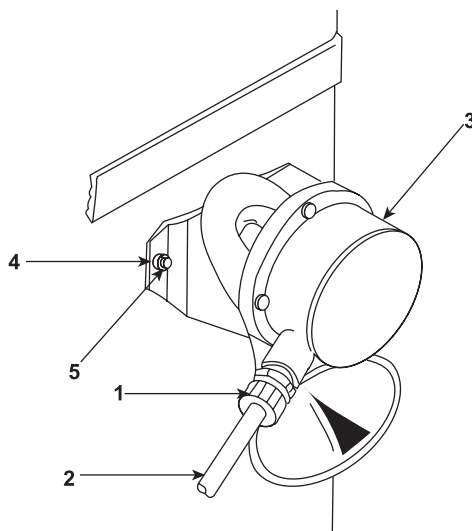
Equipment Condition:

HORN circuit breaker set to OFF, locked out,
and tagged out IAW FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the gland nut (1) and packing that secure the wiring (2) to the body (3).
2. Pull the wiring (2) out to expose its connections.
3. Set the multimeter for Vdc (Volts direct current) and place one lead on each of the wiring connections. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.



REMOVAL (continued)

4. Disconnect the wiring connections.
5. Remove the three nuts (4) from the three studs (5) and remove the horn from its mount.

INSTALLATION

1. Position the horn over the three studs (5) and secure it with three nuts (4).
2. Connect the wiring connections.
3. Secure the wiring (2) to the body (3) with the gland nut (1).
4. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAW WATER SYSTEM PIPING, HOSES, AND VALVES, REPLACE/REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Wrench, Pipe, Adj Heavy Duty (Item 30, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)
Flange Gasket (p/n 76-00317, qty 2)

Equipment Condition:

Seacock for applicable system CLOSED, locked out, and tagged out IAW FM 55-502

References:

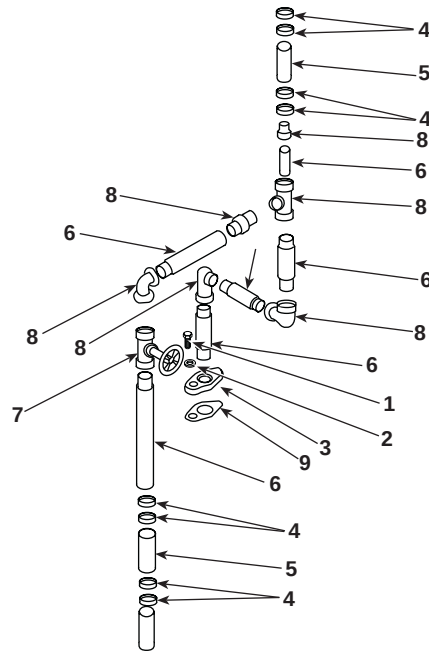
FM 55-502
TM 55-1905-242-24P (WP 0048)

REMOVAL**WARNING**

The seacock for the affected system must be closed before beginning replacement of any raw water system piping, hoses, and/or valves. Failure to observe this warning can result in flooding of the space, damage to the vessel, and serious injury or death to personnel.

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

REMOVAL (continued)

1. Remove the bolts (1) and lockwashers (2) that secure the flange (3) to its mounting. After removing flange, save old gasket to use as a template for creating new gasket.
2. Loosen the hose clamps (4) that secure the hoses (5) to the piping (6).
3. Remove the smallest possible piping section containing the pipe, hose, or valve that must be replaced.
4. Unscrew the piping (6) from the valve (7) or fitting (8) as required.

INSTALLATION

1. Procure new pipe, valves, hoses, or fittings as required.
2. If piping (6) was removed from a valve (7) or fitting (8) during Removal, wrap the male pipe threads with antiseizing tape sealant prior to installation.
3. Screw the piping (6) into the valve (7) or fitting (8).
4. Install the piping section containing the pipe, hose, or valve that was replaced, back into the system.
5. Tighten the hose clamps (4) that secure the hoses (5) to the piping (6).
6. Place a new gasket (9) on the flange mounting and position the flange (3) for installation.
7. Install the bolts (1) and lockwashers (2) that secure the flange (3) to its mounting.
8. Remove the lockouts and tagouts, check the operation the system, and check for leakage.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAW WATER SYSTEM DUPLEX STRAINER, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

Seacock CLOSED, locked out, and tagged
out IAW FM 55-502

Materials/Parts:

Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

References:

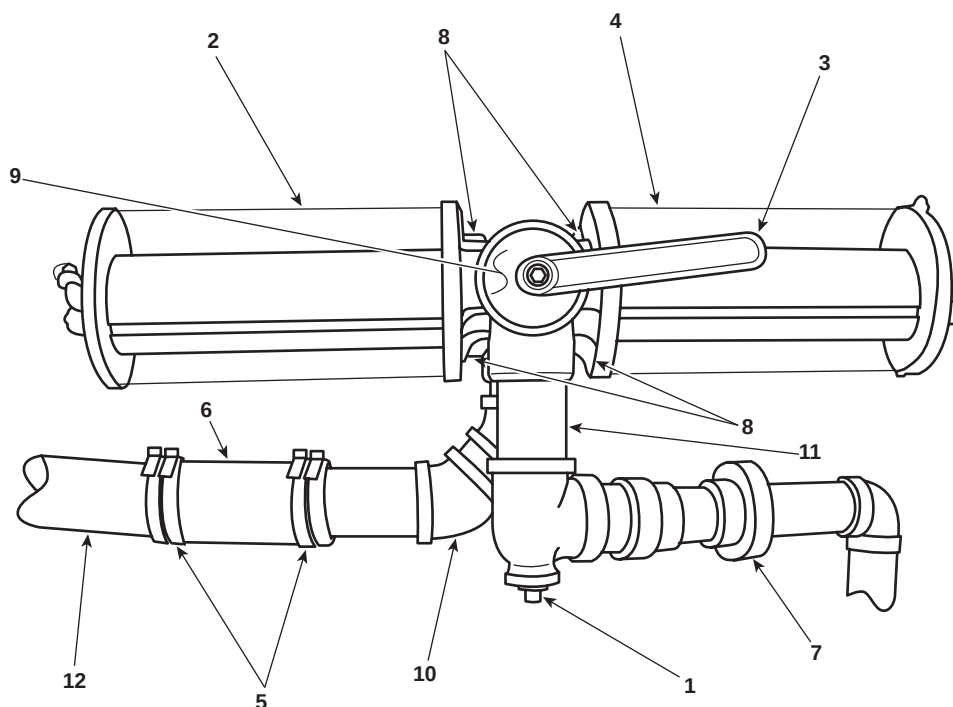
FM 55-502

TM 55-1905-242-24P (WP 0049)

REMOVAL**WARNING**

The seacock for the affected system must be closed before beginning replacement of the raw water system strainer. Failure to observe this warning can result in flooding of the space, resulting in damage to the vessel and serious injury or death to personnel.

1. Remove the drain plug (1) to drain the selected strainer (2).



REMOVAL (continued)

2. Rotate the selector handle (3) to select the remaining strainer (4) and drain that strainer.
3. Loosen the hose clamps (5) and slide them back off the hose (6).
4. Remove the hose (6).
5. Using two wrenches, disconnect the union fitting (7).
6. Remove the four bolts (8) that secure the strainer assembly (9) to the bulkhead.
7. Remove the strainer assembly (9) with the associated piping attached.
8. Remove the pipes (10 and 11) from the strainer assembly (9).

INSTALLATION

1. Wrap the male pipe threads with antiseizing tape sealant and install the pipes (10 and 11) on the strainer assembly (9).
2. Position the strainer assembly (9) on the bulkhead and secure it with the four bolts (8).
3. Slide the hose (6) over the ends of the pipes (10 and 12).
4. Secure the hose (6) with the hose clamps (5).
5. Connect and securely tighten the union fitting (7).
6. Install the drain plug (1) and position the selector handle (3) to select one of the strainers (2 or 4).
7. Remove the lockouts and tagouts, operate the system, and check for leakage.
8. After checking for leakage with one strainer (2 or 4) selected, position the selector handle (3) to select the remaining strainer and check it for leakage.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
POTABLE WATER SYSTEM PIPING, HOSES, AND VALVES, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Crowfoot Attachment, Socket Wrench, 1 1/4
(Item 31, Table 1, WP 0230 00)
Suitable Drain Pan

Personnel Required:

Two Watercraft Engineers, 88L

References:

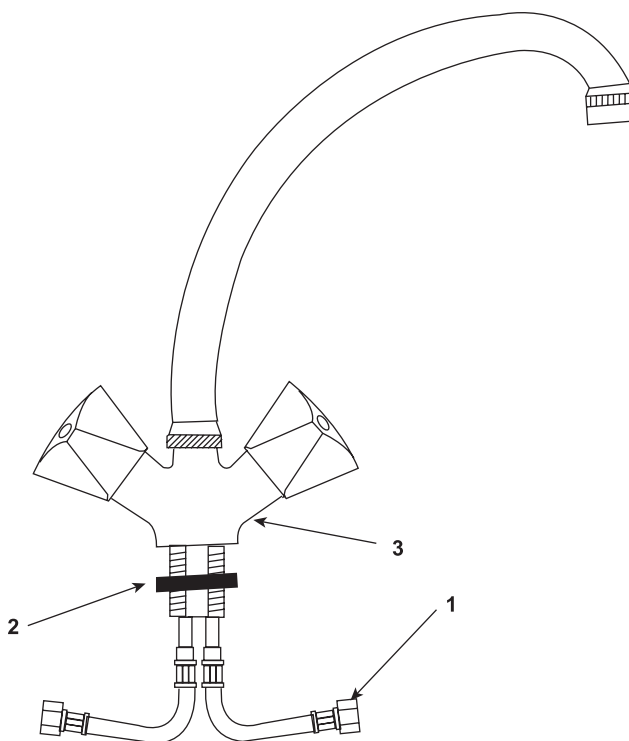
FM 55-502
TM 55-1905-242-24P (WP 0050)

Equipment Condition:

FRESH WTR TANK PRESS SET circuit
breaker set to OFF, locked out, and
tagged out IAW FM 55-502

REMOVAL

1. Position a suitable drain pan under the faucet to be replaced.
2. Turn ON the faucet (both hot and cold) and ensure that no water runs. If no water runs, proceed to the next step. If water runs, allow time for the residual pressure in the pressure set to dissipate. If water continues to run, check to ensure that the circuit breaker is properly secured.
3. Loosen and remove the hose fittings (1) from the standing piping.
4. Loosen and remove the nut (2) that secures the faucet assembly (3) to the sink.
5. Remove the faucet assembly (3) from the sink.



INSTALLATION

1. Position the faucet assembly (3) onto the sink and secure it with the nut (2).
2. Connect the hose fittings (1) to the standing piping and tighten them snugly.
3. Remove the lockouts and tagouts, allow the potable water pressure to build up, and check the operation of the faucet. Ensure that the faucet turns ON and OFF and that it does not leak.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
WATER PRESSURE SET, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)
Suitable Drain Pan

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0051)

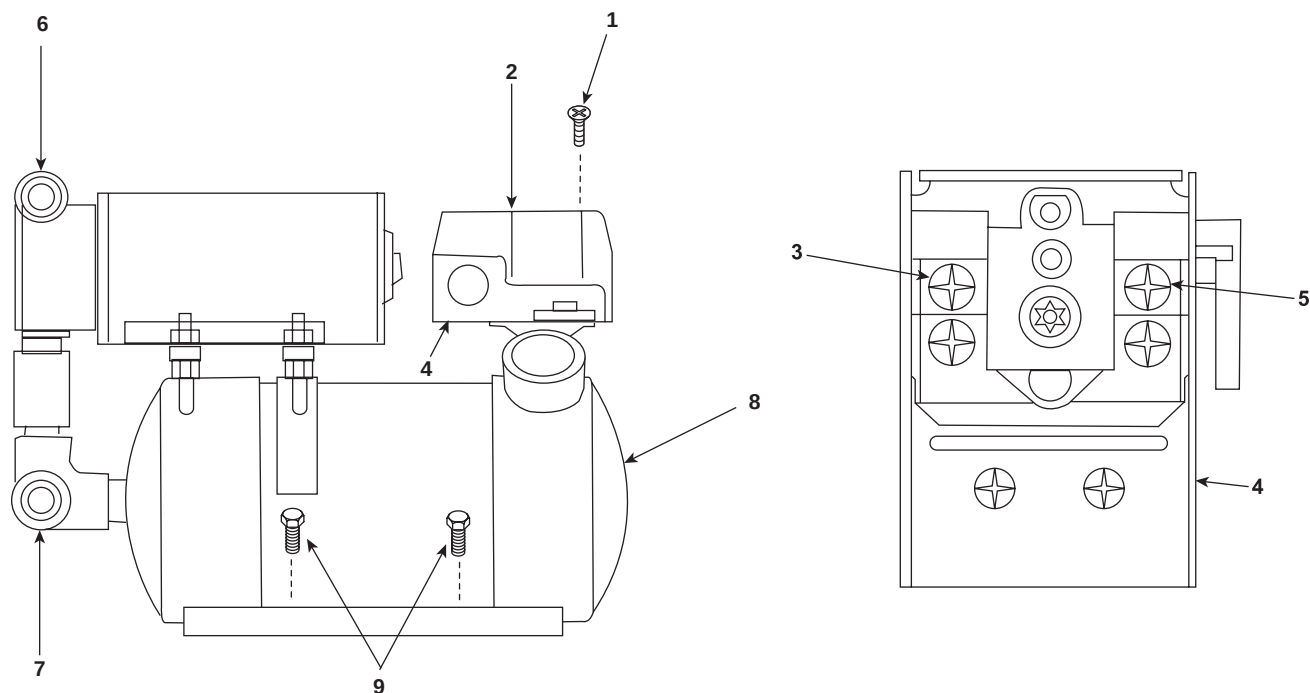
Equipment Condition:

FRESH WTR TANK PRESSURE SET
circuit breaker set to OFF, locked out,
and tagged out IAW FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the screw (1) that secures the pressure switch cover (2).
2. Remove the pressure switch cover (2).
3. Set the multimeter to the Vdc (Volts direct current) setting. Place the positive multimeter lead on the positive terminal (3) of the pressure switch (4) and the negative multimeter lead on the negative terminal (5) of the pressure switch and note the reading. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the pressure switch circuit breaker is properly secured.
4. Label and remove the wiring and pressure strain relief from the pressure switch (4).
5. Remove the piping from the intake (6) and discharge (7) ports of the pressure set (8).
6. Remove the bolts (9) that secure the pressure set (8) to the deck and remove the pressure set.



INSTALLATION

1. Position the pressure set (8) on the deck and secure it with the bolts (9).
2. Attach the piping to the intake (6) and discharge (7) ports of the pressure set (8).
3. Connect the wiring to the pressure switch (4) using the labels from step 4 of Removal as a guide.
4. Position the pressure switch cover (2) on the pressure switch (4) and secure it with the screw (1).
5. Remove the lockouts and the tagouts and test the operation of the system. Ensure that the pressure set cuts ON and OFF automatically and that it does not leak.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
AIR CONDITIONING AND VENTILATION SYSTEMS PIPING, VALVES, STRAINERS,
WATER HEATER, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
 Multimeter (Item 2, Table 1, WP 0230 00)
 Drop Light, Extension (Item 16, Table 1, WP 0230 00)
 Suitable Drain Pan

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
 Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
 Antifreeze, Ethylene Glycol Inhibited (Item 6, Table 2, WP 0230 00)

Equipment Condition:

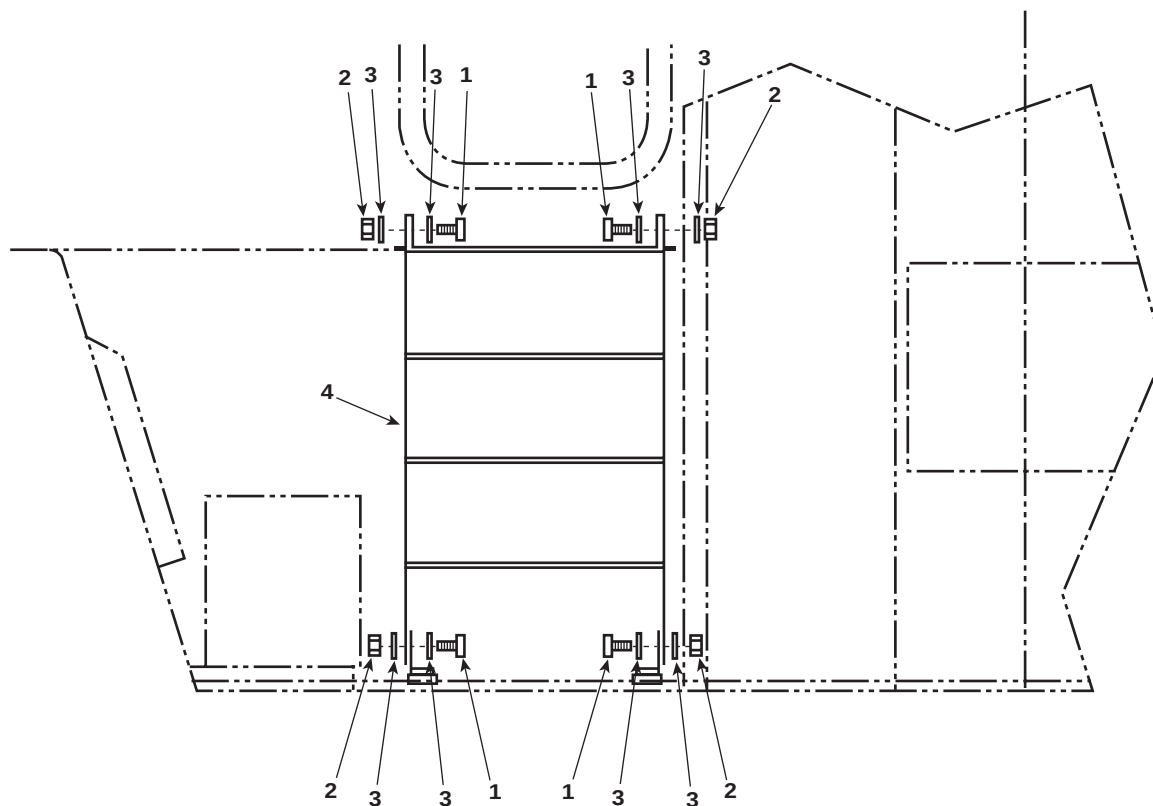
FRESH WTR TANK PRESS SET and HOT WATER HEATER circuit breakers set to OFF, locked out, and tagged out IAW FM 55-502
 Water heater shutoff valves on starboard propulsion engine CLOSED, locked out, and tagged out IAW FM 55-502

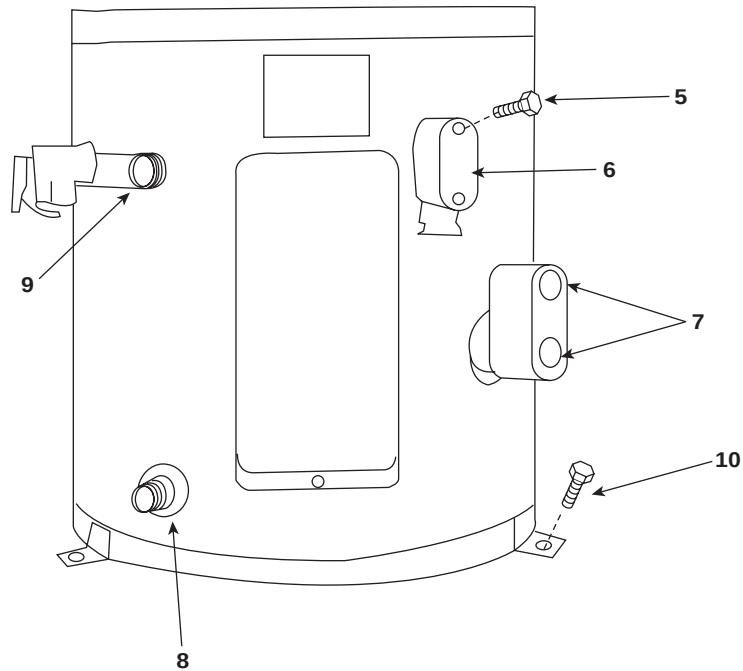
References:

FM 55-502
 TM 55-1905-242-24P (WP 0052)

REMOVAL

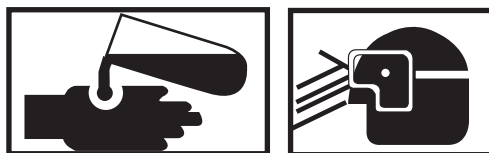
1. Remove the four bolts (1), four nuts (2), and eight flat washers (3) that secure the accommodation access ladder (4). Lift the accommodation access ladder clear of the work area.
2. Remove the two screws (5) that secure the junction box cover (6) to the junction box.



REMOVAL (continued)**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

3. Set the multimeter to the Vac (Volts alternating current) setting and measure for voltage across the wiring connections in the junction box. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the HOT WATER HEATER circuit breaker is properly secured.
4. Label and disconnect the wiring from inside the junction box.
5. OPEN a hot water faucet and leave it OPEN to allow the system to drain its pressure and to vent.
6. Don chemical protective gloves and goggles.

REMOVAL (continued)**WARNING**

Do not allow antifreeze to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling antifreeze. Failure to comply can result in illness, serious injury, or death.

7. Position a suitable drain pan beneath the heat exchanger fittings (7) and remove the propulsion engine coolant lines from the heat exchanger fittings.
8. Disconnect the potable water lines from the inlet (8) and outlet (9) connections.
9. Remove or turn the connections away from the unit.
10. Remove the three bolts (10) that secure the water heater to the deck.
11. Remove the water heater from its mounting location.

INSTALLATION

1. Position the water heater in its mounting location and secure it with three bolts (10).
2. Connect the potable water lines to the inlet (8) and outlet (9) connections.
3. Connect the propulsion engine coolant lines to the heat exchanger fittings (7).
4. Connect the wiring inside the junction box using the labels from step 4 of Removal as a guide.
5. Install the junction box cover (6) and secure it with two screws (5).
6. Lift the accommodation access ladder (4) into position and secure it with four bolts (1), four nuts (2), and eight flat washers (3).
7. Remove the lockouts and tagouts and check the operation of the system. OPEN the water heater shutoff valves on the starboard propulsion engine, ensuring that the water heater heats the potable water and does not leak. Check the coolant level in the starboard propulsion engine and replenish as necessary.
8. Dispose of used antifreeze and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
WINDSHIELD WASHER PUMP, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Equipment Condition (continued):

WIPERS STBD & WASH PUMP circuit breaker set to
OFF, locked out and tagged out IAW FM 55-502

Equipment Condition:

Void 6 prepared for confined space entry with
Confined Space Entry Permit secured, IAW
Organizational Confined Space Entry SOP and
FM 55-502

Personnel Required:

One Watercraft Engineer, 88L
One Entry Supervisor/Attendant
(Trained in Confined Entry Space)

References:

FM 55-502
Organizational Confined Space Entry SOP
TM 55-1905-242-24P (WP 0053)

REMOVAL**WARNING**

Only properly trained personnel may enter confined spaces, or act as entry supervisors and/or attendants for those working in confined spaces. Before entering into a confined space, the space must be cleared for entry and a Confined Space Entry Permit must be secured. All entry into confined spaces must be in accordance with the Organizational Confined Space Entry Standard Operating Procedure and FM 55-502. Entry into an uninspected confined space may result in serious injury or death.

1. Remove the void cover from Void 6 and prepare it for confined space entry in accordance with the Organizational Confined Space Entry SOP and FM 55-502.

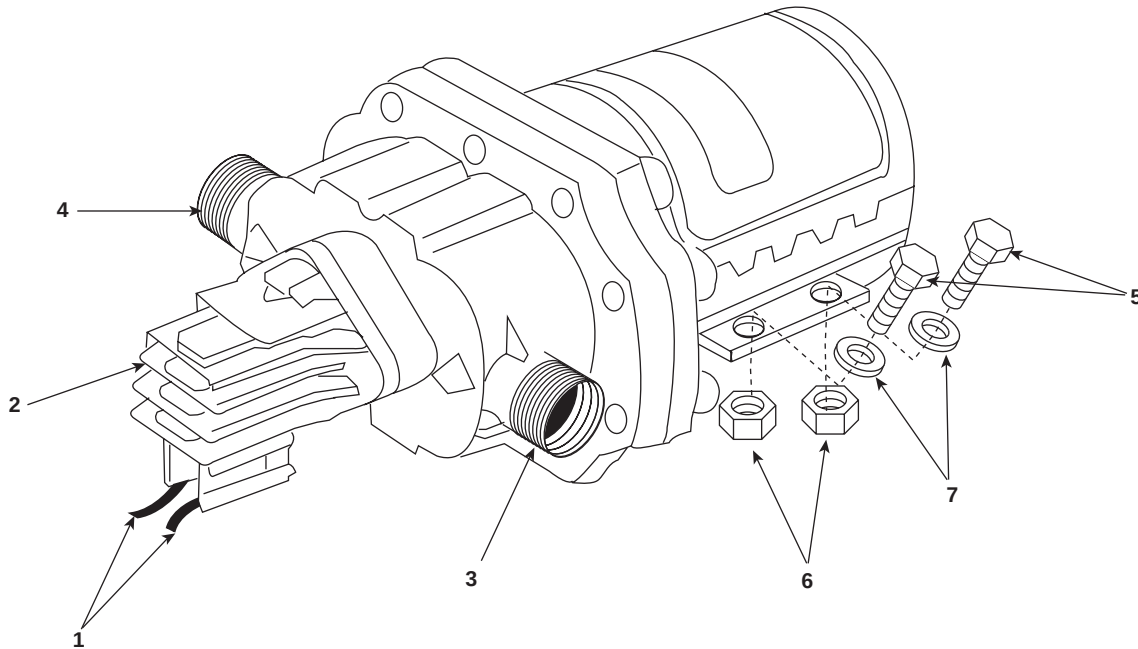
WARNING

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

2. Set the multimeter to the Vdc (Volts direct current) setting and place one multimeter lead on each of the two power wires (1) connected to the pump's microswitch (2). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the pump's circuit breaker is properly secured.

REMOVAL (continued)

3. Label and disconnect the wiring (1) from the pump's microswitch (2).
4. Disconnect the piping from the intake (3) and outlet (4) ports.
5. Remove the bolts (5), nuts (6), and washers (7) that secure the pump to its mount.

**INSTALLATION**

1. Position the pump on its mount and secure it with the bolts (5), nuts (6), and washers (7).
2. Connect the piping to the intake (3) and outlet (4) ports.
3. Connect the wiring (1) to the pump's microswitch (2) using the labels from step 3 of Removal as a guide.
4. Clear the lockouts and tagouts and check the operation of the system, ensuring that the pump delivers water to the nozzles and that it does not leak.
5. Install the void cover on Void 6 and terminate the confined space entry permit.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
POTABLE WATER TANK MONITOR SYSTEM, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Equipment Condition (continued):

RUDDERANGLE & TANK GAUGES circuit breaker set to
OFF, locked out and tagged out IAW FM 55-502
Potable water tank drained

Equipment Condition:

Void 6 prepared for confined space entry with
Confined Space Entry Permit secured, IAW
Organizational Confined Space Entry SOP and
FM 55-502

Personnel Required:

One Watercraft Engineer, 88L
(Trained in Confined Space Entry)
One Entry Supervisor/Attendant

References:

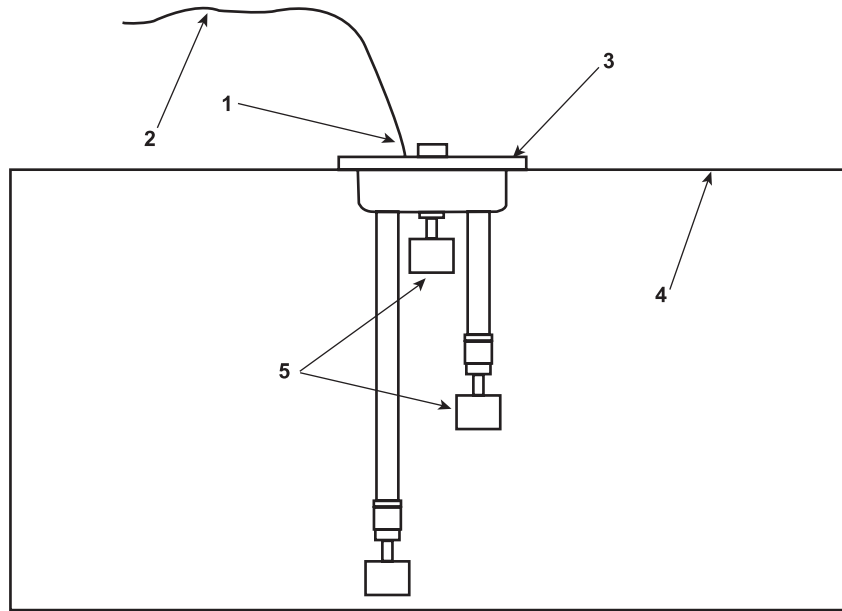
FM 55-502
Organizational Confined Space Entry SOP

REMOVAL--TANK UNIT

WARNING

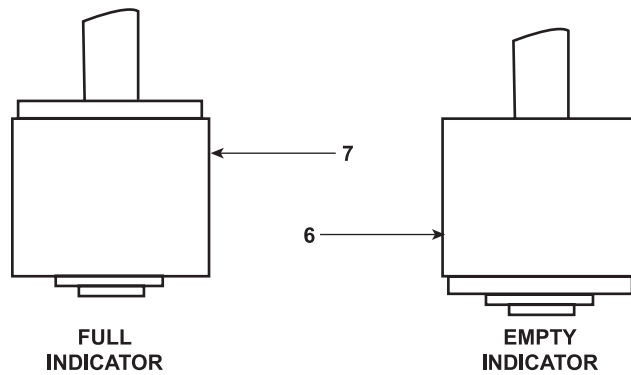
Only properly trained personnel may enter confined spaces, or act as entry supervisors and/or attendants for those working in confined spaces. Before entering into a confined space, the space must be cleared for entry and a Confined Space Entry Permit must be secured. All entry into confined spaces must be in accordance with the Organizational Confined Space Entry Standard Operating Procedure and FM 55-502. Entry into an uninspected confined space may result in serious injury or death.

1. Remove the void cover from Void 6 and prepare it for confined space entry in accordance with the Organizational Confined Space Entry SOP and FM 55-502.
2. Set the multimeter to the Vdc (Volts direct current) setting and read the voltage across each of the wiring terminals (1) on the tank. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
3. Label and disconnect the wiring (2) from the wiring terminals (1).
4. Unscrew the tank unit (3) from the tank (4).



INSTALLATION--TANK UNIT

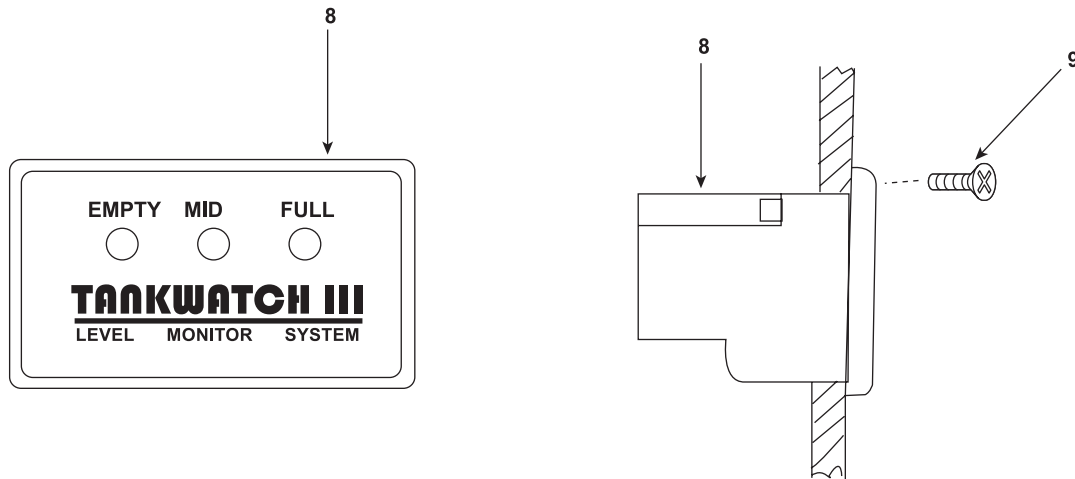
1. Adjust the probes (5) on the new tank unit (3) to the same level as the old unit. Ensure that the lowest level probe is set as an "Empty Indicator" (6) and that the middle and highest probes are set as "Full Indicators" (7).



2. Screw the tank unit (3) into the tank (4).
3. Connect the wiring (2) to the wiring terminals (1) using the labels from step 3 of Removal--Tank Unit as a guide.
4. Fill the potable water tank and check for leaks at the tank unit (3).
5. Remove the lockouts and tagouts and check the operation of the system.
6. Install the void cover on Void 6 and terminate the confined space procedures.

REMOVAL--DISPLAY UNIT

1. Remove the lower starboard panel from the console.
2. Set the multimeter to the Vdc (Volts direct current) setting. Place the positive multimeter lead on terminal #2 on the back of the display unit (8) and the negative lead on the #4 terminal on the back of the display unit. If no voltage is detected, proceed to the next step. If voltage is detected, ensure that the circuit breaker is properly secured.
3. Label and remove the wiring from the back of the display unit (8).
4. Remove the four screws (9) that secure the display unit (8) to the panel.

**INSTALLATION--DISPLAY UNIT**

1. Position the display unit (8) in the panel and secure it with four screws (9).
2. Connect the wiring to the back of the display unit (8) using the labels from step 3 of Removal--Display Unit as a guide.
3. Install the lower starboard panel onto the console.
4. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BLACK WATER SYSTEM PIPING, HOSES, AND VALVES, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Materials/Parts:

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Apron, Chemical Protection (Item 11, Table 2, WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

Personnel Required:

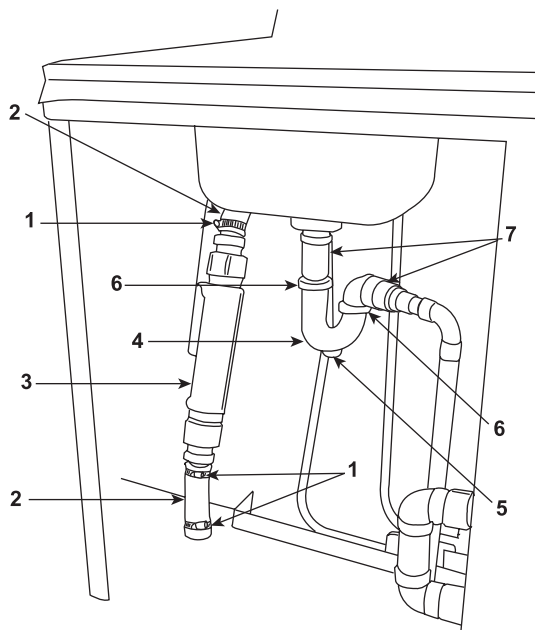
One Watercraft Engineer, 88L

References:

TM 55-1905-242-24P (WP 0055)

REMOVAL--VENT FILTER

1. Loosen the hose clamps (1) on each end of the filter that secure the rubber hose (2) to the vent filter (3).
2. Twist the vent filter (3) to break it free of the rubber hose (2).
3. Slide the vent filter (3) out of the rubber hose (2).

**INSTALLATION--VENT FILTER**

1. Procure a new vent filter.
2. Slide the ends of the vent filter (3) into the rubber hose (2) and secure with hose clamps (1).

REMOVAL--SINK TRAP

1. Position a suitable drain pan beneath the sink trap (4).
2. Remove the drain plug (5) from the sink trap (4) and allow the sink trap to drain into the drain pan.
3. Loosen the two trap nuts (6) and remove the sink trap (4).

INSTALLATION--SINK TRAP

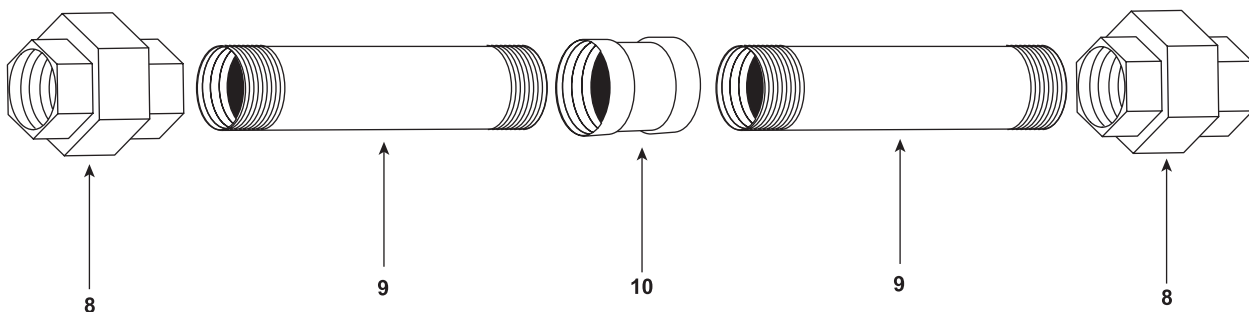
1. Position a new or cleaned sink trap (4) into the piping (7) and secure it by tightening the two trap nuts (6).
2. If not already installed, install the drain plug (5) into the sink trap (4).
3. Pour fresh water into the sink and check for leakage at the sink trap.
4. Dispose of the water in the drain pan by pouring it down the drain.

WARNING

Sewage is a common mode of transmission for parasitic organisms that may have the capability of causing communicable diseases. Protective gloves and a protective apron should be worn to help prevent contact with sewage. After coming in contact with sewage or contaminated equipment, be sure to clean yourself with a disinfectant soap. Avoid sewage contact with skin abrasions, punctures, cuts, and other open wounds. Wipe up and clean any spills and/or contaminated equipment using a disinfectant soap. Failure to comply could result in illness, serious injury, or death.

REMOVAL--MISCELLANEOUS PIPING

1. Position a suitable drain pan beneath the area of repair.
2. Loosen the union (8) at one end of the piping section that contains the component that will be replaced.
3. Loosen the union (8) at the other end of the piping section that contains the component that will be replaced and remove the piping section.
4. Disassemble the piping section as necessary to remove the pipe (9) or fitting (10) to be replaced.



INSTALLATION--MISCELLANEOUS PIPING

1. Clean the threads of all disassembled parts with a wire brush.
2. Wrap the male threads of all disassembled parts (except the unions (8)) with antiseizing sealant tape.
3. Assemble the piping section using new pipe (9) or fitting (10) as required.
4. Position the piping section in place and secure it by tightening the unions (8).
5. Pour fresh water through the affected piping section and check for leaks.
6. Dispose of the water in the drain pan by pouring it down the drain.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BLACK WATER DISCHARGE PUMP, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)
Suitable Drain Pan

Personnel Required:

Two Watercraft Engineers, 88L

Material/Parts:

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Apron, Chemical Protection (Item 11, Table 2, WP 0230 00)

Equipment Condition:

BLACK WTR DISC PUMP circuit breaker set
to OFF, locked out, and tagged out IAW
FM 55-502

References:

FM 55-502
FM 55-509-1
TM 55-1905-242-24P (0135)

REMOVAL**WARNING**

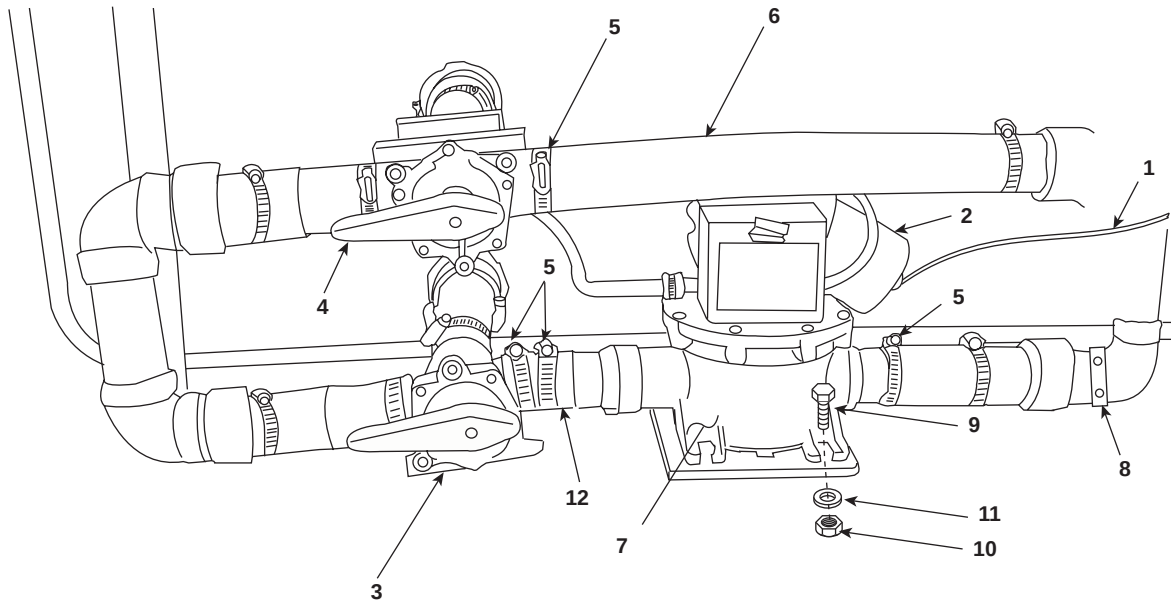
Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

Sewage is a common mode of transmission for parasitic organisms that may have the capability of causing communicable diseases. Protective gloves and a protective apron should be worn to help prevent contact with sewage. After coming in contact with sewage or contaminated equipment, be sure to clean yourself with a disinfectant soap. Avoid sewage contact with skin abrasions, punctures, cuts, and other open wounds. Wipe up and clean any spills and/or contaminated equipment using a disinfectant soap. Failure to comply could result in illness, serious injury, or death.

1. Position a suitable drain pan beneath the work area.
2. Cut the wires (1) approximately 6 inches from the motor (2).
3. Set the multimeter to the Vdc (Volts direct current) setting. Place one multimeter lead on each of the wire ends cut in step 2. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
4. Position the inlet and discharge valves (3 and 4) as shown in the illustration.
5. Loosen the hose clamps (5) securing the piping (6) to the pump (7), discharge valve (4), and inlet valve (3).
6. Remove the mounting bracket (8) securing the piping (6) and slide the piping off the pump (7) and discharge valve (4).
7. Remove the bolts (9), nuts (10), and washers (11) securing the pump (7) to its foundation.

REMOVAL(continued)

8. Slide the pump (7) out of the hose (12) and off its foundation.

**INSTALLATION**

1. Slide the pump (7) into the hose (12) and position it on its foundation with the mounting holes aligned.
2. Secure the pump to the foundation with the bolts (9), nuts (10), and washers (11).
3. Slide the piping (6) onto the pump (7) and discharge valve (4) and install the mounting bracket (8) to hold it in position.
4. Tighten the hose clamps (5) securing the piping (6) and hose (12) to the discharge valve (4), pump (7), and inlet valve (3).
5. Connect the wires (1) cut in step 2 of Removal in accordance with FM 55-509-1.
6. Remove the lockouts and tagouts and check the operation of the system.
7. Dispose of the waste in the drain pan by pouring it down the drain and flushing the drain pan with clean water.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BLACK WATER TANK MONITOR SYSTEM, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)
 Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L
 (Trained in Confined Space Entry)
 One Entry Supervisor/Attendant

Equipment Condition:

Void 6 prepared for confined space entry with
 Confined Space Entry Permit secured, IAW
 Organizational Confined Space Entry SOP
 and FM 55-502
 RUDDER ANGLE & TANK GAUGES circuit
 breaker set to OFF, locked out, and tagged
 out IAW FM 55-502
 Potable water tank drained

Materials/Parts:

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
 Apron, Chemical Protection (Item 11, Table 2, WP 0230 00)

References:

FM 55-502
 Organizational Confined Space Entry SOP
 TM 55-1905-242-24P (WP 0057)

REMOVAL--TANK UNIT

WARNING



Only properly trained personnel may enter confined spaces, or act as entry supervisors and/or attendants for those working in confined spaces. Before entering into a confined space, the space must be cleared for entry and a Confined Space Entry Permit must be secured. All entry into confined spaces must be in accordance with the Organizational Confined Space Entry Standard Operating Procedure and FM 55-502. Entry into an uninspected confined space may result in serious injury or death.

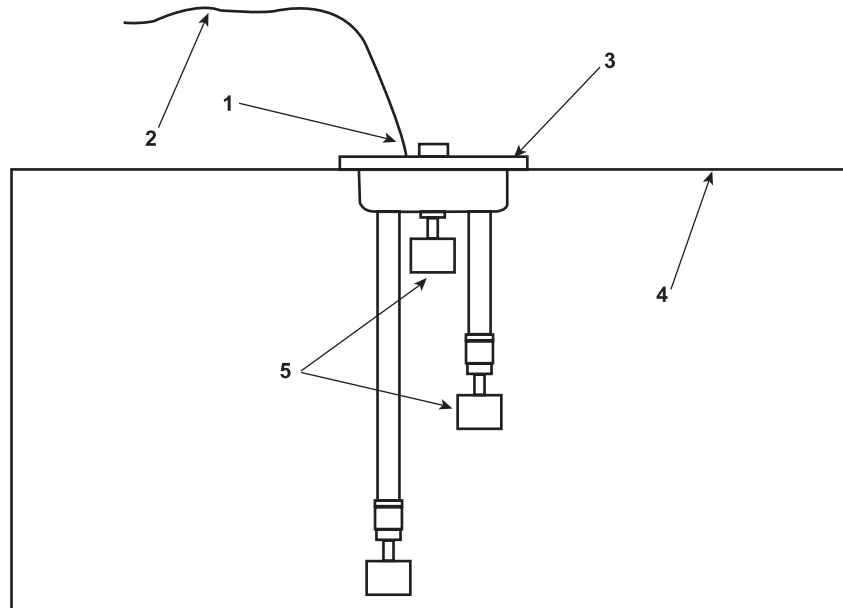
Sewage is a common mode of transmission for parasitic organisms that may have the capability of causing communicable diseases. Protective gloves and a protective apron should be worn to help prevent contact with sewage. After coming in contact with sewage or contaminated equipment, be sure to clean yourself with a disinfectant soap. Avoid sewage contact with skin abrasions, punctures, cuts, and other open wounds. Wipe up and clean any spills and/or contaminated equipment using a disinfectant soap. Failure to comply could result in illness, serious injury, or death.

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

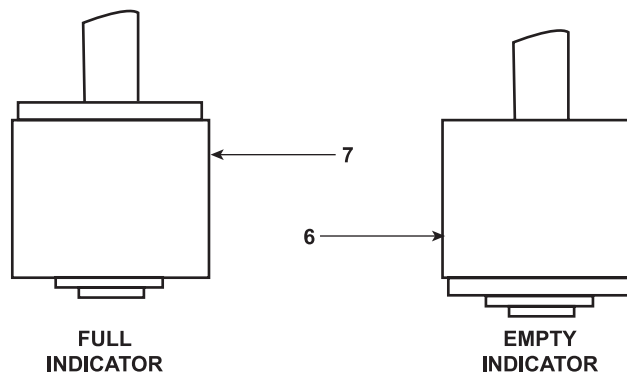
1. Remove the void cover from Void 6 and prepare it for confined space entry in accordance with the Organizational Confined Space Entry SOP and FM 55-502.

REMOVAL--TANK UNIT (continued)

2. Set the multimeter to the Vdc (Volts direct current) setting and check for voltage across each of the wiring terminals (1) on the tank unit (3). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
3. Label and disconnect the wiring (2) from the wiring terminals (1).
4. Unscrew the tank unit (3) from the tank (4).

**INSTALLATION--TANK UNIT**

1. Adjust the probes (5) on the new tank unit (3) to the same level as the old unit. Ensure that the lowest level probe is set as an "Empty Indicator" (6) and that the middle and highest probes are set as "Full Indicators" (7).



2. Screw the tank unit (3) into the tank (4).
3. Connect the wiring (2) to the wiring terminals (1) using the labels from step 3 of Removal--Tank Unit as a guide.

INSTALLATION--TANK UNIT (continued)

4. Fill the black water tank with fresh water and check for leaks at the tank unit (3).
5. Remove the lockouts and tagouts and check the operation of the system.
6. Install the void cover on Void 6, pump out the black water tank, and terminate the enclosed space procedures.

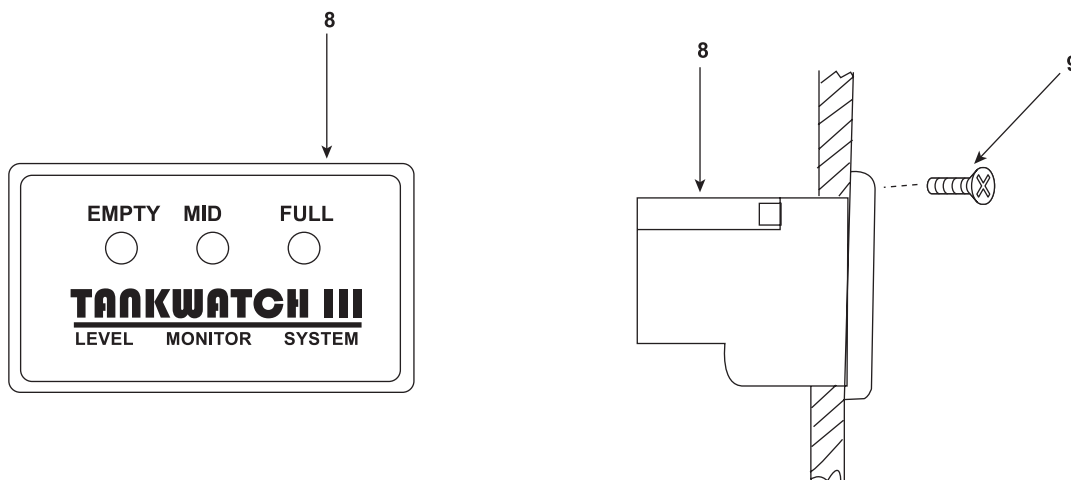
REMOVAL--DISPLAY UNIT

1. Remove the lower starboard panel from the console.



Replace or repair components only after the affected circuit has been secured, locked out and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

2. Set the multimeter to the Vdc (Volts direct current) setting. Place the positive multimeter lead on terminal #2 on the back of the display unit (8) and the negative lead on the #4 terminal on the back of the display unit. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
3. Label and remove the wiring from the back of the display unit (8).
4. Remove the four screws (9) that secure the display unit (8) to the panel.



INSTALLATION--DISPLAY UNIT

1. Position the display unit (8) in the panel and secure it with four screws (9).
2. Connect the wiring to the back of the display unit (8) using the labels from step 3 of Removal--Display Unit as a guide.
3. Install the lower starboard panel onto the console.
4. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
AIR CONDITIONING AND VENTILATION SYSTEMS PIPING, VALVES, STRAINERS,
HOSES, AND FITTINGS, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502

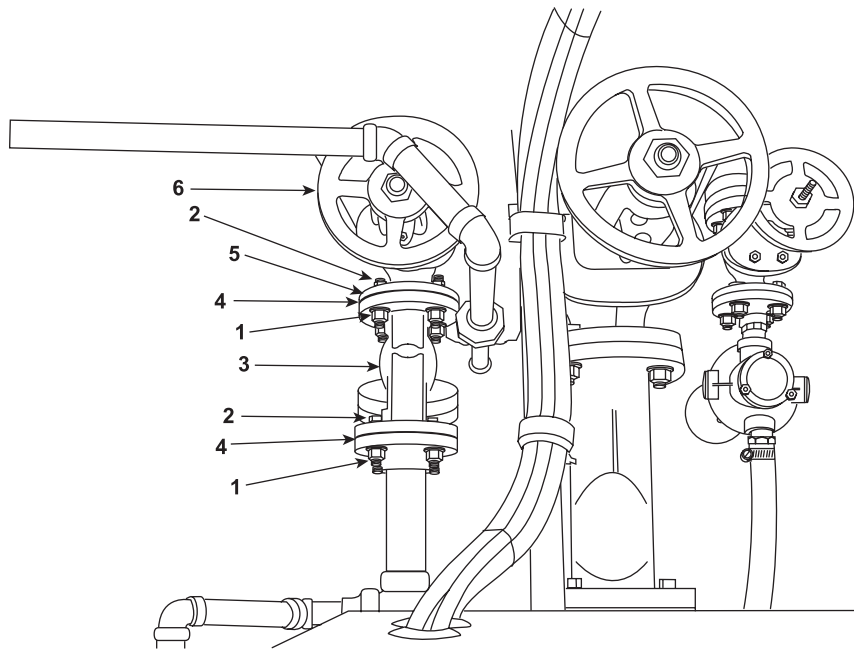
TM 55-1905-242-24P (WP 0058)

Equipment Condition:

Air conditioning seacock CLOSED, locked out,
and tagged out IAW FM 55-502
A/C PILOTHOUSE, A/C ACCOM PORT SIDE,
A/C ACCOM STBD SIDE, A/C SEA WTR
COOLING PUMP circuit breakers set to OFF,
locked out, and tagged out IAW FM 55-502

WARNING

The seacock for the affected system must be closed before beginning replacement of any raw water system piping, hoses, and/or valves. Failure to observe this warning can result in flooding of the space, damage to the vessel, and serious injury or death to personnel.



GENERAL

Only raw water piping, valves, strainers, hoses, and fittings may be replaced by unit maintenance personnel. Refrigerant valves, strainers, hoses, and fittings must be replaced by direct support maintenance personnel.

REMOVAL

1. Remove the nuts (1) and bolts (2) that secure the strainer assembly (3) in the piping.
2. Remove the strainer assembly (3) and the gaskets (4) from the piping.
3. If the strainer assembly (3) will be removed for an extended period of time, install a suitable blanking plate over the seacock flange (5) to prevent inadvertent flooding of the vessel.

INSTALLATION

1. Clean the flanges with a wire brush to ensure a good seal for the gaskets (4).
2. Procure a new strainer assembly (3) and/or gaskets (4) as required.
3. Position the strainer assembly (3) and gaskets (4) in the piping and secure with bolts (2) and nuts (1).
4. Remove the lockouts and tagouts from the seacock (6), OPEN the seacock, and check for leaks.
5. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
AIR CONDITIONING RAW WATER PUMP, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)
 Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
 TM 55-1905-242-24P (WP 0059)

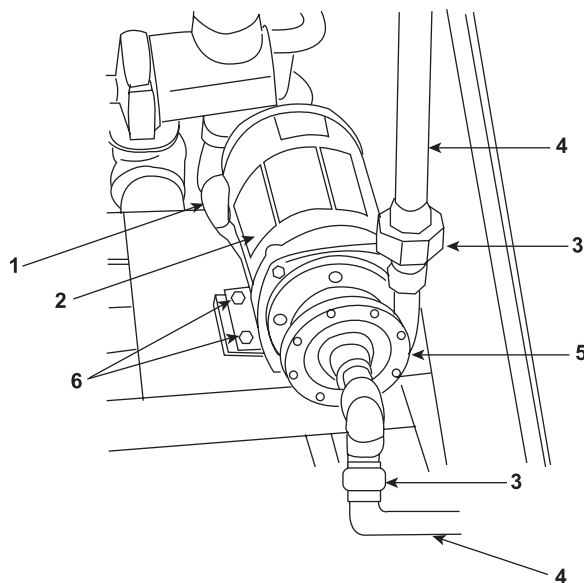
Equipment Condition:

A/C SEA WTR COOLING PUMP circuit breaker
 set to OFF, locked out, and tagged out IAW
 FM 55-502
 Air Conditioning seacock CLOSED, locked out,
 and tagged out IAW FM 55-502

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove access cover on the end of the pump motor (2) for access to the wiring terminals (1).
2. Set the multimeter to the Vac (Volts alternating current) setting. Check for voltage across each of the wiring terminals (1) at the pump motor (2). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.



REMOVAL (continued)

3. Label and disconnect the wiring from the wiring terminals (1) at the pump motor (2).
4. Loosen the two unions (3) and free the piping (4) from the pump (5).
5. Remove the bolts (6) that secure the raw water pump assembly to its mount.

INSTALLATION

1. Position the raw water pump assembly on its mount and secure it with the bolts (6).
2. Connect the piping (4) to the pump (5) with the two unions (3).
3. Connect the wiring to the wiring terminals (1) at the pump motor (2) using the labels from step 3 of Removal as a guide.
4. Replace the access cover.
5. Remove the lockouts and tagouts from the seacock, OPEN the seacock, and check for leaks at the pump (5) and the two unions (3).
6. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

**UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
VENTILATION FANS, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

References:

FM 55-502
TM 55-1905-242-24P (WP 0062)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

Ventilation circuit breaker set to OFF, locked out, and
tagged out IAW FM 55-502

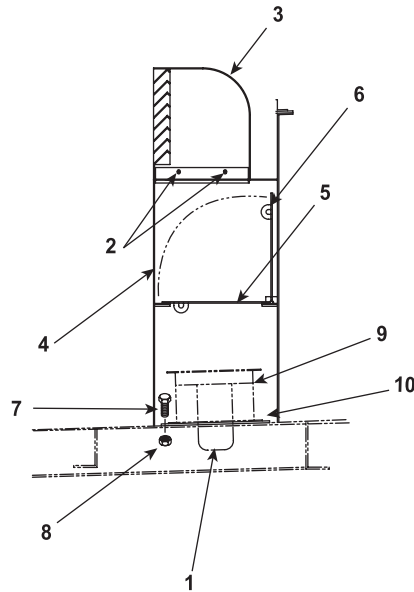
REMOVAL--ENGINE ROOM VENTILATION FAN**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

NOTE

The engine room ventilation fans are located in the engine room exhaust ventilation enclosure. The engine room exhaust ventilation enclosure is located just starboard of the engine room hatch.

1. Set to OFF the ENG RM VENT FAN NO. 1 and ENG RM VENT FAN NO. 2 circuit breakers and lock out and tag out the breakers in accordance with FM 55-502.
2. Set the multimeter to the Vdc (Volts direct current) setting. Place one multimeter lead on each terminal of the engine room ventilation fan motor (1). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
3. Label and disconnect the wiring from the engine room ventilation fan motor (1).
4. Remove the bolts (2) that secure the vent hood (3) to the vent duct (4). Remove the vent hood.
5. Ensure that the exhaust fire flap (5) is in the OPEN position (6).
6. Remove the bolts (7) and nuts (8) that secure the engine room ventilation fan (9) to its mount (10).
7. Remove the engine room ventilation fan (9) through the opening in the top of the vent duct (4).

REMOVAL--ENGINE ROOM VENTILATION FAN (continued)**INSTALLATION--ENGINE ROOM VENTILATION FAN**

1. Position the engine room ventilation fan (9) on its mount (10) by inserting it through the opening in the vent duct (4).
2. Secure the engine room ventilation fan (9) to its mount (10) with the bolts (7) and nuts (8).
3. Position the vent hood (3) on the vent duct (4) and secure it with the bolts (2).
4. Connect the wiring to the engine room ventilation motor (1), using the labels from step 3 of Removal--Engine Room Ventilation Fan as a guide.
5. Remove the lockouts and tagouts and check the operation of the system, ensuring that the fan blows air out of the engine room, not into it.

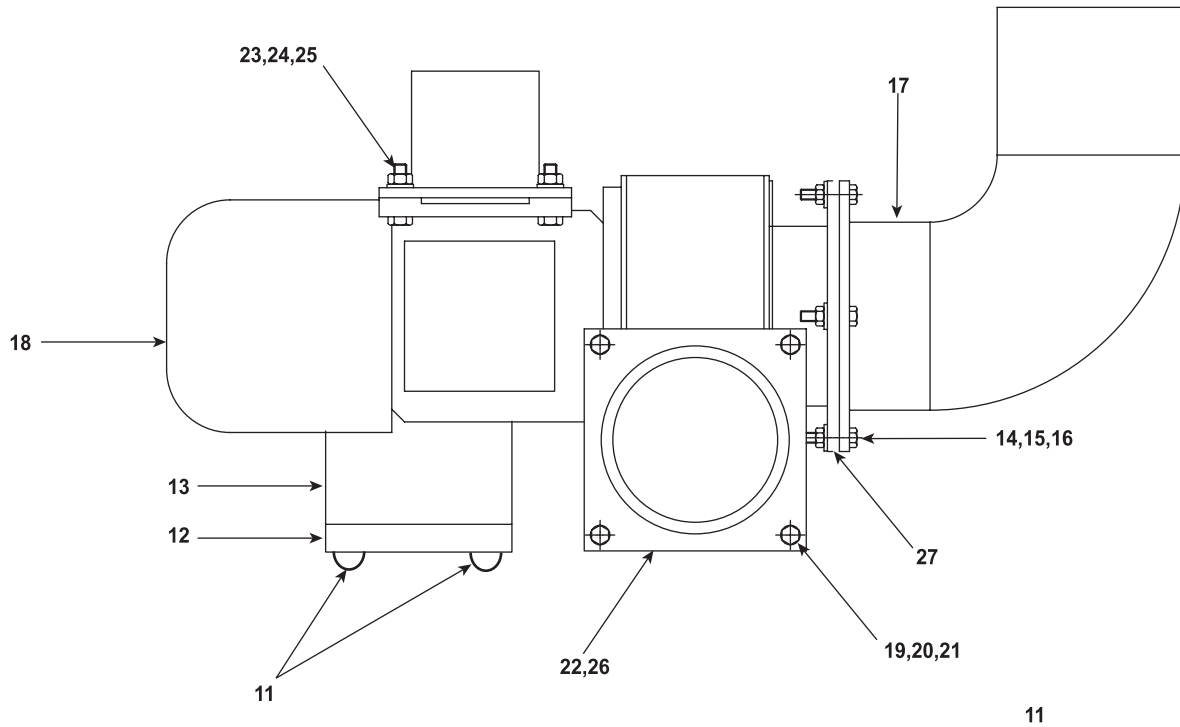
REMOVAL--BATTERY COMPARTMENT VENTILATION FAN**WARNING**

Charging and discharging batteries produce explosive hydrogen gas. Do not allow smoking, sparks, or open flame in the vicinity of the battery compartment. When the battery compartment ventilation fan is inoperative, dangerous levels of hydrogen gas can be found in the battery compartment if the batteries are charged or discharged. Ensure that the batteries are neither charged nor discharged when the battery compartment fan is inoperative. Failure to comply could result in damage to equipment and serious injury or death to personnel.



Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Set to OFF, lock out, and tag out the PORT BATTERY ISOL SWITCH and the STBD BATTERY ISOL SWITCH in accordance with FM 55-502.
2. Open the battery compartment hatch and all of the accommodation module hatches in order to allow air circulation to the battery compartment.
3. Remove the screws (11) that secure the junction box cover (12) to the junction box (13). Remove the junction box cover.
4. Set the multimeter to the Vdc (Volts direct current) setting. Place one multimeter lead on each of the terminals inside the junction box (13). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the battery isolation switches are properly secured.
5. Label and disconnect the wiring from the terminals inside the junction box (13).
6. Remove the bolts (14), nuts (15), and washers (16) that secure the inlet flange (17) to the battery compartment ventilation fan (18).
7. Remove the bolts (19), nuts (20), and washers (21) that secure the outlet flange (22) to the battery compartment ventilation fan (18).
8. Remove the bolts (23), nuts (24), and washers (25) that secure the battery compartment ventilation fan (18) to its mount and remove the battery compartment ventilation fan.



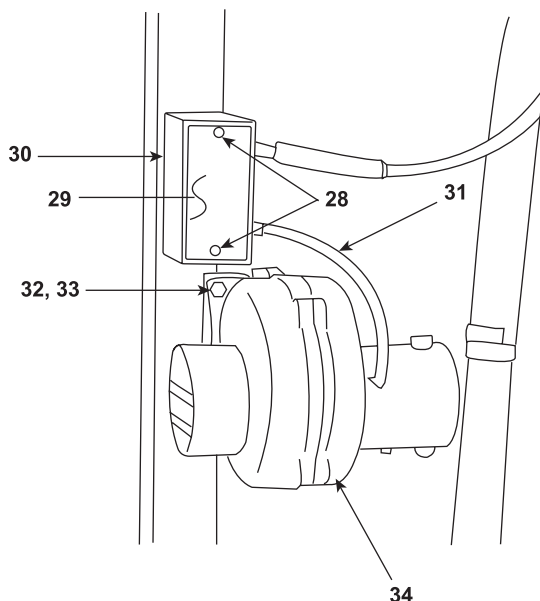
INSTALLATION--BATTERY COMPARTMENT VENTILATION FAN

1. Position the battery compartment ventilation fan (18) on its mount and secure it with the bolts (23), nuts (24), and washers (25).
2. Position the outlet flange (22) on the battery compartment ventilation fan (18) with its gasket (26) and secure it with the bolts (19), nuts (20), and washers (21).
3. Position the inlet flange (17) on the battery compartment ventilation fan (18) with its gasket (27) and secure it with the bolts (14), nuts (15), and washers (16).
4. Connect the wiring to the terminals inside the junction box (13) using the labels from step 5 of Removal--Battery Compartment Ventilation Fan as a guide.
5. Position the junction box cover (12) on the junction box (13) and secure it with the screws (11).
6. Remove the lockouts and tagouts and check the operation of the system, ensuring that the fan pulls air out of the battery compartment.
7. Close and secure the battery compartment hatch and any other hatches as required.

REMOVAL--ACCOMMODATION MODULE VENTILATION FAN**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Set to OFF, lock out, and tag out the VENT FAN NO.1 ACCOM or VENT FAN NO. 2 ACCOM circuit breaker in accordance with FM 55-502.
2. Remove the two screws (28) that secure the junction box cover (29) to the junction box (30), and remove the junction box cover.
3. Set the multimeter to the Vdc (Volts direct current) setting. Place one multimeter lead on each of the wiring connections inside the junction box (30). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
4. Label and remove the wiring (31) from the junction box (30).
5. Remove the bolts (32) and washers (33) that secure the accommodation module ventilation fan (34) to the bulkhead.

**INSTALLATION--ACCOMMODATION MODULE VENTILATION FAN**

1. Position the accommodation module ventilation fan (34) on the bulkhead and secure it with the bolts (32) and washers (33).
2. Connect the wiring (31) inside the junction box (30) using the labels from step 4 of Removal--Accommodation Module Ventilation Fan as a guide.

INSTALLATION--ACCOMMODATION MODULE VENTILATION FAN (continued)

3. Position the junction box cover (29) on the junction box (30) and secure it with the screws (28).
4. Remove the lockouts and tagouts and check the operation of the system, ensuring that the fan blows air out of the accommodation module, not into it.

REMOVAL--WATER CLOSET VENTILATION FAN

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the screws that secure the access plate to the deck inside the pilothouse. Remove the deck access plate.
2. Set to OFF, lock out, and tag out the VENT FAN W/C circuit breaker in accordance with FM 55-502.
3. Remove the two screws (28) that secure the junction box cover (29) to the junction box (30), and remove the junction box cover.
4. Set the multimeter to the Vdc (Volts direct current) setting. Place one multimeter lead on each of the wiring connections inside the junction box (30). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
5. Label and remove the wiring (31) from the junction box (30).
6. Remove the bolts (32) and washers (33) that secure the water closet ventilation fan (34) to the bulkhead.

INSTALLATION--WATER CLOSET VENTILATION FAN

1. Position the water closet ventilation fan (34) on the bulkhead and secure it with the bolts (32) and washers (33).
2. Connect the wiring (31) inside the junction box (30) using the labels from step 5 of Removal--Water Closet Ventilation Fan as a guide.
3. Position the junction box cover (29) on the junction box (30) and secure it with the two screws (28).
4. Remove the lockouts and tagouts and check the operation of the system, ensuring that the fan blows air out of the water closet, not into it.
5. Install the deck access plate and secure it with its screws.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BILGE SYSTEM PIPING, VALVES, STRAINERS, HOSES, AND FITTINGS, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L
(Trained in Confined Space Entry)
One Entry Supervisor/Attendant

Equipment Condition:

Void prepared for confined space entry with
Confined Space Entry Permit secured, IAW
Organizational Confined Space Entry SOP
and FM 55-502

Materials/Parts:

Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

References:

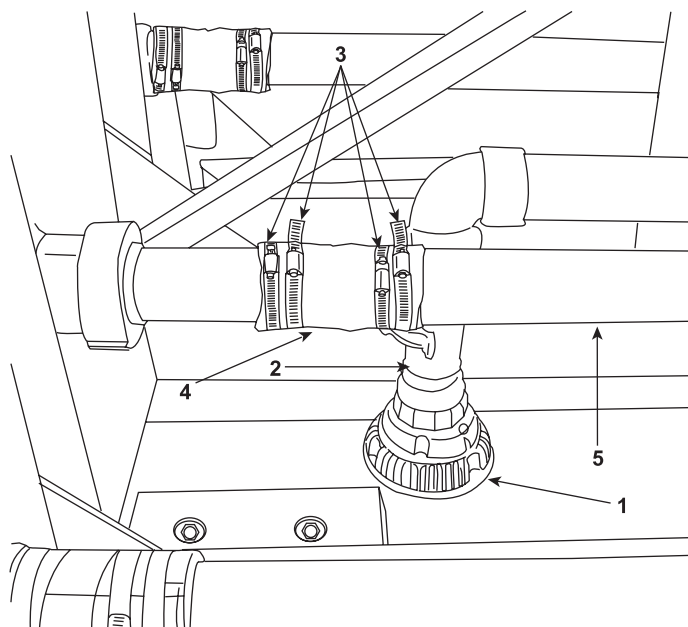
FM 55-502
Organizational Confined Space Entry SOP
TM 55-1905-242-24P (WP 0063)

REMOVAL--BILGE STRAINER

WARNING

Only properly trained personnel may enter confined spaces, or act as entry supervisors and/or attendants for those working in confined spaces. Before entering into a confined space, the space must be cleared for entry and a Confined Space Entry Permit must be secured. All entry into confined spaces must be in accordance with the Organizational Confined Space Entry Standard Operating Procedure and FM 55-502. Entry into an uninspected confined space may result in serious injury or death.

1. Remove the void cover from the desired void and prepare it for confined space entry in accordance with the Organizational Confined Space Entry SOP and FM 55-502.
2. Unscrew the strainer (1) from the piping (2).



INSTALLATION--BILGE STRAINER

1. Wrap the threads on the piping (2) with antiseizing sealant tape.
2. Screw the strainer (1) onto the piping (2).
3. Install the void cover and terminate the confined space entry procedure.

REMOVAL--PIPING

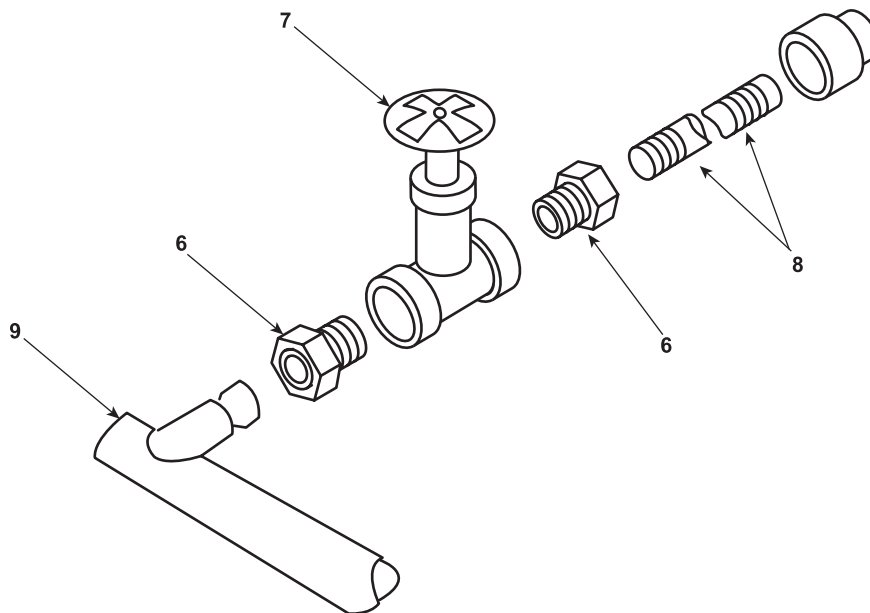
1. Remove the void cover from the desired void and prepare it for confined space entry in accordance with the Organizational Confined Space Entry SOP and FM 55-502.
2. Loosen the hose clamps (3) that secure the hose (4) to the piping (5).
3. Slide the hose (4) off the piping (5). Remove the piping as required.

INSTALLATION--PIPING

1. Position the piping (5) in the void and place the hose (4) over the piping.
2. Secure the hose (4) to the piping (5) with the hose clamps (3).
3. Install the void cover and terminate the confined space entry procedure.

REMOVAL--VALVES

1. Loosen the union halves (6) that secure the valve (7) to the piping (8) and the bilge manifold (9).
2. Remove the valve (7) from the piping (8) and bilge manifold (9).
3. Remove the union halves (6) from the valve (7).



INSTALLATION--VALVES

1. Wrap the pipe threads on the union halves (6) with antiseizing sealant tape. Do not wrap the mating surface of the union halves with antiseizing sealant tape.
2. Thread the union halves (6) into the valve (7).
3. Position the valve (7) in place and secure it with the union halves (6).

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
OILY WATER COLLECTION SYSTEM PIPING, VALVES, STRAINERS,
HOSES, AND FITTINGS, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

Equipment Condition:

OILY WTR BILGE PUMP circuit breaker set to
OFF, locked out, and tagged out IAW FM
55-502

All oily water collection system valves CLOSED

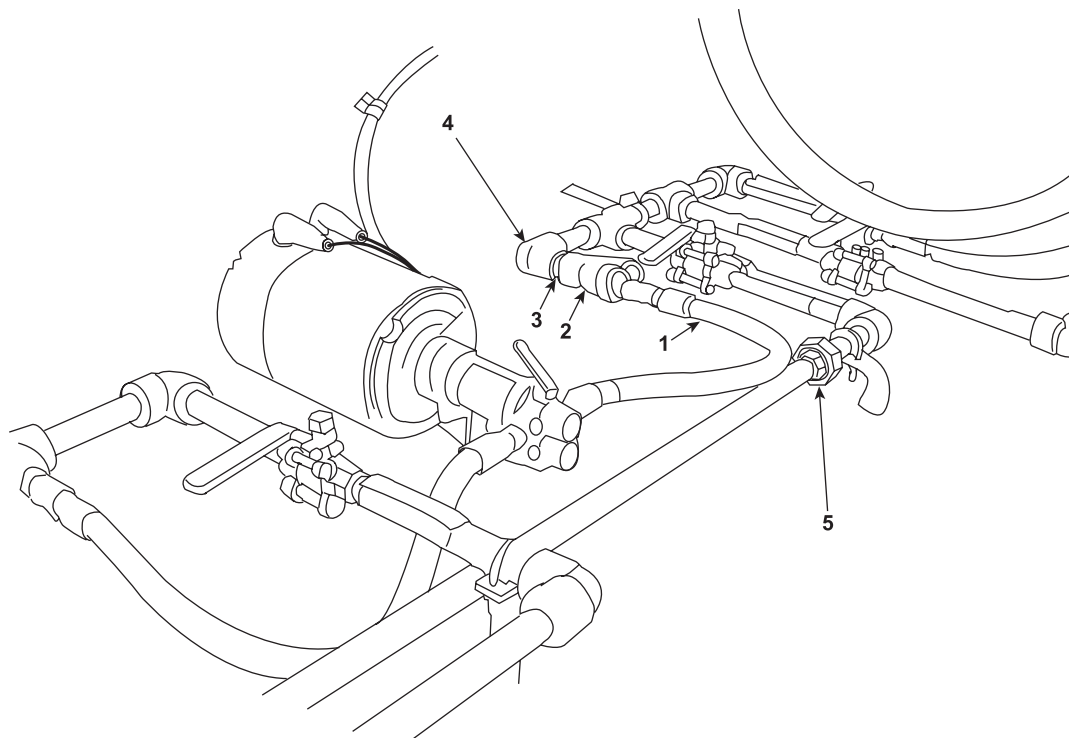
References:

FM 55-502

TM 55-1905-242-24P (WP 0065)

REMOVAL--STRAINER

1. Disconnect the hose (1) from the strainer (2).
2. Unscrew the strainer (2) from the nipple (3) and elbow (4).
3. If the nipple (3) came off with the strainer (2), remove the nipple from the strainer.



INSTALLATION--STRAINER

1. Clean all pipe threads with a wire brush.
2. Wrap all male pipe threads with antiseizing sealant tape.
3. If the nipple (3) was removed, thread the nipple into the strainer (2).
4. Thread the strainer (2) onto the elbow (4) and tighten it snugly.
5. Connect the hose (1) to the strainer (2).
6. If no further components will be replaced, clear the lockouts and tagouts and return the valves to their operational positions.

REMOVAL--PIPING, FITTINGS, HOSES, VALVES

1. Disconnect the appropriate hose (1) or union (5) as necessary to remove the piping section that contains the piping, hose, valve and/or fitting to be replaced.
2. Disassemble the piping section as required to gain access to the piping, hose, valve, and/or fitting to be replaced.

INSTALLATION--PIPING, FITTINGS, HOSES, VALVES

1. Clean all pipe threads with a wire brush.
2. Wrap all male pipe threads with antiseizing sealant tape.
3. Assemble the piping section with new piping, hoses, valves, and/or fittings to its original configuration.
4. Connect the piping section back into the vessel by attaching the unions and/or hoses that were disconnected in step 1 Removal--Piping, Fittings, Hoses, Valves in this work package.
5. Remove the lockouts and tagouts and return the valves to their operational configuration.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
WASTE OIL PUMP, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0067)

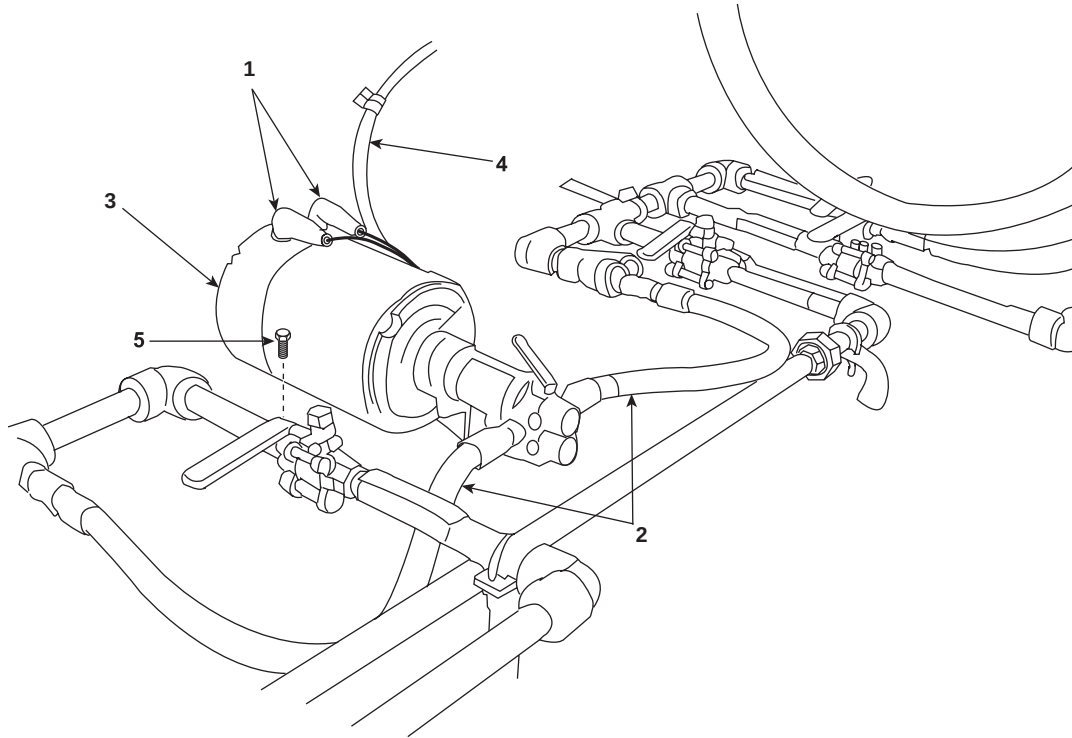
Equipment Condition:

OILY WTR BILGE PUMP circuit breaker set to
OFF, locked out, and tagged out
IAW FM 55-502
All oily water collection system valves CLOSED

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Set the multimeter to the Vdc (Volts direct current) setting. Place one multimeter lead on each of the two motor terminals (1). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
2. Disconnect the hoses (2) from the waste oil pump (3).
3. Label and disconnect the wiring (4) from the two motor terminals (1).



4. Remove the bolts (5) that secure the waste oil pump (3) to its mount.

INSTALLATION

1. Position the waste oil pump (3) on its mount and secure it with the bolts (5).
2. Connect the wiring (4) to the two motor terminals (1) on the waste oil pump (3) using the labels from step 3 of Removal as a guide.
3. Connect the hoses (2) to the waste oil pump (3).
4. Remove the lockouts and tagouts and check the operation of the system, ensuring that the waste oil pump draws properly and that there are no leaks.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
HAND PUMP, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts:

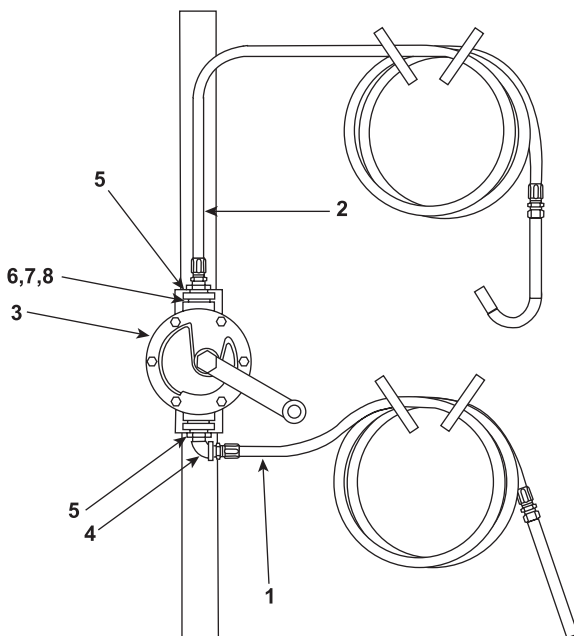
Sealant (Tape, Antiseizing) (Item 14, Table 2,
WP 0230 00)

References:

TM 55-1905-242-24P (WP 0068)

REMOVAL

1. Remove the suction hose (1) and the discharge hose (2) from the hand pump (3).
2. Remove the elbow (4), and reducing fittings (5) from the hand pump (3).
3. Remove the bolts (6), nuts (7), and washers (8) that secure the hand pump (3) to the bulkhead and remove the hand pump.

**INSTALLATION**

1. Position the hand pump (3) on the bulkhead and secure it with the bolts (6), nuts (7), and washers (8).
2. Clean all the pipe threads with a wire brush and wrap the male pipe threads with antiseizing sealant tape.
3. Thread the elbow (4) and reducing fittings (5) into the hand pump (3) and tighten them snugly.
4. Attach the suction hose (1) and the discharge hose (2) to the hand pump (3) and tighten them snugly.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
FIREFIGHTING AND BALLAST SYSTEM PIPING, VALVES, STRAINERS, HOSES, AND FITTINGS,
REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
 WP 0026 00
 TM 55-1905-242-24P (WP 0069)

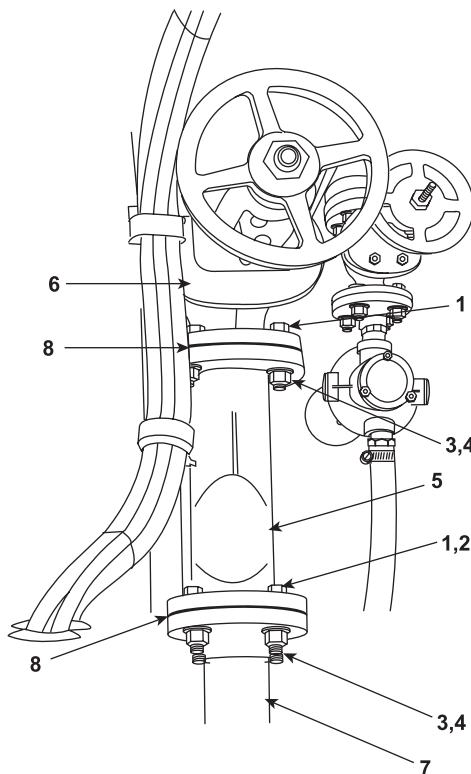
Equipment Condition:

Diesel generator secured, locked out, and
 tagged out IAW FM 55-502
 Fire pump seacock CLOSED, locked out, and
 tagged out IAW FM 55-502

REMOVAL--STRAINER**NOTE**

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

1. Remove the bolts (1), flat washers (2), lockwashers (3), and nuts (4) that secure the strainer (5) to the seacock (6) and to the piping (7).
2. Remove the strainer (5) and gaskets (8).
3. If the strainer will be removed for an extended period of time, install an appropriate blanking plate over the seacock flange to prevent inadvertent flooding of the vessel.

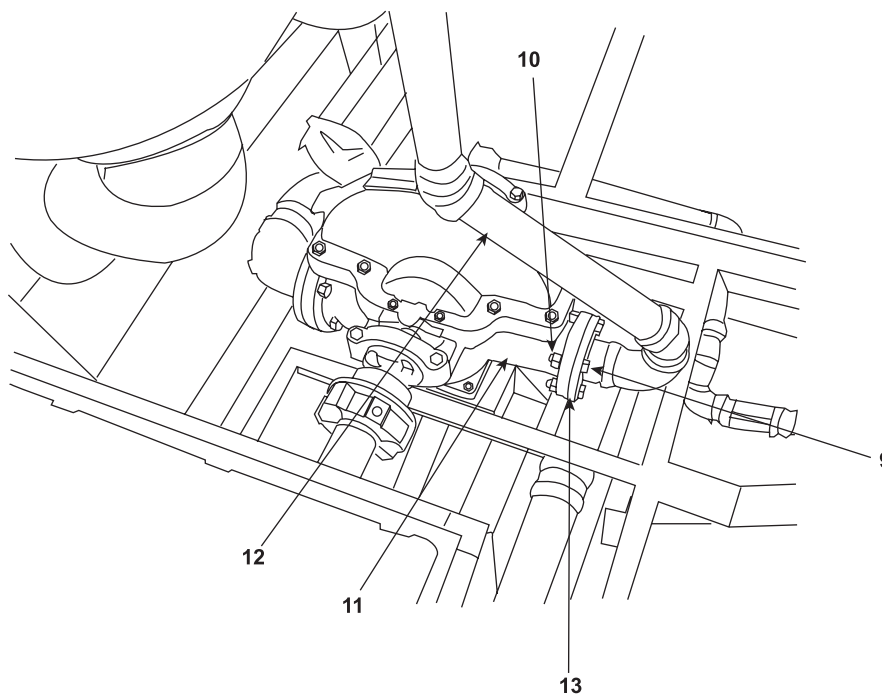


INSTALLATION--STRAINER

1. Position the strainer (5) between the seacock (6) and the piping (7) with its gaskets (8) and secure it with the nuts (4), lockwashers (3), flat washers (2), and bolts (1).
2. If no other components will be removed, clear the lockouts and tagouts, OPEN the seacock, and check for leaks.

REMOVAL--PIPING, VALVES, FITTINGS

1. Remove the bolts (9) and nuts (10) that secure the flange to the pump (11).
2. Remove the bolts and nuts from the flange at the other end of the piping section (12).
3. Remove the piping section (12).

**INSTALLATION--PIPING, VALVES, FITTINGS**

1. Position the piping section (12) with its gaskets (13) and secure it with the bolts (9) and nuts (10).
2. Remove the lockouts and tagouts and OPEN the seacock.
3. Operate the fire monitor (WP 0026 00) and check the work area for leaks.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BALLAST/FIRE PUMP, ALIGN

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Dial Indicator (Item 5, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

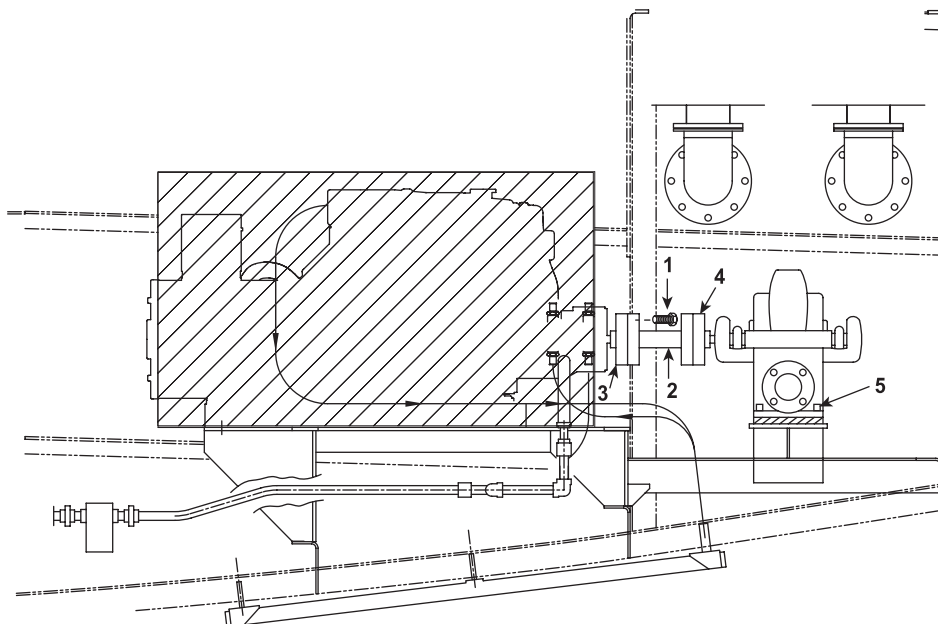
FM 55-502
TM 55-1905-242-24P (WP 0070)

Equipment Condition:

Diesel generator secured, locked out, and tagged
out IAW FM 55-502

ALIGN

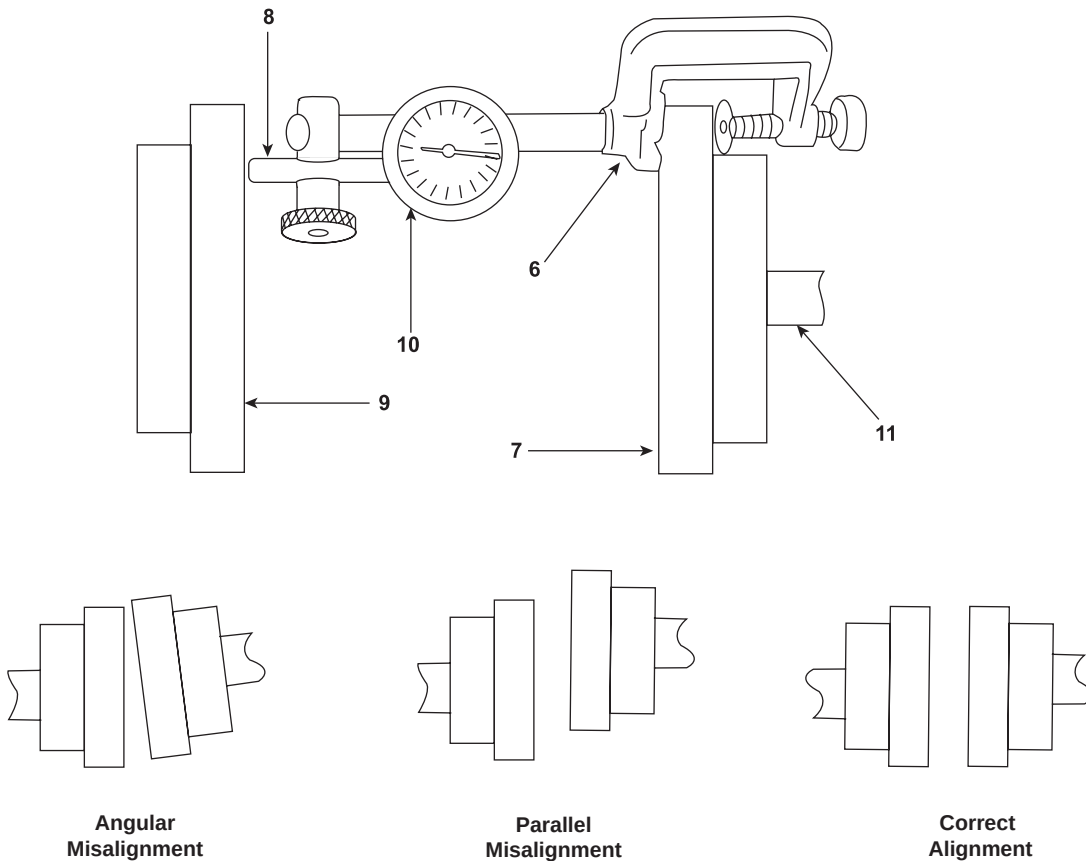
1. Remove the shaft guard from above the fire pump drive shaft.
2. Remove the six bolts (1) that secure the pump drive shaft (2) to the engine flange (3) and to the pump flange (4).
3. Remove the pump drive shaft (2).
4. Clean the mating faces of the engine flange (3) and the pump flange (4) with a wire brush, ensuring that both surfaces are clean, smooth, and free of corrosion.
5. Check that the pump mounting bolts (5) are tight.



ALIGN (continued)**NOTE**

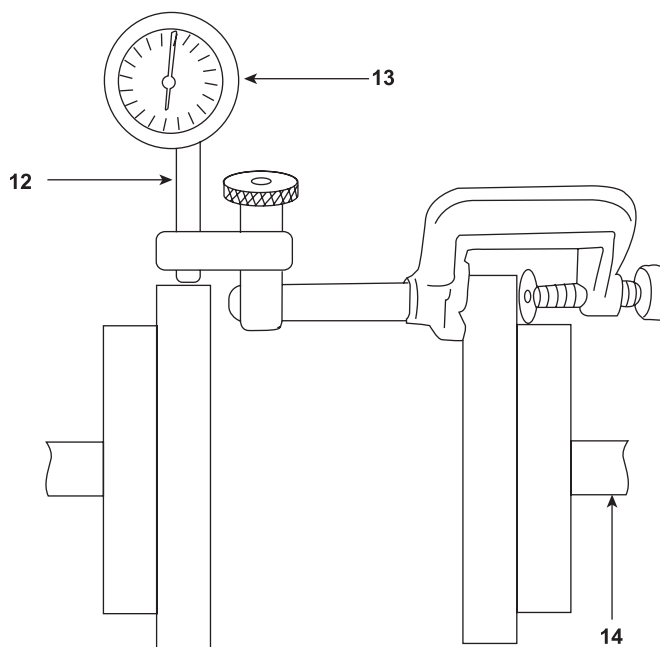
The dial indicator fixing stand must be fastened to the pump flange in order to obtain an accurate reading. Fastening the fixing stand to the engine flange will result in inaccurate readings.

6. Fasten the dial indicator fixing stand (6) to the pump flange (7) as shown below to check the angular alignment.
7. Position the dial indicator (8) against the engine flange (9) as shown. The dial indicator should have a 0.200 inch to 0.300 inch preload when installed against the engine flange.
8. Zero the dial indicator (8) by twisting its bezel (10).
9. Slowly rotate the pump shaft (11) while noting the dial indicator (8) reading. Note how far the dial indicator needle moves to either side of zero. Add the readings on both sides of zero to determine the amount of angular misalignment. For example, if the dial indicator needle moves 0.002 inch to one side of zero and 0.004 inch to the other side of zero, add the two readings ($0.002 \text{ in} + 0.004 \text{ in} = 0.006 \text{ in}$) to determine that the angular misalignment is 0.006 inch.
10. Maximum angular misalignment is 0.150 inch (3.80 mm). If the angular misalignment exceeds this specification, the misalignment must be corrected. Angular misalignment is corrected by loosening the pump mounting bolts and repositioning (rotating) the pump on its mounting. After adjusting the alignment, tighten the pump mounting bolts and recheck the alignment.



ALIGN (continued)

11. Reposition the dial indicator (12) as shown to check the parallel alignment. The dial indicator should have a 0.200 inch to 0.300 inch preload when installed against the engine flange.
12. Zero the dial indicator (12) by twisting its bezel (13).
13. Slowly rotate the pump shaft (14) while noting the dial indicator (12) reading. Note how far the dial indicator needle moves to either side of zero. Add the readings on both sides of zero to determine the amount of parallel misalignment. For example, if the dial indicator needle moves 0.002 inch to one side of zero and 0.004 inch to the other side of zero, add the two readings (0.002 in + 0.004 in = 0.006 in) to determine that the parallel misalignment is 0.006 inch.



14. Maximum parallel misalignment is 0.150 inch (3.80 mm). If the parallel misalignment exceeds this specification, the misalignment must be corrected. Parallel misalignment is corrected by loosening the pump mounting bolts, fabricating shims from shim stock, and placing the shims between the pump mounting pads and the pump mounts. After adjusting the alignment, tighten the pump mounting bolts and recheck the alignment.
15. It is frequently necessary to adjust both the angular and the parallel alignment several times before the correct alignment is obtained. Once the proper angular and parallel alignment measurements are obtained, retighten the mounting bolts one last time and recheck the measurement.
16. Once the final alignment has been obtained and rechecked, install the pump drive shaft (2) and secure it in place with the six bolts (1).
17. Install the fire pump drive shaft guard.
18. Remove the lockouts and tagouts and check the operation of the fire pump, watching for any unusual noise or vibration.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
FIRE PUMP ELECTRIC CLUTCH, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)
 Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
 TM 55-1905-242-24P (WP 0071)

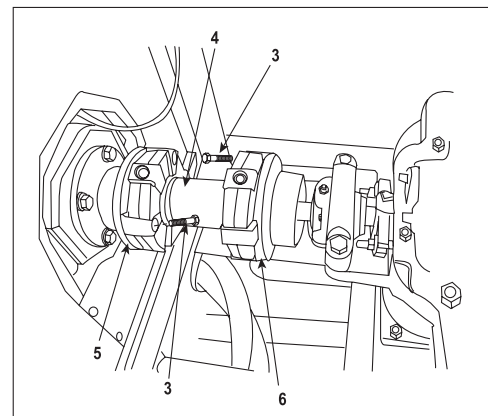
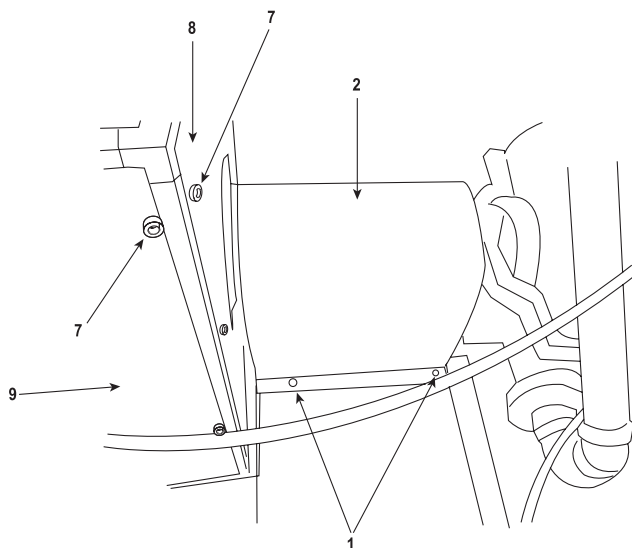
Equipment Condition:

Diesel generator secured, locked out, and tagged out IAW FM 55-502
 FIRE PUMP CLUTCH circuit breaker set to OFF, locked out, and tagged out IAW FM 55-502

REMOVAL**WARNING**

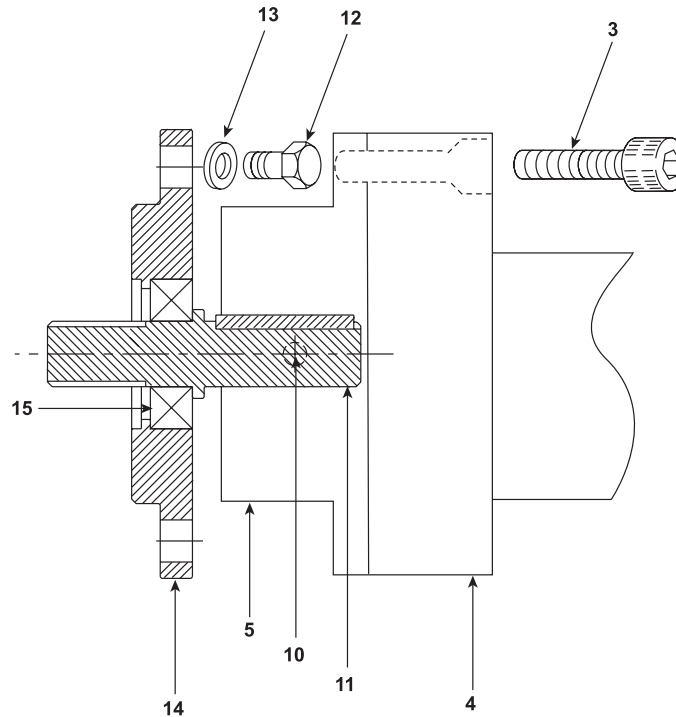
Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the bolts (1) that secure the pump drive shaft guard (2) to the deck plates. Remove the pump drive shaft guard.



REMOVAL (continued)

2. Remove the bolts (3) that secure the pump drive shaft (4) to the engine flange (5) and to the pump flange (6). Remove the pump drive shaft.
3. Remove the screws (7) that secure the aft and aft inboard sound insulation panels (8 and 9). Remove the insulation panels.
4. Remove the three set screws (10) that secure the engine flange (5) to the intermediate shaft (11) and remove the engine flange.
5. Remove the bolts (12) and washers (13) that secure the bearing housing (14) to the front of the engine and remove the bearing housing, bearing (15), and intermediate shaft (11) as an assembly.

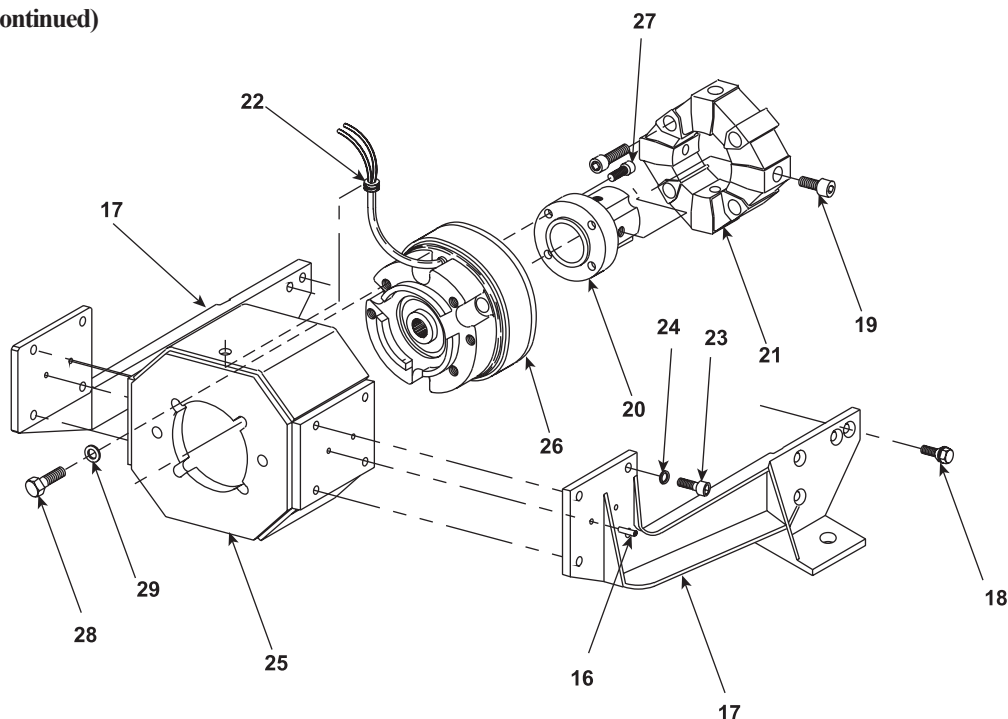


6. Use pliers to remove the dowel pins (16) from the PTO support brackets (17).
7. Loosen, but do not remove, the PTO support bracket bolts (18) that secure the PTO support brackets (17) to the engine block.
8. Remove the bolts (19) that secure the drive hub (20) in the drive coupling (21).
9. Set the multimeter to the Vdc (Volts direct current) setting. Open the fire pump electric clutch junction box and connect one multimeter lead to each of the clutch's wires (22). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

10. Remove the clutch housing bolts (23) and lockwashers (24) that secure the clutch housing (25) to the PTO support brackets (17) and slide the clutch housing and clutch assembly (26) out as a unit.
11. Remove the bolts (27) that secure the drive hub (20) to the clutch assembly (26). Remove the drive hub from the clutch assembly.

REMOVAL (continued)

12. Remove the bolts (28) and washers (29) that secure the clutch assembly (26) to the clutch housing (25). Remove the clutch assembly from the clutch housing.

INSTALLATION

1. Position the clutch assembly (26) in the clutch housing (25) and secure it with the bolts (28) and washers (29).
2. Position the drive hub (20) in the clutch assembly (26) and secure it with the bolts (27).
3. Position the clutch housing (25) between the PTO support brackets (17) and loosely install the clutch housing bolts (23) and lockwashers (24). The clutch housing should still be free to move at this point.
4. Line up the holes for the dowel pins (16) and install the dowel pins. Leave enough dowel pin protruding from the PTO support brackets (17) to allow later removal. Tighten the clutch housing bolts (23) only after installing all of the dowel pins.
5. Install and tighten the bolts (19) that secure the drive hub (20) in the drive coupling (21).
6. Tighten the PTO support bracket bolts (18).
7. Position the bearing housing (14)/bearing (15)/intermediate shaft (11) assembly to the clutch housing (25) and secure it with the bolts (12) and washers (13).
8. Position the engine flange (5) on the intermediate shaft (11) and secure it with the three set screws (10).
9. Install the sound insulation panels (8 and 9) and secure them with the screws (7).
10. Install the pump drive shaft (4) between the engine flange (5) and the pump flange (6) and secure it with the bolts (3).
11. Position the pump drive shaft guard (2) on the deck plates and secure it with the bolts (1).
12. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
FIRE MONITOR, REPLACE/REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)

Equipment Condition:

Diesel generator, secured, locked out, and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)

Materials/Parts (continued):

Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)

Rag, Wiping (Item 5, Table 2, WP 0230 00)

Petrolatum (Item 7, Table 2, WP 0230 00)

Sealing Compound, Loctite 242 (Item 16, Table 2, WP 0230 00)

Grease (Item 21, Table 2, WP 0230 00)

O-Ring (p/n 7-57-035, qty 3)

O-Ring (p/n 7-57-080, qty 1)

Gasket, Flange (p/n A-A-1719, 3", qty 1)

References:

FM 55-502

TM 55-1905-242-24P (WP 0072)

REMOVAL**WARNING**

Use two crewmembers to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

1. Attach a safety line to the fire monitor to prevent loss overboard.
2. Remove the bolts (1) that secure the fire monitor flange base (2) to its mount.
3. Using two crewmembers, remove the fire monitor assembly from its mount.

DISASSEMBLY**NOTE**

The upper and lower friction screws are not interchangeable. Tag these screws during Disassembly to ensure that they are installed in the proper locations during Assembly.

1. Remove the set screw (3) that retains the upper friction screw (4) and remove the upper friction screw. Tag the upper friction screw to ensure that it is installed in the proper location during Assembly.
2. Remove the swivel plugs (5) from the outlet elbow (6).

DISASSEMBLY (continued)**NOTE**

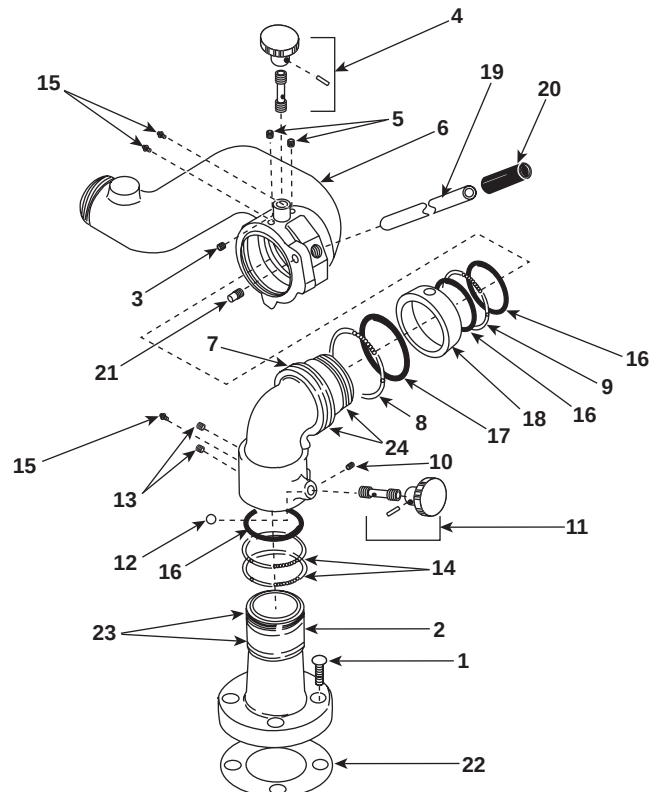
The joint between the outlet elbow and the elbow is supported by ball bearings. These ball bearings are easily lost during Disassembly. In order to prevent the loss of ball bearings, place several wiping rags under the joint during Disassembly.

3. Position several wiping rags under the joint between the outlet elbow (6) and the elbow (7). Turn the outlet elbow to permit the outer (8) and inner (9) ball bearings to fall from the swivel plug (5) holes. It may be necessary to insert a length of flexible wire into the swivel plug holes to coax the ball bearings out.
4. Count and record the number of outer (8) and inner (9) ball bearings that were removed from the joint. There are normally 56 outer ball bearings and 45 inner ball bearings, but this number can vary.
5. Use a twisting, pulling motion to separate the outlet elbow (6) from the elbow (7). If the components do not come apart easily, repeat step 3 to ensure that all of the outer (8) and inner (9) ball bearings have been removed from the joint.

NOTE

The upper and lower friction screws are not interchangeable. Tag these screws during Disassembly to ensure that they are installed in the proper locations during Assembly.

6. Remove the set screw (10) that retains the lower friction screw (11) and brake ball (12) and remove the friction screw. Tag the lower friction screw to ensure that it is installed in the proper location during Assembly.
7. Remove the swivel plugs (13) from the elbow (7).



DISASSEMBLY (continued)**NOTE**

The joint between the elbow and the flange base is supported by ball bearings. These ball bearings will fall out and are easily lost during Disassembly. In order to prevent the loss of ball bearings, place several wiping rags under the joint during Disassembly.

8. Position several wiping rags under the joint between the elbow (7) and the fire monitor flange base (2). Turn the fire monitor flange base and elbow to permit the ball bearings (14) to fall from the swivel plug (13) holes. It may be necessary to insert a length of flexible wire into the swivel plug holes to coax the ball bearings out.
9. Count and record the number of ball bearings (14) that were removed from the joint. There are normally 45 ball bearings in each of the two rows (total of 90), but this number can vary.
10. Use a twisting, pulling motion to separate the elbow (7) from the fire monitor flange base (2). If the components do not come apart easily, repeat step 8 to ensure that all of the ball bearings (14) have been removed from the joint.
11. Remove the zerk fittings (15), O-rings (16 and 17), and brake band (18).
12. Remove the handle (19), grip (20), and stop stud (21) only if they will be replaced or if the outlet elbow (6) will be replaced.
13. Remove the gasket (22). Retain the gasket for use as a pattern in step 1 of Installation.

CLEANING**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.
2. Clean the ball bearings (8, 9, and 14), the zerk fittings (15), the outlet elbow (6), the elbow (7), the fire monitor flange base (2), and any other grease contaminated parts with cleaning solvent.
3. Wipe all cleaned parts dry with clean wiping rags.
4. Inspect all parts for cracking, wear, or other damage.

ASSEMBLY

1. Procure the replacement parts necessary for repair of the fire monitor assembly.
2. If removed, install the handle (19), grip (20), and stop stud (21) into the outlet elbow (6).
3. Apply a light coat of petrolatum to one of the three the new O-rings (16) and insert it into its groove in the lower end of the elbow (7).
4. Assemble the elbow (7) to the fire monitor flange base (2) using a gentle twisting motion.
5. Install the ball bearings (14) into their grooves (23) through the swivel plug (13) holes. Ensure that the same number of ball bearings are installed as were removed during Disassembly.
6. Install the swivel plugs (13) into the elbow (7).
7. Install the brake ball (12) and the lower friction screw (11) (tagged in step 6 of Disassembly) into the elbow (7). Tighten the lower friction screw lightly.
8. Apply one to two drops of sealant compound, Loctite 242, onto the threads of the set screw (10) and install the set screw into the elbow (7). Thread the set screw in until it contacts the lower friction screw (11) and then back it out one quarter turn. Ensure that the lower friction screw moves easily after installing the set screw. Also ensure that the lower friction screw cannot be backed out of the elbow past the set screw.
9. Turn the elbow (7) one full turn in each direction and ensure that it moves freely throughout its range of motion. Check the operation of the brake at several points and ensure that the elbow is held in place when the lower friction screw (11) is tightened.
10. Install the brake band (18) onto the elbow (7).
11. Apply a light coat of petrolatum onto the other two new O-rings (16 and 17) and install them into their grooves.
12. Assemble the outlet elbow (6) to the elbow (7) using a gentle twisting motion.
13. Install the ball bearings (8 and 9) into their grooves (24) through the swivel plug (5) holes. Ensure that the same number of ball bearings are installed as were removed during Disassembly.
14. Install the swivel plugs (5) into the outlet elbow (6).
15. Install the upper friction screw (4) (tagged in step 1 of Disassembly) into the outlet elbow (6). Tighten the upper friction screw lightly.
16. Apply one to two drops of sealant compound, Loctite 242, onto the threads of the set screw (3) and install the set screw into the outlet elbow (6). Thread the set screw in until it contacts the upper friction screw (4) and then back it out one quarter turn. Ensure that the upper friction screw moves easily after installing the set screw (13). Also ensure that the upper friction screw (14) cannot be backed out of the outlet elbow past the set screw.
17. Turn the outlet elbow (6) through its full range of motion and ensure that it moves freely. Check the operation of the brake at several points and ensure that the outlet elbow is held in place when the upper friction screw (4) is tightened.
18. Dispose of used cleaning solvent and contaminated materials in accordance with local regulations.

INSTALLATION

1. Use gasket material to fashion a new gasket (22). Use the old gasket as a pattern.
2. Position the new gasket (22) on the fire monitor flange base (2).

INSTALLATION (continued)

3. Attach a safety line to the fire monitor to prevent loss overboard.

WARNING

Use two crewmembers to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

4. Using two crewmembers, position the fire monitor assembly on its mount and secure it with the bolts (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
FIREFIGHTING SYSTEM NOZZLE, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Wrench, Spanner (Item 32, Table 1,
WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L

References:

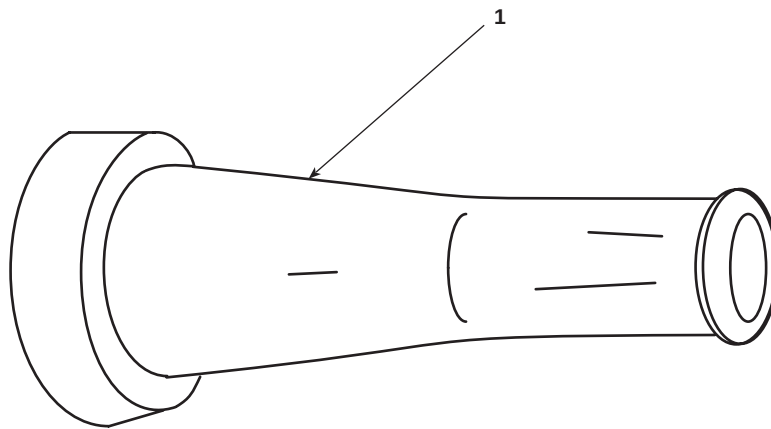
FM 55-502
TM 55-1905-242-24P (WP 0073)

Equipment Condition:

Diesel generator secured, locked out and tagged
out IAW FM 55-502

REMOVAL

Unscrew the nozzle (1) from the fire monitor and remove the nozzle.

**INSTALLATION**

1. Screw the nozzle (1) onto the fire monitor and tighten it securely.
2. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING HYDRAULIC SYSTEM VALVES, PIPING, HOSES, AND FITTINGS, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

References:

FM 55-502
TM 55-1905-242-24P (WP 0076)

REMOVAL**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

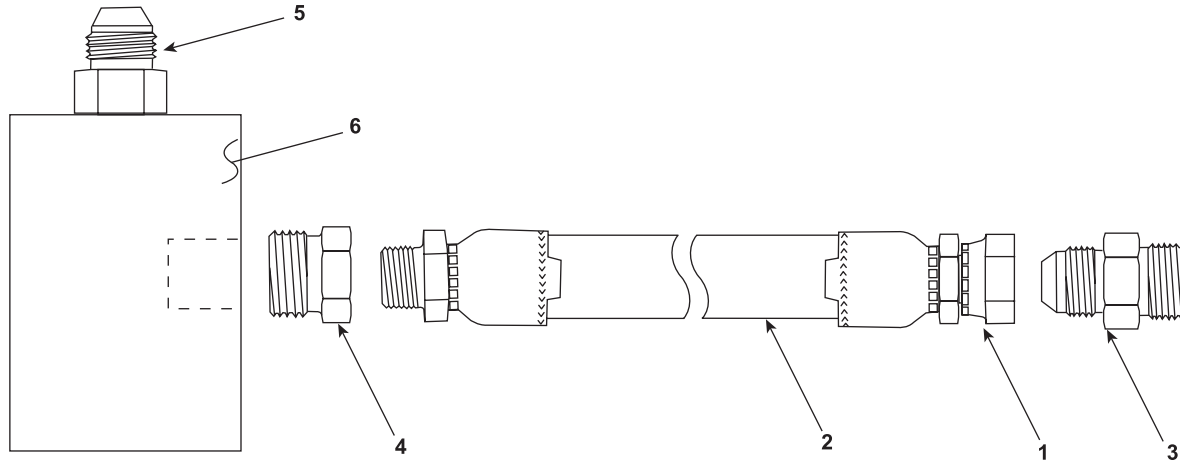
Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious injury or death.

1. Don chemical protective gloves and goggles.
2. Position a suitable drain pan beneath the work area.
3. Cautiously loosen the swivel fitting (1) on the hose (2) in order to release any residual hydraulic pressure on the system.
4. Remove one end of the hose (2) from the fitting (3) by unscrewing the swivel fitting (1).

REMOVAL (continued)

5. Unscrew the other end of the hose (2) from its fitting (4).
6. Remove the fittings (3, 4, 5) or valve (6) as required for replacement.

**CLEANING**

1. If not already on, don chemical protective gloves and goggles.
2. Use cleaning solvent to clean all parts that will be reused. Dry the parts with clean wiping rags.

INSTALLATION

⚠ CAUTION

The threaded ends of flared hydraulic fittings are not to be installed with the use of antiseizing sealant tape or any other non-hydraulic sealant. Damage to hydraulic equipment may occur.

1. Procure new hose (2), valve (6), or fittings (3, 4, 5) as required.
2. Wrap only the pipe threads of hydraulic fittings with antiseizing sealant tape prior to assembly. Do not use antiseizing sealant tape or any other non-hydraulic sealant on the threads of flared hydraulic fittings.
3. Reassemble the hose (2), valve (6), and/or fittings (3, 4, 5) in the reverse order of disassembly.
4. Remove the lockouts and tagouts and check the operation of the system, ensuring that the steering system performs normally and that no leakage is noted.
5. Replenish the steering system hydraulic reservoir as required.
6. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING SYSTEM COUNTERBALANCE VALVE, ADJUST

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)

Personnel Required:

Three Watercraft Engineers, 88L

Equipment Condition:

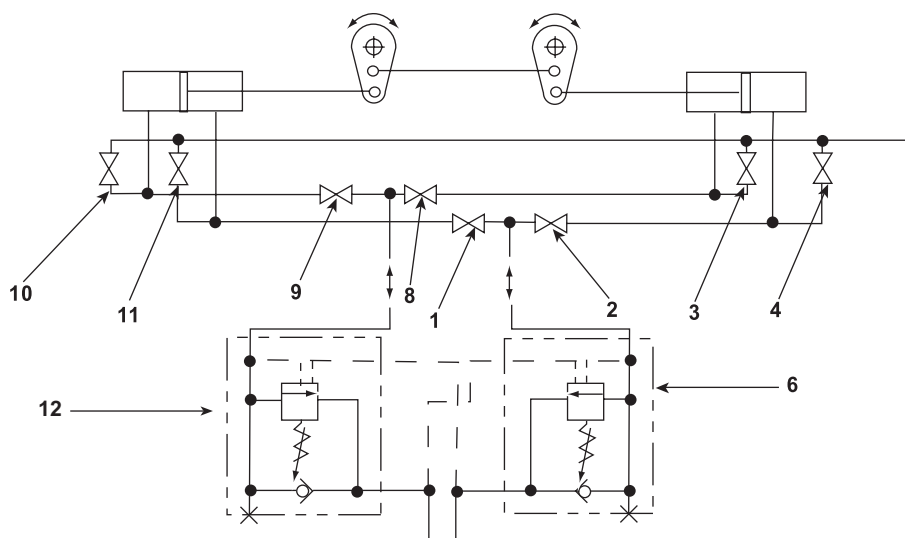
Propulsion engines running at idle

References:

TM 55-1905-242-24P (WP 0083)

ADJUST

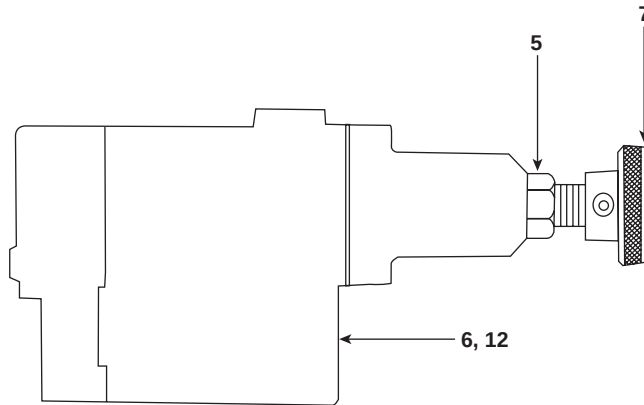
1. Position one crewmember in the pilothouse to observe the pilothouse steering system hydraulic pressure gauge readings. This crewmember should establish and maintain contact with the crewmember in the lazarette.
2. Isolate the port steering cylinder by closing the port isolation valves (1 and 2).



3. Check that the normally closed bypass valves (3 and 4) for the port steering cylinder are CLOSED.
4. Turn the helm wheel in the pilothouse slowly in one direction while observing the steering system hydraulic pressure gauge. Slowly turn the wheel throughout the adjustment procedure.
5. Notify the crewmember in the lazarette of the pressure reading.
6. Loosen the locknut (5) on the port counterbalance valve (6) adjusting screw (7).
7. If the pressure reading is 1000 lb/in² (68.9 bar), turn OUT the adjusting screw (7) until the pressure drops below 1000 lb/in² (68.9 bar).
8. Slowly turn the adjusting screw (7) IN until the pressure reads 1000 lb/in² (68.9 bar).
9. When 1000 lb/in² (68.9 bar) has been reached, tighten the locknut (5) snugly while holding the adjusting screw (7) stationary.

ADJUST (continued)

10. After tightening the locknut (5), check the pressure again. If the pressure is still 1000 lb/in² (68.9 bar), proceed to the next step. If the pressure is not 1000 lb/in² (68.9 bar), repeat steps 6-9, taking care not to move the adjusting screw (7) while tightening the locknut.



11. OPEN the port isolation valves (1 and 2) and leave the port bypass valves (3 and 4) CLOSED.

NOTE

Whenever one counterbalance valve is adjusted, the other must be adjusted. Proper counterbalance valve adjustment can only be obtained by adjusting both valves.

12. Isolate the starboard steering cylinder by closing the starboard isolation valves (8 and 9).
13. Check that the normally closed bypass valves (10 and 11) for the starboard steering cylinder are CLOSED.
14. Turn the helm wheel in the pilothouse slowly in one direction while observing the steering system hydraulic pressure gauge. Slowly turn the wheel throughout the adjustment procedure.
15. Notify the crewmember in the lazarette of the pressure reading.
16. Loosen the locknut (5) on the starboard counterbalance valve (12) adjusting screw (7).
17. If the pressure reading is 1000 lb/in² (68.9 bar), turn OUT the adjusting screw (7) until the pressure drops below 1000 lb/in² (68.9 bar).
18. Slowly turn the adjusting screw (7) IN until the pressure reads 1000 lb/in² (68.9 bar).
19. When 1000 lb/in² (68.9 bar) has been reached, tighten the locknut (5) snugly while holding the adjusting screw (7) stationary.
20. After tightening the locknut (5), check the pressure again. If the pressure is still 1000 lb/in² (68.9 bar), proceed to the next step. If the pressure is not 1000 lb/in² (68.9 bar), repeat steps 16-19, taking care not to move the adjusting screw (7) while tightening the locknut.
21. OPEN the starboard isolation valves (8 and 9) and leave the port bypass valves (10 and 11) CLOSED.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING SYSTEM CHECK VALVE, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

References:

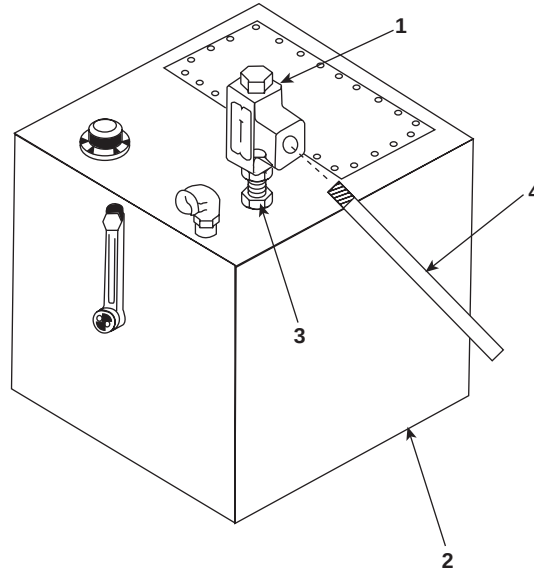
FM 55-502
TM 55-1905-242-24P (WP 0084)

REMOVAL**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.
2. Position a suitable drain pan beneath the steering hydraulic reservoir.
3. Disconnect the check valve (1) from the reservoir (2) by disconnecting the union (3).
4. Unscrew the check valve (1) from the piping (4).
5. Unscrew the union (3) from the check valve (1).



CLEANING

1. If not already on, don chemical protective gloves and goggles.
2. Clean the threads on the piping (4) and the union (3) with a wire brush.
3. Clean oily parts with cleaning solvent and wipe dry with clean wiping rags.

INSTALLATION

1. Wrap only the male pipe threads on the piping (4) and on the union (3) with antiseizing sealant tape. Do not apply antiseizing sealant tape to the mating surfaces or mating threads on the union.
2. Thread the union (3) into the check valve (1) and tighten it securely.
3. Thread the check valve (1) onto the piping (4) and tighten it securely, ensuring that the union (3) is oriented for connection.
4. Connect the check valve (1) to the reservoir (2) by connecting the union (3).
5. Remove the lockouts and tagouts and check the operation of the system, ensuring that the steering system operates normally and that no leakage is noted.
6. Replenish the steering reservoir as necessary.
7. Dispose of used hydraulic oil, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RUDDER AND TILLER, SERVICE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
 Grease Gun, Hand, 16 oz. (Item 6, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Grease (Item 21, Table 2, WP 0230 00)

Equipment Condition:

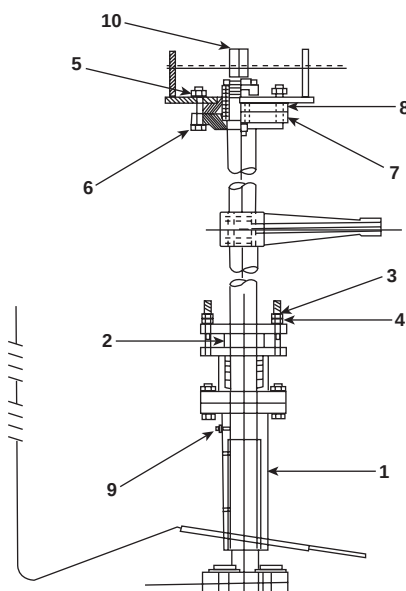
Propulsion engines secured, locked out, and tagged out IAW FM 55-502

References:

FM 55-502
 TM 55-1905-242-24P (WP 0086)

SERVICE

1. Visually check the welds at the base of the rudder port (1) for breaks, cracks, or leaks. Notify general support maintenance if any breaks, cracks, or leaks are found.
2. Check for leakage at the stuffing box (2). If leakage is noted, adjust the stuffing box:
 - a. Loosen the locknuts (3) while holding the adjusting nuts (4) stationary.
 - b. Tighten the adjusting nuts (4) evenly, one half turn at a time, until the leakage is stopped.
 - c. If the leakage cannot be stopped, notify general support maintenance for repair.
 - d. After adjusting the stuffing box (2), hold the adjusting nuts (4) stationary while tightening the locknuts (3).



SERVICE (continued)

3. Check the nuts (5) and bolts (6) that connect the lower (7) and upper (8) thrust flanges for looseness. Tighten the nuts and bolts as necessary.
4. Use the grease gun to lubricate the rudder stock at the grease fitting (9).
5. Check to make sure that the emergency tiller fits securely over the top of the rudder stock (10).
6. Remove the lockouts and tagouts, and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RUDDER ANGLE TRANSMITTER, INSPECT/ADJUST

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

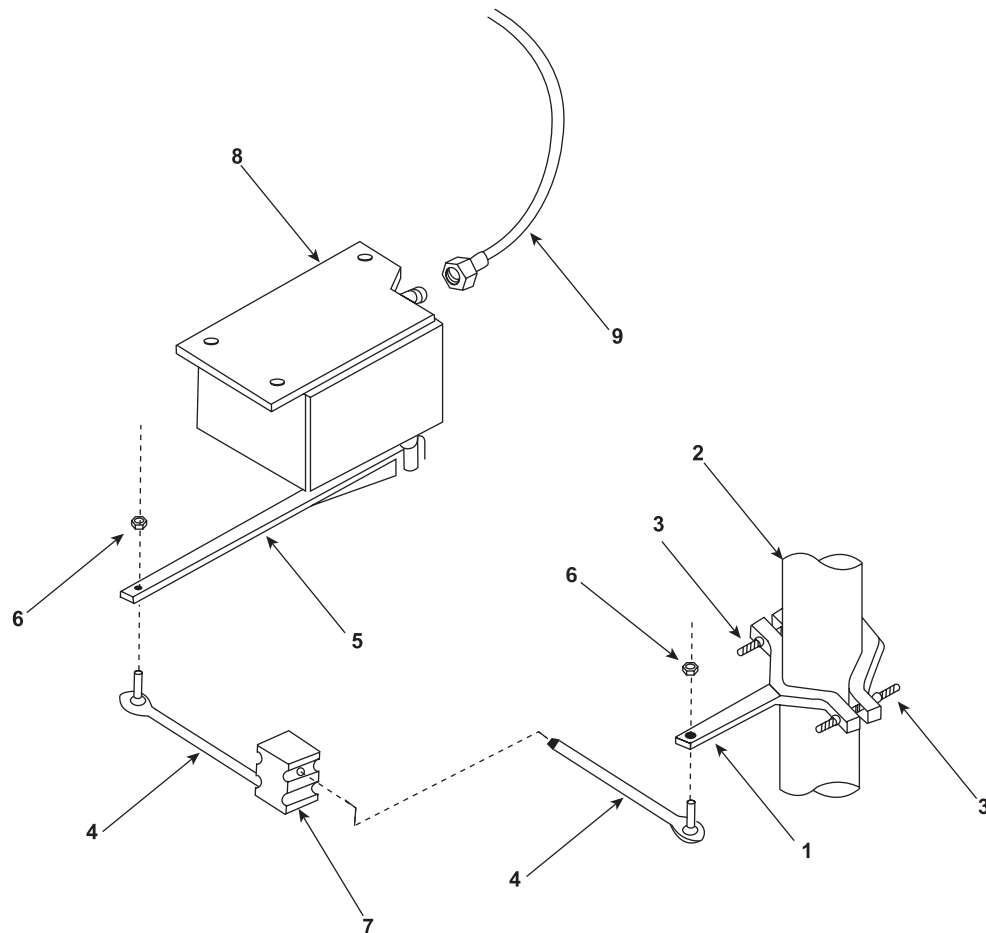
RUDDER ANGLE & TANK GAUGES circuit
breaker set to ON

References:

TM 55-1905-242-24P (WP 0087)

INSPECT

1. Check that the rudder clamp (1) is securely fastened to the rudder stock (2). Tighten the clamping bolts (3) as necessary.
2. Check that the followup linkage (4) is securely fastened to the rudder clamp (1) and to the followup arm (5). Tighten the nuts (6) and swivel block (7) as necessary.
3. Check that the followup unit (8) is securely fastened to its mount. Tighten the mounting bolts as necessary.
4. Visually inspect the wiring (9) and its connection to the followup unit (8) for corrosion, breaks, or other signs of damage. If damage is found, notify direct support maintenance.



ADJUST

1. Position the rudder amidships using the emergency tiller.
2. Position one crewmember in the pilothouse to observe the rudder angle indicator.
3. Loosen the clamping bolts (3) enough to permit the rudder clamp (1) to rotate on the rudder stock (2).
4. Rotate the rudder clamp (1) until the rudder angle indicator reads AMIDSHIPS.
5. Tighten the clamping bolts (3) and check that the rudder angle indicator still reads AMIDSHIPS.
6. Use the emergency tiller to move the rudder from hard starboard to hard port and ensure that the rudder angle indicator moves accordingly.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
HYDRAULIC RAMP SYSTEM VALVES, PIPING, HOSES, AND FITTINGS, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502

Personnel Required:

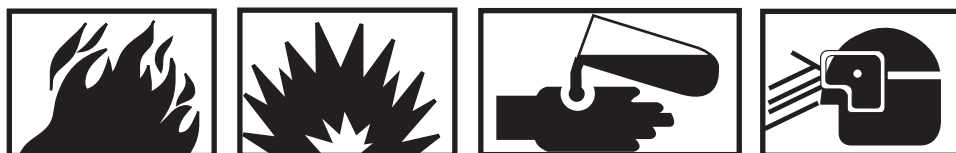
Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

References:

FM 55-502
TM 55-1905-242-24P (WP 0088)

REMOVAL**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

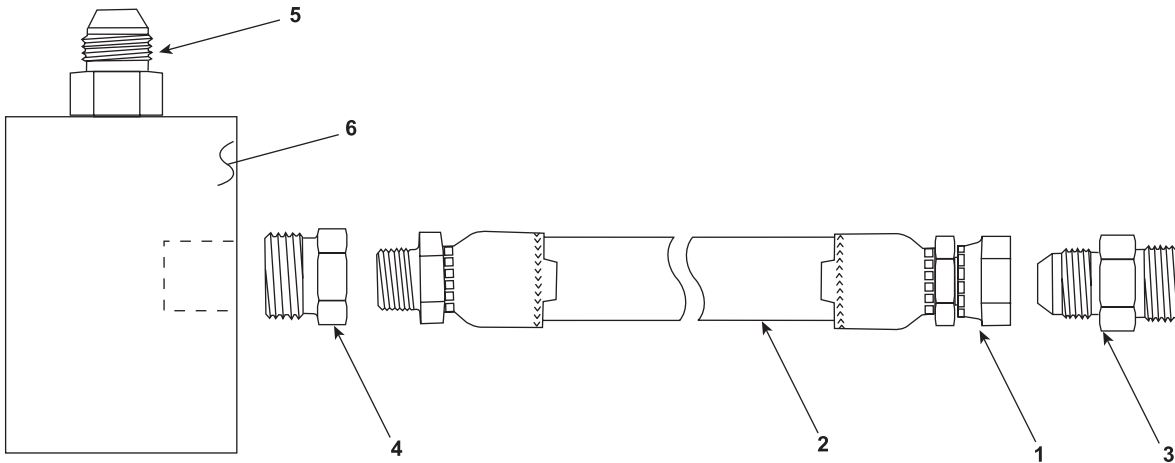
Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious injury or death.

1. Don chemical protective gloves and goggles.
2. Position a suitable drain pan beneath the work area.
3. Cautiously loosen the swivel fitting (1) on the hose (2) in order to release any residual hydraulic pressure on the system.
4. Remove one end of the hose (2) from the fitting (3) by unscrewing the swivel fitting (1).

REMOVAL (continued)

5. Unscrew the other end of the hose (2) from its fitting (4).
6. Remove the fittings (3, 4, 5) or valve (6) as required for replacement.

**CLEANING**

1. If not already on, don chemical protective gloves and goggles.
2. Use cleaning solvent to clean all parts that will be reused. Dry the parts with clean wiping rags.

INSTALLATION

⚠ CAUTION

The threaded ends of flared hydraulic fittings are not to be installed with the use of antiseizing sealant tape or any other non-hydraulic sealant. Damage to hydraulic equipment may occur.

1. Procure new hose (2), valve (6), or fittings (3, 4, 5) as required.
2. Wrap only the pipe threads of hydraulic fittings with antiseizing sealant tape prior to assembly. Do not use antiseizing sealant tape or any other non-hydraulic sealant on the threads of flared hydraulic fittings.
3. Reassemble the hose (2), valve (6), and/or fittings (3, 4, 5) in the reverse order of disassembly.
4. Remove the lockouts and tagouts and check the operation of the system, ensuring that the hydraulic ramp performs normally and that no leakage is noted.
5. Replenish the ramp system hydraulic reservoir as required.
6. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ELECTRIC TOILET, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Equipment Condition:

W/C PUMP circuit breaker set to OFF, locked
out, and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Washer, Lock (p/n NO. 10, qty 4)
Sealing Sleeve (p/n 37036-1000, qty 1)
Gasket (p/n 12558-0000, qty 1)
Seal and Retainer (p/n 1040-0000, qty 1)
Slinger (p/n 6342-0000, qty 1)
O-Ring (p/n 43990-0066, qty 1)
Gasket (p/n 37017-0000, qty 1)

References:

FM 55-502
TM 55-1905-242-24P (WP 0098)
WP 0156 00

DISASSEMBLY--PUMP AND MACERATOR ASSEMBLY**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

1. Set the multimeter to the Vdc (Volts direct current) setting and check for available voltage at the flushing switch as described in (WP 0156 00). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
2. Unplug the pump motor (1).
3. Disconnect the inlet hose from the inlet fitting (2).
4. Disconnect the hose (3) from the discharge side of the displacement pump (4).

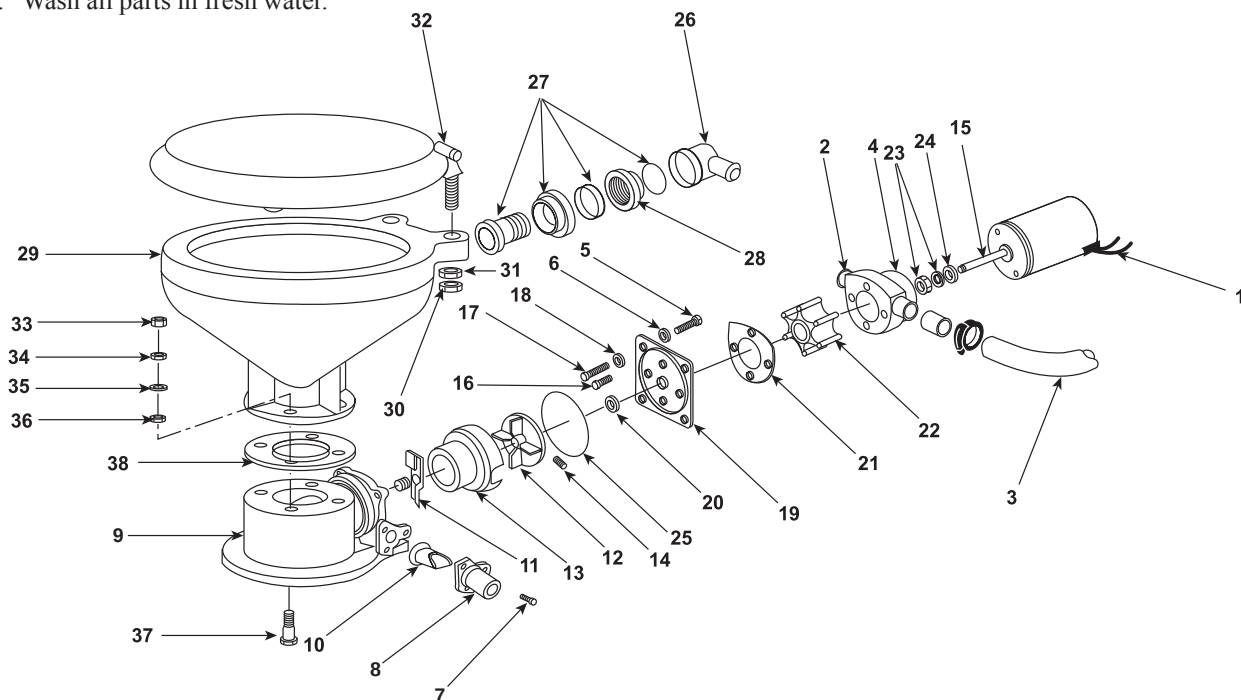
NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

5. Remove the four bolts (5) and the four lockwashers (6) at the base of the head. Remove the pump motor (1), displacement pump (4), and macerator assembly as a unit.
6. Remove the three screws (7) that secure the discharge port (8) to the base (9) and remove the discharge port (8) and the joker valve (10).

DISASSEMBLY--PUMP AND MACERATOR ASSEMBLY (continued)

7. Unscrew the chopper plate (11). Prevent the shaft from turning by placing a screwdriver by the copper blade and locking the impeller (12) blade.
8. Remove the macerator housing (13).
9. Loosen the impeller set screw (14) and slide the impeller (12) off the pump motor shaft (15).
10. Remove the two wearplate screws (16), the two top and bottom screws (17), and the two plastic sealing washers (18) that secure the plastic wearplate (19).
11. Remove the plastic wearplate (19) with the rubber sealing sleeve (20) and gasket (21).
12. Slide the displacement pump (4), impeller (22), seal and retainer (23), and slinger (24) off the pump motor shaft (15).
13. Inspect all parts for wear or damage.
14. Wash all parts in fresh water.

**ASSEMBLY--PUMP AND MACERATOR ASSEMBLY**

1. Procure the parts necessary for assembly as determined during inspection of the old parts.
2. Press the seal and retainer (23) into the displacement pump (4) with the lip facing the impeller. Ensure that the seal is seated squarely in the bore.
3. Install the slinger (24) and displacement pump (4) over the pump motor shaft (15).
4. Lubricate the impeller (22) and impeller bore with fresh water and install the impeller (22) into the displacement pump (4).
5. Position the gasket (21) against the displacement pump (4) and install the plastic wearplate (19) ensuring that the two plastic sealing washers (18) are installed under the top and bottom screws (17). Install the remaining two wearplate screws (16).
6. Slide the rubber sealing sleeve (20) onto the pump motor shaft (15) and push it into its recess in the plastic wearplate (19).

ASSEMBLY--PUMP AND MACERATOR ASSEMBLY (continued)

7. Position the impeller (12) on the pump motor shaft (15), leaving a 1/8 inch (3 mm) gap between the impeller and the wearplate (19). Secure the impeller with the impeller set screw (14).
8. Place the macerator housing (13) over the pump motor shaft (15) and impeller (12).
9. Screw the chopper plate (11) onto the pump motor shaft (15) and tighten.
10. Install the O-ring (25) in its groove on the plastic wearplate (19).
11. Line up the slot in the base (9) with the key on the macerator housing (13) and slide the pump assembly into the base (9).
12. Secure the pump assembly to the base (9) with the four bolts (5) and the four lockwashers (6).
13. Plug in the pump motor (1).
14. Remove the lockouts and tagouts and check that the pump spins freely.
15. Attach the discharge port (8) and joker valve (10) to the base (9) using the three screws (7).
16. Connect the hose (3) to the discharge side of the displacement pump (4).
17. Connect the inlet hose to the inlet fitting (2).

DISASSEMBLY--BOWL ASSEMBLY

1. Disconnect the hose from the inlet elbow (26).
2. Pull the inlet elbow (26) free from the bowl spud (27) using a twisting motion.
3. Unscrew the bowl spud retaining nut (28) and remove the bowl spud (27) from the bowl (29).
4. Remove the nuts (30) and lockwashers (31) that secure the seat and cover (32) to the bowl (29).
5. Remove the caps (33), nuts (34), stainless washers (35), plastic washers (36), and bolts (37) that attach the bowl (29) to the base (9).
6. Inspect all of the parts for wear or damage.

ASSEMBLY--BOWL ASSEMBLY

1. Procure new parts as necessary determined by the inspection done during disassembly.
2. Install a new gasket (38) on the base (9) and secure the bowl (29) to the base with the bolts (37), plastic washers (36), stainless washers (35), nuts (34), and caps (33).
3. Assemble the bowl spud (27) to the bowl (29) and secure it with the retaining nut (28).
4. Install the inlet elbow (26) and new O-ring (25) over the bowl spud (27) using a twisting motion.
5. Connect the hose to the inlet elbow (26).
6. Remove the lockouts and tagouts and check the operation of the system, watching for any signs of leakage.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
WATER CLOSET FLUSHING SYSTEM, REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
 Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

Equipment Condition:

W/C circuit breaker set to OFF, locked out, and tagged out IAW FM 55-502

References:

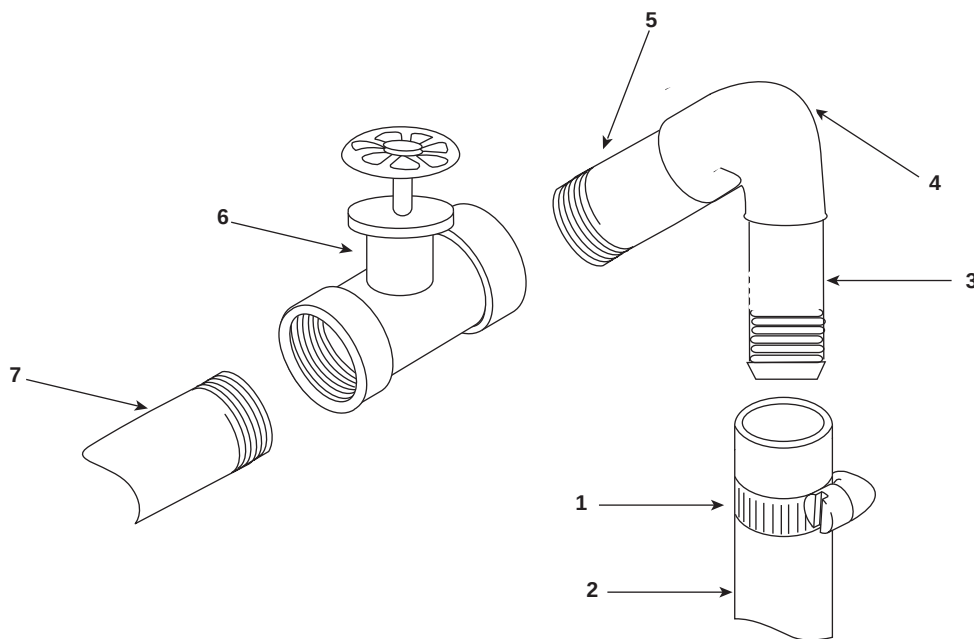
FM 55-502
 TM 55-1905-242-24P (WP 0099)

REPAIR

Repair of the water closet flushing system is accomplished by the replacement of its component parts.

REMOVAL--FLUSHING VALVE

1. Loosen the hose clamp (1) on the intake hose (2). Remove the intake hose from the hose fitting (3).
2. Unscrew the hose fitting (3), elbow (4), and nipple (5) from the flushing valve (6). The hose fitting, elbow, and nipple may be removed as an assembly if only the flushing valve will be replaced.
3. Unscrew the flushing valve (6) from the flushing inlet pipe (7).



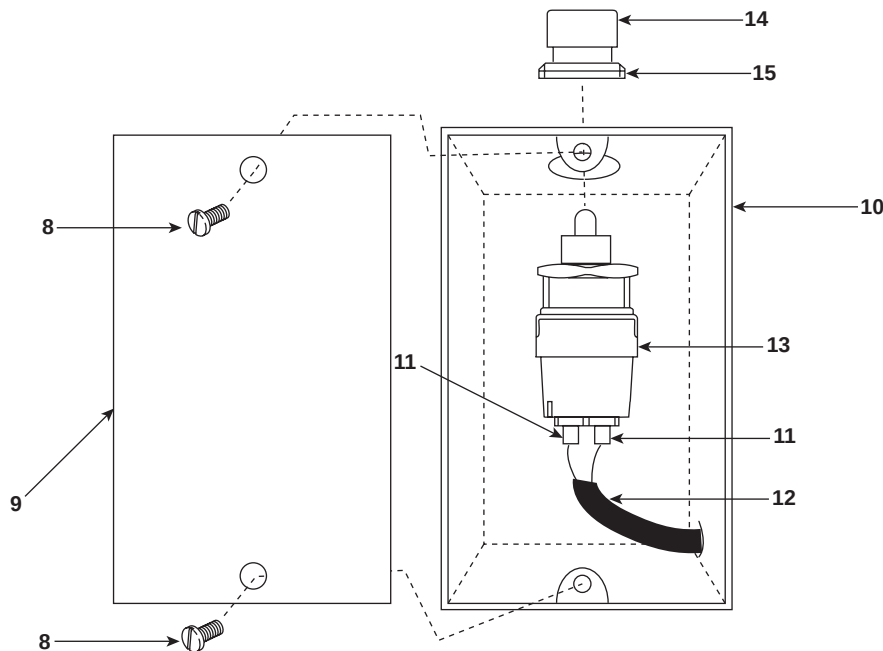
INSTALLATION--FLUSHING VALVE

1. Clean the pipe threads with a wire brush and wrap the male pipe threads with antiseizing sealant tape.
2. Thread the flushing valve (6) onto the flushing inlet pipe (7). The flushing valve handle should be on top when the final tightening is completed.
3. Thread the nipple (5), elbow (4), and hose fitting (3) assembly into the flushing valve (6). The hose fitting should be pointing toward the intake hose (2) when the final tightening is completed.
4. Slide the intake hose (2) over the hose fitting (3) and secure it with the hose clamp (1).
5. If no further repairs will be accomplished, remove the lockouts and tagouts and check the operation of the system, ensuring that no leaks are present.

REMOVAL--FLUSHING SWITCH**WARNING**

Repair flushing system only after its power source has been secured, locked out, and tagged out. Performing repairs with the system energized may result in damaged equipment and serious injury or death to personnel.

1. Remove the screws (8) that secure the cover plate (9) to the junction box (10).
2. Set the multimeter to the Vdc (Volts direct current) setting and attach one lead to each of the flushing switch terminals (11). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.



REMOVAL--FLUSHING SWITCH (continued)

3. Label the wiring (12) and disconnect it from the flushing switch (13). Go through the bottom of the junction box (10) for easier access to the flushing switch terminals.
4. Remove the protective cap (14) from the flushing switch (13).
5. Remove the bushing nut (15) that secures the flushing switch (13) to the junction box (10) and remove the flushing switch.

INSTALLATION--FLUSHING SWITCH

1. Position the flushing switch (13) in the junction box (10) and secure it with the bushing nut (15).
2. Secure the protective cap (14) onto the flushing switch (13).
3. Connect the wiring (12) to the flushing switch (13) using the labels from step 3 of Removal--Flushing Switch as a guide.
4. Position the cover plate (9) onto the junction box (10) and secure it with the screws (8).
5. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
CRANE ASSEMBLY HYDRAULIC VALVES, PIPING, HOSES, AND FITTINGS, REPLACE

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

References:

FM 55-502
TM 55-1905-242-24P (WP 0100)

REMOVAL**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

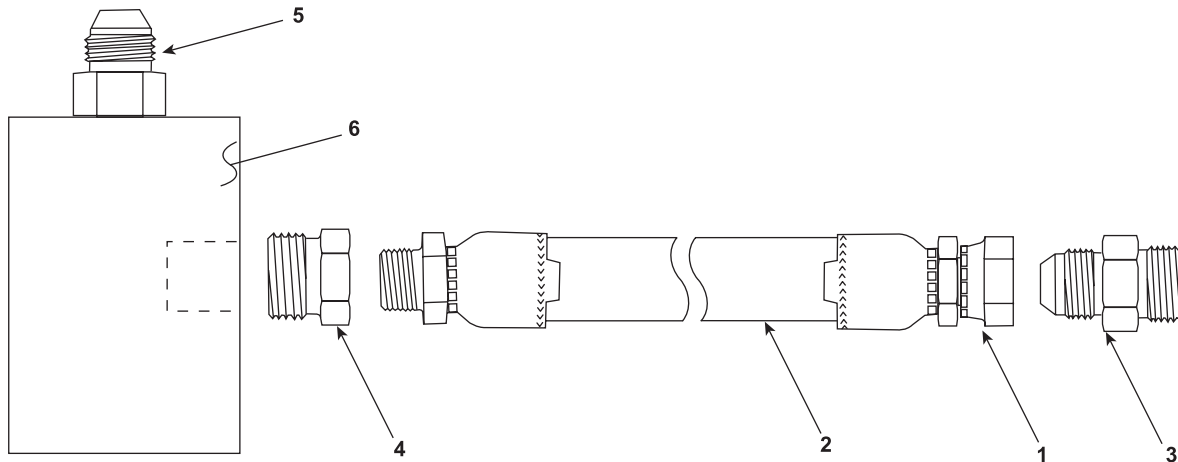
Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious injury or death.

REMOVAL (continued)**WARNING**

Prior to removing any hoses, ensure that the crane boom is sufficiently secured to prevent any movement of the boom sections. Moving or dropping boom sections present a fall and/or pinch hazard and can cause serious injury or death.

1. Don chemical protective gloves and goggles.
2. Position a suitable drain pan beneath the work area.
3. Cautiously loosen the swivel fitting (1) on the hose (2) in order to release any residual hydraulic pressure on the system.
4. Remove one end of the hose (2) from the fitting (3) by unscrewing the swivel fitting (1).
5. Unscrew the other end of the hose (2) from its fitting (4).
6. Remove the fittings (3, 4, 5) or valve (6) as required for replacement.

**CLEANING**

1. If not already on, don chemical protective gloves and goggles.
2. Use cleaning solvent to clean all parts that will be reused. Dry the parts with clean wiping rags.

INSTALLATION **CAUTION**

The threaded ends of flared hydraulic fittings are not to be installed with the use of antiseizing sealant tape or any other non-hydraulic sealant. Damage to hydraulic equipment may occur.

1. Procure new hose (2), valve (6), or fittings (3, 4, 5) as required.
2. Wrap only the pipe threads of hydraulic fittings with antiseizing sealant tape prior to assembly. Do not use antiseizing sealant tape or any other non-hydraulic sealant on the threads of flared hydraulic fittings.
3. Reassemble the hose (2), valve (6), and/or fittings (3, 4, 5) in the reverse order of disassembly.
4. Remove the lockouts and tagouts and check the operation of the system, ensuring that the hydraulic ramp performs normally and that no leakage is noted.
5. Replenish the ramp system hydraulic reservoir as required.
6. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
CRANE ASSEMBLY CONTROL BANK, REPAIR

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
 Vise (Item 3, Table 1, WP 0230 00)
 Suitable Drain Pan

Equipment Condition:

Starboard propulsion engine secured, locked out, and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
 Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
 Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
 Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
 Rag, Wiping (Item 5, Table 2, WP 0230 00)

References:

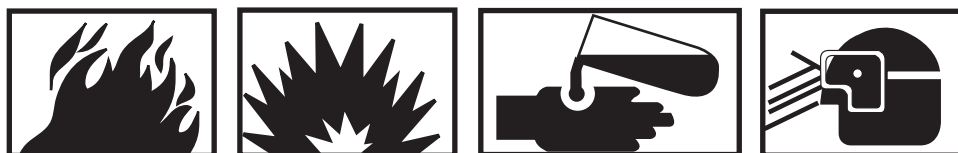
FM 55-502
 TM 55-1905-242-24P (WP 0104)

REPAIR

Repair of the control bank is accomplished by the replacement of its component parts.

DISASSEMBLY

WARNING



Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.
2. Remove the pin (1) that secures the actuator (2) in the support (3). The actuator, lever (4), and knob (5) may be removed as a unit unless the replacement of one of these components is required.
3. If the actuator (2), lever (4), and/or knob (5) must be replaced, loosen the locknuts (6) and disassemble the actuator, lever, and knob.
4. Position a suitable drain pan beneath the work area.
5. Remove the attaching screws (7) that secure the support (3) to the valve body (8). Remove the support.

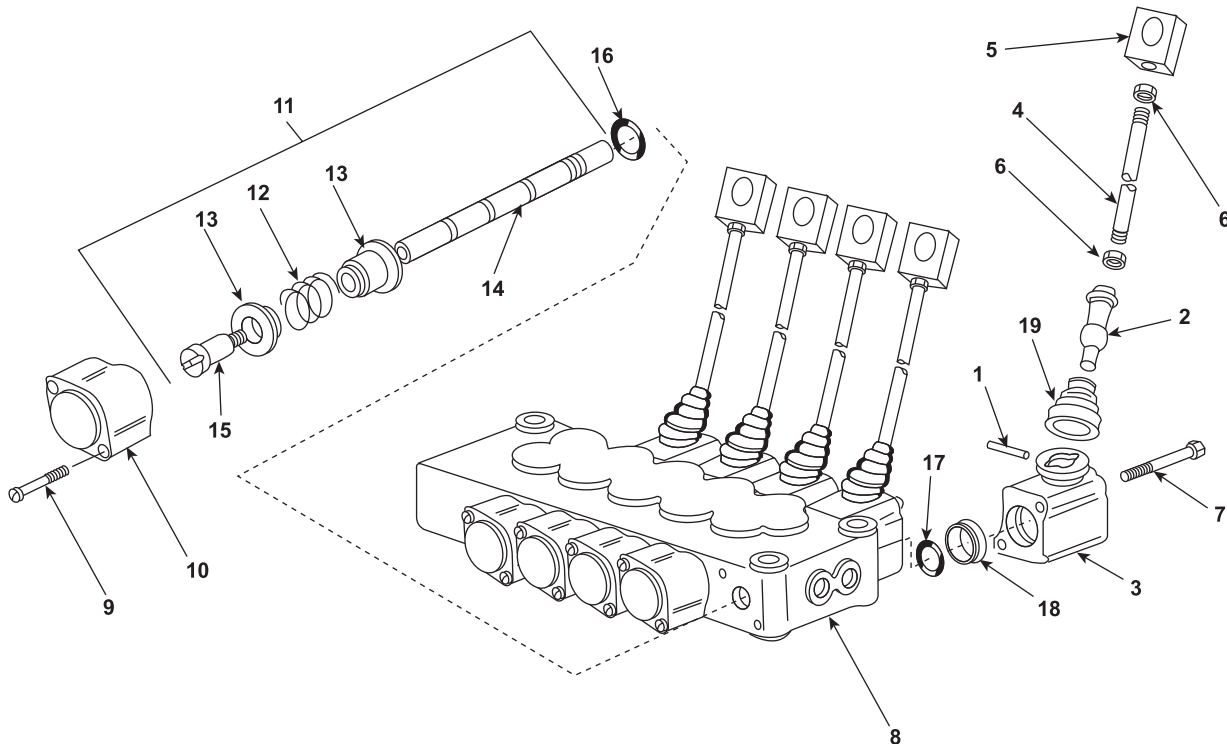
DISASSEMBLY (continued)

6. Remove the attaching screws (9) that secure the cup (10) to the valve body (8). Remove the cup (10).

⚠ CAUTION

The rod assemblies are custom machined and match-fitted to their respective valve bodies. Do not mismatch the rod assemblies and valve bodies. If a valve body or rod assembly is damaged, the entire valve body/rod assembly unit must be replaced. Take extreme care not to scratch, gouge, dent, or otherwise mar the finish on the rods and valve bodies. Failure to comply may result in serious equipment damage.

7. Slide the rod assembly (11) out of the valve body (8) and lay it on a clean wiping rag on a clean surface.
8. If the spring (12) or spacers (13) must be replaced, wrap the rod (14) in several thick layers of wiping rags and clamp it gently in the vise, taking great care not to damage the surface finish on the rod.
9. Remove the attaching screw (15), spacers (13), and spring (12).

**CLEANING**

1. If not already on, don chemical protective gloves and goggles.
2. Clean all parts in cleaning solvent and inspect them for wear, damage, or deformity. Dry the parts with clean wiping rags.
3. Procure any replacement parts necessary.

ASSEMBLY

1. If the spring (12) and spacers (13) were removed, position them on the rod (14) and secure them with the attaching screw (15).
2. Coat the O-ring (16) with a light coat of hydraulic fluid and slide it into position on the rod (14).
3. Apply a light coat of hydraulic fluid to the rod (14) and slide it into the cup end of the valve body (8).
4. Secure the cup (10) to the valve body (8) with the attaching screws (9).
5. Apply a light coat of hydraulic fluid to the support end O-ring (17).
6. Slide the support end of the O-ring (17) and the spacer (18) into position on the rod (14).
7. Position the support (3) on the valve body (8) and secure it with the attaching screws (7).
8. If the actuator (2), lever (4), and knob (5) were disassembled, assemble them and secure them with the locknuts (6).
9. Position the actuator (2) in the support (3) and secure it with the pin (1).
10. Slide the boot (19) into place.
11. Remove the lockouts and tagouts and check the operation of the system, ensuring that all crane functions operate correctly and that no leakage is noted.
12. Dispose of used hydraulic fluid, used cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

UNIT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ACCOMMODATION MODULE WINDOWS, FURNISHINGS, REPLACE AND STOW

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
 (Item 1, Table 1, WP 0230 00)

Materials/Parts:

Gloves, Anti-Flash (Item 13, Table 2, WP 0230 00)

Personnel Required:

Three Watercraft Engineers, 88L

References:

WP 0076 00

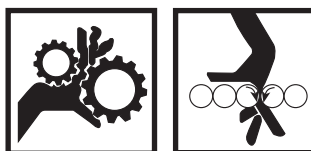
TM 55-1905-242-24P (WP 0106)

REPLACE--WINDOWS

Accommodation module window replacement procedures are contained in WP 0076 00.

REMOVAL--FURNISHINGS

WARNING

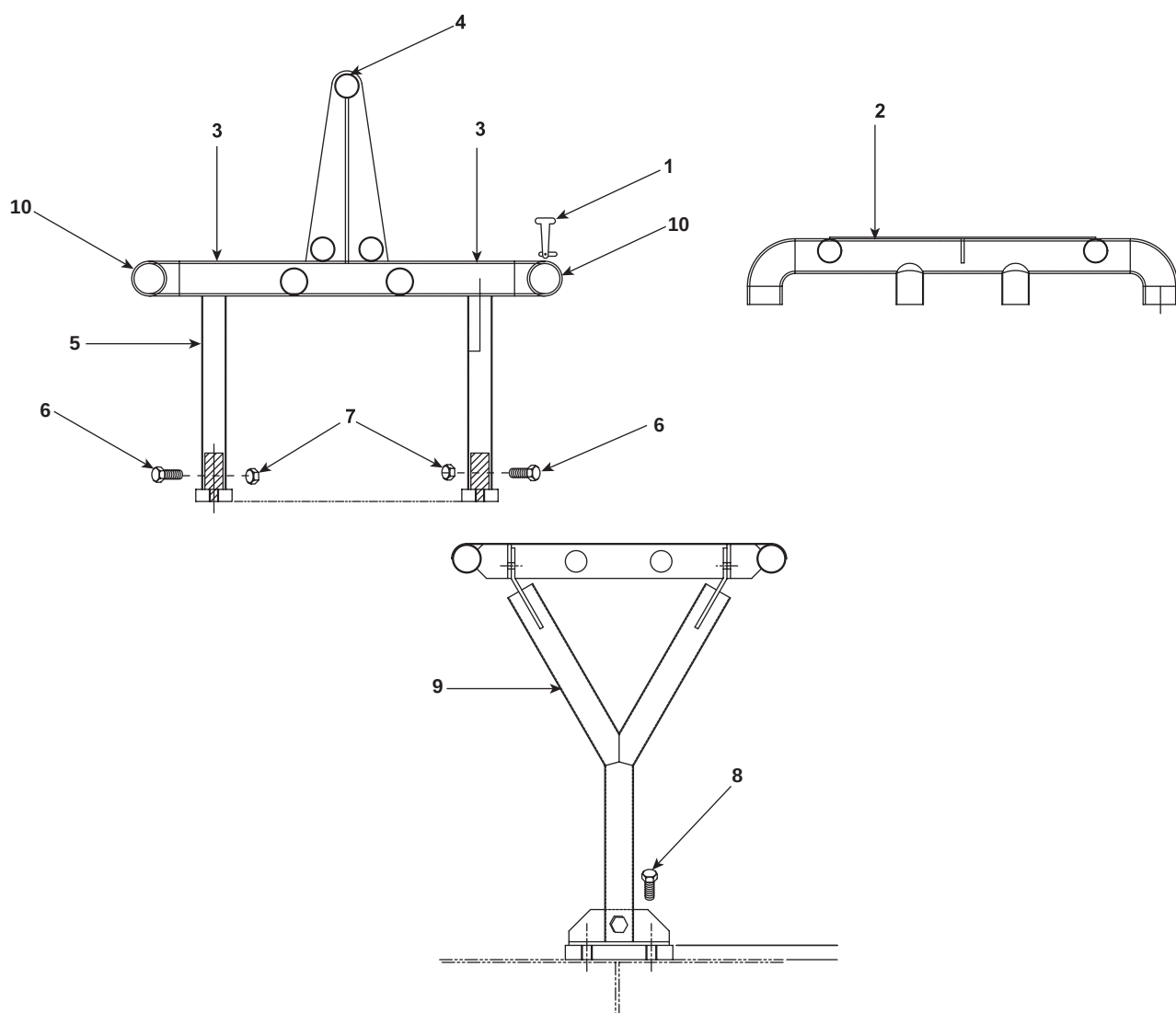


Always wear gloves when assembling or disassembling furnishings. Pinch points may be encountered during Removal or Installation. Failure to comply could result in serious injury or death.



The furnishing sections are heavy. Use two crewmembers to handle the components. Dropping the components can result in serious injury or death.

1. Remove the pins (1) that secure the seat end panel assemblies (2), seat assemblies (3), and backrest assemblies (4); remove the backrest assemblies.
2. Disassemble the seat end panel assemblies (2) and seat assemblies (3) by sliding them apart.
3. Remove the seat assemblies (3) from the leg assemblies (5).
4. Remove the bolts (6) and nuts (7) that secure the leg assemblies (5) to the floor adapter.
5. Remove the bolts (8) that secure the table legs (9) to the deck.
6. Remove the table assembly and fold its legs (9) underneath.

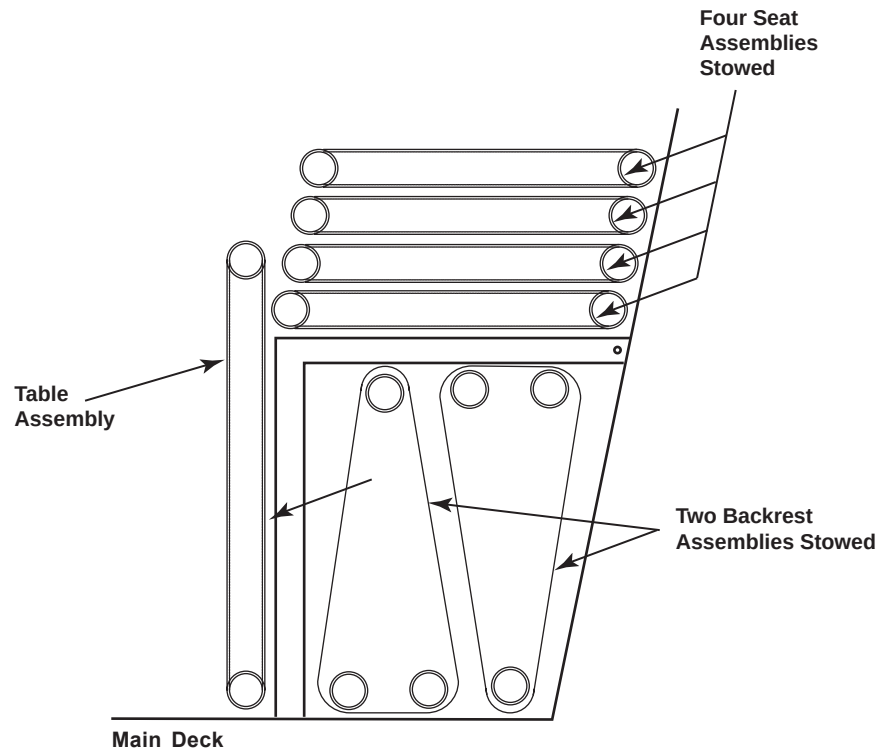


INSTALLATION--FURNISHINGS

1. Unfold the table legs (9) and position the table assembly in place on the deck.
2. Secure the table legs (9) to the deck using the bolts (8).
3. Install the leg assemblies (5) over the center of the floor adapters and secure them with the bolts (6) and nuts (7).
4. Position the seat assemblies (3) with leg assemblies (5) into the brackets (10) on the forward bulkhead.
5. Assemble the seat end panel assemblies (2) and backrest assemblies (4) and secure them with the pins (1).

STOWING--FURNISHINGS

1. Disassemble the furnishings using the Removal procedure.
2. Stow the furnishing components along the starboard bulkhead of the accommodation module using the furnishing stowage plan as a guide.

**FURNISHING STOWAGE PLAN****END OF WORK PACKAGE**

CHAPTER 8

**DIRECT SUPPORT
MAINTENANCE PROCEDURES
FOR
LANDING CRAFT, MECHANIZED (LCM-8)
(ALL VESSELS WITH MOD 2 APPLICATION)**

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
HULL, BITS, CHOCKS, TIE DOWNS, REPLACE/REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Welding Shop, Trailer Mounted (Item 7,
Table 1, WP 0230 00)

Personnel Required:

One Certified Welder
(Trained in Confined Space Entry)
One Entry Supervisor/Attendant
Fire Watch as Required IAW FM 55-502

Equipment Condition:

Vessel certified safe for HOT WORK IAW
FM 55-502
Voids (if entry is required) prepared for con-
fined space entry with Confined Space En-
try Permit secured, IAW Organizational Con-
fined Space Entry SOP and FM 55-502

References:

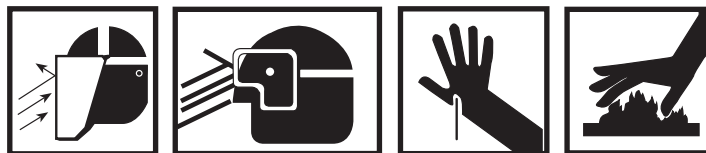
FM 55-502
TB 43-0144
TB 55-1900-204-24
Organizational Confined Space Entry SOP
TM 55-1905-242-24P (WP 0002)

REPAIR

Repair of the hull, bitts, chocks, and tiedowns is by replacement of the failed or damaged component.

REMOVAL**WARNING**

Only properly trained personnel may enter confined spaces, or act as entry supervisors and/or attendants for those working in confined spaces. Before entering into a confined space, the space must be cleared for entry and a Confined Space Entry Permit must be secured. All entry into confined spaces must be in accordance with the Organizational Confined Space Entry Standard Operating Procedure and FM 55-502. Entry into an uninspected confined space can result in serious injury or death.



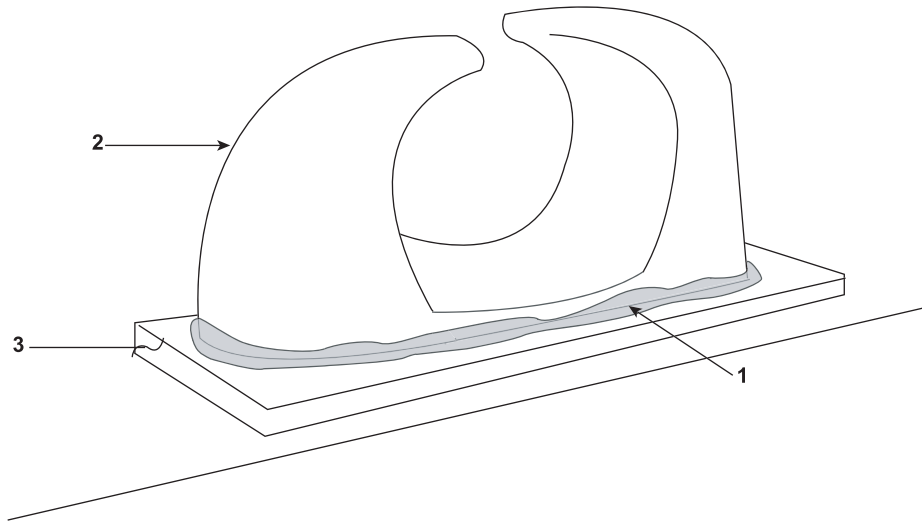
Grinding, needling, and chipping operations produce high velocity flying debris which can become lodged in the skin or in the eyes. Grinding, needling, and chipping in confined spaces can result in debris flying from unexpected directions. All personnel working in the area must wear protective eyewear, gloves, and long sleeves when performing grinding, needling and chipping operations. Failure to comply can result in serious injury or death.

Unprotected exposure to arc welding rays can cause serious eye damage and radiation burns to the skin. Never perform arc welding operations without using appropriate eye and skin protection. Failure to comply can result in serious injury or death.

1. If a confined space must be entered in order to perform work or to post a fire watch, prepare the space for confined space entry and secure a Confined Space Entry Permit in accordance with the Organizational Confined Space Entry SOP and FM 55-502.

REMOVAL—(continued)

2. Don protective goggles, gloves, and/or apron.
3. Break the weld (1) that attaches the component (2) to the vessel (3) by grinding, gouging, or cutting.
4. Remove the component (2) to be replaced.

**INSTALLATION**

1. Prepare the installation area by grinding, welding, or other appropriate method.
2. Position a new component (2) in place on the vessel (3).

⚠ CAUTION

Improper connection of ground leads can cause serious electrolytic and electronic damage to the vessel and its components. Always ensure that ground leads are connected in accordance with TB 55-1900-204-24.

3. Weld the component (2) in place.
4. Chip and grind the welds as required.
5. Prime and paint the repaired area in accordance with TB 43-0144.
6. Remove the confined space entry permit if posted.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
HATCHES AND VOID COVERS, REPLACE/REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

TM 55-1905-242-24P (WP 0002)

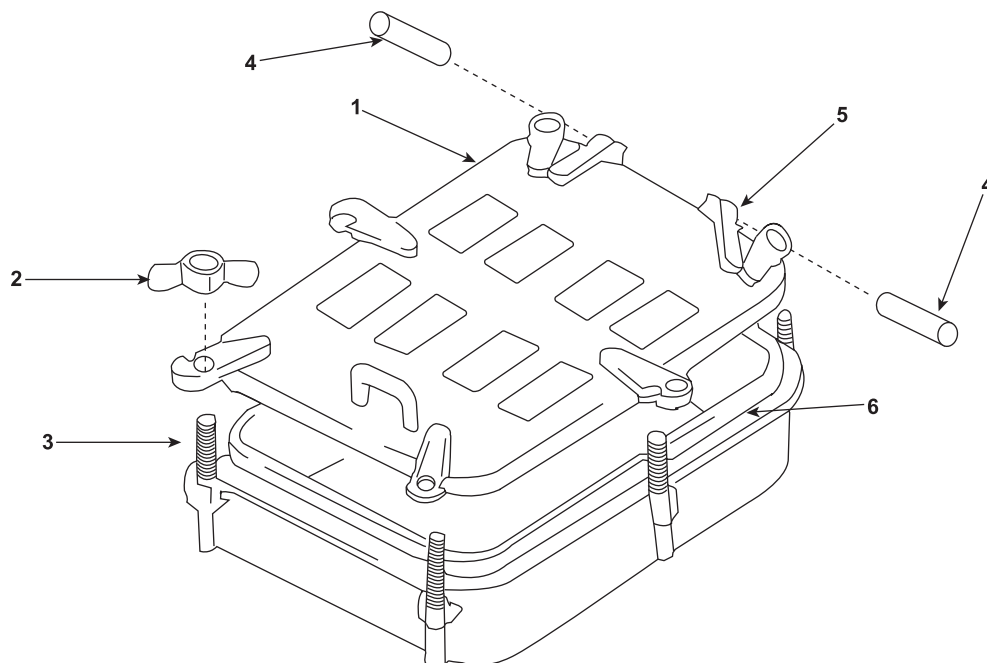
REPAIR

Repair of the hatches and void covers is accomplished by the replacement of faulty components. Replacement procedures follow.

REMOVAL--HATCHES**WARNING**

Use two crewmembers to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

1. Undog the hatch (1) by unscrewing the nuts (2) from the studs (3).
2. Remove the hinge pins (4) from the hinges (5).



REMOVAL--HATCHES(continued)

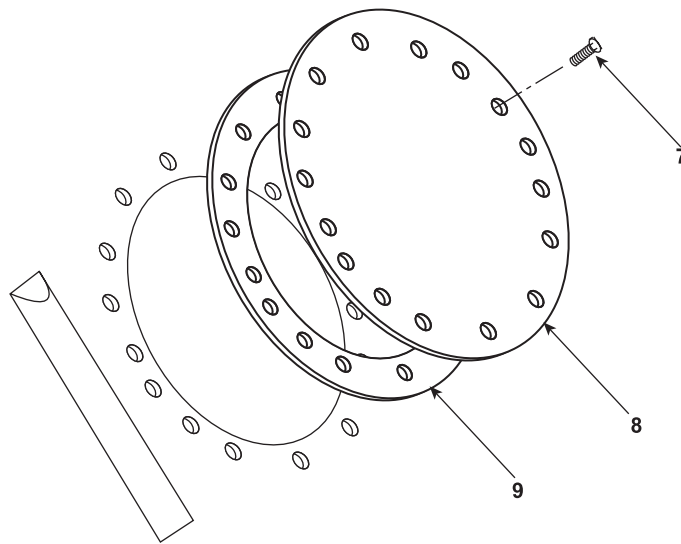
3. Using two crewmembers, lift off the hatch (1).

INSTALLATION--HATCHES

1. Position the hatch (1) on the coaming (6) and align the hinges (5).
2. Insert the hinge pins (4).
3. Secure the hatch (1) by screwing the nuts (2) onto the studs (3).

REMOVAL--VOID COVERS

1. Remove the bolts (7) that secure the void cover (8) to the vessel.
2. Remove the void cover (8) and gasket (9).



3. Clean the gasket area on the vessel and the void cover (8).

INSTALLATION--VOID COVERS

Position the void cover (8) and gasket (9) on the vessel and secure it with the bolts (7).

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STANCHIONS AND LIFELINES, REPLACE/REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

TM 55-1905-242-24P (WP 0002)

REPAIR

Repair of the stanchions and lifelines is accomplished by replacing the defective components. The replacement procedure follows.

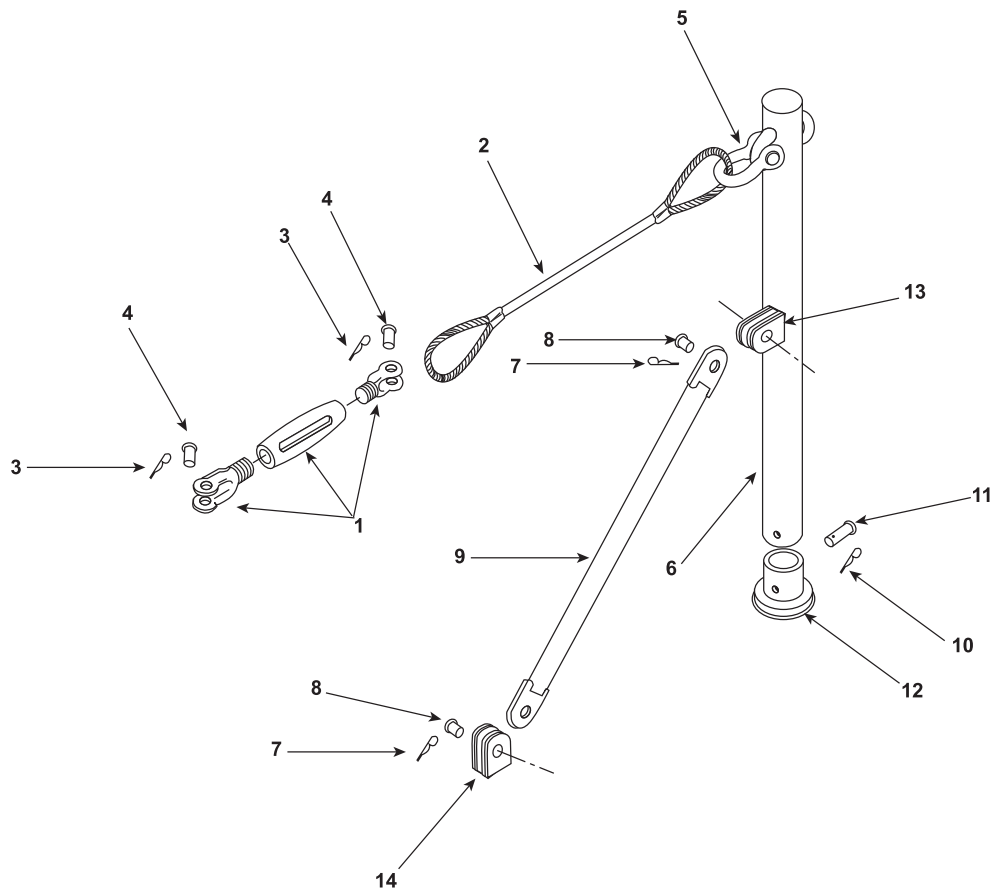
REMOVAL

1. Loosen the turnbuckle (1) to relieve tension on the lifeline (2).

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

2. Remove the cotter pins (3) that secure the turnbuckle pins (4). Remove the turnbuckle (1) and turnbuckle pins (4).
3. Remove the shackle (5) and the lifeline (2) from the stanchion (6).
4. Remove the cotter pins (7) that secure the brace pins (8). Remove the brace pins (8) and brace (9).
5. Remove the cotter pin (10) that secures the stanchion pin (11).
6. Remove the stanchion pin (11) and remove the stanchion (6) from its socket (12).

REMOVAL (continued)**INSTALLATION**

1. Insert the stanchion (6) into its socket (12) and secure it with the stanchion pin (11) and new cotter pin (10).
2. Insert the brace (9) into its mount (13) on the stanchion (6) and its mount (14) on the deck and secure it with the brace pins (8) and new cotter pins (7).
3. Attach one end of the lifeline (2) to the stanchion (6) using the shackle (5).
4. Attach one end of the turnbuckle (1) to the free end of the lifeline (2) using the turnbuckle pin (4) and new cotter pin (3).
5. Attach the free end of the turnbuckle (1) to the next stanchion using the turnbuckle pin (4) and new cotter pin (3).
6. Tighten the turnbuckle (1) to tension the lifeline (2).

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
VOIDS AND COMPARTMENTS, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)
Welding Shop, Trailer Mounted (Item 7,
Table 1, WP 0230 00)

Materials/Parts:

Gloves, Anti-Flash (Item 13, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Face Shield, Industrial, Tilting (Item 10, Table 2, WP 0230
00)

Equipment Condition:

Vessel certified safe for HOT WORK IAW
FM 55-502
Voids prepared for confined space entry with
Confined Space Entry Permit secured, IAW
Organizational Confined Space Entry SOP
and FM 55-502

References:

FM 55-502
TB 43-0144
TB 55-1900-204-24
Organizational Confined Space Entry SOP
TM 55-1905-242-24P (WP 0003)

Personnel Required:

One Certified Welder
(Trained in Confined Space Entry)
One Entry Supervisor/Attendant
Fire Watch as Required IAW FM 55-502

REPAIR**WARNING**

Only properly trained personnel may enter confined spaces, or act as entry supervisors and/or attendants for those working in confined spaces. Before entering into a confined space, the space must be cleared for entry and a Confined Space Entry Permit must be secured. All entry into confined spaces must be in accordance with the Organizational Confined Space Entry Standard Operating Procedure and FM 55-502. Entry into an uninspected confined space may result in serious injury or death.



Grinding, needling, and chipping operations produce high velocity flying debris which can become lodged in the skin or in the eyes. Grinding, needling, and chipping in confined spaces can result in debris flying from unexpected directions. All personnel working in the area must wear protective eyewear, gloves, and long sleeves when performing grinding, needling and chipping operations. Failure to comply can result in serious injury or death.

Unprotected exposure to arc welding rays can cause serious eye damage and radiation burns to the skin. Never perform arc welding operations without using appropriate eye and skin protection.

REPAIR (continued)

1. Remove all water and contamination from the void(s) to ascertain where the damage is located. If the damage is below the waterline, the vessel may have to be beached or drydocked before performing repairs.
2. Don protective goggles, face shield, and gloves. Roll sleeves down to cover all exposed skin.
3. Prepare the area for repair by removing paint, rust, and contamination.

 CAUTION

Improper connection of ground leads can cause serious electrolytic and electronic damage to the vessel and its components. Always ensure that ground leads are connected in accordance with TB 55-1900-204-24.

4. Repair the damage by welding and/or patching the area. Replace damaged areas as necessary. The nature of the repair will necessarily depend upon the nature of the damage.
5. Chip and grind the welds as required.
6. Prime and paint the repaired area in accordance with TB 43-0144. If the voids are damaged due to heavy rust, the entire void should be sandblasted to bare metal, primed, and painted in accordance with TB 43-0144.
6. Remove the confined space entry permit if posted.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
HYDRAULIC STARTING SYSTEM RESERVOIR AND FILTERS, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502
All accumulators blown down

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)
Packing, Preformed (p/n GA100201, qty 2)
Filter Element (p/n 6R020-060, qty 2)

References:

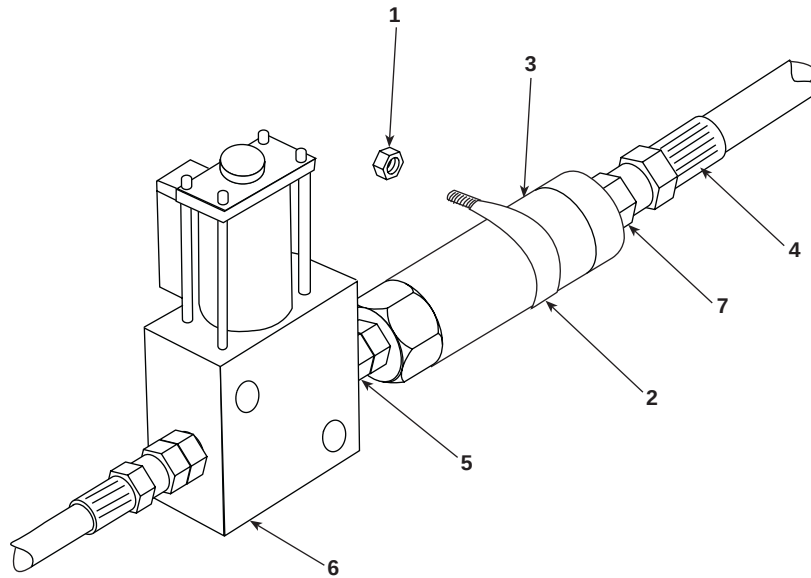
FM 55-502
TM 55-1905-242-24P (WP 0016)

REMOVAL**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

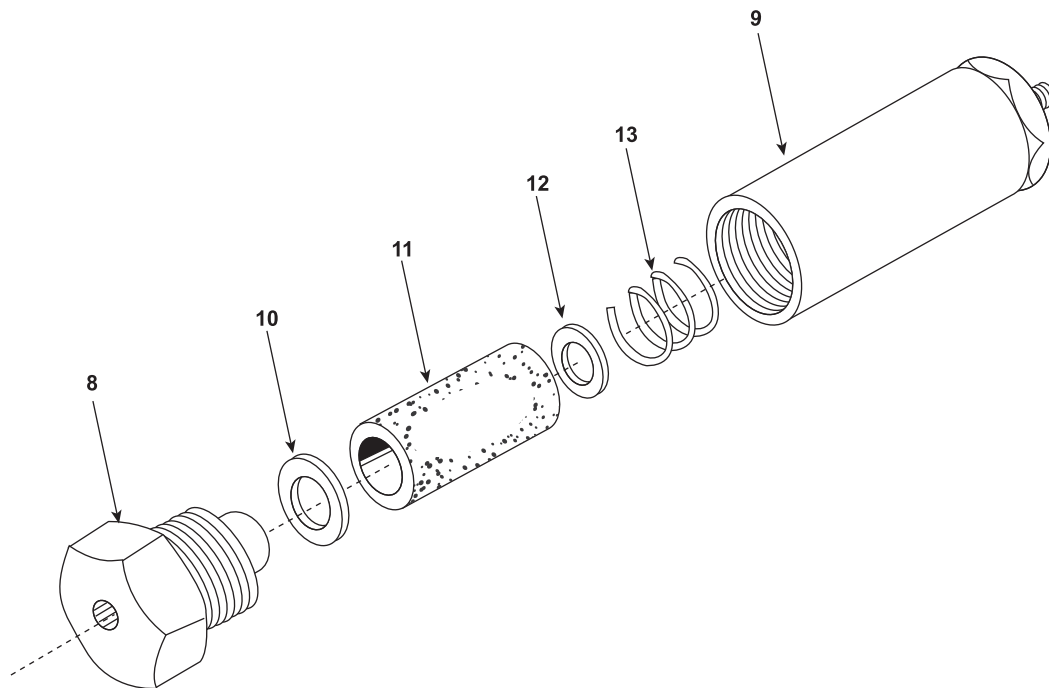
Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don protective gloves and goggles and position a suitable drain pan beneath the work area.
2. Remove the nuts (1) and U-bolt (2) that secure the filter housing (3) to its bracket.
3. Disconnect the hose (4) from the male connector (7) on the inlet side of the filter housing (3).
4. Unscrew the filter housing (3) from the reducing hex nipple (5) connecting the filter housing and the control valve (6).
5. Remove the male connector (7) from the inlet port of the filter housing (3).



DISASSEMBLY

1. Unscrew the cap (8) from the filter housing (9) and remove the preformed packing (10), filter element (11), spring seat (12) and spring (13).
2. Discard the preformed packing (10) and filter element (11) in accordance with local regulations.



CLEANING

1. Don chemical protective gloves and goggles.
2. Clean all the parts in cleaning solvent and wipe dry with clean wiping rags.

ASSEMBLY

1. Assemble the spring (13), spring seat (12), new filter element (11) and new preformed packing (10) in the filter housing (9).
2. Install the cap (8) into the filter housing (9) and tighten it snugly.

INSTALLATION

1. Wrap the pipe thread end of the male connector (7) with antiseizing sealant tape.
2. Install the male connector (7) into the inlet port of the filter housing (3).
3. Wrap the pipe thread on the reducing hex nipple (5) with antiseizing sealant tape.
4. Thread the filter housing (3) onto the reducing hex nipple (5).
5. Secure the filter housing (3) to its mount with the U-bolt (2) and nuts (1).
6. Connect the hose (4) to the male connector (7) on the inlet side of the filter housing (3).
7. Remove the lockouts and tagouts and check the operation of the system, ensuring that the hydraulic starter turns the engine properly and that no leaks exist.
8. Check the level of hydraulic fluid in the reservoir and replenish it as necessary.
9. Dispose of used hydraulic fluid, used cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
EXPANSION TANK, REPLACE/REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP0230 00)
Welding Shop, Trailer Mounted (Item 7, Table 1, WP0230 00)

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502
Cooling system drained beneath the level of the expansion tank

Personnel Required:

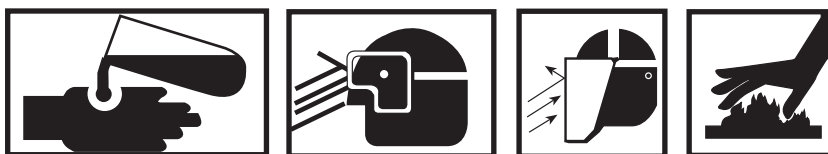
Two Watercraft Engineers, 88L
One Certified Welder

Materials/Parts:

Gloves, Chemical Protective (Item 3, Table 2, WP0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP0230 00)
Antifreeze, Ethylene Glycol Inhibited (Item 6, Table 2, WP0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP0230 00)

References:

FM 55-502
TM 5-2815-231-14
TB 55-1900-204-24
TM 55-1905-242-24P (WP 0021)

REMOVAL**WARNING**

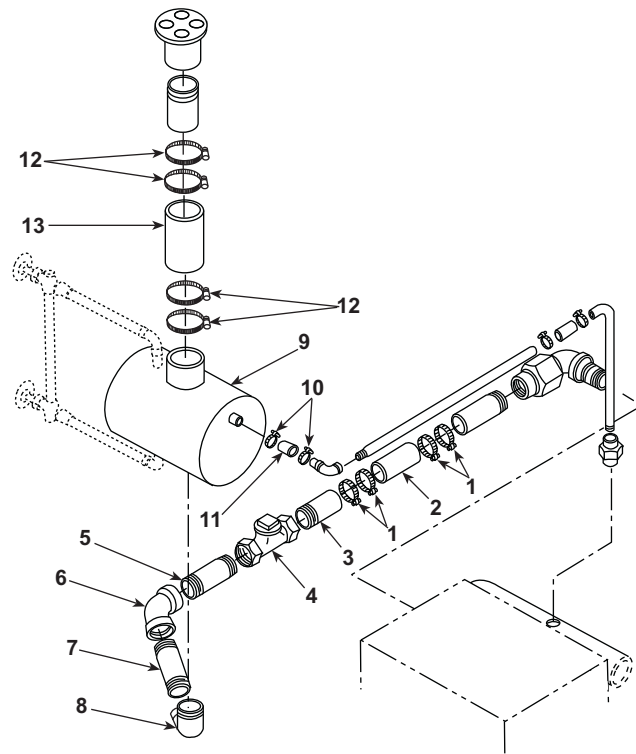
Do not allow antifreeze to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling antifreeze. Failure to comply can result in illness, serious injury, or death.

Unprotected exposure to arc welding rays can cause serious eye damage and radiation burns to the skin. Never perform arc welding operations without using appropriate eye and skin protection. Failure to comply can result in serious injury or death.

1. Remove the hose clamps (1) and hose (2).
2. Remove the pipe (3), swing check valve (4), pipe (5), and elbow (6).
3. Remove the pipe (7) and elbow (8) from the expansion tank (9).
4. Loosen the hose clamps (10) and slide them back on the hose (11). Remove the hose.
5. Loosen the hose clamps (12) and slide them back on the hose (13). Remove the hose.

NOTE

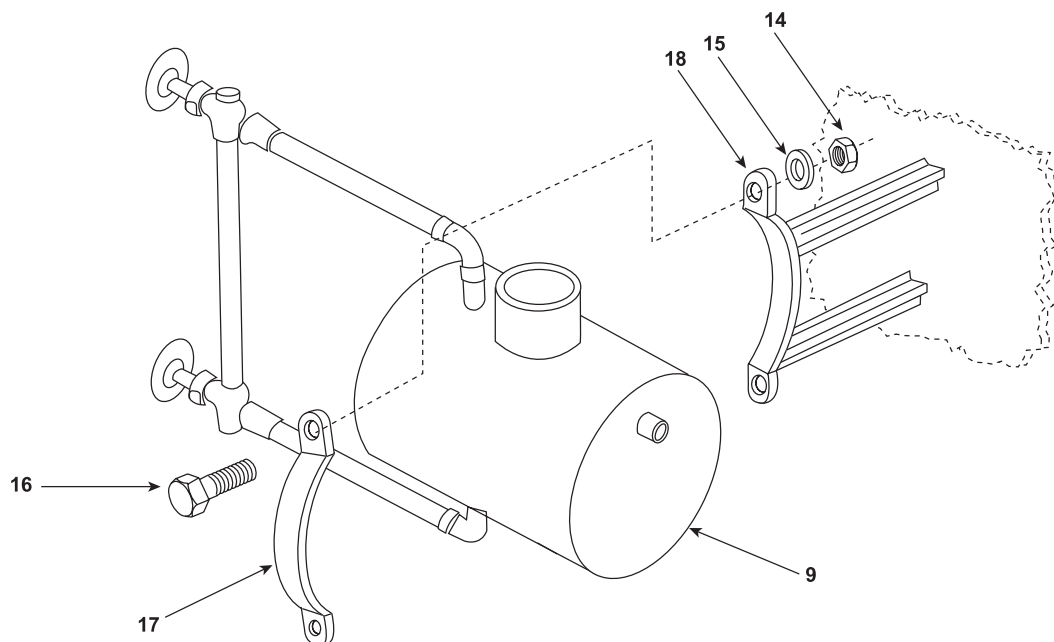
Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.



6. Remove the hex nuts (14), lockwashers (15), and capscrews (16) that secure the bracket strap (17) to the bracket (18).
7. Lift the expansion tank (9) from the mounting bracket (18), remove it from the engine room, and place it on a suitable work bench.

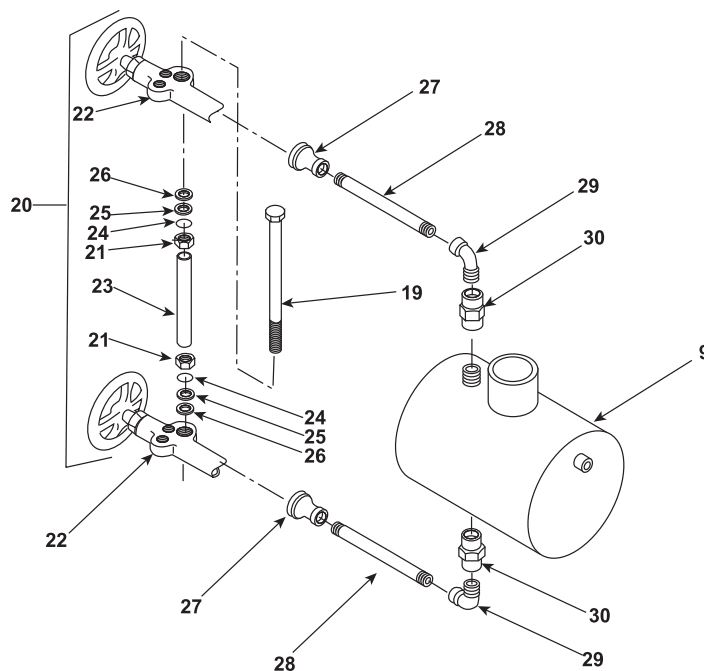
DISASSEMBLY

1. Remove the rod (19) that holds the sight glass assembly (20) together.
2. Unscrew the collars (21) from the upper and lower valves (22).
3. Slide the sight glass (23) up into the upper valve (22), then down and out to remove it.



DISASSEMBLY (continued)

4. Remove the O-rings (24, 25, and 26) from the upper and lower valves (22). Discard any defective O-rings.
5. Unscrew the upper and lower valves (22) from the reducing couplings (27).
6. Remove the pipe nipples (28) and street elbows (29) from the expansion tank couplings (30).

**REPAIR**

⚠ CAUTION

Improper connection of ground leads can cause serious electrolytic and electronic damage to the vessel and its components. Always ensure that ground leads are connected in accordance with TB 55-1900-204-24.

1. Weld any cracks or breaks in the expansion tank (9). Replace the expansion tank if it is damaged beyond repair.
2. Replace defective hoses, hose clamps, fittings, valves, sight glass, or O-rings.

ASSEMBLY

1. Wrap the male pipe threads of the street elbows (29) with antiseizing sealant tape and thread them into the expansion tank couplings (30).
2. Wrap the male pipe threads of the pipe nipples (28) with antiseizing sealant tape and thread the pipe nipples into the street elbows (29).
3. Wrap the male pipe threads of the upper and lower valves (22) and reducing couplings (27) with antiseizing sealant tape and thread the upper and lower valves and reducing couplings onto the pipe nipples (28). Ensure that the upper and lower valves are oriented to allow proper installation of the sight glass (23).
4. Install the O-rings (24, 25, and 26) into the upper and lower valves (22).

ASSEMBLY (continued)

5. Slide the collars (21) onto the sight glass (23).
6. Slide the sight glass (23) up into the upper valve (22) and then down into the lower valve (22). Secure the sight glass (23) by tightening the collars (21).
7. Install the rod (19).

INSTALLATION

1. Position the expansion tank (9) in place on the mounting bracket (18) and secure it with the bracket strap (17), capscrews (16), lockwashers (15), and hex nuts (14).
2. Slide the hose (13) into place and secure it with the hose clamps (12).
3. Install the hose (11) and secure it with the hose clamps (10).
4. Wrap the male pipe threads with antiseizing sealant tape and install the elbow (8), pipe (7), elbow (6), and pipe (5).
5. Wrap the male pipe threads with antiseizing sealant tape and install the swing check valve (4), pipe (3), and hose (2). Secure the hose with the hose clamps (1).
6. Refill the system with a mixture of antifreeze and fresh water suitable for the ambient temperature (refer to TM 5-2815-231-14).
7. Remove the lockouts and tagouts, start the engines, and bring them to operating temperature, ensuring that no leaks are present.
8. Secure the engines and recheck the engine coolant level.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
DIESEL GENERATOR, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Truck, Wrecker (Item 10, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Equipment Condition:

Diesel generator seacock set to OFF, locked out, and tagged out IAW FM 55-502
Shore power disconnected, locked out, and tagged out IAW FM 55-502
Diesel generator fuel shutoff valve set to OFF, locked out, and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Antifreeze, Ethylene Glycol Inhibited (Item 6, Table 2, WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)
Gloves, Anti-Flash (Item 13, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Face Shield, Industrial, Tilting (Item 10, Table 2, WP 0230 00)
Apron, Chemical Protection (Item 11, Table 2, WP 0230 00)
Gasket, Engine Room (p/n 145-4510931-8, qty 1)

References:

FM 55-502
WP 0145 00
WP 0146 00
TM 55-1905-242-24P (WP 0036)

REMOVAL

WARNING



Batteries produce hydrogen gas. This gas is explosive. Keep the work area free of sparks, open flame, and excessive heat. Take care to prevent conductive metal tools from arcing between the positive and negative terminals. Failure to comply can result in serious injury or death.

Batteries are filled with a sulfuric acid-based electrolyte. This electrolyte is extremely corrosive to human tissue and to many other materials. Chemical protective gloves, chemical protective goggles, face shield, and chemical protective apron must be worn at all times when the batteries are being serviced. If electrolyte comes in contact with clothing or other material, wash the affected area with large volumes of fresh water. If electrolyte comes in contact with the skin, flush the area with large volumes of water. If the electrolyte comes in contact with the eyes, flush them with large volumes of water. Continue flushing the affected area until medical assistance arrives. Failure to comply can result in serious injury or death.

REMOVAL (continued)

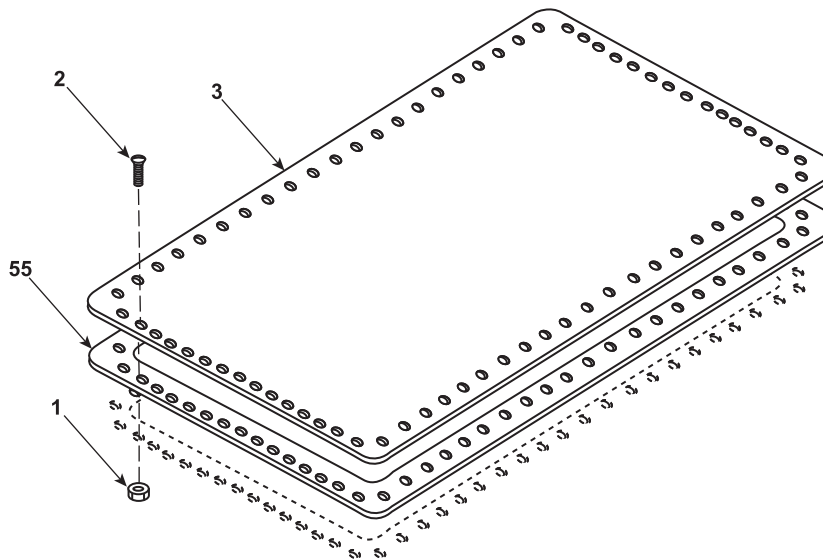
WARNING

All personnel in the vicinity of the lifting operations should wear appropriate safety equipment including gloves, hard hat, and safety shoes. Failure to comply with this warning can result in damaged equipment and serious injury or death to personnel.

Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death. Failure to comply with this warning can result in damaged equipment and serious injury or death to personnel.

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

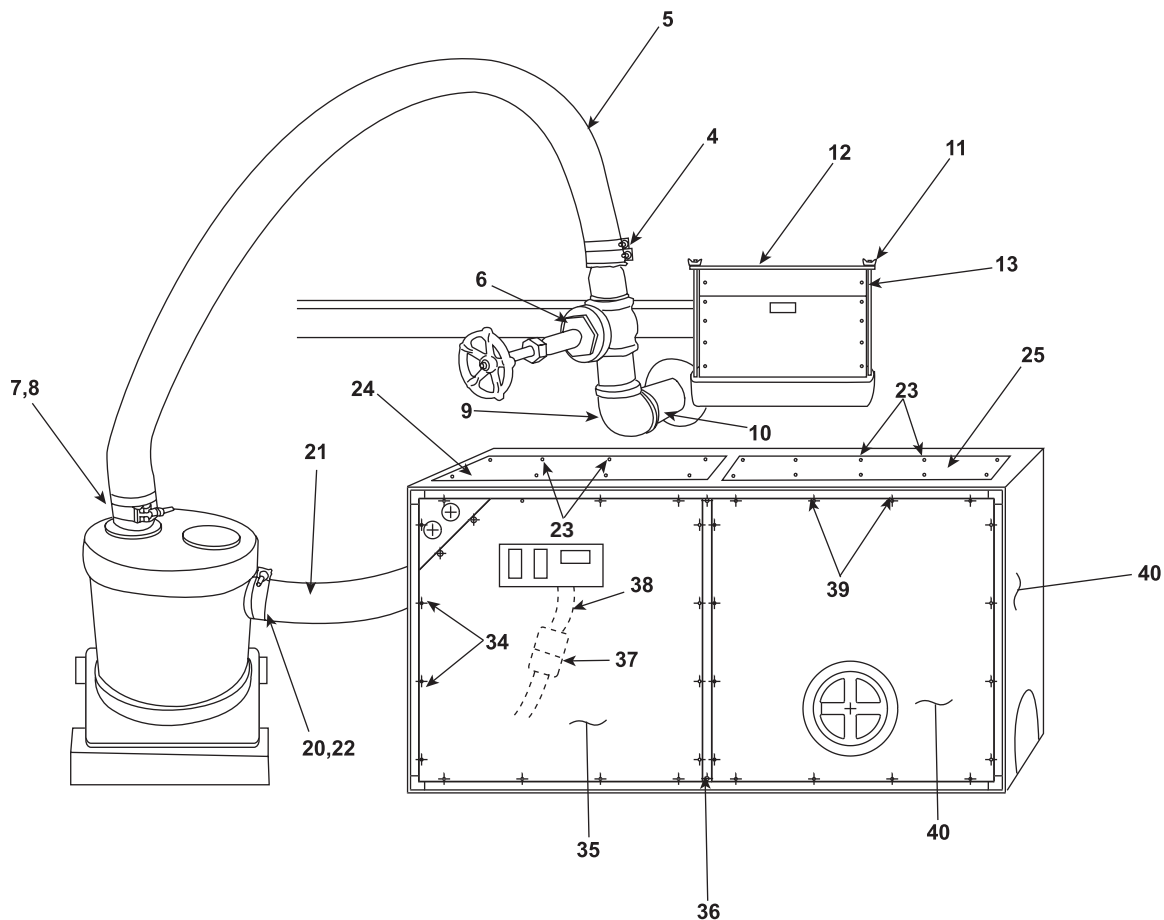
1. Remove the nuts (1) and bolts (2) that secure the Bolted Equipment Removal Panel (BERP) (3) to the deck.



2. Attach the lifting device to the BERP (3) and carefully lift it from the deck.
3. Disconnect the hose clamps (4) that secure the exhaust hose (5) to the exhaust discharge valve (6).
4. Remove the exhaust hose (5) from the exhaust discharge valve (6).
5. Disconnect the hose clamp (7) that secures the exhaust hose (5) to the muffler outlet (8). Remove the hose from the muffler outlet (8).

REMOVAL (continued)

6. Remove the exhaust discharge valve (6) and elbow (9) from the through-hull piping (10).
7. Remove the wingnuts (11) that hold the diesel generator battery box retaining strap (12). Remove the battery box retaining strap and the battery box cover (13).



8. Don protective gloves, goggles, face shield, and apron.

NOTE

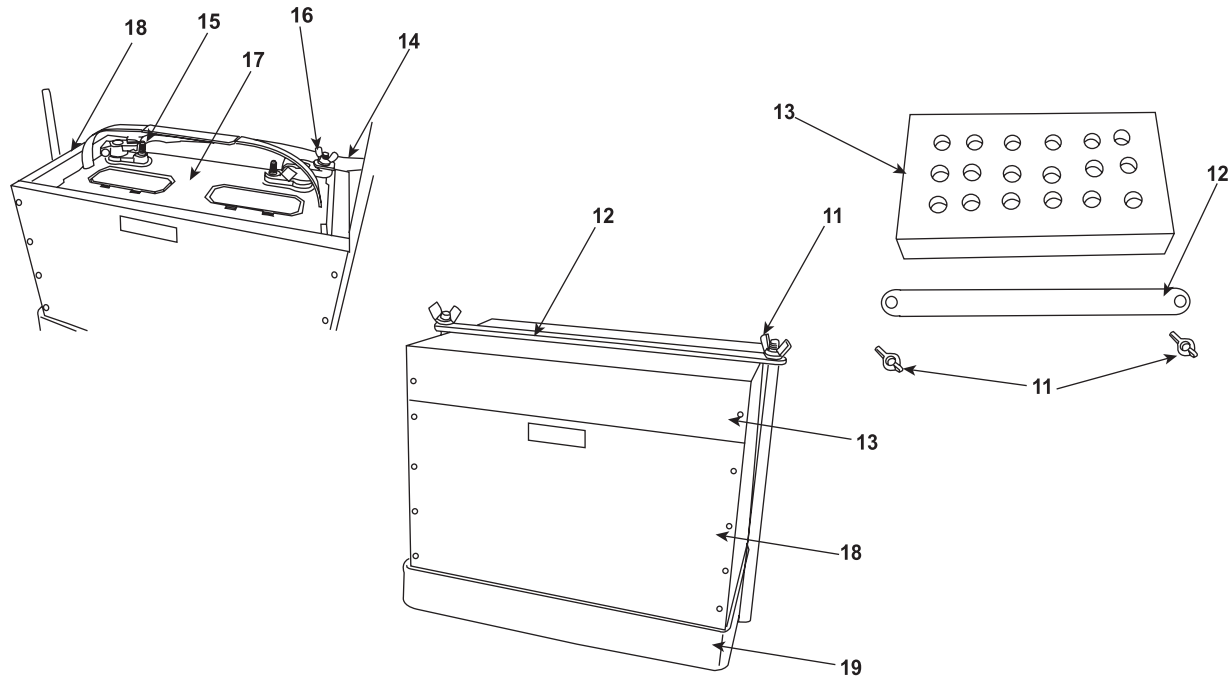
The negative battery cable must always be disconnected first and connected last.

9. Label and disconnect the negative (14) and positive (15) battery cables by removing the wing nuts (16).
10. Remove the battery (17) and the battery box (18) from the battery box mounting bracket (19).
11. Remove the four screws that secure the battery box mounting bracket (19) to the hull structure. Remove the battery box mounting bracket.
12. Disconnect the hose clamp (20) that secures the exhaust hose (21) to the muffler inlet (22). Remove the exhaust hose from the muffler inlet.

REMOVAL (continued)**NOTE**

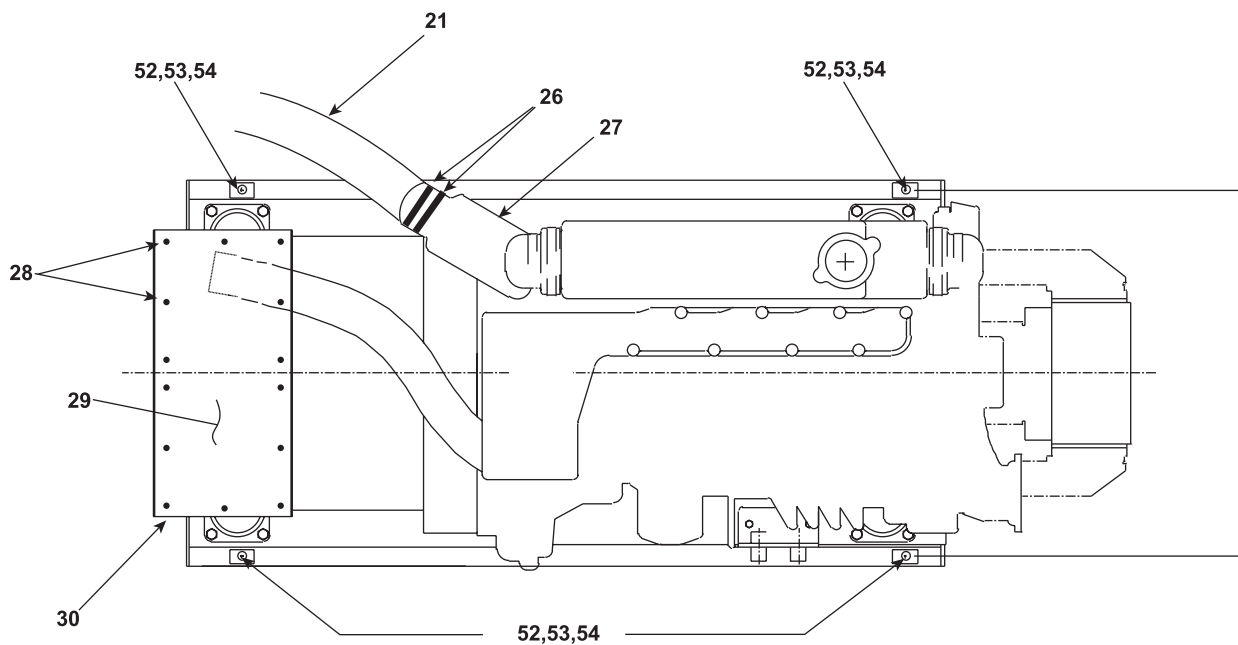
Match mark the sound insulation panels and framework before removing them. Failure to do so could cause lengthy delays upon installation.

13. Remove the screws (23) that secure the top sound insulating panels (24 and 25). Remove the sound insulating panel.



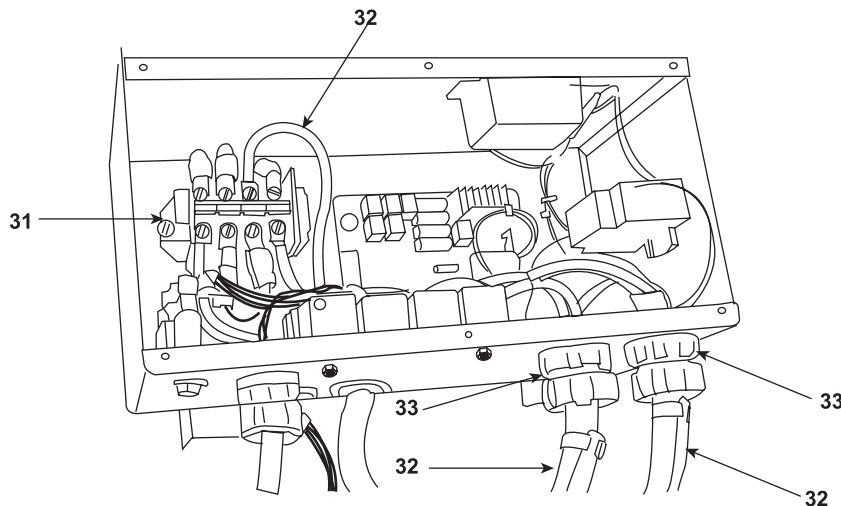
14. Disconnect the hose clamps (26) that connect the exhaust hose (21) to the engine exhaust elbow (27). Remove the exhaust hose from the engine exhaust elbow.

15. Remove the screws (28) that secure the control box cover (29) to the control box (30). Remove the control box cover.

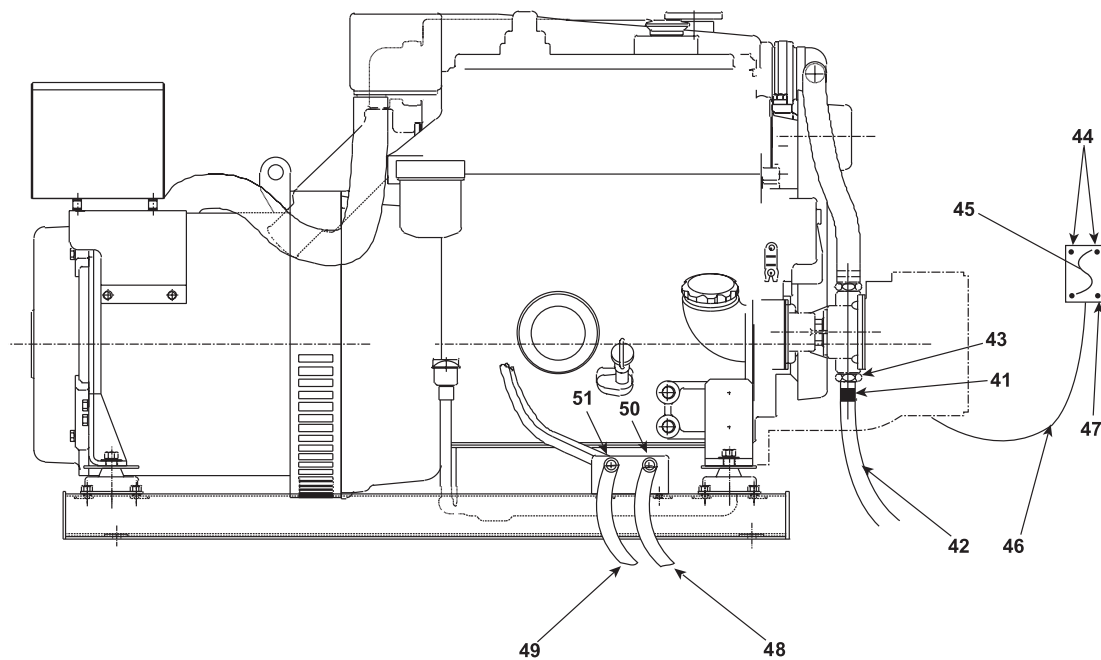


REMOVAL (continued)

16. Set the multimeter to the Vac (Volts alternating current) setting and check for voltage at all of the terminals on the terminal block (31). If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the shore power is properly secured.
17. Label and disconnect the control box wiring (32) from the terminal block (31).



18. Unscrew the strain relief nuts (33) and pull the wiring (32) from the control box (30).
19. Remove the screws (34) that secure the forward inboard sound insulating panel (35) to the sound insulation frame (36). Remove the forward inboard sound insulating panel.
20. Disconnect the quick disconnect plug (37) that connects the control wiring (38) to the main generator harness.
21. Remove the remaining screws (39) that secure the remaining panels (40) and sound insulation frame (36). Disassemble and remove the panels and frame sections.
22. Loosen the hose clamps (41) that secure the raw water inlet hose (42) to the raw water pump inlet (43). Remove the raw water inlet hose from the raw water pump inlet.
23. Remove the screws (44) that secure the fire pump clutch junction box cover (45), and remove the cover.
24. Set the multimeter to the Vdc (Volts direct current) setting. Connect one multimeter lead to each of the wiring connections and check for voltage. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
25. Label and disconnect the fire pump clutch wiring (46) and remove it from the junction box (47).
26. Remove the fire pump drive shaft (refer to WP 0145 00).
27. Label and disconnect the fuel inlet (48) and return (49) lines from the inlet (50) and discharge (51) fittings. Cap the fittings and lines to prevent contamination from entering the fuel system.
28. Remove the mounting bolts (52), washers (53), and nuts (54) that secure the diesel generator base to the hull structure.
29. Carefully inspect the work area for any other interference that might foul the diesel generator as it is removed from the engine room. Remove or relocate the interference as necessary.
30. Attach the lifting device to the diesel generator.
31. Carefully lift the diesel generator off its bed out of the engine room. Take care that the diesel generator does not foul on the starboard propulsion engine or on any other equipment on the way out of the engine room.



INSTALLATION

1. Attach the lifting device to the diesel generator.
2. Carefully lower the diesel generator onto its bed in the engine room, taking care that the diesel generator does not foul the starboard propulsion engine or any other equipment on its way into the engine room.
3. Line up the diesel generator base with its mounting holes and secure it to the hull structure with the mounting bolts (52), washers (53), and nuts (54).
4. Uncap the fuel lines and fittings. Connect the fuel inlet line (48) to the inlet (50) fitting and the return (49) line to the discharge (51) fitting using the labels from step 27 of Removal as a guide.
5. Install and align the fire pump drive shaft (refer to WP 0145 00 and WP 0146 00).
6. Connect the fire pump clutch wiring (46) in the junction box (47) using the labels from step 25 of Removal as a guide.
7. Position the fire pump junction box cover (45) on the junction box and secure it with the screws (44).
8. Connect the raw water inlet hose (42) to the raw water pump inlet (43) and secure it with the hose clamp (41).

NOTE

Do not install the top panels or the forward inboard panel at this time. These panels will be installed later.

9. Assemble the sound insulation frame (36) and panels (40) according to the match marks made during removal. Do not install the top panels or the forward panels at this time. Secure the frame sections and panels with the screws (39).
10. Connect the quick disconnect plug (37) that connects the control wiring (38) to the main generator harness.
11. Position the forward inboard sound insulating panel (35) in place and secure it with the screws (34).
12. Feed the control box wiring (32) through the strain reliefs and secure it with the strain relief nuts (33).

INSTALLATION (continued)

13. Connect the control box wiring (32) to the terminal block (31) using the labels from step 17 of Removal as a guide.
14. Position the control box cover (29) on the control box (30) and secure it with the screws (28).
15. Connect the exhaust hose (21) to the engine exhaust elbow (27) and secure it with the hose clamps (26).
16. Position the top sound insulating panels (24 and 25) on the frame and secure them with the screws (23).
17. Slide the exhaust hose (21) onto the muffler inlet (22) and secure it with the hose clamp (20).
18. Position the battery box mounting bracket (19) on the vessel structure and secure it with four screws.
19. Place the battery box (18) and battery (17) into the battery box mounting bracket (19).

NOTE

Always connect the negative battery cable last and disconnect it first.

20. Connect the positive (15) battery cable first, and then the negative (14) cable to the battery with the wing nuts (16).
21. Position the battery box cover (13) onto the battery box (18) and secure it with the battery box retaining strap (12) and wingnuts (11).
22. Wrap the male pipe threads of the through-hull piping (10) with antiseizing sealant tape and install the exhaust discharge valve (6) and elbow (9) onto the through-hull piping (10). Ensure that the exhaust discharge valve (6) and piping are oriented to allow installation of the exhaust hose (5).
23. Slide the exhaust hose (5) over the muffler outlet (8) and secure it with the hose clamp (7).
24. Slide the exhaust hose (5) over the exhaust discharge valve (6) and secure it with the hose clamps (4).
25. Remove the lockouts and tagouts and check the operation of the diesel generator, ensuring that the engine runs smoothly, that it runs at the proper speed, that it will produce the proper voltage, and that no leaks are present.
26. When the diesel generator checks out properly, position a new gasket (55) around the BERP opening.
27. Carefully lower the BERP (3) into place on the deck and secure it with the bolts (2) and nuts (1).

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAW WATER SYSTEM DUPLEX STRAINER, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine
(Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

Propulsion engines secured, locked out, and
tagged out IAW FM 55-502
Raw water duplex strainer removed
(WP 0128 00)

Materials/Parts:

Gasket Cylinder (p/n 10, qty 4)

References:

FM 55-502
WP 0128 00
TM 55-1905-242-24P (WP 0049)

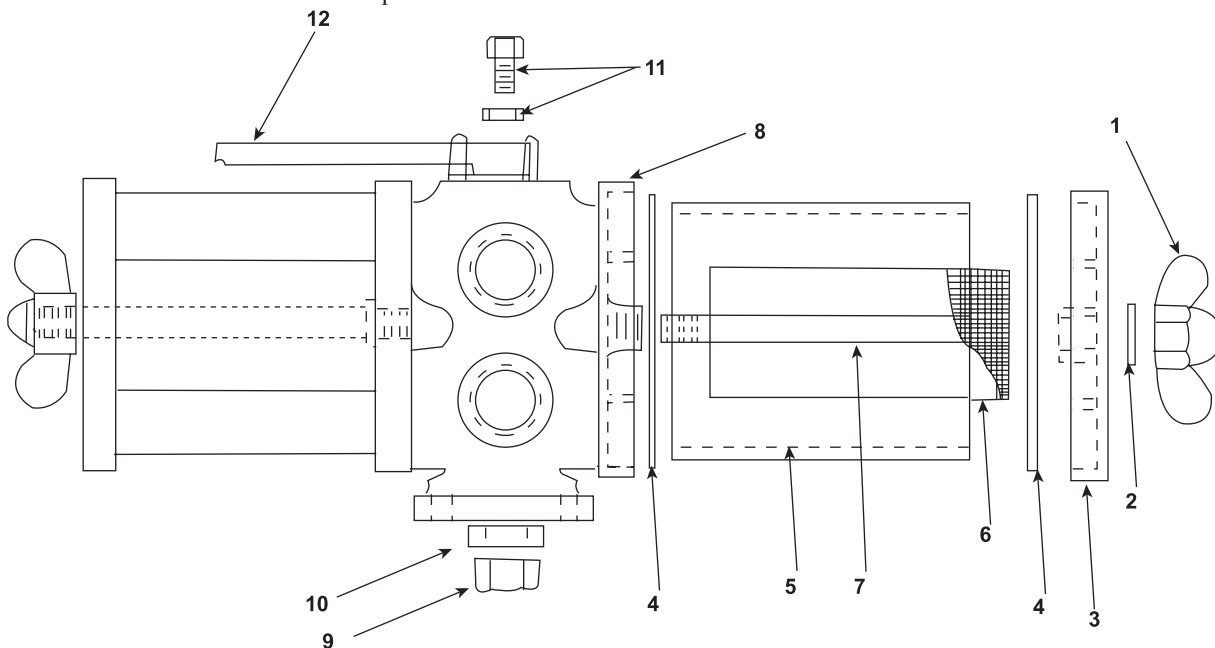
REPAIR

Repair of the duplex strainer is accomplished by the replacement of its component parts as required.

DISASSEMBLY**NOTE**

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

1. Loosen and remove the wing nut (1), lockwasher (2), end cap (3), and cylinder gasket (4) from the lucite cylinder (5).
2. Lift the strainer screen (6) off the threaded rod (7).
3. Remove the lucite cylinder (5) and the cylinder gasket (4) from the body (8).
4. Remove the threaded rod (7).
5. Disassemble the other end of the duplex stainer in the same manner.



DISASSEMBLY (continued)

6. Remove the nut (9), washer (10), and screw and washer assembly (11) from the body (8).
7. Remove the handle (12) from the body (8).

CLEANING

1. Clean all parts in fresh water.
2. Inspect all parts for wear, deformity, or damage. Replace all of the cylinder gaskets (4) and any other worn, deformed, or damaged parts.

ASSEMBLY

1. Install the threaded rod (7) into the body (8).
2. Position a cylinder gasket (4) in place on the body (8) and insert the strainer screen (6) over the threaded rod (7).
3. Place the lucite cylinder (5) on the body (8).
4. Place a new cylinder gasket (4) in the end cap (3).
5. Install the end cap (3) onto the lucite cylinder (5) and secure it with the lockwasher (2) and wing nut (1).
6. Assemble the other end of the strainer in the same manner.
7. Install the handle (12) on the body (8) using the nut (9), washer (10), and screw and washer assembly (11).
8. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
AIR CONDITIONING COOLING UNITS, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
 Tool Kit, Service Refrigeration (Item 8, Table 1, WP 0230 00)
 Recovery Unit (Item 9, Table 1, WP 0230 00)
 Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Monochlorodifluorom (Refrigerant) (R-22) (Item 27, Table 2, WP 0230 00)
 Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)

Equipment Condition:

A/C SEA WTR COOLING PUMP circuit breaker set to OFF, locked out, and tagged out IAW FM 55-502
 Circuit breaker for appropriate cooling unit set to OFF, locked out, and tagged out IAW FM 55-502
 Deck plate removed in pilothouse

References:

FM 55-502
 TM 55-1905-242-24P (WP 0060)

REMOVAL

WARNING



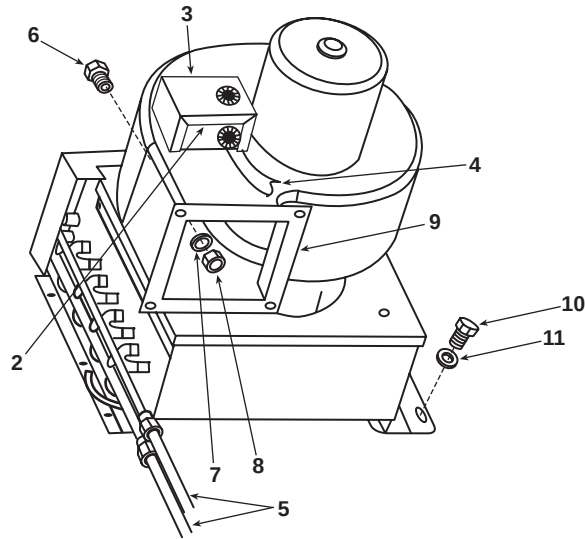
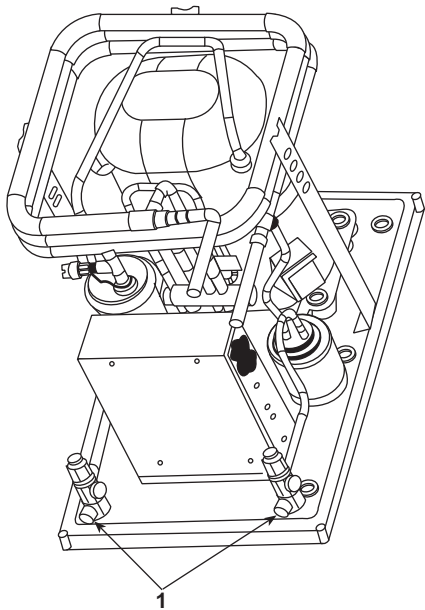
Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

Goggles should always be worn when working with refrigerant. Failure to wear goggles when working with refrigerant may result in serious injury or death to personnel.

1. Don protective goggles and connect the recovery unit to the service valves (1) for the appropriate condensing unit and evacuate the system.
2. To remove the pilothouse cooling unit:
 - a. Remove the center and starboard access panels under the pilothouse console.
 - b. Remove the screws (2) that secure the electrical box cover (3). Remove the cover.
 - c. Set the multimeter to the Vac (Volts alternating current) setting. Locate the terminal block to which the wiring (4) is connected and use the multimeter to check for voltage. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
 - d. Label and disconnect the wiring (4) from the cooling unit.

REMOVAL (continued)

- e. Disconnect the refrigerant piping (5) from the cooling unit. Cap the open ends of the piping to prevent entry of contamination into the system.
- f. Remove the bolts (6), washers (7), and nuts (8) that secure the output flange (9) to the duct.
- g. Remove the bolts (10) and washers (11) that secure the cooling unit to the bulkhead. Remove the cooling unit.



3. To remove the accommodation module cooling unit:

- a. Remove the starboard access panel or open the port stowage locker door, as appropriate.
- b. Remove the screws (2) that secure the electrical box cover (3). Remove the cover.
- c. Set the multimeter to the Vac (Volt alternating current) setting. Locate the terminal block to which the wiring (4) is connected and use the multimeter to check for voltage. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
- d. Label and disconnect the wiring (4) from the cooling unit.
- e. Disconnect the refrigerant piping (5) from the cooling unit. Cap the open ends of the piping to prevent entry of contamination into the system.
- f. Remove the bolts (6), washers (7), and nuts (8) that secure the output flange (9) to the duct.
- g. Remove the bolts (10) and washers (11) that secure the cooling unit to the bulkhead. Remove the cooling unit.

INSTALLATION

1. To install the accommodation module cooling unit:
 - a. Position the cooling unit on the bulkhead and secure it with the bolts (10) and washers (11).
 - b. Position the duct on the output flange (9) and secure it with the bolts (6), washers (7), and nuts (8).
 - c. Connect the refrigerant piping (5) to the cooling unit.
 - d. Connect the wiring (4) to the cooling unit using the labels from step 3d of Removal as a guide.
 - e. Position the electrical box cover (3) on the electrical box and secure it with the screws (2).
 - f. Install the starboard access panel or close the port stowage locker door, as appropriate.
 - g. Proceed to steps 3 through 5 below.
2. To install the pilothouse cooling unit:
 - a. Position the cooling unit on the bulkhead and secure it with the bolts (10) and washers (11).
 - b. Position the duct on the output flange (9) and secure it with the bolts (6), washers (7), and nuts (8).
 - c. Connect the refrigerant piping (5) to the cooling unit.
 - d. Connect the wiring (4) to the cooling unit using the labels from step 2d of Removal as a guide.
 - e. Position the electrical box cover (3) on the electrical box and secure it with the screws (2).
 - f. Install the center and starboard access panels under the pilothouse console.
 - g. Proceed to steps 3 through 5 below.
3. Connect the manifold gauges and vacuum pump to the service valves (1) and draw the system into a vacuum. Allow the system to remain in a vacuum for at least 30 minutes before proceeding.
4. Remove the vacuum pump. Remove the lockouts and tagouts and recharge the system with monochlorodifluorom (refrigerant).
5. Check the operation of the system. The fan should operate at all speeds, and the output air should be noticeably cooler than the ambient air.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
AIR CONDITIONING CONDENSING UNITS, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Tool Kit, Service Refrigeration (Item 8, Table 1, WP 0230 00)
Recovery Unit (Item 9, Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Monochlorodifluorom (Refrigerant) (R-22) (Item 27, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)

Equipment Condition:

A/C SEA WTR COOLING PUMP circuit breaker set to OFF, locked out, and tagged out IAW FM 55-502.
Circuit breaker for appropriate cooling unit set to OFF, locked out, and tagged out IAW FM 55-502.

References:

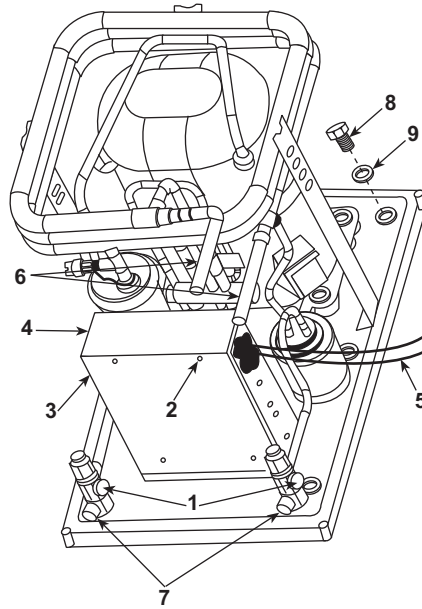
FM 55-502
TM 55-1905-242-24P (WP 0061)

REMOVAL**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

Goggles should always be worn when working with monochlorodifluorom (refrigerant). Failure to wear goggles when working with monochlorodifluorom (refrigerant) can result in serious injury or death to personnel.

1. Don protective goggles.
2. Connect the recovery unit to the service valves (1) and recover the monochlorodifluorom (refrigerant) from the unit.
3. Remove the screws (2) that secure the electrical box cover (3) to the electrical box (4). Remove the cover.
4. Set the multimeter to the Vac (Volts alternating current) setting. Locate the terminal block to which the wiring (5) is connected. Use the multimeter to check for voltage. If no voltage is noted, proceed to the next step. If voltage is noted, ensure that the circuit breaker is properly secured.
5. Label and remove the wiring (5) from the electrical box (4).
6. Remove the raw water lines from the condenser fittings (6).
7. Disconnect the refrigerant lines from the service valve fittings (7).
8. Remove the bolts (8) and washers (9) that secure the condensing unit to the deck. Remove the condensing unit.



INSTALLATION

1. Position the condensing unit on the deck and secure it with the bolts (8) and washers (9).
2. Connect the refrigerant lines to the service valve fittings (7).
3. Connect the raw water lines to the condenser fittings (6).
4. Connect the wiring (5) inside the electrical box (4) using the labels from step 5 of Removal as a guide.
5. Position the electrical box cover (3) on the electrical box (4) and secure it with the screws (2).
6. Connect the manifold gauges and vacuum pump to the service valves (1) and draw the system into a vacuum. Allow the system to remain in a vacuum for at least 15 minutes before proceeding.
7. Remove the vacuum pump. Remove the lockouts and tagouts and charge the system with monochlorodifluorom (refrigerant).
8. Check the operation of the system. The output air should be noticeably cooler than the ambient air.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BILGE PUMP/HYDRAULIC MOTOR ASSEMBLY, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Suitable Drain Pan

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)

Equipment Condition:

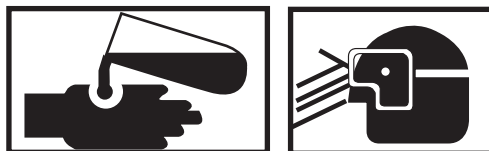
Propulsion engines secured, locked out, and
tagged out IAW FM 55-502

References:

FM 55-502
TM 55-1905-242-24P (WP 0064)

Personnel Required:

Two Watercraft Engineers, 88L

REMOVAL**WARNING**

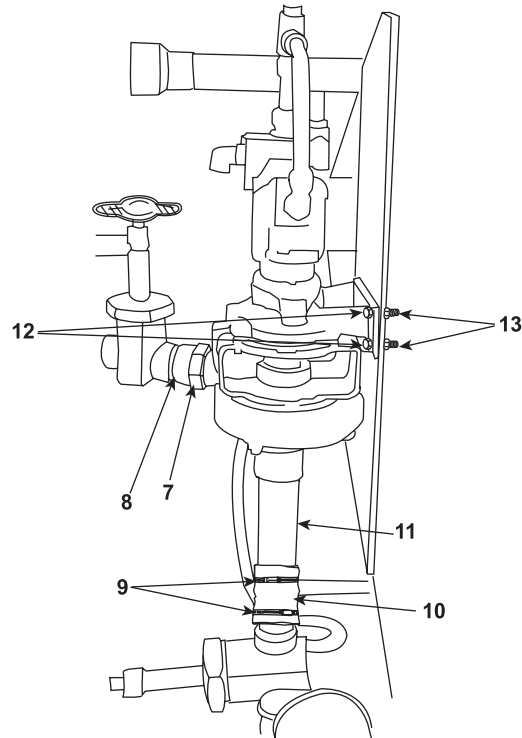
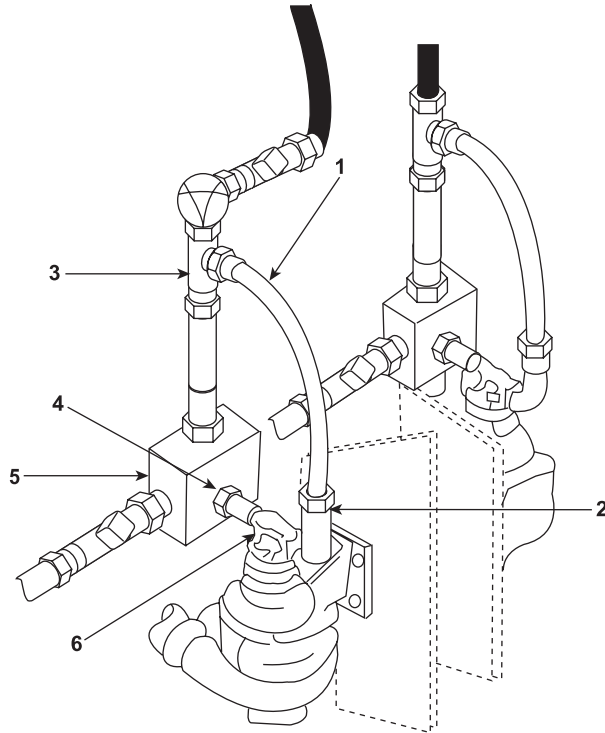
Do not allow hydraulic fluid or engine oil to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious injury or death.

1. Don chemical protective gloves and goggles and position a suitable drain pan beneath the work area.
2. Loosen, but do not remove, the discharge line (1) to allow any residual pressure and fluid to drain from the system.
3. Disconnect the discharge line (1) from the discharge elbow (2) and the T connection (3). Remove the discharge line.
4. Disconnect the union (4) that connects the flow control valve (5) to the motor (6). Remove the flow control valve from the motor.
5. Disconnect the union (7) from the bilge pump discharge piping (8).
6. Loosen the hose clamps (9) that secure the suction hose (10) to the suction piping (11).
7. Remove the four mounting bolts (12) and nuts (13) that secure the pedestal to the upright.

REMOVAL (continued)

8. Remove the pump/hydraulic motor assembly from the engine room and place it on a suitable work bench.
9. Plug and/or cap all open hydraulic lines to prevent contamination of the system.

**INSTALLATION**

1. Position the pump/hydraulic motor assembly against the upright, and secure it with the four mounting bolts (12) and nuts (13).
2. Remove the plugs and/or caps from the hydraulic lines and reconnect the hydraulic lines to their fittings.
3. Secure the suction hose (10) to the suction piping (11) with the hose clamps (9).
4. Connect the bilge pump discharge piping (8) at the union (7).
5. Connect the flow control valve (5) to the motor (6) with the union (4).
6. Connect the hydraulic return line (1) to the discharge elbow (2) and the T connection (3).
7. Remove the lockouts and tagouts and check the operation of the system, ensuring that the motor and pump operate properly and that no hydraulic fluid or water leaks are present.
8. Check the level of hydraulic fluid in the reservoir and replenish the hydraulic fluid as required.
9. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BILGE PUMP/HYDRAULIC MOTOR ASSEMBLY, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Wrench, Torque, 1/2" Drive, 0-200 lb-ft (Item 12, Table 1, WP 0230 00)

Equipment Condition:

Bilge pump/hydraulic motor assembly removed (WP 0170 00)

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts: (continued)

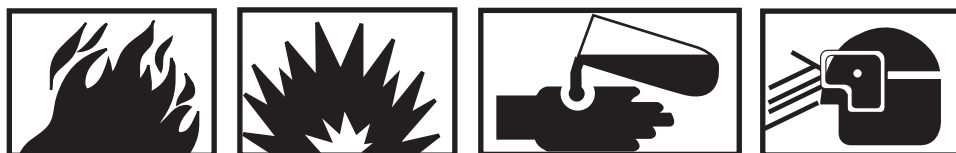
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Crocus Cloth (Item 22, Table 2, WP 0230 00)
Gasket (p/n 21216, qty 1)
Seal, Shaft Dirt (p/n 20010-02, qty 1)
Seal, High Pressure (p/n 2009-04, qty 1)
O-Ring (p/n 25001-31, qty 1)
O-Ring (p/n 25000-38, qty 2)
O-Ring (p/n 25009-20, qty 1)

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)

References:

WP 0170 00
TM 55-1905-242-24P (WP 0064)

DISASSEMBLY**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

NOTE

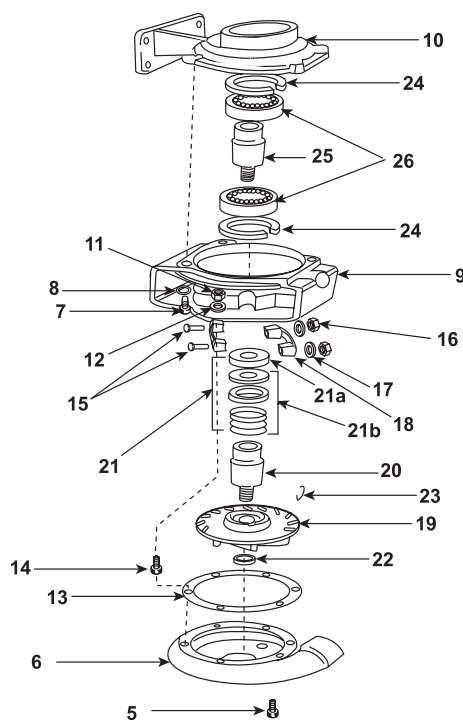
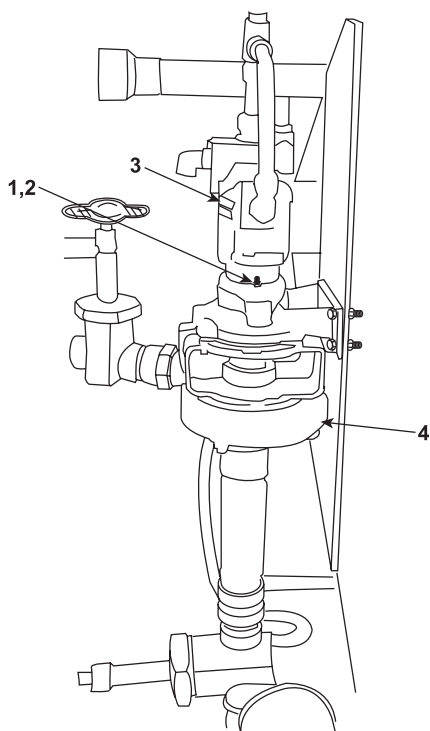
The motor and pump must be separated before disassembling either unit. If only one unit (pump or motor) requires repair, the other unit may be left intact until the pump and motor are joined.

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

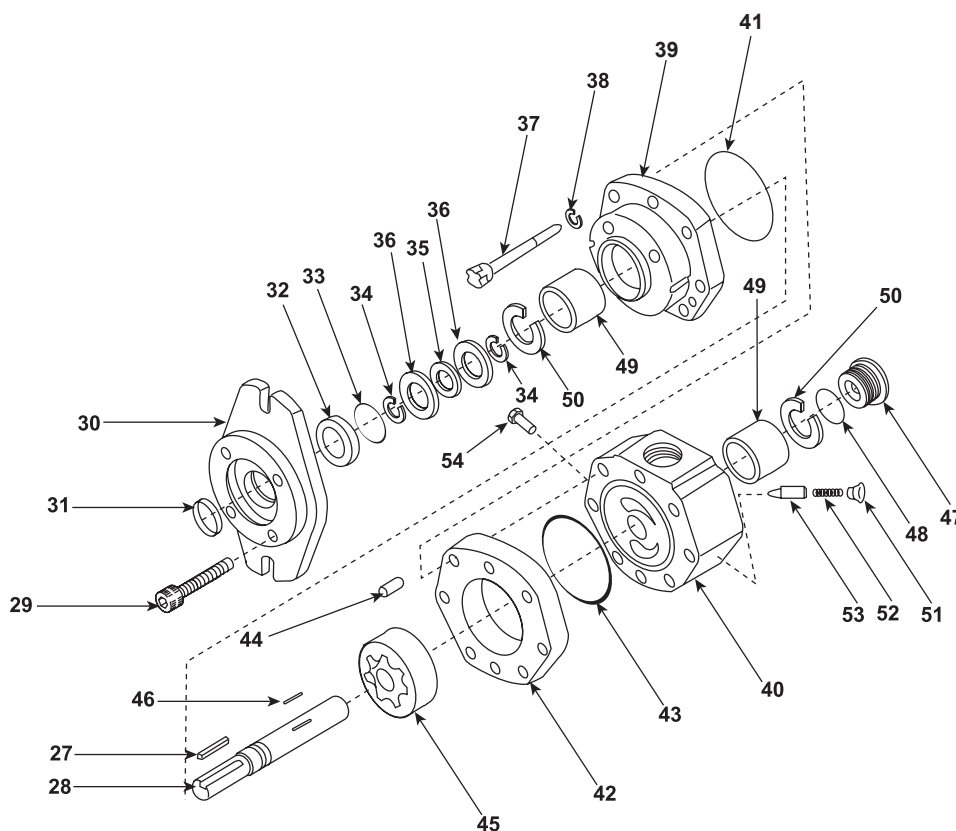
DISASSEMBLY (continued)

1. Don chemical protective gloves and goggles.
2. To separate the bilge pump from the hydraulic motor:
 - a. Remove the two bolts (1) and washers (2) that secure the hydraulic motor (3) to the bilge pump (4).
 - b. Slide the hydraulic motor (3) out of the bilge pump (4).
3. To disassemble the bilge pump:
 - a. Remove the drain plug (5) and drain the housing (6) of any residual water.
 - b. Remove the four capscrews (7) and lockwashers (8) that secure the pump adapter (9) to the pedestal (10).
 - c. Separate the pump adapter (9) from the pedestal (10).
 - d. Remove the six nuts (11) and lockwashers (12) that secure the pump adapter (9) to the housing (6).
 - e. Separate the pump adapter (9) from the housing (6) and remove the gasket (13). Do not remove the studs (14) from the housing unless they require replacement.
 - f. Remove the bolts (15), nuts (16), and lockwashers (17) that hold the shaft clamp (18) together. Remove the shaft clamp.
 - g. Slide the impeller (19), shaft sleeve (20), and seal assembly (21) out of the pump adapter (9). The seal seat (21a) will remain in the pump adapter.
 - h. Carefully remove the seal seat (21a) from the pump adapter (9) and remove the seal assembly (21b) from the shaft sleeve (20).
 - i. Remove the impeller locknut (22) from the end of the shaft sleeve (20) and slide the impeller (19) and Woodruff key (23) off the shaft sleeve.
 - j. Remove the snap rings (24) from the pedestal (10).



DISASSEMBLY (continued)

- k. Remove the shaft (25) and the bearings (26) from the pedestal (10) as an assembly. Do not remove the bearings from the shaft unless they must be replaced. If the bearings must be replaced, use a puller to pull them off the shaft.
4. To disassemble the hydraulic motor:
 - a. Remove the shaft drive key (27) from the shaft (28).
 - b. Remove the four screws (29) from the face of the mounting flange (30). Remove the mounting flange.
 - c. Remove the shaft dirt seal (31), high pressure shaft seal (32), O-ring (33), retainer rings (34), thrust bearing (35), and washers (36).
 - d. Remove the six screws (37) and lockwashers (38) that secure the front bearing housing (39) to the motor body (40).
 - e. Separate the front bearing housing (39) from the motor body (40). Remove the motor body and front bearing housing O-ring (41).
 - f. Remove the gerotor housing (42) and O-ring (43) from the motor body (40). Do not remove the four locating dowels (44) unless they must be replaced.
 - g. Remove the gerotor (45) and the gerotor drive key (46) from the shaft (28).
 - h. Remove the end plug (47) and O-ring (48) from the motor body (40).
 - i. Do not remove the roller bearings (49) from the motor body (40) or from the front bearing housing (39) unless the bearings will be replaced. If the bearings will be replaced, remove the retaining rings (50) from the motor body and front bearing housing and gently drive out the bearings.



DISASSEMBLY (continued)

- j. Remove the two check valve plugs (51), springs (52), and check valve poppets (53) from the motor body (40).
- k. Remove the external drain plug (54) from the motor body (40).

CLEANING AND INSPECTION

1. If not already on, don protective gloves and goggles. Clean all metal parts with cleaning solvent and dry them with clean wiping rags.
2. Inspect the gasket for nicks, tears, or other damage. Replace the gasket if it is not intact.
3. Inspect the shaft sleeve for nicks, burrs, wear, or other damage. If the shaft sleeve has nicks or burrs, they may be removed with crocus cloth. If the shaft sleeve is worn or damaged, it must be replaced.
4. Inspect the seal seat, cup, and bellows for wear or deterioration. If the perfect lapped surface remains on the seal seat and cup, they may be reused; if not, they must be replaced. The bellows may be reused if it is not deteriorated.
5. Inspect the bearings for wear or damage. Check that the bearings roll smoothly. Replace the bearings if they are worn, damaged, or do not roll smoothly.
6. Inspect the impeller and the pump housing for wear or damage. Replace the component if excessive wear or damage is found.
7. Inspect the roller bearings and shaft for wear and damage. Check that the bearings roll smoothly. Replace the roller bearings if they are worn, damaged, or do not roll smoothly. Replace the shaft if it is worn.
8. Inspect the sealing surfaces of the front bearing housing, motor body, and gerotor housing for scratches, nicks, scoring, or other damage. Replace or remachine the parts as necessary.
9. Inspect the gerotor for wear or damage. The gerotor must be perfectly smooth. Replace the gerotor if it is worn or damaged.
10. Replace the O-rings and seals.

ASSEMBLY

1. To assemble the hydraulic motor:
 - a. Place the gerotor drive key (46) into its slot on the shaft (28) and slide the gerotor (45) over it.
 - b. Install the roller bearings (49) into the front bearing housing (39) and the motor body (40) if they were removed. The bearings can be installed most easily by placing them in a freezer for one hour prior to installation. The frozen bearings should slide easily into their bores. If freezing the bearings is not practical, install them with great care to prevent damage during installation.
 - c. Install the retainer rings (50) to secure the roller bearings (49) in their bores. The sharp edge of the retainer rings must be positioned away from the bearing in order to hold properly.
 - d. Install the thrust bearing (35) on the shaft (28) between the washers (36).
 - e. Install the retainer rings (34) that locate the thrust bearing (35) and washers (36) on the shaft (28). The sharp edge of the retainer rings must be positioned away from the washers in order to hold properly. The gaps in the retainer rings must be placed 180 degrees away from the milled slots in the shaft.
 - f. Place the shaft assembly and the front bearing housing O-ring (41) into the front bearing housing (39).

ASSEMBLY (continued)

- g. Install the gerotor housing (42) over the gerotor (45) and onto the front bearing housing (39). Ensure that the front bearing housing O-ring (41) is located properly, and not pinched when the gerotor housing is firmly seated.
 - h. Install the O-ring (43) into the motor body (40).
 - i. Apply a generous coating of hydraulic fluid to the gerotor (45) and position into the motor body (40) over the shaft (28). Ensure that the O-ring (43) is located properly and not pinched when the motor body is firmly seated.
 - j. Secure the front bearing housing (39), gerotor housing (42), and motor body (40) with the six screws (37) and lockwashers (38). Torque the screws to 42 lb-ft (57 Nm).
 - k. Install the shaft dirt seal (31), high pressure shaft seal (32), and O-ring (33) into the mounting flange (30). Coat the sealing surfaces with clean hydraulic fluid.
 - l. Position the mounting flange (30) onto the front bearing housing (39) and secure it with the four screws (29). Torque the screws to 8 lb-ft (11 Nm).
 - m. Install the shaft drive key (27) in the shaft (28) keyway.
 - n. Install the two check valve poppets (53), springs (52), check valve plugs (51), and external drain plug (54) into the motor body (40).
 - o. Place the O-ring (48) over the end plug (47) and install the end plug into the motor body (40).
2. To assemble the bilge pump:
- a. Lubricate the seal seat (21a) and cup assembly with clean hydraulic fluid. Press the seal seat into the pump adapter (a) counterbore, seating it firmly and squarely. Install the seal cup into the seal seat.
 - b. Install the impeller (19) and Woodruff key (23) onto the shaft sleeve (20) and secure with the impeller locknut (22).
 - c. Press the seal bellows, washer, and seal assembly (21b) onto the shaft sleeve (20).
 - d. Slide the impeller (19)/shaft sleeve (20)/seal assembly (21) into the pump adapter (9).
 - e. Install the drain plug (5) and gasket (13) on the housing (6) and install the housing and gasket onto the pump adapter (9). Secure the housing to the pump adapter with the studs (14), lockwashers (12), and six nuts (11).
 - f. If removed, assemble the bearings (26) and snap rings (24) onto the shaft (25).
 - g. Install the shaft assembly (25, 26, and 24) into the shaft sleeve (20).
 - h. Install the shaft clamp (18), bolts (15), lockwashers (17), and nuts (16). Loosely tighten the bolts and nuts.
 - i. Rotate the shaft (25) slowly by hand to make sure that the impeller (19) does not rub or hit the housing (6). If the impeller rubs or hits, pry the impeller back and rotate the shaft again. If the impeller does not rub or hit, finish tightening the bolts (15) and nuts (16).
 - j. Position the pump adapter (9) onto the pedestal (10) and secure it with the four capscrews (7) and lockwashers (8).

ASSEMBLY (continued)

3. To assemble the hydraulic motor to the bilge pump:
 - a. Sliding the hydraulic motor (3) into the bilge pump (4).
 - b. Secure the hydraulic motor (3) to the bilge pump (4) with the bolts (1) and washers (2).
4. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
WASTE OIL PUMP, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)

Equipment Condition:

Waste oil pump removed (WP 0142 00)

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts:

Cleaning Solvent PD 680 (Item 2, Table 2, WP 0230 00)

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)

Materials/Parts (continued):

Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)

Rag, Wiping (Item 5, Table 2, WP 0230 00)

Grease (Item 21, Table 2, WP 0230 00)

Seal, Plain Encased (p/n A5007, qty 1)

O-Ring (p/n 9797-033, qty 1)

References:

FM 55-502

WP 0142 00

TM 55-1905-242-24P (WP 0142)

DISASSEMBLY**WARNING**

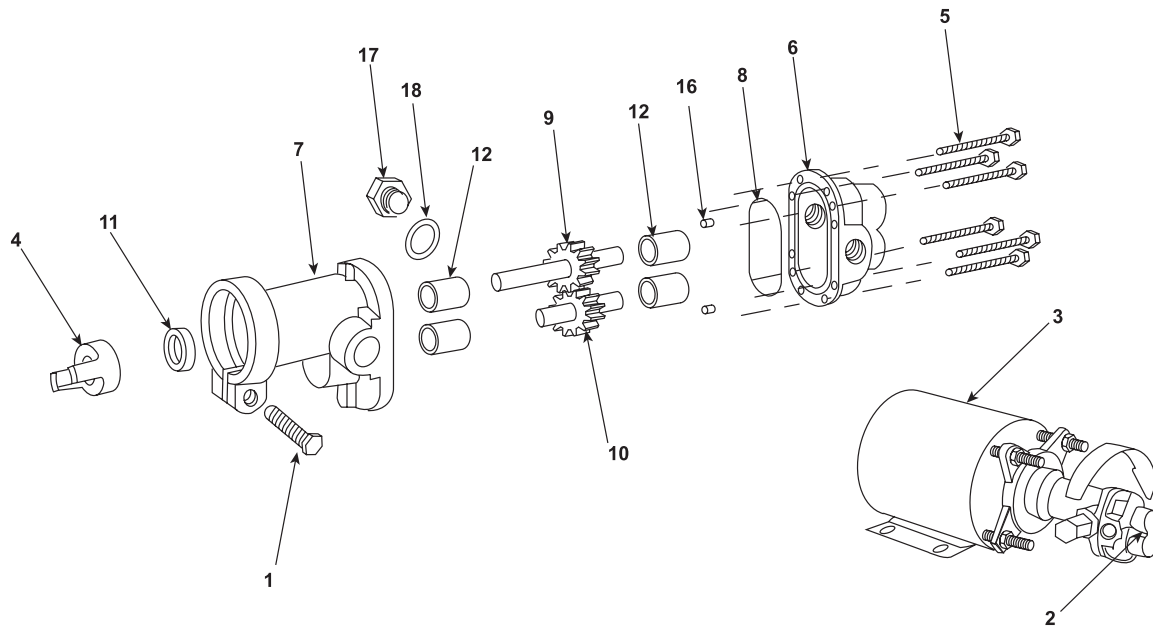
Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

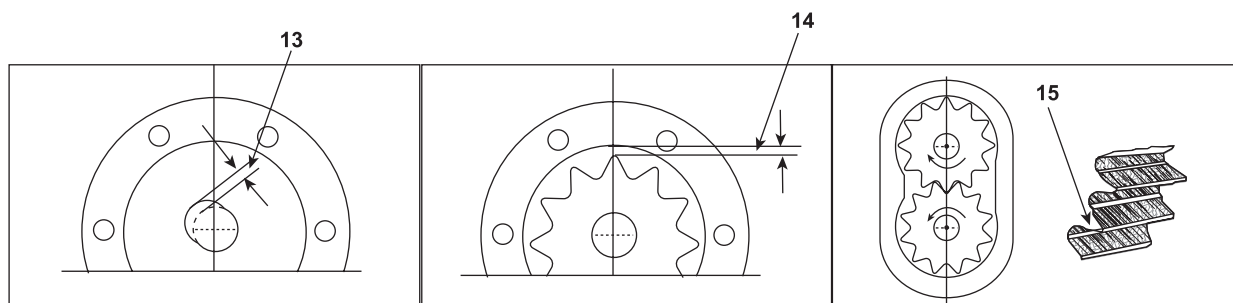
1. Don chemical protective gloves and goggles.
2. Loosen the clamping screw (1) that clamps the waste oil pump (2) to the motor (3). Slide the waste oil pump off the motor, taking care not to lose the coupling (4).
3. Remove the screws (5) that attach the body (6) to the cover (7). Remove the cover and the O-ring (8).
4. If not already removed, slide the coupling (4) off the drive gear shaft (9).
5. Slide the drive gear (9) and the idler gear (10) out of the body (6).
6. Use a small punch to remove the seal (11) from the cover (7).

DISASSEMBLY (continued)

7. If the bearings (12) will be replaced, use a small chisel to chip them out of their bores. The bearing material is very brittle and will chip out easily. Take care not to damage the bearing bores during removal.

**CLEANING AND INSPECTION**

1. If not already on, don protective gloves and goggles.
2. Wash all parts in cleaning solvent and dry them with clean wiping rags.
3. Check the cover (7) and body (6) for signs of wear or scoring. Replace the body and/or cover if scoring or wear is present.
4. Check the amount of bearing wear by sliding the exposed (coupling) end of the drive gear (9) shaft into each of the four bearings (12) and check for side play. Replace the bearings if the shaft side play (13) exceeds 0.006 inch (0.15 mm). A new shaft in new bearings should have a side play of 0.002 to 0.003 inch (0.05 to 0.08 mm). If the bearings require replacement, replace them before performing the remaining clearance inspections.
5. Check the clearance between the gear teeth and the gear chamber (14) by installing the gears and measuring the clearance with a feeler gauge. If the gear teeth to gear chamber clearance exceeds 0.010 inch (0.25 mm), the waste oil pump (2) is beyond repair and must be replaced.
6. Check the gears for gear teeth wear (15). Gear teeth wear occurs on the pressure face of each tooth only. The extent of wear can be approximated by visualizing the tooth profile on the back face transposed to the pressure face. Replace the gears if they show signs of wear.



CLEANING AND INSPECTION (continued)

7. Check the gears for side wear by noting the level of the gear face below the flange surface. For a new waste oil pump, the gear face is even with or slightly above 0.001 inch (0.03 mm) the body flange. If the gear face is lower than 0.005 inch (0.03 mm) below the flange, replace the gears or the body as necessary.

ASSEMBLY

1. Carefully press a new seal (11) into the cover (7).
2. If removed, install new bearings (12) into the cover (7) and the body (6).
3. Rub a thin film of clean grease onto the seal (11) and the gear shafts (9 and 10). Slide the gears into the body (6).
4. Rub a thin film of clean grease onto the O-ring (8) and install the O-ring into its groove on the body (6).
5. Position the cover (7) in place on the body (6), aligning it with the dowel pins (16). Secure the cover to the body with the screws (5).
6. Turn the drive gear shaft (9) by hand and check that the gears rotate freely.
7. Remove the cap plugs (17) from the body (6) and install new sealing washers (18). Install the cap plugs and tighten them snugly.
8. Slide the coupling (4) onto the drive gear shaft (9).
9. Slide the waste oil pump (2) onto the motor (3), aligning the coupling (4) to the motor drive. Secure the waste oil pump to the motor by tightening the clamping screw (1).
10. Dispose of used cleaning solvent and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
HAND PUMP, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)

Equipment Condition:

Hand pump removed (WP 0143 00)

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts:

Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)

Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)

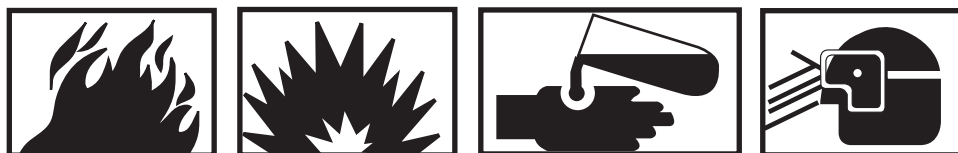
Rag, Wiping (Item 5, Table 2, WP 0230 00)

References:

FM 55-502

WP 0143 00

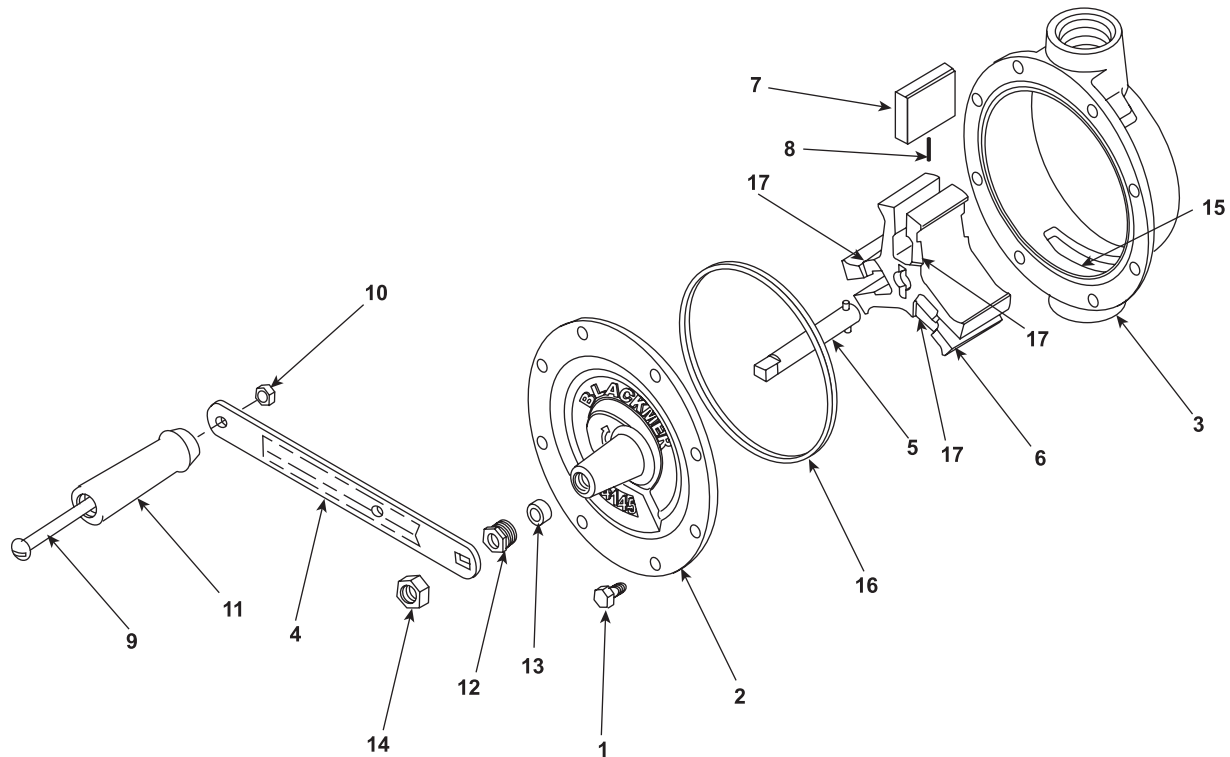
TM 55-1905-242-24P (WP 0068)

DISASSEMBLY**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don protective gloves and goggles.
2. Remove the bolts (1) that attach the head (2) to the cylinder (3).
3. Remove the head (2), crank handle (4), and shaft and pin assembly (5) as a unit.
4. Remove the rotor (6) and vanes (7) as an assembly.
5. Remove the vanes (7) and springs (8) from the rotor (6).
6. Do not remove the handle pin (9), nut (10), grip (11), packing nut (12), packing (13), or jam nut (14) unless one or more of these items requires replacement.



CLEANING AND INSPECTION

1. If not already on, don protective gloves and goggles.
2. Clean all parts in cleaning solvent and dry with clean wiping rags.
3. Inspect the cylinder and head for rust, signs of wear, or gouging. Rust and light wear can be dressed out by sanding.
4. Inspect the vanes for wear or breakage. Replace the vanes if worn or broken.

ASSEMBLY

1. Lay the cylinder (3) flat on the workbench with the internal port recesses (15) to the right.
2. Position the O-ring (16) in its groove on the cylinder (3).
3. Place the rotor (6) in the cylinder (3) with the relief grooves (17) facing in the direction of rotation (clockwise).
4. Insert the springs (8) into the vanes (7).
5. Place a vane (7) with spring (8) installed into the slot in the rotor (6). The spring must face the center of the rotor.
6. Compress the spring (8) against the bottom of the vane slot and slide the vane into position. Ensure that the spring enters the corresponding hole in the rotor slot.
7. Repeat steps 5-6 for the remaining two vanes (7).
8. Position the head (2) assembly on the cylinder (3), ensuring that the shaft and pin assembly (5) engages the slot in the rotor (6).

ASSEMBLY (continued)

9. Secure the head (2) assembly to the cylinder (3) with the bolts (1).
10. Turn the pump by hand and ensure that it rotates freely.
11. Dispose of used cleaning solvent and contaminated materials in accordance with local procedures.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BALLAST/FIRE PUMP, REPAIR/REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Hoisting Device, 2 Ton (Item 11, Table 1,
WP 0230 00)

Equipment Condition:

Diesel generator secured, locked out, and
tagged out IAW FM 55-502
FIRE PUMP CLUTCH circuit breaker set to OFF,
locked out and tagged out IAW FM 55-502
Fire pump seacock CLOSED, locked out, and
tagged out IAW FM 55-502

Equipment Condition (continued):

Fire pump drive shaft removed (WP 0146 00)
Fire pump inlet and discharge piping removed
(WP 0144 00)

Personnel Required:

Two Watercraft Engineers, 88L

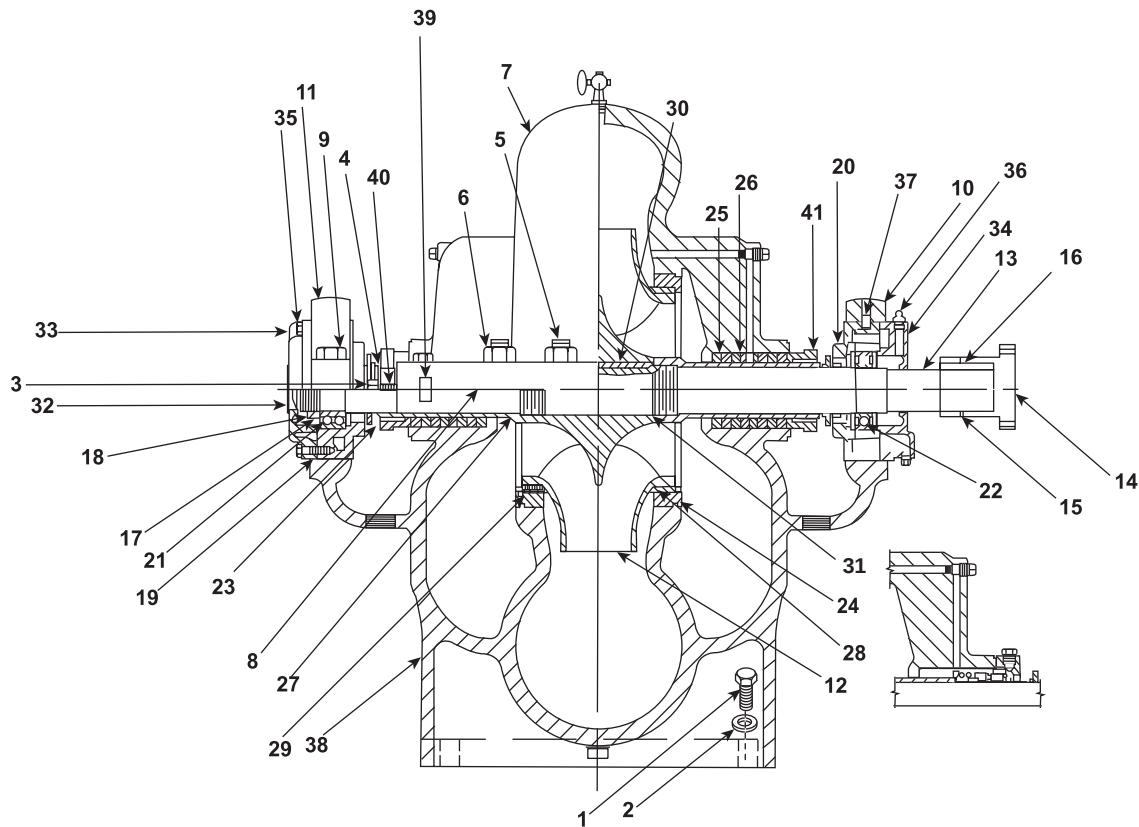
References:

FM 55-502
WP 0144 00
WP 0145 00
WP 0146 00
TM 55-1905-242-24P (WP 0070)

REMOVAL**NOTE**

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

1. Remove the bolts (1) and lockwashers (2) that secure the pump to its base.
2. Attach the hoisting device to the pump and lift it free of its mount. Set the pump down on the deck plate. Reattach the hoisting device to another overhead structure closer to the engine room hatch. Lift the pump and set it down on the deck plate in a position closer to the engine room hatch. Continue "walking" the pump across the deck with the hoisting device until the pump can be hoisted out the engine room hatch.



DISASSEMBLY

NOTE

Unless the lower half casing must be replaced, pump repair may be performed without removing the pump.

1. Remove the split gland nuts (3) and gland clips (4).
2. Remove the bolts (5) and nuts (6) and lift off the upper half casing (7).
3. Remove the parting gasket (8) and soak it in water.
4. Remove the bearing cap bolts (9). Match mark and remove the bearing caps (10 and 11).
5. Lift out the impeller (12) and pump shaft (13) as an assembly.
6. Do not remove the drive flange (14) unless the flange or the shaft must be replaced. If the flange must be replaced, remove it by loosening the set screw (15) and sliding the flange off the shaft. Remove the coupling key (16).
7. Open the tangs on the bearing lockwasher (17). Unscrew and remove the bearing locknut (18) and bearing lockwasher.
8. Pull off the bearing housings (19 and 20).
9. Remove the bearings (21 and 22) from the bearing housings (19 and 20).
10. Remove the deflectors (23) and case wearing rings (24).
11. Remove the packing rings (25) and lantern rings (26).

DISASSEMBLY (continued) **CAUTION**

One shaft sleeve is right hand thread, the other is left hand thread. The shaft sleeves must be turned in the correct direction when removing and installing them to prevent damage to the shaft and shaft sleeves.

12. Mark the impeller (12) location in relation to the pump shaft (13) and remove by unscrewing the shaft sleeves (27). One shaft sleeve is right-hand thread, the other is left-hand thread.
13. If the impeller wear rings (28) will be replaced, remove all 12 set screws (29) and chisel the impeller wear rings from the impeller (12).

ASSEMBLY

1. If removed, press the impeller wear rings (28) onto the impeller (12), ensuring that they are fully and evenly seated. Secure the impeller wear rings with the 12 set screws (29).
2. Position the impeller key (30) on the pump shaft (13).
3. Slide the impeller (12) onto the pump shaft (13), centering the impeller between the shaft threads. Use the match marks from step 12 of Disassembly as a guide.
4. Slide the shaft sleeve gaskets (31) over the pump shaft (13) and place one gasket against each side of the impeller (12).
5. Thread the shaft sleeves (27) onto the pump shaft (13), but do not draw them up to the impeller (12) yet.
6. Place the lantern rings (26) and deflectors (23) on the pump shaft (13).
7. Slide the bearings (21 and 22) into the bearing housings (19 and 20). Press only on the outer race, if required.
8. Place the bearing housings (19 and 20) on the pump shaft (13). Press only on the inner bearing race if required.
9. Place the bearing lockwasher (17) on the pump shaft (13) and secure the bearing housing (19 and 20) in place with the bearing locknut (18).
10. Press the bearing dust cover (32) into the bearing cover (33).
11. Place the bearing covers (33 and 34) on the bearing housings (19 and 20) and secure with the bolts (35). Ensure that the grease fitting (36) matches the dowel pin (37) hole in the bearing housing.
12. Position the case wearing rings (24) on the impeller (12) and lower the impeller/pump shaft (13) assembly into the lower half casing (38). Ensure that the tongue on the wear ring matches the slot in the lower casing.
13. Match the bearing caps (10 and 11) to the match marks from step 4 of Disassembly as a guide on the casing and position them on the dowel pins (37) that extend from the bearing housings. Secure the bearing caps with the bearing cap bolts (9).
14. Position the impeller (12) in the center of the lower half casing (38) and tighten both shaft sleeves (27) against the impeller.
15. Position the parting gasket (8) on the lower half casing (38).
16. Inspect the inside of both casing halves and remove all foreign objects. Then carefully lower the upper half casing (7) onto the dowel pin (39).

ASSEMBLY (continued)

17. Place the swing bolts (40) in the proper positions and secure the two casing halves (7 and 38) together with the nuts (6) and bolts (5).
18. Place the packing rings (25) over the pump shaft (13) and slide them, one at a time, into the stuffing box. Alternate the position of the ring splices 120° apart. Position the lantern rings (26) so that the seal water passage is in line with the ring splice.
19. When packing is complete, place the split glands (41), gland clips (4), and split gland nuts (3) on the swing bolts (40). Draw the split gland nuts down tight to seat the bottom rings of the packing, then loosen the split gland nuts to finger tight for starting.
20. Turn the pump by hand and ensure that it turns without binding. The packing will provide resistance to turning, but should not bind the pump.
21. If the pump was removed from the boat for repair, install it following the procedure in the Installation procedure in this work package.
22. Align the pump (WP 0145 00).
23. Install the pump drive shaft (WP 0146 00) and pump piping (WP 0144 00).
24. Remove the lockouts and tagouts, set the fire monitor to discharge overboard, and operate the pump.

 CAUTION

Do not overtighten the packing. Overtightening can cause burning of the packing and scoring of the pump shaft.

25. Tighten the split gland nuts (3) only enough to slow the flow of water past the packing. The desired flow rate is 3 to 4 drops per minute. Overtightening of the packing can burn the packing and score the pump shaft.
26. After checking the operation and adjusting the packing, secure the pump.

INSTALLATION

1. Lower the pump into the engine room through the hatch and “walk” it over to its base using the lifting device.
2. Position the pump on its base and secure it with the bolts (1) and lockwashers (2).
3. Align the pump (WP 0145 00).
4. Connect the pump drive shaft (WP 0146 00).
5. Connect the pump piping (WP 0144 00).
6. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ENGINE ROOM FIRE SUPPRESSION SYSTEM HOSES, NOZZLES, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L

Equipment Condition:

Engine room fire suppression pull box locked
out and tagged out IAW FM 55-502

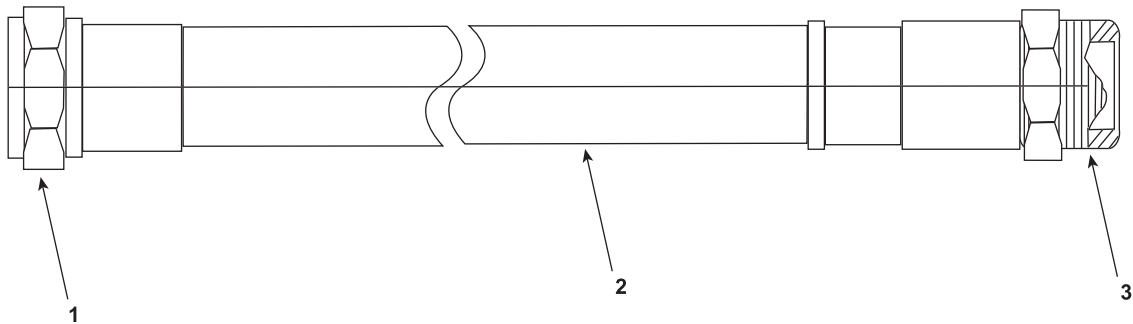
References:

FM 55-502

TM 55-1905-242-24P (WP 0074)

REMOVAL--HOSE

1. Loosen the nut (1) that holds one end of the hose (2).
2. Unscrew the hose (2) from the fitting, using a wrench to turn the pipe connection (3).

INSTALLATION--HOSE

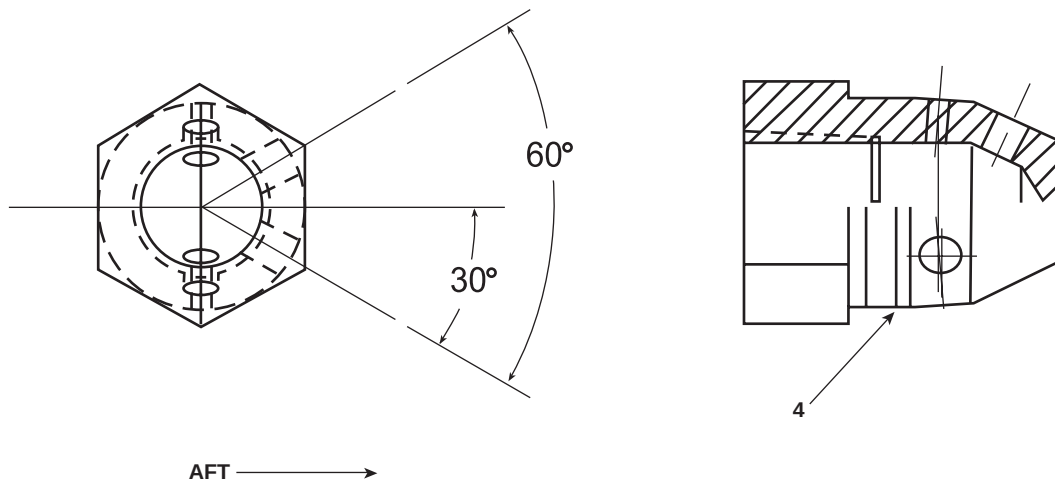
1. Screw the pipe connection (3) snugly into its fitting.
2. Attach the other end of the hose (2) by attaching and tightening the nut (1).

REMOVAL--NOZZLE

Remove the nozzle (4) by unscrewing it from its fitting.

INSTALLATION--NOZZLE

1. Thread the nozzle (4) onto its fitting, ensuring that the discharge openings are oriented aft as shown.



2. Remove the lockouts and tagouts.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
CYLINDER ASSEMBLY, FM-200, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)

Personnel Required:

Three Watercraft Engineers, 88L

Equipment Condition:

Engine room fire suppression pull box locked
out and tagged out IAW FM 55-502

References:

FM 55-502
TM 55-1905-242-24P (WP 0075)

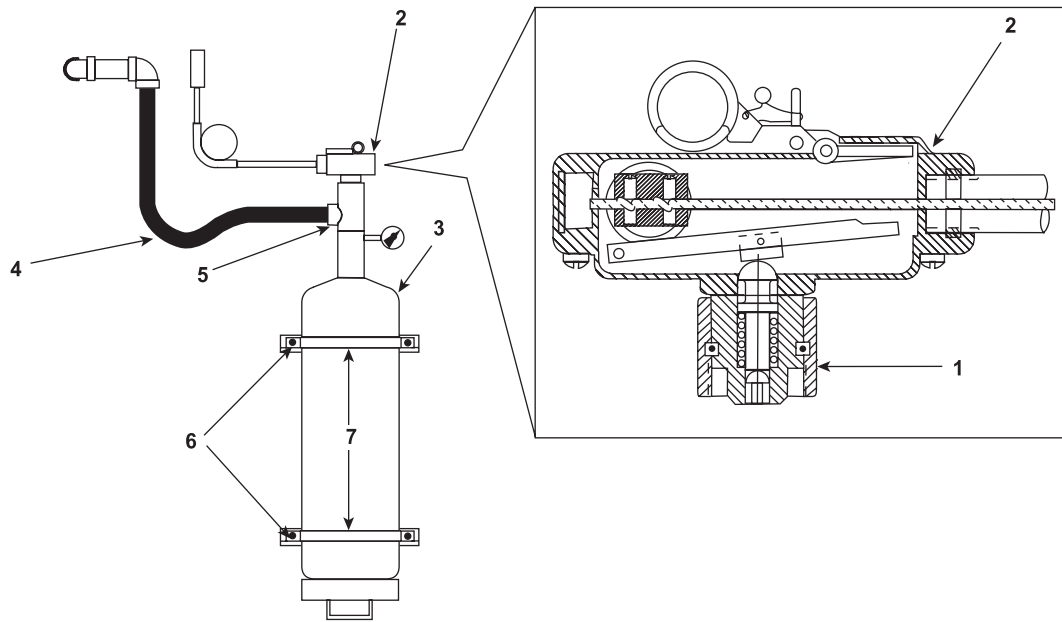
REMOVAL**WARNING**

Use two crewmembers to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

NOTE

The control head must be in the “set” position (actuating pin is in the fully retracted or “set” position) before attaching it to the control valve to prevent accidental discharge. Observe that the actuating pin has moved to its fully retracted position.

1. Disconnect the swivel nut (1) on the control head (2) from the cylinder valve actuation port.
2. Remove the control head (2) from the cylinder (3) and install its protection cap in its place.
3. Loosen the swivel nut on the flexible discharge hose (4) and remove the flexible discharge hose from the discharge outlet port adapter (5) and install the safety cap in its place.
4. Remove the bolts (6) that secure the cylinder straps (7). Remove the cylinder straps.
5. Using two crewmembers, lift the cylinder (3) from its mount to the accommodation module deck.



INSTALLATION

1. Using two crewmembers, lift the cylinder (3) onto its mount.
2. Orient the cylinder (3) with the valve outlet angled toward the cylinder discharge piping.
3. Secure the cylinder (3) in place with the cylinder straps (7) and bolts (6).
4. Remove the safety cap from the cylinder valve outlet port adapter (5) and attach the flexible discharge hose (4).
5. Check that the control head (2) is in the “set” position (the actuating pin in the fully retracted position).
6. Remove the protection cap from the cylinder actuation port and install the control head (2), securing it with the swivel nut (1).
7. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING PUMP, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and
tagged out IAW FM 55-502

Personnel Required:

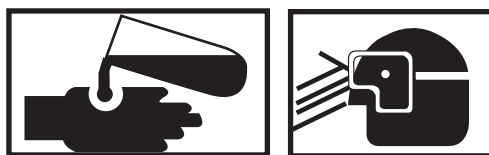
Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

References:

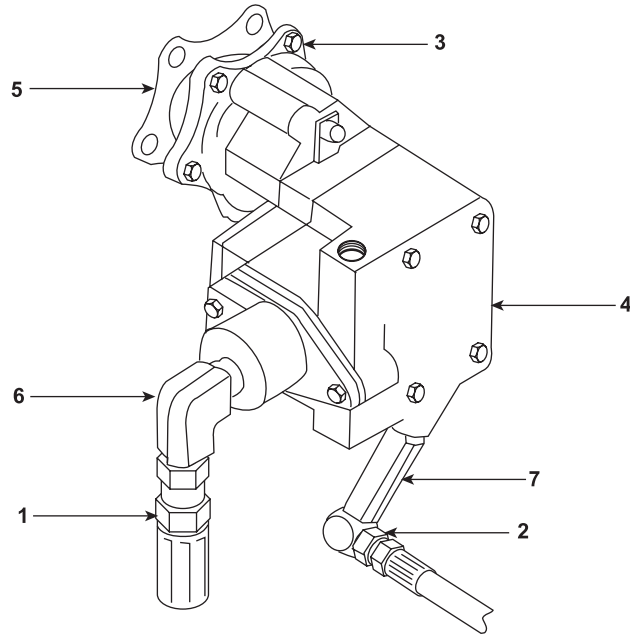
FM 55-502
TM 55-1905-242-24P (WP 0077)

REMOVAL**WARNING**

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious injury or death.

1. Don chemical protective gloves and goggles.
2. Position a suitable drain pan beneath the work area.
3. Loosen, but do not remove, the suction (1) and discharge (2) lines, and allow any residual pressure and fluid to drain from the lines.
4. Remove the suction (1) and discharge (2) lines. Cap the lines to prevent contamination of the system.
5. Remove the mounting bolts (3) and remove the pump (4) and gasket (5) from the engine.
6. Remove the suction (6) and discharge (7) fittings from the pump (4).



INSTALLATION

1. Align the pump drive and position the pump (4) and a new gasket (5) on the engine. Secure the pump with the mounting bolts (3).
2. Wrap the male threads of the suction (6) and discharge (7) fittings with antiseizing sealant tape and install the fittings into the pump (4).
3. Remove the caps from the suction (1) and discharge (2) lines and connect the lines to the suction (6) and discharge (7) fittings.
4. Remove the lockouts and tagouts and check the operation of the system, ensuring that the helm operates normally and that no leakage is present.
5. Check the hydraulic fluid level in the reservoir and replenish it as required.
6. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING CYLINDERS, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and
tagged out IAW FM 55-502
Steering bypass valves OPEN (WP 0020 00)
Steering isolation valves CLOSED
(WP 0020 00)

Personnel Required:

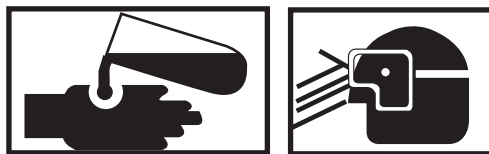
Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
(WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

References:

FM 55-502
WP 0020 00
TM 55-1905-242-24P (WP 0078)

REMOVAL**WARNING**

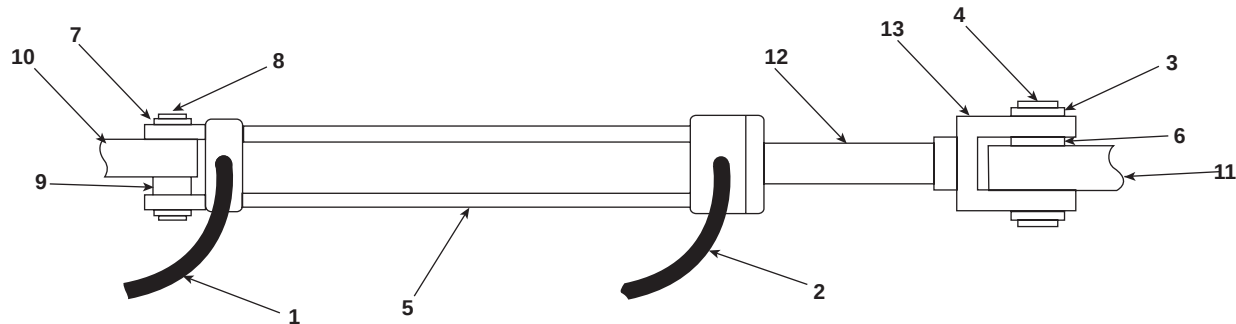
Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious injury or death.

1. Don chemical protective gloves and goggles and position a suitable drain pan beneath the work area.
2. Loosen, but do not remove, the hydraulic hoses (1 and 2) to allow any residual pressure and fluid to drain from the system.
3. Label and disconnect the hydraulic hoses (1 and 2). Cap the hose ends to prevent contamination of the system.
4. Remove the circlip (3) from the clevis pin (4) on the rod end of the cylinder (5). Remove the clevis pin and spacer (6).
5. Remove the circlip (7) from the clevis pin (8) on the piston end of the cylinder (5).

REMOVAL (continued)

6. Have one crewmember support the cylinder (5) while the other removes the clevis pin (8) and spacer (9).
7. Remove the cylinder (5) from the support plate (10) and tiller mount (11).

**INSTALLATION**

1. Have one crewmember position the cylinder (5) on the support plate (10) while the other installs the clevis pin (8) and spacer (9).
2. Install the circlip (7) on the clevis pin (8).
3. Extend or retract the cylinder rod (12) as required to align the clevis (13) with the tiller mount (11).
4. Install the clevis pin (4) and spacer (6) through the clevis (13) and tiller mount (11). Secure the clevis pin with the circlip (3).
5. Uncap the hydraulic hoses (1 and 2) and install them on their respective fittings using the labels from step 3 Removal as a guide.
6. OPEN the steering isolation valves and CLOSE the steering bypass valves (WP 0020 00).
7. Remove the lockouts and tagouts, and bleed the air from the system by using the helm to swing the rudders from full port to full starboard eight to ten times. Also check for any sign of leakage.
8. Check the hydraulic fluid level in the reservoir and replenish it as necessary.
9. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING HELM UNIT, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Wrench, Torque, 1/2 in. Drive, 0-200 lb-ft (Item 12, Table 1, WP 0230 00)
Suitable Drain Pan

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

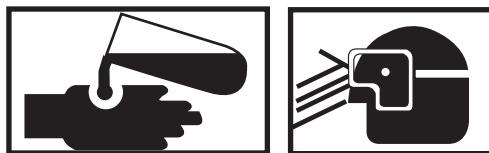
Hydraulic Fluid (Item 1, Table 2, WP 0230 00)

References:

FM 55-502
TM 55-1905-242-24P (WP 0079)

Equipment Condition:

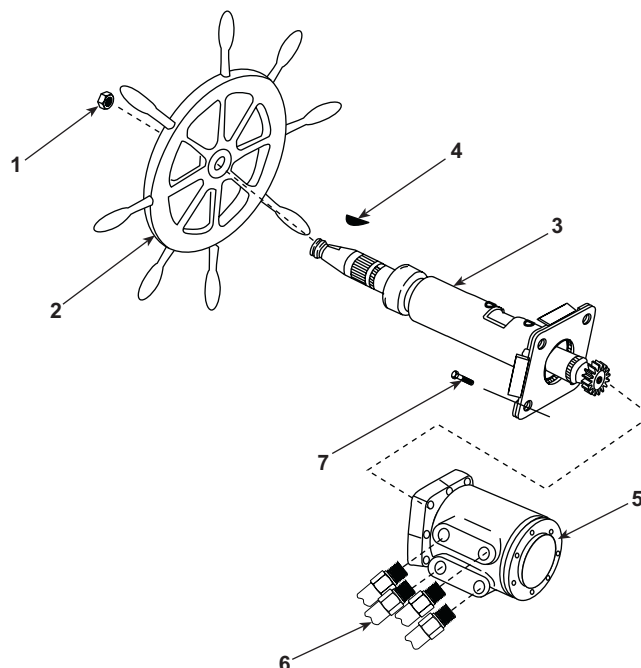
Propulsion engines secured, locked out, and tagged out IAW FM 55-502
Access panel below helm removed

REMOVAL**WARNING**

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious injury or death.

1. Don chemical protective gloves and goggles and position a suitable drain pan beneath the helm unit (5).
2. Remove the nut (1) that secures the helm (2) to the steering column (3). Remove the helm and key (4).
3. Loosen, but do not remove, the four hydraulic hoses (6) at the helm unit (5) to permit any residual hydraulic pressure or fluid to drain from the system.
4. Label and remove the four hydraulic hoses (6) from the helm unit (5). Cap the open ends of the hoses to prevent contamination of the system.
5. With one crewmember holding the steering column (3) and the other holding the helm unit (5), remove the bolts (7) that secure the steering column and helm unit to the console. Remove the steering column and the helm unit.

REMOVAL (continued)**INSTALLATION****NOTE**

Rotate the steering column shaft while bringing the steering column and helm unit together. This will allow the splines on the steering column to engage the splines on the helm unit.

1. With one crewmember holding the steering column (3) and the other holding the helm unit (5), bring the units together at the console. Rotate the steering column shaft while bringing the units together to allow the splines on the units to engage.
2. Secure the steering column (3) to the helm unit (5) with the bolts (7). Torque the bolts to 23 lb-ft (31 Nm).
3. Remove the caps from the four hydraulic hoses (6) and install the hydraulic hoses to the helm unit (5) using the labels from step 4 of Removal as a guide.
4. Install the key (4) and helm (2) on the steering column (3), and secure in place with the nut (1).
5. Clear the lockouts and tagouts and bleed the air from the system by steering from hard port to hard starboard and back. Perform eight to ten cycles of port/starboard steering to completely purge the air from the system.
6. Check the operation of the system, ensuring that the helm operates normally and that no leakage is present.
7. Check the hydraulic fluid level in the reservoir and replenish it as required.
8. Install the access panel below the helm.
9. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING SYSTEM RELIEF VALVE, ADJUST**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)

Personnel Required:

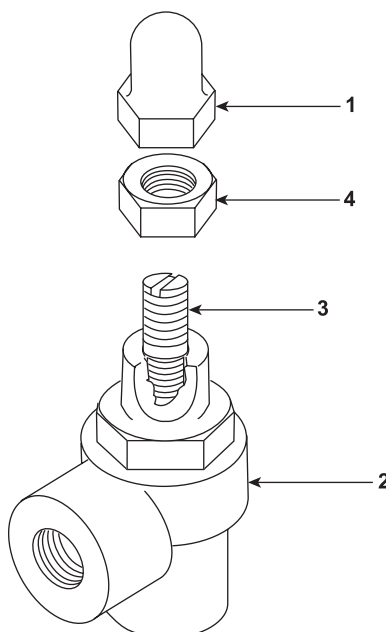
One Watercraft Engineer, 88L

Equipment Condition:

Access panel below helm removed

ADJUST

1. With at least one propulsion engine running, turn the helm hard port or hard starboard until resistance is felt. Continue to hold the helm against the resistance while noting the hydraulic pressure on the console gauge. This is the relief pressure. Desired relief pressure is 1500 lb/in² (103 bar).
2. If the relief pressure is incorrect, adjust it by performing the following procedures:
 - a. Remove the cap nut (1) from the relief valve (2).
 - b. Hold the adjusting bolt (3) stationary with a screwdriver while loosening the locknut (4).
 - c. Turn the adjusting bolt (3) clockwise to increase the relief pressure or counterclockwise to reduce the relief pressure as required.
 - d. When the proper relief pressure has been achieved, hold the adjusting bolt (3) stationary with a screwdriver while tightening the locknut (4).
 - e. After tightening the locknut (4), check the relief pressure again and readjust if necessary.
 - f. After final adjustment is achieved, install the cap nut (1) and tighten it snugly.



END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING SYSTEM RELIEF VALVE, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502
Access panel below helm removed

Personnel Required:

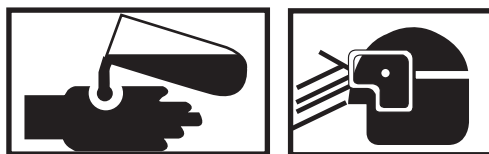
One Watercraft Engineer, 88L

Materials/Parts:

Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)

References:

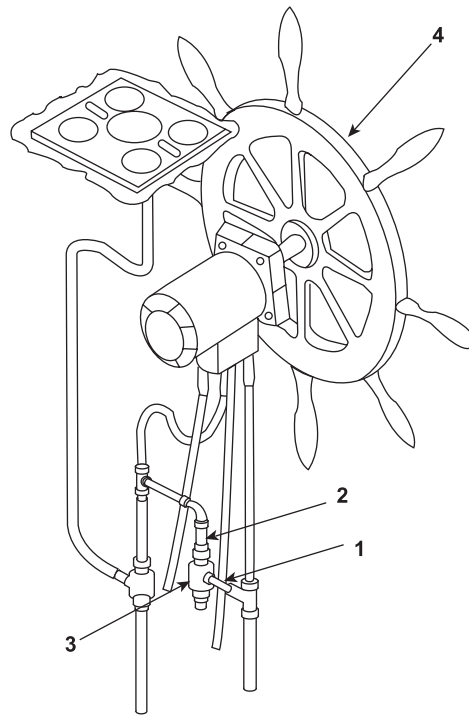
FM 55-502
WP 0181 00
TM 55-1905-242-24P (WP 0081)

REMOVAL**WARNING**

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious injury or death.

1. Don chemical protective gloves and goggles and position a suitable drain pan beneath the work area.
2. Loosen, but do not remove, the piping (1 and 2) from the relief valve (3) to permit any residual hydraulic pressure or fluid to drain from the system.
3. Remove the piping (1 and 2) from the relief valve (3).



INSTALLATION

1. Position the relief valve (3) under the console and connect the piping (1 and 2).
2. Remove the lockouts and tagouts and adjust the relief valve (WP 0180 00).
3. After adjusting the relief valve (3), check the operation of the system. Ensure that the helm operates normally and that no leaks are present.
4. Check the level of hydraulic fluid in the reservoir and replenish as required.
5. Install the access panel below the helm.
6. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING SYSTEM FLOW DIVIDER, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and
tagged out IAW FM 55-502

Personnel Required:

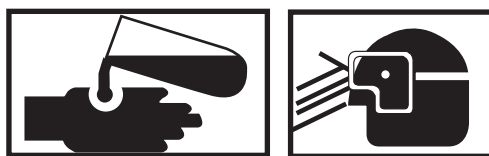
One Watercraft Engineer, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

References:

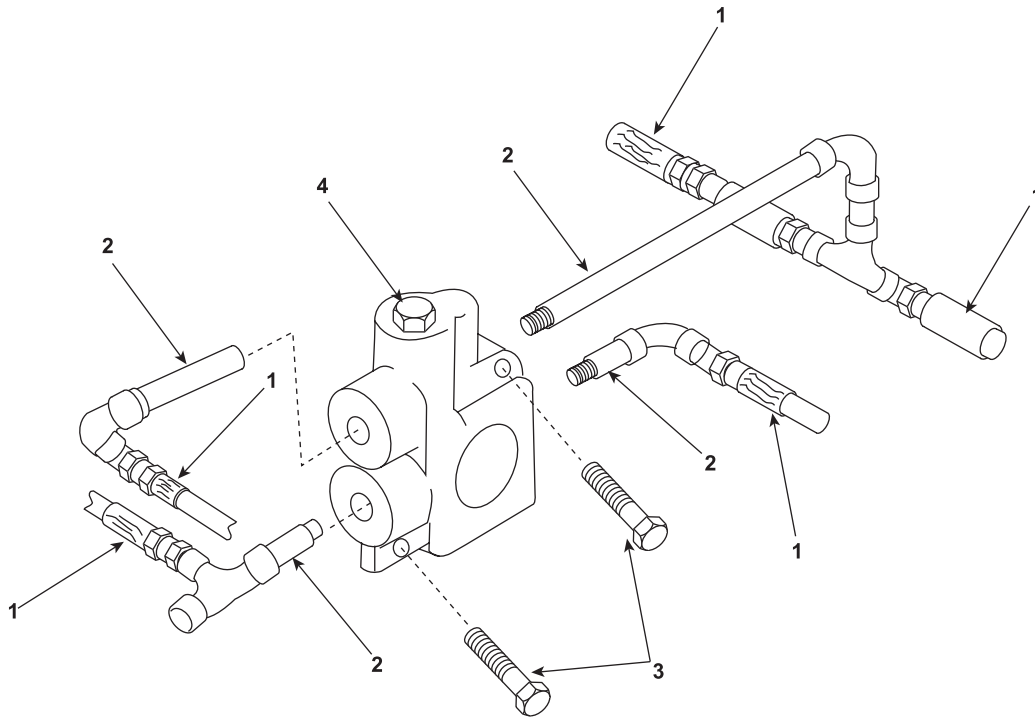
FM 55-502
TM 55-1905-242-24P (WP 0082)

REMOVAL**WARNING**

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly can cause serious injury or death.

1. Don chemical protective gloves and goggles.
2. Position a suitable drain pan beneath the work area.
3. Loosen, but do not remove, the hydraulic hoses (1) connected to the flow divider piping (2) to permit any residual hydraulic pressure or fluid to drain from the system.
4. Label and remove the hydraulic hoses (1) from the flow divider piping (2). Cap the open hoses to prevent contamination of the system.
5. Remove the bolts (3) that attach the flow divider (4) to the structure. Remove the flow divider.
6. Label and remove the flow divider piping (2) from the flow divider (4).



INSTALLATION

1. Wrap the male pipe threads of the flow divider piping (2) with antiseizing sealant tape, and install the piping in the flow divider (4) using the labels from step 6 of Removal as a guide.
2. Position the flow divider (4) on the structure and secure it with the bolts (3).
3. Connect the hydraulic hoses (1) to the flow divider piping (2) using the labels from step 4 of Removal as a guide.
4. Remove the lockouts and tagouts and check the operation of the system, ensuring that the helm operates normally and that there are no leaks present.
5. Dispose of the used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING SYSTEM COUNTERBALANCE VALVE, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502

Materials/Parts:

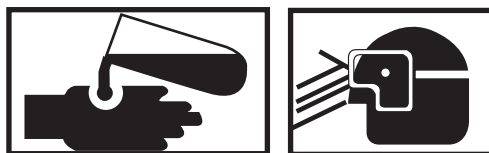
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)

Personnel Required:

One Watercraft Engineer, 88L

References:

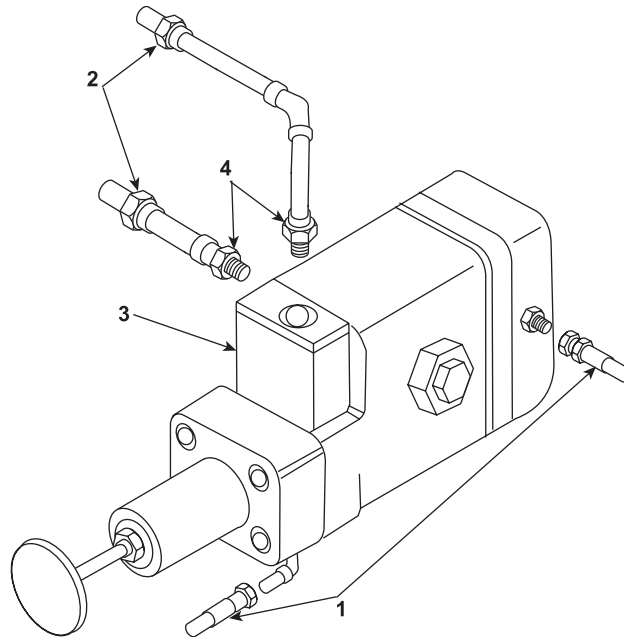
FM 55-502
WP 0150 00
TM 55-1905-242-24P (WP 0083)

REMOVAL**WARNING**

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly may cause serious injury or death.

1. Don chemical protective gloves and goggles.
2. Position a suitable drain pan beneath the work area.
3. Loosen, but do not remove, the hydraulic hoses (1) and unions (2) connected to the counterbalance valve (3) to permit any residual hydraulic pressure or fluid to drain from the system.
4. Label and remove the hydraulic hoses (1) and unions (2) from the counterbalance valve (3) and remove the valve. Cap the open hoses and unions to prevent contamination of the system.
5. Label and remove the counterbalance valve piping (4) from the counterbalance valve (3).



INSTALLATION

1. Wrap the male pipe threads of the counterbalance valve piping (4) with antiseizing sealant tape and install the piping in the counterbalance valve (3) using the labels from step 5 of Removal as a guide.
2. Position the counterbalance valve (3) and connect the unions (2) and the hydraulic hoses (1) using the labels from step 4 of Removal as a guide.
3. Remove the lockouts and tagouts, adjust the counterbalance valve (WP 0150 00), and check the operation of the system. Ensure that the helm operates normally and that no leaks are present.
4. Dispose of the used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RUDDER ANGLE TRANSMITTER, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

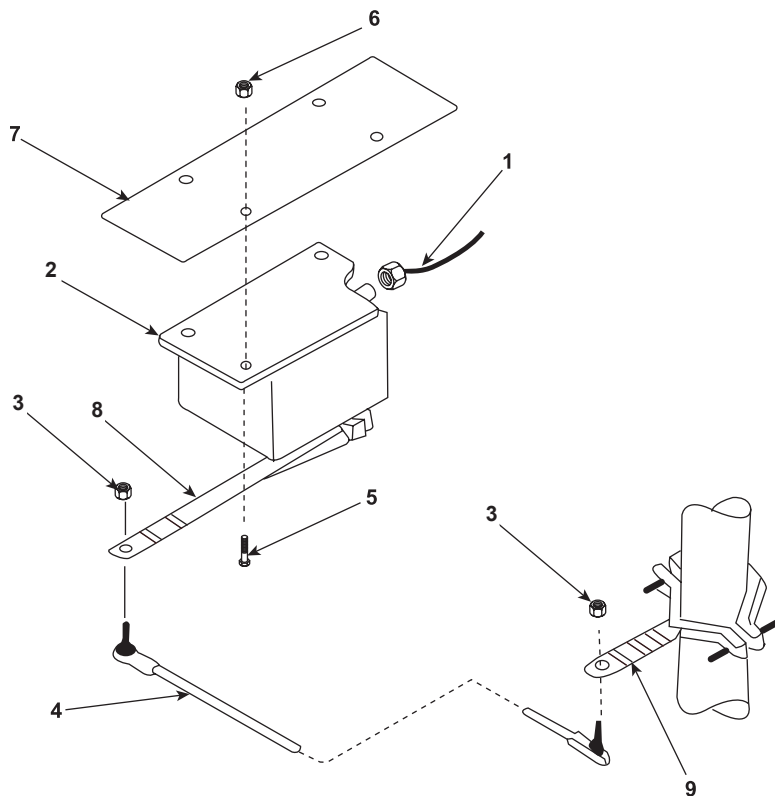
Propulsion engines secured, locked out, and
tagged out IAW FM 55-502
Rudder AMIDSHIPS
RUDDER ANGLE & TANK GAUGES circuit
breaker set to OFF, locked out, and tagged
out IAW FM 55-502

References:

FM 55-502
TM 55-1905-242-24P (WP 0087)

REMOVAL

1. Disconnect the power/transmitter cable (1) at the transmitter (2).
2. Mark the mounting holes and remove the nuts (3) on both ends of the transmitter linkage (4) and remove the transmitter linkage.
3. Remove the bolts (5) and nuts (6) that secure the transmitter (2) to its mount (7). Remove the transmitter.



INSTALLATION

1. Position the transmitter (2) on its mount (7) with the actuating arm (8) facing the same direction as the tiller activating arm (9). Secure the transmitter to the mount with the bolts (5) and nuts (6).
2. Install the transmitter linkage (4) to the same mounting holes from which it was removed, using the marks from step 2 of Removal as a guide. Secure the transmitter linkage with the nuts (3).
3. Connect the power/transmitter cable (1) to the transmitter (2).
4. Clear the lockouts and tagouts and check the operation of the system, ensuring that the unit indicates the proper rudder angle from hard port to hard starboard.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP HOIST HYDRAULIC PUMP, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Suitable Drain Pan

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)

Equipment Condition:

Propulsion engines secured, locked out, and
tagged out IAW FM 55-502

References:

FM 55-502
TM 55-1905-242-24P (WP 0089)

Personnel Required:

Two Watercraft Engineers, 88L

REMOVAL**WARNING**

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly can cause serious injury or death.

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

1. Remove the bolts (1), nuts (2), and lockwashers (3) that secure the guard (4) to the structure. Remove the guard.
2. Don chemical protective gloves and goggles and position a suitable drain pan beneath the work area.
3. Loosen, but do not remove, the bolts (5) that secure the piping (6) to the pump (7) to permit any residual hydraulic pressure and fluid to drain from the system.

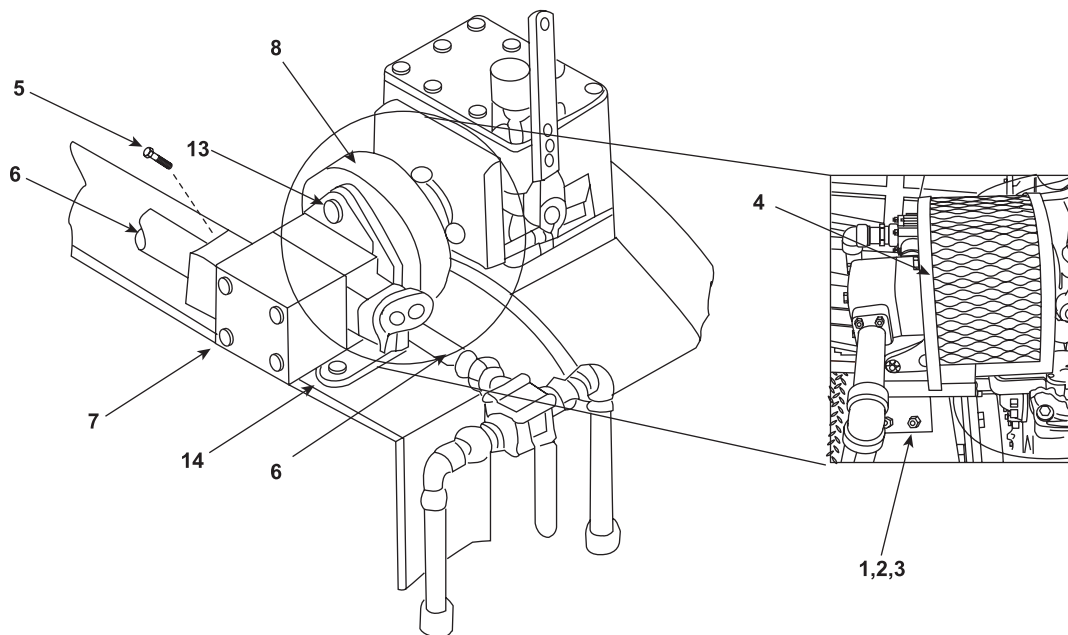
REMOVAL (continued)

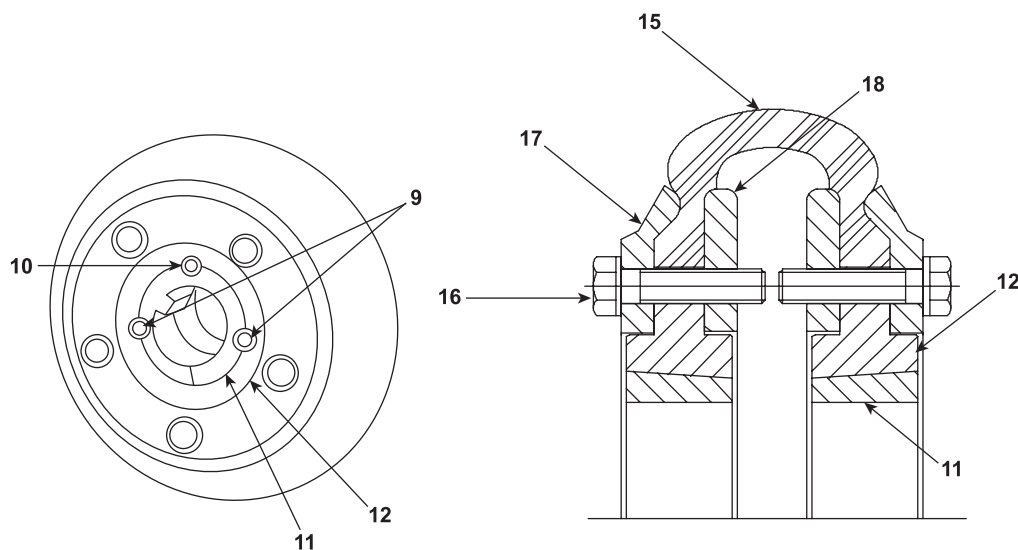
4. To loosen the coupling assembly (8) from the pump (7):
 - a. Remove the two socket head fixing bolts (9).
 - b. Thread one of the socket head fixing bolts (9) into the unclamping hole (10).
 - c. Tighten the socket head fixing bolt (9) until the taper lock (11) “pops” free from the side flange (12).
 - d. Remove the socket head fixing bolt (9) and slide the taper lock (11) toward the pump (7).
5. Remove the bolts (5) that secure the piping (6) to the pump (7).
6. Remove the bolts (13) that secure the pump (7) to the mounting bracket (14). Remove the pump.

NOTE

If only the coupling will be replaced, it can be replaced with the PTO flange still mounted to the PTO. If the PTO flange must be replaced, remove the flange from the PTO by following step 4 of Removal.

7. If the coupling (15) will be replaced, to remove it:
 - a. Remove the clamp bolts (16) from one side flange (12).
 - b. Remove the outer (17) and inner (18) clamp rings from the side flange (12).
 - c. Repeat steps a and b for the other side flange (12).



REMOVAL (continued)**INSTALLATION**

1. If the coupling is being replaced, to install it:
 - a. Position the coupling (15) on the first side of the side flange (12).
 - b. Position the inner (18) and outer (17) clamp rings and secure them loosely with the clamp bolts (16). Tighten the bolts only finger tight at this point.
 - c. Position the remaining side flange (12) in the coupling (15).
 - d. Position the inner (18) and outer (17) clamp rings and secure them loosely with the clamp bolts (16). Tighten the bolts only finger tight at this point.
 - e. Check all around the coupling assembly to ensure that the coupling (15) is properly seated in the side flange (12) and inner (18) and outer (17) clamp rings.
 - f. Tighten all of the clamp bolts (16).
2. Place the taper lock (11) over the pump (7) shaft with the fixing holes facing the pump.
3. Position the pump (7) in its mounting bracket (14) and secure it with the bolts (13).
4. Connect the piping (6) to the pump (7) with the bolts (5).
5. To connect the coupling to the pump:
 - a. Align the fixing holes on the taper lock (11) with the fixing holes on the side flange (12).
 - b. Slide the taper lock (11) into the side flange (12) and secure it with the socket head fixing bolts (9).

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

6. Position the guard (4) on the structure and secure it with the bolts (1), nuts (2), and lockwashers (3).

INSTALLATION (continued)

7. Remove the lockouts and tagouts and check the operation of the system, ensuring that the pump operates normally and that no leaks are present.
8. Check the hydraulic fluid reservoir in the reservoir and replenish as required.
9. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP HOIST CONTROL VALVE, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Suitable Drain Pan

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)

Equipment Condition:

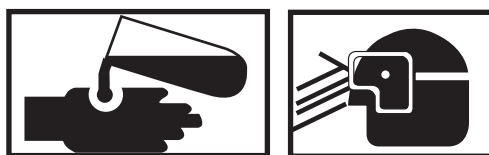
Propulsion engines secured, locked out, and
tagged out IAW FM 55-502

References:

FM 55-502
TM 55-1905-242-24P (WP 0090)

Personnel Required:

Two Watercraft Engineers, 88L

REMOVAL**WARNING**

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly can cause serious injury or death.

1. Don chemical protective gloves and goggles.
2. Position a suitable drain pan beneath the work area.

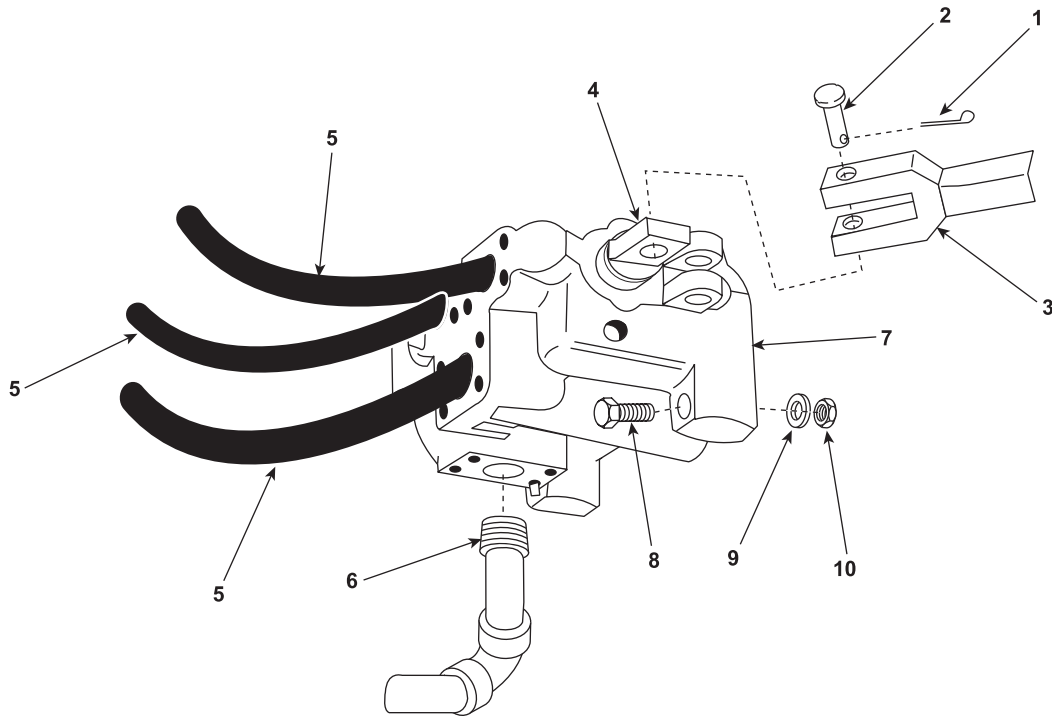
NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

3. Remove the cotter pin (1) and clevis pin (2) that secure the control rod (3) to the shaft (4).
4. Loosen, but do not remove, the hoses (5) and return line (6) to permit any residual hydraulic pressure or fluid to drain from the system.
5. Label and disconnect the hoses (5) and return line (6) from the valve (7).

REMOVAL (continued)

6. Remove the bolts (8), lockwashers (9), and nuts (10) that secure the valve (7) to the overhead. Remove the valve.

**INSTALLATION**

1. Position the valve (7) on the overhead and secure it with the bolts (8), lockwashers (9), and nuts (10).
2. Connect the hoses (5) and return line (6) to the valve (7) using the labels from step 5 of Removal as a guide.
3. Connect the control rod (3) to the shaft (4) with the clevis pin (2). Secure the clevis pin with the cotter pin (1).
4. Remove the lockouts and tagouts and check the operation of the system, ensuring that the ramp operates properly and that no leaks are present.
5. Check the hydraulic fluid level in the reservoir and replenish as required.
6. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP HOIST HYDRAULIC CHECK VALVE, REPLACE/REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and
tagged out IAW FM 55-502

Personnel Required:

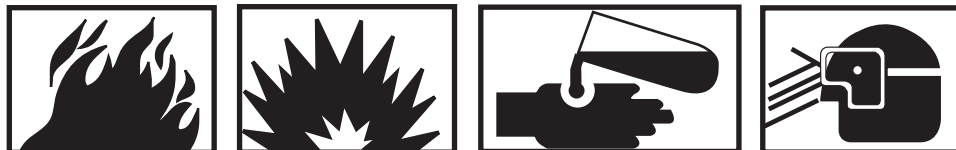
One Watercraft Engineer, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)
Crocus Cloth (Item 22, Table 2, WP 0230 00)
O-Ring (p/n 82-20220-21, qty 1)

References:

FM 55-502
TM 55-1905-242-24P (WP 0091 00)

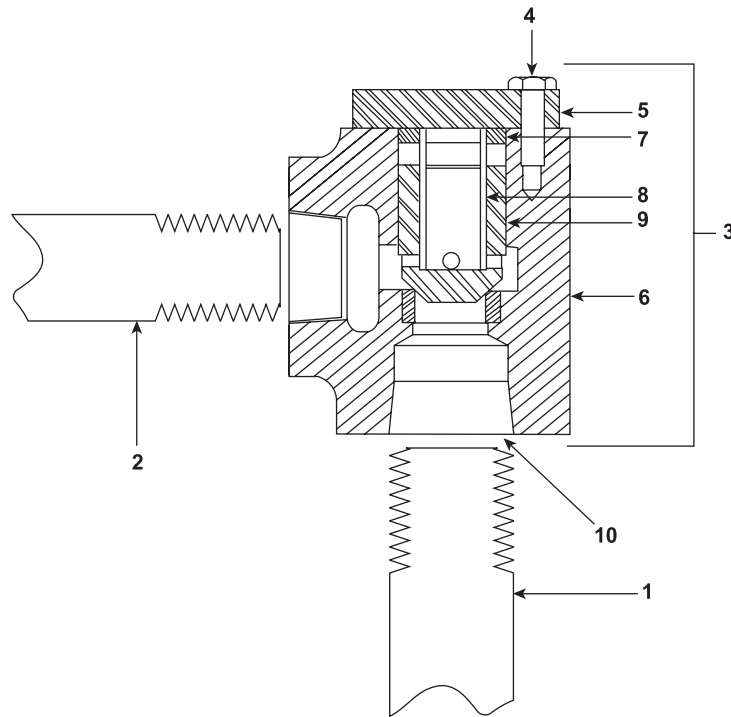
REMOVAL**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly can cause serious injury or death.

1. Don chemical protective gloves and goggles and position a suitable drain pan beneath the work area.
2. Loosen, but do not remove, the inlet (1) and outlet (2) piping at the check valve (3) to permit any residual hydraulic fluid or pressure to drain from the system.
3. Disconnect the inlet (1) and outlet (2) piping and remove the check valve (3).



DISASSEMBLY

1. Remove the bolts (4) that secure the cap (5) to the valve body (6). Remove the cap.
2. Remove the O-ring (7).
3. Remove the spool spring (8) and spool (9) from the valve body (6).

CLEANING AND INSPECTION

1. If not already on, don protective goggles and gloves.
2. Clean all parts with cleaning solvent and dry with wiping rags.
3. Inspect the spool spring (8) for distortion, loss of tension, or broken coils.
4. Inspect the spool (9) for nicks, burrs, or other damage.
5. Inspect the valve body (6) for cracks. Also inspect for nicks, burrs, or other damage in the spool cavity.

REPAIR

1. Replace the O-ring (7).
2. Remove any nicks or burrs with crocus cloth.
3. If the spool spring (8) is damaged, replace the spring.

ASSEMBLY

1. Coat the spool bore of the valve body (6) with a light coat of clean hydraulic fluid.
2. Install the spool (9) and spool spring (8) into the valve body (6). The tapered end of the spool (9) must be installed facing the inlet port (10).
3. Install the preformed packing (7) in the valve body (6).
4. Position the cap (5) on the valve body (6) and secure it with the bolts (4).

INSTALLATION

1. Wrap the male pipe threads on the inlet (1) and outlet (2) piping with antiseizing sealant tape.
2. Connect the inlet (1) and outlet (2) piping to the check valve (3).
3. Remove the lockouts and tagouts and check the operation of the system, ensuring that the ramp operates normally and that no leakage is present.
4. Check the hydraulic fluid level in the reservoir and replenish as required.
5. Dispose of used hydraulic fluid, used cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP HOIST HAND PUMP, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502

Personnel Required:

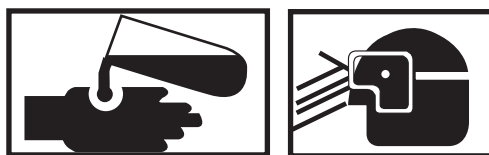
One Watercraft Engineer, 88L

Materials/Parts:

Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)

References:

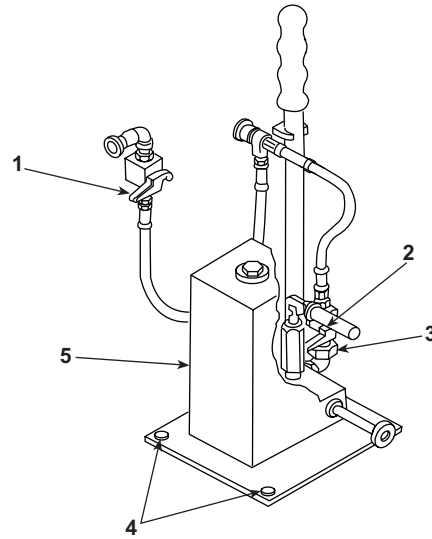
FM 55-502
TM 55-1905-242-24P (WP 0092)

REMOVAL**WARNING**

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly can cause serious injury or death.

1. Don chemical protective gloves and goggles.
2. Position a suitable drain pan beneath the work area.
3. CLOSE the upper (1) and lower (2) control valves.
4. Loosen, but do not remove, the union (3) in order to permit any residual hydraulic pressure or fluid to drain from the system.
5. Disconnect the union (3) and cap the ends to prevent contamination of the system.
6. Remove the mounting bolts (4), and remove the hand pump (5) from its enclosure.



INSTALLATION

1. Position the hand pump (5) in its enclosure and secure it with the mounting bolts (4).
2. Remove the caps from the union (3) and connect the union to the hand pump (5).
3. Remove the lockouts and tagouts and check the operation of the system, ensuring that the hand pump lowers and halts the bow ramp properly and that no leaks are present.
4. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP LOCKING HYDRAULIC CYLINDERS, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Suitable Drain Pan

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)

Equipment Condition:

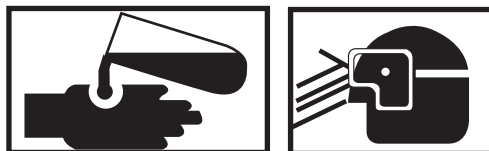
Propulsion engines secured, locked out, and
tagged out IAW FM 55-502
Bow ramp lowered

References:

FM 55-502
TM 55-1905-242-24P (WP 0093)

Personnel Required:

One Watercraft Engineer, 88L

REMOVAL**WARNING**

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Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly can cause serious injury or death.

1. Don chemical protective gloves and goggles.

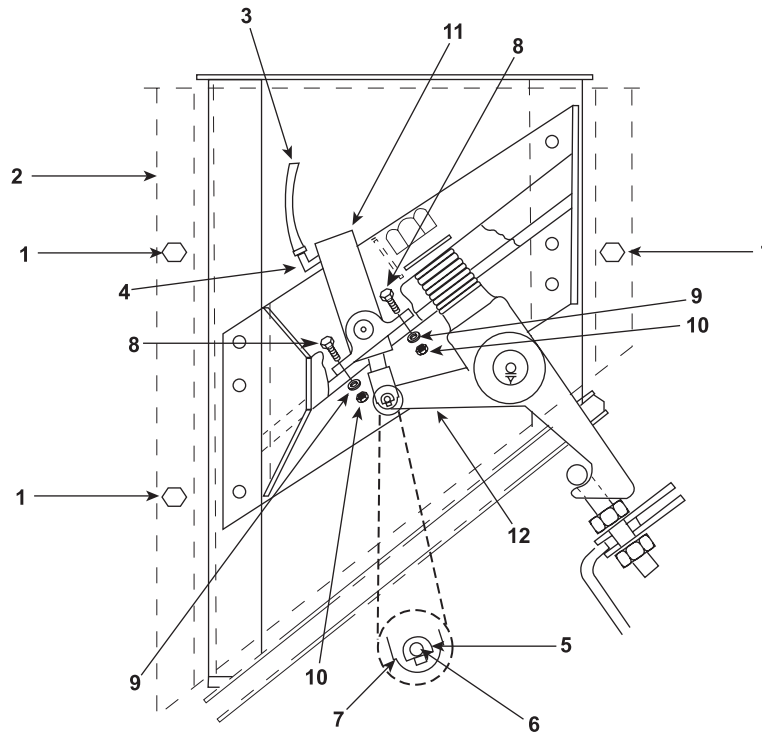
NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

2. Remove the bolts (1) that secure the protective cover (2) to the cargo well. Remove the protective cover.
3. Position a suitable drain pan beneath the work area.
4. Loosen, but do not remove, the hydraulic line (3) at the elbow (4) to permit any residual hydraulic pressure or fluid to drain from the system.

REMOVAL (continued)

5. Remove the circlip (5) and pin (6) from the cylinder clevis (7).
6. Remove the bolts (8), lockwashers (9), and nuts (10) that secure the cylinder (11) to the mount. Remove the cylinder.

**INSTALLATION**

1. Position the cylinder (11) on its mount and secure it with the bolts (8), lockwashers (9), and nuts (10).
2. Install the pin (6) through the cylinder clevis (7) and ramp latch (12). Secure the pin (6) with the circlip (5).
3. Install the hydraulic line (3) to the elbow (4).
4. Position the protective cover (2) on the cargo well and secure it with the bolts (1).
5. Remove the lockouts and tagouts and check the operation of the system, ensuring that the cylinder (11) operates properly and that no leaks are present.
6. Check the hydraulic fluid level in the reservoir and replenish as required.
7. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP WINCH HYDRAULIC MOTOR, REPLACE/REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Wrench, Torque, 1/2" Drive, 0-200 lb-ft (Item 12, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502
Winch removed (WP 0191 00)

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)

Materials/Parts (continued):

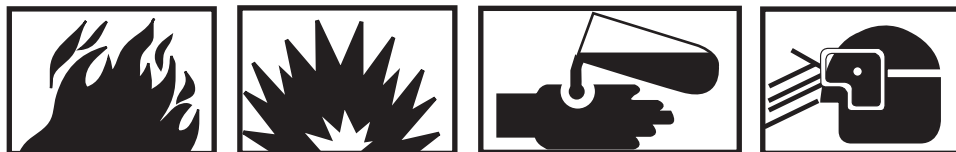
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)
Grease (Item 21, Table 2, WP 0230 00)
Packing (p/n 50392, qty 12)
O-Ring (p/n 22666, qty 1)
Packing, Preformed (p/n 21040, qty 1)
Retainer, Packing (p/n MS28782-25, qty 2)
O-Ring Shaft (p/n 50306, qty 2)
Seal, Pocket (p/n 50486, qty 8)
Seal, Plain Encased (A22069, qty 2)
O-Ring Housing (p/n G258, qty 2)
Packing, Preformed (p/n 50337, qty 1)
Packing, Preformed (p/n G270, qty 1)
O-Ring Shaft (p/n 50588, qty 2)

References:

FM 55-502
TM 55-1905-242-24P (0094)
WP 0191 00

REMOVAL

WARNING



Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

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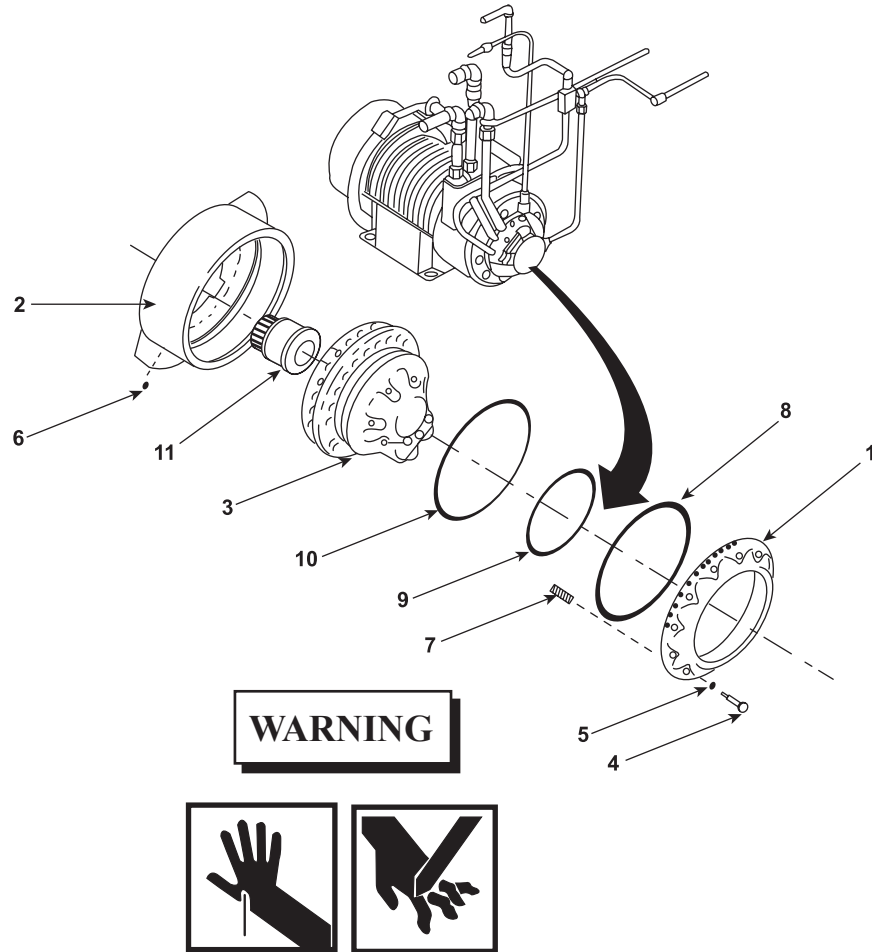
REMOVAL (continued)

1. Match mark the spring cover (1) to the primary housing (2) and to the motor assembly (3) so that these parts may be oriented correctly upon assembly.

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

2. Position a suitable drain pan beneath the primary housing (2) and drain its oil by removing one of the bottom bolts (4) with its seal washer (5), and by removing one pipe plug (6) from the top of the primary housing to permit air to enter.

**WARNING**

The spring cover is under extreme spring pressure. Use extreme caution when removing the spring cover. Loosen all bolts evenly, one-half turn at a time, until all spring tension has been relieved. Failure to comply can result in serious injury or death.

3. Remove the remaining bolts (4) and seal washers (5) by loosening each bolt one-half turn at a time until all the spring pressure has been relieved. Remove the spring cover (1) after all of the spring pressure has been relieved and all of the bolts (4) and seal washers (5) removed.

NOTE

In most cases, there will be a spring in every hole. However, in certain applications fewer springs are required, and it is important that they be located symmetrically when they are replaced. Note and mark any hole that does not contain a spring.

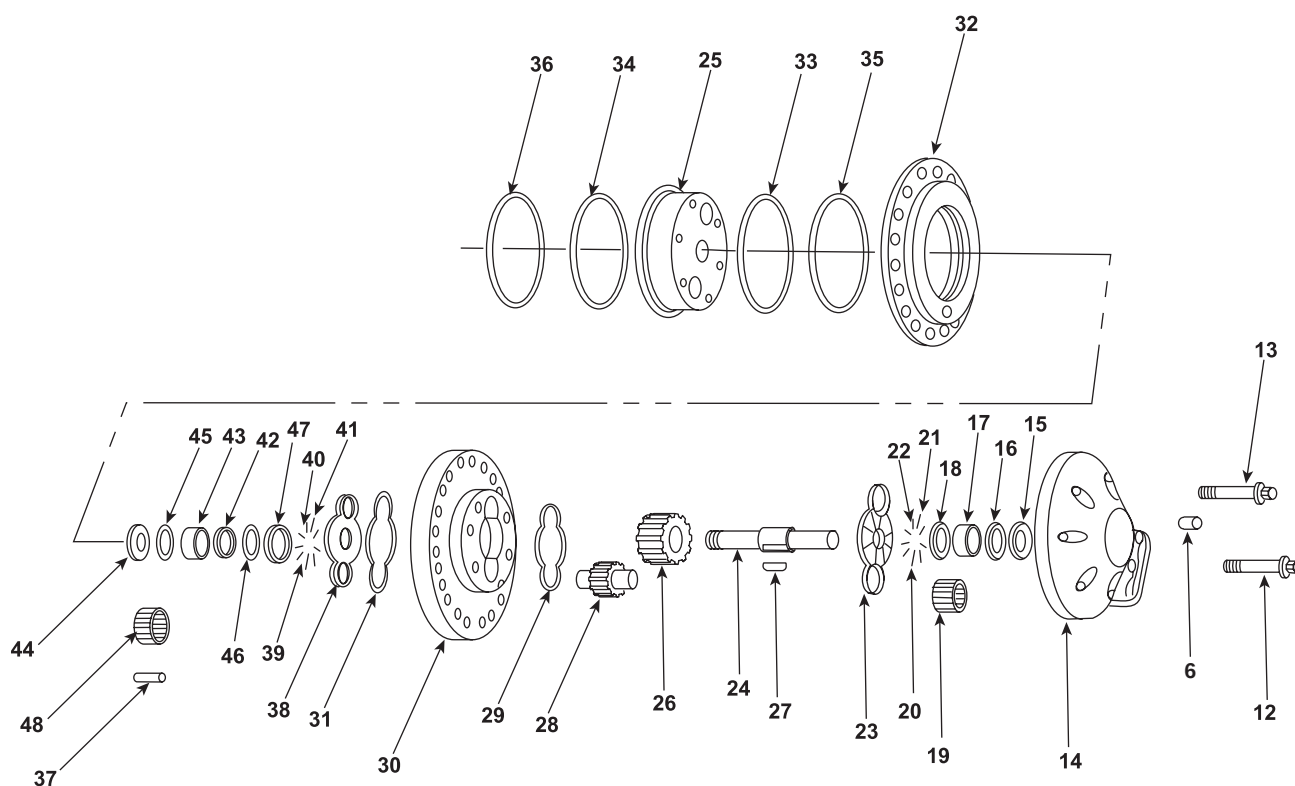
4. Mark any holes in the spring cover (1) that do not contain a spring (7). Remove the springs (7) from the spring cover.

REMOVAL (continued)

5. Remove the preformed packing (8 and 9) and dispose of it in accordance with local regulations.
6. Remove the snap ring (10) and motor assembly (3).
7. Remove the primary sun gear (11) if it has remained on the motor shaft (24).

DISASSEMBLY

1. Remove the capscrews (12 and 13) from the port end cover (14).
2. Lift off the port end cover (14). The gasket (15), packing (16), bushing seal (17), spacer (18), roller bearings (19), pocket seal (20), pocket seals (21 and 22), and thrust plate (23) will be removed with the port end cover.
3. Remove the motor shaft (24) from the shaft end cover (25). The sun gear (26) and key (27) will be removed with the motor shaft.
4. Match mark the sun gear (26) and motor shaft (24) to permit proper orientation during Assembly.
5. Press the sun gear (26) off the motor shaft (24) and remove the key (27).
6. Remove the planet gears (28) and place them with the sun gear (26). These gears are a matched set and must be kept together.
7. Remove the O-ring (29) and discard it in accordance with local regulations.
8. Remove the gear housing (30).



DISASSEMBLY (continued)

9. Remove the O-ring (31) and discard it in accordance with local regulations.
10. Remove the brake piston (32) from the shaft end cover (25).
11. Remove the O-rings (33 and 34) and backup rings (35 and 36) and discard them in accordance with local regulations.
12. Remove the pin (37) from the brake piston (32) only if replacement is required because of damage or wear.
13. Turn up the port end cover (14) and the shaft end cover (25) so that the thrust plates (23 and 38) are up. Pry off the thrust plates with a knife blade or thin screwdriver. Take care not to mar the face next to the covers (14 and 25).
14. Remove the pocket seals (20, 21, 22, 39, 40, and 41) and discard them in accordance with local regulations.
15. Remove the spacers (18 and 42) and bushing seals (17 and 43) from the covers (14 and 25).
16. Remove the gaskets (15 and 44), packings (16, 45, and 46) and spacer (47) from the covers (14 and 25).
17. Remove the roller bearings (19 and 48) only if they will be replaced.

CLEANING **CAUTION**

Never use cleaning solvent or other substances to clean the thrust plates. Clean the thrust plates only with clean, lint free wiping rags. Any other cleaning method can result in damage to the thrust plates.

1. Clean the thrust plates with clean wiping rags.
2. Don protective gloves and goggles.
3. Clean all parts except the thrust plates with cleaning solvent and dry with clean wiping rags. Allow the roller bearings to air dry after cleaning.

INSPECTION

1. Discard all O-rings, backup washers, and pocket seals and replace with new.
2. Inspect the roller bearings to ensure that the rollers roll freely. Inspect the rollers for pits, breaks, or excessive wear. Replace the bearing(s) if any of these conditions exist.
3. Inspect the gears for scoring or roughness. Remove minor roughness with a fine hone. Replace any gears showing more than minor scoring or roughness.

NOTE

If any of the gears or roller bearings are replaced because of excessive wear, it is good practice to replace both the gears and the bearings. Replacement of one part and not the other will cause premature wear of the new part because of its attempt to conform to the wear pattern of the old part. Also, if the gears and bearings are replaced due to excessive wear, carefully check the side of the gear housing bore that has the most wear. In most cases, the gear housing will also have to be replaced along with the gears and bearings.

4. Inspect the sun gear hubs and planet gear for excessive wear at the bearing points. If the wear exceeds 0.001 inch (0.03 mm) on the hub diameter, the gear should be replaced. Replace gears in sets since they are matched at the time of manufacture.

INSPECTION (continued)

5. Inspect the machined surfaces of the port end cover, shaft end cover, and gear housing for roughness. Stone to remove minor roughness. Replace if roughness is excessive.
6. Measure the gear housing bore. A new housing measures 2.0025 inch (50.86 mm) in the small bores and 3.7525 inch (95.31 mm) in the large bore. Replace the gear housing if the radial wear exceeds 0.006 inch (0.15 mm).
7. Inspect the thrust plates for erosion or excessive wear on the running surfaces. Replace if necessary.
8. Inspect the motor shaft for distortion. Replace the motor shaft if it is bent or otherwise distorted.
9. Rewash all parts except the thrust plates and dry thoroughly.

ASSEMBLY

1. Install the spacers (18 and 42) in the inside groove in the bushing seals (17 and 43). Install one gasket (15 and 44) in the outside groove.
2. Lubricate the packings (16 and 45) with grease and install one packing in the inside groove of each bushing seal (17 and 43) so that both spacers (18 and 42) are together at the thick wall side of the groove.
3. Install the packing (46) in the outside groove so that it is at the same end of the bushing seal (43) as the packing (45). Give all packings an additional coat of grease.
4. Place the port end cover (14) and the shaft end cover (25) on the work bench with the bearing bores facing up.
5. Install the bushing seal (17) in the center bore in the port end cover (14) so that the spacer (18) enters before the gasket (15).
6. Install the roller bearings (19 and 48) in the outer bore of the port end cover (14) and the shaft end cover (25) so that they bottom at the end of the bearing bore.
7. Install the bushing seal (43) in the shaft end cover (25) so that the spacer (42) enters the bore before the packing (46). Locate the bushing seal against the roller bearing (48).
8. Place the spacer (47) in the center bore of the shaft end cover (25) next to the bushing seal (43). Press the bushing seal in until it seats on the end of the bore. Be sure that all packings are installed toward the gear side of the covers (14 and 25).
9. Check that the outside bores are clean and install the roller bearings (19 and 48) so that they bottom at the end of the bearing bores.
10. Place a small amount of grease into the middle slots in the open face of each thrust plate (23 and 38) and insert the pocket seals (20 and 39) in each thrust plate.
11. Place the thrust plates (23 and 38) with the pocket seal slots toward the covers (14 and 25) and install over the roller bearings (19 and 48).
12. Check to see that the pocket seals (20 and 39) are still in place and tap the thrust plates (23 and 38) into position with a soft hammer until approximately 1/32 inch clearance is left between the thrust plates and the covers (14 and 25).
13. Insert a pocket seal (21 and 40) into each of the four center radial slots in the thrust plates (23 and 38). Insert a pocket seal (22 and 41) into each of the four outside slots in the thrust plates. Be sure to push each pocket seal all the way into the slots so that the hidden end is always in contact with the roller bearing race.

ASSEMBLY (continued)

14. Tap the assembled thrust plate (23 and 38) into position against the face of the covers (14 and 25). Trim the exposed ends of the pocket seals (20 and 39) square and flush with the thrust plates.
15. Install the backup ring (36) in the outside groove of the shaft end cover (25).
16. Lubricate the O-ring (34) with grease and install it next to the backup ring (36) so that it is on the side of the backup ring nearest to the thrust plate (38) end of the shaft end cover (25). Give the O-ring (34) an additional coat of grease.
17. Install the backup ring (35) in the inside groove in the brake piston (32).
18. Lubricate the O-ring (33) and install it next to the backup ring (35) so that it is on the same side as the backup ring nearest to the large bore of the brake piston (32). Give the O-ring an additional coat of grease.
19. Check that the pin (37) is installed in the brake piston (32) to the shaft end cover (25). Ensure that the backup rings (35 and 36) do not extrude and get pinched between the mating diameters of the brake piston and the shaft end cover.
20. Place the key (27) in the keyway of the motor shaft (24), then press the sun gear (26) over the motor shaft. Ensure that the sun gear bottoms against the motor shaft shoulder.
21. Place the shaft end cover (25) on the workbench with the thrust plate (38) facing up and install the motor shaft assembly through the bushing seal (43). Take care not to extrude the gasket (44).
22. Lubricate the O-rings (29 and 31) with grease and install one on each side of the gear housing (30). Give the O-rings an additional coat of grease.
23. Assemble the gear housing (30) over the thrust plate (38) on the shaft end cover (25) so that the gear housing and the shaft end cover are concentric. Ensure that the pin (37) locates in the gear housing. Tap the gear housing in place.

NOTE

If the gears are not being replaced with new parts, assemble the gears with respect to the port end shaft as match marked during Disassembly.

24. Take the matched planet gears (28) and install them so that they pilot into the roller bearings (48) in the shaft end cover (25) and mate with the sun gear (26).
25. Install the port end cover (14) onto the gear housing (30) so that the hubs of the gears (26 and 28) pilot into the roller bearings (19). The thrust plate (23) should also pilot into the gear housing. Use a soft hammer to seat the port end cover, taking care that the O-rings (29 and 31) do not get pinched during assembly.
26. Wrap the threads of the pipe plugs (6) with antiseizing sealant tape and install the pipe plugs (6) in the port end cover (14).
27. Install the capscrews (12 and 13) and tighten evenly in stages to a torque of 200 lb-ft (271 Nm). After tightening the capscrews, ensure that the motor shaft (24) can be rotated by hand.

INSTALLATION**NOTE**

It may be necessary to rotate the motor assembly slightly so that the spline at the end of the motor shaft will engage with the gear in the primary planet assembly.

1. Place the winch assembly in a vertical position. Install the motor assembly (3) and primary sun gear (11) in the primary housing (2) by holding it square with the end of the primary housing as it enters the primary housing. The spline at the end of the motor shaft (24) will engage with the primary sun gear in the primary planet assembly and the motor will pilot into the planet hub bushing.
2. Install the snap ring (10) and make sure that it is properly seated in the bottom of the snap ring groove all the way around the primary housing (2).
3. Rotate the motor assembly (3) in the primary housing (2) to align with the match marks made during disassembly.
4. Lubricate a new preformed packing (9) with grease and install it in its groove on the motor assembly (3). Lubricate the preformed packing again after installation.
5. Install the brake springs (7) in the spring cover (1). If all of the spring holes were not used when disassembled, refer to the match marks made during Disassembly and install the springs only in the holes used previously.
6. Lubricate a new preformed packing (8) with grease and install it in its groove in the spring cover (1). Lubricate the preformed packing again after installation.
7. Install the spring cover (1) over the motor assembly (3), aligning it according to the match marks made during disassembly.
8. Install the bolts (4) and seal washers (5). Tighten the bolts evenly, turning each bolt one-half turn at a time to ensure that the spring cover (1) remains parallel to the end of the primary housing (2) as it is tightened into place. Torque the bolts to 50 lb-ft (68 Nm).
9. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.
10. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP WINCH, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
 Hoisting Device, 2 Ton (Item 11, Table 1, WP 0230 00)
 Suitable Drain Pan

Personnel Required:

Three Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
 Gloves, Anti-Flash (Item 13, Table 2, WP 0230 00)
 Grease (Item 21, Table 2, WP 0230 00)
 Lubricating Oil, Gear (Item 23, Table 2, WP 0230 00)

Equipment Condition:

Ramp lowered and supported by land, pier, or safety chains
 Observe other equipment conditions contained in the procedure

References:

FM 55-502
 TM 55-1905-242-24P (WP 0095)

REMOVAL**WARNING**

Use a suitable hoisting device to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

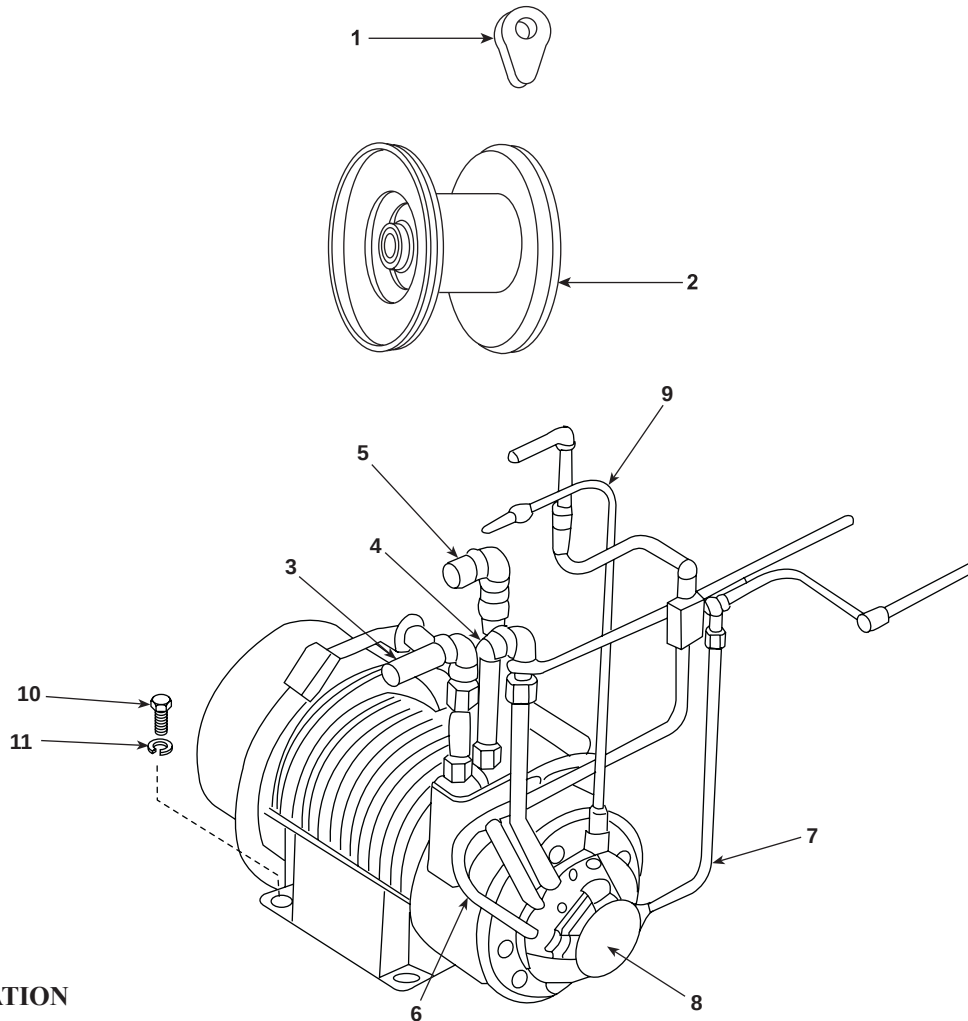
Always wear leather gloves when handling wire rope. Handling wire rope with bare hands can cause serious injury or death.

1. Position one crewmember in the pilothouse to operate the winch and one crewmember on the bow ramp to receive the winch cable. The crewmember on the bow ramp must don protective leather gloves.
2. Have the crewmember in the pilothouse operate the winch in the RAMP DOWN position while the crewmember on the bow ramp fakes the winch cable onto the ramp. Pay out the winch cable until all of the winch cable has been removed from the winch drum.
3. Remove the wedge (1) that secures the bitter end of the winch cable to the winch drum (2) and remove the winch cable from the winch drum.
4. Lockout and tagout the propulsion engines in accordance with FM 55-502.
5. Position a suitable drain pan under the work area.
6. Label and disconnect the hoses (3, 4, 5, 6, and 7) from the winch (8). Cap the hoses and the winch fittings to prevent system contamination.
7. Remove the tubing (9) from the winch (8). Cap the tubing and winch fitting to prevent system contamination.

REMOVAL(continued)**NOTE**

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

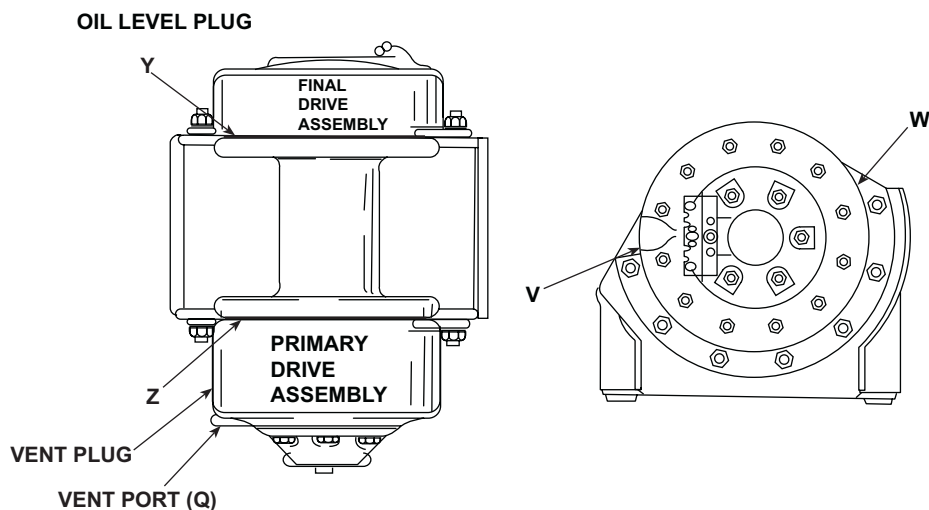
8. Remove the mounting bolts (10) and lockwashers (11) that secure the winch (8) to its foundation.
9. Attach a suitable hoisting device to the winch (8) and remove it from its foundation.

**INSTALLATION**

1. Ensure that the final drive is filled with gear lubricating oil 80W-90 to the level of the filler plug.
2. Fill the primary drive assembly with hydraulic fluid through the vent port (Q).
3. Use a suitable hoisting device to set the winch (8) on its foundation.
4. Secure the winch (8) to its foundation with the mounting bolts (10) and lockwashers (11).
5. Remove the caps and connect the hoses (3, 4, 5, 6, and 7) to the winch (8) using the labels from step 6 of Removal as a guide.
6. Remove the caps and connect the tubing (9) to the winch (8).
7. To check the alignment of the winch:
 - a. Use feeler gauges to measure the clearance between the winch drum and the final drive (Y) at points "V" and "W."
 - b. Use feeler gauges to measure the clearance between the winch drum and the primary drive (Z) at points "V" and "W."

INSTALLATION (continued)

- c. For proper alignment, clearance “Y” should be the same at points “V” and “W.” Clearance “Z” should also be the same at points “V” and “W.” Clearance “Y” does not have to equal clearance “Z.”
- d. If clearance “Y” or “Z” varies by more than 0.005 inch (0.13 mm) as measured at points “V” and “W,” install shims under the corner of the winch base until clearances are within acceptable tolerances when the winch is bolted solidly to its mounting.



8. Position one crewmember in the pilothouse to operate the winch and two crewmembers on the bow ramp to feed the winch cable. The crewmembers on the bow ramp must don protective leather gloves.
9. Install the bitter end of the winch cable into the winch drum (2) and secure it with the wedge (1).
10. Remove the lockouts and tagouts from the propulsion engines.
11. Place the ramp control in the UP position (winch in the cable) while one crewmember on the bow ramp keeps the winch cable taut and the other crewmember ensures that the winch cable reels evenly onto the winch drum (2).
12. After taking up all of the slack in the winch cable, position the bow ramp as required.
13. Check the winch area to ensure that no leakage is present.
14. Dispose of used oil, hydraulic fluid, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
CRANE HYDRAULIC VALVES, HOSES, AND FITTINGS, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Suitable Drain Pan

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)

Equipment Condition:

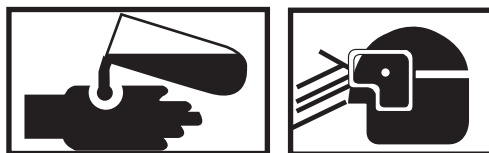
Propulsion engines secured, locked out, and
tagged out IAW FM 55-502
Crane boom at rest in boom cradle or otherwise
supported to prevent unexpected movement

References:

FM 55-502
WP 0157 00
WP 0158 00
WP 0222 00
TM 55-1905-242-24P (WP 0100)

Personnel Required:

Two Watercraft Engineers, 88L

REMOVAL--SLEWING STOP VALVE**WARNING**

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

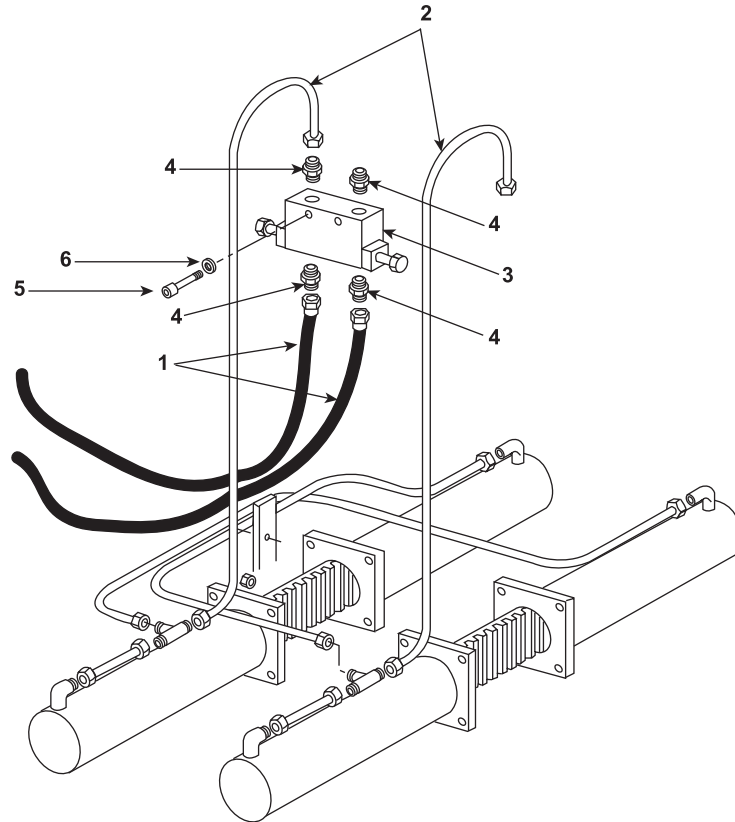
Hydraulic hoses and lines may be under pressure. Relieve pressure by operating the appropriate control valve if possible. Loosen fittings on hose lines slowly. Allow oil to run around threads of fitting, releasing pressure before disconnecting fitting. Releasing pressurized oil suddenly can cause serious injury or death.

1. Don chemical protective gloves and goggles and position a suitable drain pan under the work area.
2. Loosen, but do not remove, the hoses (1) and piping (2) at the slewing stop valve (3) in order to permit any residual hydraulic fluid or pressure to drain from the system.
3. Label and remove the hoses (1) and piping (2) from the slewing stop valve (3).
4. Label and remove the fittings (4) from the slewing stop valve (3).

REMOVAL--SLEWING STOP VALVE (continued)**NOTE**

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

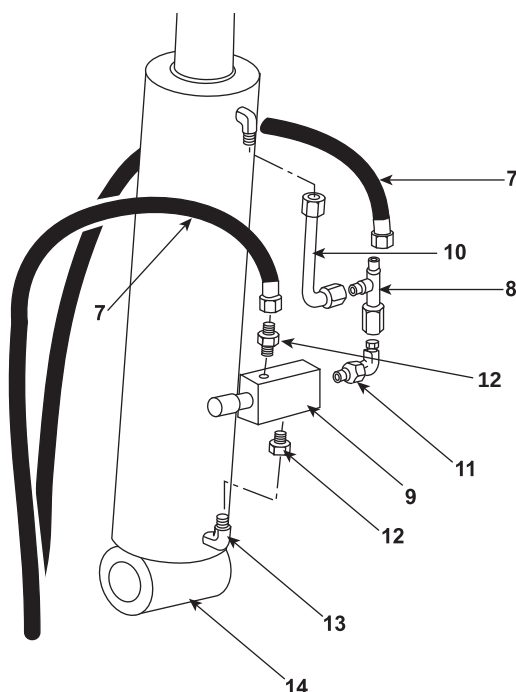
5. Remove the bolts (5) and lockwashers (6) that secure the slewing stop valve (3) to the structure. Remove the slewing stop valve.

**INSTALLATION--SLEWING STOP VALVE**

1. Position the slewing stop valve (3) on the structure and secure it with the bolts (5) and lockwashers (6).
2. Install the fittings (4) into the slewing stop valve (3) using the labels from step 4 of Removal--Slewing Stop Valve as a guide.
3. Install the hoses (1) and piping (2) onto the slewing stop valve (3) using the labels from step 3 of Removal--Slewing Stop Valve as a guide.
4. If no further work will be performed, remove the lockouts and tagouts and check the operation of the system.
 - a. Slew the boom from one extreme to the other and ensure that the slewing stop valve stops the boom from slewing at both extremes of swing.
 - b. Check that the boom slews smoothly at both slow and fast speeds.
 - c. Check that the boom stops properly when the control is released.
 - d. Check that no leaks are present.
5. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.
6. Check the hydraulic fluid level in the reservoir and replenish as required.

REMOVAL--FIRST BOOM CYLINDER HOLDING VALVE

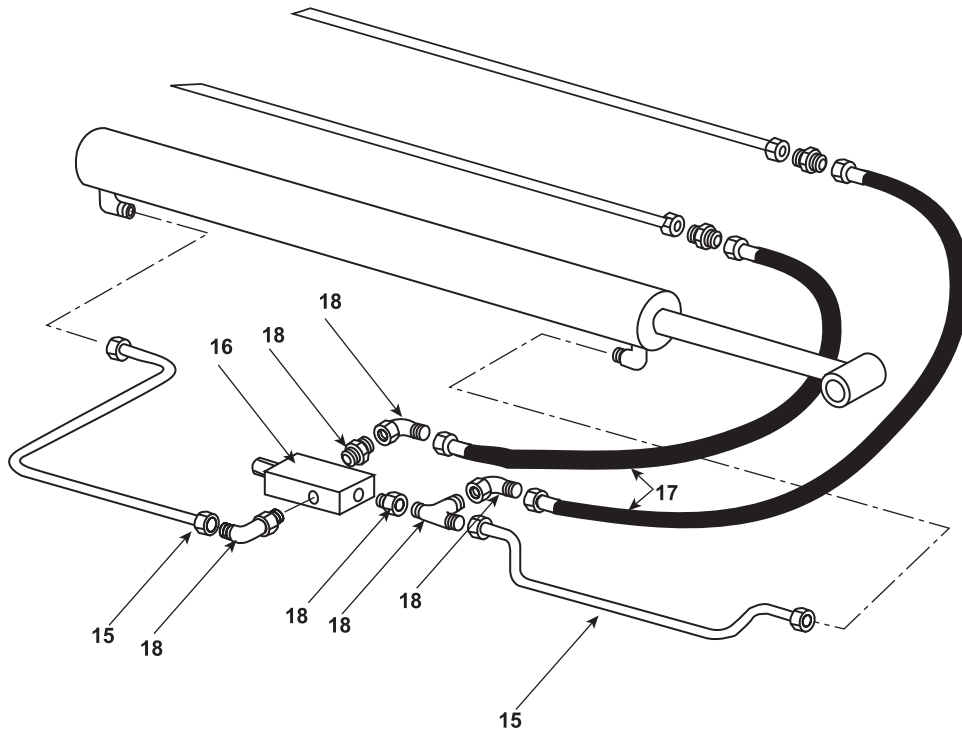
1. Don chemical protective gloves and goggles and position a suitable drain pan beneath the work area.
2. Loosen, but do not remove, the hoses (7) and “T” fitting (8) at the holding valve (9) to permit any residual hydraulic fluid or pressure to drain from the system.
3. Label and remove the hoses (7), piping (10), “T” fitting (8), and elbow (11).
4. Unscrew the holding valve (9), fittings (12), and elbow (13) as a unit from the first boom cylinder (14).
5. Label and remove the fittings (12) and elbow (13) from the holding valve (9).

**INSTALLATION--FIRST BOOM CYLINDER HOLDING VALVE**

1. Install the fittings (12) and elbow (13) into the holding valve (9) and install these items as a unit onto the first boom cylinder (14) using the labels from step 5 of Removal--First Boom Cylinder Holding Valve as a guide.
2. Install the hoses (7), piping (10), “T” fitting (8), and elbow (11) using the labels from step 3 of Removal--First Boom Cylinder Holding Valve as a guide.
3. If no further work will be performed, remove the lockouts and tagouts and check the operation of the system, ensuring that the boom cylinder moves smoothly in both directions and that it does not “drift” when the control lever is released.
4. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.
5. Notify general support maintenance to perform a lift test on the crane (WP 0222 00).

REMOVAL--SECOND BOOM CYLINDER HOLDING VALVE

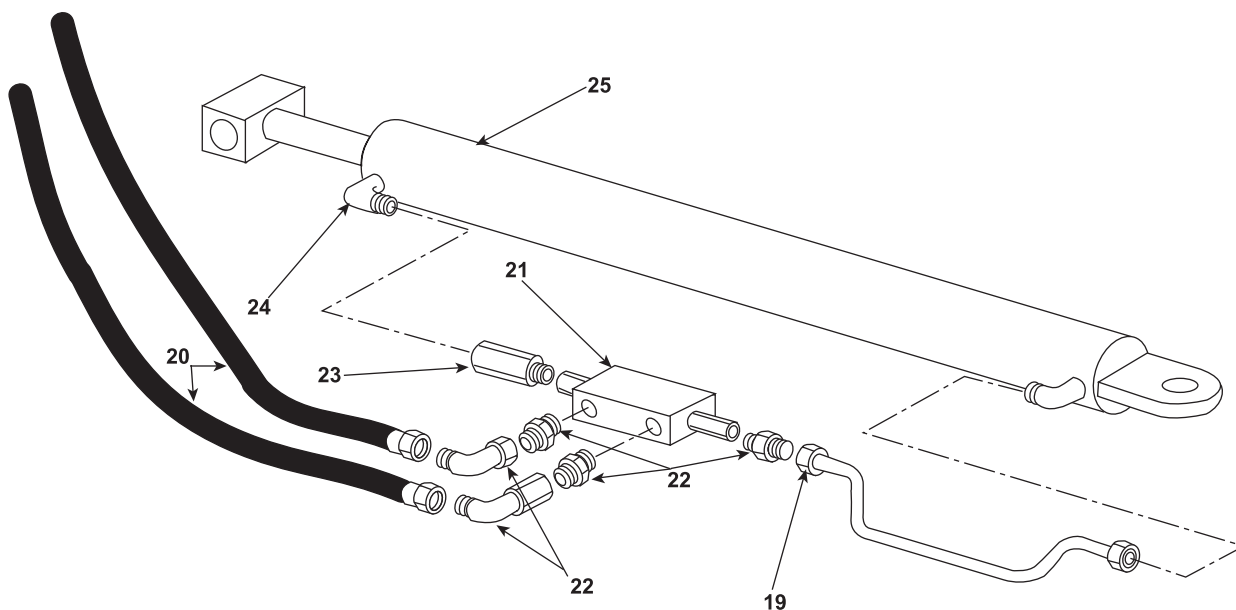
1. Don chemical protective gloves and goggles and position a suitable drain pan beneath the work area.
2. Loosen, but do not remove, the piping (15) at the holding valve (16) to permit any residual hydraulic fluid or pressure to drain from the system.
3. Label and remove the piping (15), hoses (17), and fittings (18).
4. Remove the holding valve (16).

**INSTALLATION--SECOND BOOM CYLINDER HOLDING VALVE**

1. Position the holding valve (16) and install the piping (15), hoses (17), and fittings (18) using the labels from step 3 of Removal--Second Boom Cylinder Holding Valve as a guide.
2. If no further work will be performed, clear the lockouts and tagouts and check the operation of the system, ensuring that the boom cylinder moves smoothly in both directions and that it does not “drift” when the control lever is released.
3. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.
4. Notify general support maintenance to perform a lift test on the crane (WP 0222 00).

REMOVAL--EXTENSION CYLINDER HOLDING VALVE

1. Don chemical protective gloves and goggles and position a suitable drain pan beneath the work area.
2. Loosen, but do not remove, the piping (19) and hoses (20) at the holding valve (21) to permit any residual hydraulic fluid or pressure to drain from the system.
3. Label and remove the piping (19), hoses (20), and fittings (22).
4. Unscrew the holding valve (21), fitting (23), and elbow (24) as a unit from the extension cylinder (25).

**INSTALLATION--EXTENSION CYLINDER HOLDING VALVE**

1. Assemble the holding valve (21), fitting (23), and elbow (24) and install them as a unit into the extension cylinder (25).
2. Install the piping (19), hoses (20), and fittings (22) using the labels from step 3 of Removal--Extension Cylinder Holding Valve as a guide.
3. If no further work will be performed, remove the lockouts and tagouts and check the operation of the system, ensuring that the boom cylinder moves smoothly in both directions and that it does not "drift" when the control lever is released.
4. Dispose of used hydraulic fluid and contaminated materials in accordance with local regulations.
5. Notify general support maintenance to perform a lift test on the crane (WP 0222 00)

REPAIR--VALVE BANK

Repair of the valve bank is described in WP 0158 00.

REPAIR--HOSES AND FITTINGS

Repair of the hoses and fitting is accomplished by the replacement of the defective hoses and/or fittings. For replacement procedures refer to WP 0157 00.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
CRANE ASSEMBLY SLEWING UNIT, REPLACE/REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Suitable Drain Pan

Equipment Condition:

Crane positioned at midpoint of slewing rotation
Starboard propulsion engine secured, locked out, and tagged out IAW FM 55-502

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)

References:

FM 55-502
TM 55-1905-242-24P (WP 0101)

REMOVAL**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Before securing the starboard propulsion engine, operate the crane and position it at the midpoint of its slewing rotation.
2. Secure the starboard propulsion engine and perform appropriate lockout/tagout procedures in accordance with FM 55-502.
3. Don chemical protective gloves and goggles and position a suitable drain pan beneath the work area.

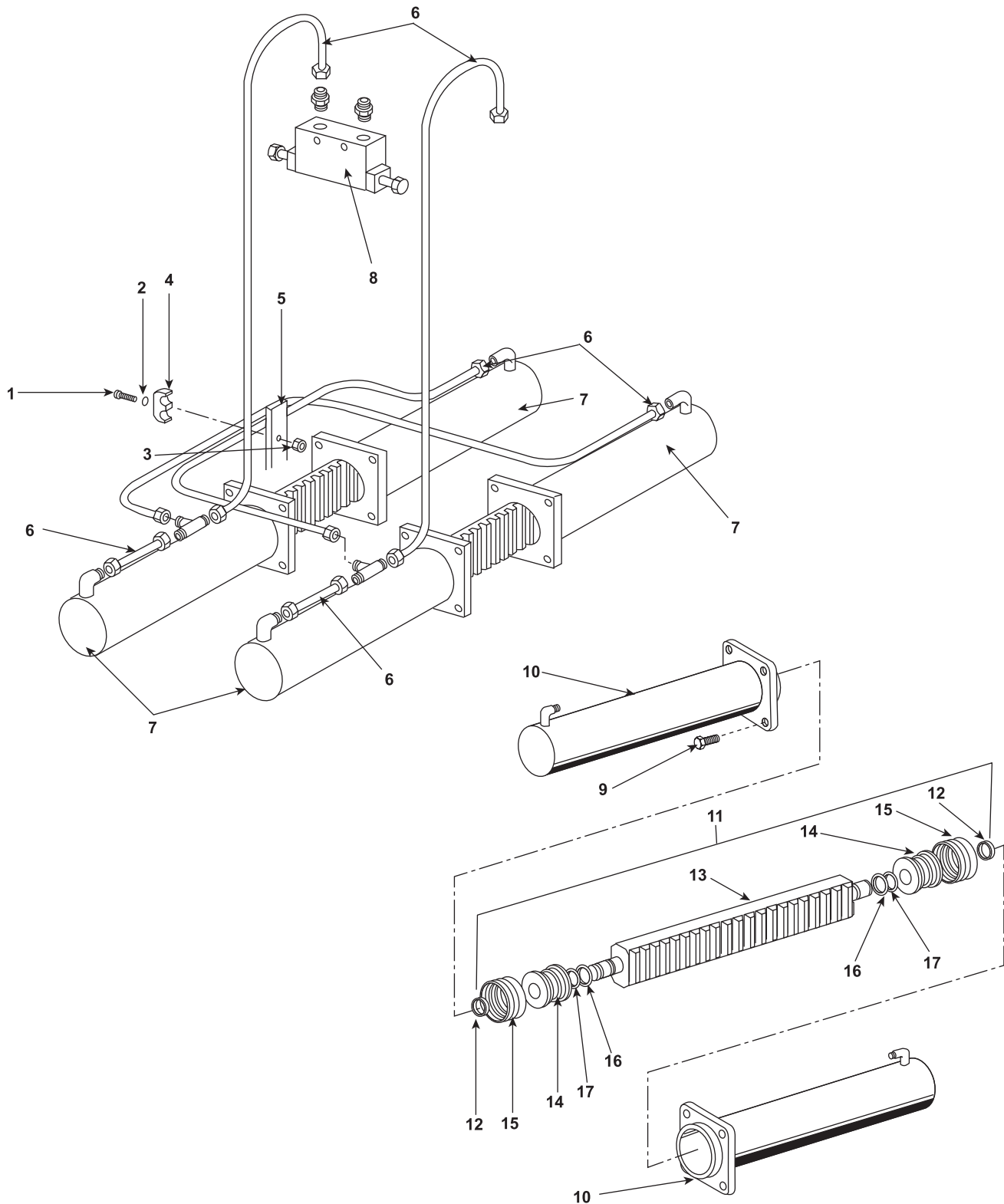
NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

4. Remove the bolt (1), lockwasher (2), nut (3), and line clamp (4) from the mounting bracket (5).
5. Label and remove all the hydraulic lines (6) from the slewing cylinders (7) and block (8).

REMOVAL (continued)

6. Remove the bolts (9) that secure the slewing cylinder barrels (10) to the crane base.
7. Pull the slewing cylinder barrels (10) off the rack assembly (11).
8. Remove the circlips (12) from the end of the racks (13) and remove the pistons (14), gaskets (15 and 16), and O-rings (17).



REMOVAL (continued)

9. Rotate the boom assembly slowly by hand. This will walk the racks (13) out of the base assembly.
10. Inspect all of the removed parts for signs of wear, damage, or deterioration.
11. If not already on, don chemical protective gloves and goggles, clean all disassembled parts with cleaning solvent, and wipe them dry with wiping rags.

REPAIR

Repair of the slewing assembly is accomplished by the replacement of worn, damaged, or deteriorated components.

INSTALLATION

1. Position the racks (13) so that one rack is on each side of the crane base. The teeth should be facing the centerline of the crane base and both racks should be pushed in until they lightly contact the pinion gear inside the base.
2. Rotate the boom slowly by hand to walk the racks (13) back into the crane base. Continue rotating the boom until both racks are centered in the crane base.
3. Install the gaskets (15 and 16), O-rings (17), and pistons (14) onto the racks (13) and secure them with the circlips (12).
4. Apply a light coat of hydraulic fluid to the gaskets (15).
5. Slide the cylinder barrels (10), one at a time, over the ends of the racks (13). It may be necessary to hold the boom stationary while the cylinder barrels are being installed.
6. Secure the cylinder barrels (10) to the crane base with the bolts (9).
7. Connect the hydraulic lines (6) to the slewing cylinders (7) and the block (8) using the labels from step 5 of Removal as a guide.
8. Secure the hydraulic lines (6) to the mounting bracket (5) with the line clamp (4), nut (3), lockwasher (2), and bolt (1).
9. Remove the lockouts and tagouts and check the operation of the system, ensuring that the crane slews smoothly through its full range of motion. Slew the crane through its full range of motion six to eight times to work all the air from the system.
10. Check the hydraulic fluid level and replenish as necessary.
11. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**DIRECT SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
CRANE ASSEMBLY EXTENSION ASSEMBLY, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)

Materials/Parts:

Grease (Item 21, Table 2, WP 0230 00)

Equipment Condition:

Starboard propulsion engine secured, locked
out, and tagged out IAW FM 55-502

References:

FM 55-502
TM 55-1905-242-24P (WP 0102)

Personnel Required:

Two Watercraft Engineers, 88L

DISASSEMBLY**WARNING**

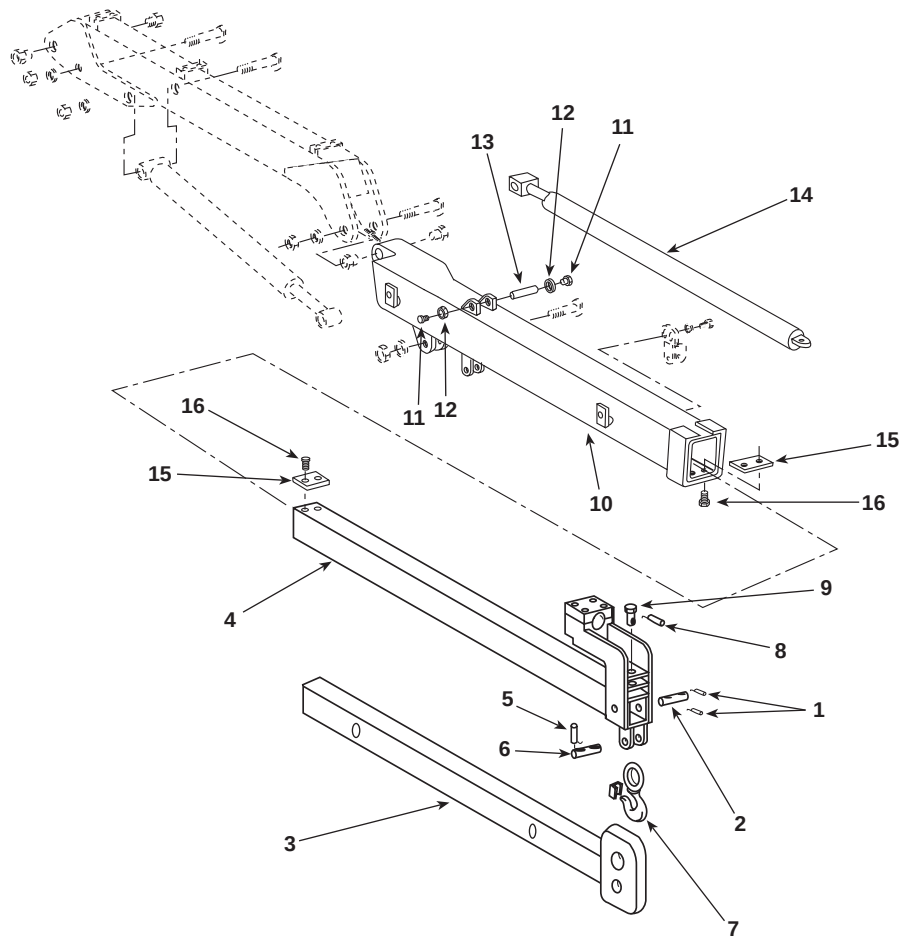
Use two crewmembers to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

1. With the boom in its stowed position, remove one of the hairpin clips (1) that secure the manual extension pin (2) and remove the pin.
2. Using two crewmembers, pull the manual extension section (3) completely out of the hydraulic extension section (4).
3. Remove one of the hairpin clips (5) that secures the hook pin (6). Remove the hook pin and the hook (7).

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

4. Remove the cotter pin (8) that secures the extension cylinder outer pin (9) and remove the outer pin.
5. Using two crewmembers, pull the hydraulic extension section (4) out of the second boom section (10).
6. Remove the screws (11), washers (12), and pin (13) that secure the extension cylinder (14) to the second boom section (10).



INSPECTION

1. Inspect the manual extension section (3), the hydraulic extension section (4), and all hardware for wear, damage, or deformity.
2. If the bushings (15) are worn, remove them by removing their attaching screws (16).
3. Inspect the extension cylinder (14) for dents, scrapes, or corrosion of the rod section. Check the barrel for cracking or damage. Check the entire cylinder for signs of leakage. Replace the cylinder if damage or leakage are found.
4. Procure any parts necessary.

ASSEMBLY

1. If the bushings (15) were removed, position them on the second boom section (10) and on the hydraulic extension section (4) and secure them with their attaching screws (16).
2. Apply a light coat of grease to the bushings (15).
3. Position the extension cylinder (14) on the second boom section (10) and secure it with the pin (13), washers (12), and screws (11).
4. Using two crewmembers, slide the hydraulic extension section (4) into the second boom section (10).

ASSEMBLY (continued)

5. Secure the hydraulic extension section (4) to the extension cylinder (14) using the extension cylinder outer pin (9) and cotter pin (8).
6. Using two crewmembers, slide the manual extension section (3) into the hydraulic extension section (4).
7. Secure the manual extension section (3) to the hydraulic extension section (4) with the manual extension pin (2) and hairpin clips (1).
8. Attach the hook (7) to the hydraulic extension section (4) using the hook pin (6) and hairpin clips (5).
9. Remove the lockouts and tagouts and check the operation of the system, ensuring that the hydraulic extension section (4) slides smoothly in and out of the second boom section (10).

END OF WORK PACKAGE

CHAPTER 9

**GENERAL SUPPORT
MAINTENANCE PROCEDURES
FOR
LANDING CRAFT, MECHANIZED (LCM-8)
(ALL VESSELS WITH MOD 2 APPLICATION)**

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
HYDRAULIC STARTING SYSTEM RECHARGING PUMP, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Vise (Item 3, Table 1, WP 0230 00)
Installer, Recharging Pump Shaft Seal (Item 13, Table 1, WP 0230 00)

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502
Recharging pump removed (WP 0086 00)

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts: (continued)

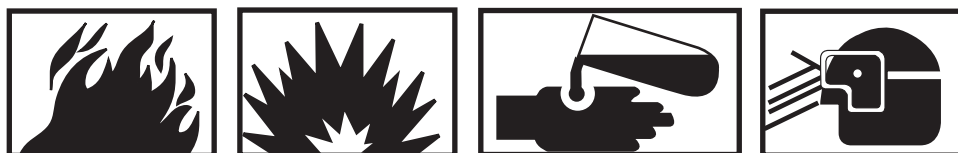
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Grease (Item 21, Table 2, WP 0230 00)
O-Ring (p/n GA1129-2, qty 1)
Packing, Preformed (p/n GA1129-4, qty 1)
O-Ring (p/n GA1129-1, qty 2)
Retainer, Packing (p/n RG100157, qty 2)
O-Ring (p/n GA1129-7, qty 1)
Seal, Oil (p/n SE100082, qty 1)
Packing (p/n GA1129-5, qty 1)
Seal, Oil (p/n SE1047, qty 1)

References:

WP 0086 00
TM 55-1905-242-24P (WP 0014)

Materials/Parts:

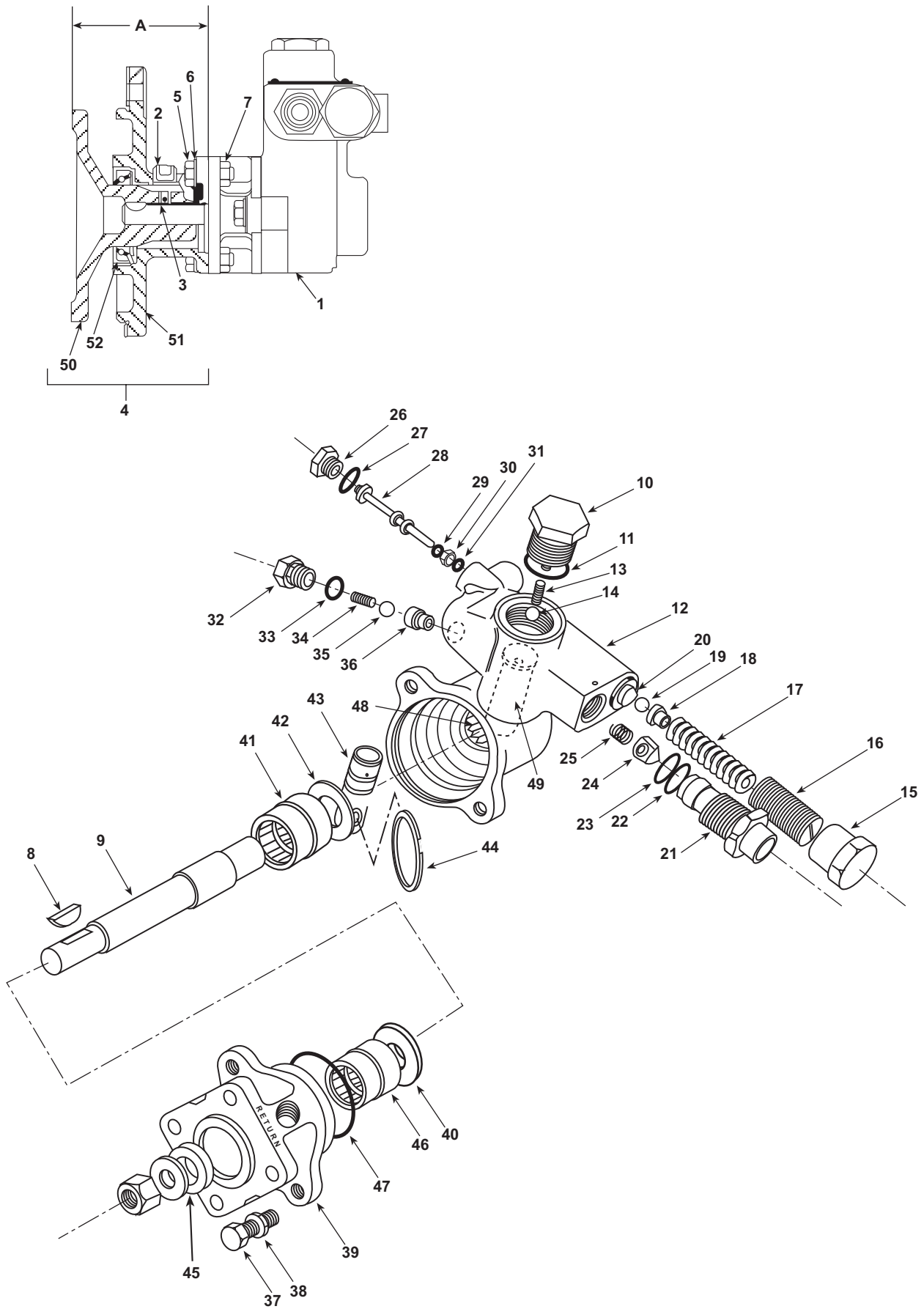
Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)

DISASSEMBLY**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.
2. Clamp the pump assembly (1) in a vise.
3. Remove the pipe plug (2) and setscrew (3) from the drive assembly (4).



DISASSEMBLY (continued)**NOTE**

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

4. Remove the bolts (5), lockwashers (6), and nuts (7) that attach the pump assembly (1) to the drive assembly (4). Separate the drive assembly from the pump assembly.
5. Remove the Woodruff key (8) from the drive shaft (9).
6. Remove the hex plug (10) and O-ring (11) from the top of the pump housing (12). This will allow the valve spring (13) and check ball (14) to be removed. Remove the valve spring and check ball.
7. Remove the unloading valve cap (15), adjusting screw (16), spring (17), valve seat (18), and steel ball (19). Do not remove the valve seat (20) unless replacement is required.
8. Remove the adapter fitting (21), backup ring (22), O-ring (23), inlet valve (24), and inlet valve spring (25).
9. Remove the hex plug (26) and O-ring (27). Insert a dowel in the opposite side and push out the valve plunger (28).
10. Remove the backup ring (29), O-ring (30), and backup ring (31).
11. Remove the hex plug (32), O-ring (33), spring (34), check ball (35), and valve seat (36).
12. Remove the bolts (37) and lockwashers (38) holding the mounting flange assembly (39).
13. Remove the drive shaft (9), washer (40), needle bearing (41), and washer (42).
14. Remove the piston (43) and piston retaining ring (44).
15. Remove the oil seal (45), roller bearing (46), and O-ring (47) from the mounting flange assembly (39).
16. Remove the carrier needle bearing (48) in the pump housing (12) only if it will be replaced. Do not attempt to remove the sleeve (49) from the pump housing. It is not replaceable.
17. Separate the intermediate drive (50) from the flange assembly (51).
18. Remove the oil seal (52) from the flange assembly (51).

CLEANING

1. If not already on, don protective goggles and gloves and clean all parts thoroughly with cleaning solvent.
2. Dry all parts, except needle bearings, with clean wiping rags. Allow the needle bearings to air dry.
3. Remove any foreign material from the bleed hole of the piston.

INSPECTION

1. Discard all O-rings (11, 23, 27, 30, 33, and 47) and the oil seal (45). Replace these with new parts.
2. Examine the springs (13, 17, 25, and 34) to be sure that they are not bent, chafed, or otherwise deformed. Replace the springs as necessary.
3. Inspect all check balls (14, 19, and 35) and valve seats (18, 20, and 36) for scoring, pitting, or other damage. Replace the check balls and/or valve seats as necessary.

INSPECTION (continued)

4. Inspect the piston (43) for scratches or scoring. Replace the piston as necessary.
5. Examine the drive shaft (9) to be sure that it is free of burrs or other damage. Check to be sure that the keyway is not broken or rounded over. Replace the shaft as necessary.
6. Inspect the needle and roller bearings (41, 46, and 48) for wear, scoring, pitting, or grooving. Replace the bearings as necessary.
7. Examine the pump housing (12) for cracks or other damage. Check the threads for damage. Replace the pump housing as necessary.
8. Inspect the intermediate drive (50) for cracks and wear. Replace the intermediate drive as necessary.
9. Inspect the flange assembly (51) for cracks, wear, damaged thread, or other damage. Replace the flange assembly as necessary.
10. Inspect the pipe plug (2) and setscrew (3) for thread damage. Replace the pipe plug and setscrew as necessary.

ASSEMBLY

1. Lubricate the new oil seal (52) with clean hydraulic fluid and install it into the flange assembly (51).
2. Install the intermediate drive (50) in the flange assembly (51).
3. Press the carrier needle bearing (48) into the pump housing (12) if it has been removed.
4. Install the piston retaining ring (44) on the piston (43). Put a light coat of grease on the piston and slide the piston with the piston retaining ring into the sleeve (49). The bleed hole in piston must be facing the inlet.
5. Install the needle bearing (41) and the washer (42) on the drive shaft (9) and then install the drive shaft into the pump housing (12). Ensure that the drive shaft enters the carrier needle bearing (48) freely.
6. Put a light coat of grease on the outside diameter of the roller bearing (46). Press the roller bearing into the bore of the mounting flange assembly (39) until it is flush with the surface.
7. Lubricate the new oil seal (45) with clean hydraulic fluid and press it into the bore of the mounting flange assembly (39) to a depth of 1/4 inch (6 mm) below the surface of the flange. Ensure that the garter spring in the oil seal is facing in the direction of the roller bearing (46).
8. Install the washer (40) on the drive shaft (9). Using the recharging pump shaft seal installer tool, install the mounting flange assembly (39) and O-ring (47) over the drive shaft.
9. Secure the mounting flange assembly (39) with two bolts (37) and lockwashers (38) before removing the shaft seal installation tool.
10. Install the check ball (14), valve spring (13), and hex plug (10) with a new O-ring (11).
11. Install the inlet valve spring (25), inlet valve (24), and adapter fitting (21) with new O-ring (23) and backup ring (22).
12. Install the valve seat (20) if removed. Install the steel ball (19), valve seat (18), spring (17) and adjusting screw (16). Install the unloading valve cap (15) loosely until final pressure adjustment is obtained.
13. Install the backup ring (29), O-ring (30) and backup ring (31) on the valve plunger (28). Install the valve plunger assembly into the pump housing (12). Install the O-ring (27) on the hex plug (26) and screw the hex plug into the pump housing.

ASSEMBLY (continued)

14. Install the valve seat (36), check ball (35), and spring (34). Install the hex plug (32) with a new O-ring (33).
15. Install the Woodruff key (8) in the drive shaft (9) and check for free rotation of the drive shaft.
16. Install the pump assembly (1) drive shaft (9), with the Woodruff key (8) in place into the drive assembly (4).
17. Secure both assemblies with the bolts (5), lockwashers (6), and nuts (7).
18. Ensure that distance "A" measures 2.594 inches (65.89 mm) before tightening the bolts (5).
19. Install the setscrew (3) and pipe plug (2) in the drive assembly (4).

ADJUST

1. Install the pump on the propulsion engine from which it was removed (WP 0086 00).
2. Remove the lockouts and tagouts and start the engine served by the pump.
3. Remove the unloading valve cap (15) to gain access to the adjusting screw (16).
4. Use a screwdriver to turn the adjusting screw (16) clockwise to increase the setting or counterclockwise to decrease the setting. Set the adjusting screw for the pump to unload at 3000 lb/in², as observed on the accumulator pressure valves.
5. Check the hydraulic fluid level in the reservoir. Replenish as required.
6. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
ACCUMULATOR, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
 Vise (Item 3, Table 1, WP 0230 00)
 Wrench, Torque, 1/2 in. Drive, 0-200 lb-ft (Item 12, Table 1, WP 0230 00)
 Hose Assembly, Accumulator Charging (Item 14, Table 1, WP 0230 00)
 Gauge Assembly, Accumulator (Item 15, Table 1, WP 0230 00)
 Drop Light, Extension (Item 16, Table 1, WP 0230 00)
 Air Compressor (Item 17, Table 1, WP 0230 00)

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
 Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
 Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
 Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
 Rag, Wiping (Item 5, Table 2, WP 0230 00)
 Grease (Item 21, Table 2, WP 0230 00)
 Nitrogen Gas (Item 24, Table 2, WP 0230 00)
 Gasket (p/n GA100117, qty 2)
 Packing, Preformed (p/n 203524, qty 8)
 Packing, Preformed (p/n RG100155, qty 8)
 Packing, Preformed (p/n GA100475, qty 2)

Equipment Condition:

Accumulator removed (WP 0087 00)

References:

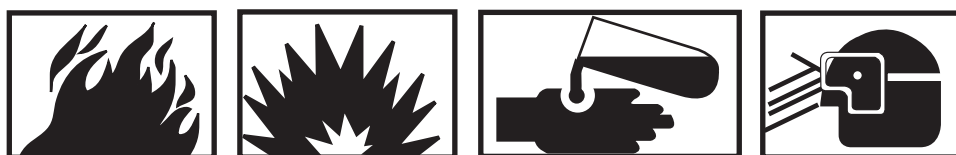
FM 55-502
 TM 55-1905-242-24P (WP 0015)
 WP 0022 00
 WP 0087 00

Personnel Required:

Two Watercraft Engineers, 88L

DISASSEMBLY

WARNING



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1. Don chemical protective gloves and goggles.
2. Remove the protective cap (1) and loosen the air valve (2) until the nitrogen gas escapes.
3. Remove the air valve assembly (3) and air valve gasket (4).
4. Remove the fusible plug (5) and gasket (6).

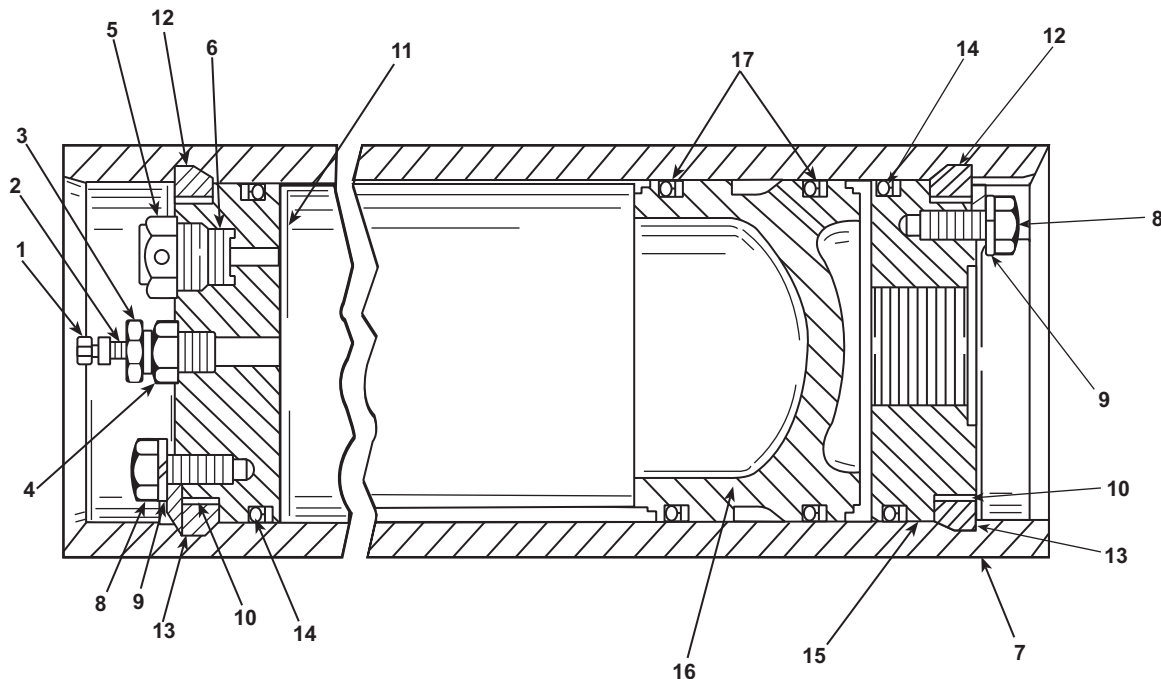
DISASSEMBLY (continued)

5. Secure the housing (7) in a vise.

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

6. Remove the screws (8), lockwashers (9), and retaining plate (10) from the air end cap (11).
7. Screw a 1/2 - 20 fitting into the air valve assembly (3) port.
8. Push the air end cap (11) into the housing (7) far enough to permit removal of the ring segments (12 and 13). Remove the ring segments and air end cap.
9. Remove the O-ring (14).
10. Repeat steps 5-9 for the oil end cap (15).



11. Use a wooden dowel to push the piston (16) out of the housing (7).
12. Remove the seal rings (17) from the piston (16).

CLEANING

1. If not already on, don protective gloves and goggles.
2. Clean all metal parts with cleaning solvent and dry them with clean wiping rags.

INSPECTION

1. Use a drop light to examine the bore of the housing (7). The bore must be free of scratches. Check the ring segment grooves (12 and 13) for sharp, square edges to retain the ring segments. Remachine or replace the housing as required.
2. Examine the air end cap (11) and oil end cap (15) for damage. Check the fitting threads and fusible plug (5) holder threads. Repair or replace the air end cap and oil end cap as required.

INSPECTION (continued)

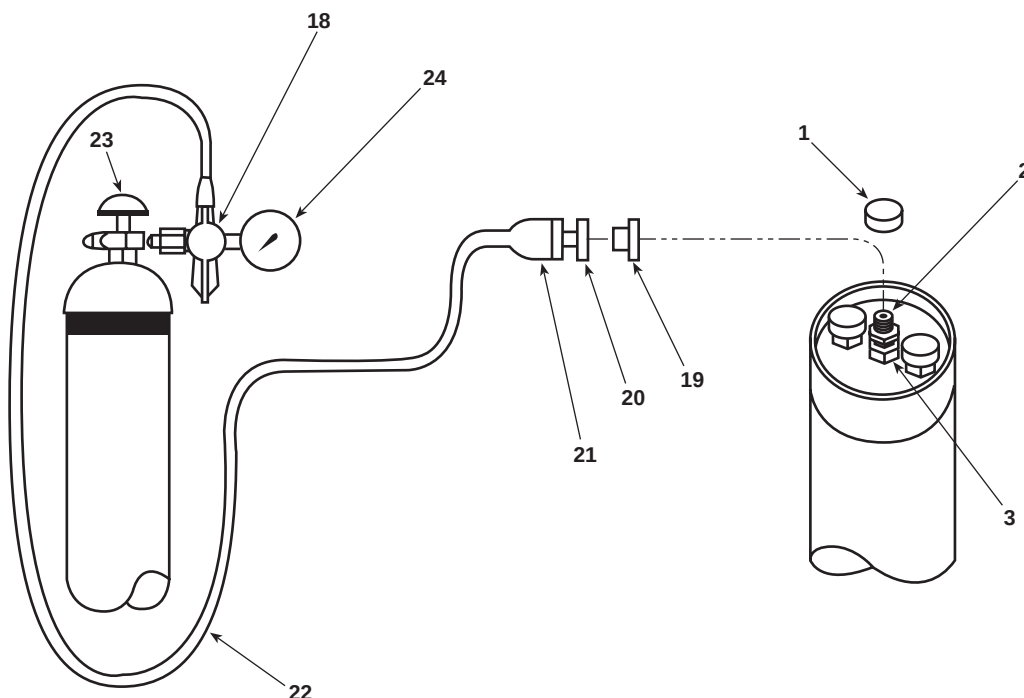
3. Examine the piston (16) for scratches or scoring on the Outside Diameter (O.D.). Slide the piston, without seal rings (17), through the housing (7) to ensure that it moves freely throughout the length of the housing. Machine or replace the piston as required.
4. Discard all O-rings and gaskets in accordance with local regulations. Obtain new parts as required.

ASSEMBLY

1. Install the seal rings (17) onto the piston (16). Lubricate the seal rings with clean hydraulic fluid.
2. Coat the Inside Diameter (I.D.) of the housing (7) with clean hydraulic fluid.
3. Insert the piston (16) into the housing (7) bore with the closed end first. Check the seal rings (17) to be sure they are not twisted or otherwise damaged.
4. Push the piston (16) half way down the housing (7) bore.
5. Install the O-ring (14) to the oil end cap (15). Coat the O-ring with light grease to hold it in place.
6. Slide the oil end cap (15) into the housing (7) beyond its normal position.
7. Install the ring segments (12 and 13) to hold the oil end cap (15) in place.
8. Push the piston (16) against the oil end cap (15) to position the oil end cap against the ring segments (12 and 13).
9. Install the retaining plate (10) and secure the oil end cap (15) with the lockwashers (9) and screws (8).
10. Install the O-ring (14) to the air end cap (11). Coat the O-ring with light grease to hold it in place.
11. Slide the air end cap (11) into the housing (7) beyond its normal position.
12. Install the ring segments (12 and 13) and hold in place.
13. Apply pneumatic force of 50 lb/in² (3.4 bar) maximum to position the air end cap (11) against the ring segments (12 and 13).
14. Install the retaining plate (10) and secure it with the lockwashers (9) and screws (8).
15. Release the pneumatic pressure.
16. Install the gasket (6) and fusible plug (5). Torque the fusible plug to 20 to 25 lb-ft (27 to 34 Nm).
17. Install the air valve gasket (4) and air valve assembly (3). Torque the air valve assembly to 45 to 50 lb-ft (61 to 68 Nm). Do not tighten the air valve (2) at this time.
18. Dispose of used cleaning solvent, hydraulic fluid, and contaminated materials in accordance with local regulations.

CHARGING

1. Attach the nitrogen regulator (18) to the nitrogen tank.
2. Install the air valve stem extension (19) on the air check valve connector (20).
3. Completely back off the shaft pin in the air check valve connector (21) on the charging kit hose (22).
4. Remove the protective cap (1) from the air valve (2) on the accumulator.
5. Install the connectors on the air valve stem extension (19) on the air valve (2).
6. Turn the shaft pin in the air check valve connector (20) clockwise until the valve core air valve is depressed.
7. Open the nitrogen tank valve (23) on the nitrogen tank and allow a small flow of nitrogen to enter the accumulator until the charging kit gauge (24) registers 1300 lb/in² (90 bar). Close the nitrogen tank valve.
8. Check the precharge pressure (WP 0022 00). Allow time for the pressure to stabilize
9. Pressure indicated on pressure gauge (24) is accumulator precharge pressure. Add nitrogen as required to achieve the proper precharge pressure.
10. Back off the shaft pin in the air check valve connector (20).
11. Tighten the air valve (2) on the accumulator valve stem. Torque to 140 to 160 lb-ft (15.8 to 18.1 Nm).
12. Close the nitrogen tank valve (23) and disconnect the charging kit from the accumulator.
13. Disconnect the charging kit from the nitrogen tank.
14. Install the protective cap (1) on the air valve (2).

**END OF WORK PACKAGE**

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
HYDRAULIC STARTING SYSTEM HAND PUMP, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)

Equipment Condition:

Hand pump removed (WP 0090 00)

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)

Materials/Parts (continued):

Sealant (Tape, Antiseizing) (Item 14, Table 2, WP 0230 00)
Crocus Cloth (Item 22, Table 2, WP 0230 00)
O-Ring (p/n GA100113, qty 1)
O-Ring (p/n GA100213, qty 1)
Packing, Preformed (p/n RG100214, qty 1)
O-Ring (p/n GA100215, qty 1)
O-Ring (p/n GA100111, qty 1)
Packing Plunger (p/n GA100097, qty 1)
Packing, Preformed (p/n RG100207, qty 1)
Packing, Preformed (p/n RG100208, qty 1)
O-Ring (p/n GA100108, qty 1)
O-Ring (p/n GA100110, qty 1)
Packing, Preformed (p/n RG100209, qty 1)

References:

WP 0090 00
TM 55-1905-242-24P (WP 0019)

DISASSEMBLY

WARNING



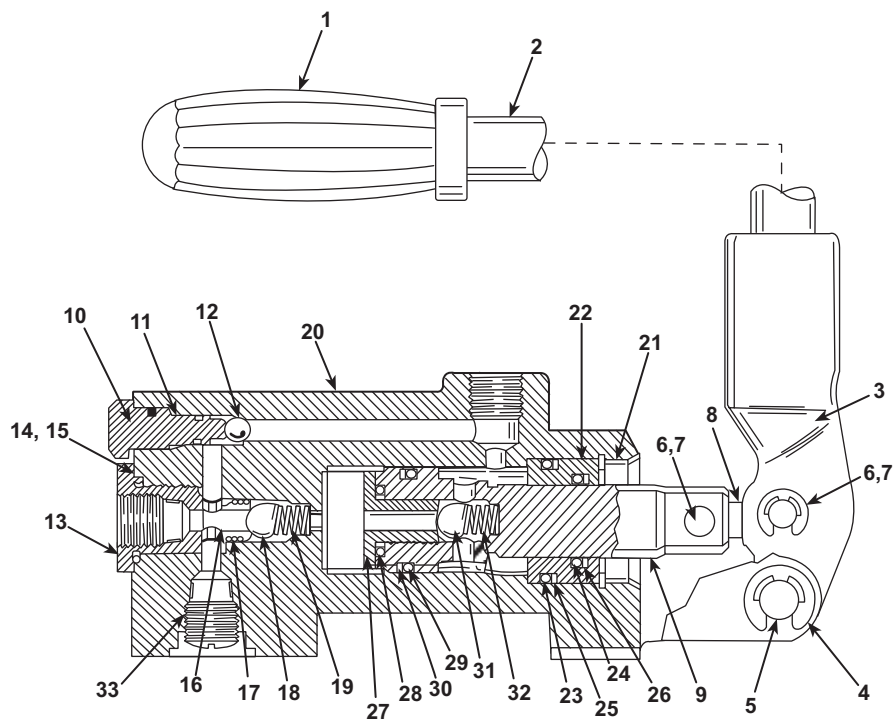
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1. Don chemical protective gloves and goggles.
2. Pull the pump handle grip (1) from the hand pump operating handle (2) only if the pump handle grip is damaged.
3. Remove the hand pump operating handle (2) from the hand pump operating lever (3).

DISASSEMBLY (continued)

4. Remove the retaining rings (4) from the clevis pin (5). Remove the clevis pin.
5. Remove the retaining rings (6), clevis pins (7), and link (8) to remove the hand pump operating lever (3) from the plunger (9).
6. Remove the bleeder screw (10), O-ring (11), and ball (12).
7. Remove the inlet oil fitting (13), O-ring (14), backup ring (15), O-rings (16 and 17), ball check valve (18), and spring (19) from the pump body (20).
8. Remove the retaining ring (21), bushing (22), and plunger (9) assembly from the pump body (20).
9. Slide the bushing (22) off the plunger (9).
10. Remove the O-rings (23 and 24) and backup rings (25 and 26) from the bushing (22).
11. Remove the check valve seat (27), O-rings (28 and 29), backup ring (30), ball check valve (31), and spring (32).
12. Remove the pipe plug (33).

**CLEAN**

1. If not already on, don protective gloves and goggles.
2. Clean all metal parts with cleaning solvent and dry them with clean wiping rags.

INSPECTION

1. Inspect the springs for distortion, loss of tension, or broken coils. Replace the springs as required.
2. Inspect the pins, balls, and plunger for burrs, nicks, or other wear. Remove minor nicks or burrs with crocus cloth. Replace the pins, balls, and/or plunger as required.

INSPECTION (continued)

3. Inspect the hand grip for deterioration. Replace the hand grip as required.
4. Replace all packing, O-rings, and seals with new parts.
5. Remove burrs or nicks with crocus cloth.

ASSEMBLY

1. Wrap the pipe plug (33) threads with antiseizing sealant tape and install the pipe plug in the pump body (20).
2. Install the O-rings (28 and 29) and backup ring (30) on the check valve seat (27). Lubricate the O-rings with clean hydraulic fluid.
3. Install the check valve seat (27), ball check valve (31), and spring (32) into the plunger (9).
4. Install the O-rings (23 and 24) and backup rings (25 and 26) on the bushing (22). Lubricate the O-rings with clean hydraulic fluid.
5. Slide the bushing (22) over the plunger (9).
6. Install the plunger (9) assembly into the pump body (20) and secure it with the retaining ring (21).
7. Install the O-rings (14, 16, and 17) and backup ring (15) on the inlet oil fitting (13). Lubricate the O-rings with clean hydraulic fluid.
8. Install the spring (19), ball check valve (18) and inlet oil fitting (13) into the pump body (20).
9. Install the O-ring (11) on the bleeder screw (10). Lubricate the O-ring with clean hydraulic fluid.
10. Install the ball (12) and bleeder screw (10) in the pump body (20).
11. Position the hand pump operating lever (3) in the plunger (9) and secure it with the retaining rings (6), clevis pins (7), and link (8).
12. Position the hand pump operating lever (3) in the pump body (20) and secure it with the clevis pin (5) and retaining rings (4).
13. Install the pump handle grip (1) on the hand pump operating handle (2) if the grip was removed.
14. Install the hand pump operating handle (2) in the hand pump operating lever (3).
15. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
KEEL COOLERS, INSPECT/TEST/REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Air Compressor (Item 17, Table 1, WP 0230 00)
Water Tank Large Enough to Accomodate Keel Cooler

Equipment Condition:

Vessel in drydock or beached
Cooling system drained

Personnel Required:

Two Watercraft Engineers, 88L
One Watercraft Operator, 88K

Materials/Parts:

Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Gasket (p/n 2825, qty 12)

References:

TM 55-1905-242-24P (WP 0022)

INSPECTION

1. Inspect the keel cooler for evidence of leaking.
2. Inspect for loose or missing mounting hardware.
3. Inspect hoses for cracks, breaks, and deterioration.
4. Inspect hose clamps for looseness and tighten as required.

REMOVAL**WARNING**

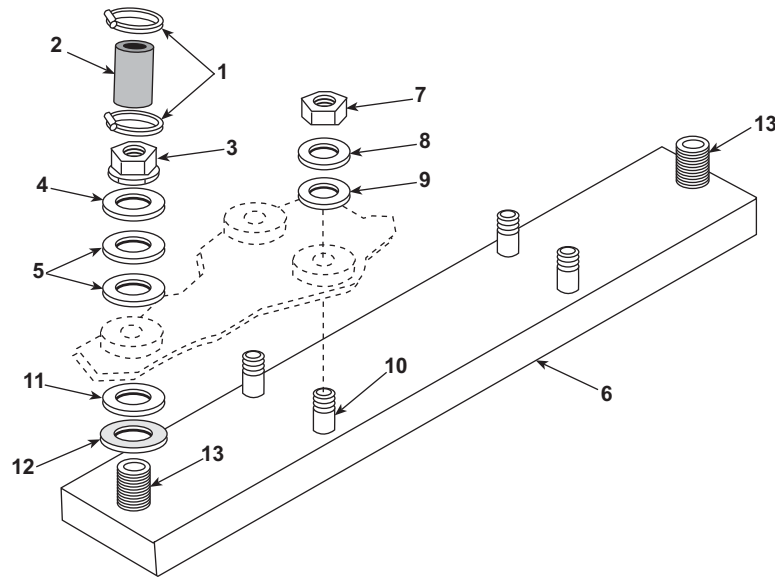
The keel cooler is heavy. Before removing the keel cooler mounting hardware, position two crewmembers beneath the vessel to support the keel cooler. Never allow personnel to support the keel cooler without assistance. Failure to comply can result in damaged equipment and serious injury or death to personnel.

Do not allow antifreeze to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling antifreeze. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.
2. Loosen the hose clamps (1) and slide them onto the flexible hose (2). Remove the hose.

REMOVAL (continued)

3. Repeat step 2 for the other keel cooler connection.
4. Remove the nuts (3), copper washers (4), and neoprene gaskets (5) from each end of the keel cooler (6).
5. Remove the nuts (7), flat washers (8), and neoprene gaskets (9) from the mounting studs (10).
6. Remove the keel cooler (6) from the hull.
7. Remove the copper washers (11) and neoprene gaskets (12) from the keel cooler (6).

**TESTING**

1. Cap one keel cooler fitting (13) to hold air under approximately 20 lb/in² (1.4 bar).
2. Cap the other keel cooler fitting (13) with a cap that will accommodate the air compressor hose.
3. Pressurize the keel cooler (6) to approximately 10 lb/in² (0.7 bar) and submerge the keel cooler in a tank of clear water, not allowing the capped keel cooler fittings (13) to become submerged.
4. Visually inspect for any air bubbles that would indicate a leak. A steady stream of bubbles will indicate a leak. An occasional bubble may indicate air trapped in the keel cooler coils upon submersion.
5. If a leak is found, the keel cooler (6) must be replaced.

REPAIR

1. Replace all gaskets (5, 9, and 12).
2. Replace all damaged or defective hardware.
3. Replace defective hoses (2) or hose clamps (1).

INSTALLATION

1. Place the neoprene gaskets (12) and copper washers (11) over the keel cooler fittings (13).
2. Using two crewmembers, lift the keel cooler (6) into position. Secure it with the neoprene gaskets (9), flat washers (8), and nuts (7).
3. Install the neoprene gaskets (5), copper washers (4), and nuts (3) onto the keel cooler fittings (13). Tighten the nuts.
4. Slide the hoses (2) into place and secure them with the hose clamps (1).

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
PROPELLER, PROPELLER SHAFT, CUTLESS BEARING, INSPECT**

INITIAL SETUP:**Equipment Condition:**

Vessel in drydock or beached
Propulsion engines secured, locked out, and
tagged out IAW FM 55-502

References:

FM 55-502
WP 0200 00
WP 0201 00
WP 0203 00
TM 55-1905-242-24P (WP 0023)

Personnel Required:

One Watercraft Engineer, 88L

INSPECT--PROPELLER

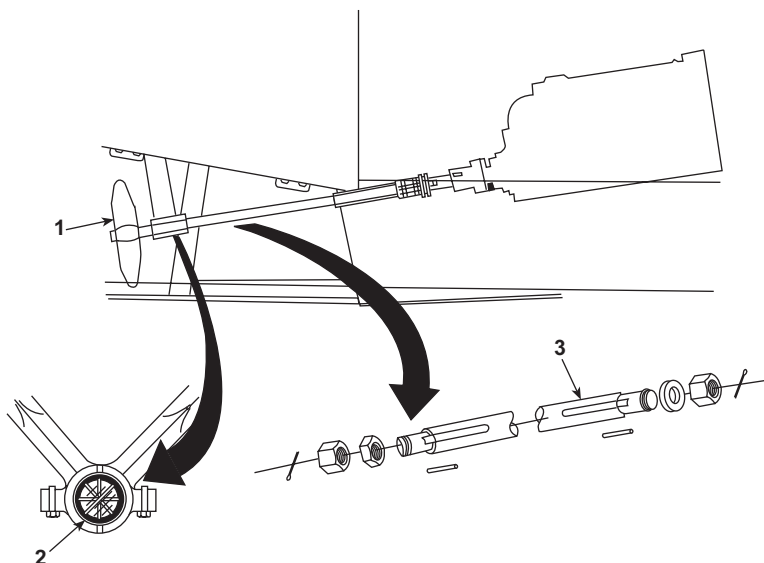
1. Inspect the propeller (1) for cracks, bends, corrosion, and other defects.
2. Repair the propeller (1) as required (WP 0201 00).

INSPECT--CUTLESS BEARING

1. Inspect the cutless bearing (2) for tears and wear.
2. Replace the cutless bearing (2) as required (WP 0200 00).

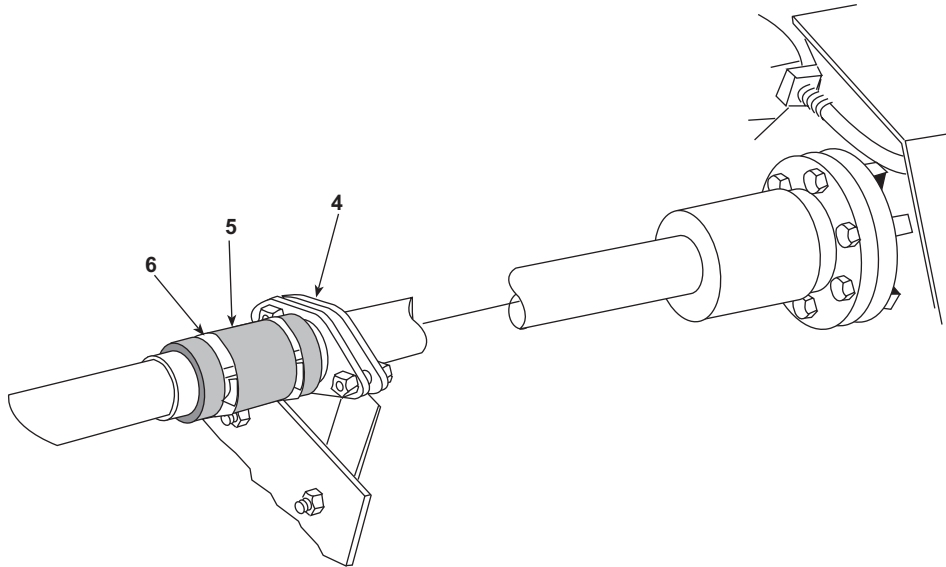
INSPECT--PROPELLER SHAFT AND HARDWARE

1. Inspect the propeller shaft (3) for pitting, cracks, corrosion, bends, thread damage, or other damage. Pay particular attention to the wear area at the cutless bearing (2).
2. Repair (WP 0201 00) or replace (WP 0200 00) the propeller shaft (3) as required.



INSPECT--STUFFING BOX AND HOSE ASSEMBLY

1. Inspect the stuffing box (4) for cracks and corrosion.
2. Inspect the flexible hose (5) for deterioration, wear, or leakage. Check the hose clamps (6) for damage.
3. If the stuffing box (4) is cracked, replace it (WP 0203 00). If the stuffing box is corroded, clean the corrosion from the stuffing box.
4. If the flexible hose (5) is deteriorated, worn, or leaking, replace the flexible hose (WP 0203 00).
5. If the hose clamps (6) are damaged, replace them (WP 0203 00).

**END OF WORK PACKAGE**

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
PROPELLER, PROPELLER SHAFT, CUTLESS BEARING, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
 Puller, Propeller, Size 8 (Item 18, Table 1, WP 0230 00)
 Wrench, Box, Propeller Nut (Item 26, Table 1, WP 0230 00)
 Wrench, Box, Shaft Nut (Item 27, Table 1, WP 0230 00)

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502

Equipment Condition (continued):

Vessel drydocked or beached

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Compound, Antiseize (Item 12, Table 2, WP 0230 00)

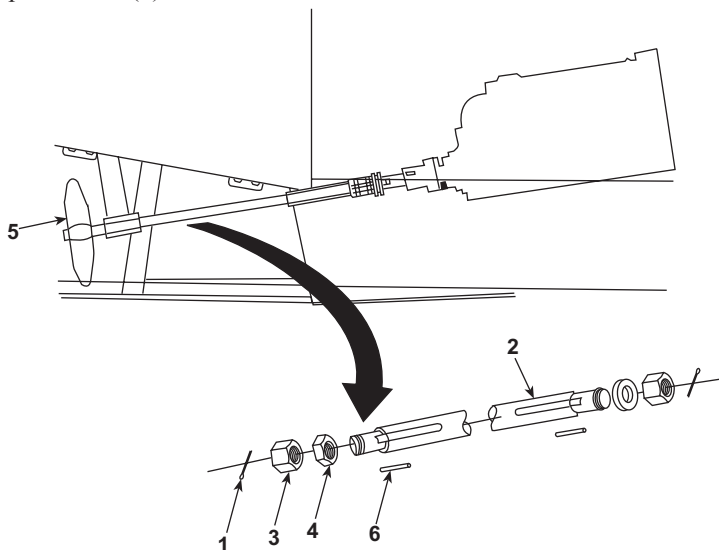
References:

FM 55-502
 WP 0202 00
 TM 55-1905-242-24P (WP 0023)

REMOVAL--PROPELLER**NOTE**

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

1. Remove the cotter pin (1) from the end of the propeller shaft (2).
2. Remove the plain hex nut (3) and jam nut (4) from the propeller shaft (2).
3. Use the propeller puller to pull the propeller (5) from the propeller shaft (2).
4. Remove the key (6) from the propeller shaft (2).

**INSTALLATION--PROPELLER**

1. Apply a light coat of antiseize compound to the propeller shaft (2) taper.
2. Install the key (6) and propeller (5) on the propeller shaft (2).
3. Secure the propeller (5) to the propeller shaft (2) with the jam nut (4), plain hex nut (3), and cotter pin (1).
4. Remove the lockouts and tagouts and check the operation of the system.

REMOVAL--PROPELLER SHAFT**WARNING**

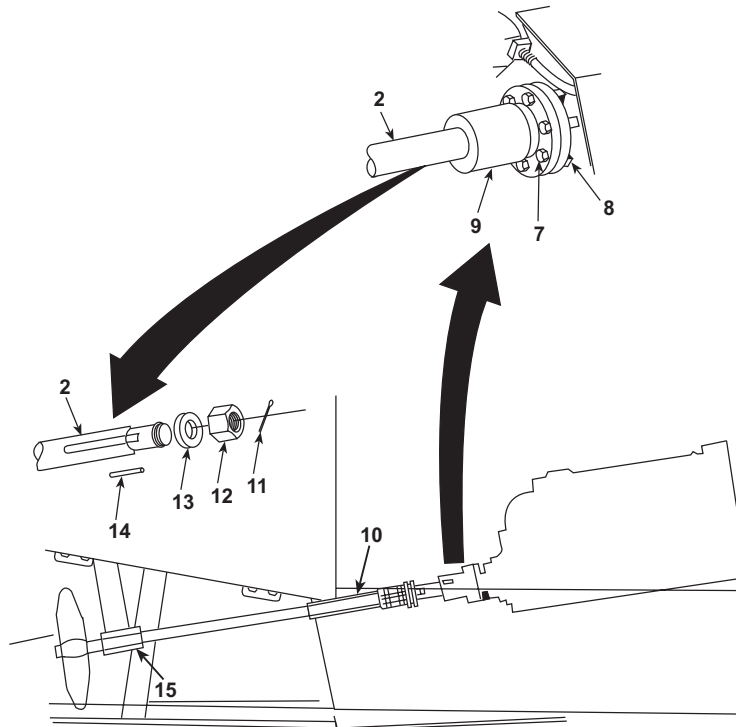
Use two crewmembers to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

1. Remove the bolts (7) and nuts (8) from the shaft coupling (9).
2. Slide the propeller shaft (2) down through the stern tube (10) until enough clearance exists between the shaft coupling (9) and the marine transmission coupling to permit the removal of the shaft coupling from the propeller shaft.
3. Remove the cotter pin (11), hex nut (12), and washer (13) from the end of the propeller shaft (2).

CAUTION

Do not use a hammer on the threaded ends of the propeller shaft or on the mating surfaces of the shaft coupling when removing the shaft coupling from the propeller shaft. Use the hammer only on that portion of the shaft coupling that attaches to the propeller shaft. Failure to comply with this caution can result in equipment damage.

4. Jar the shaft coupling (9) loose from the propeller shaft (2) with a heavy hammer. Remove the shaft coupling and the key (14) from the propeller shaft.
5. Using two crewmembers, pull the propeller shaft (2) out through the stern tube (10) and strut (15).

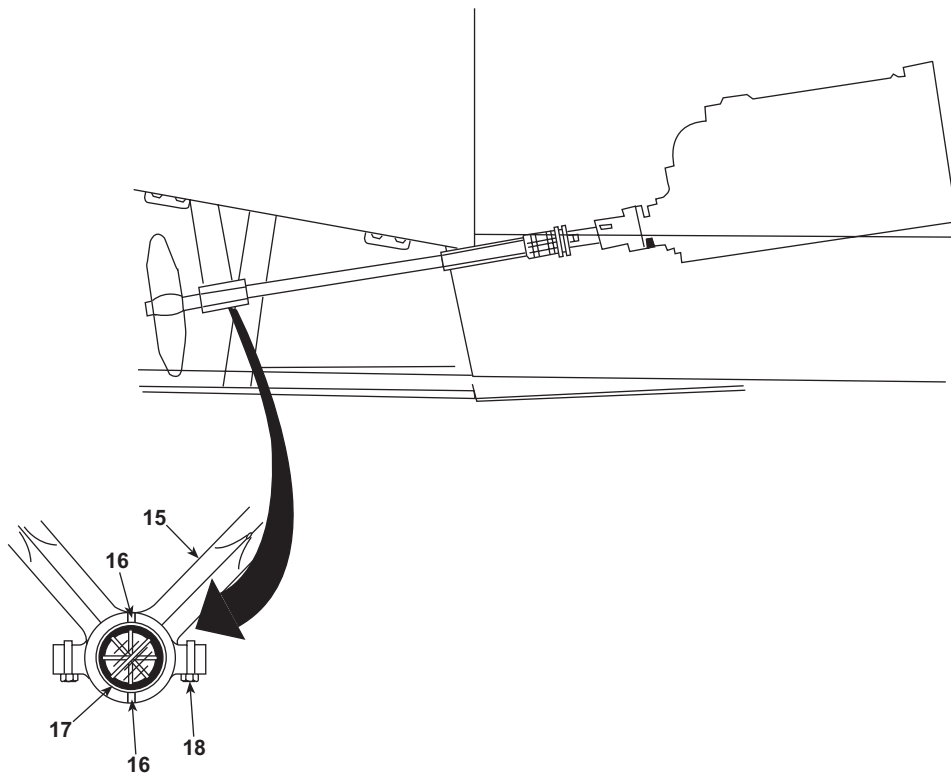


INSTALLATION--PROPELLER SHAFT

1. Using two crewmembers, slide the propeller shaft (2) into place through the strut (15) and stern tube (10).
2. Apply a light coat of antiseize compound on the propeller shaft (2) taper.
3. Install the key (14) and shaft coupling (9) on the propeller shaft (2).
4. Secure the shaft coupling (9) to the propeller shaft (2) with the washer (13), hex nut (12), and cotter pin (11).
5. Align the propeller shaft (refer to WP 0202 00).
6. Secure the shaft coupling (9) to the the marine transmission with the bolts (7) and nuts (8).
7. Remove the lockouts and tagouts and check the operation of the system.

REMOVAL--CUTLESS BEARING

1. Perform the Removal--Propeller and Removal--Propeller Shaft procedures in this work package.
2. Remove the capscrews (16) that secure the cutless bearing (17) in the strut (15).
3. Loosen the bolts (18) that secure the upper and lower strut castings.
4. Remove the cutless bearing (17) from the strut (15).



INSTALLATION--CUTLESS BEARING

1. Procure a new cutless bearing.
2. Install the cutless bearing (17) in the strut (15).
3. Tighten the bolts (18) that secure the upper and lower strut castings.
4. Secure the cutless bearing (17) with the capscrews (16).
5. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
PROPELLER AND SHAFT, REPAIR**

INITIAL SETUP:**Equipment Condition:**

Propeller removed (WP 0200 00)

References:

WP 0200 00

S9086-HP-STM-010/CH-245R3

REPAIR

Propeller repair should be performed only by facilities and personnel specially trained in propeller repair and testing procedures. Normal field repair of propellers is accomplished by the replacement of the propeller with a good spare. Spare propellers are provided with the vessel's Basic Issue Items (BII). Refer to WP 0200 00 for propeller replacement procedures.

Facilities performing propeller repair must adhere to the following guidelines:

1. All repairs shall be to the manufacturer's designed tolerances and dimensions.
2. All repairs shall be in accordance with S9086-HP-STM-010/CH-245R3.
3. Repairs to propeller blades shall be limited to approximately 10% of propeller radius and total material buildup not to exceed 5% of the designed propeller weight. Reshaping of propeller blades is to be limited to minor corrections in pitch, contour and/or rake.
4. Extensive damage to the propeller or blades requiring build up of materials in excess of the quantities listed above, or extensive reshaping and contouring of blades shall be performed as authorized by the Contracting Officer.

All propellers submitted for repair shall undergo the following testing:

1. Perform a satisfactory Nondestructive Testing (NDT) dye penetrant test of the hub(s) and keyway(s).
2. Perform a satisfactory static balance test of the propeller(s).

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
PROPELLER SHAFT, ALIGN**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)
Dial Indicator (Item 5, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502

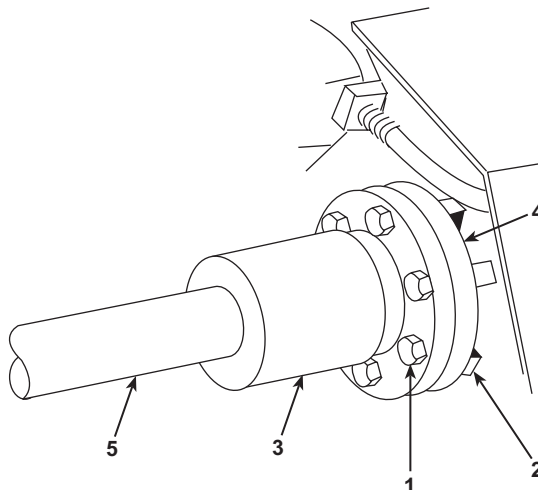
Equipment Condition:

Propulsion engines secured, locked out, and
tagged out IAW FM 55-502
Vessel afloat for final alignment

ALIGNMENT**NOTE**

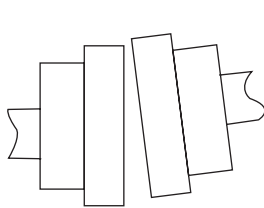
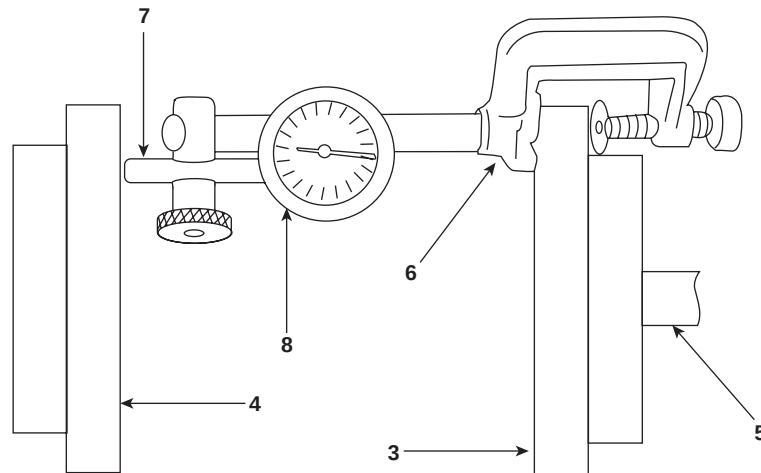
Propeller shaft alignment is not permanently fixed. The alignment changes with every docking due to changes in the keel blocking, temperature variations, and the direction of the sun's rays relative to the fore and aft line of the vessel. The alignment of shafting is affected by the temporary removal of machinery attached to the shafting or in the vicinity of the shafting because of the redistribution of weights and stresses. The alignment is not the same when the vessel is waterborne as when it is in drydock. The final alignment and bolting of the main propulsion shafting should always be done when the vessel is waterborne.

1. Remove the bolts (1) and nuts (2) that secure the shaft coupling (3) to the transmission output flange (4).
2. Slide the propeller shaft (5) back to allow clearance between the shaft coupling (3) and the transmission output flange (4).
3. Clean the mating faces of the shaft coupling (3) and the transmission output flange (4) with a wire brush, ensuring that both surfaces are clean, smooth, and free of corrosion.
4. Fasten the dial indicator fixing stand (6) to the shaft coupling (3) as shown to check the angular alignment.

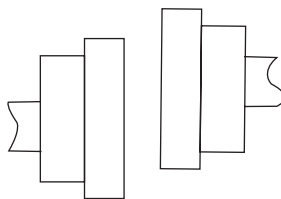


ALIGNMENT (continued)

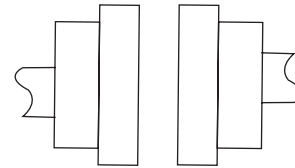
5. Position the dial indicator (7) against the transmission output flange (4) as shown. The dial indicator should have a 0.100 inch to 0.200 inch preload when installed against the transmission output flange.
6. Zero the dial indicator (7) by twisting its bezel (8).
7. Slowly rotate the propeller shaft (5) while noting the dial indicator (7) reading. Note how far the dial indicator needle moves to either side of zero. Add the readings on both sides of zero to determine the amount of angular misalignment. For example, if the dial indicator needle moves 0.002 inch to one side of zero and 0.004 inch to the other side of zero, add the two readings (0.002 inch + 0.004 inch = 0.006 inch) to determine that the angular misalignment is 0.006 inch.



**Angular
Misalignment**

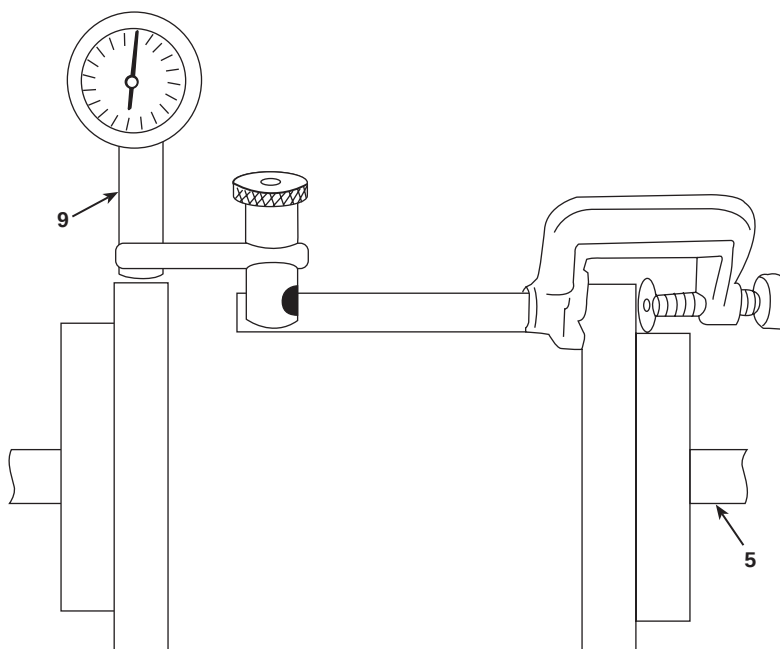


**Parallel
Misalignment**



**Correct
Alignment**

8. Maximum allowable angular misalignment is 0.025 inch (0.10 mm). Angular misalignment is corrected by loosening the engine/marine transmission mounting bolts and repositioning the engine and marine transmission as necessary. After adjusting the alignment, tighten the engine/marine transmission mounting bolts and recheck the alignment.
9. Reposition the dial indicator (9) as shown to check the parallel alignment. The dial indicator should have a 0.100 inch to 0.200 inch preload when installed against the engine flange.
10. Slowly rotate the propeller shaft (5) while noting the dial indicator (9) reading. Note how far the dial indicator needle moves to either side of zero. Add the readings on both sides of zero to determine the amount of parallel misalignment. For example, if the dial indicator needle moves 0.002 inch to one side of zero and 0.004 inch to the other side of zero, add the two readings (0.002 inch + 0.004 inch = 0.006 inch) to determine that the parallel misalignment is 0.006 inch.

ALIGNMENT (continued)

11. Maximum allowable parallel misalignment is 0.025 inch (0.10 mm). Parallel misalignment is corrected by loosening the engine/marine transmission mounting bolts, and adjusting the engine and marine transmission up, down, or sideways as necessary. After adjusting the alignment, tighten the engine/marine transmission mounting bolts and recheck the alignment.
12. It is frequently necessary to adjust both the angular and the parallel alignment several times before the correct alignment is obtained. Once the proper angular and parallel alignment measurements are obtained, retighten the mounting bolts one last time and recheck the measurement.
13. Once the final alignment has been obtained, slide the propeller shaft (5) forward to mate the shaft coupling (3) and the transmission output flange (4).
14. Secure the shaft coupling (3) to the transmission output flange (4) with the bolts (1) and nuts (2).
15. Remove the lockouts and tagouts and check the operation of the propulsion system, watching for any unusual noise or vibration.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STUFFING BOX, REPAIR/REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502
Vessel in drydock or beached for replacement
Propeller shaft removed for replacement (WP 0200 00)

Materials/Parts:

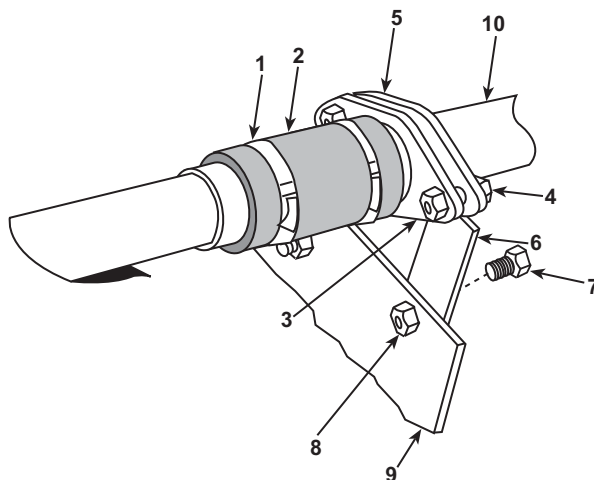
Packing, Preformed

References:

FM 55-502
WP 0057 00
WP 0200 00
TM 55-1905-242-24P (WP 0023)

REPAIR

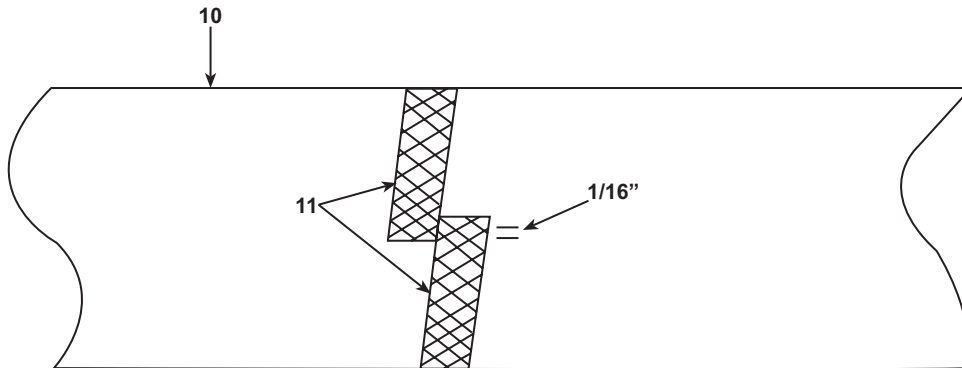
1. Loosen the hose clamps (1) and remove them from the flexible hose (2) if the clamps will be replaced.
2. Remove the two upper bolts (3) and nuts (4) securing the stuffing box (5) to the packing brace (6).
3. Loosen the two lower bolts (7) and nuts (8) securing the packing braces (6) (one on either side) to the mounting plate (9).
4. Slide the forward portion of the stuffing box (5) up the propeller shaft (10) and remove the old packing from the aft portion of the stuffing box.



5. Procure new packing material.
6. Wrap the packing material (11) around the propeller shaft (10) to determine the proper length for the new packing material sections. Cut the ends square and allow them to overlap approximately 1/16 inch (0.16 mm) to permit a snug fit in the stuffing box.
7. Slide the packing material sections into the aft section of the stuffing box (5). Stagger the end gaps of the packing material section to prevent excessive leakage.

REPAIR (continued)

8. Slide the forward portion of the stuffing box (5) into the aft portion.
9. Install the packing braces (6) and secure the packing braces and the stuffing box (5) with the bolts (3 and 7) and nuts (4 and 8). Install the new hose clamps (1) if required.
10. Remove the lockouts and tagouts and adjust the stuffing box as described in WP 0057 00.

**REMOVAL**

1. If not already removed, remove the propeller shaft as described in WP 0200 00.
2. Loosen the hose clamps (1) and slide them off the flexible hose (2).
3. Remove the bolts (3 and 7) and nuts (4 and 8) that secure the packing braces (6) to the stuffing box (5) and the mounting plate (9). Remove the packing braces.
4. Slide the stuffing box (5) out of the flexible hose (2).

INSTALLATION

1. Slide the new stuffing box (5) into the flexible hose (2).
2. Install the packing braces (6) and secure them to the stuffing box (5) and mounting plate (9) with the bolts (3 and 7) and nuts (4 and 8).
3. Slide the hose clamps (1) onto the flexible hose (2) and tighten them snugly.
4. Install new packing in the stuffing box (5) as described in the Repair procedure in this work package.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
MUFFLERS, PIPING, AND LAGGING, REPLACE/REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502
Raw water system seacock CLOSED, locked out, and tagged out IAW FM 55-502
Engine room certified safe for HOT WORK IAW FM 55-502

Materials/Parts:

Gloves, Anti-Flash (Item 13, Table 2, WP 0230 00)
Wire, Nonelectrical (Item 25, Table 2, WP 0230 00)
Gasket (p/n 13226E9449M7, qty 12)
Gasket (p/n MIL-G-14243NONASBESTOS, qty 8)
Gasket (p/n 13226E9449M15, qty 4)

References:

FM 55-502
MIL-I-16411
MIL-STD-769J
TM 55-1905-242-24P (WP 0024)

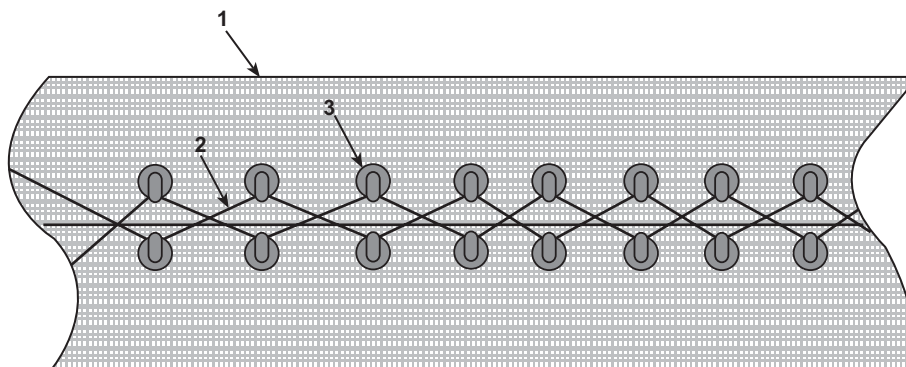
Personnel Required:

Two Watercraft Engineers, 88L

REMOVAL**WARNING**

Always wear gloves when handling hot engine components. Handling hot engine components with bare hands or skin may result in severe burns, serious injury, or death.

1. Remove the lagging (1) from the exhaust system by removing the wire (2) from the clips (3). Put the lagging aside for installation unless it is damaged and needs replacement.

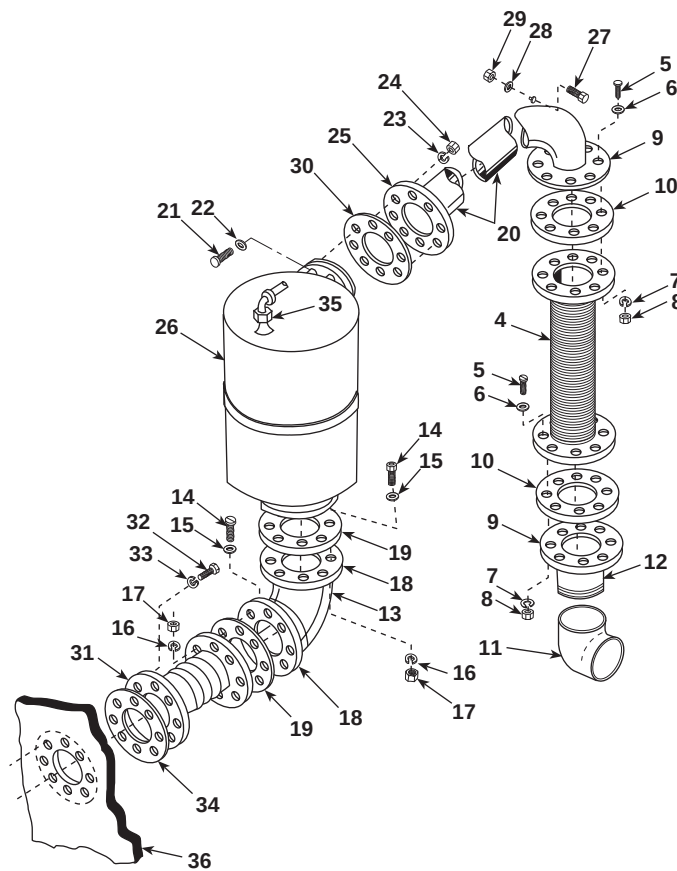


REMOVAL (continued)**NOTE**

Remove only those components that will be replaced and those that must be removed in order to remove the defective parts.

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

2. To remove the flexible joint (4):
 - a. Remove the bolts (5), washers (6), lockwashers (7), and nuts (8) that secure the flexible joint (4) to the flanges (9).
 - b. Remove the flexible joint (4) and gaskets (10).



3. To remove the exhaust elbow (11):
 - a. Remove the flexible joint (4) as described in step 2 of Removal.

NOTE

It may be necessary to heat the exhaust elbow in order to remove it from the exhaust manifold.

- b. Unscrew the exhaust elbow (11), pipe (12), and flanges (9) as an assembly from the exhaust manifold.
- c. Unscrew the pipe (12)/flange (9) assembly from the exhaust elbow (11) if necessary.

REMOVAL (continued)

4. To remove the exhaust outlet elbow (13):
 - a. Remove the bolts (14), washers (15), lockwashers (16), and nuts (17) that secure the flanges (18).
 - b. Remove the exhaust outlet elbow (13) and gaskets (19).
5. To remove the muffler inlet piping (20):
 - a. Remove the bolts (5 and 21), washers (6 and 22), lockwashers (7 and 23), and nuts (8 and 24) that secure the flanges (9 and 25) to the flexible joint (4) and muffler (26).
 - b. Remove the bolts (27), lockwashers (28), and nuts (29) from the hangers.
 - c. Remove the muffler inlet piping (20) and gaskets (10 and 30).
6. To remove the exhaust expansion connector joint (31):
 - a. Remove the bolts (14 and 32), washers (15), lockwashers (16 and 33), and nuts (17) that secure the exhaust expansion connector joint (31).
 - b. Remove the exhaust expansion connector joint (31) and gaskets (19 and 34).
7. To remove the muffler (26):
 - a. Disconnect the raw water piping (35) from the top of the muffler (26).
 - b. Remove the bolts (21), washers (22), lockwashers (23), and nuts (24) that secure the muffler inlet piping (20) to the muffler (26).
 - c. Remove the bolts (14), washers (15), lockwashers (16), and nuts (17) that secure the exhaust outlet elbow (13) to the muffler (26).
 - d. Remove the muffler (26) and gaskets (19 and 30).

REPAIR

1. Repair of the exhaust expansion connector joint (31), flexible joint (4), muffler (26), and exhaust elbow (11) are accomplished by replacement of the defective parts.
2. Repair of the exhaust outlet elbow (13), muffler inlet piping (20), and piping (12)/flange (9) assembly is accomplished by fabricating new components. Use the old parts as a pattern when the replacement parts are fabricated.
3. Repair of insulation/lagging is accomplished by fabricating new insulation/lagging in accordance with MIL-STD-769J. Insulation material must be 1 inch (25.8 mm) thick and must conform to MIL-I-16411, Type II.

INSTALLATION

1. To install the muffler (26):
 - a. Position new gaskets (19 and 30) on the muffler (26) flanges and position the muffler in the muffler inlet piping (20).
 - b. Secure the muffler (26) to the exhaust outlet elbow (13) with the bolts (14), washers (15), lockwashers (16), and nuts (17).
 - c. Secure the muffler (26) to the muffler inlet piping (20) with bolts (21), washers (22), lockwashers (23), and nuts (24).

INSTALLATION (continued)

- d. Connect the raw water piping (35) to the top of the muffler (26).
2. To install the exhaust expansion connector joint (31):
 - a. Position the exhaust expansion connector joint (31) and new gaskets (19 and 34) between the exhaust outlet elbow (13) and the hull (36).
 - b. Secure the exhaust expansion connector joint (31) with the bolts (14 and 32), washers (15), lockwashers (16 and 33), and nuts (17).
3. To install the muffler inlet piping (20):
 - a. Position the muffler inlet piping (20) and new gaskets (10 and 30) between the muffler (26) and the flexible joint (4).
 - b. Secure the muffler inlet piping (20) to the flexible joint (4) and muffler (26) with the bolts (5 and 21), washers (6 and 22), lockwashers (7 and 23), and nuts (8 and 24).
 - c. Secure the muffler inlet piping (20) to the hangers with the the bolts (27), lockwashers (28), and nuts (29).
4. To install the exhaust outlet elbow (13):
 - a. Position the exhaust outlet elbow (13) and new gaskets (19) between the muffler (26) and the exhaust expansion connector joint (31).
 - b. Secure the exhaust outlet elbow (13) with the bolts (14), washers (15), lockwashers (16), and nuts (17).
5. To install the flexible joint (4):
 - a. Position the flexible joint (4) and new gaskets (10) between the muffler inlet piping (20) and exhaust elbow (11).
 - b. Secure the flexible joint (4) to the muffler inlet piping (20) and exhaust elbow (11) with the bolts (5), washers (6), lockwashers (7), and nuts (8).
6. To install the exhaust elbow (11):
 - a. Screw the pipe (12)/flange (9) assembly into the exhaust elbow (11) if they were removed during disassembly.
 - b. Screw the exhaust elbow (11), pipe (12), and flange (9) as an assembly into the exhaust manifold.
 - c. Install the flexible joint (4) as described in step 5 of Installation.
7. Install the lagging (1) and secure it by crisscrossing wire (2) through the clips (3).
8. Remove the lockouts and tagouts and check the operation of the system, ensuring that no exhaust or raw water leaks are present.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
BATTERY CHARGER, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Multimeter (Item 2, Table 1, WP 0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502
TM 55-1905-242-24P (WP 0033)

Equipment Condition:

Battery charger circuit breaker set to OFF,
locked out, and tagged out IAW FM 55-502
Battery isolation switches set to OFF, locked
out, and tagged out IAW FM 55-502

REPAIR

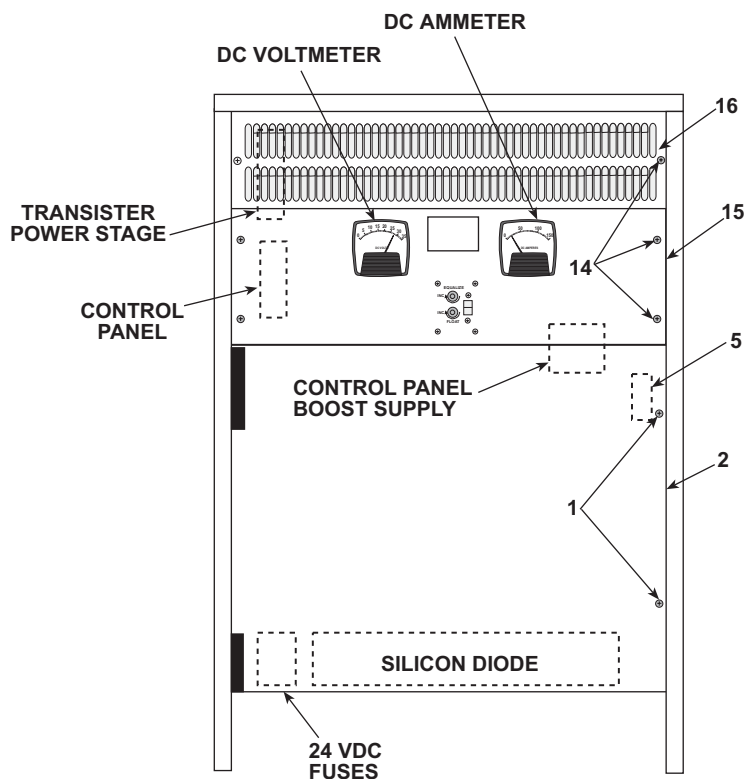
Repair of the battery charger is accomplished by replacement of the necessary components. The procedures for replacing these components follow. Only those components specified in this procedure are authorized for repair. If the unit requires more extensive repair, it must be replaced. Replacement of the battery charger is accomplished at the depot level of maintenance. Notify depot support maintenance for replacement.

SECURE POWER**WARNING**

Replace or repair components only after the affected circuit has been secured, locked out, and tagged out. Performing replacement with the circuit energized may result in damaged equipment and serious injury or death to personnel.

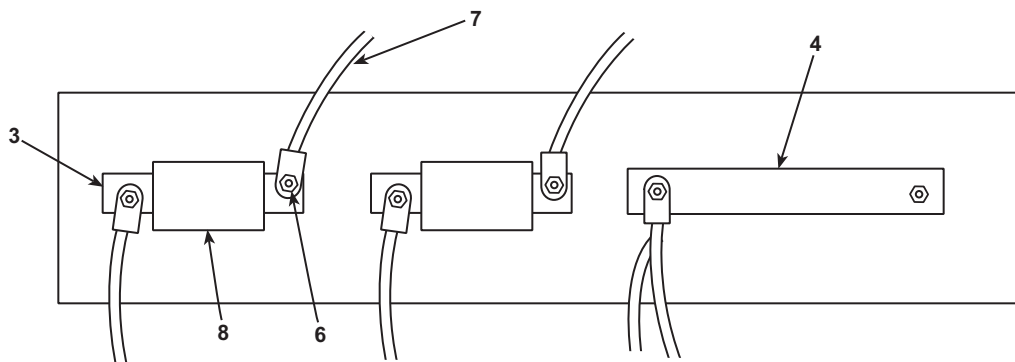
Before performing any repairs on the battery charger:

1. Loosen the screws (1) that secure the access door (2), and open the access door.
2. Set the multimeter to the Vdc (Volts direct current) setting. Connect the positive multimeter lead to a positive fuse terminal (3) and the negative multimeter lead to the negative terminal strip (4). Note the voltage. Repeat this operation for the other three positive fuse terminals. If no voltage is noted on any of the positive fuse terminals, proceed to the next step. If voltage is noted, check that the battery isolation switches are properly secured.
3. Set the multimeter to the Vac (Volts alternating current) setting. Connect the positive multimeter lead to the input side of the 220 Volt fuse (5) and the negative lead to a clean case ground. Note the voltage. If no voltage is noted, proceed to the next step. If voltage is noted, check that the battery charger circuit breaker is properly secured.



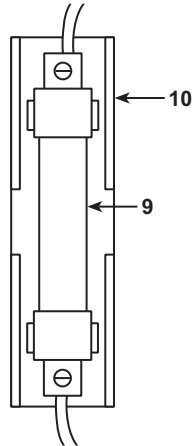
24 VDC FUSE REPLACEMENT

1. Remove the nuts (6) and wiring (7) from both ends of the defective fuse (8).
2. Remove the fuse (8) from its studs.
3. Position a new fuse (8) on its studs.
4. Position the wiring (7) on the fuse studs and secure the fuse (8) and wiring with the nuts (6).

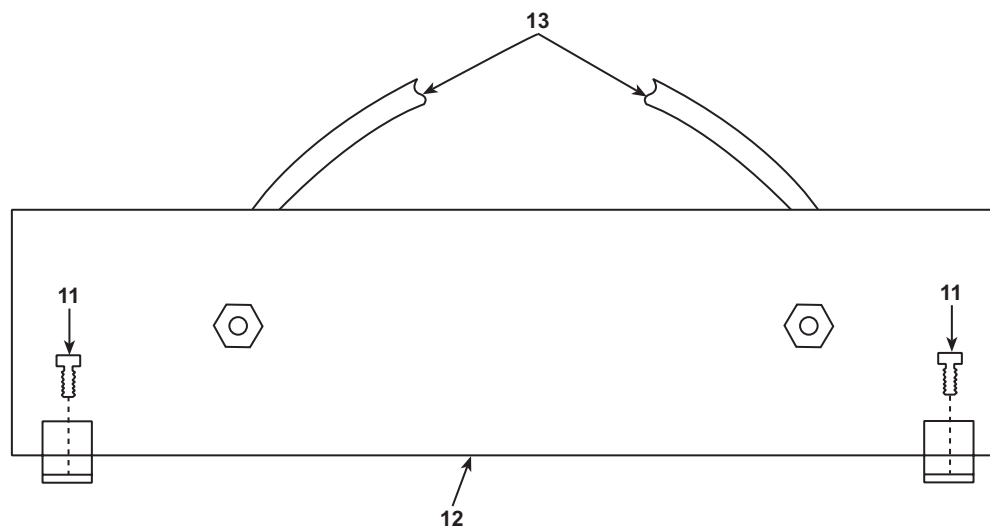


220 VAC FUSE REPLACEMENT

1. Pull the fuse (9) from its holder (10).
2. Push a new fuse (9) into place in the holder (10).

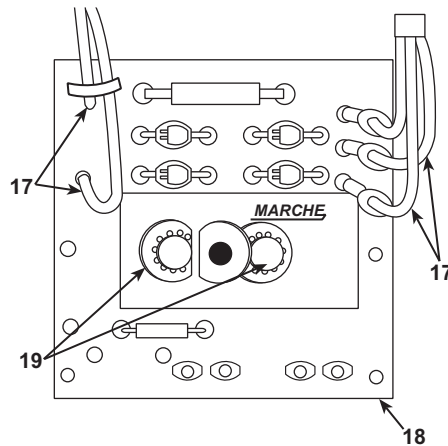
**SILICON DIODE REPLACEMENT**

1. Remove the screws (11) that secure the silicon diode assembly (12) to the cabinet.
2. Label and disconnect the wiring (13) from the silicon diode assembly (12).
3. Connect the wiring (13) to the new silicon diode assembly (12) using the labels from step 2 of Silicon Diode Replacement as a guide.
4. Position the silicon diode assembly (12) in the cabinet and secure it with the screws (11).

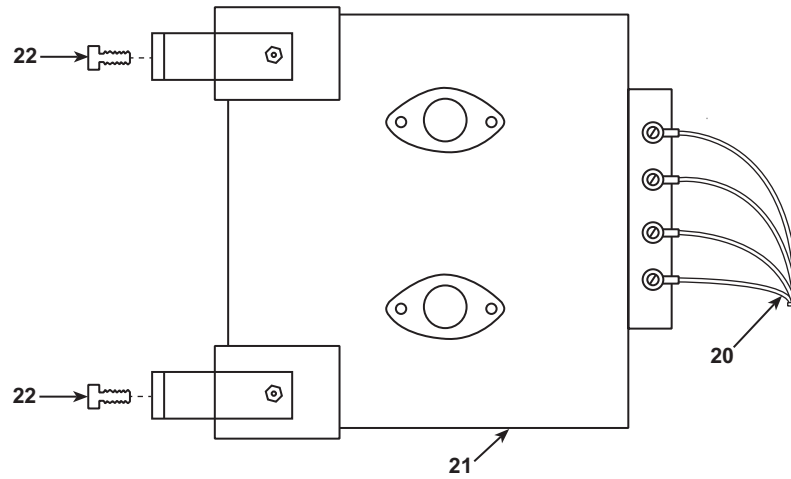


CONTROL PANEL BOOST SUPPLY REPLACEMENT

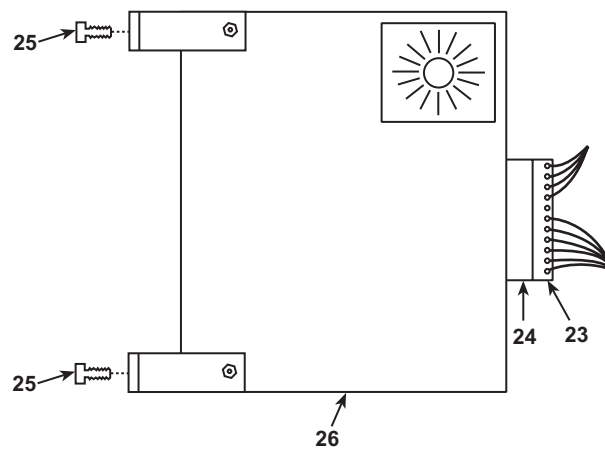
1. Remove the screws (14) that secure the recessed controls panel (15) and the vent panel (16) to the cabinet. Remove the recessed controls panel and the vent panel.
2. Label and disconnect the wiring (17) from the control panel boost supply (18).
3. Remove the screws (19) that secure the control panel boost supply (18) to the cabinet. Remove the control panel boost supply.
4. Position a new control panel boost supply (18) in the cabinet and secure it with the screws (19).
5. Connect the wiring (17) to the control panel boost supply (18) using the labels from step 2 of Control Panel Boost Supply Replacement as a guide.
6. Position the vent panel (16) and the recessed controls panel (15) on the cabinet and secure them with the screws (14).

**TRANSISTOR POWER STAGE REPLACEMENT**

1. Remove the screws (14) that secure the recessed controls panel (15) and the vent panel (16) to the cabinet. Remove the recessed controls panel and the vent panel.
2. Label and disconnect the wiring (20) from the transistor power stage (21).
3. Remove the screws (22) that secure the transistor power stage (21) to the cabinet. Remove the transistor power stage.
4. Position a new transistor power stage (21) in the cabinet and secure it with the screws (22).
5. Connect the wiring (20) to the transistor power stage (21) using the labels from step 2 of Transistor Power Stage Replacement as a guide.
6. Position the vent panel (16) and the recessed controls panel (15) on the cabinet and secure them with the screws (14).

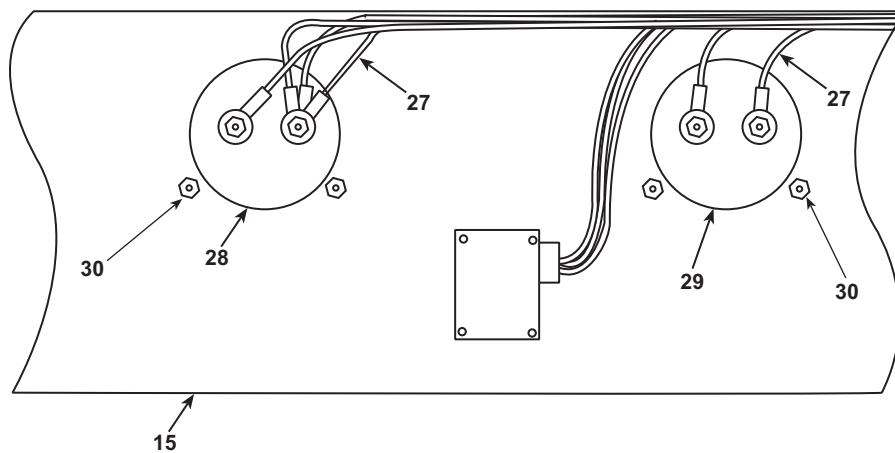
TRANSISTOR POWER STAGE REPLACEMENT (continued)**CONTROL PANEL REPLACEMENT**

1. Remove the screws (14) that secure the recessed controls panel (15) and the vent panel (16) to the cabinet. Remove the recessed controls panel and the vent panel.
2. Disconnect the wiring plug (23) from the control panel connector (24).
3. Remove the screws (25) that secure the control panel (26) to the cabinet. Remove the control panel.
4. Position a new control panel (26) in the cabinet and secure it with the screws (25).
5. Connect the wiring plug (23) to the control panel connector (24).
6. Position the vent panel (16) and the recessed controls panel (15) on the cabinet and secure them with the screws (14).



DC VOLTMETER OR DC AMMETER REPLACEMENT

1. Remove the screws (14) that secure the recessed controls panel (15) to the cabinet. Remove the recessed controls panel (15).
2. Label and remove the wiring (27) from the DC ammeter (28) or the DC voltmeter (29) as necessary.
3. Remove the nuts (30) that secure the DC ammeter (28) or the DC voltmeter (29) to the recessed controls panel (15). Remove the defective gauge.
4. Position a new DC ammeter (28) or DC voltmeter (29) in the recessed controls panel (15) and secure it with the nuts (30).
5. Connect the wiring (27) to the DC ammeter (28) or DC voltmeter (29) using the labels from step 2 of DC Voltmeter or DC Ammeter Replacement as a guide.
6. Position the recessed controls panel (15) on the cabinet and secure it with the screws (14).

**FOLLOW-ON SERVICE**

After completing the necessary repairs:

1. Close the access door (2) and secure it with the screws (1).
2. Remove the lockouts and tagouts, power up the battery charger, and check for proper operation.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING PUMP, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Vise (Item 3, Table 1, WP 0230 00)
Arbor Press (Item 21, Table 1, WP 0230 00)

Equipment Condition:

Steering pump removed (WP 0177 00)

Personnel Required:

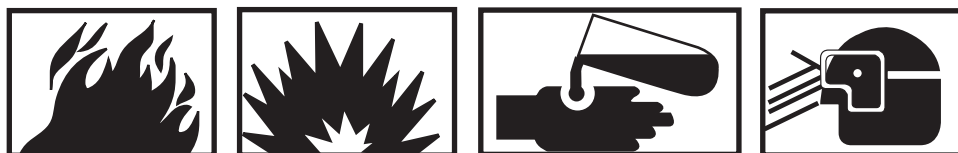
One Watercraft Engineer, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
O-Ring (p/n 174619, qty 1)
Seal, Plain Encased (p/n 263585, qty 1)
O-Ring (p/n 213998, qty 1)
O-Ring (p/n 199390, qty 1)
Gasket (p/n 283556, qty 1)

References:

WP 0177 00
TM 55-1905-242-24P (WP 0077)

DISASSEMBLY**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.

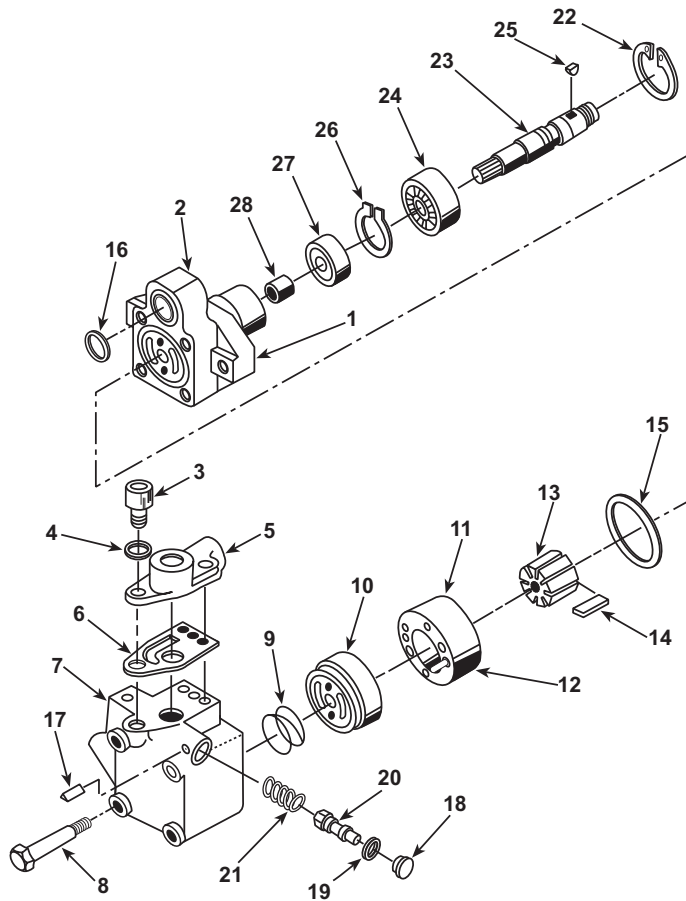
! CAUTION

Use protective jaws when clamping the pump body in the vise. Failure to use protective jaws can result in damage to the pump body.

2. Clamp the mounting flange (1) of the body (2) in the vise. Use protective jaws to prevent damage to the mounting flange.
3. Remove the bolts (3), washers (4), manifold (5), and gasket (6) from the cover (7).

DISASSEMBLY (continued)

4. Remove the screws (8) from the cover (7). Separate the cover from the body (2).
5. Remove the spring (9) and pressure plate (10) from the body (2).
6. Matchmark the cam ring (11) to the body (2) by lightly scribing the outside face of the cam ring. Remove the cam ring, pins (12), rotor (13), vanes (14), and O-rings (15 and 16) from the body.
7. Clamp the cover (7) in the vise. Use protective jaws. Drive out the retaining pin (17) with a pin punch.
8. Remove the plug (18), O-ring (19), control valve (20), and spring (21) from the cover (7).
9. Remove the retaining ring (22) from the body (2).
10. Remove the shaft (23) and bearing (24) from the body (2) as an assembly.
11. Remove the woodruff key (25) from the shaft (23).
12. If the bearing (24) will not be replaced, do not remove it from the shaft (23). If the bearing will be replaced, remove the retaining ring (26) from the shaft and press the bearing off the shaft.
13. Gently tap the shaft seal (27) from the body (2).
14. If the needle bearing (28) will not be replaced, do not remove it. If the needle bearing will be replaced, gently tap it out of the body (2).



CLEANING

1. Don protective gloves and goggles.
2. Clean all metal parts in cleaning solvent and dry them with clean wiping rags.

INSPECTION

1. Discard and replace the old seal (27) and O-rings (15, 16, and 19).
2. Check the bearings (24 and 28) for wear and looseness. Check for pitted or cracked races, needles, and balls.
3. Check the body (2), pressure plate (10), cam ring (11), and rotor (13) for scoring and wear.
4. Inspect the seal mating surface on the shaft (23) for scoring. Inspect the shaft for burrs or nicks. If marks on the shaft cannot be removed by light polishing, or if the shaft is scored, replace the shaft.
5. Inspect the vanes (14) for burrs, wear, and excessive play in the rotor (13) slots. Replace the vanes and rotor if the slots are worn. Replace the vanes if the vanes are worn.
6. Insert the control valve (20) into its bore in the cover (7). Rotate the control valve through 360 degrees while moving it in and out of the bore to check for binding. Check the control valve for wear and replace it if it is worn or binding.

ASSEMBLY

1. Press the needle bearing (28) into the body (2) if it was removed during disassembly.
2. Position the shaft seal (27) with the spring side of the seal facing toward the needle bearing (28). Press the shaft seal into place until it engages the shoulder within the body (2).

CAUTION

When pressing the bearing onto the shaft, apply pressure only to the inner bearing race.
Applying pressure to the outer bearing race can damage or destroy the bearing.

3. Press a new bearing (24) onto the shaft (23) if the bearing was removed during disassembly. Take care to apply pressure only to the inner bearing race.
4. Install the retaining ring (26) on the shaft (23) with the sharp edge facing away from the bearing (24).
5. Slide the shaft assembly (23, 24, and 26) into the body (2).
6. Install the retaining ring (22) into its groove in the body (2) with the sharp edge facing away from the bearing (24).
7. Insert the woodruff key (25) into the shaft (23) and tap it gently into place.
8. Install the body (2) in the vise with the shaft end facing down. Install the O-rings (15 and 16) into their grooves.
9. Insert the vanes (14) into the rotor (13) with the radius edge toward the cam ring (11).
10. Place the rotor (13) and vanes (14) over the shaft (23) and onto the body (2) with the rotor counterbore facing the body.
11. Insert the pins (12) through the cam ring (11) and place the cam ring over the rotor (13) and vanes (14). Align the matchmarks made during disassembly.

ASSEMBLY (continued)

12. Install the pressure plate (10) over the pins (12) and up against the cam ring (11), rotor (13), and vanes (14).
13. Place the spring (9) on top of the pressure plate (10), then install the cover (7) over the spring.
14. Line up the screw holes in the cover (7) with the holes in the body (2) and secure the cover with the screws (8).
15. Insert the spring (21) into the control valve bore of the cover (7).

 CAUTION

Install the control valve into the bore with the hex head going first into the bore. If the control valve is reversed in the counterbore, the unit will malfunction and pressure will rise dangerously high.

16. Apply a light coat of clean hydraulic fluid to the control valve (20) and install the control valve into its bore with the hex head going first into the bore.
17. Install the O-ring (19) onto the plug (18) and slide the plug into the cover (7). Press the plug into the cover until the retaining pin (17) can be inserted into the cover. Install the retaining pin to secure the cover.
18. Position the gasket (6) and manifold (5) on the cover (7) and secure the manifold with the bolts (3) and washers (4).
19. Turn the shaft (23) by hand and check that the shaft turns without binding.
20. Dispose of used cleaning solvent and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING CYLINDERS, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)

Equipment Condition:

Steering cylinder(s) removed (WP 0178 00)

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts:

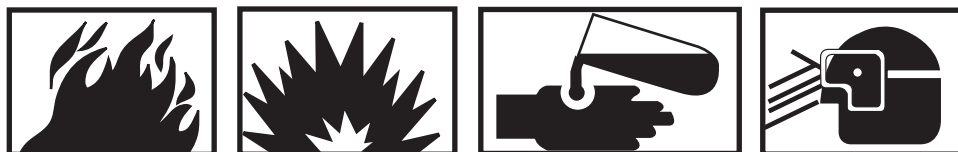
Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)

Materials/Parts: (continued)

Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Ring, Retaining Rod, Packing (p/n A08-187, qty 1)
Packing Assembly V type (p/n V63-6-4P, qty 1)
O-Ring (p/n A26-033, qty 1)
Gasket Seal (p/n A27-033, qty 1)
O-Ring End Cover (p/n A26-224, qty 2)
Gasket (p/n AN6244-2, qty 2)
Packing, Piston (p/n A8253-2, qty 4)
O-Ring Piston (p/n 26-116, qty 1)

References:

WP 0178 00
TM 55-1905-242-24P (WP 0078)

DISASSEMBLY**WARNING**

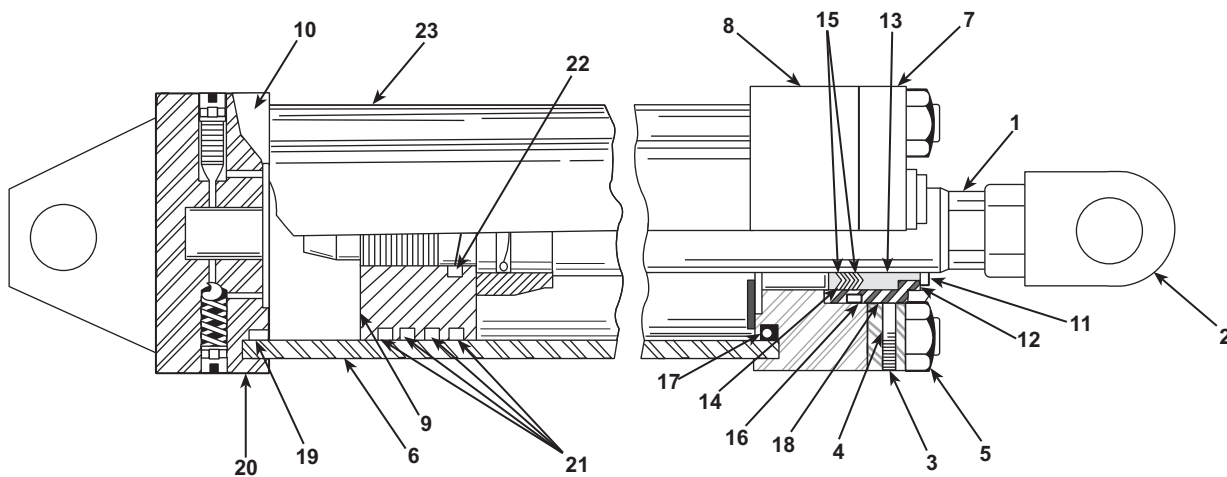
Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

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1. Don chemical protective gloves and goggles.
2. Place a wrench on the flats of the piston rod (1) to keep it from turning, and unscrew the stud (2) from the piston rod.
3. Remove the cartridge setscrew (3) and cartridge slug (4).
4. Remove the tie rod nuts (5).
5. Slide the piston rod (1) out of the cylinder (6). The piston rod will come out as an assembly with the cartridge retaining plate (7), head end cover (8), and piston (9).

DISASSEMBLY (continued)

6. Remove the cylinder (6) from the end cap cover (10).
7. Remove the cartridge retaining plate (7) and head end cover (8) from the piston rod (1).
8. Remove the rod wiper (11), bearing cartridge (12), and rod bearing (13) from the head end cover (8).
9. Remove the rod packing retaining ring (14) and rod packing (15).
10. Remove the O-rings (16 and 17) and gasket (18) from the head end cover (8).
11. Remove the O-ring (19) and gasket (20) from the end cap cover (10).
12. Remove the piston retaining lock screw and unscrew the piston (9) from the piston rod (1).
13. Remove the piston ring packing (21) and O-ring (22) from the piston (9).
14. Remove the tie rods (23) from the end cap cover (10) only if the tie rods or end cap cover will be replaced.

**CLEANING**

1. If not already on, don protective gloves and goggles.
2. Clean all metallic parts in cleaning solvent and dry with clean wiping rags.

INSPECTION

1. Inspect the piston rod and cylinder bore for wear and scoring.
2. Inspect threaded parts for thread damage.
3. Inspect end covers for nicks, burrs, cracks, or other damage.
4. Replace damaged parts with new.

ASSEMBLY

1. Lightly lubricate all parts with clean hydraulic fluid before installation.
2. Install a new O-ring (19) and gasket (20) in the end cap cover (10).
3. Thread the tie rods (23) into the end cap cover (10) if they were removed during disassembly.
4. Install new piston ring packing (21) and O-ring (22) on the piston (9).
5. Thread the piston (9) onto the piston rod (1) and secure it with the lockscrew.
6. Install the rod packing (15) and packing retaining ring (14) into the head end cover (8).
7. Install new O-rings (16 and 17) and gasket (18) into the head end cover (8).
8. Install the rod wiper (11), bearing cartridge (12), and rod bearing (13) into the head end cover (8).
9. Install the head end cover (8) onto the piston rod (1).
10. Install the cartridge retaining plate (7) on the head end cover (8).
11. Install the tie rod nuts (5).
12. Install the cartridge slug (4) and cartridge setscrew (3).
13. Install the stud (2) into the piston rod (1).
14. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING SYSTEM HELM UNIT, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Vise (Item 3, Table 1, WP 0230 00)
Installer Helm Unit Valve Spring (Item 22, Table 1, WP 0230 00)

Equipment Condition:

Helm unit removed (WP 0179 00)

Personnel Required:

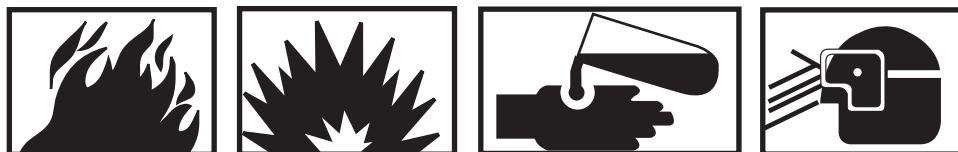
Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Seal, Plain Encased (p/n 844, qty 1)
Preformed Packing (p/n 20599, qty 1)
O-Ring (p/n 20783, qty 1)
O-Ring (p/n 15006, qty 1)

References:

WP 0179 00
TM 55-1905-242-24P (WP 0079 00)

DISASSEMBLY--SHAFT AND FLANGE ASSEMBLY**WARNING**

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1. Don chemical protective gloves and goggles.
2. Remove the retaining rings (1 and 2), bearing (3), and retaining ring (4).
3. Remove the shaft (5) from the tube and flange unit (6).
4. Remove the key (7) from the shaft (5).

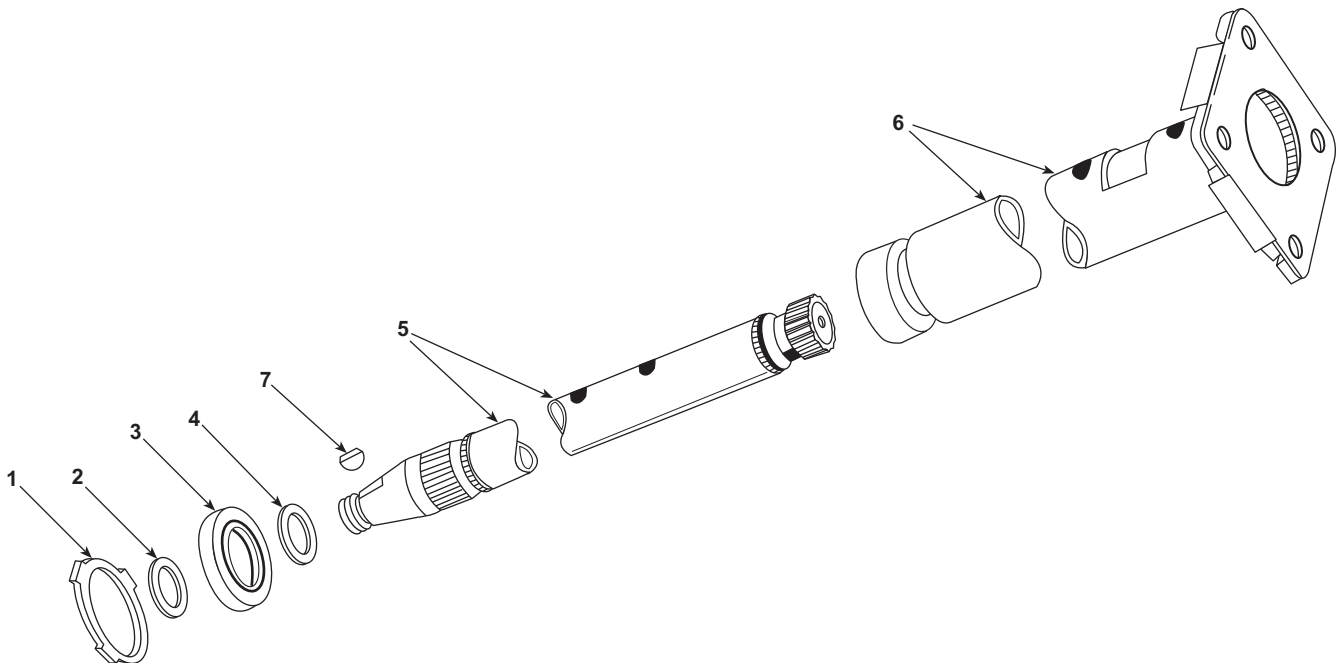
DISASSEMBLY--CONTROL SECTION

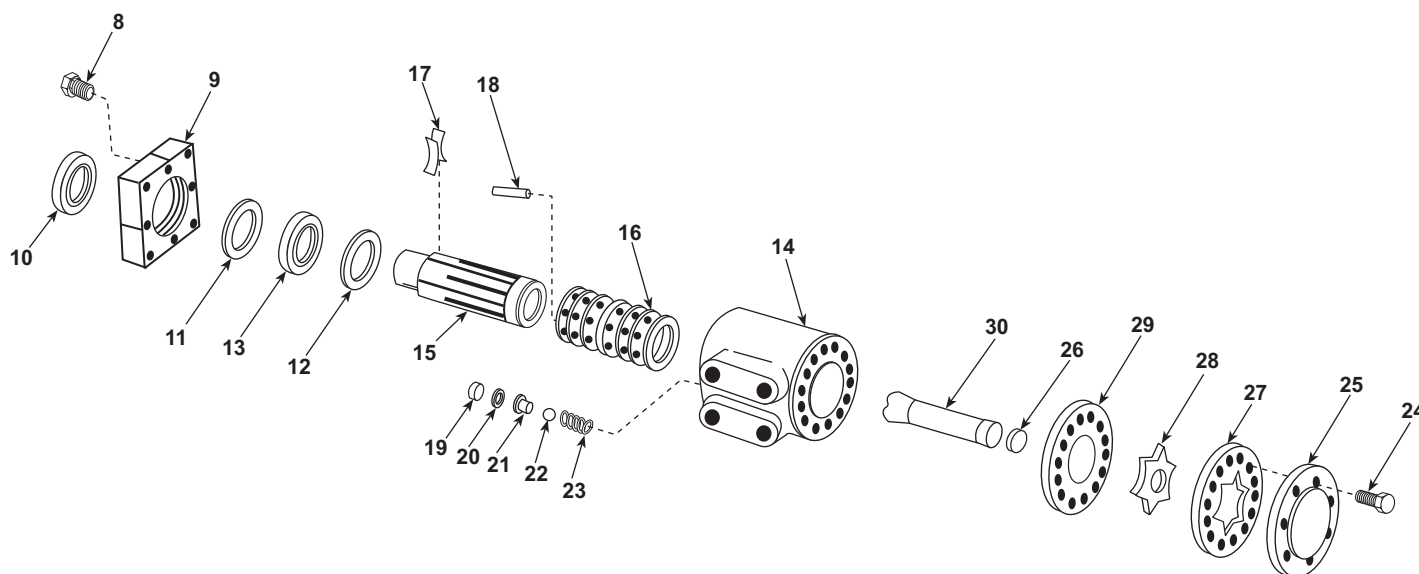
1. Don chemical protective gloves and goggles.
2. Support the control section in the vise, loosen the capscrews (8), and remove the mounting plate (9).
3. Remove the oil seal (10), preformed packing (11 and 12) and bushing (13) from the face of the housing (14).

 CAUTION

When removing the spool and sleeve assembly, be extremely careful to prevent these parts from binding, as they are closely fitted. They must generally be rotated slightly as they are withdrawn. The parts may be damaged if they are bound on disassembly.

4. Place the housing (14) on a solid surface with the port face down, so that it can be held securely. Remove the control spool (15) and control sleeve (16) from the housing.
5. Push the inside lower edge of the control spool (15) so that the control spool moves toward the splined end of the control sleeve (16).
6. Remove the centering spring set (17) and centering pin (18) from the spring slot in the control spool (15).
7. Remove the seal plug (19) and packing (20) from the housing (14).
8. Unscrew the check valve seat (21), ball (22), and check valve compression spring (23) from the housing (14).
9. Remove the capscrews (24) that secure the end cap (25) and remove the end cap.
10. Remove the shaft spacer (26), meter gear (27), star gear (28), plate (29), and drive shaft (30).





CLEANING

1. Don protective gloves and goggles.
2. Clean all metal parts in cleaning solvent and dry with clean wiping rags.

INSPECTION

1. Inspect the retaining rings and bearings for damage.
2. Check springs for loss of tension.
3. Inspect the splines on the control spool for nicks and burrs. Polish small defects. Replace the control spool if the defects are more major.
4. Inspect all threaded parts for thread damage.
5. Inspect the end cap for cracks or other damage.
6. Inspect the meter gear, star gear, and plate for cracks, burrs, wear, or other damage.
7. Inspect the spacer and drive shaft for cracks, burrs, wear, or other damage.
8. Discard all O-rings, packing, and seals and replace with new.

ASSEMBLY--CONTROL SECTION

1. Position the housing (14) in a vise with the control end up.
2. Install the check valve compression spring (23) in the housing (14) with the large end first.
3. Drop the ball (22) into the check valve hole and ensure that it rests on top of the small end of the check valve compression spring (23).
4. Thread the check valve seat (21) into the housing (14).
5. Install the packing (20) on the seal plug (19) and install the seal plug into the housing (14).

ASSEMBLY--CONTROL SECTION (continued)

6. Lubricate the control spool (15) with clean hydraulic fluid and slide it into the control sleeve (16) using a twisting motion. The control spool should slide in and rotate easily.
7. Align the spring slots of the control spool (15) and control sleeve (16) and install the centering spring set (17) using the spring installation tool.
8. Install the centering pin (18) through the control spool (15) and control sleeve (16) assembly.
9. Install the control spool (15) and control sleeve (16) assembly in the housing (14) so that the splined end of the control spool enters the housing first. Check that the assembly rotates freely in the housing.
10. Install new preformed packing (11 and 12) and bushing (13) in the housing (14).
11. Install the oil seal (10) in the mounting plate (9) and install the mounting plate on the housing (14). Secure the mounting plate with the capscrews (8).

 CAUTION

Alignment of the cross slot in the drive with valleys between the teeth of the meter gear star determines the proper valve timing of the unit. There are 12 teeth on the spline and six pump teeth on the star. Alignment is exactly right in six positions and exactly wrong in six positions. If the parts slip out of position during this part of the assembly, repeat until you are certain that correct alignment is obtained.

12. Place the plate (29) over the housing (14) so that both holes in the plate align with the tapped holes in the housing. Place the meter gear (27) on the assembly as the bolt holes align.
13. Place the splined end of the drive shaft (30) within the star gear (28) so that the slot at the control end of the drive shaft (30) is in alignment with the valleys between the meter gear (27) teeth. Push the splined end of the drive shaft so that the spline extends about one half its length beyond the meter gear star.
14. Install the drive shaft (30) and star gear (28) assembly into the housing (14) so that the star gear fits into the meter gear (27).
15. Rotate the star gear (28) slightly to bring the cross slot of the drive shaft (30) into engagement with the centering pin (18).
16. Install the shaft spacer (26) in the slot of the star gear (28) so that it is flush with the star gear surface. If the spacer does not drop flush with the star gear surface, the drive shaft (30) has not been properly engaged with the centering pin (18).
17. Install the end cap (25) and secure it with the capscrews (24).

ASSEMBLY--SHAFT AND FLANGE ASSEMBLY

1. Install the retaining ring (4), bearing (3), and retaining rings (1 and 2) onto the shaft (5).
2. Install the key (7) on the shaft (5).
3. Install the shaft (5) into the tube and flange unit (6).
4. Check that the shaft (5) turns easily in the flange unit (6).
5. Dispose of used cleaning solvent and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
STEERING SYSTEM COUNTERBALANCE VALVE, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)

Equipment Condition:

Counterbalance valve removed (WP 0183 00)

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Gasket (p/n 10-01256-02, qty 1)
Packing, Preformed (p/n 18-20210-01, qty 2)
O-Ring (p/n MS28775-217, qty 1)
Packing, Preformed (p/n 82-20007-01, qty 1)

References:

WP 0183 00
TM 55-1905-242-24P (WP 0083)

DISASSEMBLY**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.

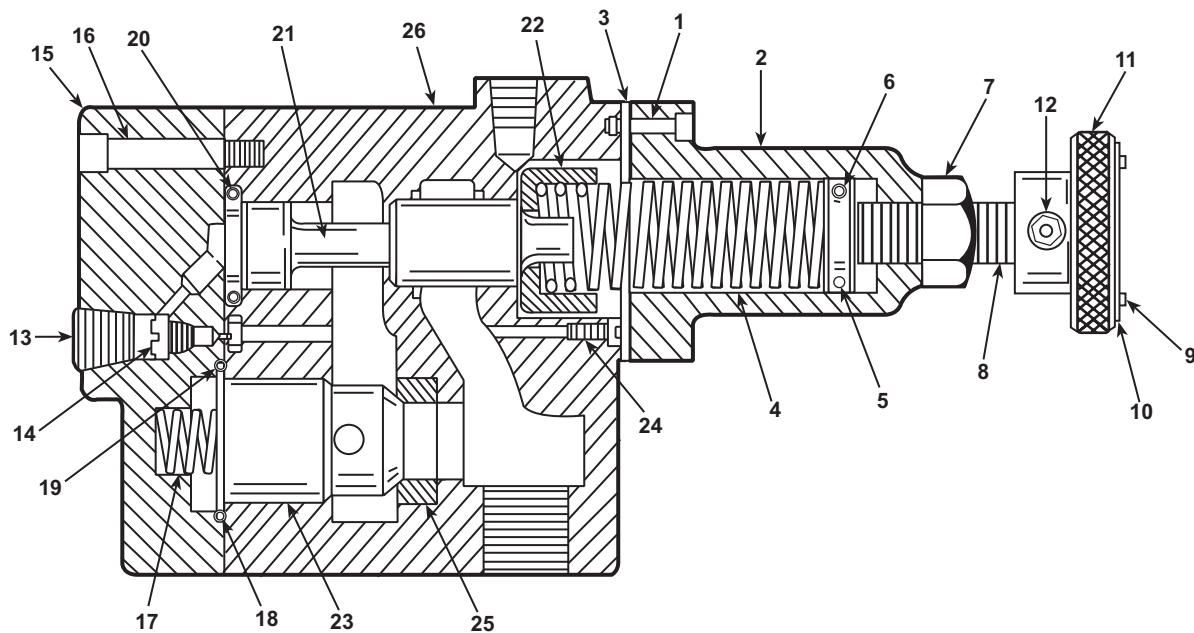
NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

2. Remove the screws (1), top cap (2), gasket (3), and main spring (4).
3. Remove the spring follower (5) and preformed packing (6).
4. Loosen the locknut (7) and remove the adjusting screw (8) with attached parts. Do not remove the locknut unless it, or the setscrew (12), will be replaced.

DISASSEMBLY (continued)

5. If damaged or illegible, remove the drive screws (9) and identification plate (10) from the adjusting knob (11).
6. If the adjusting knob (11) is damaged or defective, loosen the setscrew (12) and remove the adjusting knob from the adjusting screw (8).
7. Remove the pipe plug (13) and plug (14) from the bottom cap (15).
8. Remove the screws (16) that secure the bottom cap (15). Remove the bottom cap.
9. Remove the check spring (17) and preformed packing (18, 19, and 20).
10. Remove the main spool (21) and spring stop and seat (22).
11. Remove the check spool (23).
12. Remove the screw (24).
13. Remove the check spool seat (25) from the body (26).

**CLEANING**

1. If not already on, don protective gloves and goggles.
2. Clean all metal parts in cleaning solvent and dry with clean wiping rags.

INSPECT

1. Inspect threaded parts for thread damage.
2. Inspect identification plates for legibility and for secure mounting.
3. Check the springs for distortion or loss of tension.
4. Inspect the spools for burrs or scoring.
5. Inspect the spring stop and seat for wear.
6. Replace all packing and gaskets.

ASSEMBLY

1. Install the check spool seat (25) in the body (26).
2. Install the screw (24) in the body (26).
3. Install the check spool (23), spring stop and seat (22), and main spool (21) into the body (26).
4. Install the preformed packing (18, 19, and 20) and the check spring (17) into the body (26).
5. Position the bottom cap (15) onto the body (26) and secure it with the screws (16).
6. Install the plug (14) and pipe plug (13) into the bottom cap (15).
7. If removed, install the adjusting knob (11) onto the adjusting screw (8) and secure it with the setscrew (12).
8. If removed, install the identification plate (10) onto the adjusting knob (11) with the drive screws (9).
9. If removed, install the locknut (7) onto the adjusting screw (8) and insert the adjusting screw and attached parts into the top cap (2).
10. Install the preformed packing (6) into the spring follower (5) and install the spring follower and main spring (4) into the top cap (2).
11. Position the gasket (3) and top cap (2) on the body (26) and secure them with the screws (1).
12. Dispose of used cleaning solvent and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RUDDER AND TILLER, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)

Materials/Parts:

Gasket (p/n 445-4510939M23, qty 1)

References:

WP 0152 00

WP 0178 00

WP 0184 00

TM 55-1905-242-24P (WP 0086)

Equipment Condition:

Vessel in drydock or beached

Personnel Required:

Two Watercraft Engineers, 88L

Two Watercraft Operators, 88K

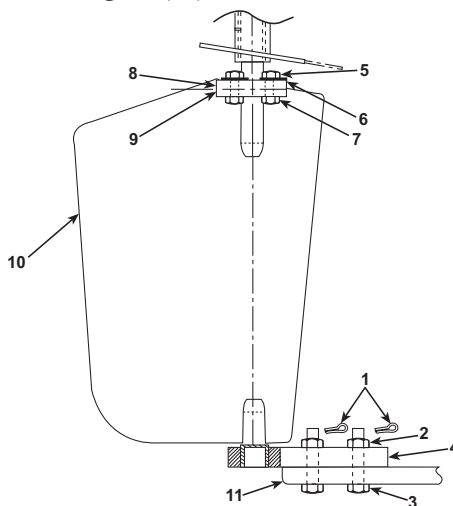
REMOVAL—RUDDER**WARNING**

Use several crewmembers to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

1. Remove the cotter pins (1), nuts (2), and bolts (3) from the rudder shoe casting (4).
2. Remove the nuts (5), washers (6), and bolts (7) that connect the upper flange (8) to the lower flange (9).
3. Allow the rudder to drop approximately 1/4 inch (6.4 mm) to separate the flanges. Using sufficient manpower, slide the rudder assembly (10) aft to clear the skeg bar (11) and remove the rudder from the craft.



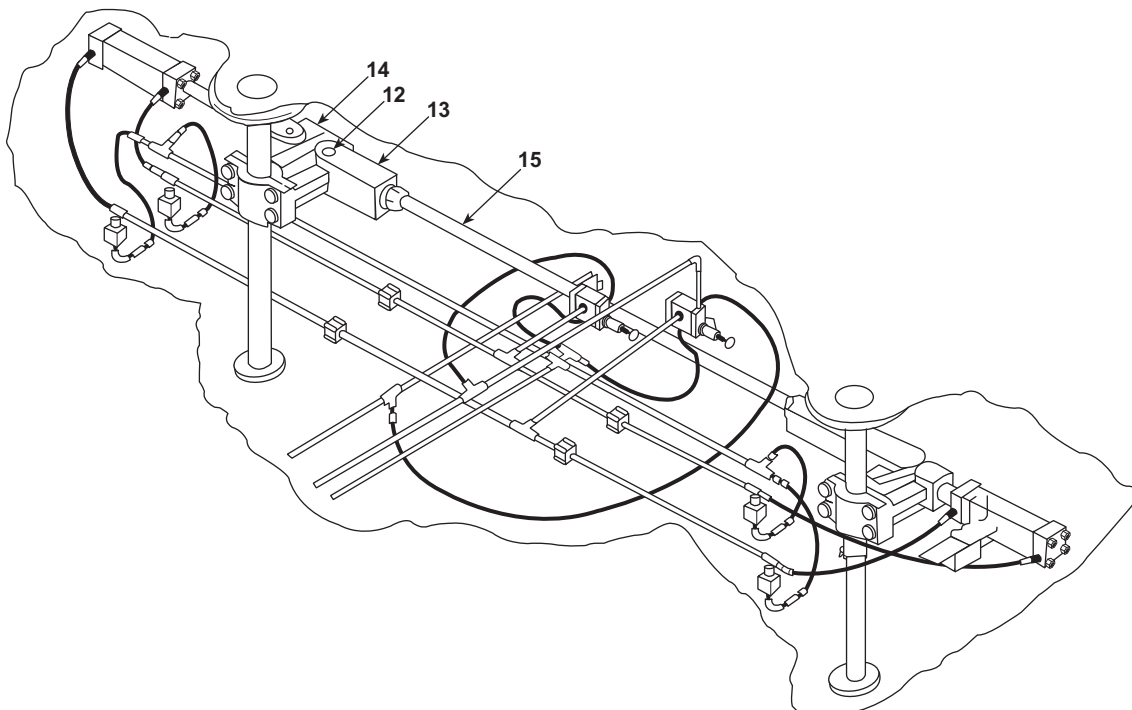
INSTALLATION--RUDDER**WARNING**

Use several crewmembers to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

1. Using sufficient manpower, slide the rudder assembly (10) forward onto the skeg bar (11) and secure the rudder shoe casting (4) loosely to the skeg bar with the nuts (2) and bolts (3). Do not tighten the nuts.
2. Align the upper flange (8) to the lower flange (9) and secure them with the nuts (5), washers (6), and bolts (7). Tighten the nuts securely.
3. Tighten the nuts (2) that secure the rudder shoe casting (4) and secure the nuts with the cotter pins (1).

REMOVAL--TIE ROD AND CYLINDER ASSEMBLY

1. Remove the clevis pin (12) from the starboard tie rod end (13) and remove the starboard tie rod end from the starboard crank (14).
2. Repeat step 1 for the port side.
3. Remove the tie rod (15).
4. Remove the steering cylinders (WP 0178 00).
5. Remove the rudder angle transmitter from the rudder stock (WP 0184 00).

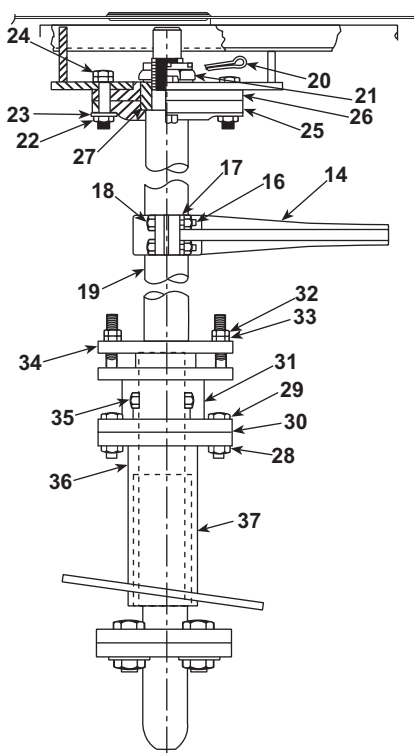


INSTALLATION--TIE ROD AND CYLINDER ASSEMBLY

1. Install the steering cylinders (WP 0178 00).
2. Position the tie rod (15) on the cranks (14).
3. Install the clevis pin (12) in the starboard tie rod end (13) to secure the starboard tie rod end to the starboard crank (14).
4. Repeat step 3 for the port side.
5. Install the rudder angle transmitter on the rudder stock (WP 0184 00).

REMOVAL--RUDDER STOCK

1. Remove the nuts (16), washers (17), and bolts (18) from the crank assembly (14).
2. Remove the crank assembly (14) from the upper rudder stock (19).
3. Remove the cotter pin (20) and nut (21) from the upper rudder stock (19).
4. Remove the flange mounting nuts (22), washers (23), and bolts (24).
5. Separate the lower thrust flange (25), upper thrust flange (26), and thrust bearing (27).
6. Remove the stuffing box mounting nuts (28), bolts (29), and gasket (30) from the stuffing box (31).
7. Remove the packing gland jam nuts (32) and hex nuts (33) from the packing gland (34).
8. Remove the packing gland (34) and flax packing (35) from the stuffing box (31).



REMOVAL--RUDDER STOCK (continued)

9. Remove the lower thrust flange (25), upper thrust flange (26), and thrust bearing (27).
10. Remove the upper rudder stock (19) by lowering it through the rudder log (36) and out the bottom of the hull.
11. Remove the sleeve bearing (37) from the rudder log (36) if the bearing will be replaced.

INSTALLATION--RUDDER STOCK

1. If the sleeve bearing (37) was removed, install it in the rudder log (36).
2. Install the stuffing box (31), stuffing box mounting nuts (28), bolts (29), and gasket (30). Do not tighten the stuffing box mounting nuts.
3. Install the upper rudder stock (19) by raising it through the rudder log (36) from the underside of the hull.
4. Install new flax packing (35) in the stuffing box (31).
5. Place the packing gland (34) over the end of the upper rudder stock (19) and position it in the stuffing box (31).
6. Install the hex nuts (33) and packing gland jam nuts (32) to secure the packing gland (34). Do not tighten the hex nuts (33) or packing gland jam nuts.
7. Position the thrust bearing (27) in place and position the upper thrust flange (26) and lower thrust flange (25) over the thrust bearing.
8. Secure the upper thrust flange (26) and lower thrust flange (25) with the bolts (24), washers (23), and flange mounting nuts (22).
9. Secure the upper rudder stock (19) to the thrust bearing (27) with the nut (21) and cotter pin (20).
10. Position the crank assembly (14) on the upper rudder stock (19) and secure the crank assembly with the bolts (18), washers (17), and the nuts (16).
11. Tighten the stuffing box mounting nuts (28). Tighten the hex nuts (33) and packing gland jam nuts (32). Adjust the stuffing box (31) only after the vessel is afloat (WP 0152 00).

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RUDDER AND TILLER, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Welding Shop, Trailer Mounted (Item 7,
Table 1, WP 0230 00)

Personnel Required:

Three Watercraft Engineers, 88L
One Certified Welder

References:

S9074-AQ-GIB-010/248
TB 43-0144
TB 55-1900-204-24
WP 0210 00
TM 55-1905-242-24P (WP 0086)

Equipment Condition:

Rudder removed (WP 0210 00)

DISASSEMBLY**WARNING**

Repairing components by means of grinding, cutting, and/or welding produces hot, flying particles. These particles can cause serious injury to personnel. These hot particles can also ignite fires in the work area and in adjacent spaces. During and after work, the work area will be very hot. Protective goggles, gloves, and/or aprons must be worn at all times during cutting and grinding operations. A fire watch must be posted whenever grinding or cutting operations are taking place. Failure to comply can result in damaged equipment and serious injury or death to personnel.

Unprotected exposure to arc welding rays can cause serious eye damage and radiation burns to the skin. Never perform arc welding operations without using appropriate eye and skin protection. Failure to comply can result in serious injury or death to personnel.

⚠ CAUTION

Improper connection of ground leads can cause serious electrolytic and electronic damage to the vessel and its components. Always ensure that ground leads are connected in accordance with TB 55-1900-204-24.

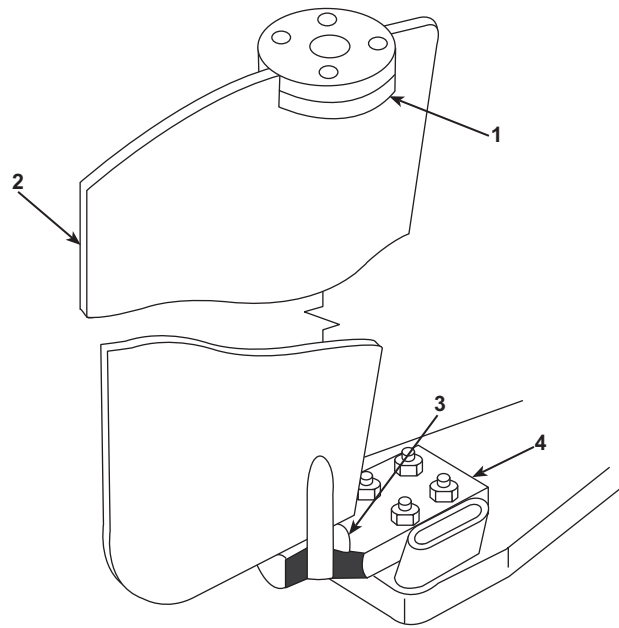
NOTE

All welding must be done by a qualified welder in accordance with S9074-AQ-GIB-010/248.

NOTE

Replace the rudder assembly if the bronze gudgeon bearing is worn or the rudder is damaged beyond repair.

1. Remove the lower rudder flange (1) from the rudder assembly (2) if damaged.
2. Remove the bronze gudgeon bearing (3) from the rudder shoe casting (4).



REPAIR

1. Weld cracks and breaks using standard welding procedures in accordance with S9074-AQ-GIB-010/248. Grind the weld areas smooth after welding is complete.
2. Straighten any bends in the rudder by heating and hammering the bent sections.
3. Remove any corrosion by wire brushing.
4. Replace any damaged or defective hardware.
5. Prime and paint all repaired areas in accordance with TB 43-0144.

ASSEMBLY

1. Install the bronze gudgeon bearing (3) in the rudder shoe casting (4).
2. Install the rudder shoe casting (4) on the rudder assembly (2).
3. Install the lower rudder flange (1) on the rudder assembly (2).

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP HOIST HYDRAULIC PUMP, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Wrench, Torque, 1/2" Drive 0-200 lb-ft (Item 12, Table 1, WP 0230 00)
Arbor Press (Item 21, Table 1, WP 0230 00)

Equipment Condition:

Pump removed (WP 0185 00)

Personnel Required:

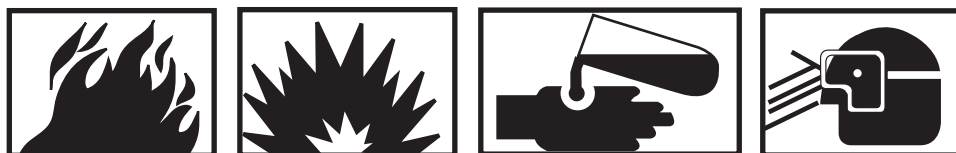
One Watercraft Engineer, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Seal, Plain Encased (p/n 193428, qty 1)
Wiper (p/n 200465, qty 1)

References:

WP 0185 00
TM 55-1905-242-24P (WP 0089)

DISASSEMBLY**WARNING**

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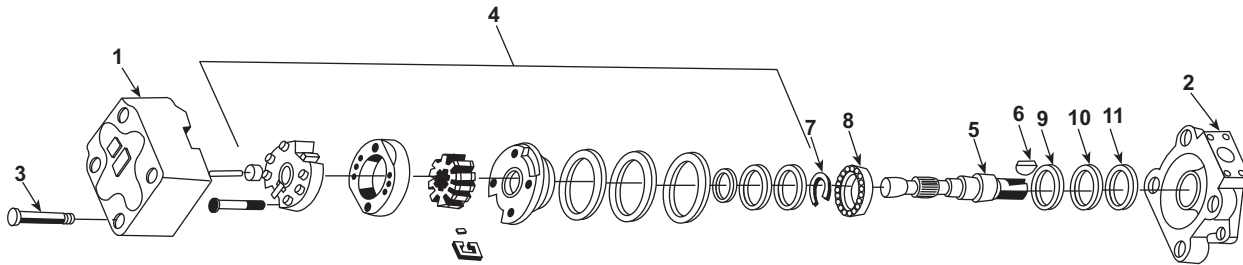
Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.
2. Matchmark the cover (1) and pump body (2) to permit proper alignment upon assembly.
3. Remove the cover bolts (3) and cover (1).

DISASSEMBLY (continued)**NOTE**

The pump cartridge assembly is serviced as an assembly. No disassembly or repair of the cartridge assembly is permitted. If the cartridge assembly is defective, replace it as an assembly.

4. Grasp the pump cartridge assembly (4) and pull it from the drive shaft (5) with a twisting motion. If necessary, loosen the pump cartridge assembly by prying under the flats of the ring with two screwdrivers. Do not disassemble the pump cartridge assembly.
5. Remove the shaft key (6) from the drive shaft (5).
6. Remove the bearing retaining ring (7) and remove the drive shaft (5) and bearing (8) from the pump body (2) by gently tapping the keyed end of the drive shaft with a soft hammer.
7. Remove the bearing (8) from the drive shaft (5) only if it will be replaced. To remove the bearing, press it off the drive shaft.
8. Remove the washer (9), seal (10), and wiper (11) from the pump body (2).

**CLEANING**

1. If not already on, don chemical protective gloves and goggles.
2. Clean all metal parts in cleaning solvent and dry with clean wiping rags.

INSPECTION

1. Inspect the bearing by rotating the bearing and applying pressure. Replace the bearing if any roughness, looseness, pitting, or cracking is noted.
2. Inspect the sealing surfaces on the drive shaft for scoring or wear. Replace the drive shaft if it is worn or if the scoring cannot be removed by light polishing.
3. Discard all seals and wipers.

ASSEMBLY

1. Install the wiper (11), seal (10), and washer (9) in the pump body (2). Ensure that the lipped edge of the wiper and seal face toward the pump cartridge assembly (4).
2. If removed during disassembly, press the bearing (8) onto the drive shaft (5) and secure it with the bearing retaining ring (7).
3. Lubricate the lips of the wiper (11) and seal (10) with clean hydraulic fluid. Lubricate the bearing (8) with clean hydraulic fluid. Install the drive shaft (5) and bearing into the pump body (2). If necessary, gently tap the drive shaft with a soft hammer to position the bearing in the pump body.

ASSEMBLY (continued)

4. Install the shaft key (6) in the drive shaft (5).
5. Lubricate the pump cartridge assembly (4) with clean hydraulic fluid and carefully install it on the drive shaft (5), and seat it firmly in the pump body (2).
6. Align the matchmarks made during disassembly and install the pump cover (1) to the pump body (2). Secure the cover with the cover bolts (3). Torque the cover bolts to 85 to 95 lb-ft (115 to 129 Nm).
7. Pour a small quantity of clean hydraulic fluid into the cover inlet port. Rotate the drive shaft (5) by hand to check for free rotation and to make sure of complete lubrication of the pump cartridge assembly (4). Cap the inlet and outlet ports to prevent the entrance of contaminants.
8. Dispose of used hydraulic fluid, cleaning solvent and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP HOIST CONTROL VALVE, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Wrench, Torque, 1/2" Drive, 0-200 lb-ft (Item 12, Table 1, WP 0230 00)

Equipment Condition:

Ramp hoist control valve removed (WP 0186 00)

Personnel Required:

One Watercraft Engineer, 88L

Materials/Parts: (continued)

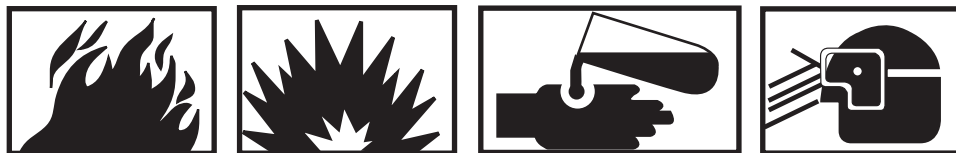
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Petrolatum (Item 7, Table 2, WP 0230 00)
Packing, Preformed (p/n 221447, qty 1)
Packing, Preformed (p/n 226191, qty 4)
O-Ring (p/n 154023, qty 1)
O-Ring (p/n 154132, qty 1)
O-Ring (p/n MS28775-218, qty 2)
O-Ring (p/n 154013, qty 1)

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)

References:

WP 0186 00
TM 55-1905-242-24P (WP 0090)

DISASSEMBLY**WARNING**

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Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

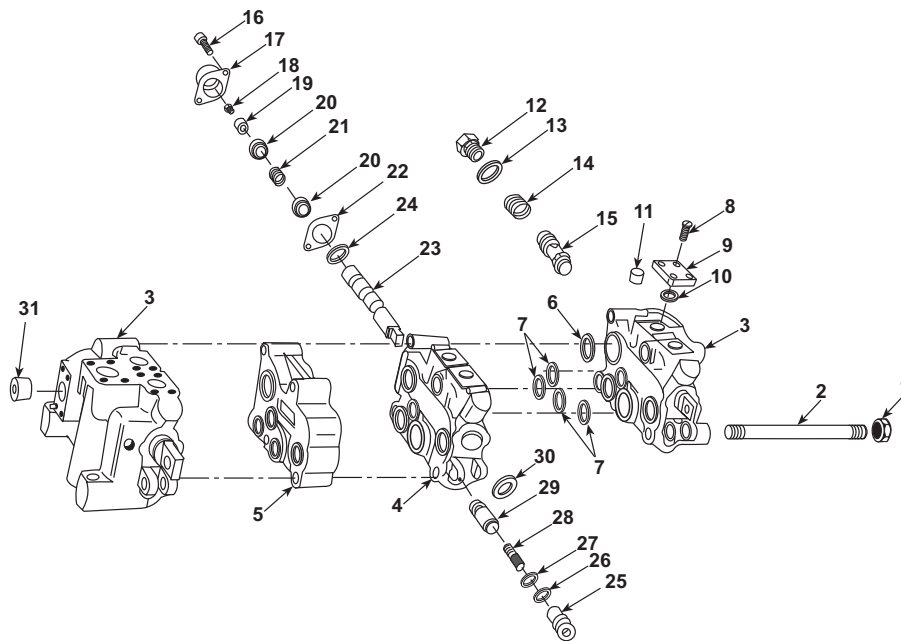
NOTE

During Disassembly, particular attention should be given to identification of parts for Assembly. Spools are selectively fitted to valve bodies and must be returned to the same valve bodies from which they were removed. Valve sections should be assembled in the same order.

1. Don chemical protective gloves and goggles.
2. Remove the hex nuts (1) from the section mounting studs (2).
3. Remove the section mounting studs (2) and separate the valve body (3) from the sections (4 and 5).

DISASSEMBLY (continued)

4. Separate section (4) from section (5).
5. Remove the packing (6 and 7) from the valve body (3).
6. Remove the capscrews (8), plate (9), and plate packing (10).
7. Remove the pipe plug (11) from the valve body (3) if it is damaged or leaking.
8. Remove the valve plug (12), packing (13), spring (14), and valve subassembly (15) from the valve body (3).
9. Remove the capscrews (16) and end cap (17).
10. Remove the guide mounting machine screw (18), valve guide (19), retainers (20), spring (21), and flat retainer (22).
11. Withdraw the valve spool (23) and packing (24) from section (4).
12. Remove the pipe plug (25), reinforcing ring (26), packing (27), spring (28), poppet (29), and packing (30) from section (4).
13. Remove the pipe plug (31) from the valve body (3).

**CLEANING**

1. If not already on, don chemical protective gloves and goggles.
2. Clean all metal parts in cleaning solvent and dry with clean wiping rags.

INSPECTION**NOTE**

Minor nicks and burrs may be polished out on all parts except the valve spool. Replace all parts showing more significant damage.

INSPECTION (continued)

1. Inspect springs for deformity or loss of tension.
2. Inspect valve spool for nicks, burrs, or scores. The valve spool cannot be repaired. The section must be replaced as a unit if the valve spool is worn or damaged in any way.
3. Inspect all threaded parts for thread damage.
4. Inspect the end caps and plates for burrs, nicks, or other damage.
5. Inspect the sealing sections of the valve bodies and sections for scores, burrs, or warpage.
6. Inspect the poppets for burrs or nicks.
7. Replace all packing.

ASSEMBLY

1. Install the pipe plug (31) in the valve body (3). Do not overtighten the pipe plug.
2. Install the packing (30) in section (4).
3. Insert the spring (28) into the poppet (29), then insert both into the section (4).
4. Install the packing (27) and reinforcing ring (26) into the section (4) and secure them with the pipe plug (25). Do not overtighten the pipe plug.
5. Place the packing (24) in position on the valve spool (23). Lubricate the valve spool with clean hydraulic fluid and insert the valve spool into the section (4).
6. Install the retainers (20), flat retainer (22), spring (21), and valve guide (19) into the section (4). Secure them with the guide mounting machine screw (18). Align the flat retainer by shifting the valve spool (23). Spool bind is an indication of retainer misalignment.
7. Install the end cap (17) and secure it with the capscrews (16).
8. Lubricate the valve subassembly (15) with clean hydraulic fluid and install the valve subassembly, spring (14), and packing (13) and secure them with the valve plug (12).
9. Install the pipe plug (11) if it was removed during disassembly.
10. Install the plate packing (10) and plate (9) and secure the plate with the capscrews (8).
11. Install the packing (6 and 7) in the sections (4 and 5) using petrolatum to hold them in place during assembly.
12. With the mounting feet on a flat surface, carefully place the valve body and sections (3, 4, and 5) together. Secure the sections with the section mounting studs (2) and hex nuts (1). Torque the hex nuts to 55 to 60 lb-ft (75 to 81 Nm).
13. Check that the valve spool (23) moves freely in the bore after torquing the hex nuts (1).
14. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP HOIST HAND PUMP, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP 0230 00)
Suitable Drain Pan

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2,
WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2,
WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)

Equipment Condition:

Hand pump removed (WP 0188 00)

Personnel Required:

One Watercraft Engineer, 88L

References:

WP 0188 00
TM 55-1905-242-24P (WP 0092)

DISASSEMBLY**WARNING**

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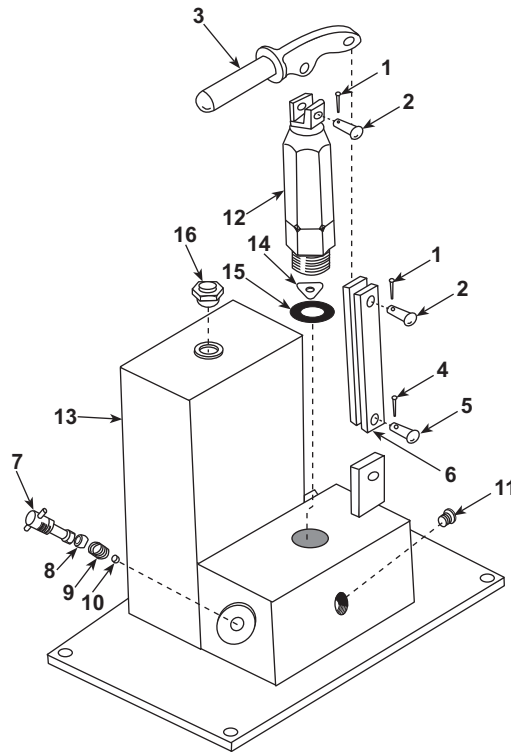
Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

2. Remove the cotter pins (1) and pins (2), and remove the lever (3).
3. Remove the cotter pin (4), pin (5), and pump links (6).
4. Remove the release screw (7), release valve (8), spring (9), ball (10), and drain plug (11).
5. Remove the pump piston assembly (12) from the reservoir and block assembly (13).
6. Remove the valve washer (14) and filter (15) from the reservoir and block assembly (13).
7. Remove the fill plug (16) from the reservoir and block assembly (13).

DISASSEMBLY (continued)**CLEANING**

1. If not already on, don protective gloves and goggles.
2. Clean all metal parts in cleaning solvent and dry with clean wiping rags.

INSPECTION**NOTE**

Minor nicks and burrs may be removed by lightly polishing the affected parts. Replace any parts that have more significant damage.

1. Inspect the spring for distortion, loss of tension, or broken coils.
2. Inspect the pins, ball, piston, and blocks for burrs or nicks.
3. Discard all packing and replace with new.

ASSEMBLY

1. Install the fill plug (16) loosely in the reservoir and block assembly (13).
2. Install the washer (14) and filter (15) in the reservoir and block assembly (13).
3. Install the pump piston assembly (12) into the reservoir and block assembly (13).
4. Install the drain plug (11), ball (10), spring (9), release valve (8) and release screw (7) into the reservoir and block assembly (13).
5. Install the pump links (6) using the pin (5) and cotter pin (4).

INSPECTION (continued)

6. Install the pump lever (3) using the pins (2) and cotter pins (1).
7. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP LOCKING HYDRAULIC CYLINDERS, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Wrench, Torque, 1/2" Drive, 0-200 lb-ft (Item 12, Table 1, WP 0230 00)

Equipment Condition:

Ramp locking hydraulic cylinders removed (WP 0189 00)

Personnel Required:

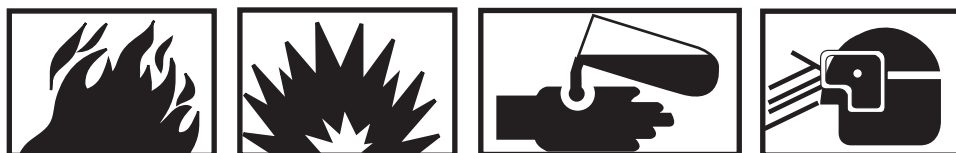
Two Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Ring, Wiper (p/n 50-00015-003, qty 1)
Seal, Bushing (p/n 50-00001-024, qty 1)
Seal, Rod (p/n 50-00006-049, qty 1)
O-Ring Barrel (p/n 50-00001-029, qty 2)
Seal, Piston (p/n 50-00001-013, qty 1)
Seal, Piston (p/n 50-00007-019, qty 1)

References:

WP 0189 00
TM 55-1905-242-24P (WP 0093)

DISASSEMBLY**WARNING**

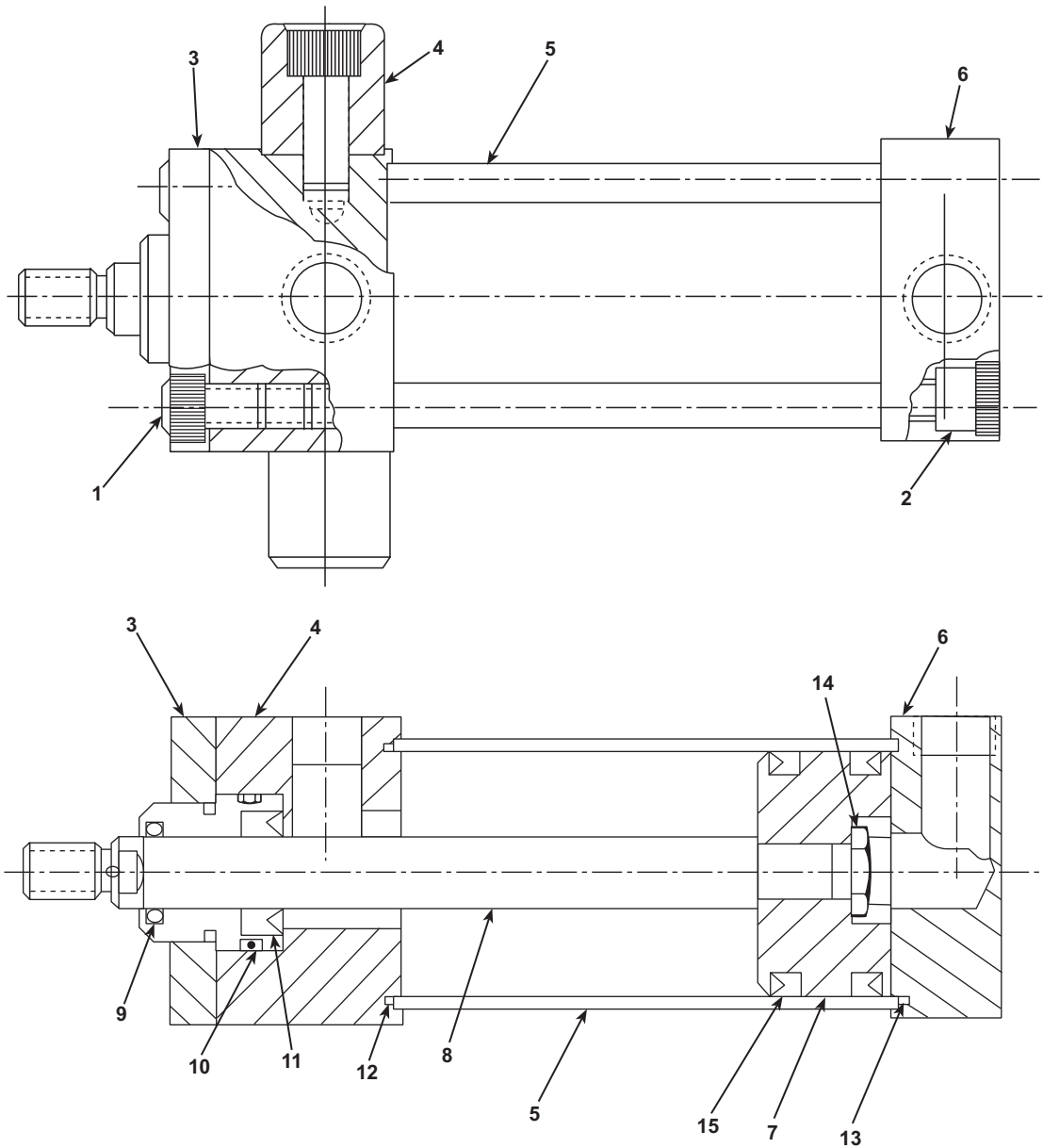
Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Don chemical protective gloves and goggles.
2. Remove the retainer plate bolts (1), nuts (2), and retainer plate (3).
3. Remove the rod end head (4) from the barrel (5).
4. Remove the blind end cap (6) from the barrel (5).
5. Withdraw the piston (7), rod (8), and attached parts from the barrel (5).
6. Remove the wiper (9), cap seal (10), rod seal (11), and barrel seal (12) from the rod end head (4).

DISASSEMBLY (continued)

7. Remove the barrel seal (13) from the blind end cap (6).
8. Do not remove the piston (7) from the rod (8) unless one of these components must be replaced. If it is necessary to remove the piston from the rod, do so by removing the nut (14) and separating the piston and rod.
9. Remove the piston seals (15) from the piston (7).

**CLEANING**

1. If not already on, don protective gloves and goggles.
2. Clean all metal parts in cleaning solvent and dry with clean wiping rags.

INSPECTION**NOTE**

Minor scoring may be removed from the piston, rod, and barrel by light stoning or lapping. Replace all damaged or distorted parts.

1. Inspect the barrel, rod, and piston for burrs and scores.
2. Inspect all threaded parts for thread damage.
3. Inspect the retainer plate, rod end head, and blind end cap for cracks or breaks.
4. Replace all seals and packings.

ASSEMBLY

1. Install the piston seals (15) on the piston (7).
2. If the piston (7) was removed from the rod (8), join the piston and the rod and secure them with the nut (14).
3. Install the barrel seal (13) in the blind end cap (6).
4. Install the wiper (9), cap seal (10), rod seal (11), and barrel seal (12) in the rod end head (4).
5. Lubricate the piston (7), piston seals (15), and the interior of the barrel (5) with clean hydraulic fluid and slide the piston (7) and rod (8) assembly into the barrel.
6. Install the blind end cap (6) on the barrel (5).
7. Lubricate the wiper (9) and rod seal (11) with clean hydraulic fluid and install the rod end head (4) on the barrel (5).
8. Install the retainer plate (3) and secure it with the retainer plate bolts (1) and nuts (2).
9. Dispose of used hydraulic fluid, cleaning solvent, and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP WINCH, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
 Wrench, Torque, 1/2" Drive, 0-200 lb-ft (Item 12, Table 1, WP 0230 00)
 Puller, Bearing, Ramp Winch (Item 23, Table 1, WP 0230 00)
 Installer, Bushing, Ramp Winch (Item 24, Table 1, WP 0230 00)
 Heel Bar (Item 28, Table 1, WP 0230 00)
 Pinch Bar, 3/4 Dia. (Item 29, Table 1, WP 0230 00)
 Scraper, Ship 15" LG all Metal (Item 33, Table 1, WP 0230 00)

Equipment Condition:

Winch motor removed (WP 0190 00)

Personnel Required:

Three Watercraft Engineers, 88L

Materials/Parts:

Hydraulic Fluid (Item 1, Table 2, WP 0230 00)
 Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
 Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)

Materials/Parts: (continued)

Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
 Rag, Wiping (Item 5, Table 2, WP 0230 00)
 Grease (Item 21, Table 2, WP 0230 00)
 Crocus Cloth A-A 1206 Type I (Item 22, Table 2, WP 0230 00)
 Lubricating Oil, Gear, 80W-90 (Item 23, Table 2, WP 0230 00)
 Packing, Preformed (p/n 21040, qty 1)
 Spacer, Ring (p/n 71066, qty 1)
 Gasket (p/n 77342, qty 1)
 O-Ring Taper Seal (p/n 25098, qty 1)
 Seal, Oil Drum (p/n 72195, qty 1)
 Spacer, Ring (p/n 71062, qty 1)
 O-Ring Drum (p/n 22357, qty 1)
 O-Ring End Cover (p/n 25016, qty 1)
 Packing, Preformed (p/n 21040, qty 1)
 Seal, Oil Housing (p/n 77336, qty 1)
 Spacer, Ring (p/n 71099, qty 1)
 O-Ring Pad (p/n 21150, qty 1)

References:

WP 0190 00
 TM 55-1905-242-24P (WP 0095)

REPAIR

Repair of the ramp winch is accomplished by the replacement of worn or damaged parts. Disassembly and assembly procedures are outlined in this work package.

WARNING



Use several crewmembers to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

REPAIR (continued)

WARNING

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

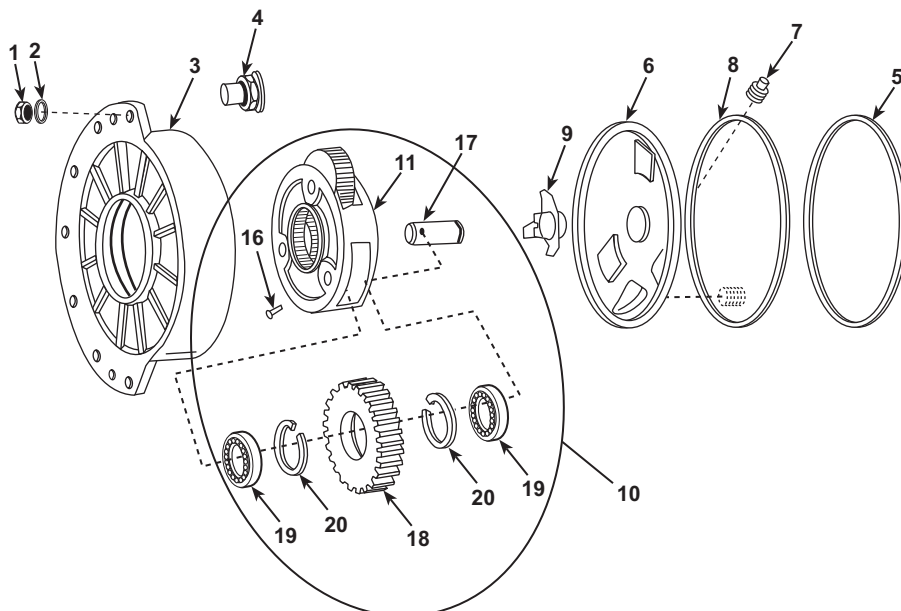
REMOVAL--FINAL DRIVE ASSEMBLY

1. Don chemical protective gloves and goggles.

NOTE

Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

2. Remove the nuts (1) and lock washers (2) from the final drive housing (3).
3. Support the final drive assembly with additional personnel or a suitable lifting device and use two heel bars to remove the final drive housing (3) from the dowel bolts (4).



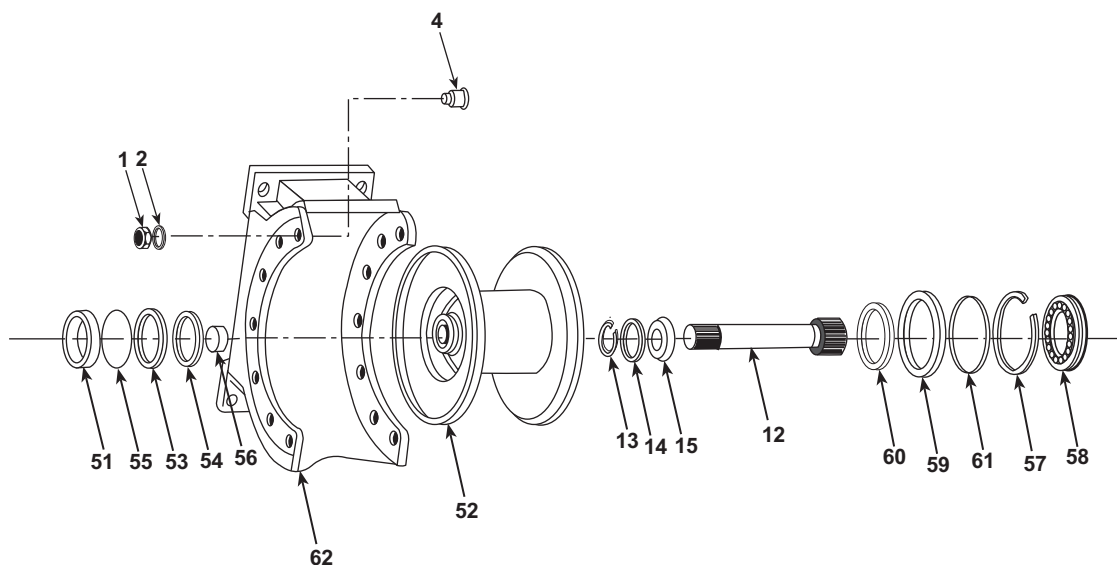
DISASSEMBLY--FINAL DRIVE ASSEMBLY

1. Remove the retaining ring (5).
2. Remove the end cover (6) by using a heel bar under the lug provided below the filler plug (7) boss. Remove the O-ring (8) from the end cover.
3. Remove the thrust plate (9) from the final planet assembly (10).

⚠ CAUTION

Use extreme caution when pulling the planet assembly. Do not damage the pilot bore in the final drive housing that carries the end cover.

4. Using two pinch bars under the rim of the planet hub (11) and against the end of the final drive housing (3), pull the planet assembly (10) off the splined end of the drum, taking care not to damage the pilot bore in the final drive housing that carried the end cover (6).
5. Remove sun gear shaft (12).
6. Remove the snap ring (13) and O-ring (14) from the sun gear shaft (12).
7. Do not remove the taper seal ring (15) unless the tapered diameter has roughness or scratches. If the taper seal ring must be replaced, remove it by using a punch between the gear teeth to drive the taper ring seal off the sun gear shaft (12).

**DISASSEMBLY--FINAL PLANET ASSEMBLY****NOTE**

It is recommended that if this assembly does not function properly, or is worn, it should be traded in for a complete new assembly. If the assembly is to be disassembled, do so only if a clean, dust free work area is available.

1. Using a 1/4" diameter pin punch, drive the pin (16) completely into the final planet pin (17).

DISASSEMBLY--FINAL PLANET ASSEMBLY (continued)

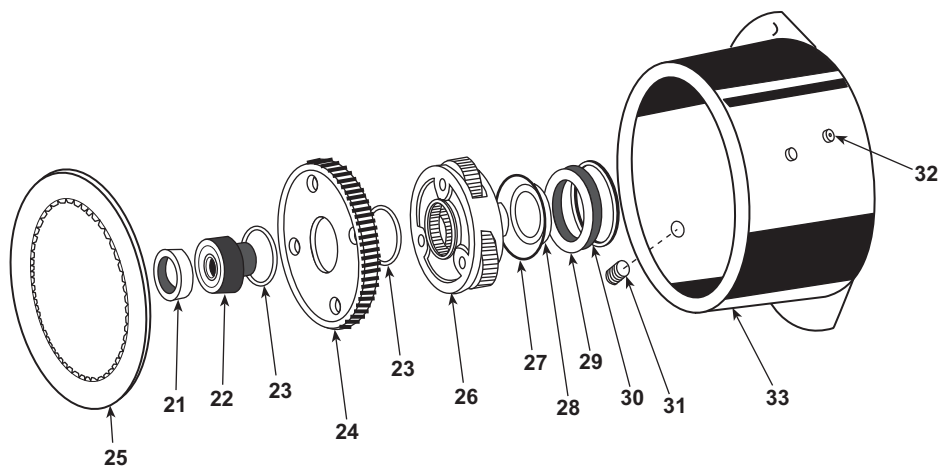
2. Remove the final planet pin (17) by tapping it out of the planet hub (11) so that it is removed from the splined bore side of the planet hub.
3. Remove pin (16) from the final planet pin (17).
4. Remove the planet gear (18) from the planet hub (11).
5. Drive the ball bearings (19) out of the planet gear (18) using a drift. Remove the snap rings (20) only if the planet gear or snap rings are to be replaced because of damage.
6. Repeat steps 1-5 for the remaining planet gears (18).

DISASSEMBLY--PRIMARY DRIVE ASSEMBLY

 CAUTION

Do not remove this assembly as a unit as damage may be caused to the seal diameter of the primary planet hub and the tapered seal diameter of the taper seal ring on the sun gear shaft.

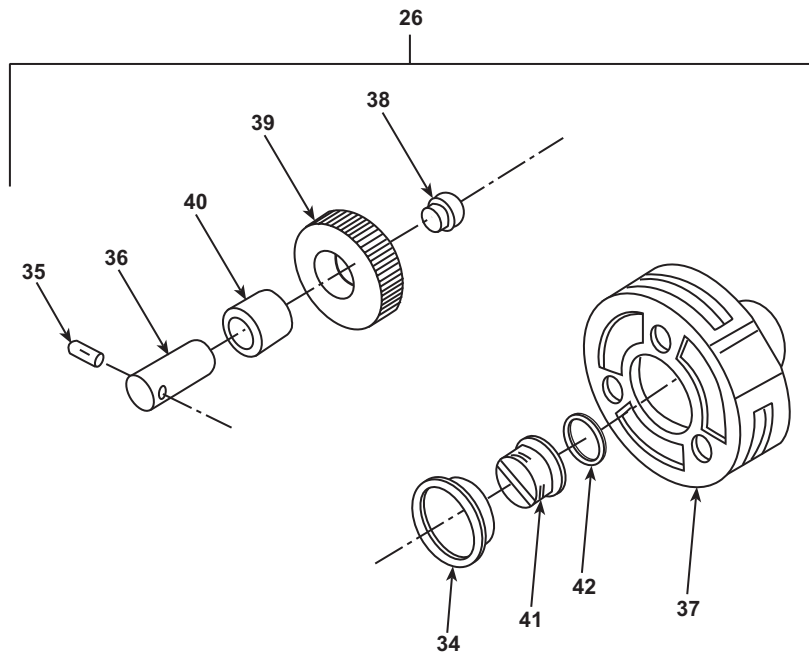
1. Remove the spring cover and motor assembly (refer to WP 0190 00).
2. If not already removed with the motor, remove the spacer (21), brake hub (22), snap ring (23), and brake ring (24).
3. Remove the brake plate (25).
4. Remove the primary planet assembly (26).
5. Remove the O-ring (27), oil seal (28), seal ring (29), snap ring (30), drain plug (31), and fill plug (32) from the primary drive housing (33).



DISASSEMBLY--PRIMARY PLANET ASSEMBLY**NOTE**

It is recommended that if this assembly does not function properly, or is worn, it should be traded in for a complete new assembly. If the assembly is to be disassembled, do so only if a clean, dust free work area is available.

1. Remove the bushing (34).
2. Using a 3/16 inch diameter pin punch, drive the pin (35) into the primary planet pin (36) until it can be removed with the primary planet pin.
3. Remove the primary planet pin (36) by tapping it out of the planet hub (37) so that it is removed from the side of the planet hub that carried the bushing (34).
4. Remove the thrust plug (38) from the primary planet pin (36).
5. Remove the planet gear (39) with the needle bearing (40).
6. Repeat steps 2-5 for the remaining planet gears (39).
7. After all the planet gears (39) have been removed, remove the thrust pad (41) and O-ring (42) from the planet hub (37).



DISASSEMBLY--BRAKE HUB ASSEMBLY**NOTE**

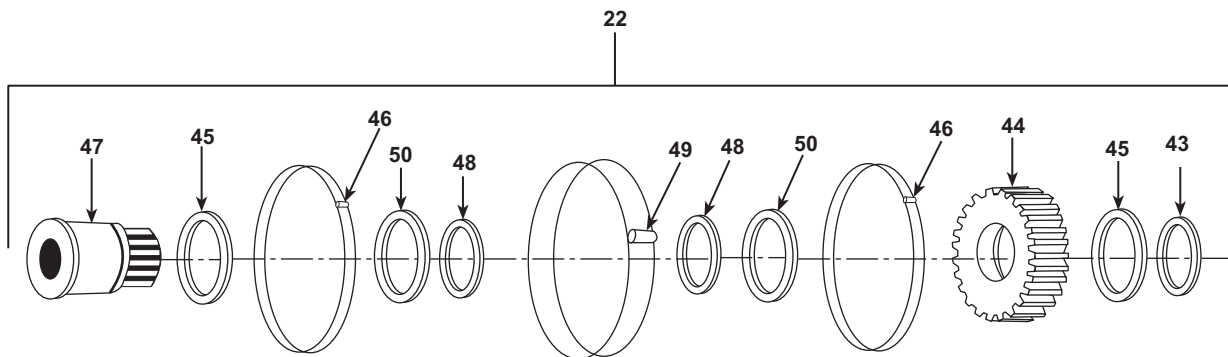
It is recommended that if this assembly does not function properly, or is worn, it should be traded in for a complete new assembly. If the assembly is to be disassembled, do so only if a clean, dust free work area is available.

1. Remove the snap ring (43) from the brake hub (44).
2. Remove the spacer (45) and rollers (46) from the gear end of the sun gear (47). Do not drop the brake hub (44) off the sun gear during removal.
3. Slide the sun gear (47) out of the brake hub (44), removing the remaining rollers (46) at the same time.
4. Remove the spacer (45) from the sun gear (47).
5. Remove the garter springs (48) and the camlocks (49) from the brake hub (44) and place them on a perfectly clean surface.

NOTE

Do not remove both snap rings unless the snap rings or brake hub will be replaced.

6. Remove one snap ring (50) from the brake hub (44).

**DISASSEMBLY--BEARINGS AND SEALS FROM DRUM**

1. Remove the bearing (51) from the drum (52) using a bearing puller to grip in the groove provided in the O.D. of the bearing. Support the puller screw on a plug located in the bore of the drum.
2. Remove the small seal ring (53) that contains the oil seal (54) and O-ring (55). Remove the oil seal and O-ring.
3. Remove the drum bushing (56) with a bearing puller only if replacement is necessary.
4. Remove the snap ring (57) from the bearing (58). Remove the bearing using the puller and method described in step 1.
5. Remove the large seal ring (59) that contains the oil seal (60) and O-ring (61). Remove the oil seal and O-ring.
6. Using a suitable lifting device or additional personnel, remove the drum (52) from the winch base (62).

CLEANING

1. Don protective gloves and goggles.
2. Clean all metal parts with cleaning solvent and dry them with clean wiping rags.

INSPECTION**NOTE**

Replace any parts that fail the inspection process.

INSPECT--FINAL DRIVE ASSEMBLY

1. Replace all O-rings, packings, and seals.
2. Check the snap rings for flatness and that they form a true circle. Replace any snap rings that are bent or damaged.
3. Check for wear at the center of the thrust plate. The original thickness at the center of the thrust plate is 1.363 inches. Replace the thrust plate if wear is greater than 3/32 inch.

INSPECT--FINAL DRIVE ASSEMBLY**NOTE**

If any one of the gears in the final drive assembly requires replacement because of tooth wear, all of the gears in the assembly should be replaced.

4. Inspect the gear teeth in the final housing. If wear is greater than 0.015 inch when compared to the unworn part of the teeth, replace the final housing.
5. Check the large pilot bore at the end of the final housing used to carry the end cover. Remove all roughness and scores carefully using a scraper and extra fine crocus cloth so that the O-ring will seal on this diameter.
6. Inspect the sun gear shaft. Check the gear teeth for wear by comparing the tooth thickness at the worn area of the teeth with the tooth thickness at the unworn end. If wear is greater than 0.012 inch, replace the sun gear shaft.
7. Inspect the taper seal ring for roughness or scratches. If these defects are found, replace the taper seal ring.

INSPECT--FINAL PLANET ASSEMBLY

1. Inspect the planet pin bores in the planet hub for scores or bruises that may have been caused in removing the planet pins. Sufficiently remove the high spots of any scores or bruises carefully with a scraper to allow a planet pin to be pressed into each bore by hand.

NOTE

If planet pins, gears, or bearings require replacement, all these parts must be replaced at the same time.

2. Inspect the planet pins for excessive wear at the bearing area. If wear exceeds 0.001 inch on the diameter, the pins should be replaced.
3. Check the planet gears for wear and damage on the gear teeth. If wear is excessive, replace the planet gears. Also replace the planet gears if the sun gears or final drive housing will be replaced.
4. Inspect the ball bearings for wear and pitting at the balls and ball grooves. Replace the bearings if worn or pitted.

INSPECT--PRIMARY DRIVE ASSEMBLY

1. Replace all O-rings, packing, and seals.
2. Inspect the bore in the spring cover for scores or bruises. If possible, smooth out scores or bruises with a scraper and extra fine crocus cloth so that the O-ring will seal effectively after assembly.
3. Check the snap ring for flatness and that it forms a true circle. Replace the snap ring if it is bent or damaged.
4. Inspect the teeth in the primary housing for wear. If wear is greater than 0.015 inch when compared to the unworn part of the teeth, replace the primary housing.
5. Inspect the friction surfaces of the brake plate. If wear has removed the grooves, replace the plate.

INSPECT--PRIMARY PLANET ASSEMBLY

1. Replace all O-rings, packing, and seals.
2. Check the planet hub. Inspect the seal diameter for scores or roughness. Try removing roughness with extra fine crocus cloth. If the roughness cannot be removed completely in this way, replace the planet hub.
3. Inspect the planet pin bores for scores and bruises that may have been caused in removing the planet pins. Sufficiently remove the high spots of any scores or bruises carefully with a scraper to allow a planet pin to be pressed into each bore by hand.
4. Inspect the pins for damage. If they are bent or distorted, discard them.

NOTE

If the planet pins, gears, or bearings require replacement, all these parts must be replaced at the same time.

5. Inspect the planet pins for excessive wear at the bearing and cam lock areas. If the wear at the bearing area is greater than 0.001 inch on the diameter when compared with the unworn areas, the planet pins should be replaced.
6. Check the planet gears for wear and damage on the gear teeth. If wear is excessive, replace the planet gears.
7. Inspect the needle bearings for freeness of the rollers. Check for pits, broken rollers, or excessive wear on the bronze bearing cage or flange. Replace the bearings if any of these conditions exist.
8. Check the thrust plugs for wear on the flange end. If the flange has worn down to 1/32 inch thick, the thrust plugs will require replacement.
9. Check the thrust pad for wear on its slotted face. If wear exceeds 1/8 inch, replace the thrust pad. Original thickness of the thrust pad was 0.500 inch.
10. Check the bushing for wear on the bore and flange. If the flange has worn to 1/32 inch thick, replace the bushing.

INSPECT--BRAKE HUB ASSEMBLY**NOTE**

If the sun gear requires replacement, all of the other primary drive gears, including the sun gear, should be replaced at the same time.

1. Inspect the sun gear for excessive wear at the bearing and camlock areas. If wear is greater than 0.001 inch on the diameter when compared with the unworn areas, the sun gear should be replaced.

INSPECT--BRAKE HUB ASSEMBLY (continued)

2. Inspect the bore of the brake hub for ridges in the center area of the bore and for wear at the center and ends of the bore. If there are definite ridges at the center of the bore or wear at any point in the bore greater than 0.001 inch in diameter, the brake hub will require replacement. The original bore was 2.8014 inches.
3. Check the rollers for pits, cracks, or excessive wear. Replace the rollers if any of these conditions exist.
4. Check the camlocks for wear at the points where they contact the sun gear and brake hub. If flats are worn on the camlocks at these points, the camlocks must be replaced.
5. Check the snap rings for flatness and that they form a true circle. Replace any snap rings that are bent or damaged.

INSPECT--DRUM AND BEARINGS

1. Replace all O-rings, packing, and seals.
2. Check the seal diameters at each end of the drum for rust or roughness. Clean and polish the seal diameters, using extra fine crocus cloth. Check the bearing hub diameters for scores and wear. If there is any wear, possibly caused by a seized bearing, the drum must be replaced.
3. Inspect the O-ring seal face in the bore of drum at the splined end. This face must have a smooth finish and be free from scratches, etc. Polish the face with extra fine emery cloth if roughness and scratches are found. Replace the drum if damage is excessive.
4. Inspect the drum bushing for bruises, scores, and wear. Use a scraper to remove all high spots. The original inside diameter of the bushing was 2.190 inch. If wear is greater than 0.010 inch, replace the bushing.
5. Inspect all ball bearings for wear and pitting at the balls and ball grooves. Replace any bearings that are worn or pitted.

ASSEMBLY--BEARINGS AND SEALS TO DRUM

1. Install the oil seal (54) in the small seal ring (53) so that the tip of the oil seal is at the end of the small seal ring (52) farthest from the O-ring groove.
2. Lubricate the O-ring (55) with grease and install it in the groove on the outside diameter of the small seal ring (53).
3. Lubricate the oil seal (54) with grease, give the O-ring (55) an additional coat of grease, and install this seal assembly on the nonsplined end of the drum (52) so that the lip of the oil seal is towards the drum. Be careful not to damage the lip of the oil seal as it is pressed over the taper on the seal diameter of the drum.
4. Pack the oil seal (54) with grease around the seal diameter of the drum (52).
5. Install the oil seal (60) in the large seal ring (59) so that the lip of the oil seal is at the end of the large seal ring which has the projecting diameter at the bore.
6. Lubricate the O-ring (61) with grease and install it in the groove on the outside of the large seal ring (59).
7. Lubricate the oil seal (60) with grease, give the O-ring (61) an additional coat of grease, and install this assembly on the splined end of the drum (52) so that the lip of the oil seal is towards the drum. Be careful not to damage the lip of the oil seal as it is pressed over the taper on the seal diameter of the drum.
8. Pack the oil seal (60) with grease around the diameter of the drum (52).
9. Install the bearing (51) on the nonsplined end of the drum (52) so that the groove on the outside diameter of the bearing is installed towards the drum. Pack the bearing thoroughly with grease.

ASSEMBLY--BEARINGS AND SEALS TO DRUM (continued)

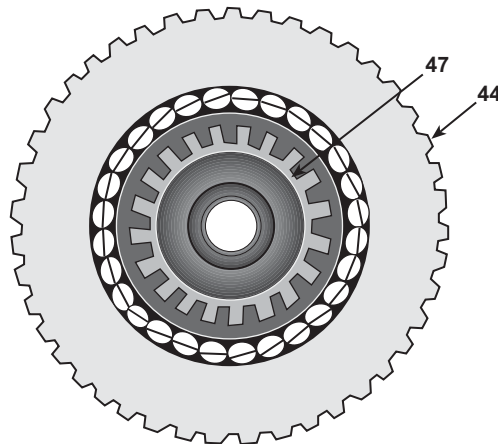
10. Install the bearing (58) on the splined end of the drum (52) so that the snap ring (57) on the bearing is installed towards the drum.
11. If removed during disassembly, press the bushing (56) in the drum (52) using a sizing mandrel that is 2.1885 inches in diameter. Install the drum bushing so that the end of the drum bushing is flush with the end of the drum.

ASSEMBLY--DRUM INTO THE WINCH BASE

1. Using additional personnel or a suitable lifting device, place the winch base (62) on the work bench so that the side that is to be the final drive end of the winch is facing up.
2. Attach the final drive housing (3) to the winch base (62) using the dowel bolts (4), lockwashers (2), and nuts (1).
3. Using additional personnel or a suitable lifting device, turn this assembly over so that it rests on the end of the final drive housing (3).
4. Using additional personnel or a suitable lifting device, take the assembled drum (52) and pilot the bearing (58) on the splined end of the drum into the bore of the final drive housing (3). Tap the drum assembly down until the snap ring (57) on the bearing at the splined end of the drum is properly seated on the end of the final drive housing bore. There will be approximately 1/16 inch clearance between the final drive housing and the end of the drum flange when the bearing snap ring is seated.
5. Torque the nuts (1) to 75 lb-ft (102 Nm).

ASSEMBLY--BRAKE HUB ASSEMBLY

1. Place the sun gear (47) splined end down, on a clean work surface.
2. Install a spacer (45) on the sun gear (47).
3. Install a snap ring (50) in the bore of the brake hub (44).
4. Place the brake hub (44) over the sun gear (47) so that it rests on the spacer (45).
5. Take 28 camlocks (49) and assemble them so that they stand on end between the sun gear (47) and the bore of the brake hub (44) as shown below.



ASSEMBLY--BRAKE HUB ASSEMBLY (continued)

6. When all 28 camlocks (49) have been assembled, install one garter spring (48) so that it engages under the projecting ends of the camlocks to force them into engagement with the sun gear (47) and the bore of the brake hub (44).
7. Install the remaining snap ring (50) in the bore of the brake hub (44) next to the camlock (49) ends.
8. Carefully turn the brake hub (44) and sun gear (47) assembly over so that it rests on the gear end of the brake hub. Be careful that the brake hub does not slide off the sun gear.
9. When the brake hub (44) is turned over, allow the brake hub to slide off the sun gear (47) just enough so that the second garter spring (48) can be installed under the projecting ends of the camlocks (49). Install the garter spring as described in step 6.
10. Install 32 rollers (46) under the spacer (45) and between the brake hub (44) and the sun gear (47).
11. Slide the brake hub (44) back against the spacer (45) and turn the brake hub over so that it rests on the splined end of the sun gear (47).
12. Install the remaining 32 rollers (46) between the brake hub (44) and the sun gear (47).
13. Install the spacer (45) and then the snap ring (43).
14. To check that the brake hub assembly (22) is assembled correctly, hold the gear end of the sun gear (47) with one hand and view the end of the assembly while the gear teeth are away from you. With the other hand, try to rotate the brake hub (44) in both directions. If the camlocks (49) have been assembled correctly, according to steps 5-13, the brake hub will rotate freely in a clockwise direction and "lock up" in the opposite direction.

ASSEMBLY--PRIMARY PLANET ASSEMBLY

1. Lubricate the O-ring (42) with grease and install its groove in the thrust pad (41). Give the O-ring an additional coat of grease and install the thrust pad in its recess in the inside wall of the planet hub (37) so that the slotted face of the thrust pad is outward.
2. Press the thrust plug (38) into the ends of the primary planet pins (36).
3. Press the needle bearing (40) into the planet gear (39) so that the ends of the needle bearing are flush or slightly below the side of the planet gear at each end.
4. Place the planet gear (39) into the planet hub (37) so that the bore of the bearing lines up with a planet pin hole.
5. Tap the primary planet pin (36) through the planet hub (37) until the drilled hole in the end of the primary planet pin lines up with the hole in the rim of the planet hub.
6. Install the pin (35), and using a 3/16 inch diameter pin punch, drive the pin in until the outer end of the pin is 3/16 inch below the outside diameter of the planet hub (37).
7. Repeat steps 1-6 for the remaining planet gears (39) and when they are installed, check that all the gears rotate freely.

ASSEMBLY--PRIMARY DRIVE ASSEMBLY**NOTE**

Before starting this assembly, the drum must be mounted between the final and primary housing, secured to the winch base according to the instructions in the Assembly--Drum into the Winch Base procedure in this work package.

1. Set the partly completed winch on end so that it rests on the end of the primary drive housing (33). Check that the drum bearing that is carried in the primary drive housing has been thoroughly packed with grease.
2. Lubricate the O-ring (27) and oil seal (28) with grease and install it in its groove in the seal ring (29).
3. Install the oil seal (28) in the seal ring (29) so that the back of the oil seal contacts the shoulder in the seal ring bore. Give the O-ring (27) and oil seal an additional coat of grease and install the seal ring in the bore of the primary drive housing (33) so that the lip of the oil seal is out towards the open end of the primary drive housing. Tap the seal ring into place with a soft hammer so that it locates against the snap ring (30) that was previously installed.
4. Install the primary planet assembly (26) so that the projecting boss locates in the bushing at the end of the drum. When this assembly is in place, rotate it by hand to make sure that it is free to turn. Check that the spacer (21) is in place in the primary planet assembly.
5. Assemble the brake ring (24) and snap rings (23) on the brake hub (22).
6. Install the brake hub (22) so that the sun gear engages with the gears in the primary planet assembly (26).

ASSEMBLY--FINAL PLANET ASSEMBLY

1. Install the snap rings (20) in the bore of the planet gear (18).
2. Press the ball bearings (19) into the planet gear (18) so that the ends of the bearings shoulder against the snap rings (20).
3. Place the planet gear (18) into the planet hub (11) so that the bore of the bearing (19) lines up with a final planet pin hole.
4. Install a final planet pin (17) in the planet hub (11) so that it passes through the ball bearings (19) in the planet gear (18) and the drilled hole in the final planet pin lines up with the hole in the rim of the planet hub.
5. Install the pin (16), using a 3/16 inch diameter pin punch, and drive the pin (16) in until the outer end of the pin is 7/16 inch below the outside diameter of the planet hub (11).
6. Repeat steps 1-5 for the remaining planet gears (18) and check that all gears turn freely.

ASSEMBLY--FINAL DRIVE ASSEMBLY**NOTE**

Before starting this assembly, the drum must be mounted between the final drive and primary housings and secured to the winch base according to the instructions in the Assembly--Drum into the Winch Base procedure in this work package.

1. If removed during disassembly, install the O-ring (14) on the sun gear shaft (12).
2. Lubricate the O-ring (14) with grease and install it over the taper seal ring (15) that is installed on the sun gear shaft (12).
3. Check that the snap ring (13) is in place on the sun gear shaft (12) and install the sun gear shaft in the winch so that it engages in the splined bore of the planet hub (11). Slide the sun gear shaft in until the snap ring contacts the end of the planet hub. At the same time, the O-ring (14) will contact the seal face on the end of the drum (52) and be pushed up the tapered diameter of the tapered seal ring (15).

ASSEMBLE FINAL DRIVE ASSEMBLY (continued)

4. Install the final planet assembly (10) so the planet gears engage in the internal teeth of the final drive housing (3) and the splined bore of the planet hub (11) locates over the splined end of the drum (52). Tap the planet assembly into place until it contacts the bearing that carries the drum in the final housing.
5. Install the thrust plate (9) in the end of the final planet assembly (10).
6. Lubricate the O-ring (8) with grease and install it in its groove in the end cover (6). Give the O-ring an additional coat of grease.
7. Install end cover (6) in final drive housing (3) so that the filler plug (7) boss will be located at the bottom of the final drive housing when the winch is mounted. Make sure that the end cover is properly seated against the gear teeth in the final drive housing.
8. Install the snap ring (5) and make sure that it is properly seated in the bottom of the snap ring groove all the way around the final drive housing (3).
9. Fill the final drive housing (3) with gear lubricating oil to the level of the filler hole and install the filler plug (7).

FOLLOW-ON PROCEDURE

Install the motor assembly as described in WP 0190 00.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP AND HINGE PINS, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Truck, Wrecker (Item 10, Table 1, WP 0230 00)
Hoisting Device, 2 Ton (Item 11, Table 1, WP 0230 00)
Maul, Ships, 5 lb. (Item 69, Table 2, WP 0228 00)

Equipment Condition:

Vessel in drydock or beached

Personnel Required:

Two Watercraft Engineers, 88L

References:

WP 0219 00
TM 55-1905-242-24P (WP 0097)

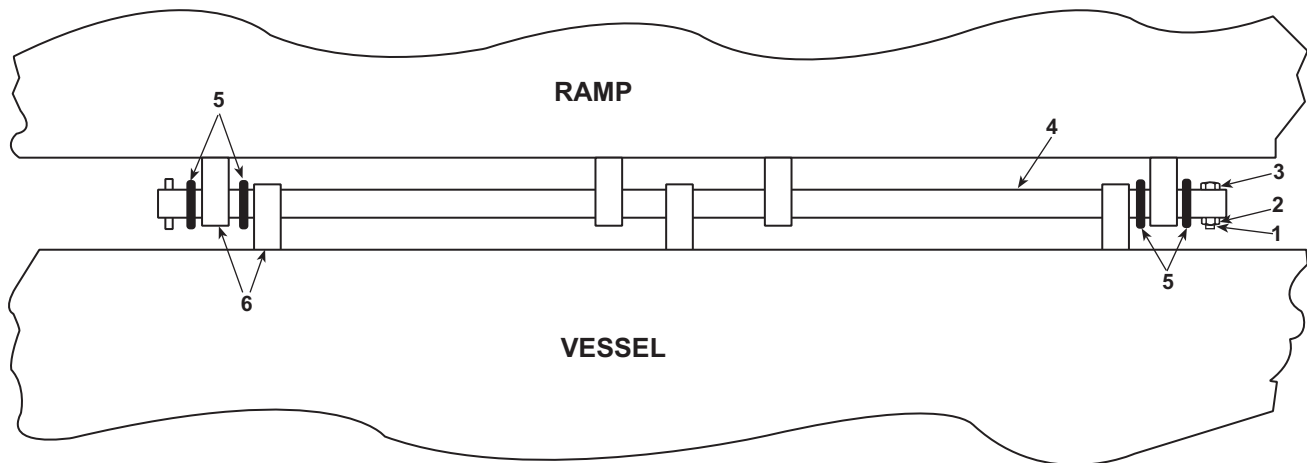
REMOVAL**WARNING**

The ramp may shift positions once the ramp hinge pins are removed. Keep hands and feet clear of the area between the ramp and the vessel at all times during hinge pin removal. Do not place hands or fingers in the ramp pin holes. Failure to heed this warning can result in serious injury or death.

All personnel in the vicinity of lifting operations should wear appropriate safety equipment including gloves, hard hat, and safety shoes. Failure to comply can result in serious injury or death.

Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.

1. Lower the ramp until it rests securely on the drydock or the beach.
2. Remove the ramp cable from the ramp (WP 0219 00).
3. Attach the wrecker truck, hoisting device, or an appropriate lifting device to the ramp.
4. Remove the nuts (1), washers (2), and bolts (3) that secure the ramp hinge pin (4).
5. Take a slight strain on the ramp with the lifting device, sufficient to ease the strain on the ramp hinge pin (4).
6. Drive out the ramp hinge pin (4), taking care to keep all body parts out of possible pinch or crush areas.
7. Remove the ramp hinge pin (4) and washers (5). Take care not to lose the washers.
8. Carefully lift the ramp up and away from the vessel.

REMOVAL (continued)**INSTALLATION**

1. Carefully swing the ramp into position on the vessel.
2. Align the holes in the hinges (6), position the washers (5), and drive in the ramp hinge pin (4) to secure the ramp.
3. Install the bolts (3), washers (2), and nuts (1) that secure the ramp hinge pin (4).
4. Install the ramp cable (WP 0219 00).
5. Raise the ramp and secure it.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP LATCH MECHANISM, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

FM 55-502

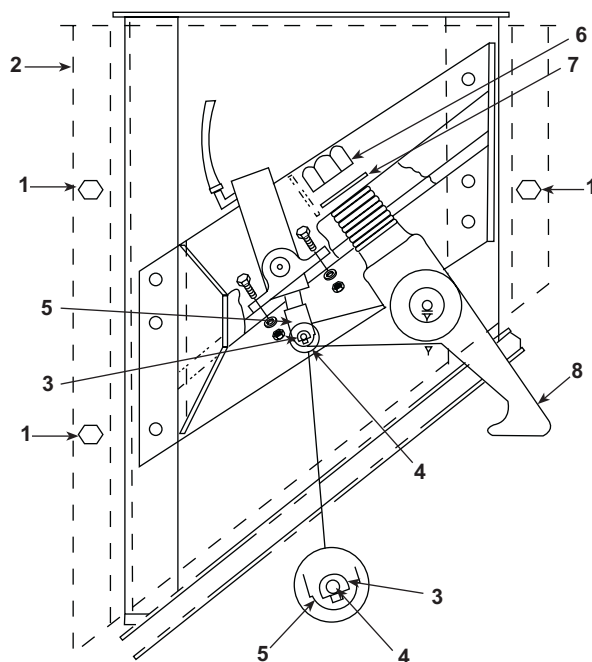
TM 55-1905-242-24P (WP 0097)

Equipment Condition:

Propulsion engines secured, locked out, and
tagged out IAW FM 55-502
Ramp lowered

REMOVAL

1. Remove the bolts (1) that secure the access plate (2) to the wing wall. Remove the access plate.
2. Remove the circlip (3) that secures the pin (4) in the clevis (5). Remove the pin.
3. Remove the nut (6) and washer (7) that secure the latch assembly (8).

**INSTALLATION**

1. Position the latch assembly (8) and secure it with the nut (6) and washer (7).
2. Install the pin (4) through the clevis (5) and the latch and secure it with the circlip (3).
3. Position the access plate (2) on the wing wall and secure it with the bolts (1).
4. Remove the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP SHEAVES AND CABLES, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP0230 00)

Personnel Required:

Three Watercraft Engineers, 88L

Equipment Condition:

Vessel in drydock or beached
Ramp fully lowered, resting on drydock or beach

Materials/Parts:

Gloves, Anti-Flash (Item 13, Table 2, WP 0230 00)

References:

TM 55-1905-242-24P (WP 0097)

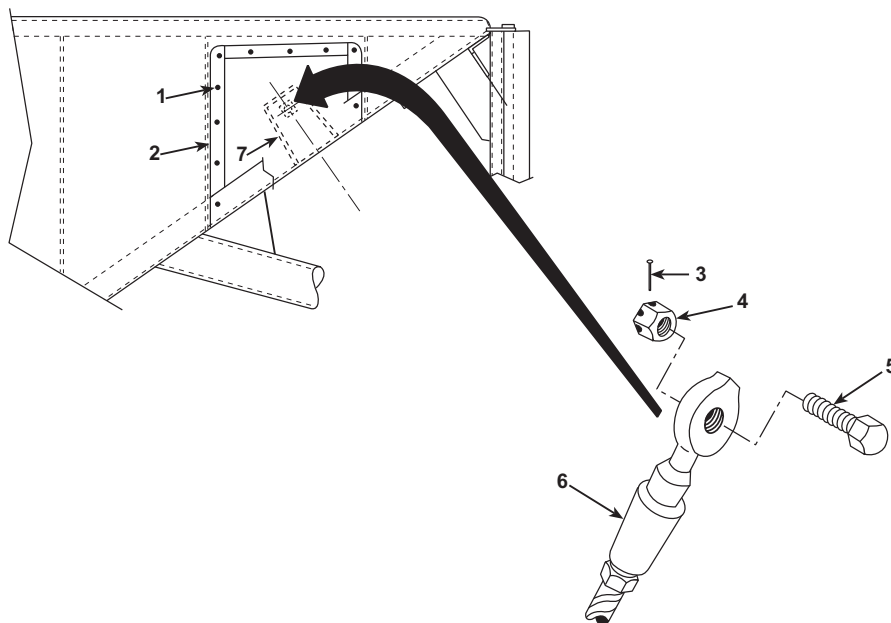
REMOVAL--RAMP CABLE**WARNING**

Always wear leather gloves when handling wire rope. Handling wire rope with bare hands can cause serious injury or death to personnel.

NOTE

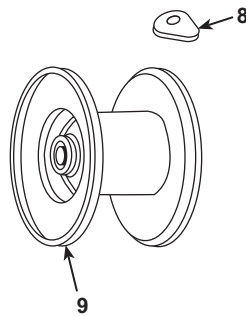
Cotter pins, lockwashers, locking nuts, and similar locking devices shall be discarded after removal and replaced with new cotter pins, lockwashers, locking nuts and similar locking devices.

1. Remove the bolts (1) that secure the access plate (2) to the bulkhead. Remove the access plate.
2. Remove the cotter pin (3), nut (4), and bolt (5) that secure the ramp cable (6) to the dead head assembly (7). Remove the ramp cable from the deadhead assembly.



REMOVAL--RAMP CABLE (continued)

3. Position one crewmember in the pilothouse to operate the winch and one crewmember on the bow ramp to receive the winch cable. The crewmember on the bow ramp must don protective leather gloves.
4. Have the crewmember in the pilothouse operate the winch in the RAMP DOWN position while the crewmember on the bow ramp fakes the winch cable onto the ramp. Pay out the winch cable until all of the winch cable has been removed from the winch drum.
5. Remove the wedge (8) that secures the bitter end of the winch cable to the winch drum (9), and remove the winch cable from the winch drum.
6. Pull the winch cable out of the ramp from the port side of the ramp, and fake it onto the cargo well deck.

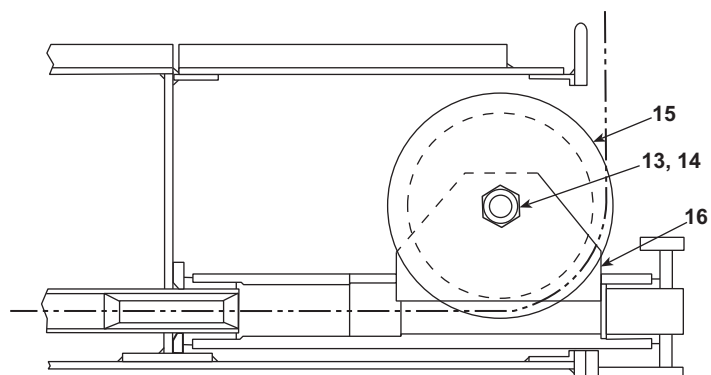
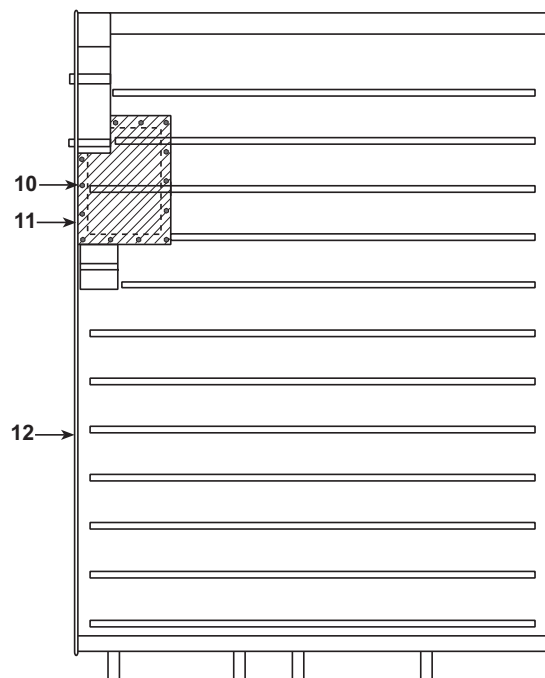
**INSTALLATION--RAMP CABLE**

1. Don protective leather gloves and feed the bitter end of the winch cable through the ramp and ramp sheaves from port to starboard.
2. Feed the bitter end of the winch cable through the wing wall sheave and to the winch drum (9).
3. Secure the bitter end of the winch cable to the winch drum (9) with the wedge (8).
4. Operate the winch in the RAMP UP position (winch in the cable) while one crewmember on the bow ramp keeps the winch cable taut and the another crewmember ensures that the winch cable reels evenly onto the winch drum (9). Continue winching until 3 to 4 wraps of the winch cable are taken around the winch drum. Cease winching.
5. Attach the end of the ramp cable (6) to the dead head assembly (7) with the cotter pin (3), nut (4), and bolt (5).
6. Position the access plate (2) on the bulkhead and secure it with the bolts (1).
7. Resume operating the winch in the RAMP UP position (winch in the cable) while one crewmember on the bow ramp keeps the winch cable taut and the another crewmember ensures that the winch cable reels evenly onto the winch drum (9). Continue winching until the winch cable is taut against the ramp.
8. Clear all personnel from the ramp area and raise and latch the ramp.

REMOVAL--SHEAVES

1. If a ramp sheave will be removed, remove the bolts (10) that secure the access plate (11) to the bow ramp (12). Remove the access plate. If the wing wall sheave will be replaced, access is gained through the cable opening in the wing wall.
2. Remove the nut (13) and bolt (14) that secure the sheave (15) to its mount (16).
3. Remove the sheave (15).

INSTALLATION--SHEAVES



INSTALLATION--SHEAVES

1. Position the sheave (15) in its mount (16).
2. Secure the sheave (15) to the mount (16) with the nut (13) and bolt (14).
3. If access plate (11) removal was required to gain access to the sheave, install the access plate and secure it with the bolts (10).

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP SEAL, REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Adhesive (Item 26, Table 2, WP 0230 00)

Equipment Condition:

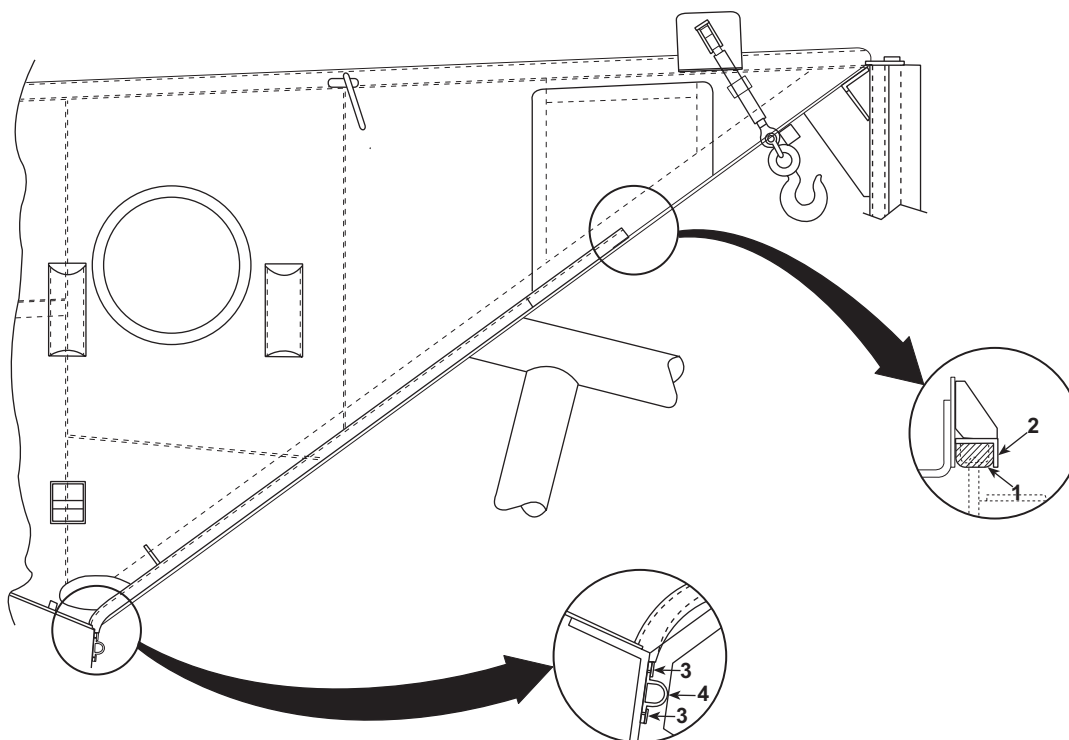
Vessel in drydock or beached
Ramp fully lowered, resting on drydock or beach

References:

TM 55-1905-242-24P (WP 0097)

REMOVAL--SIDE SEALS

1. Using a heavy scraper, remove the seal (1) from the sealing bar (2).
2. Thoroughly remove all of the old seal (1) from the sealing bar (2).

**INSTALLATION--SIDE SEALS**

1. Apply a coat of adhesive to the sealing bar (2) and to the side of the seal (1) that will be attached to the sealing bar.
2. Allow the adhesive to set up to a "tacky" state.
3. Install the seal (1) to the sealing bar (2) and allow the adhesive to cure for 12 to 24 hours before closing the ramp.

REMOVAL--BOTTOM SEAL

1. Using suitable pry bars, expand the metal tube (3) securing the seal (4) in place.
2. Remove the seal (4) from the vessel.

INSTALLATION--BOTTOM SEAL

1. Using suitable pry bars, expand the metal tube (3) far enough to accommodate the seal (4).
2. Install the seal (4) in the metal tube (3).
3. Using a heavy hammer, fold the metal tube (3) onto the seal (4) to secure the seal to the vessel.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
RAMP SHEAVES AND LATCH MECHANISM, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP0230 00)
Arbor Press (Item 21, Table 1, WP0230 00)

Equipment Condition:

Ramp latches removed (WP 0218 00)
Ramp sheaves removed (WP 0219 00)

Materials/Parts:

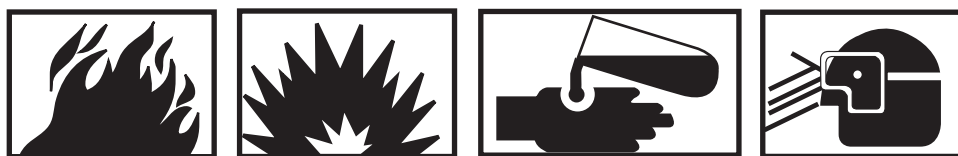
Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP0230 00)
Rag, Wiping (Item 5, Table 2, WP0230 00)
Grease (Item 21, Table 2, WP0230 00)

Personnel Required:

Two Watercraft Engineers, 88L

References:

WP 0218 00
WP 0219 00
TM 55-1905-242-24P (WP 0097)

DISASSEMBLY--RAMP SHEAVES**WARNING**

Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

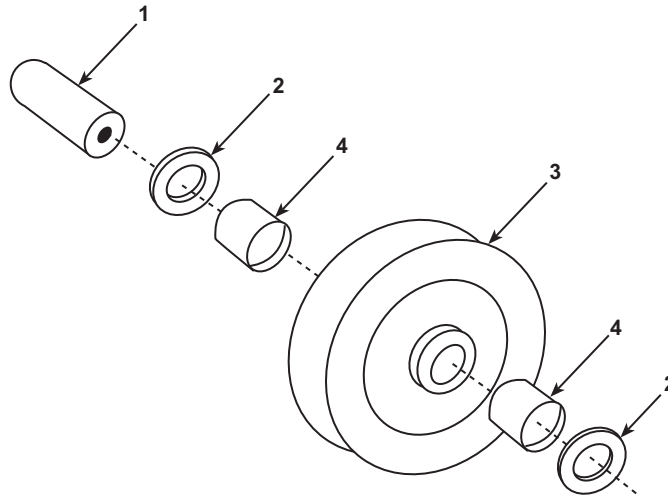
1. Don chemical protective gloves and goggles.
2. Remove the sheave pin (1) and flat thrust washers (2) from the sheave (3).
3. Use an arbor press to remove the bushing halves (4) from the sheave (3).

CLEANING

1. If not already on, don protective gloves and goggles.
2. Clean all metal parts in cleaning solvent and dry with clean wiping rags.

INSPECTION--RAMP SHEAVES

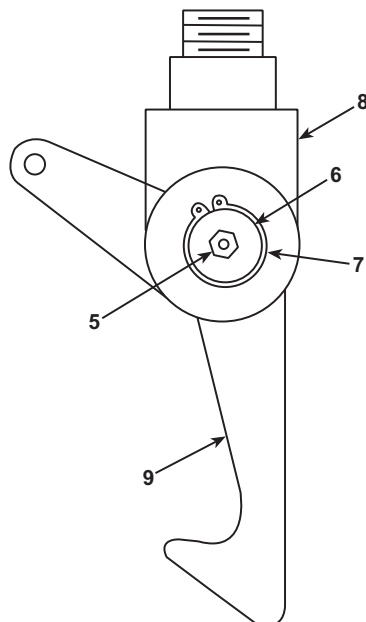
1. Inspect the sheave, bushing halves, pins, and thrust washers for cracks, breaks, burrs, or wear. Remove burrs by grinding smooth or by light stoning.
2. Replace any defective parts.

**ASSEMBLY--RAMP SHEAVES**

1. Press the bushing halves (4) into the sheave (3).
2. Lubricate the flat thrust washers (2) and pin (1) with grease and install them in the sheave (3).

DISASSEMBLY--LATCH MECHANISM

1. Remove the grease fitting (5) from the pin (6).
2. Remove the circlips (7) that secure the pin (6) in the clevis (8).
3. Remove the pin (6) from the clevis (8) and latch (9). Use an arbor press if necessary.



CLEANING

1. Don protective gloves and goggles.
2. Clean all metal parts in cleaning solvent and dry with clean wiping rags.

INSPECTION--LATCH MECHANISM

1. Inspect the latch, clevis, and pin for cracks, breaks, burrs, or wear. Remove burrs by grinding smooth or by light stoning.
2. Replace any defective parts.

ASSEMBLY--LATCH MECHANISM

1. Lubricate the pin (6) and the pin holes of the latch (9) and clevis (8) with grease.
2. Position the latch (9) inside the clevis (8) and align the pin holes.
3. Install the pin (6) through the latch (9) and clevis (8) and secure it with the circlips (7).
4. Install the grease fitting (5) in the pin (6).
5. Dispose of used cleaning solvent and contaminated materials in accordance with local regulations.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
CRANE ASSEMBLY, TEST**

INITIAL SETUP:**Equipment Condition:**

Crane prepared for operation (WP 0026 00)

References:

TB 43-0142

WP 0026 00

Personnel Required:

Two Watercraft Engineers, 88L

TEST

In accordance with TB 43-0142, the crane must be load tested and functionally tested annually. TB 43-0142 contains the full procedure for both the load testing, the annual testing, and for proper documentation of the testing.

In addition to this required annual testing, crane testing is required under the following circumstances:

1. Prior to initial use, all new, extensively repaired, or altered lifting devices shall be given a rated load test. Manufacturers and repair activities should perform this test and provide written certification of load testing to the using activity. If load test certification is not obtained or available, using activities shall arrange for testing through General Support (GS) or Direct Support (DS) maintenance activities. Manufacturer's certification or other records of rated load testing shall be maintained by the using activity.
2. Prior to initial use, all new, extensively repaired, or altered lifting devices shall be given a functional test to determine operability of the equipment. Functional testing requirements are indicated in the applicable appendix of TB 43-0142. Before performing the functional test, the proper operation of brakes and limit, locking, and other safety devices shall be tested under no-load conditions.
3. Lifting devices that have been idle for one year or more shall be functionally tested at 100% of the rated load prior to use.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
CRANE BOOM ASSEMBLY, REPAIR**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1, Table 1, WP 0230 00)
Hoisting Device, 2 Ton (Item 11, Table 1, WP 0230 00)

Equipment Condition:

Propulsion engines secured, locked out, and tagged out IAW FM 55-502
Extension cylinder and extension assemblies removed (WP 0194 00)
Hoses removed from boom cylinders (WP 0157 00)

Personnel Required:

Two Watercraft Engineers, 88L

Materials/Parts:

Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)
Gloves, Chemical Protective (Item 3, Table 2, WP 0230 00)
Goggles, Industrial, No Vents (Item 4, Table 2, WP 0230 00)
Rag, Wiping (Item 5, Table 2, WP 0230 00)
Grease (Item 21, Table 2, WP 0230 00)

References:

WP 55-502
TB 43-0142
WP 0157 00
WP 0194 00
WP 0222 00
TM 55-1905-242-24P (WP 0103)

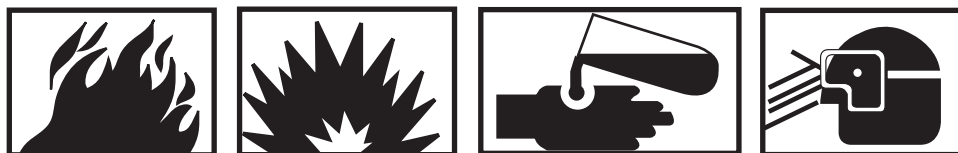
REPAIR

Repair of the crane boom assembly is accomplished by the replacement of worn or damaged parts. Disassembly and assembly procedures are outlined in this work package.

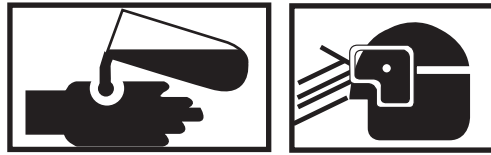
Prior to initial use, all new, extensively repaired, or altered lifting devices shall be given a functional test to determine operability of the equipment. Functional testing requirements are indicated in WP 0222 00 and in TB 43-0142. Before performing the functional test, the proper operation of brakes and limit, locking, and other safety devices shall be tested under no-load conditions.

REMOVAL--SECOND BOOM AND SECOND BOOM CYLINDER**WARNING**

Use a suitable lifting device to lift heavy loads. Heavy loads can crush. Do not allow any body parts to come under the load or between the load and a stationary object. Failure to comply can result in serious injury or death.



Cleaning solvent is flammable and its vapor is potentially explosive. Do not use cleaning solvent in the vicinity of spark, open flame, or excessive heat. Do not use cleaning solvent in unventilated spaces. Failure to comply can result in serious injury or death.

REMOVAL--SECOND BOOM AND SECOND BOOM CYLINDER (continued)**WARNING**

Do not allow hydraulic fluid or cleaning solvent to come in contact with unprotected skin or eyes. Prolonged skin contact can cause illness or injury. Eye contact can cause serious injury. Always wear chemical protective gloves and goggles when handling used hydraulic fluid and cleaning solvent. Failure to comply can result in illness, serious injury, or death.

1. Remove the bolts (1), washers (2), and nuts (3) that secure the hose clamps (4) to the first boom (5) and the second boom (6). Swing the extension cylinder hoses clear of the boom sections.
2. Remove the nut (7), washer (8), and pin (9) that secure the rod end of the second boom cylinder (10) to the second boom (6).
3. Remove the nut (11), washer (12), and pin (13) that secure the piston end of the second boom cylinder (10) to the first boom (5). Remove the second boom cylinder.
4. Remove the nut (14), washer (15), and pin (16) that secure the second boom (6) to the first boom (5). Using additional personnel or a suitable lifting device, remove the second boom.

DISASSEMBLY--SECOND BOOM

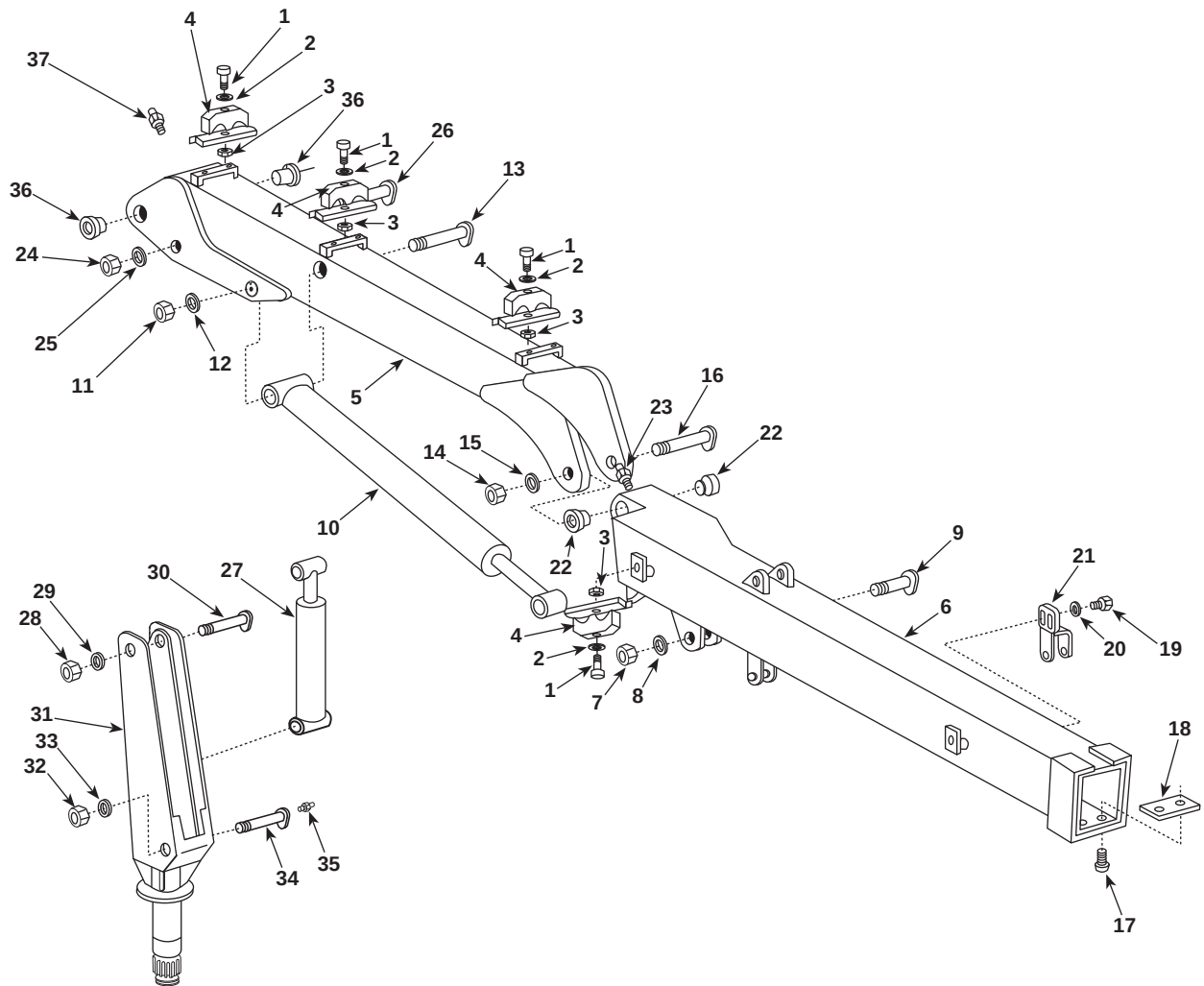
1. Remove the bolts (17) that secure the wear pad (18) to the second boom (6). Remove the wear pad.
2. Remove the bolts (19) and washers (20) that secure the mount (21) to the second boom (6). Remove the mount.
3. Remove the bushings (22) and grease fitting (23) from the second boom (6).

REMOVAL--FIRST BOOM AND FIRST BOOM CYLINDER

1. Remove the nut (24), washer (25), and pin (26) that secure the rod end of the first boom cylinder (27) to the first boom (5).
2. Remove the nut (28), washer (29), and pin (30) that secure the first boom (5) to the pedestal (31). Using additional crewmembers or a suitable lifting device, remove the first boom from the pedestal.
3. Remove the nut (32), washer (33), and pin (34) that secure the piston end of the first boom cylinder (27) to the pedestal (31). Remove the first boom cylinder.

DISASSEMBLY--FIRST BOOM

1. Remove the grease fitting (35) from the pin (34) only if the pin or fitting will be replaced.
2. Remove the bushings (36) and grease fitting (37) from the first boom (5).

DISASSEMBLY—FIRST BOOM (continued)**CLEANING**

1. If not already on, don protective gloves and goggles.
2. Clean all metal parts in cleaning solvent and dry with clean wiping rags.
3. Dispose of all contaminated materials in accordance with local regulations.

INSPECTION**NOTE**

Replace worn or damaged parts with new.

1. Inspect both boom sections for cracks, deformities, or other damage. Replace any damaged boom section.
2. Inspect the bushings and pins for wear. Replace any worn bushings or pins.
3. Inspect the wear pad for wear. Replace the wear pad if it is worn.
4. Inspect the cylinders for leaking or damage. Replace any leaking or damaged cylinder.

ASSEMBLY--FIRST BOOM

1. Install the bushings (36) and grease fitting (37) into the first boom (5).
2. Install the grease fitting (35) into the pin (34) if it was removed during disassembly.

INSTALLATION--FIRST BOOM AND CYLINDER

1. Position the piston end of the first boom cylinder (27) in the pedestal (31) and secure it with the nut (32), washer (33), and pin (34).
2. Using additional personnel or a suitable lifting device, position the first boom (5) in the pedestal (31) and secure it with the nut (28), washer (29), and pin (30).
3. Position the rod end of the first boom cylinder (27) in the first boom (5) and secure it with the nut (24), washer (25), and pin (26).

ASSEMBLY--SECOND BOOM

1. Install the bushings (22) and grease fitting (23) into the second boom (6).
2. Install the mount (21) on the second boom (6) and secure it with the bolts (19) and washers (20).
3. Install the wear pad (18) on the second boom (6) and secure it with the bolts (17).

INSTALLATION--SECOND BOOM AND CYLINDER

1. Using additional crewmembers or a suitable lifting device, position the second boom (6) on the first boom (5) and secure it with the nut (14), washer (15), and pin (16).
2. Position the piston end of the second boom cylinder (10) in the first boom (5) and secure it with the nut (11), washer (12), and pin (13).
3. Position the rod end of the second boom cylinder (10) in the second boom (6) and secure it with the nut (7), washer (8), and pin (9).
4. Position the extension cylinder hoses on the first boom (5) and second boom (6) and secure them with the bolts (1), washers (2), nuts (3), and hose clamps (4).

FOLLOW-ON PROCEDURE

1. Install the extension assembly and cylinder (WP 0194 00).
2. Lubricate all grease fittings.
3. Perform load testing and functional testing of the crane following the procedures contained in WP 0222 00.
4. Clear the lockouts and tagouts and check the operation of the system.

END OF WORK PACKAGE

**GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
CATHODIC PROTECTION (ANODES), INSPECT/REPLACE**

INITIAL SETUP:**Tools and Special Tools:**

Tool Kit, Mechanic's Rail and Marine (Item 1,
Table 1, WP0230 00)
Welding Shop, Trailer Mounted (Item 7,
Table 1, WP0230 00)

Personnel Required:

Two Watercraft Engineers, 88L
One Certified Welder

References:

TB 43-0144
TB 55-1900-204-24
TM 55-1905-242-24P (WP 0105)

Equipment Condition:

Vessel in drydock or beached

INSPECTION**WARNING**

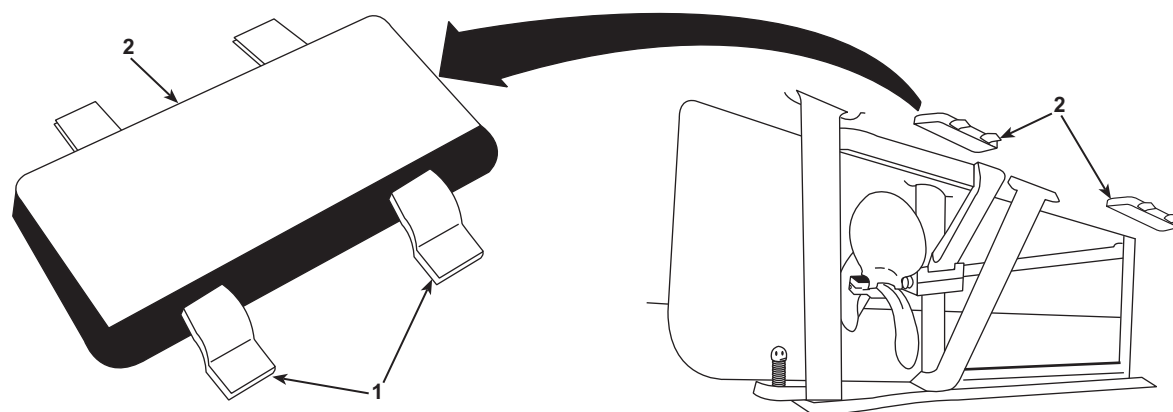
Repairing components by means of grinding, cutting, and/or welding produces hot, flying particles. These particles can cause serious injury to personnel. These hot particles can also ignite fires in the work area and in adjacent spaces. During and after work, the work area will be very hot. Protective goggles, gloves, and/or aprons must be worn at all times during cutting and grinding operations. A fire watch must be posted whenever grinding or cutting operations are taking place. Failure to comply can result in damaged equipment and serious injury or death to personnel.

Unprotected exposure to arc welding rays can cause serious eye damage and radiation burns to the skin. Never perform arc welding operations without using appropriate eye and skin protection. Failure to comply can result in serious injury or death to personnel.

1. Inspect the anode straps (1) for loose mounting.
2. Inspect the anodes (2) for deterioration and corrosion. Replace any anode that is deteriorated more than 50%.

REMOVAL

1. Cut or grind the welds that secure the straps (1) to the hull.
2. Break the straps (1) loose from the hull and remove the anode (2).
3. Clean the hull in the weld area by wire brushing or grinding to bare metal.

REMOVAL(continued)**INSTALLATION**

1. Position the anode (2) in place on the hull.

 CAUTION

Improper connection of ground leads can cause serious electrolytic and electronic damage to the vessel and its components. Always ensure that ground leads are connected in accordance with TB 55-1900-204-24.

2. Weld the straps (1) to the hull.
3. Paint the straps (1) and hull in accordance with TB 43-0144. Do not paint the anode (2).

END OF WORK PACKAGE

CHAPTER 10

SUPPORTING INFORMATION

FOR

LANDING CRAFT, MECHANIZED (LCM-8)

(ALL VESSELS WITH MOD 2 APPLICATION)

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
REFERENCES**

REFERENCES

This work package lists all field manuals, forms, technical manuals, and miscellaneous publications referenced in this manual.

ARMY REGULATIONS

AR 70-75	Survivability of Army Personnel and Materiel
AR 385-10	The Army Safety Program

DEPARTMENT OF THE ARMY PAMPHLETS

DA PAM 738-750	Functional Users Manual for The Army Maintenance Management System (TAMMS)

FIELD MANUALS

FM 4-25.11	First Aid
FM 55-502	Army Watercraft Safety
FM 55-509-1	Introduction to Marine Electricity

FORMS

DA Form 2408-9	Equipment Control Record
SF 368	Product Quality Deficiency Report

TECHNICAL BULLETINS

TB 43-0142	Safety Inspection and Testing of Lifting Devices
TB 43-0144	Painting of Watercraft
TB 55-1900-204-24	Arc Welding on Water-Borne Vessels
TB 740-93-4	Preservation of Vessels for Storage

TECHNICAL MANUALS

406B851010	Horizon HX350S VHF/FM Marine Handheld Transceiver Owner's Manual (Standard Communications)
54-0043, Rev. D	MV103AC Digital Compass System Technical Manual (KVH Industries, Inc.)
59249501	Okidata Microline 184 Turbo Printer Maintenance Manual (Okidata)
59268404	Okidata Microline 184 Turbo Printer Handbook (Okidata)
81153_3	HSB Series CRT Display Owner's Handbook (Raytheon)
81153_4	Pathfinder Radar Scanners Owner's Handbook (Raytheon)
90-FM200M-021	FM-200 ECS Series Engineered Fire Suppression System Design, Installation, Operation, and Maintenance Manual for Marine FM-200 Systems (Kidde Fire Systems)
DSC500	Operating Manual DSC 500 Digital Selective Calling Military VHF Transceiver (Ross Engineering Co.)
G263647-5	RAY430 Loudhailer Operation Manual (Raytheon)
O203 03/97	Diesel Generator Operator's Manual (Alaska Diesel Electric)
OME-55090	Furuno NAVTEX Receiver NX-500 Operator's Manual (Furuno)
OPR-330, Rev. 3	SEA 330 Operator's Manual 300W HF/SSB Radio System (SEA)
OPR-3000	SEATOR 3000 Operator's Manual (SEA)
OPR-7000G, Rev. 3	SEACALL 7000G Operator's Manual Digital Selective Calling Controller (SEA)
OPR-7001, Rev. 2	SEAWATCH 7001 Operator's Manual (SEA)

TECHNICAL MANUALS (continued)

P844K	Diesel Generator Parts Manual (Alaska Diesel Electric)
S9008-AA-PRO-010 Rev. 1, Change A	Liferaft, Inflatable Mark 6, Mod 3 Inspection, Test, and Repair Procedures
S9086-HP-STM-010/CH-245R3	Naval Ships' Technical Manual, Chapter 245 Propellers
S9074-AQ-GIB-010/248	Requirements for Welding and Brazing Procedure and Performance Qualification (Supersedes MIL-STD-248D)
STP21-1-SMCT	U.S. Army Training Manual
TM 11-5820-890-20	AN/VRC-90A Radio Set Operations and Maintenance
TM 11-5825-291-13	AN/PSN-11 GPS Operations and Maintenance
TM 11-5895-1199-12	AN/APX-72 Transponder
TM 5-2815-231-24P	Engine, Diesel, V-12 (Detroit) Installed in Landing Craft, Mechanized (LCM-8) (Rohr and Gunderson Models)
TM 5-2815-231-14	Engine, Diesel, V-12 (Detroit) Installed in Landing Craft, Mechanized (LCM-8) (Rohr and Gunderson Models)
TM 55-1905-242-24P	Repair Parts and Special Tools List, Landing Craft Mechanized (LCM-8) Mod 2
TM 750-244-6	Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use (U.S. Army Tank-Automotive Command)
W844	Diesel Generator Service Manual (Alaska Diesel Electric)

MILITARY STANDARDS

MIL-I-16411	Insulation Felt, Thermal, Glass Fiber
MIL-STD-769J	Thermal Insulation Requirements for Machinery and Piping

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
LANDING CRAFT, MECHANIZED (LCM-8) (ALL CRAFT WITH MOD 2 APPLICATION)
MAINTENANCE ALLOCATION CHART (MAC)
INTRODUCTION**

THE ARMY MAINTENANCE MANAGEMENT SYSTEM MAC

This introduction provides a general explanation of all maintenance and repair functions authorized at various maintenance 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 and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

- Unit - includes two subcolumns, C (operator/crew) and 0 (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) 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) 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 condition; 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 of 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.

Maintenance Functions (continued)

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 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 materiel 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.)

Explanation of Columns in the MAC (continued)

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 figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance 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
- H - General support maintenance
- D - Depot maintenance

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 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.

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
MAINTENANCE ALLOCATION CHART**

Table 1. MAC for LCM-8 Mod 2

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
00	LANDING CRAFT, MECHANIZED, LCM-8, MOD 2								
01	HULL STRUCTURE								
0101	Hull, Bitts, Chocks, Tiedowns, Stan- chions, Lifelines, Hatches, and Void Covers	Inspect Service Replace Repair	1.5 8.0		6.0 4.0			1 1,7 1,7	A
0102	Void and Compart- ments	Inspect Service Repair	4.0 30.0		16.0			1 1,7	B
0103	Pilothouse								
010301	Mast, Windows	Inspect Service Replace	0.5 0.5	3.0				1	
010302	Wipers and Wiper Motor	Inspect Service Replace	0.5 0.5	2.0				1 1	
010303	Control Console, Instrument Lights, and Switches	Inspect Service Replace	0.5 1.0	2.0				1 1	
010304	Engine/Transmis- sion Instruments	Replace		2.0				1	
010305	Hydraulic Gauges, Rudder Angle Indi- cator, and Ammeter	Replace		2.0				1	
010306	Engine Shutdown Control and Emer- gency Engine Shut- down Control	Inspect Service Replace	0.5 0.5	2.0				19 1	

Table 1. MAC for LCM-8 Mod 2 (continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
02	PROPULSION SYSTEM								
0201	Propulsion Engines	Inspect Test Adjust Service Replace Repair	3.1 0.6 4.8 10.2 2.5	2.8 1.0 0.2 37.2 11.6	 2.0 6.0 198.0 53.0	 592.0 133.0			C
0202	Marine Gear	Inspect Test Service Replace Repair	0.4 2.0 0.5	 1.0 3.0	 2.0 80.0 26.0	 50.0			D
0203	Tachometer Drive Gear and Cable	Replace		2.0					E
0204	Propulsion Controls and Linkages								
020401	Propulsion Control Head	Inspect Service Replace	0.5 2.0	 4.0				1, 19 1	
020402	Throttle Linkage	Inspect Adjust Replace	0.5	1.5 4.0				1 1	
020403	Clutch Linkage	Inspect Adjust Replace	0.5	1.5 3.0				1 1	
0205	Hydraulic Starting System								
020501	Starting System Valves, Piping, Hoses, and Fittings	Inspect Replace	0.5	3.0				1	
020502	Recharging Pump	Inspect Replace Repair	0.5	2.0		3.0		1 3, 1	
020503	Accumulator	Inspect Service Replace Repair	0.5	1.5 1.5		3.5		1 1 1, 3, 12, 14 15, 16, 17	F

Table 1. MAC for LCM-8 Mod 2 (continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
020504	Reservoir and Filters	Inspect Service Replace	0.1 0.5		3.0			1 1	G
020505	Control Valve	Inspect Replace	0.2	1.5				1	
020506	Starting Motor	Inspect Replace Repair	0.5	1.5 4.0				1 1,3	
020507	Hand Pump	Inspect Replace Repair	0.5	1.5		2.5		1 1	
0206	Engine Cooling System								
020601	Piping, Hoses, and Valves	Inspect Service Replace	0.5 0.5 1.5					1 1	
020602	Expansion Tank	Inspect Replace Repair	0.1		2.0 2.0			1 1,7	
020603	Keel Coolers	Inspect Test Replace				2.5 1.0 5.0		1, 17 1	H I, J I, J
0207	Propeller, Propeller Shaft, Cutless Bearing	Inspect Replace Repair Align				2.5 4.0 12.0 4.0		1, 18, 26, 27 1, 5	H J J, K
0208	Stuffing Box	Inspect Adjust Repair Replace	0.2 0.3				2.0 2.0	1 1 1	J J
0209	Exhaust System								
020901	Mufflers, Piping and Lagging	Inspect Replace Repair	0.1			3.0 4.0		1, 7 1, 7	L

Table 1. MAC for LCM-8 Mod 2 (continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
0210	Fuel System								
021001	Tank, Piping, Valves, Hoses, and Fittings	Inspect Service Replace	0.5 2.5	3.0				1 1	B
021002	Fuel Filter/Water Separator	Inspect Service Replace	0.1 0.2 0.5					1 1	
03	ELECTRICAL SYSTEMS								
0301	Batteries and Cables	Inspect Service Test Replace	0.1 0.3	1.0 1.5				1 1 2,4 1	
0302	Alternator and Belts	Inspect Adjust Test Replace	0.1 0.5 0.5	1.0				1 1,2 1,2	
0303	24 Volt Supply and Distribution								
030301	24/12V Converter	Inspect Test Replace	0.1 0.2	1.0				2 1,2	
030302	24 Volt Wiring	Inspect Repair	0.2	1.0				1,2	
030303	24V Control and Distribution Panels	Inspect Test Repair	0.5	0.5 1.0				2 1	M
030304	Ground Detector	Replace Repair		1.0 0.5				1,2 1,2	M
030305	Battery Charger	Inspect Test Replace Repair	0.5	1.0		3.0	13.5	1, 2, 7, 11	
0304	220V/110V Supply and Distribution								
030401	220V/110V Wiring	Inspect Repair	0.2	1.0				1,2	

Table 1. MAC for LCM-8 Mod 2 (continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
030402	220V/110V Control and Distribution Panels	Inspect Test Repair	0.5	0.5 1.0	16.0			2 1,2	M
030403	Power Transformers 220V/110V	Inspect Test Replace	0.5 0.5	1.0				2 1,2	
0305	Diesel Generator Assembly	Service Test Replace Repair		1.0 1.0				1,2,10	N
0306	Lighting Fixtures and Switches	Inspect Replace Repair	0.1 1.0 1.0					1,2 1,2	
04	COMMAND AND SURVEILLANCE								
0401	AN/PSN-11 GPS (GPS 9801)	Replace		0.5				1	O
0402	AN/PSN-11(V)1 INTFC & SWBOX 9801	Replace		0.5				1	
0403	Digital Compass System (KVH MV103AC)	Replace		0.5				1,2	P
0404	Alarm, Safety and Warning Systems								
040401	General Alarm System	Test Repair	0.5	1.0				1	
040402	Fire Detection System	Inspect Test Repair	0.5	1.0 1.0				1 1,2	
0405	Radio Systems								
040501	Radio Set AN/VRC-92A	Replace		0.5				1,2	Q
040502	VHF-FM DSC 500A	Replace		0.5				1,2	R
040503	SEATOR SEA 3000 Modem	Replace		0.5				1,2	S

Table 1. MAC for LCM-8 Mod 2 (continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
040504	MF/HF DSC Watch Receiver	Replace		0.5				1, 2	T
040505	SEACALL 7000 MF/HF DSC Controller	Replace		0.5				1, 2	U
040506	HF/SSB Radio Telephone SEA330 Controller	Replace		0.5				1, 2	V, W
040507	MF/HF Transceiver RF SEA 3301	Replace		0.5				1, 2	V, W
040508	RF SEA 1630 Coupler	Replace		0.5				1, 2	V, W
040509	Printers ML 184T-S	Replace		0.5				1	X
040510	VHF FM Handhelds HX350SAS1SL	Replace		0.5				1	Y
040511	RAY 430 Loud-hailer	Replace		0.5				1, 2	Z
040512	NAVTEX Receiver NX-500	Replace		0.5				1, 2	AA
040513	AN/APX-72 Transponder	Replace		0.5				1, 2	AB
040514	AN/SPX-69 R80 Radar	Replace		0.5				1, 2	AC
040515	COMSEC KY-99	Replace		0.5				1	
040516	Antenna Assemblies	Inspect Replace	0.5	2.0				1	
0406	Navigation Lights: Bulbs and Lens Housing	Inspect Replace	0.5 1.0					1	
040601	Receptacles	Inspect Replace	0.5	1.0				1, 2	
040602	Search Light	Inspect Service Replace Repair	0.2 0.5	1.0 1.0				1 1, 2 1, 2	

Table 1. MAC for LCM-8 Mod 2 (continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
0407	Electric Horn	Inspect Replace	0.2	1.0				1, 2	
05	AUXILIARY SYSTEMS								
0501	Raw Water System								
050101	Piping, Hoses, and Valves	Inspect Service Replace Repair	0.5 0.5	4.0 4.0				1 1 1 30	
050102	Duplex Strainer	Inspect Service Replace Repair	0.2 0.5	1.5	1.0			1 1 1 1	
0502	Potable Water System								
050201	Piping, Hoses, and Valves	Inspect Service Replace Repair	0.5 0.5	4.0 4.0				1 1 31	
050202	Water Pressure Set	Inspect Replace	0.5	1.0				1, 2	
050203	Water Heater	Inspect Replace	0.5	3.0				1, 2	
050204	Windshield Washer Pump	Inspect Replace	0.5	2.0				1, 2	
050205	Tank Monitor System	Inspect Replace	0.5	1.0				1, 2	
0503	Blackwater System								
050301	Piping, Hoses, and Valves	Inspect Replace	0.5	4.0				1	
050302	Discharge Pump	Inspect Service Replace	0.1 0.1	2.5				1 1, 2	
050303	Tank Monitor System	Inspect Replace	0.5	1.0				1, 2	

Table 1. MAC for LCM-8 Mod 2 (continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
0504	Heating, Air Conditioning, and Ventilation Systems								
050401	Piping, Valves, Strainers, Hoses, and Fittings	Inspect Service Replace	2.0 2.0	8.0				1 1	
050402	Raw Water Pump	Inspect Replace	0.5	1.0				1, 2	
050403	Cooling Units	Inspect Service Replace	0.5 0.5		4.0			1, 2, 8, 9	
050404	Condensing Units	Service Replace	0.5		4.0			1, 2, 3, 4	
050405	Ventilation Fans	Inspect Replace	0.5	1.0				1, 2	
0505	Bilge System								
050501	Piping, Valves, Strainers, Hoses, and Fittings	Inspect Service Replace	2.0 2.0	8.0				1 1 1	
050502	Bilge Pump/ Hydraulic Motor Assembly	Inspect Service Replace Repair	0.1 0.1		2.5 3.5			1 1 1 1	
0506	Oily Water Collection System								
050601	Piping, Valves, Strainers, Hoses, and Fittings	Inspect Service Replace	2.0 2.0	8.0				1 1 1	
050602	Waste Oil Tank	Inspect Service	1.0 2.0					1	
050603	Waste Oil Pump	Replace Repair		1.0	2.0			1, 2 1	
050604	Hand Pump	Replace Repair		1.0	2.0			1 1	
0507	Fire Fighting and Ballast System								

Table 1. MAC for LCM-8 Mod 2 (continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
050701	Piping, Valves, Strainers, Hoses, and Fittings	Inspect Service Replace	2.0 2.0	8.0				1 1 1	
050702	Ballast/Fire Pump	Inspect Service Align Repair Replace	1.0 2.0	4.0	16.0 16.0			1 1, 2 1 1, 11	
050703	Electric Clutch	Inspect Replace	0.5	2.0				1	
050704	Fire Monitor	Inspect Adjust Service Replace Repair	0.5 0.5 0.5	2.0 3.0				1 1 1 1	
050705	Fire Nozzle	Replace		1.0				1, 32	
050706	Engine Room Fire Suppression System	Test Inspect	0.1 0.1					1	
05070601	Piping, Hoses, Nozzles, etc.	Inspect Service Replace	2.0 2.0		8.0			1 1 1	
05070602	Cylinder Assembly, FM-200	Inspect Replace Repair	0.5		1.0			1	AH
0508	Steering System								
050801	Hydraulic System Valves, Piping, Hoses, and Fittings	Inspect Replace	0.5	3.0				1 1	
050802	Steering Pump	Inspect Service Replace Repair	0.5 0.5		1.0	4.0		1, 3 1 1 1, 3, 13	
050803	Steering Cylinders	Inspect Service Replace Repair	0.5 0.5		1.0	4.0		1 1 1 1	

Table 1. MAC for LCM-8 Mod 2 (continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
050804	Helm Unit	Inspect Service Replace Repair	1.0 1.5		3.0	6.0		1 1 1, 22	
050805	Relief Valve	Adjust Inspect Replace	0.1		1.0 1.0			1 1 1	
050806	Flow Divider	Inspect Replace	0.1		1.0			1	
050807	Counterbalance Valve	Inspect Adjust Replace Repair	0.1	1.0	1.5	3.0		1 1 1	
050808	Check Valve	Inspect Replace	0.1	1.0				1 1	
050809	Hydraulic Reser- voir, Filter, and Strainers	Inspect Service	0.3 0.5					1 1	G
0509	Rudder and Tiller	Inspect Service Replace Repair	1.0 1.0	1.0		16.0 24.0		1 1, 6 1 1, 7	J J
0510	Rudder Angle Transmitter (Follow-up Unit)	Inspect Adjust Replace		1.0 2.0	2.0			1 1	
0511	Hydraulic Ramp System								
051101	Valves, Piping, Hoses, and Fittings	Inspect Replace	1.5	3.0				1 1, 3	AD
051102	Ramp Hoist Hydraulic Pump	Inspect Replace Repair	0.5		6.0	4.0		1 1, 12, 21	
051103	Ramp Hoist Control Valve	Inspect Replace Repair	0.5		3.0	3.5		1 1 1	
051104	Ramp Hoist Hydraulic Check Valve	Inspect Replace Repair	0.5		2.5 4.0			1 1	

Table 1. MAC for LCM-8 Mod 2 (continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
051105	Ramp Hoist Hand Pump	Inspect	0.5					1	
		Service	0.5					1	
		Replace			3.0			1	
		Repair				4.0		1	
051106	Ramp Locking Hydraulic Cylinders	Inspect	0.5					1	
		Service	0.5					1, 6	
		Replace			2.5			1	
		Repair				4.0		1, 12	
051107	Ramp Winch Hydraulic Motor	Inspect	1.0					1	
		Service	1.0					1, 6	
		Replace			6.0			1	
		Repair			4.0			1, 12	
051108	Ramp Winch	Inspect	1.0					1	
		Service	1.0					1, 11	
		Replace			8.0			1, 12, 23,	
		Repair				12.0		24, 28, 29, 33	
051109	Ramp Reservoir, Strainers and Filters	Inspect	0.5						
		Service	1.0					1	G
051110	Ramp, Ramp Cables, Chains, Sheaves, Latch Mechanisms, Seal and Hinge Pins	Inspect	2.5					1, 6	
		Service	3.5					1, 10, 11,	
		Replace Repair				4.0 5.0		25 1, 21	AE
0512	Water Closet Compartment								
051201	Electric Toilet	Test	0.5						
		Repair		2.0				1, 2	
051202	Water Closet Flushing System	Inspect	0.5						
		Repair		2.0				1, 2	
0513	Crane Assembly	Test				2.0			AF
051301	Hydraulic Valves, Hoses, and Fittings	Inspect	0.5						
		Replace		1.0				1	
		Repair			2.0			1	
051302	Slewing Unit	Replace			3.0			1	
		Repair			4.0			1	

Table 1. MAC for LCM-8 Mod 2 (continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIP	(6) REMARKS
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
051303	Extension Assembly	Inspect Service Repair	0.5 1.0		2.0			1 1	
051304	Boom Assembly	Inspect Service Repair	0.5 1.0			2.0		1	
051305	Control Bank	Inspect Service Repair	0.5 1.0	2.0				1 1	
06	OUTFIT AND FURNISHINGS								
0601	Cathodic Protection	Inspect Replace				0.1 1.0		1 1	H J
0602	Accommodation Module Windows, Furnishings	Inspect Replace	0.5	2.0				1	

Table 2. Tool and Test Equipment Requirements for LCM-8 Mod 2

Tool or Test Equipment Reference Code	Maintenance Level	Nomenclature	National/ NATO Stock Number	Tool Number
1	C, O, F, & H	Tool Kit, Mechanic's Rail & Marine	5180-00-629-9783	SM55-4-5180S02
2	C, O & F	Multimeter	6625-00-553-0142	TS-352BU
3	O, F, & H	Vise	5120-00-188-1182	GGG-V-410 TY4
4	C, O & F	Tester, Battery	6630-00-171-5126	GG-T-258 (81348)
5	H	Dial Indicator	4910-00-779-7103	J8165-2
6	O, F	Grease Gun, Hand, 16 oz.	4930-00-253-2478	MIL-G-3859
7	F, H	Welding Shop, Trailer Mounted	3431-01-090-1231 and 3431-01-341-6232	11022000 and 11022000-2
8	F	Tool Kit, Service Refrigeration	5180-00-596-1474	SC 5180-90-CL-N18
9	F	Recovery Unit	4330-01-387-1541	5150
10	F	Truck, Wrecker	2320-01-230-0304	8750189
11	F	Hoisting Device, 2 Ton	3950-00-965-0096	MIL-H-904E
12	F & H	Wrench, Torque, 1/2" Drive, 0-200 lb-ft		J1264 (33287)
13	H	Installer, Recharging Pump Shaft Seal		EHS41-1533
14	H	Hose Assembly, Accumulator Charging	4730-00-412-3805	TSF8600
15	H	Gauge Assembly, Accumulator	4920-00-003-1462	TSE8601
16	H	Drop Light, Extension	6230-00-268-9246	MILL 4020
17	H	Air Compressor, 40 CFM, Type 1	4310-00-133-3512	HR10-8
18	H	Puller, Propeller, Size 8	5120-00-372-0652	372-0652
19	H	Oiler, Hand, 8 oz.	4930-00-266-9182	GGG-O-591
20	H	Anvil	5120-00-180-2885	GGG-A-576TY1
21	H	Arbor Press		
22	H	Installer Helm Unit Valve Spring	5120-01-357-4000	600057
23	H	Puller, Bearing, Ramp Winch		C13115 (36581)
24	H	Installer, Bushing, Ramp Winch		B1397(36581)

Table 2. Tool and Test Equipment Requirements for LCM-8 Mod 2 (continued)

Tool or Test Equipment Reference Code	Maintenance Level	Nomenclature	National/ NATO Stock Number	Tool Number
25	H	Sledge Hammer, 3 lb	5120-00-242-3915	GGG-H-86 TY10CL2
26	H	Wrench, Box, Propeller Nut	5120-00-277-1575	HX840A
27	H	Wrench, Box, Shaft Nut	5120-00-277-1576	HX880A
28	H	Heel Bar		
29	H	Pinch Bar, 3/4 Dia.	5120-00-224-1372	GGG-B-101 (81348)
30	O	Wrench, Pipe, Adj Heavy Duty Aluminum Handle, 14 Long	5120-00-277-1478	GGG-W-651
31	O	Crowfoot Attachment, Socket Wrench, 1-1/4	5120-01-335-1122	SCO40 (55719)
32	O	Wrench, Spanner	5120-00-277-9076	MS16147-3 (96906)
33	H	Scraper, Ship, 15" LG all Metal	5110-00-240-3094	GGG-S-116 (81348)

Table 3. Remarks

REFERENCE CODE	REMARKS
A	Service of hull, bitts, chocks, tiedowns, stanchions, lifelines, hatches and void covers includes removing paint and rust, cleaning gaskets (on hatches) and painting. Dogs and hinges on hatches are to be freed, and cleaned of paint.
B	Tank/compartment is to be free of explosive/combustible fumes/liquids prior to any spark causing or hot work.
C	Refer to TM 5-2815-231-14 for Repair of the Propulsion Engines.
D	Refer to TM 5-2815-231-14 for repair of the Marine Gear.
E	Refer to TM 5-2815-231-14 for replacement of the Tachometer Drive Gear Cable.
F	Repair of accumulator includes charging accumulator with nitrogen gas.
G	Service includes replacement of filter elements. System valves and piping will be replaced on a case by case basis (refer to RPSTL; TM55-1905-242-24P).
H	Inspection may be accomplished in dry dock or by divers with vessel in water.
I	When the keel cooler has been removed from the vessel for repairs, test the keel cooler before replacing it.
J	Maintenance Function requires vessel in drydock or beached.
K	Repair includes straightening, metalizing and balancing.
L	“Replace” includes exhaust insulation.
M	Repair is limited to replacement of circuit breakers, fuses, lamps, and switches.
N	Major repair of the generator will be accomplished by a commercial vendor. Refer to Commercial Manual: Electrical Generator (Model M-844L): Operation - Manual 0203; Parts Catalog - P844K; AC Generator - OPX300K1 02/99.
O	Refer to TM 11-5825-291-13 for repair of the AN/PSN-11.
P	Refer to Commercial Manual: Digital Compass System, KVH MV103AC, KVH Part No. 54-0043, Rev. D.
Q	Refer to TM 11-5820-890-20 for repair of the AN/VRC-90A Radio Set.
R	Refer to Commercial Manual: ROSS Engineering Co. DSC500 Military VHF Radio Operator's Manual.
S	Refer to Commercial Manual: SEATOR SEA 3000 Modem: SEATOR 3000 OPR-3000, Rev. 5.
T	Refer to Commercial Manual: MF/HF DSC Watch Receiver: Seawatch 7001 OPR-7001, Rev. 2.
U	Refer to Commercial Manual: SEACALL 7000 MF/HF DSC Controller: SEACALL 7000G OPR-7000G, Rev. 3
V	Refer to Commercial Manual: HF/SSB Radio Telephone SEA330: SEA 330 OPR-330, Rev. 3.

Table 3. Remarks (continued)

REFERENCE CODE	REMARKS
W	The SEA330 Radio Telephone is comprised of the 3300GH Controller, 3301G Transceiver, and 1630 Antenna Tuner.
X	Refer to Commercial Manual: Printers ML 184T-S: ODA Part No. 59249501; Oki-J Part No. M-520907 1A.
Y	Refer to Commercial Manual: VHF FM Handhelds 406B851010
Z	Refer to Commercial Manual: RAY 430 Loudhailer: Document No. G263647-5.
AA	Refer to Commercial Manual: NAVTEX Receiver NX-500: OME-550-90Z
AB	Refer to TM 11-5895-1199-12 for repair of the AN/APX-72 Transponder.
AC	Refer to Commercial Manual: AN/SPS-69, R80 Radar: Document number: 81153-3; Scanner: Document number: 81154-4.
AD	“Replace” involves changing hoses and hose fittings. System valves and piping will be replaced on a case by case basis (refer to RPSTL; TM55-1905-242-24P).
AE	Replacement of Ramp requires vessel in drydock or beached.
AF	Lift test annually or following major repair.
AG	Replace includes window gaskets.
AH	Repair of the FM-200 Cylinder Assembly should be accomplished by the OEM or a qualified Fire Suppression System service company. Refer to Commercial Manual: FM-200 Fire Suppression System: P/N 90-FM200M-021.
AI	Repair of the Water Closet Flushing System is accomplished by replacement of the individual components (Valves, Strainers, Fixtures).

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS**

INTRODUCTION

Scope

This work package lists COEI and BII for the Landing Craft, Mechanized (LCM-8) Mod 2 to help you inventory items for safe and efficient operation of the equipment.

General

The COEI and BII information is divided into the following lists:

Components of End Item (COEI). This list is for information purposes only and is not authority to requisition replacements. These items are part of the Landing Craft, Mechanized (LCM-8) Mod 2. 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.

Basic Issue Items (BII) These essential items are required to place the Landing Craft, Mechanized (LCM-8) Mod 2 in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the Landing Craft, Mechanized (LCM-8) Mod 2 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 COEI List and 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 (in all capital letters) followed by a minimum description when needed. The stowage location of COEI and 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 Rqr. Indicates the quantity required.

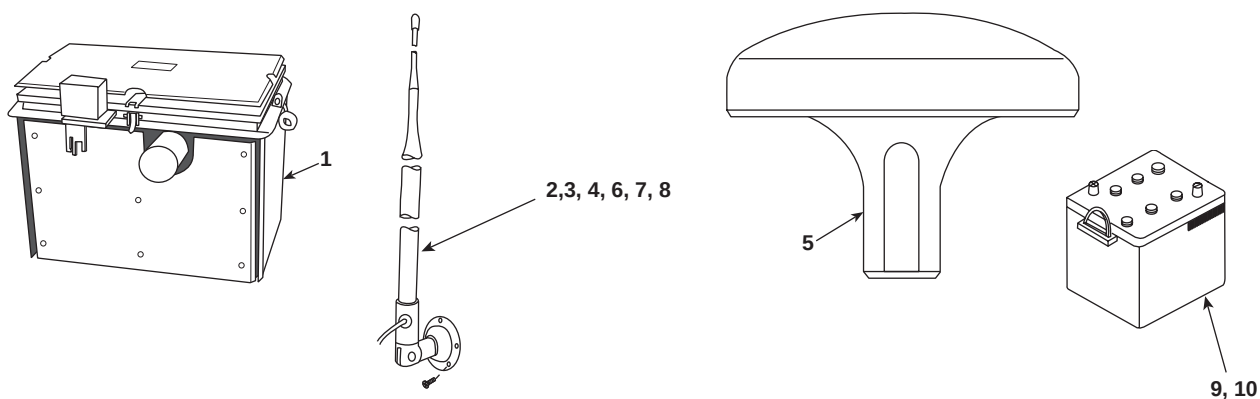


Table 1. Components of End Item List

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
1		AMMUNITION BOX (Main Deck, 2 stbd., 1 port) (53711) 804-5184210		EA	3
2	5985-01-308-8988	ANTENNA (SINGARS) (lazarette) (80058) AS-3900A/VRC		EA	1
3	5985-00-985-9022	ANTENNA ELEMENT (SINGARS) (lazarette) (80058) AS1730/VRC		EA	1
4	5985-00-856-2728	ANTENNA ELEMENT (SINGARS) (lazarette) (80058) AT1095/VRC		EA	1
5		ANTENNA, GPS RECEIVER (lazarette) (0UVG2) AT575-32W-TUCF-000-RG-36-NM		EA	1
6	5985-01-471-7205	ANTENNA, MF/HF TRANSCEIVER (lazarette) (23657) 5300		EA	1
7	5985-00-974-5834	ANTENNA, VHF-FM TRANSCEIVER (lazarette) (23657) 396-1		EA	2
8	5985-01-052-1272	ANTENNA, WATCH/NAVTEX RECEIVER (lazarette) (23657) 390-1		EA	1
9	6140-01-446-9498	BATTERY, STORAGE, 12V (Generator) (battery box, engine room) (19207) 6TME/TYP1		EA	1
10	6140-00-190-9828	BATTERY, STORAGE, 12V (Main) (battery locker, accommodation module) (81348) 8D-900-D		EA	4

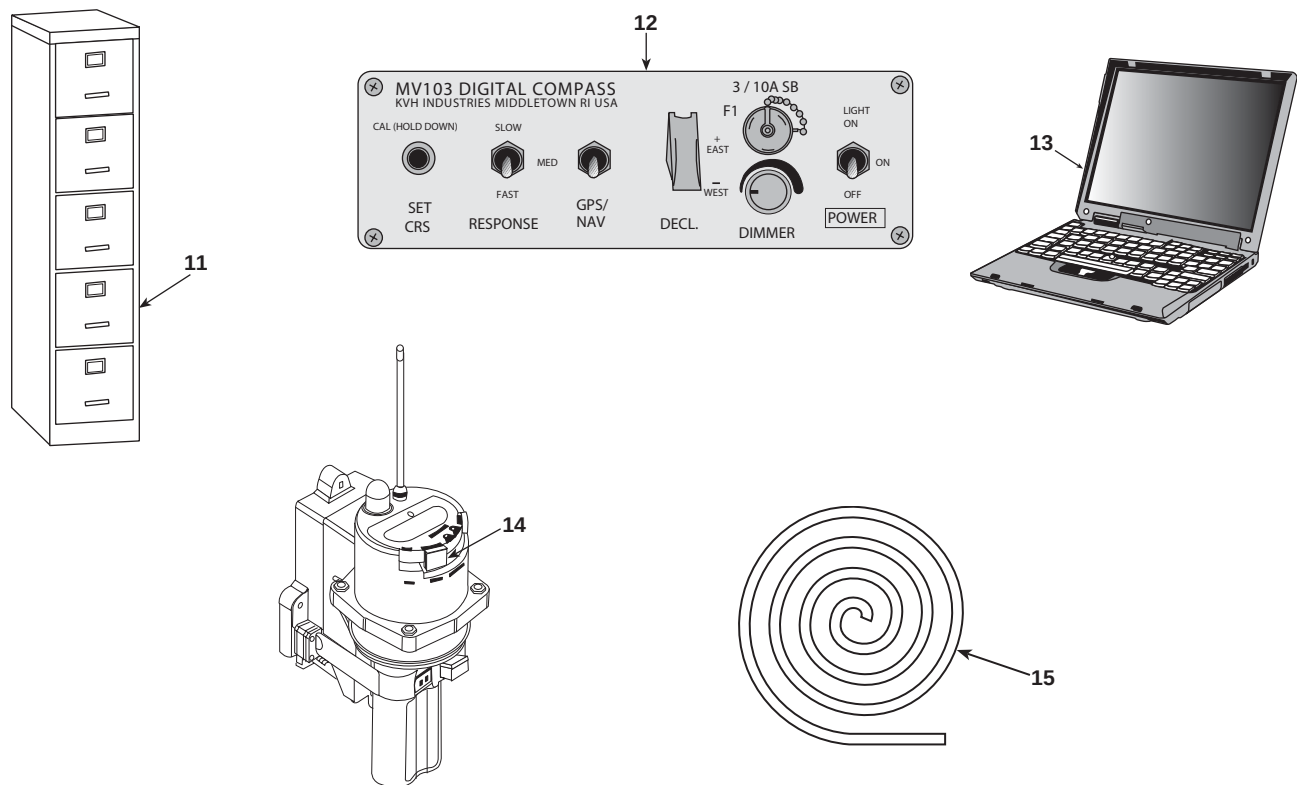


Table 1. Components of End Item List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY RQR
11	6320-01-406-6098	CABINET, FILING, Type II Steel (accommodation module, port aft corner) (97946) C238A		EA	1
12		COMPASS SYSTEM, DIGITAL (in brackets, in pilothouse) (72197) KVH 103AC		EA	1
13		DATA TERMINAL (comms locker) IBM Thinkpad		EA	1
14		EPIRB, SATFIND-406 M3 (in mount on accommodation module bulkhead or in pilothouse) (04855) S-1010		EA	1
15		HYDRAULIC HOSE, all sizes: (lazarette) (65230) GC85-011-1 (50599) MS28741-6-1200 (01276) FA710EFE1080		EA	4
	4720-00-494-2527 4720-00-702-5214 4620-00-986-3967				

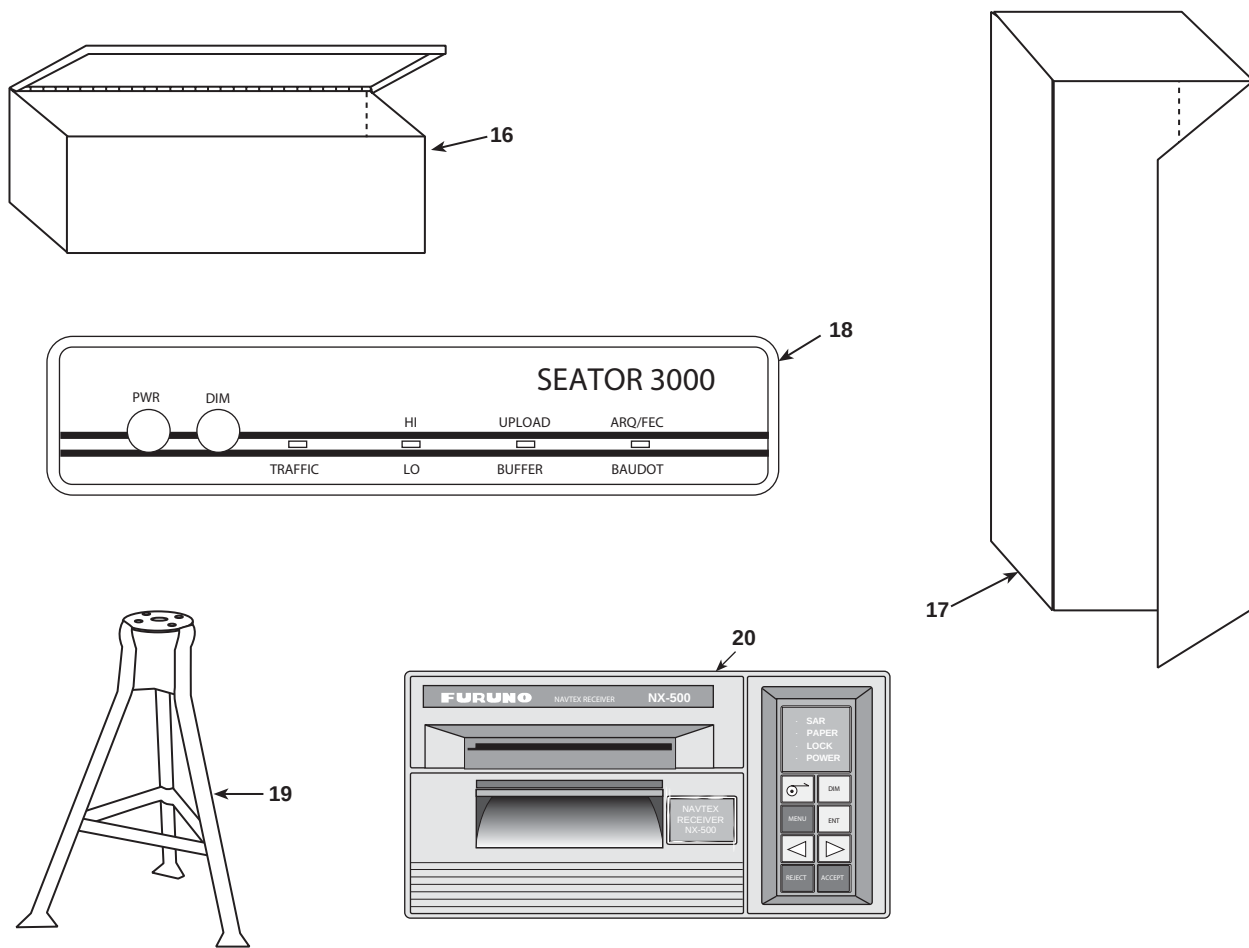


Table 1. Components of End Item List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY RQR
16	1005-00-879-2819	LOCKER, CREW SERVED WEAPONS, 50 Cal. M.G. (lazarette) (97403) 13226E9480		EA	1
17		LOCKER, INDIVIDUAL ARMS, Vertical Cab., M16A1/M203 (lazarette) (97403) 13226E9479		EA	1
18		MODEM, SEATOR (comms locker) (0E8U6) SEA3000		EA	1
19		MOUNT, MACHINE GUN (50 cal) (main deck) (10001) 2663138		EA	2
20		NAVTEX RECEIVER (comms locker) (S0622) NX-500		EA	1

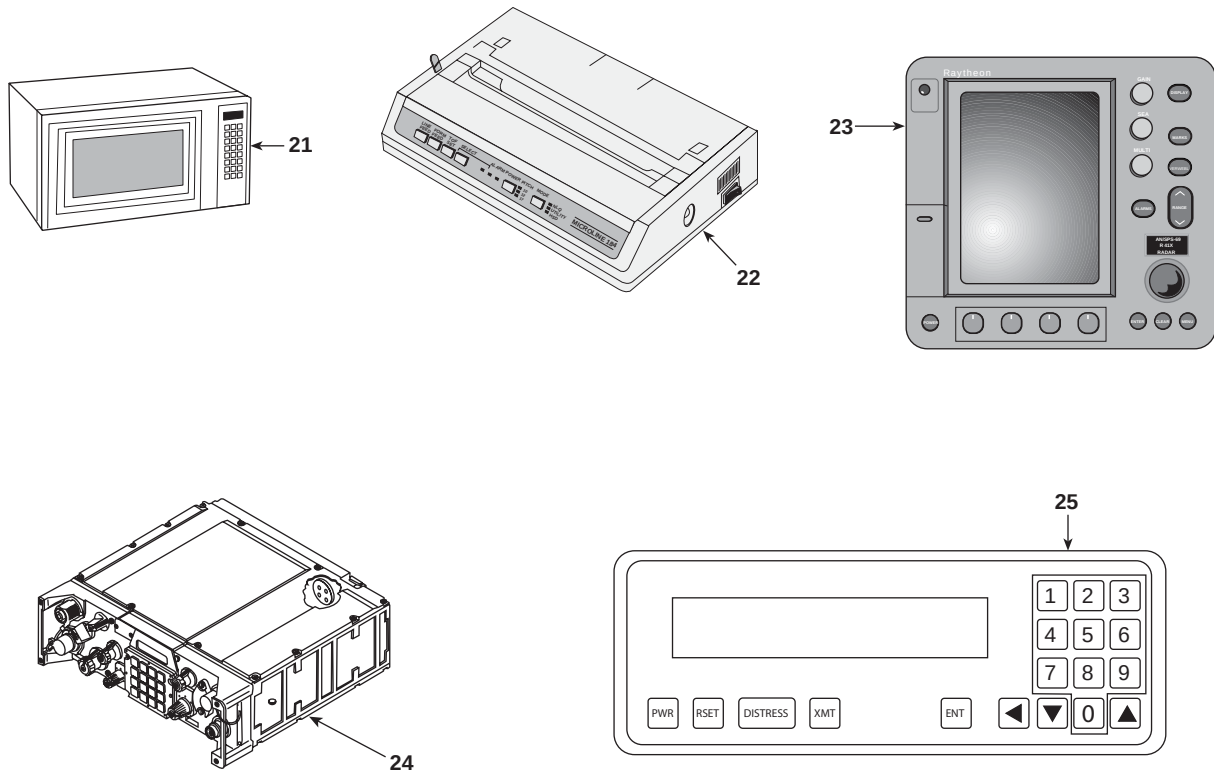


Table 1. Components of End Item List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY RQR
21	7025-01-341-5929	OVEN, MICROWAVE (accommodation module, shelf above sink) (39428) 4496T31		EA	1
22		PRINTER, AUTOMATIC (comms locker) (25405) ML184 Turbo		EA	2
23		RADAR (in brackets, in pilothouse) (7H422) Model R80		EA	1
24	5820-01-267-9477	RADIO SET (SINCGARS) (comms locker) (80058) AN/VRC-92A		EA	1
25	7025-01-471-7799	RECEIVER, DIGITAL DATA (comms locker) (0E8U6) 7000G		EA	1

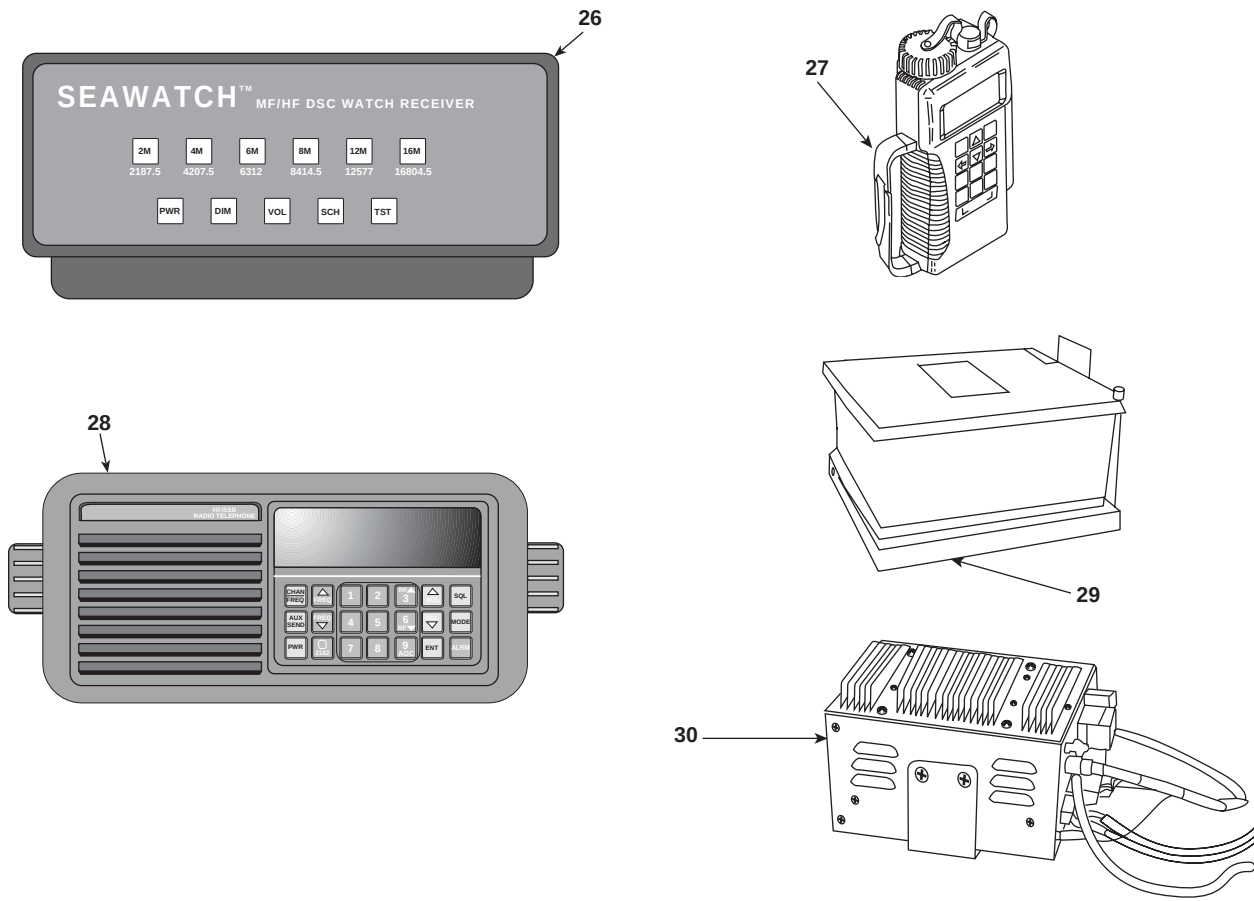


Table 1. Components of End Item List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
26	7025-01-471-0268	RECEIVER, DIGITAL DATA (comms locker) (OE8U6) 7001		EA	1
27	5825-01-395-3513	RECEIVER, GPS (Pilothouse) (13499) AN/PSN-11(V)1		EA	1
28	5820-01-471-7798	RECEIVER/TRANSMITTER (pilothouse) (OE8U6) 330		EA	1
29		RF COUPLER (accommodation module top) (OE8U6) SEA1630		EA	1
30		TRANSCIVER, MF/HF (comms locker) (OE8U6) SEA3301		EA	1

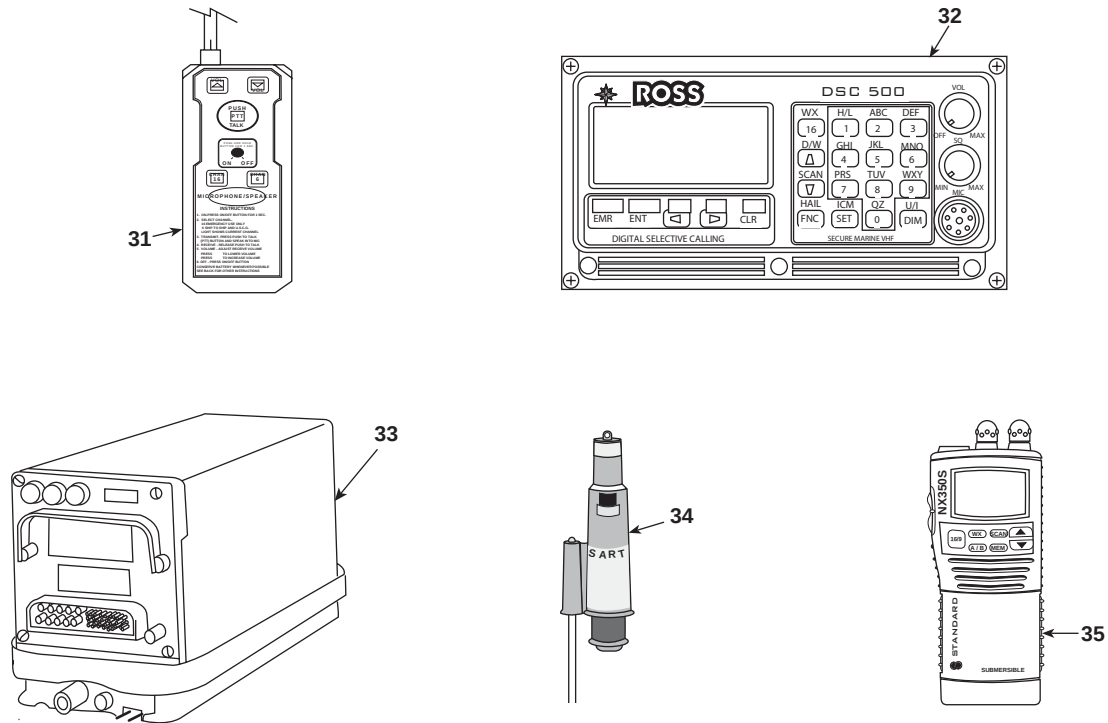


Table 1. Components of End Item List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
31		TRANSCIVER, SURVIVAL (accommodation module inside aft entry hatch) (18560) SR-102		EA	2
32	5985-01-471-0269	TRANSCIVER, VHF/FM (comms locker) (0WF67) DSC500		EA	1
33	5895-00-879-0211	TRANSPONDER SET (pilothouse) (80058) AN/APX-72		EA	1
34	5895-01-440-7010	TRANSPONDER SET (SART) (pilothouse, accommodation module) (18560) 2700		EA	2
35		VHF FM HANDHELD RADIO (comms locker) (61057) HX 350SAS1SL		EA	2

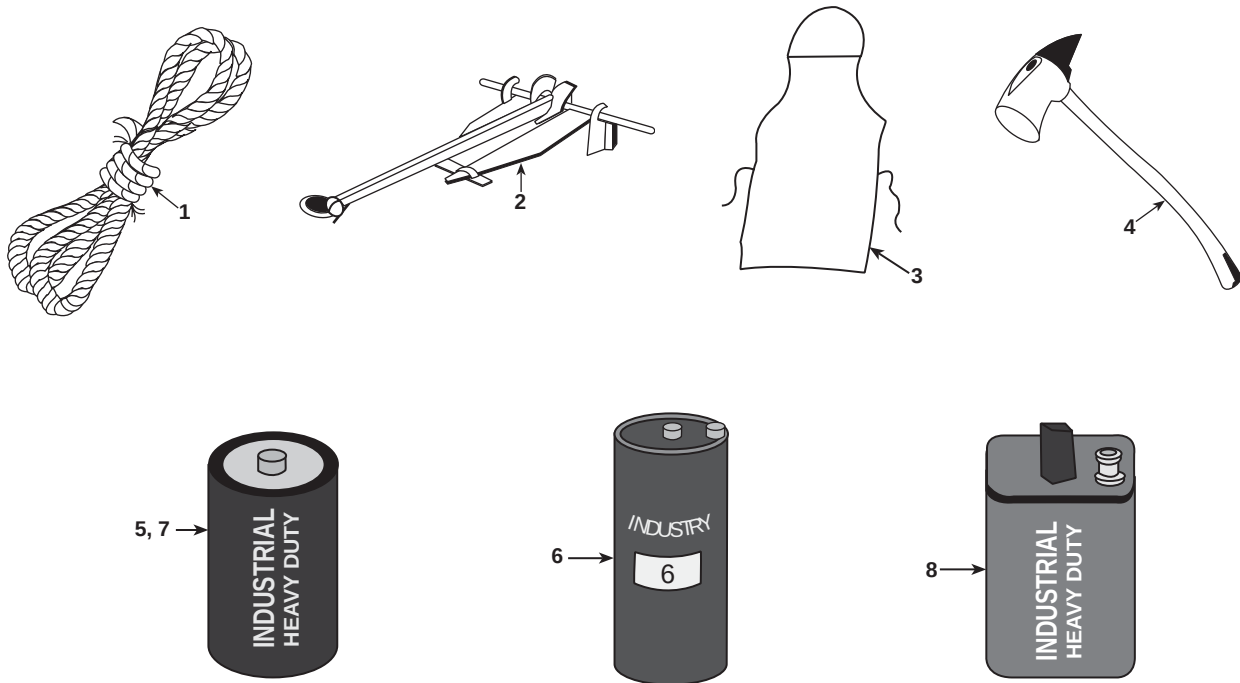


Table 2. Basic Issue Items List

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
1	4020-00-919-3443	ANCHOR LINE (lazarette)		FT	125
2	2040-00-377-8599	Make From (81349) MIL-R-17343 ANCHOR, MARINE, 75 LB (lazarette)		EA	1
3	8415-00-082-6108	(81349) MIL-A-15707 APRON, UTILITY (lazarette)		EA	1
4	4210-00-142-4949	(58536) A-A-55063 AXE, PICKHEAD (lazarette)		EA	2
5	6135-00-835-7210	(88044) AN8028-1 BATTERY (LIGHT MARKER) (port stowage locker)		EA	1
6	6135-00-050-0915	(81349) BA-3030/U BATTERY, DRY, 1.5 VOLT (port stowage locker)		EA	2
7	6135-00-985-7846	(81349) BA-23 BATTERY, DRY, 12 EA PER PACKAGE (port stowage locker)		PG	2
8	6135-00-643-1310	(77542) AL-C BATTERY, DRY, 6 VOLT, 12 EA PER PACKAGE (port stowage locker)		PG	3
		(80204) C18.1			

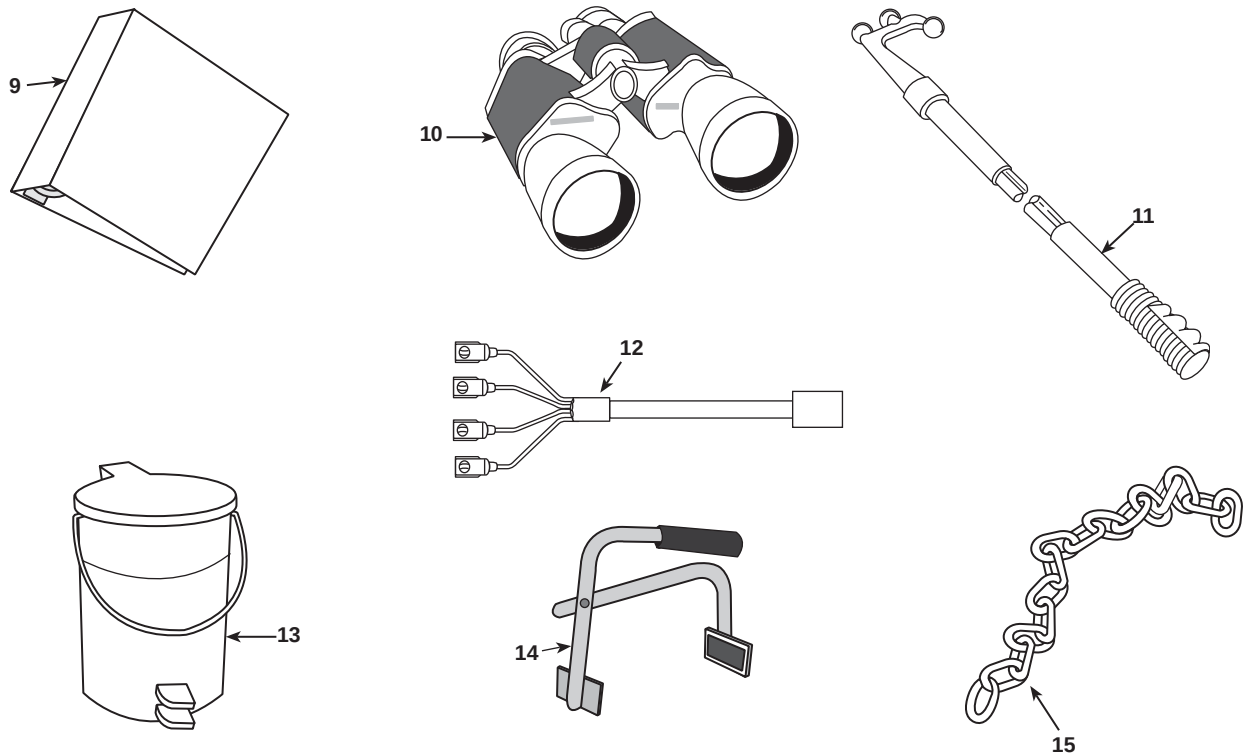


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY RQR
9	7510-00-889-3494	BINDER-EQUIPMENT LOG BOOK (pilothouse) (19207) 11677003		EA	1
10	6650-00-530-0974	BINOCULAR, 7 X 50 (pilothouse) (81349) B13656TYPE M17A1		EA	2
11	2040-00-268-9250	BOAT HOOK, 10FT (lazarette) (21530) H389		EA	2
12	6150-01-523-8976	CABLE ASSEMBLY, SHORE POWER (port exterior stowage locker) (16998) M151841-24W-100-BWRG (use with item 22)		EA	1
13	7240-00-256-7700	CAN, FLAMMABLE WASTE, 10 GL (engine room) (58536) A-A-1674		EA	1
14	5120-00-529-4124	CARRIER, BATTERY, HAND (lazarette) (80534) 541		EA	1
15	4010-00-555-9510	CHAIN ASSEMBLY, ANCHOR, 3/8", 10FT LG (lazarette) (81349) MILC2683A		AY	1

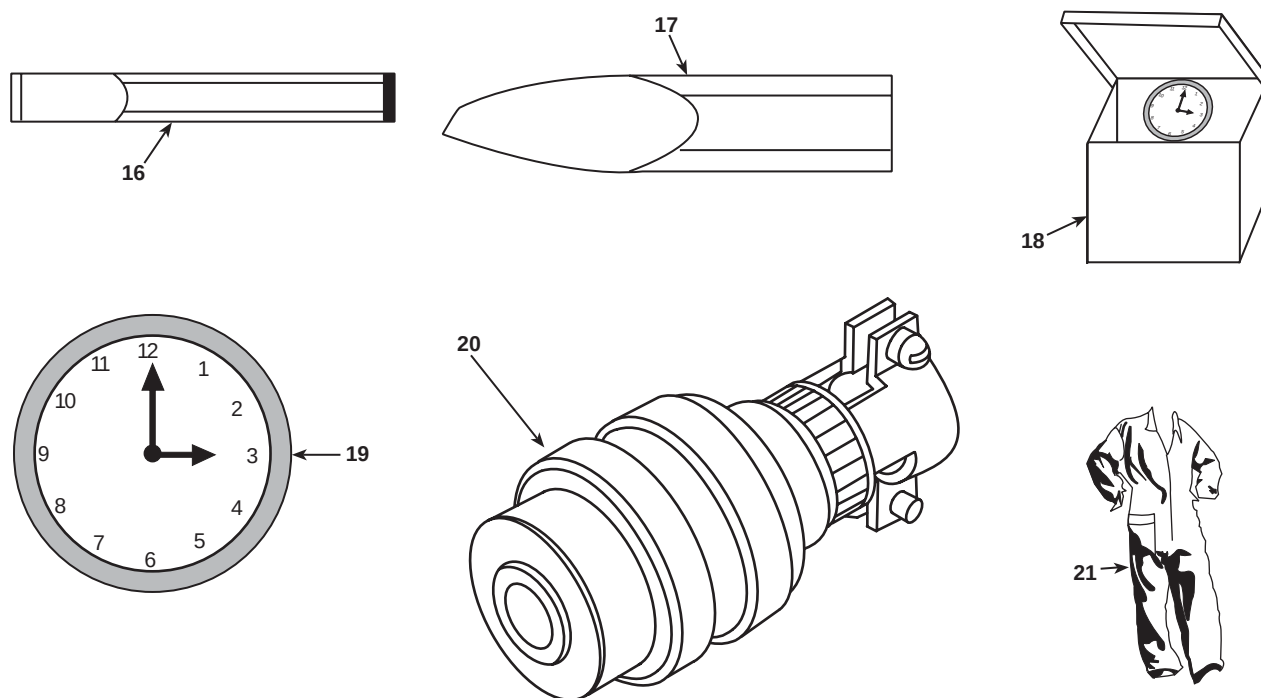


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY RQR
16	5110-00-242-3457	CHISEL, COLD, HAND 3/8" (lazarette) (45225) CC10		EA	1
17	5110-00-222-2117	CHISEL, HAND, HALF ROUND NOSE (lazarette) (81348) GGG-C-313		EA	1
18	6645-01-282-1928	CHRONOMETER (pilothouse) (54121) MQ-2		EA	1
19	6645-01-229-7499	CLOCK, WALL (accommodation module) (81349) MIL-C-1194D TYPE A		EA	1
20	5935-01-210-6370	CONNECTOR, PLUG, ELECTRICAL (SHORE POWER) (port exterior stowage locker) (78011) JPS1034HR (use with item 14)		EA	1
21		COVERALL, ANTI-EXPOSURE (lazarette) 8415-01-011-5051, Small 8415-01-011-5052, Medium 8415-01-011-5053, Large 8415-01-011-5054, X-Large (58536) A-A-55278		EA	6

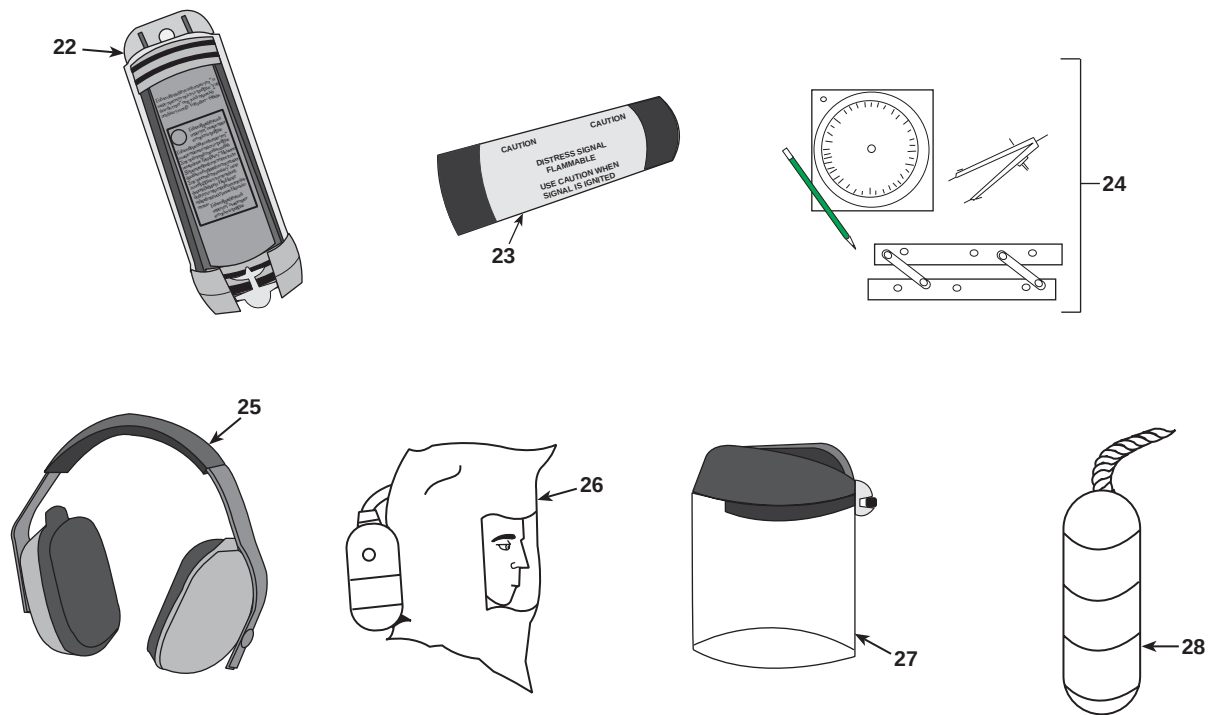


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
22	6230-01-143-4778	DISTRESS LIGHT MARKER, RING BUOY (pilothouse exterior) (88193) UL1196PARA3.1		EA	2
23	1370-01-144-3561	DISTRESS SIGNAL, MARINE SMOKE & ILLUMINATION (pilothouse exterior) (10001) 5532237		EA	12
24	6675-00-286-0602	DRAFTING INSTRUMENT SET (pilothouse) (81349) MIL-N-634		SE	1
25	4240-00-022-2946	EAR PROTECTOR (lazarette) (81349) MIL-P-38268		EA	4
26	4240-01-116-9888	EMERGENCY ESCAPE BREATHING DEVICE (EEBD) (lazarette) (53655) 802300-01		EA	1
27	4240-00-542-2048	FACE SHIELD, TILTING (lazarette) (58536) A-A-1770		EA	1
28	2040-00-821-0808	FENDER, MARINE, 16 DIA. X 36 LG. (cargo well) (80064) 805-1340571-16X36IN Fendaire		EA	4

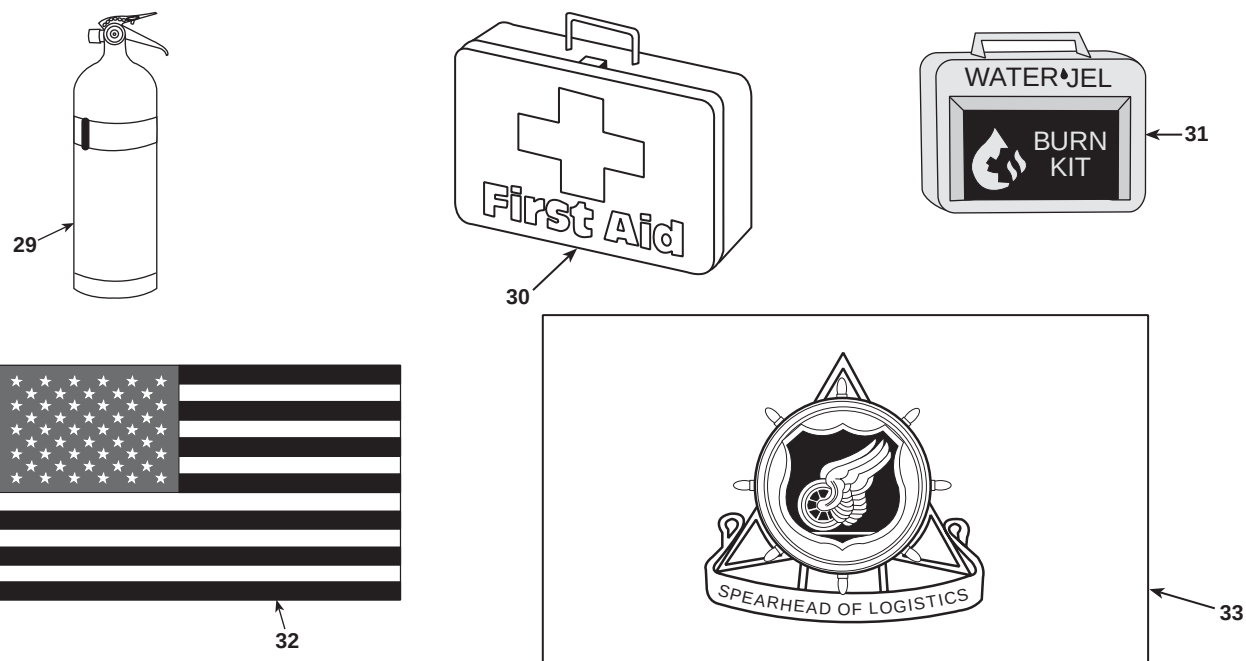


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY RQR
29	4210-00-889-2491	FIRE EXTINGUISHERS, PORT., DRY CHEM. (pilothouse, accomodation module, engine room) (58536) A-A-393		EA	6
30	6545-00-922-1200	FIRST AID KIT, GENERAL PURPOSE (pilothouse) (64616) SC C-6545-IL VOL2		EA	1
31	6545-01-526-9237	FIRST AID, BURN TREATMENT (pilothouse) (1NNH6) AWK-1 Kit Consists of: 6510-01-457-5844, 2 EA 8 x 18 Dressing 6510-01-243-5894, 1 EA 4 X 16 Dressing 6510-01-439-0862, 1 EA 72 X 60 Burn Blanket 6510-01-243-5897, 4 EA 4 X 4 Dressing 6510-01-439-5735, 1 EA 12 X 16 Face Mask Dressing 8510-01-485-8257, 25 EA BurnJel Topical Dressing		KT	1
32	8345-00-245-2040	FLAG, NATIONAL, UNITED STATES OF AMERICA (inside pilothouse) (81348) DDD-F-416		EA	1
33	8345-00-935-3120	FLAG, ORGANIZATIONAL (inside pilothouse) (81349) MIL-F-2692		EA	1

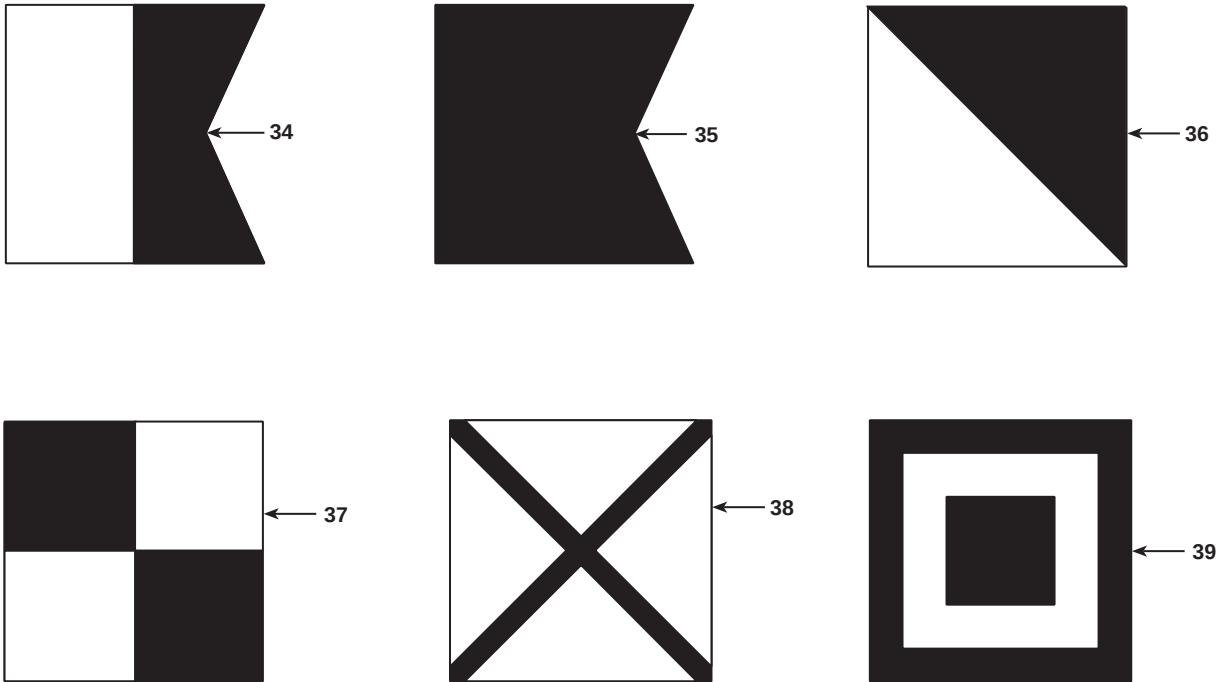


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
34	8345-00-935-0445	FLAG, SIGNAL, ALPHABETIC LETTER A (inside pilothouse) (83421) 8345-00-935-0445		EA	1
35	8345-00-926-6803	FLAG, SIGNAL, ALPHABETIC LETTER B (inside pilothouse) (83421) 8345-00-926-6803		EA	1
36	8345-00-935-0451	FLAG, SIGNAL, ALPHABETIC LETTER O (inside pilothouse) (83421) 8345-00-935-0451		EA	1
37	8345-00-926-6814	FLAG, SIGNAL, ALPHABETIC LETTER U (inside pilothouse) (83421) 8345-00-926-6814		EA	1
38	8345-00-935-0455	FLAG, SIGNAL, ALPHABETIC LETTER V (inside pilothouse) (80064) 16696 SH 7A		EA	1
39	8345-00-935-0456	FLAG, SIGNAL, ALPHABETIC LETTER W (inside pilothouse) (80064) 16696 SH 7A(W)		EA	1

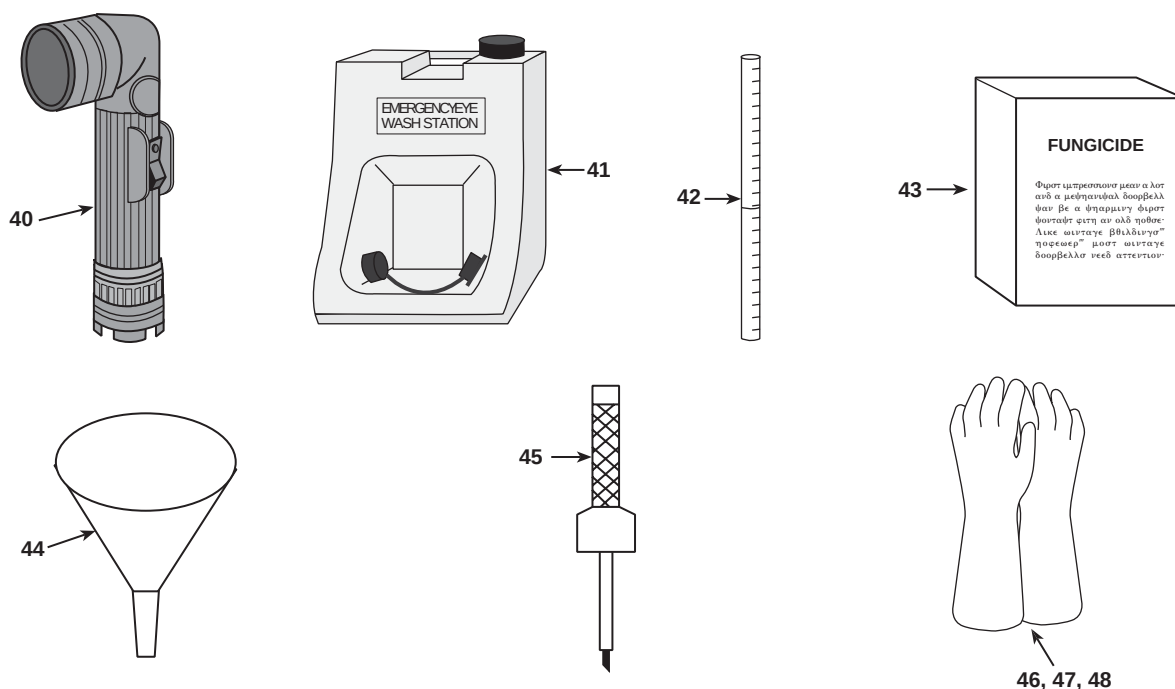


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
40	6230-00-264-8261	FLASHLIGHT, BATTERY OPERATED (lazarette) (U4207) E/N47		EA	2
41	4240-01-258-1245	FOUNTAIN, EYE AND FACE WASH, . PORTABLE, 16 GAL (accommodation module) (00236) PORTA-STREAM II 16Gal		EA	1
42	2040-01-107-1164	FUEL SOUNDING ROD (lazarette) (67060) 046045-1		EA	1
43	6840-01-267-4346	FUNGICIDE (EYE AND FACE WASH) (lazarette) (00236) ABA		BX	1
44	7240-00-527-9868	FUNNEL, STEEL 1 QT (lazarette) (58536) A-A-1066		EA	1
45	5210-00-387-9581	GAUGE, INJECTOR TIMING (lazarette) (33287) J1853		EA	1
46	8415-01-267-9661	GLOVES, ANTI-FLASH (lazarette) (81349) MIL-G-2874		PR	6
47	8415-00-266-8677	GLOVES, CHEMICAL PROTECTION (lazarette) (81348) ZZ-G-381		PR	1
48	8415-00-264-3618	GLOVES, SHELL ELECTRICAL (lazarette) (81349) MIL-G-10849		PR	1

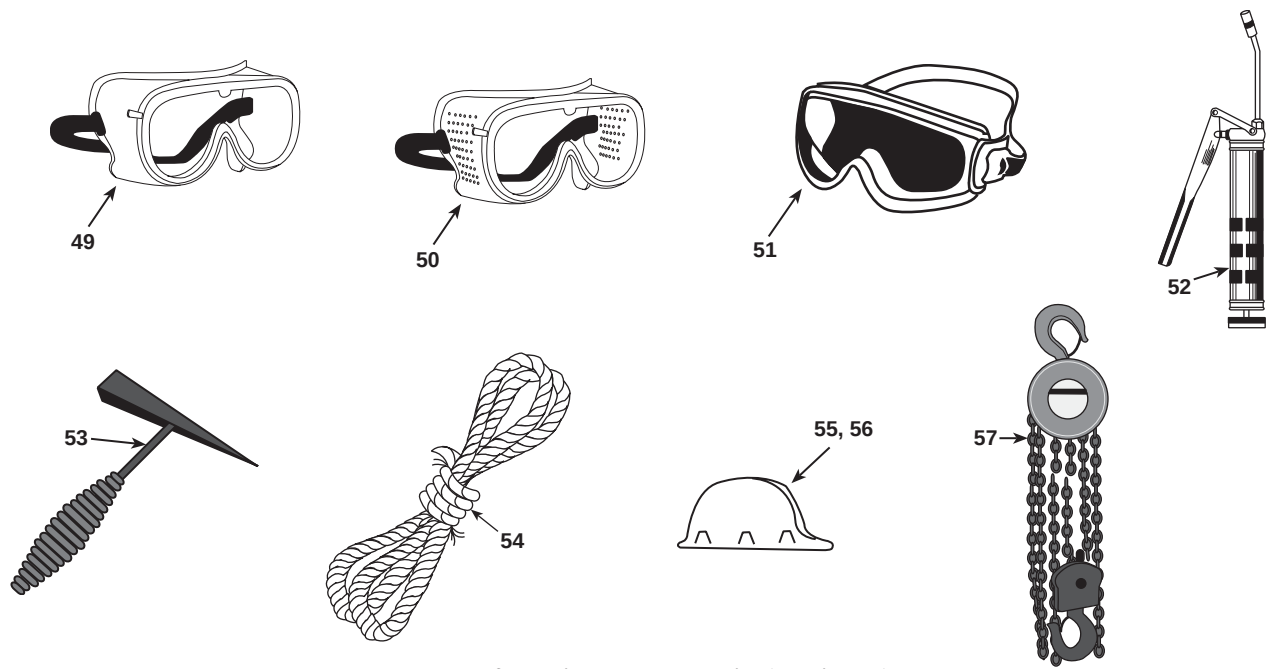


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
49	4240-00-190-6432	GOGGLES, CHEMICAL SPLASH, NO VENTS (lazarette) (58536) A-A-1110		PR	1
50	4240-00-052-3776	GOGGLES, PLASTIC, SAFETY (lazarette) (81348) GG-G-531		EA	3
51	8465-01-328-8268	GOGGLES, SUN, WIND, AND DUST (lazarette) (81349) MIL-G-43914		PR	4
52	4930-00-253-2478	GREASE GUN, HAND, LEVER OPERATED, 15OZ (lazarette) (81349) MIL-G-3859		EA	2
53	5120-00-224-4111	HAMMER, HAND, SCALING 1 LB (lazarette) (58536) A-A-1300		EA	2
54	4020-01-344-0552	HEAVING LINE, SAFETY, 100' (lazarette) (0GU87) NIS-G-0213		EA	2
55	8415-00-935-3136	HELMET, SAFETY, ORANGE (lazarette) (80204) ISEA/ANSI Z89.1		EA	3
56	8415-00-935-3139	HELMET, SAFETY, WHITE (lazarette) (58536) A-A-2269		EA	1
57	3950-00-235-4239	HOIST CHAIN RAMP (lazarette) (81349) MIL H904		EA	2

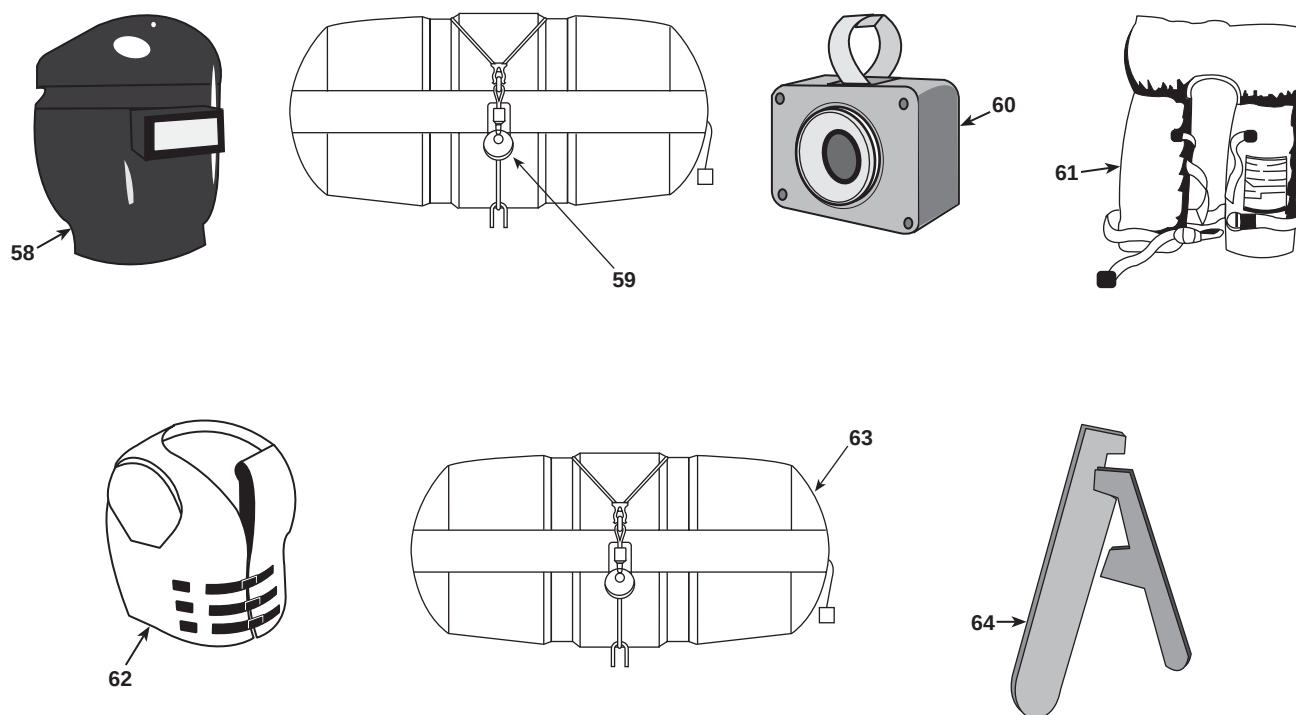


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
58	8415-01-268-3473	HOOD, ANTI-FLASH (lazarette) (81349) MIL-H-24936		EA	6
59	4220-01-279-7287	HYDROSTATIC RELEASE (accommodation module top) (53711) 803-5959322 ASSY 99		EA	2
60	6230-01-141-2901	LANTERN, ELECTRIC, 6 VOLT WITHOUT RELAY (engine room) (81349) M16377/53-100.2		EA	4
61	4220-01-485-1135	LIFE PRESERVER, VEST (life vest locker) (63806) Model 1600-ORG-NAV		EA	56
62	4220-01-415-9817	LIFE PRESERVER, VEST (life vest locker) (63806) IWV-222		EA	6
63	4220-01-444-6260	LIFE RAFT INFLATABLE (accommodation module top) (074V1) 00013592		EA	2
64	6260-01-086-8077	LIGHT, LIFE PRESERVER (life vest locker) (0BY83) 9-80770		EA	66

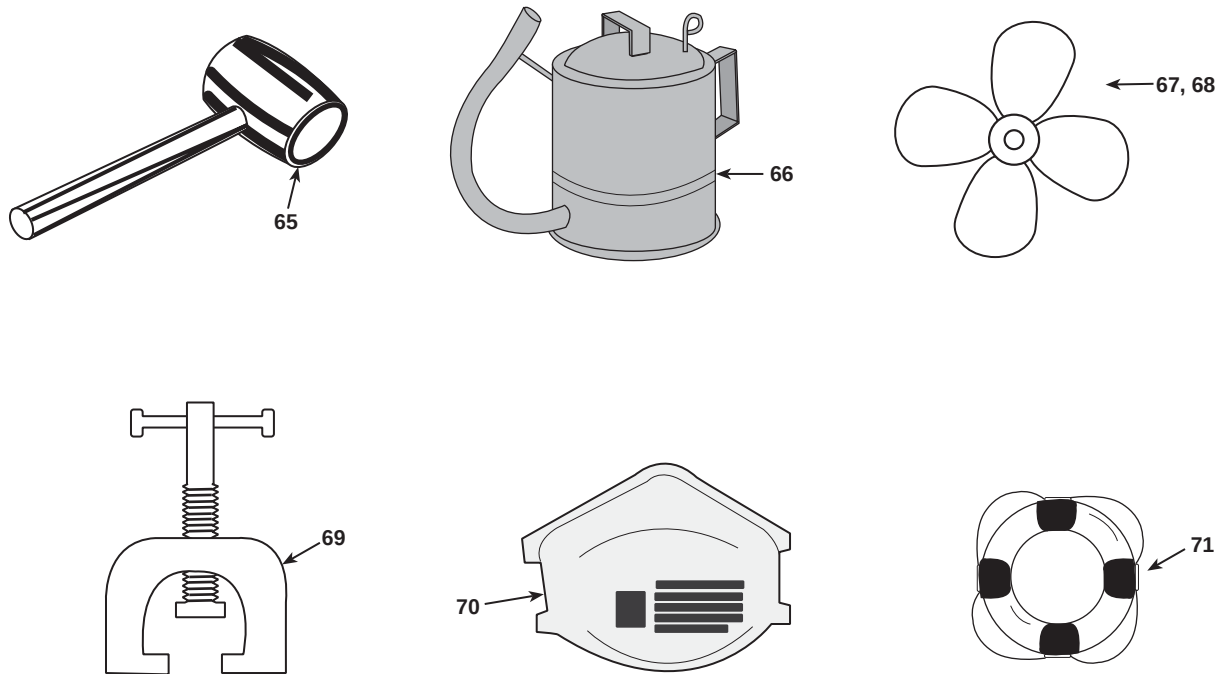


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
65	5120-00-255-1476	MAUL, SHIPS, 5 LB (lazarette) (58536) A-A-1285		EA	1
66	7240-00-233-6025	MEASURE, LIQUID 4 QT (lazarette) (58536) A-A-1607		EA	1
67	2010-00-540-7689	PROPELLER, MARINE (lazarette) (76455) MICHALLOYK34INHDLH		EA	1
68	2010-00-540-7690	(72201) Propeller, Seagull Type 1 LH PROPELLER, MARINE (lazarette) (76455) MICHALLOYK34INHDLH		EA	1
69	5120-00-944-4268	(72201) Propeller, Seagull Type 1 RH PULLER, BATTERY TERMINAL (lazarette) (70786) 21		EA	1
70	4240-00-868-0203	RESPIRATOR (lazarette) (79687) 122115S		EA	2
71	4220-00-275-3157	RING BUOY, 30" (pilothouse exterior) (81340) SUBPART 160.050-30IN.		EA	3

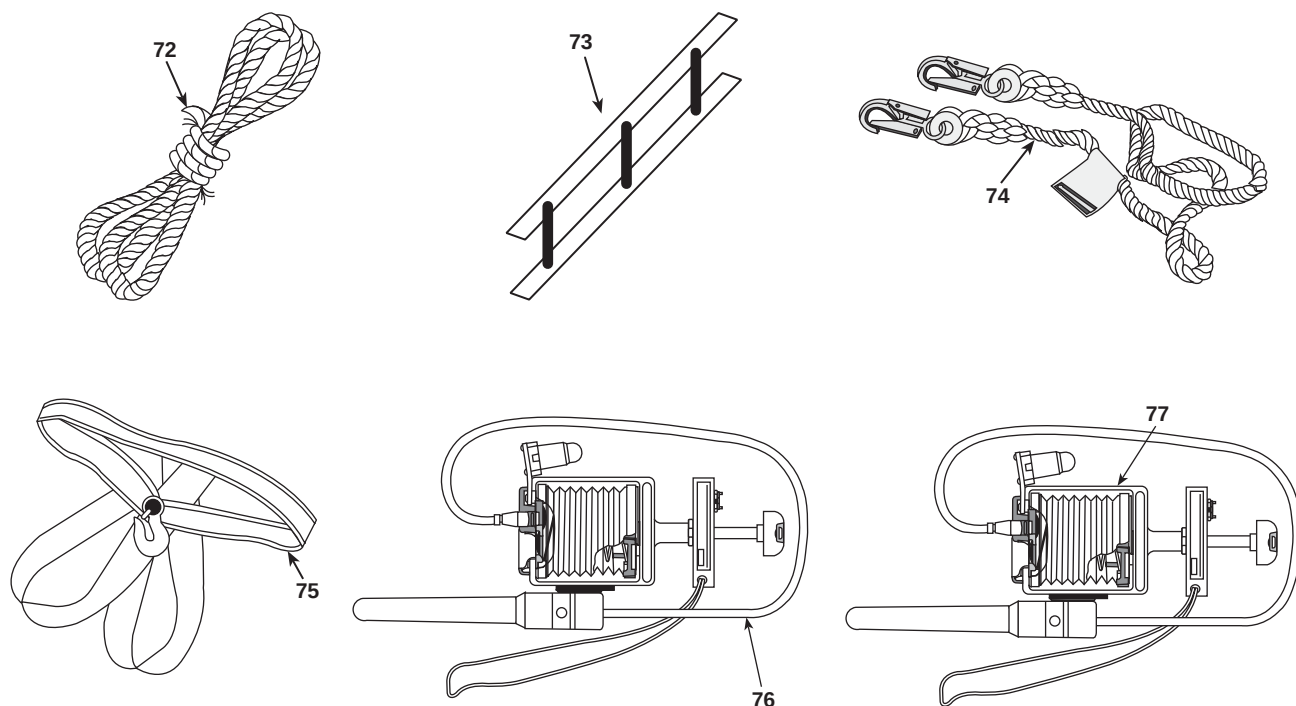


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
72	4020-00-919-3443	ROPE, FIBROUS, NYLON 1" DIA., 3" CIRCUMFERENCE (lazarette) (81349) MILR17343 Rope, Nylon, 48' Make From (81349) MIL-R-17343 Rope, Nylon, 18' Make From (81349) MIL-R-17343 Rope, Nylon, 90' Make From (81349) MIL-R-17343		RL	2
73	6675-00-191-1509	RULER, PARALLEL (pilothouse) (81348) GG-P-118		EA	2
74	4240-00-022-2518	SAFETY HARNESS WORKING LANYARD (lazarette) (86809) 505002		EA	2
75	4020-00-022-2522	SAFETY HARNESS, TORSO (lazarette) (55799) 502644		EA	1
76	4720-01-521-1706	SAMPLING LINE, 10' (pilothouse) (00VT4) 73067		EA	3
77	6665-01-429-8592	SAMPLING PUMP (pilothouse) (55799) 487500		EA	1

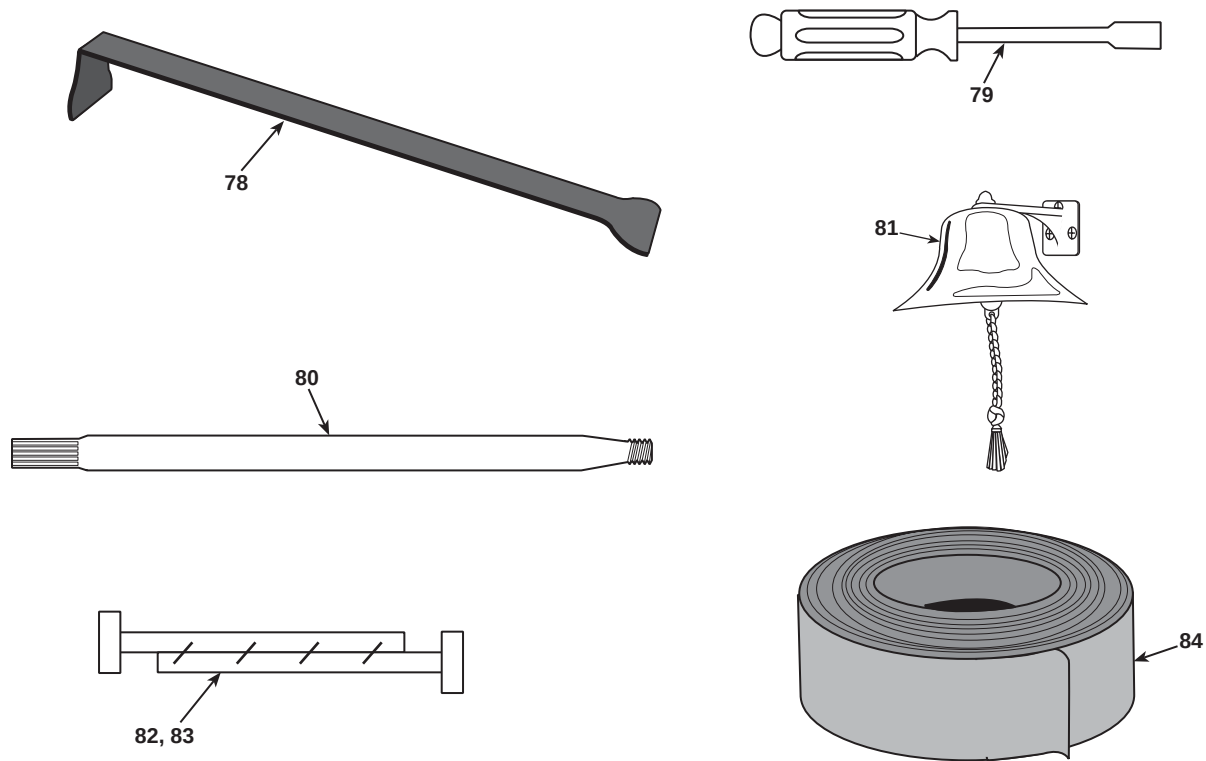


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY RQR
78	5110-00-240-3094	SCRAPER,SHIP,15 LG ALL METAL (lazarette) (81348) GGG-S-116		EA	1
79	5120-00-237-6985	SCREWDRIVER,3/8" FLAT TIP,8" LG (lazarette) (80204) B107.15 TY1CL2DEA		EA	1
80	2010-01-347-6850	SHAFT,PROPELLER,6 TYPE 630 (lazarette) (19207) 13226E9472 Detail 13-A		EA	2
81	6350-00-256-9061	SHIP'S BELL,20 LBS. (pilothouse exterior) (81349) D24673-4		EA	1
82	2090-00-052-1581	SHORING,ADJUSTABLE,STEEL,LONG 6'-11' (lazarette) (81349) MILS23965		EA	1
83	2090-00-058-3737	SHORING,ADJUSTABLE,STEEL,SHORT 3'-5' (lazarette) (81349) MIL-S-23965 Model 3-5		EA	1
84	9390-01-078-8660	TAPE,REFLECTIVE,3 X 50 YDS (lazarette) (63156) FD 1402 Pressure Sensitive		RL	1

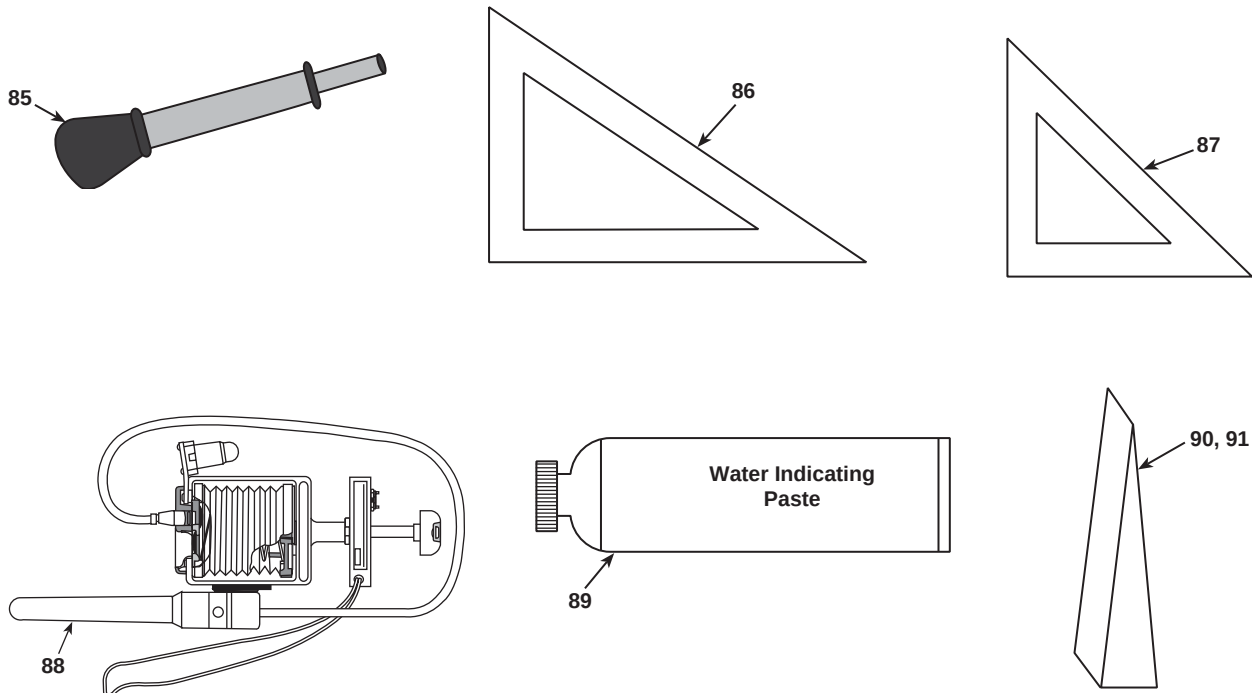


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY RQR
85	6630-00-171-5126	TESTER, BATTERY ELECTROLYTE SOLUTION (lazarette) (81348) GG-T-258		EA	1
86	6675-00-190-5867	TRIANGLE, DRAFTING, 10 (pilothouse) (81348) GG-T-671/4		EA	1
87	6675-00-190-5862	TRIANGLE, DRAFTING, 8 SIZE AND 45 ANGLE (pilothouse) (80244) 6675-00-190-5862		EA	1
88	4720-01-521-1706	TUBING, NONMETALLIC (pilothouse) (00VT4) 804142		BX	1
89	6850-00-001-4194	WATER INDICATING PASTE (lazarette) (65093) SAR-GEL		PG	1
90	5510-00-268-3475	WEDGE, HARDWOOD, 1-1/2" X 2" X 12" (lazarette) (80064) S8800-461043		EA	6
91	5510-00-268-3479	WEDGE, HARDWOOD, 2" X 2" X 8" (lazarette) (80064) S8800-461043		EA	6

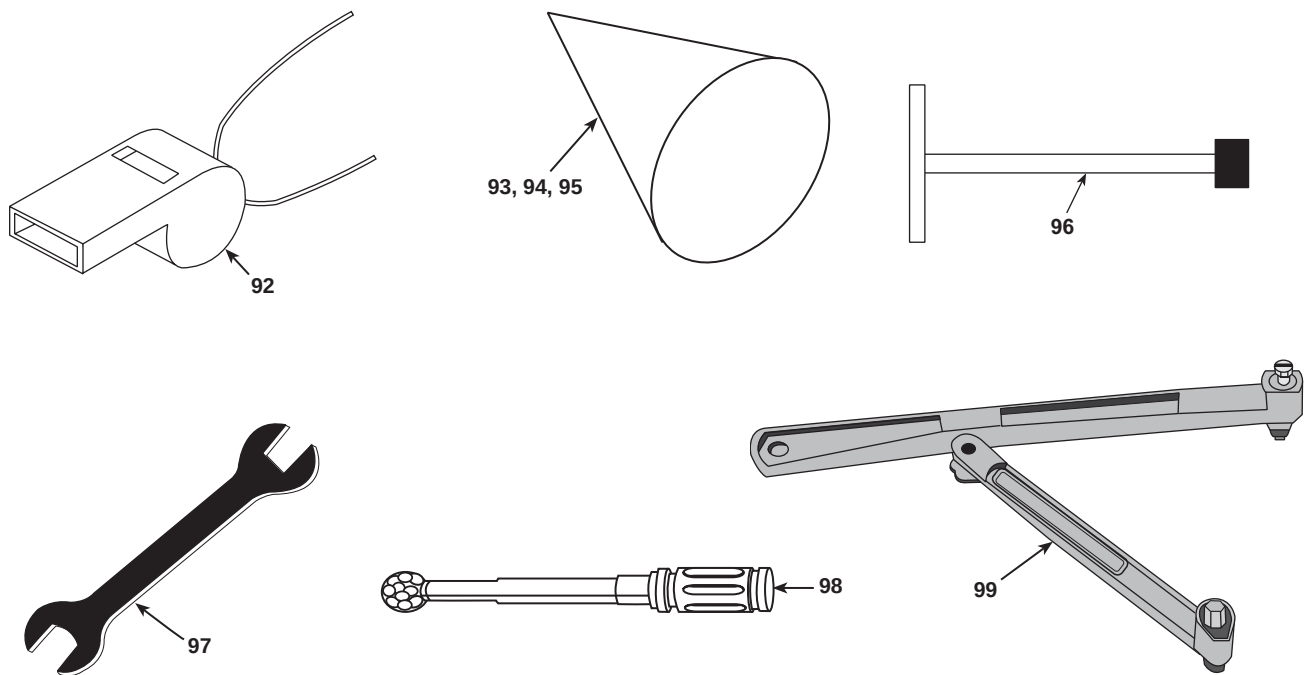


Table 2. Basic Issue Items List (continued)

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
92	8465-00-254-8803	WHISTLE, BALL, PLASTIC WITH LANYARD (life vest locker) (86421) 8465-00-254-8803		EA	66
93	5510-00-260-8969	WOOD PLUG, SOFT, 10" (lazarette) (80064) 803-461043		EA	5
94	5510-00-260-8953	WOOD PLUG, SOFT, 3" (lazarette) (80064) 803-461043		EA	5
95	5510-00-260-8962	WOOD PLUG, SOFT, 8" (lazarette) (80064) 803-461043		EA	10
96	5120-00-712-0517	WRENCH, FUEL SOUNDING TUBE (lazarette) (80064) LCM8S5501H1387536		EA	1
97	5120-00-277-1247	WRENCH, OPEN END, 1-5/16" (lazarette) (80244) GGG-W-636TY5		EA	2
98	5120-00-247-2540	WRENCH, TORQUE, 0-150 FTLBS. (lazarette) (58536) A-A-1274		EA	1
99	5120-00-116-9553	WRENCH, SPANNER (lazarette) (46576) FIG826		EA	3

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
EXPENDABLE AND DURABLE ITEMS LIST**

INTRODUCTION

Scope

This work package lists expendable and durable items that you will need to operate and maintain the Landing Craft, Mechanized (LCM-8) Mod 2. 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 list and is referenced in the narrative instructions to identify the item (e.g., Use brake fluid (Item 5, WP 0098 00)).

Column (2)—Level. This column identifies the lowest level of maintenance that requires the listed item (C = Operator/Crew, O = Unit, F = Direct Support, H = General Support).

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 (P/N). 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.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGEC, PART NUMBER	(5) U/M
1	F	5350-00-224-7215	Abrasive Paper, 600 Grit (58536)A-A-1047	EA
2	F	8940-00-145-0020	Adhesive (RTV) (80063)SM-B-586250	TU
3	H	8040-00-165-8614	Adhesive (37695)827848-7	QT
4	C	6850-00-181-7933	Antifreeze, Ethylene Glycol Inhibited (81349)MIL-A-46153	CN
5	C	8105-01-174-0945	Bag, Plastic, 11 GL Capacity (58536)A-A-2299	BX
6	C	7520-00-281-5911	Basket, Waste Paper (58536)A-A-182	EA
7	C	7920-00-291-8305	Broom, Upright (58536)A-A-2998	EA
8	C	7920-00-240-6358	Brush, Dusting, Bench (58536)A-A-3062	EA
9	C	7920-00-291-5815	Brush, Wire, Scratch (58536)A-A-3118	EA
10	C	7920-00-772-5800	Brush, Sanitary (58536)A-A-3069	EA
11	C	7240-00-160-0440	Can, Garbage, 32 Gal. (58536)A-A-1069	EA
12	O	6260-00-840-5578	Candle, Illuminating (81349)MIL-C-25539	DZ
13	C	6850-00-281-1985	Cleaning Solvent, Dry (81348)P-D-680	GL
14	C	8030-00-251-3980	Compound, Antiseize (81349)MIL-A-907	CN
15	F	5350-00-221-0872	Crocus Cloth (58536)A-A-1206 Type I	EA
16	O	6840-01-279-3951	Deodorant, Chemical Container (53800)673535	EA
17	C	6840-00-530-7109	Disinfectant, General Purpose (58536)A-A-1438	GL

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEMNAME, DESCRIPTION, CAGEC, PART NUMBER	(5) U/M
18	C	4510-00-585-6305	Dispenser, Paper Towel (58536) A-A-2380 TY3	EA
19	C	6810-00-107-1510	Distilled Water (81348) O-C-265	DR
20	C	7290-00-224-8308	Dustpan (58536) A-A-300	EA
21	C		Flushing Compound No 8509 (Spec AF-3595)	GL
22	F	9620-00-233-6712	Graphite, Dry (81348) SS-G-659	LB
23	C	9150-00-530-6814	Grease, Wire Rope Exposed (81349) MIL-G-18458	CN
24	O	9150-00-149-1593	Grease,Ball and Roller Bearing (81349) DOD-G-24508	CN
25	C	8520-00-225-8563	Hand Cleaner Paste (58536) A-A-279	TB
26	C	7920-00-267-1218	Handle, Mop (58536) A-A-3061	EA
27	C	9150-00-111-6256	Hydraulic Fluid (81349) MIL-H-46170	QT
28	C	9150-00-582-5480	Hydraulic Fluid (81349) MIL-H-17672	DR
29	O	9240-01-170-0702	Lamp,Incandescent (61204) 904-00003	EA
30	O	9150-00-188-9858	Lubrication Oil, Engine OE (5 gal) (81349) MIL-L-2104	CN
31	F	9150-01-035-5393	Lubricating Oil, Gear, 80W-90 (81349) MIL-L-2105	CN
32	F	6830-01-382-5105	Monochlorodifluorom (R-22) (7G746) 2W199 FREON-22	50 lb
33	C	7920-00-171-1148	Mophead, Wet (58536) A-A-3081	EA
34	H	6505-01-141-0643	Nitrogen Gas (81348) BB-N-411	CF

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGEC, PART NUMBER	(5) U/M
35	C	7240-00-160-0455	Pail, Utility 14 QT (58536) A-A-1273	EA
36	C	8540-00-530-3770	Paper, Toilet, 96 Rolls Per Box (58536) A-A-697	BX
37	C	9150-00-250-0933	Petrolatum (81348) VV-P-236	CN
38	C	7920-00-205-1711	Rag, Wiping (58536) A-A-2522	BE
39	O	8030-00-889-3535	Sealant (tape, antiseizing) 1/2 wide (81349) MIL-T-27730	RO
40	O	8030-01-025-1692	Sealing Compound, Loctite 242 (81349) MIL-S-46163	BT
41	O	3940-01-183-9412	Sling, Endless (15434) 3375957	EA
42	O	1365-01-359-7102	Smoke (aerosol) (61908) 25S, ES400	EA
43	C	6810-00-241-1099	Sodium Bicarbonate (81348) OS571	DR
44	O	5970-00-012-1276	Tape, Insulation, Electrical (75037) 88	RO
45	O	7510-01-286-5495	Tape, Silicone (75037) 70	RO
46	C	8540-00-262-7178	Towel, Paper, Single Fold (58536) A-A-696	BX
47	C	7240-00-965-4427	Waste, Receptacle 10 GL (58536) A-A-235	EA
48	H	9505-00-804-3814	Wire, Nonelectrical (81348) QQ-W-423	RO

END OF WORK PACKAGE

**OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE
FOR LANDING CRAFT, MECHANIZED (LCM-8) (ALL VESSELS WITH MOD 2 APPLICATION)
TOOL IDENTIFICATION LIST AND COMMON MATERIALS/PARTS**

TOOL IDENTIFICATION LIST

This work package lists all common tools and supplements and special tools/fixtures needed to maintain the LCM-8, Mod 2.

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., "Hoisting Device, 2 Ton (Item 11, Table 1, WP 0230 00)").

Column (2) -- Item Name. This column lists the item by noun nomenclature and other descriptive features (e.g., "Hoisting Device, 2 Ton").

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 the 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

(1) ITEM NO.	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER/ (CAGEC)	(5) REFERENCE
1	Tool Kit, Mechanic's Rail & Marine	5180-00-629-9783	SM55-4-5180S02 (81996)	TM 55-1905-242-24P
2	Multimeter	6625-00-553-0142	TS-352BU (81349)	TM 55-1905-242-24P
3	Vise	5120-00-188-1182	GGG-V-410 TY4 (80244)	TM 55-1905-242-24P
4	Tester, Battery	6630-00-171-5126	GG-T-258 (81348)	TM 55-1905-242-24P
5	Dial Indicator	4910-00-779-7103	J8165-2 (33287)	TM 55-1905-242-24P
6	Grease Gun, Hand, 16 oz.	4930-00-253-2478	MIL-G-3859 (81349)	TM 55-1905-242-24P
7	Welding Shop, Trailer Mounted	3431-01-090-1231 3431-01-341-6232	11022000 (59678) 11022000-2 (19200)	TM 55-1905-242-24P
8	Tool Kit, Service Refrigeration	5180-00-596-1474	SC 5180-90-CL-N18 (50980)	TM 55-1905-242-24P
9	Recovery Unit	4330-01-387-1541	5150 (0K5D1)	TM 55-1905-242-24P
10	Truck, Wrecker	2320-01-230-0304	8750189 (19207)	TM 55-1905-242-24P
11	Hoisting Device, 2 Ton	3950-00-965-0096	MILH904E (81349)	TM 55-1905-242-24P

Table 1. Tool Identification List (continued)

(1) ITEM NO.	(2) ITEMNAME	(3) NATIONAL STOCKNUMBER	(4) PART NUMBER/ (CAGEC)	(5) REFERENCES
12	Wrench, Torque, 1/2" Drive, 0-200 lb-ft		J1264 (33287)	TM 55-1905-242-24P
13	Installer, Recharging Pump Shaft Seal		EHS41-1533	TM 55-1905-242-24P
14	Hose Assembly, Accumulator Charging	4730-00-412-3805	TSF8600 (07988)	TM 55-1905-242-24P
15	Gauge Assembly, Accumulator	4920-00-003-1462	TSE8601 (03840)	TM 55-1905-242-24P
16	Drop Light, Extension	6230-00-268-9246	MILL4020 (81349)	TM 55-1905-242-24P
17	Air Compressor, 40 CFM, Type 1	4310-00-133-3512	HR10-8 (11568)	TM 55-1905-242-24P
18	Puller, Propeller, Size 8	5120-00-372-0652	372-0652 (80244)	TM 55-1905-242-24P
19	Oiler, Hand, 8 oz.	4930-00-266-9182	GGG-O-591 (81348)	TM 55-1905-242-24P
20	Anvil	5120-00-180-2885	GGG-A-576TY1 (81348)	TM 55-1905-242-24P
21	Arbor Press			TM 55-1905-242-24P
22	Installer Helm Unit Valve Spring	5120-01-357-4000	600057 (96151)	TM 55-1905-242-24P
23	Puller, Bearing, Ramp Winch		C13115 (36581)	TM 55-1905-242-24P
24	Installer, Bushing, Ramp Winch		B1397 (36581)	TM 55-1905-242-24P
25	Sledge Hammer, 3 lb	5120-00-242-3915	GGG-H-86TY10CL2	TM 55-1905-242-24P
26	Wrench, Box, Propeller Nut	5120-00-277-1575	HX840A	TM 55-1905-242-24P
27	Wrench, Box, Shaft Nut	5120-00-277-1576	HX880A	TM 55-1905-242-24P
28	Heel Bar			
29	Pinch Bar, 3/4 Dia.	5120-00-224-1372	GGG-B-101 (81348)	TM 55-1905-242-24P
30	Wrench, Pipe, Adj Heavy Duty Aluminum Handle, 14 Long	5120-00-277-1478	GGG-W-651 (81348)	TM 55-1905-242-24P
31	Crowfoot Attachment, Socket Wrench, 1-1/4	5120-01-335-1122	SCO40 (55719)	TM 55-1905-242-24P
32	Wrench, Spanner	5120-00-277-9076	J4749 (33287)	TM 55-1905-242-24P
33	Scraper, Ship, 15" LG all Metal	5110-00-240-3094	GGG-S-116 (81348)	TM 55-1905-242-24P

COMMON MATERIALS/PARTS LIST**Scope**

Table 2 lists all common materials and parts needed to maintain the LCM-8, Mod 2. These materials are specific to no system, but are, instead, used commonly and frequently in many widely-varied maintenance procedures.

Explanation of Columns in the Common Materials/Parts 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., "Cleaning Solvent MIL-PRF-680 (Item 2, Table 2, WP 0230 00)").

Column (2) -- Maintenance Level. This column lists the maintenance level(s) at which each material/part is utilized.

Column (3) -- Item Name. This column lists the item by noun nomenclature and other descriptive features (e.g., "Rag, Wiping").

Column (4) -- National Stock Number. This is the National Stock Number (NSN) assigned to the item: use it to requisition the item.

Column (5) -- Unit of Issue. Indicates the unit of issue for the item (e.g., GL (gallon) or BX (box)).

Table 2. Common Materials/Parts List

(1) ITEM NO.	(2) MAINTENANCE LEVEL	(3) ITEM NAME	(4) NATIONAL STOCK NUMBER	(5) UNIT OF ISSUE
1	C, O, F, & H	Hydraulic Fluid, MIL-H-46170	9150-00-111-6256	GL
2	C, O, F, & H	Cleaning Solvent MIL-PRF-680	6850-01-474-2319	GL
3	C, O, F, & H	Gloves, Chemical Protective	8415-00-266-8677	BX
4	C, O, F, & H	Goggles, Industrial, No Vents	4240-00-190-6432	EA
5	C, O, F, & H	Rag, Wiping	7920-00-205-1711	BL
6	C & F	Antifreeze, Ethylene Glycol Inhibited, AA52624-1-A	6850-01-464-9125	CN
7	C, O, & H	Petrolatum	9150-00-250-0933	CN
8	C	Sodium Bicarbonate	6810-00-241-1099	DR
9	C	Distilled Water	6810-00-107-1510	DR
10	C & F	Face Shield, Industrial, Tilting	4240-00-542-2048	EA
11	C & F	Apron, Chemical Protection	8415-00-082-6108	EA
12	C	Compound, Antiseize MIL-A-907	8030-00-251-3980	CN
13	F & H	Gloves, Anti-Flash	8415-01-267-9661	PR
14	O, F, & H	Sealant (tape, antiseizing) MIL-T-27730 1/2" wide	8030-00-889-3535	RO

Table 2. Common Materials/Parts List (continued)

(1) ITEM NO.	(2) MAINTENANCE LEVEL	(3) ITEM NAME	(4) NATIONAL STOCK NUMBER	(5) UNIT OF ISSUE
15	O	Lubrication Oil, Engine OE (5 gal) MIL-L-2104	9150-00-188-9858	CN
16	O	Sealing Compound, Loctite 242, MIL-S-46163	8030-01-025-1692	BT
17	O	Tape, Insulation, Electrical	5970-00-012-1276	RO
18	O	Tape, Silicone	7510-01-286-5495	RO
19	O	Candle, Illuminating MIL-C-25539	6260-00-840-5578	DZ
20	O	Smoke (aerosol)	1365-01-359-7102	CN
21	O, F, & H	Grease MIL-G-18709	9150-00-149-1593	CN
22	F & H	Crocus Cloth A-A1206 Type I	5350-00-221-0872	EA
23	F	Lubricating Oil, Gear, 80W-90, MIL-L-2105	9150-01-035-5393	CN
24	H	Nitrogen Gas	6505-01-141-0643	CF
25	H	Wire, Nonelectrical	9505-00-804-3814	RO
26	H	Adhesive	8040-00-165-8614	QT
27	F	Monochlorodifluorom (R-22)	6830-01-382-5105	50 lb

END OF WORK PACKAGE

GLOSSARY

Aft or after	At, near, or toward the stern.
Aids to navigation	Charted marks (such as buoys, beacons, lights, and electronic devices) to assist navigators.
Amidships	Usually in the line of the keel, but sometimes halfway between bow and stern; often contracted to “midships.”
Astern	Behind the vessel; in the direction of the stern.
Athwartship	At right angles to the fore-and-aft line of a vessel; across the vessel in a direction at right angles to the keel.
Beam	The maximum width of a vessel, also called breadth.
Berth	A place for securing a vessel, either in the stream or alongside a wharf or other vessel.
Bilge	The lowest interior position of a ship; the water that accumulates in the bilge is called bilge water.
Bilge pump	A pump used aboard vessels to remove accumulations of water in the bilge.
Bitter end	Last end of a rope or inboard end of an anchor cable secured to a bitt.
Bitts	Pair of heavy posts, set vertically in a deck or on a pier, to which mooring or towing lines are fastened.
Boat hook	A wooden staff with a metal hook and prod at one end used for fending off or holding on when coming alongside a vessel or a wharf. It is also used for picking up small objects from the water.
Bow	The forward part of a vessel.
Bowline	A line leading from the bow of a vessel.
Bulkhead	Partition dividing the interior of a vessel into various compartments.
Chafe	To wear down by rubbing the surface of a line against a solid object.
Chafing gear	A guard of canvas, rope, or similar material placed around spars, lines, or rigging to prevent wear.
Chocks	Round or oval holes in a vessel’s bulwark, sometimes fitted with rollers, through which hawsers and ropes are passed; also blocks of wood for supporting boats, weights, and so on.
Cleat	Wood or metal fitting that has two projecting horns to which a line is secured.
Coaming	Sidewall of a hatch projecting above the deck around the perimeter of the hatch to prevent water from going below.
Coxswain	The enlisted person in charge of a small craft.

GLOSSARY (continued)

Dogs	Small, bent metal fittings used to secure watertight doors, hatch covers, manhole covers, and so on to close and fasten as tight as possible.
Draft	The depth of water a vessel requires to float freely; the depth of a vessel from the waterline to the keel; also a sling load of cargo.
Engine room	Compartment containing the propulsion machinery of a vessel.
Faking down	To lay down rope in long or circular turns (coils) so that each turn of rope overlaps the next one underneath in such a way that the rope is clear for running.
Fender	A device of canvas, wood, or rope used over the side to take the shock of contact between vessel and wharf or other vessel when alongside.
Fore	Parts of a vessel at or adjacent to the bow; also parts between the midship section and stern.
Fore and aft	Lengthwise of a ship.
Gunwale	The uppermost continuous strake in a vessel's side; the upper edge of a vessel's hull.
Hard over	Turning the wheel as far as possible in a given direction.
Hatch	Opening in a deck giving access to cargo holds.
Helm	The machine by which a vessel is steered.
Hold	Space between the lowermost deck and the bottom of a vessel that is used for the stowage of ballast, cargo, and stores.
Hull	Framework of a vessel, including all decks, but exclusive of masts, yards, riggings, and all outfit or equipment.
Inboard	Toward the centerline of a vessel; also the side next to a wharf or another vessel.
KDF	A filter media consisting of copper-zinc formulations used to remove chlorine and other impurities contained in water.
Knot	A unit of speed equal to 1 nautical mile per hour.
Lanyard	Rope used to make anything fast, especially a short piece reeved through deadeyes, connecting shrouds, stays, and so on, to side of vessel.
Lazarette	A compartment used for storage purposes in the stern of a vessel.
Left-hand propeller	When viewed from astern, the propeller that turns counterclockwise while driving the boat ahead.
Life lines	Lines stretched fore and aft along the decks to give the crew safety against being washed overboard.
Life jacket	An apparatus of buoyant material, designed to keep a person afloat.

GLOSSARY (continued)

Life raft	Raft kept buoyant by cylindrical air chambers, designed to keep survivors of a disaster afloat for rescue.
Life ring	Floating ring covered with canvas that is designed to support a person in water.
Main deck	First complete deck running the full length of a vessel.
Maneuver	To make a series of changes in direction and position for a specific purpose.
Moored	Lying with both anchors down; tied to a pier or anchor buoy; also to secure a vessel other than by anchoring with a single anchor.
Mooring lines	Cables or ropes used to tie up a vessel.
Outboard	Toward the side of a vessel in relation to the centerline or outside the vessel entirely; also, the side away from a wharf or vessel alongside.
PFD	Personal Flotation Device: An apparatus of buoyant material, designed to keep a person afloat.
Pier	A wharf that projects into a harbor, with water and accommodations for berthing vessels on two or more sides of it.
Port side	The left side of a vessel looking forward, indicated by a red running light when underway at night; an opening in a vessel's side; a harbor for cargo operations.
Potable water	Drinkable water, meeting standards set by the U.S. Public Health Service.
Quarter	General area from the middle of a vessel to the extreme stern; also to proceed with the quarter to the wind or sea; to bring the sea or wind first on one quarter and then on the other.
Right-hand propeller	When viewed from astern, the propeller that turns clockwise while driving the boat ahead.
Rudder	Flat structure hung vertically on the sternpost, just aft of the screw, and used to steer a vessel by offering resistance to the water when turned to an angle with the centerline.
Rudder amidships	The position of the rudder when it parallels the keel line of the vessel.
Running lights	All lights required to be shown during peacetime by a vessel that is under way.
Scope	Length of anchor chain or cable to which a vessel is riding.
Seacock	Valve connecting with the outside sea water in the lower part of vessel that can be used to flood various parts.
Sheave	A grooved wheel or pulley inside a block over which a line runs.
Spring line	A mooring line leading at an angle of about 45 degrees from the fore and aft line of a vessel to a wharf or another vessel.

GLOSSARY (continued)

Starboard side	Right side of a vessel looking forward, indicated by a green running light when underway at night.
Stern	The after end (rear) of a vessel.
Stern line	A line leading from the stern of a vessel.
Stow	To put away, to lock up for safekeeping in a proper place.
Topside	Above decks, such as on the weather deck or bridge.
Towing bitts	Vertical posts on a vessel to which towing or mooring lines are secured.
Trim	Difference in draft at the bow and stern of a vessel; manner in which a vessel floats on the water, whether on an even keel or down by the head or stern; shipshape. To adjust a vessel's position in the water by arranging ballast, cargo, and so on. To arrange for sailing; to assume, or cause a vessel to assume, a certain position, or trim, in the water.
Turnbuckle	Link threaded on both ends of a short bar that is used to pull objects together.
Underway	A vessel is said to be underway when she is not anchored, moored, aground, or beached.
Wharf	Projecting platform of timber, stone, or other material that extends into water deep enough for vessels to be accommodated alongside for loading or unloading.
Wheel	The instrument attached to the rudder by which a vessel is steered.
Winch	A piece of machinery that operates a shaft, fitted with a drum or drums upon which lines or cables are wound to hoist or haul an object.

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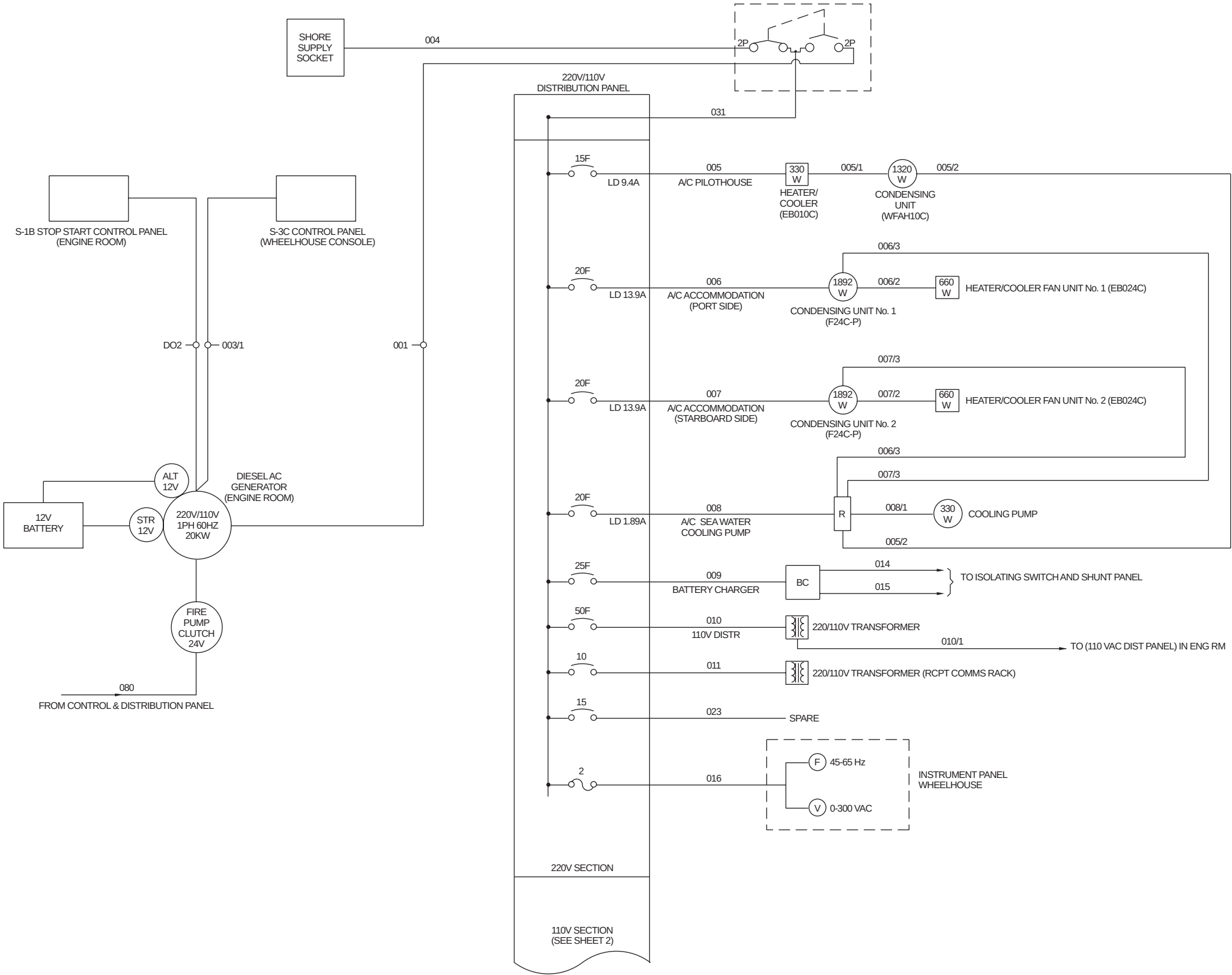
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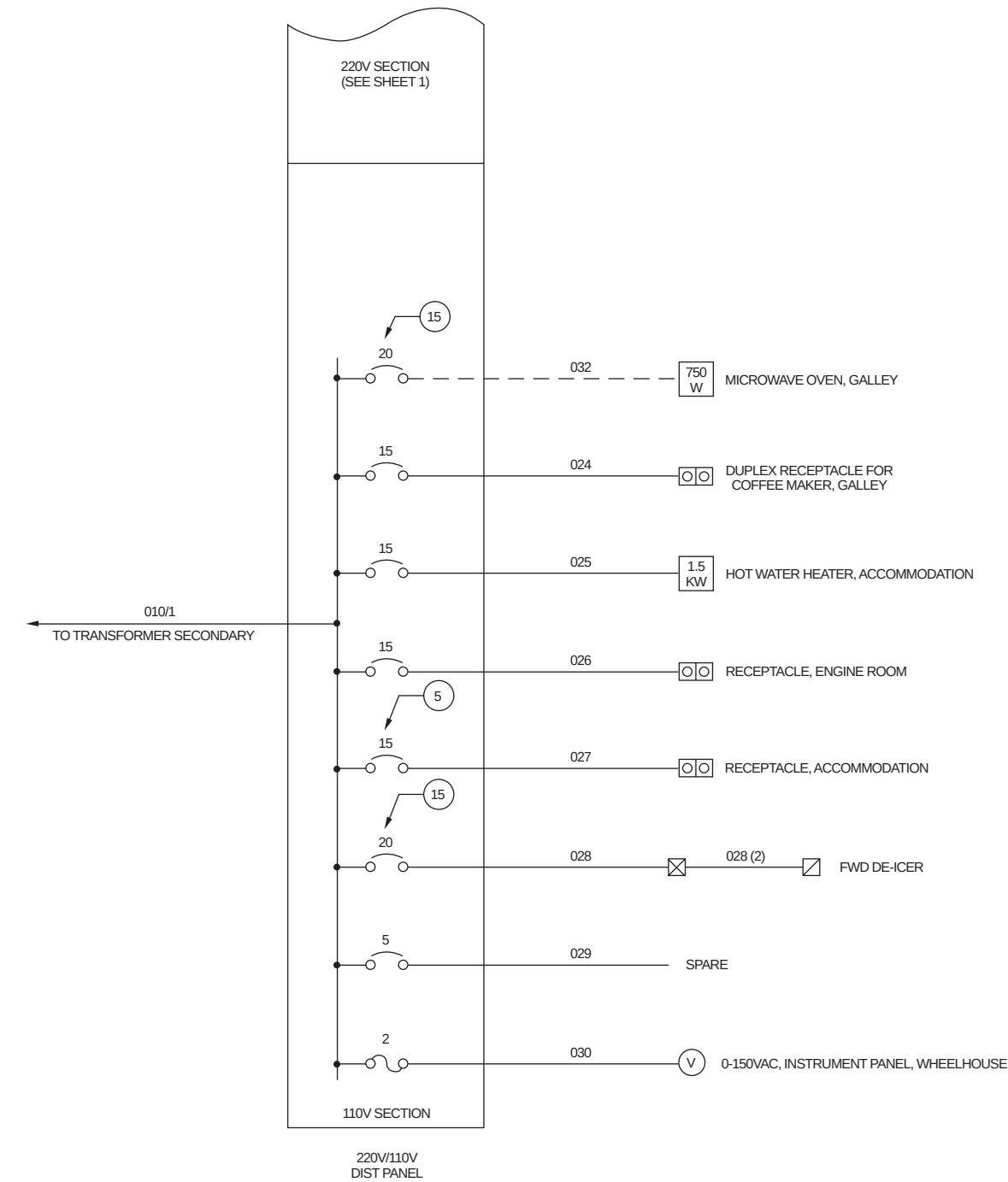
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L Port, black water system, theory of operation	0011 00-2
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END OF WORK PACKAGE

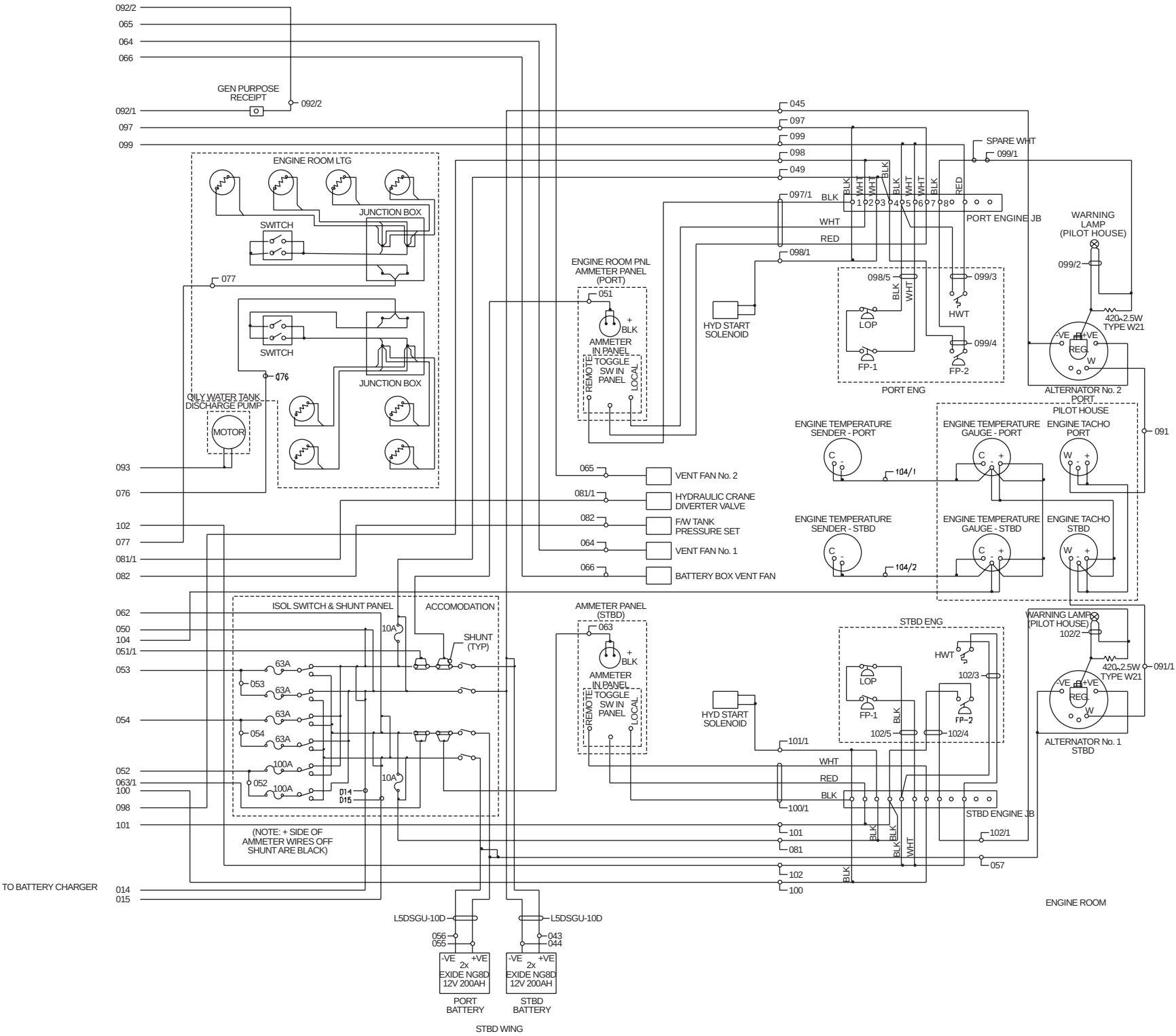


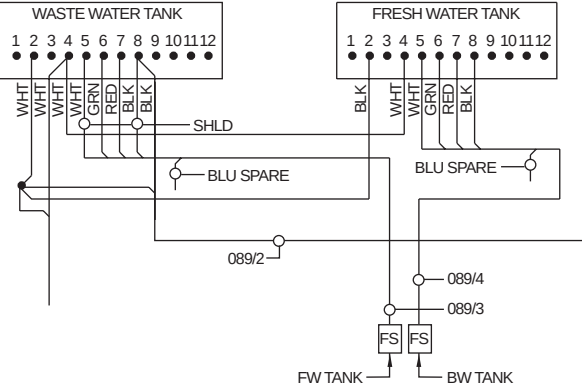
220/110 VAC SUPPLY AND DISTRIBUTION



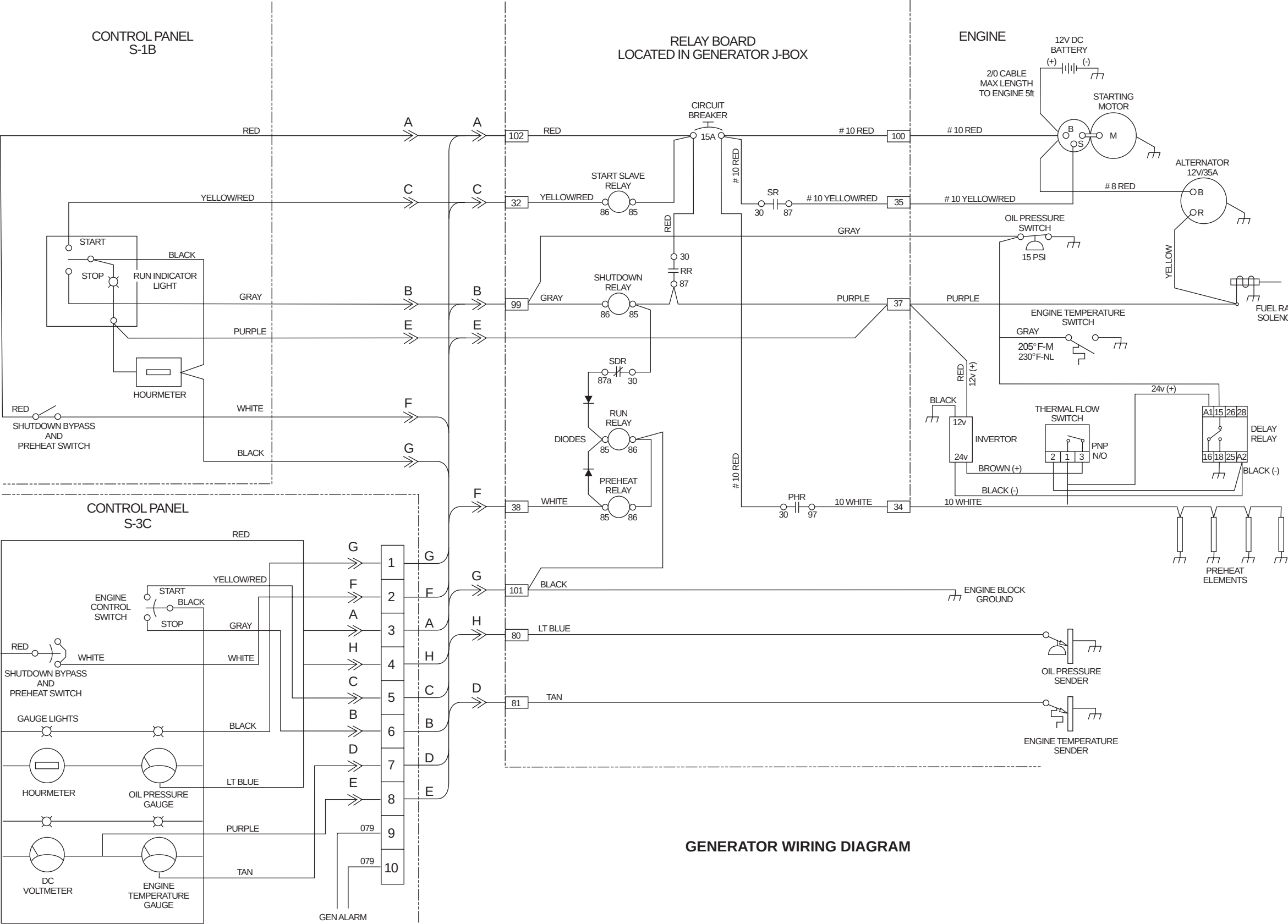
220/110 VAC SUPPLY AND DISTRIBUTION



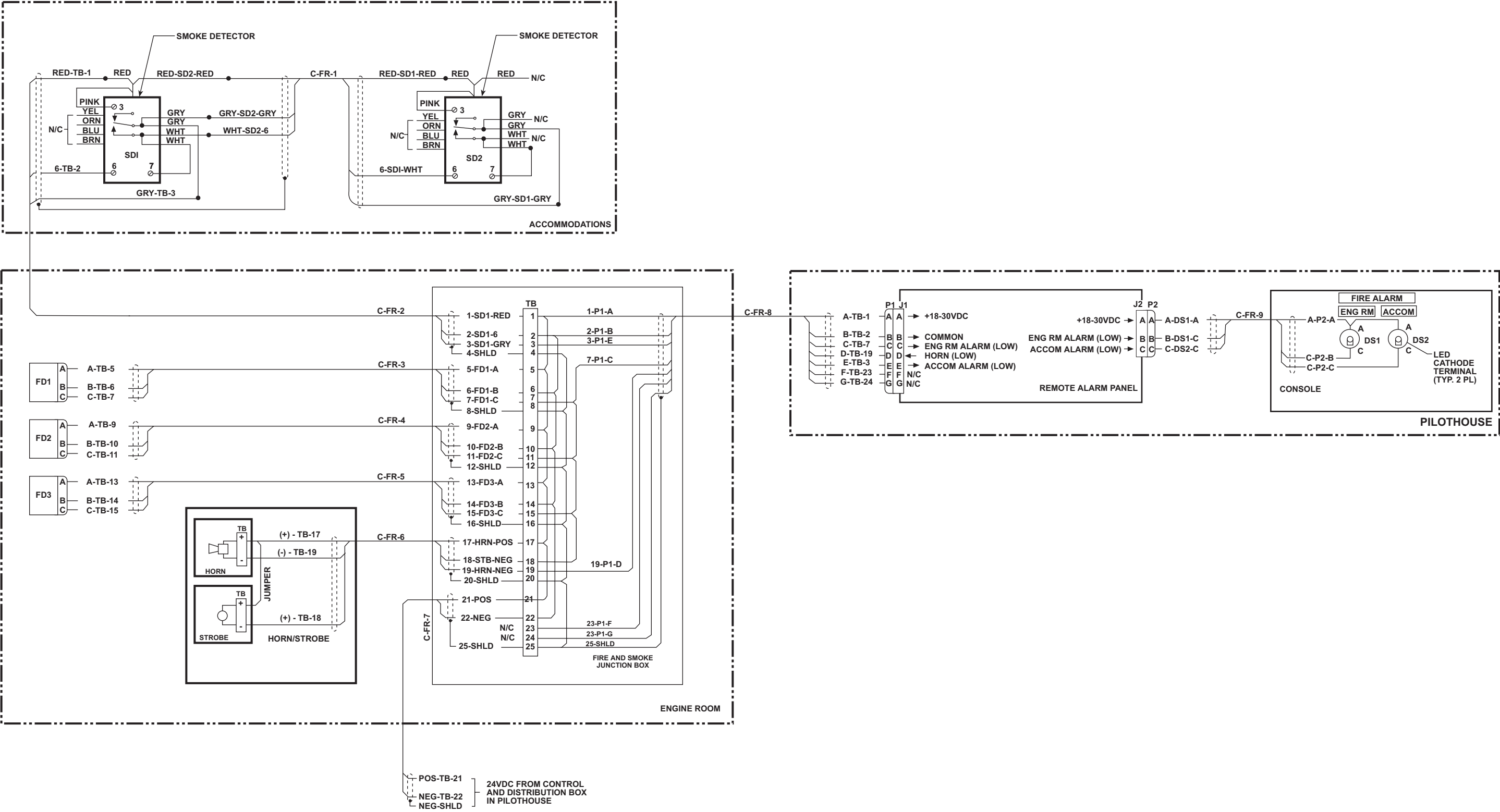




24 VDC ELECTRICAL SUPPLY AND DISTRIBUTION



GENERATOR WIRING DIAGRAM



FIRE ALARM WIRING DIAGRAM

By Order of the Secretary of the Army:

Official:



SANDRA R. RILEY

*Administrative Assistant to the
Secretary of the Army*

PETER J. SCHOOMAKER
*General, United States Army
Chief of Staff*

0524901

DISTRIBUTION: To be distributed in accordance with the initial distribution requirements for IDN: 256854, requirements for TM 55-1905-242-14.

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: "Whoever" whoever@avma27.army.mil
To: whoever@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 For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.						Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE: Date form is filled out.
TO: (Forward to proponent of publication or form) (Include ZIP Code) Mailing address found on title block page.						FROM: (Activity and location) (Include ZIP Code) Your mailing address.	
PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS							
PUBLICATION/FORM NUMBER: TM X-XXXX-XXX-XXX						DATE: Date of the TM.	TITLE: Title of TM.
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)	
	0019 00 1	3	1	1		Step No. 2 says to secure doors open with locking bar or hooks from where to what? The bars or hooks are not identified.	
	0019 00 4	4	1	1		Step No. 19 states to remove locking bars, pins or hooks from where to what? The bars, pins or hooks are not identified. Where are they stored?	
SAMPLE							
* Reference to line numbers within the paragraph or subparagraph.							
TYPED NAME, GRADE OR TITLE Doe, John, CPL				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION 755-1313		SIGNATURE CPL John Doe	

TM 55-5825-311-10-2

TO: (Forward to proponent of publication or form) (Include ZIP Code)				FROM: (Activity and location) (Include ZIP Code)				DATE:	
PART II- REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS									
PUBLICATION/FORM NUMBER: TM X-XXXX-XXX-XXX						DATE: Date of the TM.		TITLE: Title of TM.	
PAGE NO.	COLM NO.	LINE NO.	FEDERAL STOCK NUMBER	REFERENCE NO.		FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION
SAMPLE									
PART III - REMARKS (Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)									
* Reference to line numbers within the paragraph or subparagraph.									
TYPED NAME, GRADE OR TITLE Doe, John, CPL				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION 755-1313			SIGNATURE <i>CPL John Doe</i>		

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		

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		

TO: <i>(Forward direct to addressee listed in publication)</i>				FROM: <i>(Activity and location) (Include ZIP Code)</i>				DATE	
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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			
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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		

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigrams = .035 ounce
 1 dekagram = 10 grams = .35 ounce
 1 hectogram = 10 dekagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46
 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

Sqaure 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 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>Multliply by</i>	<i>To change</i>	<i>To</i>	<i>Multliply 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	sqaure 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	millitliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pounds-inches	newton meters	.11296			

Temperature (Exact)

° F	Fahrenheit	5/9 (after	Celsius	° C
	temperature	subtracting 32)	temperature	

