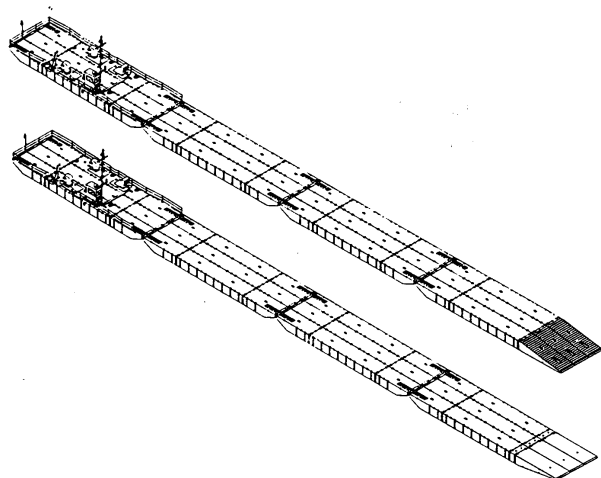


TECHNICAL MANUAL

**UNIT, DIRECT SUPPORT AND GENERAL
SUPPORT MANUAL MAINTENANCE**

**MODULAR CAUSEWAY FERRY (MCF)
NSN 1945-01-398-3856**



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

WARNING SUMMARY

CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU

Carbon monoxide is without color or smell, but can kill you. Breathing 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. Carbon monoxide can become dangerously concentrated under conditions of no ventilation.

Precautions must be followed to ensure operator's safety when MCF Powered Module is in operation.

- OPERATE the powered module with the exhaust pipes unobstructed.
- DO NOT operate the powered module with a known exhaust (combustion air) leak.
- BE ALERT at all times during operating procedures for carbon monoxide poisoning. If exposure is present, IMMEDIATELY evacuate personnel to fresh air.
- BE AWARE the field protection mask used for nuclear-biological-chemical attack WILL NOT protect you from carbon monoxide poisoning.

- THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION.

LIFE PRESERVERS, LIFE RAILS, LIFE RINGS

Wear life preservers (work vest) at all times when aboard the boat. Personnel could fall overboard. Have life rails in place and life rings available. Wear life preservers (work vest) at all times when aboard the boat.

PERSONAL PROTECTIVE GEAR

Hardhats and safety shoes must be worn by all personnel. Noise in unstaffed areas will exceed 85 decibels (db) during normal operation. Hearing protection is required.

NO SMOKING

THERE IS ABSOLUTELY NO SMOKING ABOARD THIS VESSEL.

ROADWAY CONNECTORS

Minimize vessel maneuvering against bay until all roadway connectors are in place. Personnel injury could result.

SLAVE STARTING

Do not allow personnel between boats during slave starting.

ROUGH WEATHER OR NIGHT CONDITIONS

Extra precautions must be observed during rough weather conditions or night operations.

LOSS OF STEERING

In the event of loss of steering, get out of the seaway as quickly and safely as possible, install the emergency steering system, drop anchor, and wait for assistance (refer to paragraph 2-85).

Warning a

WARNING SUMMARY (Cont'd)

COOLING SYSTEM

Debris could be ingested into the cooling water system. Insure the grating is installed. If clogged, there will be a decrease in cooling effectiveness.

COILED LINES AND ROPES

Watch feet around coiled lines and ropes as they are being payed out. Personnel are to stand clear of anchor lines as it is launched.

ENGINE HATCH COVERS

Keep the engine hatch covers closed when engines are running, except when necessary during engine maintenance.

LOCKOUT, TAGOUT OF POWER SOURCE

Personnel must not service equipment unless the power source is properly locked out and tagged OUT OF SERVICE. Always disconnect electrical power before attempting any maintenance action.

HOT SURFACES

Personnel should be aware of hot surfaces to avoid burns.

HOT COMPONENTS

Contact with hot components can cause burns. Allow unit to cool down before attempting service A Inspection/maintenance activity.

ROTATING MACHINERY

To prevent loose clothing from getting caught, all rotating machinery, alternator belts and drive shaft machinery guards must be reinstalled when maintenance is completed.

JEWELRY

Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock. Remove rings, bracelets, wristwatches, and neck chains before working around or on the unit.

HEAVY OBJECTS

Exercise care and use appropriate lifting equipment when handling heavy weighted objects. Do not lift materials or equipment over 50 lbs without using appropriate material handling equipment.

Warning b

WARNING SUMMARY (Cont'd)

FLUID AND FUEL SPILLS

Lubrication oil, diesel fuel, ether starting fluid, antifreeze and hydraulic fluid are hazardous materials. Clean up of fluid spills should be handled with approved procedures. Avoid contact with fluids - solvents, antifreeze, oils, etc. Contact with skin or eyes may cause irritation or damage to eyes. Ingestion or inhalation of such fluids or fumes can be fatal. Wash hands as soon as possible if contacted. Pregnant soldiers should be especially careful not to inhale, ingest such fluids or fumes. Beware that the combination of some fluids are volatile and could ignite.

Fuel is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection is required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition. Post FUEL FLAMMABLE/NO SMOKING signs around the area. Suitable fire extinguisher must be present.

Fuel on clothing can be fatal if ignited by a static discharge. If fuel gets on your clothes, leave the refueling area as soon as possible and wet clothes with water before taking them off. In extreme cold conditions, clothes should not be wet; instead, ground yourself to a piece of grounded equipment by taking hold of it before taking off the clothes. Wash skin with warm soapy water.

Spilled fuel creates a flammable, vapor-air mixture and fire can take place. Stop refueling immediately if fuel spill occurs.

BATTERIES

Batteries give off explosive hydrogen gas. Do not smoke around batteries. When CONNECTING battery cables, always connect cable to positive battery terminal first. When DISCONNECTING battery cables, always disconnect negative cable first.

Always wear personal protective gear including safety glasses, face shield, apron, and gloves when performing maintenance of the batteries.

PROPER VENTILATION

There is the potential for explosion or fire if compartments are not properly ventilated. Keep vents clear and NO SMOKING.

PETROLEUM LEAKS

If petroleum based fluid leaks into the compartment, it becomes slippery. Petroleum based fluids contaminate bilge water and create fumes. Clean bilge prior to maintenance.

FUEL TANK PRESSURE

There is the potential of pressure build up in the fuel tank. Insure the compartment is properly ventilated and clean.

HAZARD REPORTING

Report all hazards. If at any time you detect a hazard, it is your responsibility to report the hazard to ensure that it is corrected. If you detect a "new" or "suspected new" hazard, particularly due to equipment installation, modification, or repair, it is your responsibility to report through your chain-of-command to ensure that a SAFETY GRAM is submitted to the US Army Aviation and Troop Command (ATCOM), Safety Office. This will ensure that this hazard will be investigated, publicized, or corrected, as required.

Warning c

WARNING SUMMARY (Cont'd)**CARBON DIOXIDE (CO2)**

Fire in protected compartments or accidental activation of the CO2 system while personnel occupy compartment could result in loss of life if CO2 is released. Personnel must listen for siren, recognize its sound, and evacuate space immediately (within 30 seconds).

Depression of fire suppression system control head lever releases CO2. DO NOT DEPRESS fire suppression control head lever during normal maintenance.

The forward compartment is not vented. Prior to entering this compartment after discharge of CO2 the compartment shall be completely cleared of any CO2 that may have entered. The use of an external fan positioned to draw out any remaining agent contained within is recommended.

ELECTRICAL SHORTS

Shorting positive 24 VDC to structure causes voltage arcing and flash. May cause temporary vision loss and burns. Electrical maintenance personnel should use care when troubleshooting system while energized particularly in using voltmeter probes. All maintenance performed with main circuit breaker in the OFF position and batteries disconnected.

The 24 volt system can produce high amperage. Use extreme caution while performing general maintenance procedures.

VENTILATION

When performing maintenance in the Machinery Compartment, provide adequate ventilation of the powered module machinery compartment. Extinguish all open flames, heat sources, and smoking materials.

HYDRAULICS

Hydraulic lines and components contain residual hydraulic fluid and pressure. When disconnecting hydraulic lines and removing hydraulic components, precautions shall be taken to remove pressure and collect the residual fluid in an appropriate container and prevent spillage.

HIGH VOLTAGE

Use extreme caution when checking energized circuits.

BE CERTAIN that there is someone assisting you who can remove power immediately.

ALWAYS place Power OFF warning tags on power supply switches so that no one will apply power while are performing maintenance.

POLARITY

Ensure polarity is correct when reassembling or connecting direct current (DC) motors.

Warning d

Unit, Direct Support, and General Support Maintenance Manual

MODULAR CAUSEWAY FERRY (MCF)
NSN 1945-01-398-3856

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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

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

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HOW TO USE THIS MANUAL

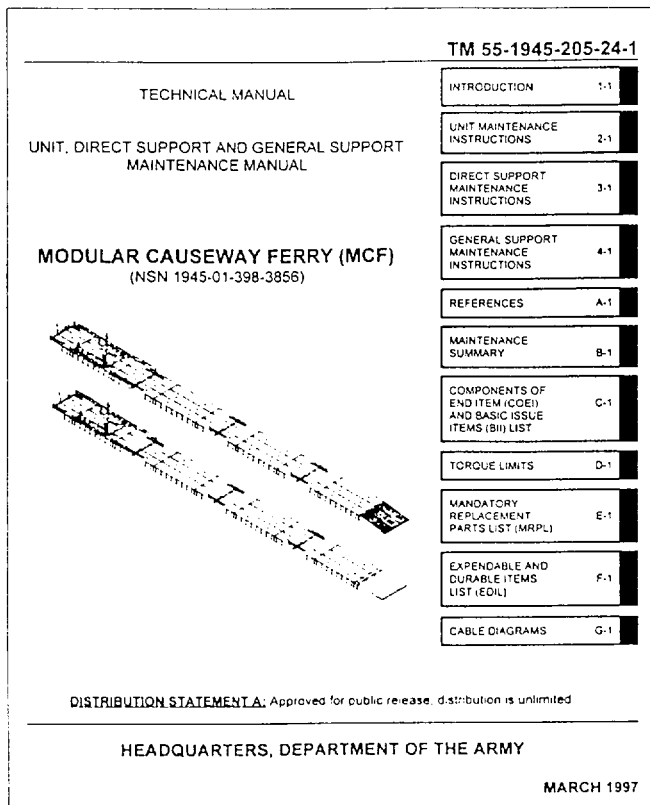
This manual contains certain features to improve the convenience of this manual and increase the user's efficiency. These features include:

a. **Accessing Information** - These include physical entry features such as the bleed-to-edge indicators on the cover and at the beginning of each major division of the manual. Extensive troubleshooting guides for specific systems lead directly to step by step directions for problem solving and maintenance tasks.

b. **Illustrations** - A variety of methods are used to make locating and fixing components much easier. Locator illustrations in PMCS tables, exploded views, and cut-away diagrams make the information in this manual easier to understand and follow.

When using the manual, read and understand the entire maintenance action before performing the task.

The following example illustrates how to use the manual.



TASK: The organizational maintenance mechanic reports that the engine exhaust is white.

TROUBLESHOOTING STEPS:

1. Look at the cover of this manual. You'll see chapter titles from top to bottom on the righthand side.
2. Look at the edge of the manual. On some of the pages you'll see black bars (edge indicators) that are aligned with the chapter bars on the cover. These are the locations of the chapters in the text.
3. Look for "UNIT MAINTENANCE INSTRUCTIONS" in the chapter list on the cover.
4. Turn to those pages with the edge indicator matching the black bar for UNIT MAINTENANCE INSTRUCTIONS. Page numbers are also listed next to chapter titles.

5. On the first page of UNIT MAINTENANCE INSTRUCTIONS is a chapter table of contents. Locate "Section IV. UNIT TROUBLESHOOTING PROCEDURES".

6. Turn to the page indicated: 2-13.

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OVERVIEW

This chapter contains information for troubleshooting and maintenance of the Modular Causeway Ferry (MCF) by unit level maintenance personnel.

Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

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2-2 Special Tools, TMDE, and Support Equipment	2-1
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2-1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

2-2 Special Tools, TMDE, and Support Equipment. Special tools are listed in Appendix B Maintenance Allocation Chart (MAC), of this manual.

2-3 Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List TM 55-1945-205-24P covering Unit, Direct Support, and General Support Maintenance for the Modular Causeway Ferry (MCF).

Section II. SERVICE UPON RECEIPT

2-4 General	2-1
2-5 Checking Unpacked Equipment	2-1
2-6 Preliminary Servicing and Adjustment of Equipment	2-2

2-4 General. This section contains service upon receipt instructions. All information required to inspect, service, and adjust the equipment and ready it for operation.

2-6 Checking Unpacked Equipment.

- a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report.
- b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.
- c. Check to see whether the equipment has been modified.

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Section IV. UNIT TROUBLESHOOTING PROCEDURES

2-8 General	2-13
2-9 Unit Troubleshooting Procedures	2-13

2-8 General. This section contains troubleshooting and corrective action procedures authorized at the unit maintenance level.

2-9 Unit Troubleshooting Procedures. Refer to symptom index to locate the troubleshooting procedure for the observed malfunction. Table 2-2 lists malfunctions that may occur during operation or maintenance of the MCF. Tests, checks, inspections, and corrective actions should be performed in the order listed. If a malfunction is beyond the scope of unit maintenance is discovered, refer the malfunction to direct support maintenance. The hydraulic schematic (Figure 2-1) and electrical schematics (Appendix G) are provided to aid in troubleshooting.

NOTE

This table is not intended to cover every possible symptom, but is rather a list of the more frequent problems and some of their causes.

SYMPTOM INDEX

Symptom	Page
1. Water is not spilling out of outlet port	2-15
2. Drive train does not operate freely and smoothly; excessive vibration is experienced during operation	2-15
3. Alternator is not charging the batteries	2-15
4. The diesel engine does not start in cold temperatures	2-16
5. Diesel engine (See Section 15, TM 55-1945-205-24 (ENGINE) for Troubleshooting)	2-10
6. Power take-off (PTO) (See Section 16, TM 55-1945-205-24 (ENGINE) for Troubleshooting)	2-16
7. The Z-drive reduction gearbox is operating hot (above 180 °F)	2-16
8. Water jet thruster is not developing thrust (no water is being delivered)	2-16
9. Thruster can only develop a small amount of thrust (not enough water is being delivered)	2-17
10. Engine exhaust has developed water leaks	2-17
11. Engine exhaust has developed exhaust leaks	2-17
12. Exhaust smoke is consistently white in nature	2-17
13. No exhaust smoke	2-17
14. High hydraulic fluid pressure, neutral condition	2-17
15. Low hydraulic fluid pressure	2-18
16. High hydraulic fluid temperature	2-18
17. Thruster steering operation does not function	2-18
18. PTO clutch operation does not function	2-19
19. Diesel engine is not receiving fuel from fuel tank	2-20
20. Diesel engine is mis-firing caused by clogged or damaged injectors	2-20
21. Bilge pump does not function	2-20
22. Bilge system reduced flow	2-21
23. Bilge Pump does not operate in Local Control Mode	2-21
24. Bilge pump does not operate in remote mode from operator cab	2-22
25. Bilge pump #1 does not operate in local control mode	2-24
26. Bilge pump #1 does not operate in remote mode from operator cab	2-25
27. Bilge pump will not shut off	2-26
28. Water entering bilge from pump discharge line when pump is not operating	2-26
29. Bilge pump starts but will not stay on in remote mode (from operator cab)	2-27
30. Thermal detector does not trip fire alarm	2-27
31. Bilge pumps will not operate from the Operator Cab	2-28

2-13

7. On the first page of "Section IV. UNIT TROUBLESHOOTING PROCEDURES", page 2-13, is the "SYMPTOM INDEX".

8. Look down the list until you find "Exhaust smoke is consistently white in nature".

9. Turn to the page indicated: 2-17.

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Table 2-3. Unit Troubleshooting Procedures (Cont.)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
Step 3	Inspect suction bowl, discharge bowl, discharge elbow, or steering nozzle for clogging. Clear debris from the water flow path of the thruster.
Step 4	Inspect suction bowl and impeller for clogging preventing impeller rotation. Clear debris from the water flow path of the thruster.
9	Thruster can only develop a small amount of thrust (not enough water is being delivered).
Step 1	Ensure diesel engine is operating at required speed. Increase the speed of the diesel engine. Notify direct support maintenance.
10	Engine exhaust has developed water leaks.
Step 1	Inspect for faulty clamps, gaskets, hoses, or exhaust system components. Replace faulty components.
11	Engine exhaust has developed exhaust leaks.
Step 1	Inspect for faulty clamps, gaskets, hoses, or exhaust system components. Replace faulty components.
12	Exhaust smoke is consistently white in nature.
Step 1	Inspect water jacketed exhaust system components for water in the exhaust piping. Repair exhaust system.
13	No exhaust smoke.
Step 1	Inspect for blockage in exhaust system components. Disassemble, locate and remove the blockage within the exhaust system.
14	High hydraulic fluid pressure, neutral condition.
Step 1	Ensure dump valve is energized. Repair electrical control circuit to the dump valve.

2-17

10. On page 2-17, steps/tests relating to resolving the problem of "Exhaust smoke is consistently white in nature" are:

Step 1. You inspect the exhaust system components and find water in the exhaust piping.

11. The corrective action is to repair the exhaust system. No references to Direct Support or General Support are included, so the task is authorized for the Unit Level Maintenance.

12. Return to page 2-1.

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OVERVIEW

This chapter contains information for troubleshooting and maintenance of the Modular Causeway Ferry (MCF) by unit level maintenance personnel.

Section I. REPAIR PARTS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

2.1 Common Tools and Equipment	2-1
2.2 Special Tools, TMDE, and Support Equipment	2-1
2.3 Repair Parts	2-1

2.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

2.2 Special Tools, TMDE, and Support Equipment. Special tools are listed in Appendix B Maintenance Allocation Chart (MAC) of this manual.

2.3 Repair Parts. If repair parts are listed and authorized in the Repair Parts and Special Tools List TM 55-1945 205-24P covering Unit, Direct Support, and General Support Maintenance for the Modular Causeway Ferry (MCF).

Section II. SERVICE UPON RECEIPT

2.4 General	2-1
2.5 Checking Unpacked Equipment	2-1
2.6 Preliminary Servicing and Adjustment of Equipment	2-2

2.4 General. This section contains service upon receipt instructions. All information required to inspect, service, and adjust the equipment and ready it for operation.

2.5 Checking Unpacked Equipment.

- Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on (SU Form 8, Manufacturing Improvement Report).
- Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA PAM 738 7-50.
- Check to see whether the equipment has been modified.

2-1

13. the chapter table of contents on page 2-1, locate "Section V. UNIT MAINTENANCE PROCEDURES".

14. Turn to the page indicated: 2-51.

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Section V. UNIT MAINTENANCE PROCEDURES

Paragraph	Page
2-10 General	2-53
2-11 Duplex Strainer	2-54
2-12 Alternator V-Belts	2-57
2-13 Alternator	2-60
2-14 Diesel Engine	2-62
2-15 Water Bypass Tube, Diesel Engine	2-63
2-16 Cold Start Starting Aid, Diesel Engine	2-64
2-17 Power Take Off (PTO), Diesel Engine	2-67
2-18 Anode, Z-Drive Reduction Gearbox Cooler	2-68
2-19 Thruster Assembly	2-70
2-20 Steering Indicator Resolver, Thruster	2-72
2-21 Thruster Junction Box	2-74
2-22 Hydraulic Junction Box	2-78
2-23 Steering Joystick Assembly	2-78
2-24 Hydraulic Manifold	2-80
2-25 Bridge Control Panel Assembly	2-84
2-26 Fast Lube System	2-87
2-27 Drive Shaft Guard	2-90
2-28 Thruster Coupling Guard	2-91
2-29 Alternator Belt Guard	2-92
2-30 Diesel Coupling Guard	2-93
2-31 Engine Exhaust System	2-94
2-32 Hydraulic System	2-97
2-33 Hydraulic Pump	2-101
2-34 Hydraulic Reservoir	2-103
2-35 Hydraulic Cylinder (PTO Clutch)	2-105
2-36 Valve Manifold Assembly	2-108
2-37 Filter Assembly, Hydraulic	2-112
2-38 Needle Valve (Hydraulic Pump Priming)	2-115
2-39 Needle Valve (Emergency Steering)	2-117
2-40 Bage Pump	2-119
2-41 Float Switch w/Guard, Bage	2-121
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2-43 Fire Suppression System	2-125
2-44 Cable Control Head, Fire Suppression System	2-130
2-45 Discharge Head, Fire Suppression System	2-132
2-46 Remote Cable Pull Box and Cable, Fire Suppression System	2-134
2-47 Time Delay Cylinder, Control Head and Pressure Switch, Fire Suppression System	2-136
2-48 Safety Outlet, Fire Suppression System	2-138
2-49 Alarm Siren, Fire Suppression System	2-139
2-50 Discharge Nozzle, Fire Suppression System	2-141
2-51 Pressure Operated Trip Mechanism, Fire Suppression System	2-143
2-52 Fuel Mech Strainer	2-144
2-53 Check Valve, Fuel System	2-146
2-54 Fuel Water Separator	2-148
2-55 Ball Valve, Fuel System	2-152
2-56 Limit Switch, Electrical System	2-154
2-57 Thermal Detector, Electrical System	2-156
2-58 Bage Pump Control Assembly "AS"	2-158
2-59 Relay, Relay Terminal and Relay Socket, Bage Pump Control	2-160
	2-51

15. In the unit maintenance procedures table of contents on page 2-51, locate Engine Exhaust System.

16. Turn to the page indicated: 2-94.

DETAILED MAINTENANCE PROCEDURES:

17. Detailed procedures: Include everything you must do to accomplish a basic maintenance task.

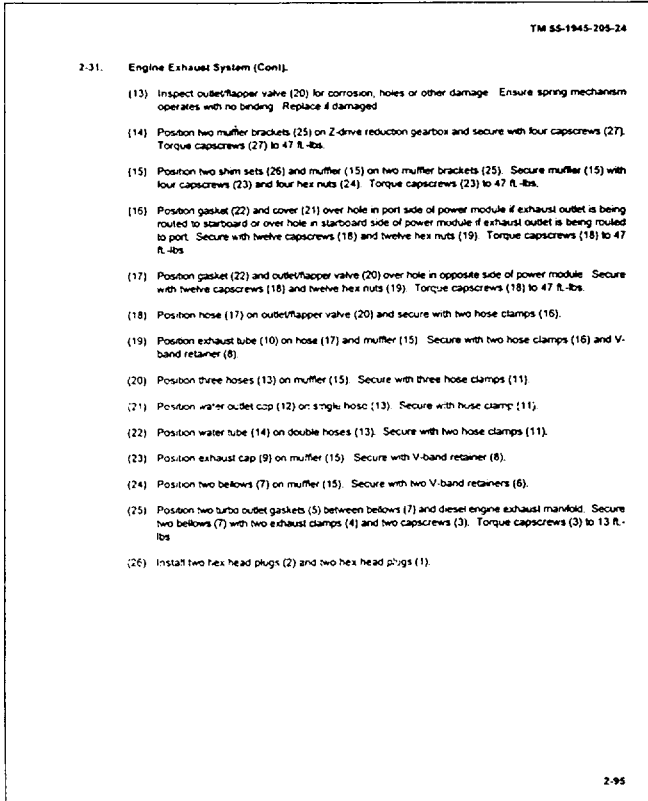
a. Before beginning the maintenance task, look through the procedure. You must familiarize yourself with the entire maintenance procedure before beginning the maintenance task. The entire procedure of paragraph 2-31: Engine Exhaust System includes: Repair.

b. four basic headings listed under "INITIAL SETUP" outline the task conditions, materials, tools and references. They are:

- Tools: Lists all tools (standard or special) required to perform the task.
- Materials/Parts: All parts or materials necessary to perform the task. Expendable and durables are identified with an item number from Appendix F and mandatory replacement parts are identified with an item number from Appendix E.

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2-31. Engine Exhaust System.	
The task covers	Repair
INITIAL SETUP	
Tools	Equipment Condition
General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-020-9783)	All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE
Torque wrench (NSN 5120-00-554-7292)	
Materials/Parts	
Gasket, Turbo Outlet (Item 4, Appendix E)	
WARNING	
Ensure exhaust system is cool before performing maintenance. Failure to comply can result in serious injury to personnel.	
NOTE: (figure 2-25)	
(1)	Drain water from the exhaust system by removing two hex. head plugs (1) and two hex. head plugs (2)
(2)	Remove two cap screws (3) and two exhaust clamps (4) securing exhaust system to diesel engine exhaust manifold and collect two turbo outlet gaskets (5)
(3)	Remove two V band retainer (6) and collect two bellows (7)
(4)	Remove two V band retainers (8) securing exhaust cap (9) and exhaust tube (10). Remove exhaust cap (9)
(5)	Remove six hose clamps (11), water outlet cap (12), three hoses (13) and water tube (14) from exhaust tube (10) and muffler (15)
(6)	Remove four hose clamp (16) securing hose (17) to exhaust tube (10) and outlet/flapper valve (20)
(7)	Remove twenty four cap screws (18) and twenty four nuts (19) securing outlet/flapper valve (20) and cover (21). Collect outlet/flapper valve (20), cover (21) and two gaskets (22)
(8)	Remove four cap screws (23) and four nuts (24) from two muffler brackets (25). Collect muffler (15) and two shim sets (26)
(9)	Remove four cap screws (27) and collect two muffler brackets (25)
(10)	Inspect exhaust port gaskets (22) integrity and damage. Replace if damaged or torn
(11)	Inspect muffler (15), water tube (14) and exhaust tube (10) for corrosion, holes or other damage. Replace if damaged
(12)	Inspect hoses (13) and (17) for punctures or cracks. Replace if damaged
	2-94



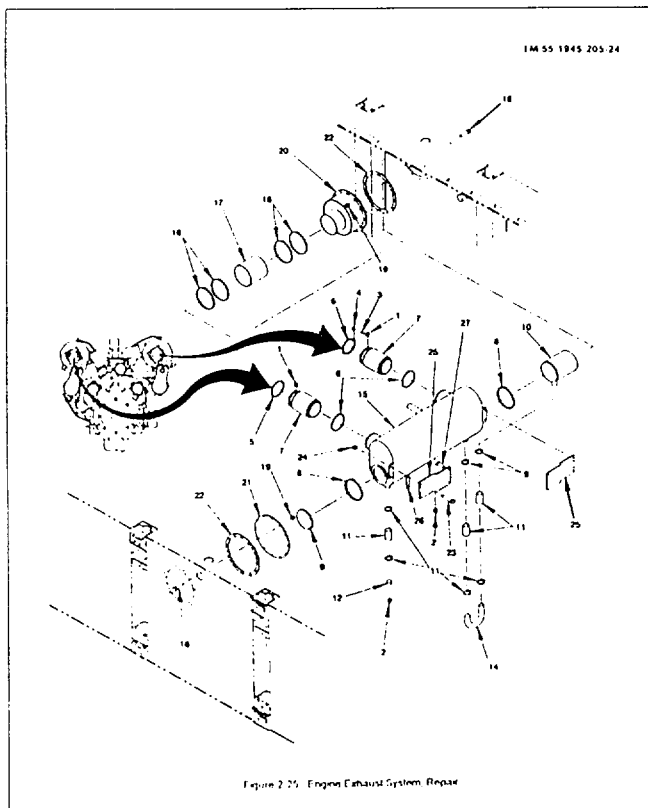
- Equipment Condition: Notes the conditions that must exist before starting the task. For engine exhaust system maintenance, all power must be off to the equipment and all equipment and controls/indicators tagged **OUT OF SERVICE**. The Equipment Condition will also include any prerequisite maintenance tasks to be performed with reference to the specific paragraph number.

- References: Other manuals necessary to complete the task. For engine exhaust system maintenance, no references are listed, so all steps to complete the task are contained within this manual. A listing of reference materials is contained in Appendix A.

- c. A step by step maintenance procedure follows the Initial Setup. Specific precautions, which may result in injury to personnel or damage to equipment, are contained within the maintenance procedure. Repair of the engine exhaust system consists of two pages of text (2-94 and 2-95) and one page of illustration (2-96) to show part location.

- d. At the end of a procedure, "FOLLOW ON MAINTENANCE" will list those additional tasks that must be performed to complete the procedure.

18. Refer to TM 55-1945-205-24P; Unit, Direct Support and General Support Maintenance Repair Parts and Special Tools List for Modular Causeway Ferry (MCF), when requisitioning parts, special tools, and equipment for unit, direct support and general support maintenance.



CHAPTER 1

INTRODUCTION

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 Section I GENERAL INFORMATION 1-1
 Section II EQUIPMENT DESCRIPTION AND DATA 1-5
 Section III PRINCIPLES OF OPERATION 1-8

OVERVIEW

This chapter contains general information pertaining to Modular Causeway Ferry (MCF) and its components.

Section I. GENERAL INFORMATION

1-1 Scope 1-1
 1-2 Maintenance Forms and Procedures 1-1
 1-3 Destruction of Army Material to Prevent Enemy Use 1-1
 1-4 Preparation for Shipment or Storage 1-1
 1-5. Quality Assurance (QA) 1-4
 1-6 Reporting Equipment Improvement Recommendations (EIRs) 1-4
 1-7 Warranty Information 1-4
 1-8 Equipment Requiring Calibration 1-5
 1-9 Corrosion Prevention and Control (CPC) 1-5

1-1. Scope. This manual contains instructions for Unit, Direct Support, and General Support Maintenance levels for the Modular Causeway Ferry (MCF).

The model number(s) assigned to this equipment are (TBD).

1-2. Maintenance Forms and Procedures. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750 as contained in the Maintenance Management Update.

1-3. Destruction of Army Material to Prevent Enemy Use. Procedures for destruction of Army material to prevent enemy use are contained in TM 750-244-6.

1-4. Preparation for Shipment or Storage. Refer to TM 55-1945-205-10 and the following for procedures to place the equipment into storage and prepare equipment for shipment.

1-4.1. Non-Powered Modules Preservation. All preservation procedures on non-powered modules (beach/sea end, center, end rakes, and P3 may be performed by lower level maintenance. (Refer to TM 55-1945-205-10).

1-4.2. General Instructions. The following instructions apply whenever the MCF is being prepared for shipment or storage.

- a. All Modular Causeway Ferries (MCF) are to be shipped in kit formats by section. Each MCF consists of one (1) Beach/Sea End Section Assembly (P/N E19183), two (2) Intermediate Section Assemblies (P/N E19193) and one (1) Powered Section Assembly (P/N E19203).
- b. Packing and packaging shall be to Level A (maximum protection during storage and transportation) in accordance with MIL-STD-2073-1A.
- c. The various components of the Modular Causeway Ferry (MCF) shall be packaged, preserved, marked, and identified as specified herein.
- d. Battery cables B-4 and B-5 shall be disconnected prior to shipment.

- e. Fire suppression cable control head and discharge heads shall be disconnected prior to shipment.
- f. Sea chest valve shall be closed prior to shipment.
- g. Fuel line ball valves (supply and return) at fuel tank shall be closed prior to shipment.

1-4.3. Propulsion Module Preservation. The following preservation procedures must be performed prior to packing for shipment and long-term storage (more than 30 days)..

- a. Preserve Diesel Engine and Marine Gear in accordance with Extended Storage instructions contained in Section 15.3 of TM 55-1945-205-24-2.
- b. Fill Hydraulic Reservoir to the top of sight gauge with fresh lubricant specified in LO 55-1945-205-12 and install a red tag with instructions to drain to operating level and sample the hydraulic fluid prior to operation. (Refer to paragraph 2-28).
- c. Drain and fill Transfer Case to top of gear case with fresh lubricant specified in LO 55-1945-205-12 and install a red tag with instruction to drain case to operating level and sample the oil prior to operation. (Refer to paragraph 3-14).
- d. Tie a plastic bag over Transfer Case Breather and install a yellow tag with instructions to remove plastic bag prior to operation.
- e. Ensure the drive shaft grease fittings are thoroughly greased. (Refer to paragraph 2-12).
- f. Close fuel system supply and return ball valves. (Refer to TM 55-1945-205-10, paragraphs 2-30). Drain and flush fuel tank, after flushing dry tank with compressed air.
- g. Disassemble fuel/water separator on the fuel tank, clean and dry separator. (Refer to paragraph 2-49).
- h. Drain and fill pump-jet gearbox to the mounting flange of the upper gear case cover with fresh oil specified in LO 55-1945-205-12 and install a red tag with instruction to drain pump-jet gearbox to operating level and sample lubricant prior to operation. (Refer to paragraph 2-21). The vent cap on the thruster expansion tank is a pressure compensated vent. Vent should not be covered during shipment and storage.
- i. Fill both planetaries completely with oil specified in LO 55-1945-205-12, tie plastic bags over the breather vent caps and install yellow tag with the instructions to drain to proper level and sample oil at start-up. (Refer to paragraph 2-21).
- j. Ensure that the emergency steering unit grease fittings are thoroughly greased.
- k. Insert desiccant bags inside all electrical control boxes. Install a yellow tag with instructions to remove desiccant bags prior to operation.

1-4.4. Propulsion Module Preparation for Shipment. The following procedures must be performed prior to shipment of the propulsion module.

- a. Insure propulsion module has been preserved per instructions in paragraph 1-4.3.
- b. Disconnect Cable Control Head from CO₂ cylinder in lazaret. Rotate control head upward and secure to overhead piping. Install a red tag to reconnect cable control head prior to operation.
- c. Remove Lever Control Head and Flex Hose from CO₂ cylinders and screw shipping cap back onto cylinders. Install a red tag to reconnect lever control head prior to operation.
- d. Disconnect battery cables B4 and B5 prior to shipment. Tag and secure cables in module. Install a red tag on the batteries to reconnect cables B4 and B5 prior to operation.

- e. Make sure that butterfly valve at the sea chest is in the closed position prior to shipment.
- f. Attach a red tag to diesel engine raw water pump with warning to make sure raw water pump impeller is removed if engine is to be started with the module out of the water and the raw water system de-activated.
- g. Check that the main circuit breaker switch in the propulsion module is in the off position.
- h. Check that all stored components in the lazaret are secure.
- i. Remove the two emergency battle lanterns from the propulsion module. The batteries should be removed from the lanterns and then the batteries and lanterns packaged, marked for shipment with other loose items.
- j. Check that hatches are securely locked.
- k. Interconnect cables in propulsion module to be secured to tubular hanger on underside of engine hatch. Pins and receptacles to be coated with silicone compound G623.
- l. Engine heater hoses should be draped down to the lower deck and secured to prevent damage from shipping vibration.

1-4.5. Operator Cab/Air Plenum Preparation for Shipment. The following procedure must be performed prior to shipment of the cab, intake air plenum and exhaust plenums.

- a. Coat rubber seal on cab door with MIL-C-21567 silicone compound or commercial equivalent.
- b. Remove windshield wiper blade from wiper assembly, wrap, label and store inside operator's cab prior to packaging cab.
- c. Remove the batteries from the emergency battle lantern on the cab. Batteries should be wrapped and labeled.
- d. Remove Triton Radio Receiver/Transmitter and battery pack with leather case and head set (P/N E06498-1, -2, -3, and -4). Items should be wrapped and labeled for shipment.
- e. Disconnect and remove the following items from the operator's cab prior to shipment:
 - Spotlight, P/N E09438
 - Singgars Antenna, P/N E02873, Item 38
 - Navigation Bell, P/N E08278
 - Antenna, P/N E06508-2
 - Navigation Horn, P/N E08108
- f. Apply a film of grease (MIL-G-81322) to the air intake louvre door hinges on the cab and intake plenum assemblies.
- g. Exhaust plenum opening shall be sealed with barrier wrap or suitable material.
- h. Before closing up the cab, insert desicant bags inside control panels. Install yellow tags with instructions to remove desicant bags prior to operation.

1-4.6. Mast/Stub Mast Preparation for Shipment. The following procedures must be performed before shipment of the navigation masts.

- a. Remove all the light bulbs from the mast and stub mast assembly lighting fixtures. Bulbs should be identified and packaged in a separate container to be secured inside the mast shipping container.
- b. Disconnect electrical cable connectors at terminal box and secure the two cables to the lower yardarms.

- c. Disconnect bottom mast subassembly from upper mast subassembly by removing mounting hardware. Mounting hardware should remain with the upper mast subassembly during shipping.

1-4.7. Electrical Interconnect Cable Preparation for Shipment. Prior to packaging the interconnect cable assembly the pins and connectors should be coated with silicone compound G623.

1-4.8. Preparation For Delivery.

- a. Refer to TM 55-1945-205-10 for shipping breakdown of MCF components by section.
- b. The 40' Non-Powered pontoons, 20' Raked pontoons, 40' Propulsion Modules and Beach/Sea End Modules are shipped self-contained. All remaining components will be shipped in containers or on skids identified for use with their intended section assembly (i.e., Beach Sea End Section Assembly, Intermediate Section Assembly or Powered Section Assembly). Components for each section will be shipped in wooden containers sequentially numbered for that section only.
- c. Cleaning, if necessary, shall be in accordance with process C-1 and drying, if required, shall be in accordance with procedure D1 or D4 of MIL-P-116 as noted below:
 - Process C1 of MIL-P-116 - Items shall be cleaned by any process or combination of processes which will accomplish thorough cleaning without damage to the item.
 - Procedure D1 of MIL-P-116 - Drying shall be accomplished by subjecting the item to a blast of prepared dry and clean compressed air.
 - Procedure D-4 of MIL-P-116 - Drying shall be accomplished by wiping the surfaces of the item with clean, dry, lint free cloths.
- d. The unit package and packing shall incorporate sufficient cushioning material, bracing or other shock- absorbing devices, to ensure that the components will meet their intended functional requirements after transportation. Cushioning material and packaging procedures shall be such that the components/system shall not be contaminated with dust or foreign materials.
- e. Components and/or assemblies shall be packed in wooden boxes in accordance with PPP-B-601, except for the following items which are banded to wooded skids:
 - Exhaust Plenum Assembly, P/N E18263
 - Intake Plenum Assembly, P/N E12183
 - Anchor Assembly, P/N E20053 (less Buoy and Rope Assemblies)
 - Spreader, P/N E1 9872

Refer to TM 55-1945-205-10 for container component breakdown by section.

1-5. Quality Assurance (QA). Torque values, adjustment measurements and readings identified within maintenance procedures will receive an inspection by a designated quality insurance inspector before starting the next step, unless it has been determined that the inspection can be performed after completing the entire procedure.

1-6. Reporting Equipment Improvement Recommendations (EIRs). If your MCF system needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell what you don't like about your equipment, design or performance. Put it on a SF 368 (Product Quality Deficiency Report) Mail it to us at: Commander, U.S. Army ATCOM, ATTN: AMSAT-I-MTW, 4300 Goodfellow Blvd., St. Louis, MO, 63120-1798.

1-7. Warranty Information. The MCF is warranted to be free of material and workmanship defects within the scope of the purchase specifications for a period of eight months after government acceptance. Report all defects in material and workmanship to your supervisor, who will take appropriate action.

The manufacturer does not warrant conditions resulting from damage and/or neglect from use outside the scope of normal operating and maintenance procedures as set forth in the applicable manuals.

1-8. Equipment Requiring Calibration. Calibration requirements for the MCF are found in appropriate technical manuals and technical bulletins.

1-9. Corrosion Prevention and Control (CPC). Corrosion Prevention and Control (CPC) of Army material 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 Standard Form 368, Product Quality Deficiency Report. Use of keywords such as "corrosion", "rust", "deterioration", or "cracking" will ensure that the information is identified as a problem. The form should be submitted to the address specified in DA PAM 738-750.

Section II. EQUIPMENT DESCRIPTION AND DATA

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1-11	Equipment Data.....	1-5
1-12	Safety Procedures.....	1-5
1-13	Disassembly and Assembly Procedures.....	1-6
1-14	General Repair Practices.....	1-7

1-10. Equipment Characteristics, Capabilities and Features. Detailed descriptions and data covering the Modular Causeway Ferry (MCF) are described in TM 55-1945-205-10.

1-11. Equipment Data. TM 55-1945-205-10 contains tabulated data for the Modular Causeway Ferry (MCF). Additional data applicable to the Unit, Direct Support and General Support levels can be found at the front of the applicable chapters of this manual.

1-12. Safety Procedures.

a. First Aid of Injuries. Refer to FM 21-11, First Aid for Soldiers, for first aid treatments of injured personnel. For any injury, always seek medical attention immediately.

b. Personnel Precautions. Observe all warnings listed in this manual. Basic safety precautions are listed before the procedures to which they apply. The work WARNING appears in this technical manual to alert you to situations that could cause you injury. Other general safety precautions to follow are:

- (1) USE PERSONAL PROTECTIVE EQUIPMENT. Protect your eyes against acid burns and foreign objects. Operate MCF only when necessary to keep sound levels down and prevent hearing loss. Guard your skin from burns, rashes and toxic substances that are absorbed through the skin.
- (2) STAY CLEAR OF MOVING PARTS. Remove watches, rings and other jewelry that could catch in moving parts and cause injury. Keep hands, feet and clothing away from all machinery in motion.
- (3) USE CARE IN THE HANDLING OF FLAMMABLE MATERIALS. Notify others in the area that you are handling flammable. Know emergency procedures in case of accident or fire.
- (4) USE SPECIAL CARE WHEN HANDLING FUEL OR WORKING ON FUEL SYSTEM. Fuel is very flammable and can explode easily. To avoid serious injury or death, observe the following precautions:
 - (a) Keep fuel away from open flame or any spark (ignition source).
 - (b) Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.
 - (c) Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.

- (d) Clean fuel tank to purge any flammable liquid or vapors before welding, grinding or using any heat producing device near the fuel tank.
 - (e) "NO SMOKING" when working with open fuel, fuel lines or fuel tanks.
- (5) VENTILATE. Carbon monoxide is a colorless, odorless, deadly poisonous gas, which, when breathed, deprives the body of oxygen and causes suffocation. Carbon monoxide becomes dangerously concentrated under conditions of inadequate ventilation. To avoid serious injury or death, observe the following precautions:
- (a) Do not operate engine in an enclosed area unless it is adequately ventilated.
 - (b) Do not idle engine for long periods without maintaining adequate ventilation in compartments.
 - (c) Be alert at all times during MCF operation for exhaust odors and exposure symptoms. If either are present, immediately ventilate compartments.
- (6) USE CARE WHEN PERFORMING MAINTENANCE PROCEDURES ON ELECTRICAL COMPONENTS. Always disconnect battery ground cable or power source before working on electrical components. If you receive an electrical shock, get medical attention immediately.
- (7) USE CARE WHEN HANDLING HEAVY ITEMS. Properly support heavy items before removing. To avoid serious injury or death, observe the following precautions:
- (a) Keep clear of suspended items.
 - (b) Use sufficient number of personnel to maintain control of items.
 - (c) Use a hoist or get help when lifting components that weigh more than 50 lbs.
 - (d) If an item begins to fall; let it fall.

1-13. Disassembly and Assembly Procedures. Follow these general practices when performing disassembly and assembly procedures.

- a. Read the procedure and thoroughly understand it before performing maintenance or repair. Be alert during procedure.
- b. Keep major components and assemblies together whenever possible and practical.
- c. Tag hoses, electrical wires, cables and harnesses to identify them and aid in installation.
- d. Have all the necessary parts, tools, material and personnel before starting procedure.
- e. Keep related parts together for identification purposes.
- f. To prevent loss, temporarily reinstall attaching hardware such as screws, bolts, washers and nuts.
- g. Cap all hydraulic or other fluid lines and fittings when disconnected.
- h. Only disassemble to point of problem.
- i. Make sure parts are clean and lubricated before assembly.

1-14. General Repair Practices.

- a. Perform General troubleshooting procedures.
- b. Replacement of Parts. Only replace unserviceable parts or parts which must be discarded. Always discard the following: cotter pins, lockwire, preformed packings (o-rings) and non-neoprene seals and gaskets.
- c. Cleaning. Cleaning is a necessary part of most tasks. Use the following guidelines when cleaning:

WARNING

Before using any and all chemicals, read and understand all information in the Material Safety Data Sheets (MSDS) for each chemical.

- (1) Use cleaning solvent for cleaning metal parts only.
- (2) Use a mild detergent solution for cleaning rubber, plastic and nylon parts.
- (3) Always clean parts before inspecting them. Ensure all dirt, grit, grease, and other accumulations are removed from parts to enable a proper inspection.

WARNING

When using compressed air, its pressure shall not exceed 30 psi. Use only with effective chip guarding and personnel protective equipment (goggles/shield, gloves, etc.). Do not direct airstream towards self or other personnel.

- (4) Dry parts with lint free cloths. Use compressed air when specified.
- (5) Use a wire brush, tap or die to clean rust, accumulated dirt, sealant and paint from bolts, screws, nuts and threaded holes.
- (6) After cleaning, protect all parts from dust and dirt.
- (7) Keep work area floors and workbenches clean and dry. Clean as you go to prevent accidents.
- (8) Dispose of oily rags in specified containers to prevent fire hazard.
- (9) Keep the MCF clean. Oil, grease and debris may hide a serious problem.
- (10) Clean all new parts before installation.

c. Inspection Criteria. Proper inspection of parts and operating equipment prevents small problems from becoming major problems. Equipment defects can be discovered by performing PMCS at both crew and organizational levels. Perform detailed inspection any time a component is disassembled.

- (1) Visually check for any of the following problems: broken welds, loose fasteners, damaged threads, bending, cracking, deformity, nicks, cuts, scratches, gouges, distortion, blockage or inoperability.
- (2) Check for evidence of excessive or uneven wear.
- (3) Inspect all new parts for defects before installation.
- (4) Routinely check hoses, lines and fittings for leaks.

d. General Repair Practices. The following are general repair practices to follow. To prevent further damage to components, take corrective action promptly. Be sure to follow all warnings, cautions and notes.

- (1) Discard broken and non-reusable parts.
- (2) Paint exposed metal to protect from rust. Do not paint electrical harnesses, wiring, hoses or finished machine parts.
- (3) Perform all lubrication and PMCS on schedule.
- (4) Remove burrs, scratches or raised metal. Use a fine file, stone or crocus cloth dipped in oil.

e. Lubrication. Refer to LO 55-1945-205-12 for detailed, illustrated instructions on proper lubrication. Some general practices to remember include:

- (1) Use the correct lubricant.
- (2) Keep lubricants clean.
- (3) Clean all fittings prior to lubrication.
- (4) Lubricate cleaned disassembled, and new parts to prevent rust.

f. Application of Adhesives. Silicone rubber adhesive, sealing compound and thread retaining compounds are recommended in some tasks to ensure and strengthen seals. The following procedures describe their correct use and application.

- (1) Silicone Rubber Adhesive.
 - (a) Thoroughly clean all existing sealant and dirt that may remain on parts. The sealant must have a clean surface to adhere to or there will not be an effective seal.
 - (b) After the parts are cleaned, apply sealant and reassemble.
- (2) Retaining and Sealing Compounds.

WARNING

Refer to Material Safety Data Sheets (MSDS) before using any and all retaining sealing compounds.

Section III. PRINCIPLES OF OPERATION

1-15	MCF Functional Description	1-8
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1-15. MCF Functional Description. For functional descriptions of the MCF and all of its major assemblies and subassemblies, refer to TM 55-1945-205-10.

CHAPTER 2

UNIT MAINTENANCE INSTRUCTIONS

OVERVIEW 2-1

Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT 2-1

Section II SERVICE UPON RECEIPT..... 2-1

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OVERVIEW

This chapter contains information for troubleshooting and maintenance of the Modular Causeway Ferry (MCF) by unit level maintenance personnel.

Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

2-1 Common Tools and Equipment..... 2-1

2-2 Special Tools, TMDE, and Support Equipment..... 2-1

2-3 Repair Parts 2-1

2-1. Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

2-2. Special Tools, TMDE, and Support Equipment. Special tools are listed in Appendix B Maintenance Allocation Chart (MAC), of this manual.

2-3. Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List TM 55-1945- 205-24P covering Unit, Direct Support, and General Support Maintenance for the Modular Causeway Ferry (MCF).

Section II. SERVICE UPON RECEIPT

2-4 General..... 2-1

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2-6 Initial Servicing and Adjustment of Equipment..... 2-2

2-4. General. This section contains service upon receipt instructions and all information required to inspect, service, and adjust the equipment and ready it for operation.

2-5. Checking Unpacked Equipment.

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report.

b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA PAM 738-750.

c. Check to see whether the equipment has been damaged during shipment. Report all damage to your supervisor.

2-6. Initial Servicing and Adjustment of Equipment. The MCF is shipped in ISO PACK configurations. To prepare the equipment for use after delivery or after long term storage, carefully unpack all components and perform the following inspections and servicing. Refer to TB 740-97-4.

- a. Perform "Procedure for Restoring and Engine to Service Which Has Been in Extended Storage" steps listed in section 15.3 of TM 55-1945-205-24-2.
- b. Check or change engine oil and filters (LO 55-1945-205-12).
- c. Check engine cooling water (ethylene glycol/water) and filter (TM 55-1945-205-10).
- d. Drain fluid in hydraulic system to operating level and sample the fluid prior to operation. Drain and bleed system as necessary in accordance with paragraph 2-28.
- e. Drain transfer case lubricating oil to operating level and sample the lubricant prior to operation.
- f. Restore the marine gear to operating condition in accordance with Section 15.3 of TM 55-1945-205-2 and paragraph 2-20.
- g. Drain lubricating oil in pump-jet planetary gearboxes to operating levels and take samples prior to operation. Refer to paragraphs 2-21 and 2-23 for instructions..
- h. Drain lubricating oil in pump-jet upper gearbox to operating level in accordance with paragraph 2-21. Sample the oil prior to operation.
- i. Check hydro-handpump oil level in accordance with paragraph 2-21.
- j. Lubricate drive shafts in accordance with LO 55-1945-205-12 and paragraph 2-12.
- k. Check charge on batteries. 804D batteries (Main batteries) should indicate 12.72 volts output or a specific gravity of 1.265 at 77° F. Charge, as necessary, at 10-20 amperes for approximately 2 hours. DG12-12 (located in A9 panel) should indicate 12/66 volts output at 77° F. Charge, as necessary, at 500 micro-amperes for approximately 3 hours. Connect main battery cables in accordance with TM 55-1945-205-10 and paragraph 2-66.
- l. Adjust alternator belts in accordance with paragraph 2-15.
- m. Remove fuel system inspection access cover. Visually inspect tank.
- n. Fill fuel tank with diesel fuel to a level where fuel is at the FULL mark on the sight level, in accordance with TM 55-1945-205-10:
- o. Check or change the filter element in the fuel/water separator in accordance with paragraph 2-49.
- p. Check and clean raw water duplex strainer baskets in accordance with paragraph 2-11.
- q. Check/replace raw water cooling system anodes (sea chest, raw water pump, fuel cooler, heat exchanger, marine gear oil cooler and transfer case oil cooler).
- r. Check for smooth operation of exhaust system flapper valve. Refer to paragraph 2-27 and figure 2-19.
- s. Prior to assembly of powered section, verify port/starboard configuration of exhaust outlet port. Reassemble exhaust system if necessary (paragraph 2-27)
- t. Check and clean bilge pump strainers (TM 55-1945-205-10).
- u. Touch-up paint as required on all modules.

2-6. Initial Servicing and Adjustment of Equipment (Cont).

- v. Check for installation of drain plug in bottoms of non-powered modules in accordance with TM 55-1945-205-10. Replace if damaged or missing.
- w. Weigh fire suppression system CO2 cylinder (paragraph 2-38).
- x. Prime the raw water pump in accordance with TM 55-1945-205-10.

NOTE

The following procedures assumes that the Powered Section is assembled.

- y. Perform PMCS in accordance with TM 55-1945-205-10.
- z. Open raw water inlet butterfly valve and raw water system ball valves (muffler and transfer case oil cooler) in accordance with TM 55-1945-205-10.
- aa. Prime fuel system: vent all air from the fuel/water separator; use priming pump to fill the fuel filter and fuel pump in accordance with TM 55-1945-205-10.
- ab. Unlock the exhaust outlet flapper in accordance with TM 55-1945-205-10.
- ac. Verify the intake plenum vent doors are open and the operating cable is attached to the fire suppression pressure trip.
- ad. Verify the Marine Gear is in DISENGAGE.
- ae. Turn on all circuit breakers; operator's cab and propulsion module. Check all fuses; replace if required (TM 55-1945-205-10).
- af. Start engine (TM 55-1945-205-10).
- ag. Verify the hydraulic pump is priming (paragraph 2-28).

NOTE

With the hydraulic pump priming valve open, the Low Hydraulic Pressure indicator in the operator's cab may illuminate.

- ah. Verify the raw water cooling system is functional; water will discharge from the exhaust port in the hull.
- ai. Vent all air from the hydraulic system (paragraph 2-28).
- aj. Close hydraulic pump priming valve.
- ak. Exercise steering to ensure full capability.
 - al. Check steering and the thrust direction indicator.
- am. Check all operator controls, indicators, lamps, etc. for port module, starboard module and masts (TM 55-1945-205-10).

**Section III. UNIT PREVENTIVE MAINTENANCE
CHECKS AND SERVICES (PMCS)**

2-7 INTRODUCTION2-4
 2-7.1 General PMCS Procedures2-4
 2-7.2 PMCS Procedures2-4
 2-7.3 Reporting Repairs.....2-5
 2-7.4 Leakage Definitions2-5

2-7. INTRODUCTION. To ensure that the Modular Causeway Ferry (MCF) is ready for operation at all times, it must be inspected on a regular basis so that defects may be found before they result in serious damage, equipment failure, or injury to personnel. This section contains only those checks and services authorized by the watercraft operator through the Maintenance Allocation Chart (MAC) under "inspection" and "service" functions. When performing PMCS, read and follow all safety instructions found in the Warning Summary at the front of this manual. All Warnings and Cautions shall be followed.

2-7.1. General PMCS Procedures.

- a. Keep equipment clean. Dirt, oil and debris may cover up a serious problem. Clean as you work and as needed. On bare metal surfaces use a dry cleaning solvent in accordance with all instructions on the applicable MSDS. On rubber, plastic and painted surfaces use soap and water.
- b. While performing specific PMCS procedures, routinely check the following components:
 - 1) Bolts, Nuts and Screws. Verify that they are not loose, missing, bent or broken. Correct deficiencies or report to direct support maintenance.
 - 2) Welds. Inspect for loose, chipped paint, rust or cracks around welds. Correct deficiencies or report to direct support maintenance.
 - 3) Electric Conduit, Wires or Connectors. Inspect for cracked, broken or frayed insulation, bare wires and loose or broken connectors. Correct deficiencies or report to direct support maintenance.
 - 4) Hoses, Lines and Fittings. Inspect for wear, damage and leaks. Verify that clamps and fittings are tight. Correct deficiencies or report to direct support maintenance.
 - 5) Deterioration. Visually inspect for chipped, cracked or flaking paint, rust or corrosion. Correct deficiencies or report to direct support maintenance.

2-7.2. PMCS Procedures.

- a. Unit Level Maintenance PMCS are provided in Table 2-1. If the PMCS is performed in the order listed it will become a routine habit and the person responsible is less likely to omit a function.
- b. Before starting PMCS, read all the checks required for the applicable interval and prepare any tools required.
- c. If any deficiencies are discovered during PMCS perform the required task. If any component or system is not serviceable, or if given service does not correct the problem notify your supervisor.
- d. The columns in Table 2-1 are defined as follows.
 - 1) Item No. Column provides a logical sequence for PMCS to be performed and is used as a source of item numbers for the "TM ITEM NO" column when recording PMCS results on DA Form 2404.
 - 2) Interval. Column specifies when the PMCS is to be performed.

2-7.2. PMCS Procedures (Cont'd).

- 3) Location. System location where task is to be performed.
- 4) Item to Check/Service. Column lists the item which is to be checked or serviced.
- 5) Procedure. Column instructs what is to be performed to complete the PMCS.
- 6) Not Fully Mission Capable if: Column briefly states reason the MCF is not mission capable.

2-7.3. Reporting Repairs. All defects which are not classified as Unit Level or that cannot be corrected immediately must be reported on a DA Form 2404, Equipment Inspection and Maintenance Work Sheet or the appropriate maintenance level. If a serious problem is found, IMMEDIATELY report it to your supervisor.

2-7.4. Leakage Definitions. It is important to know how fuel leakage affects the status of the servicing unit. Listed below are the types/classes of leakage an operator must know to determine whether the MCF is mission capable.

- a. Class I. Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
- b. Class II. Leakage of fluid great enough to form drops, but not great enough to cause drops to drip from item being inspected.
- c. Class III. Leakage of fluid great enough to form drops that fall from item being inspected.

CAUTION

When operating with Class I or II leaks, continue to check fluid levels more frequently than that required in PMCS.

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

Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS).

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Item to Check/ Service		
1	Weekly	Modular Causeway Ferry System	Inspect components and modules for broken welds, cracks, punctures or corrosion. Repair as necessary.	Broken welds, cracks or punctures are present.
2	2400 hours or annually	Center, left, right, P3, and non-powered modules	Perform integrity test of modules and repair leaks, cracks, corrosion as necessary. Refer to paragraphs 2-89 through 2-92, 2-147, 2-176.	Leaks present or structural damage which interferes with operation.

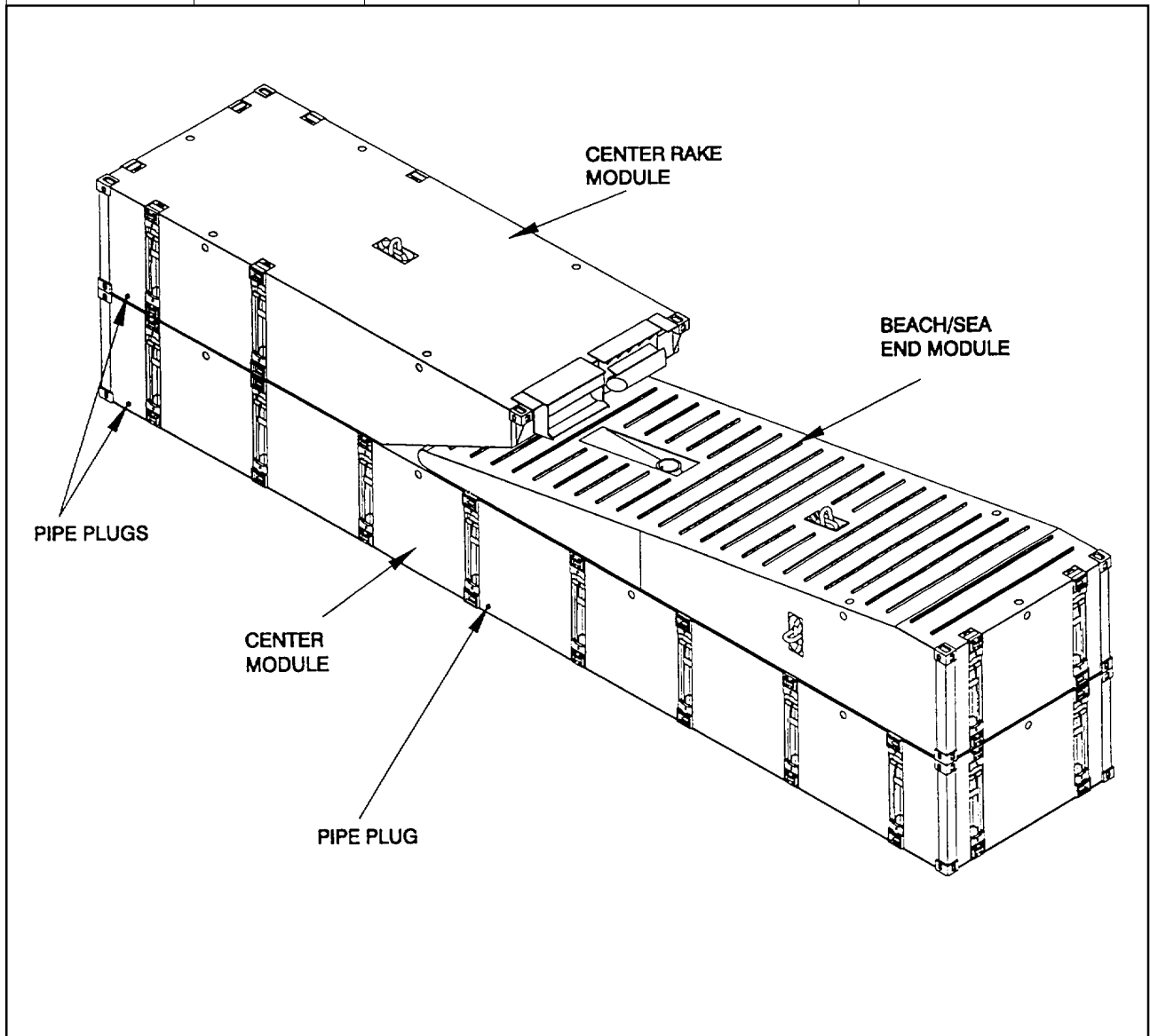


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Item to Check/ Service		
3	Monthly	a. Thruster Junction Box (A2) b. Hydraulic Junction Box c. Bilge Pump Control (A5) d. Engine Junction Box (A4) e. Single Bilge Pump Control (A7) f. Propulsion Module Junction Box (A3) g. Circuit Breaker Panel (A6) h. Ventilation Fan Relay Enclosure (A8) i. Operator's Cab Circuit Breaker Panel (A3) j. Terminal Board (A4) k. Navigation Lights Terminal Box l. Pump-Jet Direction/Aux Battery Junction Box (A9) m. Mast Enclosure n. NATO receptacle JB3	Open electrical enclosures/panels and inspect for corrosion, evidence of moisture and loose or damaged connections/components. Repair as necessary.	Evidence of loose or damaged components.

Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Item to Check/Service		

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Con't

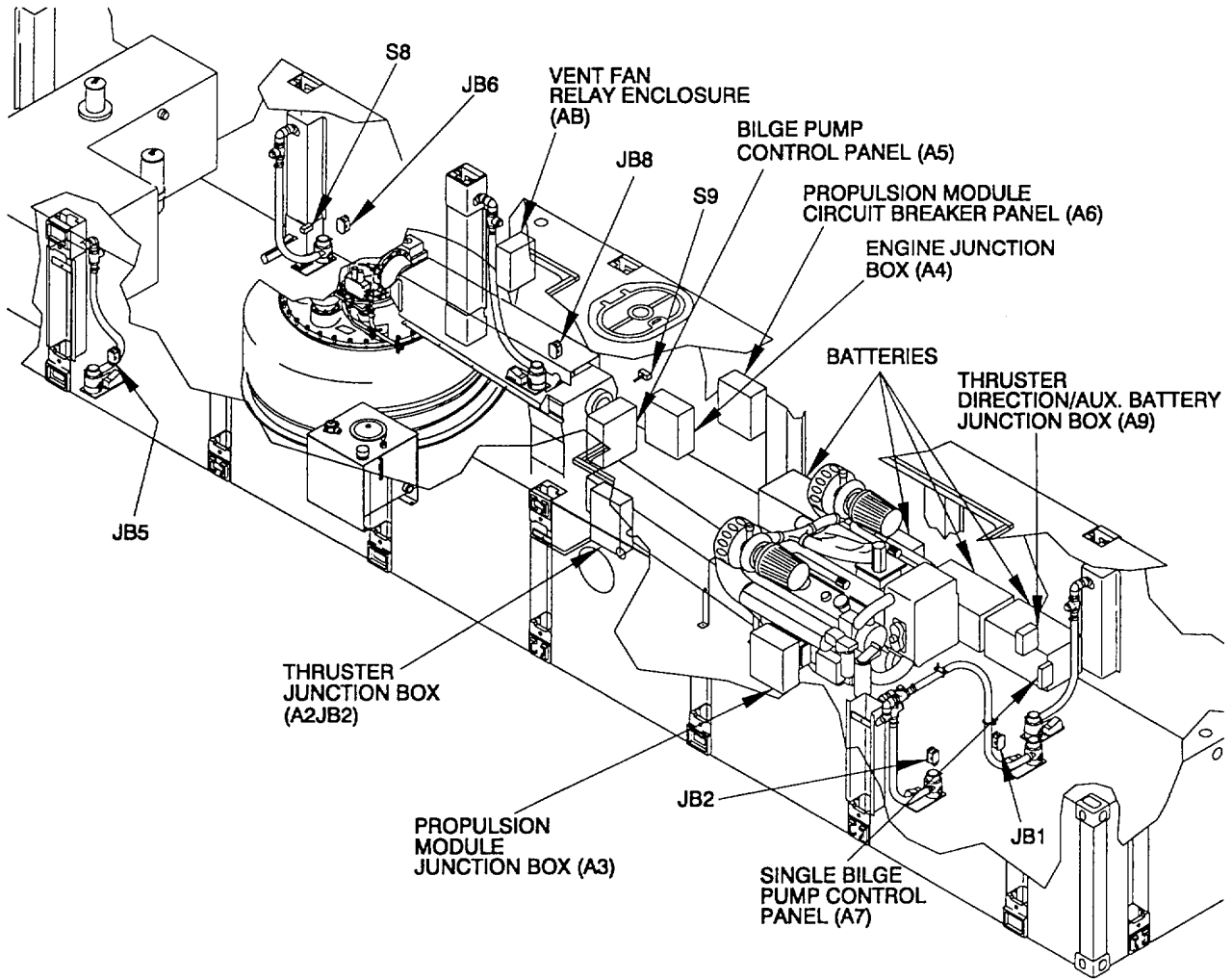


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Location	Item to Check/	Procedure	Not Fully Mission Capable If:
	Interval Service			
4	Weekly	Main Power Batteries	If operating charging levels are found to be too low while starting engine, change battery immediately. Check each cell with a hydrometer to determine condition of battery in accordance with TM 961-40-200-4 and paragraph 2-66. DO NOT run battery down. Apply light coat of grease on cable clamps. Inspect for damage.	Batteries unserviceable. Repair or replace as necessary.

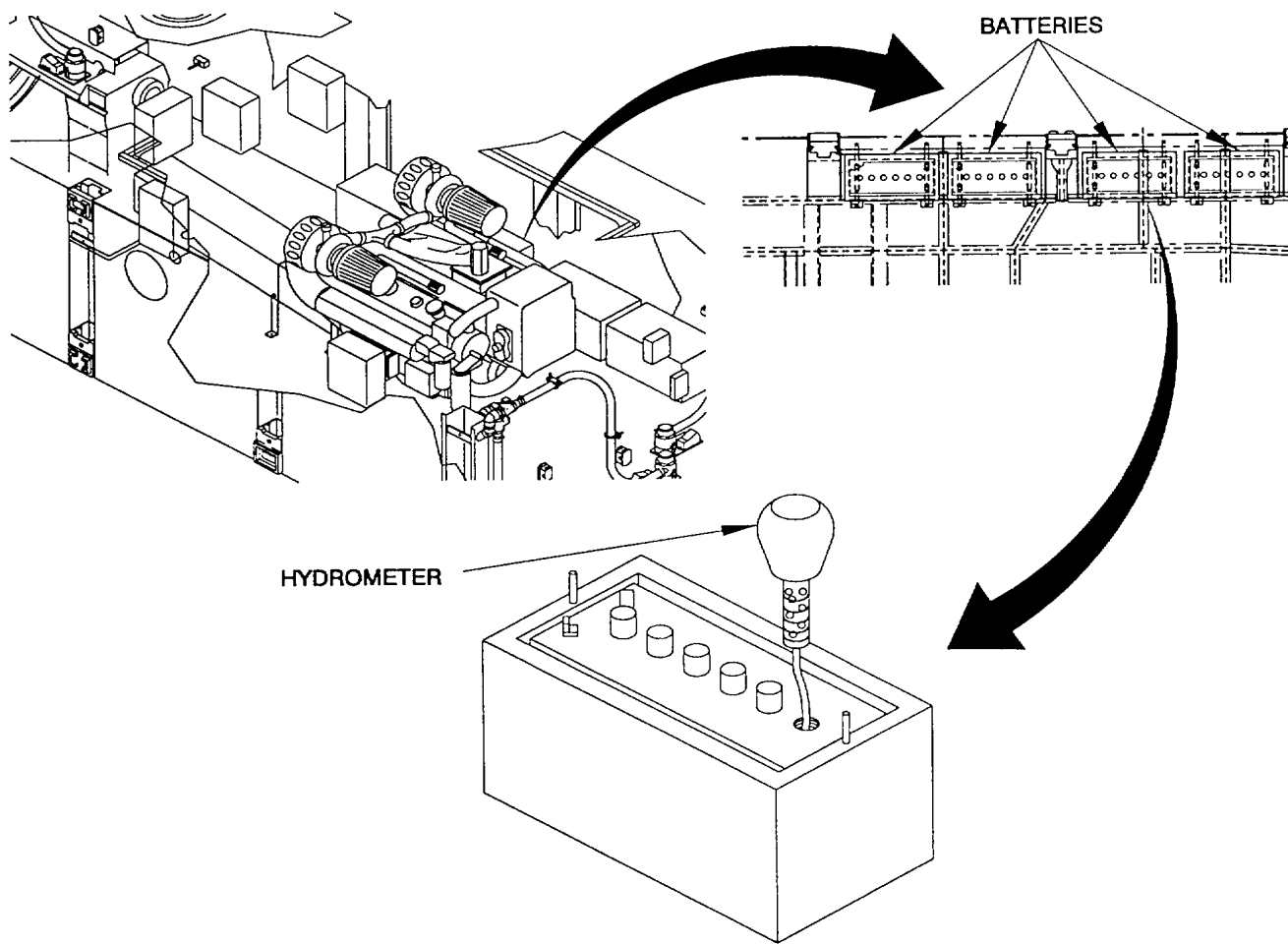


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Location	Item to Check/	Procedure	Not Fully Mission Capable If:
	Interval Service			
5	Annually or 2400 hrs.	Deployment Spring	Lightly grease spring. Refer to LO 55-1945-205-12.	Connector pin spring inoperable.

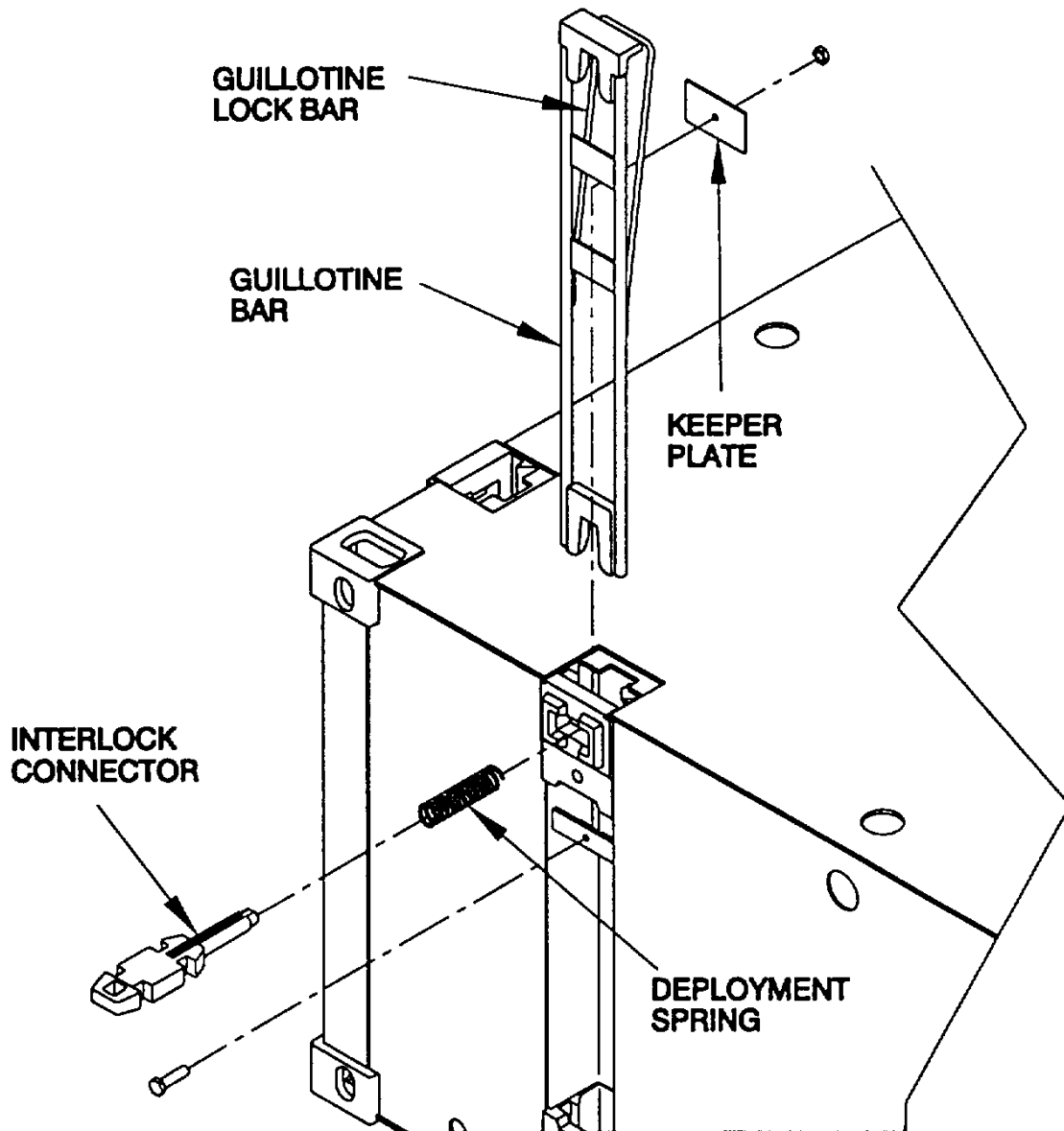


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Location Interval Service	Item to Check/	Procedure	Not Fully Mission Capable If:
6	Semi-annually or 1200 hrs.	Pump-jet Gearbox Expansion Tank and Planetary Gearboxes	Change Oil. Refer to paragraphs 2-21 and 2-23, and LO 55-1945-205-12	Oil Level low or oil is contaminated.
7	Weekly	Fuel System	Check for water in fuel tank using water detection paste.	Class I fuel leakage
8	Monthly or 200 hours.		Replace fuel filter and clean/water separator filter. Refer to paragraph 2-49. Replace engine fuel filters. Refer to paragraph 2-13	
9	Annually		Drain fuel, remove inspection covers and inspect for corrosion. damage.	

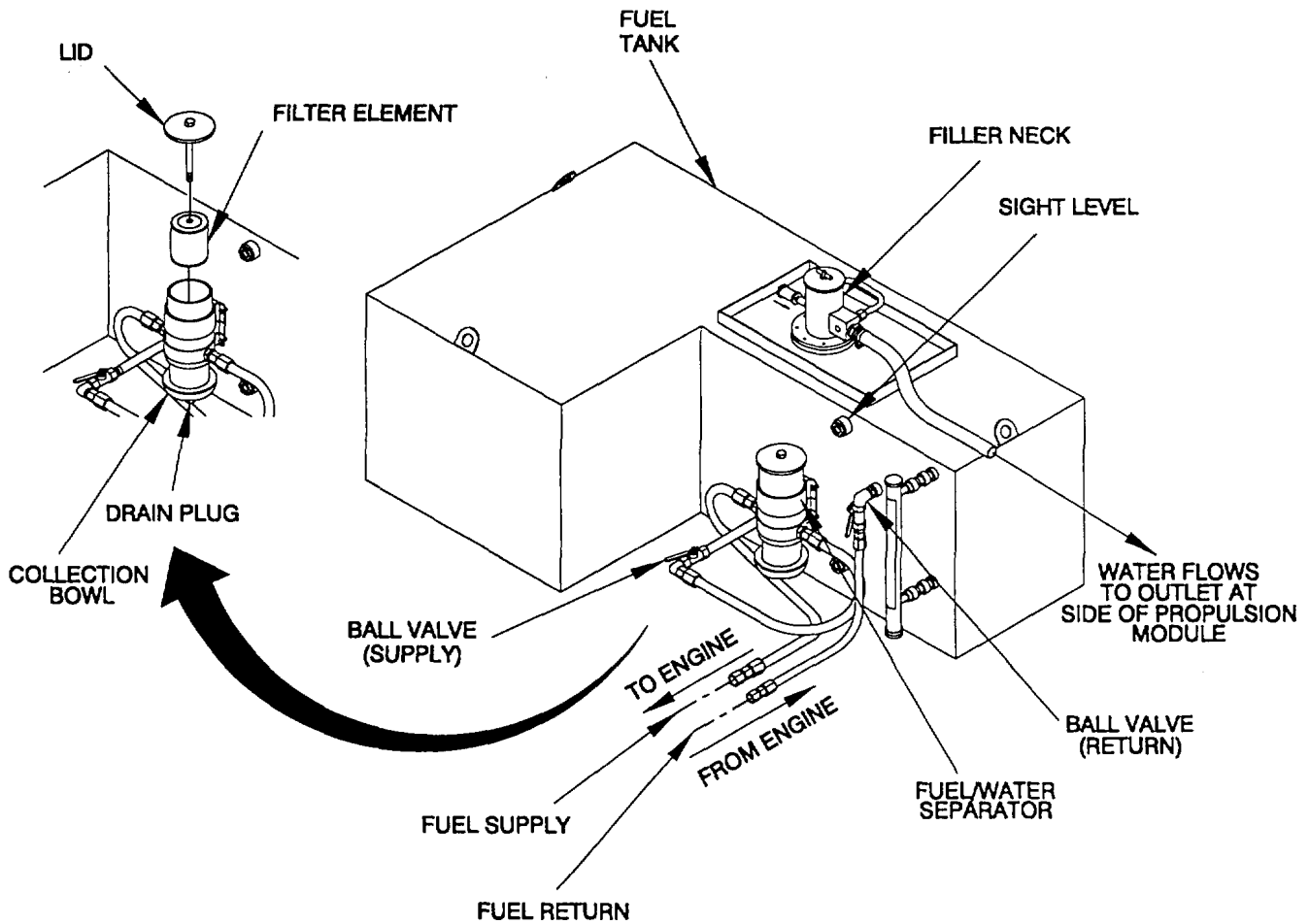


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Location Interval Service	Item to Check/	Procedure	Not Fully Mission Capable If:
10	Monthly	Fire Extinguisher	Weigh fire extinguisher. Read pressure gauge.	Seal broken, damage to nozzle, or gauge shows that extinguisher is discharged (in the Red zone of gauge).
11	Monthly	Fire Suppression Pressure Switch	Test switch IAW 2-38c	Inoperable switch.

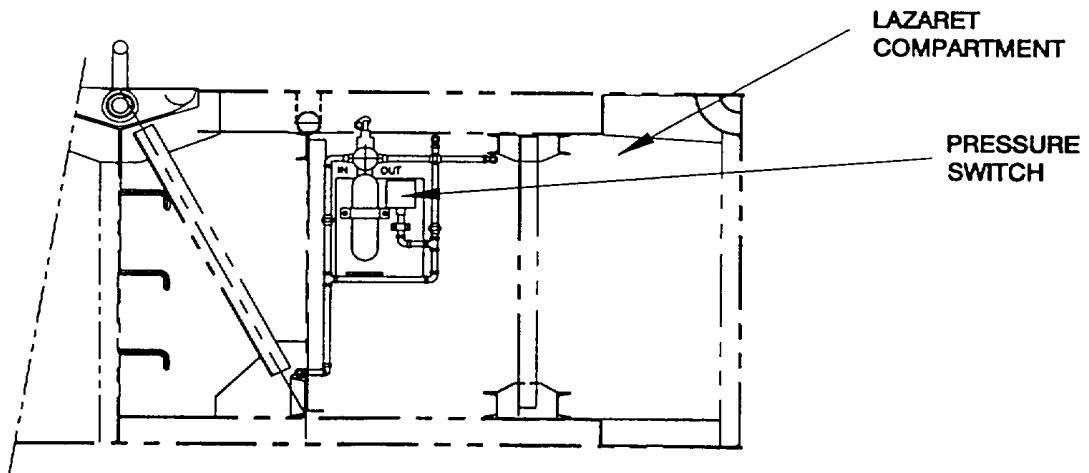
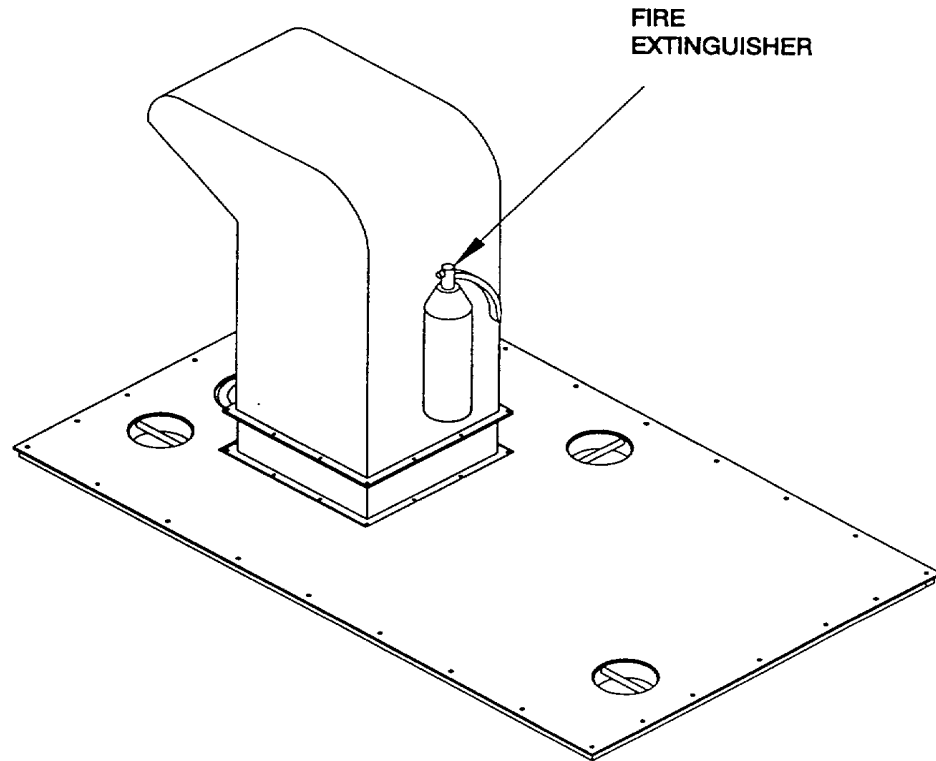


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
12	150 hrs. or in accordance with AOAP 90 days or 100 hrs.	Diesel Engine	Completely drain the crankcase of oil and replace with proper grade of oil. (Refer to LO 55-1945-205-12). Intervals are IAW the log book engine hour meter readings. Reference TM 55-1945-205-24-2 for further preventive maintenance checks and services.	
13	200 hrs or	Engine Coolant Filter Element	Maintain Supplemental Coolant Additive (SCA) to prescribed Annually concentration. Test nitrate concentration by using a titration kit or Detroit Diesel 2-Way Coolant Test Strips. Replace SCA Filter Element annually or if the nitrate concentration is below 800 ppm. Reference TM 55-1945-205-2 for further engine cooling system checks and services.	Nitrate concentration is below 800 ppm.
14	Monthly	Cold-Pack Starting Aid	Weigh the fluid cylinder. Refer to paragraph 2-18.	Empty 21 oz. Cylinder weighs 16 oz. (238 gr.); full cylinder weighs 37 oz. (510 gr.).

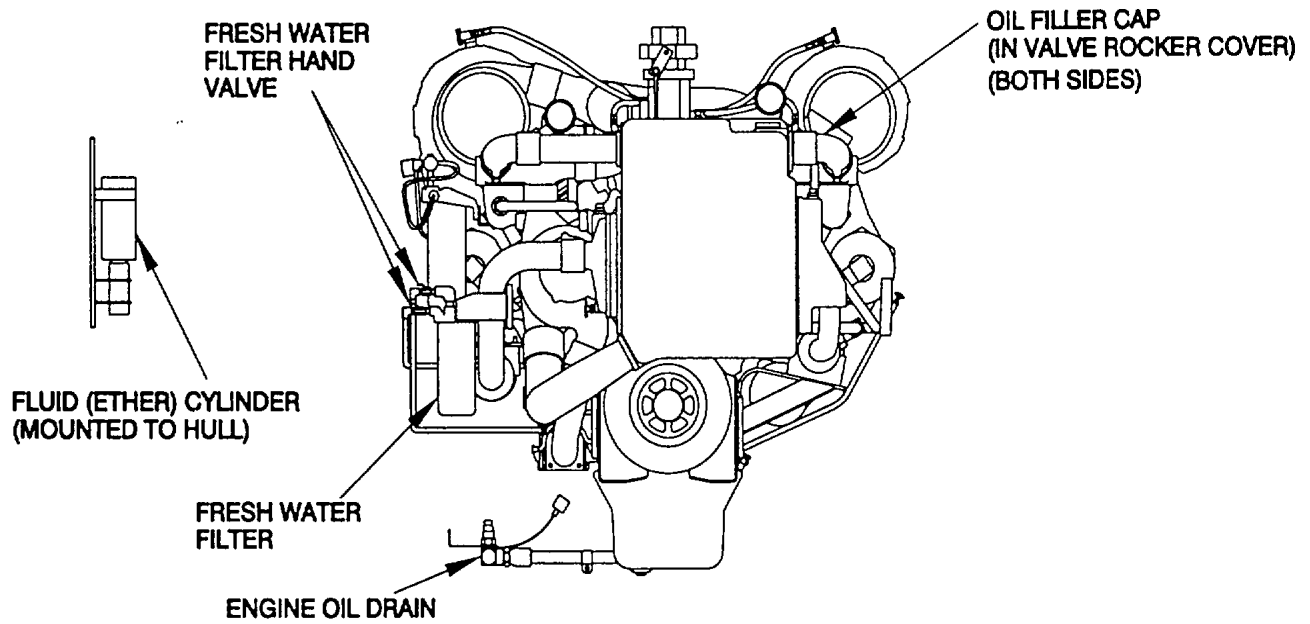


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Item to Check/ Service		
15	250 Hours or Annually	Hydraulic System	a. Replace hydraulic reservoir filter elements (2 places). Refer to paragraph 2-28.	Filters are clogged or damaged.
	First 500 Hours and every 200 Hours or Annually		b. Change hydraulic fluid in hydraulic reservoir. Refer to paragraph 2-28.	
16	AOAP 180 Days		c. Perform hydraulic system AOAP at 180 day intervals.	Hydraulic fluid is contaminated

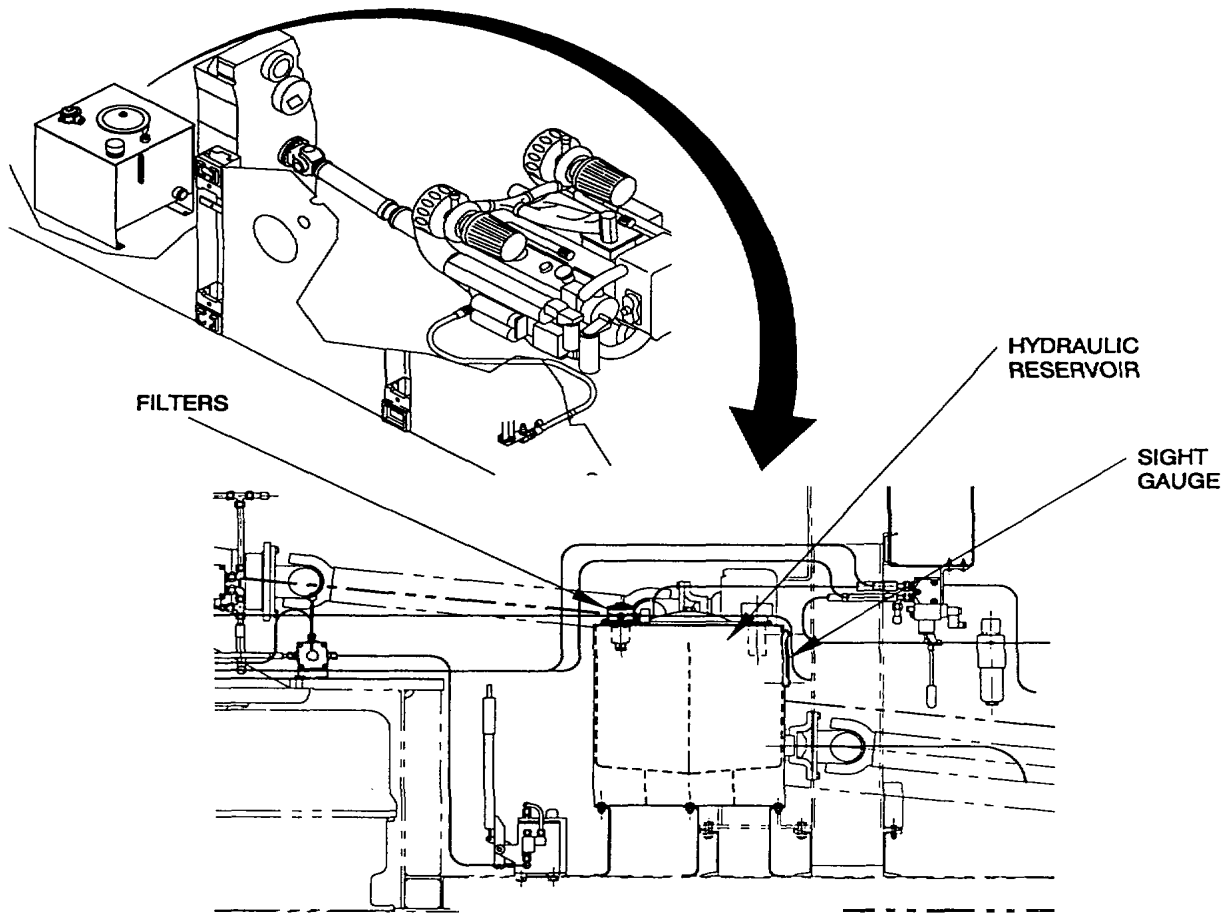


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Item to Check/ Service		
17	Monthly or AOAP 90 days or 100 hours.	Transfer Case	Change oil. Refer to LO 55-1945-205-12.	Oil is contaminated.
18	300 hours or AOAP 90 days or 100 hours	Marine Gear 205-12.	<p>Change oil. Refer to LO 55-1945-205-12.</p> <p>Clean Strainer Basket. Refer to TM 55-1945-205-24-3 (MARINE TRANSMISSION), Section I.</p> <p>NOTE</p> <p>Strainer Basket must be cleaned after first 10 hours of operation.</p> <p>Always clean strainer basket when oil is changed.</p>	<p>Oil is contaminated.</p> <p>Strainer basket damaged.</p>

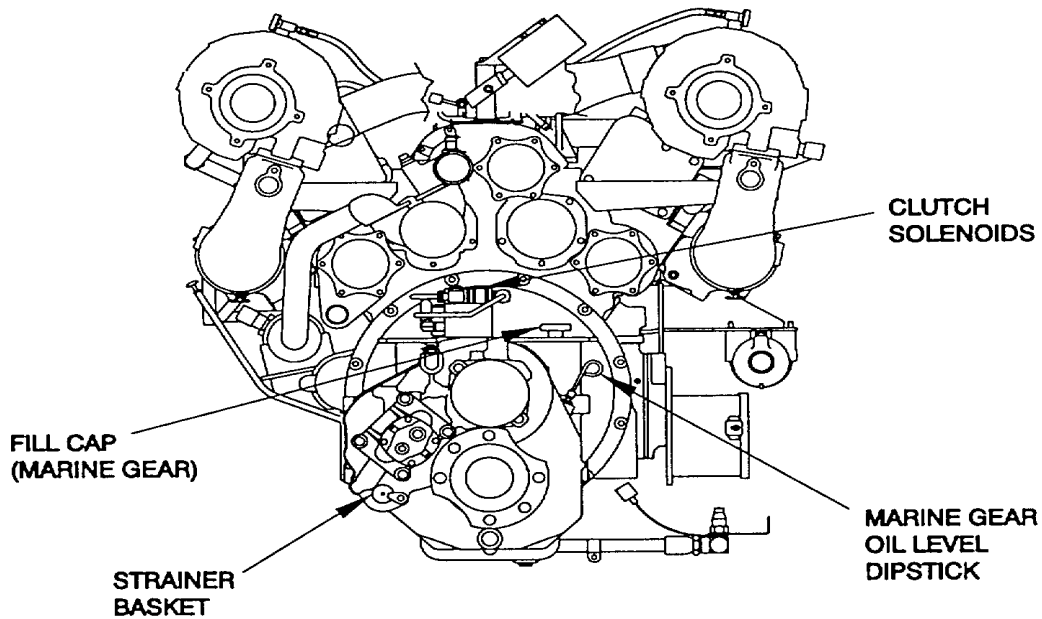


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Item to Check/Service		
19	Weekly	Spotlight	Clean lens and reflector on spotlight. Inspect for cracked lens, broken seals, corrosion. Lube shafts and pivot points IAW LO 55-1945-205-12. Check wire connections.	Inoperable.
20	Monthly	Main and Stub Masts	Lower Main and Stub Masts and check for damaged or cracked lenses, bad gaskets, structural damage or inoperable condition.	Structural damage, cracked or broken lenses, or inoperable condition.

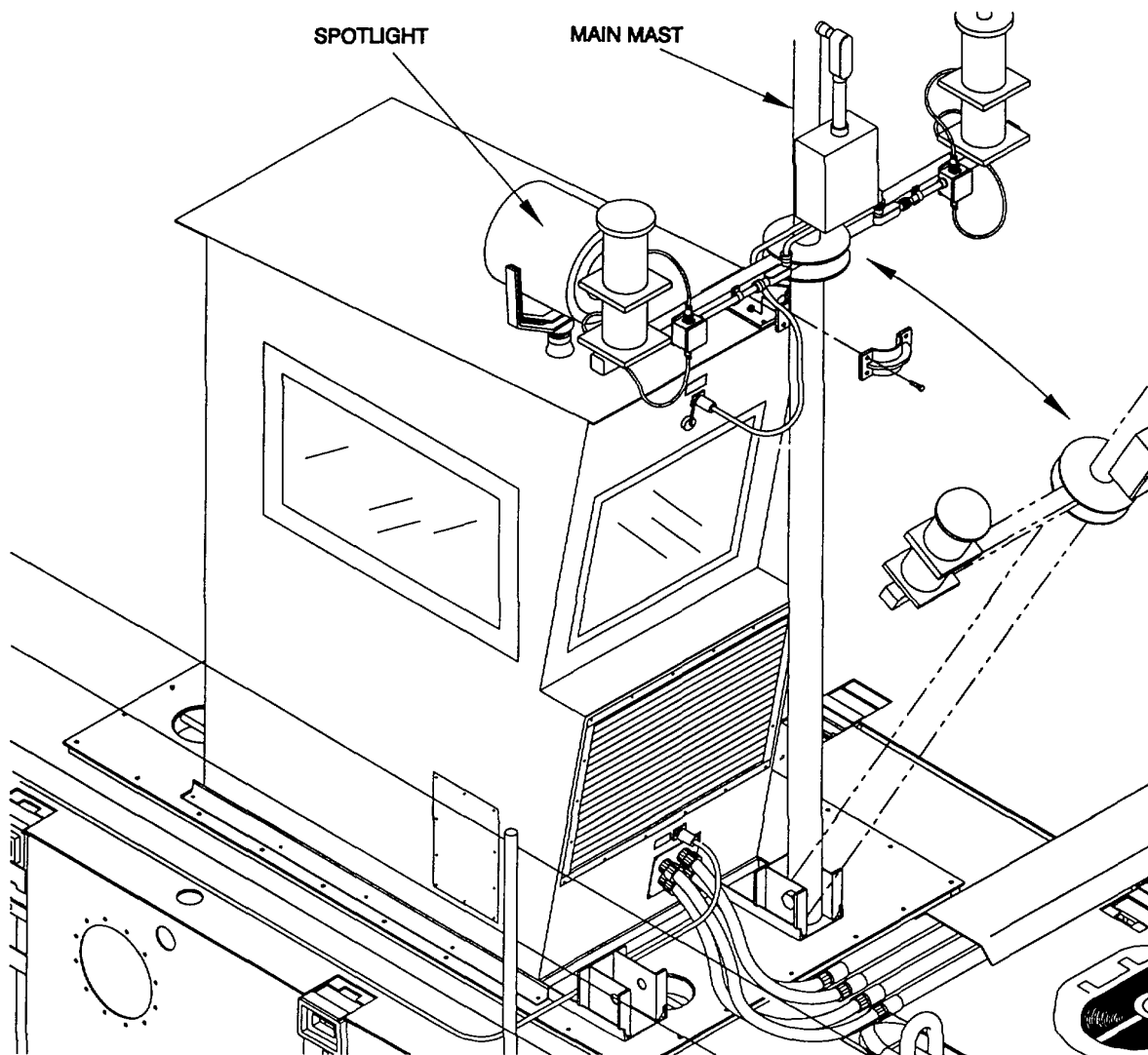


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Interval Service	Location	Procedure	Not Fully Mission Capable If:
		Item to Check/		
21	Monthly	Flexors	Inspect per paragraph 2-93.	Damaged or corroded flexors in need of repair.
22	Monthly	Spreader	Apply antiseize compound to connecting hardware. Check for integrity of slings. Grease wire ropes.	

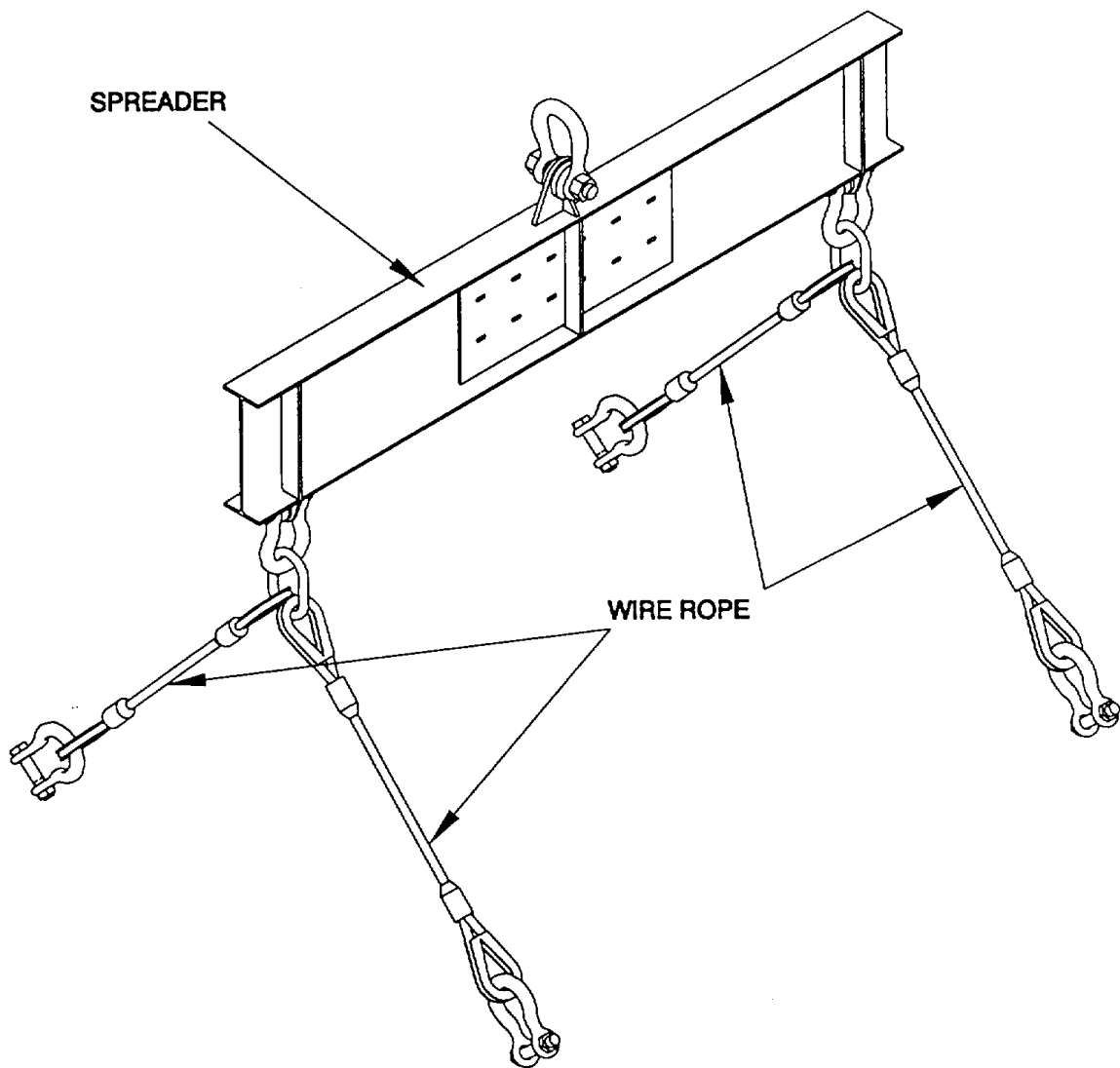


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Interval Service	Location Item to Check/	Procedure	Not Fully Mission Capable If:
23	Monthly	Raw water cooling system anode plugs	Inspect and clean all zinc anodes.	

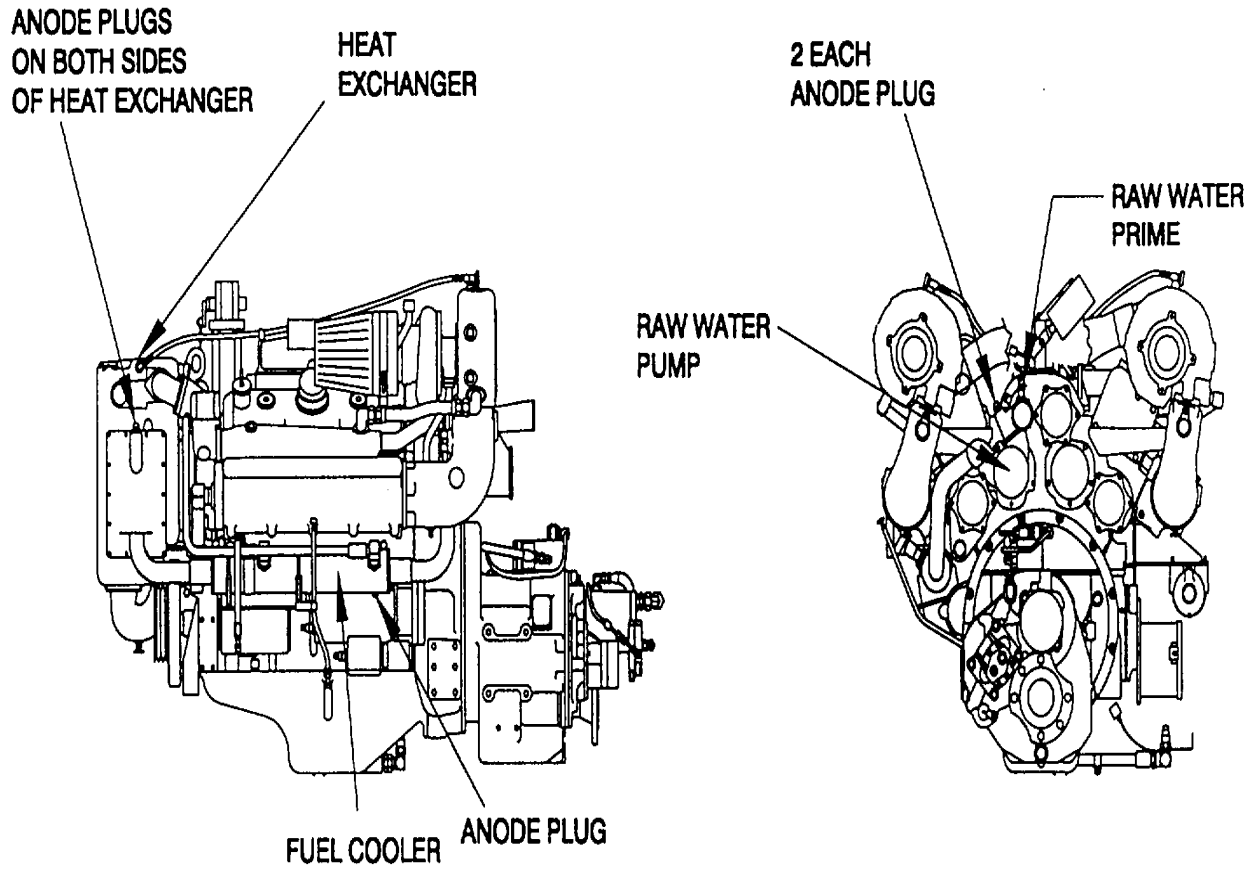
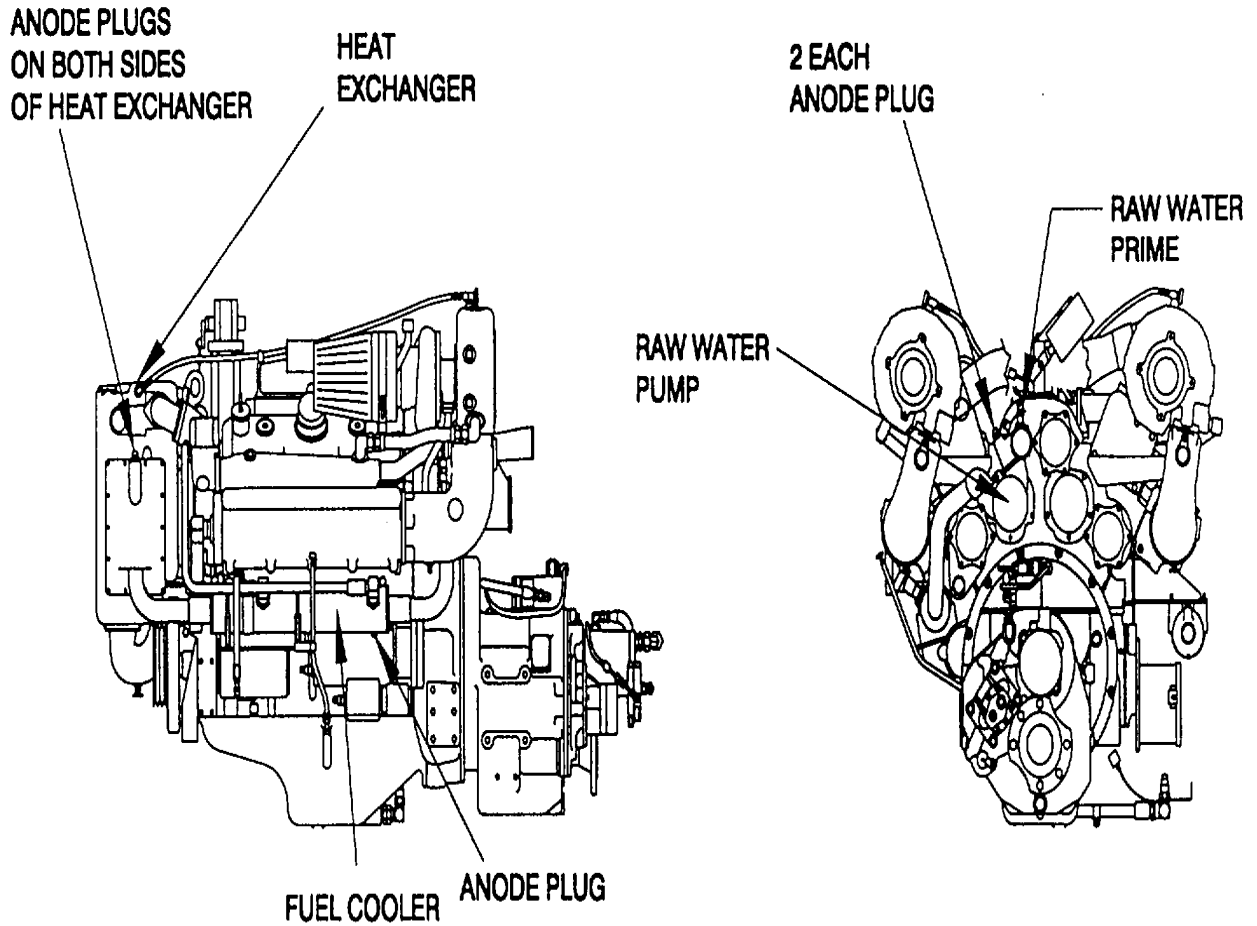


Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) (Cont'd).

Item No.	Interval Service	Location	Procedure	Not Fully Mission Capable If:
		Item to Check/		

23
Con't



Section IV. UNIT TROUBLESHOOTING PROCEDURES

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2-8. General. This section contains troubleshooting and corrective action procedures authorized at the unit maintenance level.

2-9. Unit Troubleshooting Procedures. Refer to symptom index to locate the troubleshooting procedure for the observed malfunction. Table 2-2 lists malfunctions that may occur during operation or maintenance of the MCF. Tests, checks, inspections, and corrective actions should be performed in the order listed. If a malfunction is beyond the scope of unit maintenance is discovered, refer the malfunction to direct support maintenance. The hydraulic schematic (figure 2-1) and electrical schematics (Appendix G) are provided to aid in troubleshooting.

WARNING

Use caution when checking energized circuits.

NOTE

This table is not intended to cover every possible symptom, but is rather a list of the more frequent problems and some of their causes.

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Table 2-2. Unit Troubleshooting Procedures. (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1.	Water is not expelling out of exhaust outlet port and/or transfer case cooling system port.	
	Step 1. Inspect duplex strainer for clogging.	Clean or replace duplex strainer basket.
	Step 2. Ensure exhaust flapper is unlocked.	Unlock exhaust flapper.
	Step 3. Ensure sea chest butterfly valve, exhaust cooling valve and transfer cooler valve is in OPEN position.	Place valve in OPEN position.
	Step 4. Inspect raw water cooling system's plumbing for leakage and/or breaks.	Repair as necessary.
	Step 5. Inspect engine raw water pump for damage.	Replace as necessary.
2.	Drive train does not operate freely and smoothly; excessive vibration is experienced during operation.	
	Step 1. Check securement of drive train components between marine gear and transfer case and transfer case and pump-jet. Correct securement as necessary.	
	Step 2. Inspect drive shaft universal joint bearing for failure.	Report to next higher level maintenance.
	Step 3. Inspect drive shaft for out of balance condition.	Report to next higher level maintenance.
	Step 4. Inspect components for loose foundation bolts.	Tighten foundation bolts as necessary.
	Step 5. Inspect marine gear for structural damage.	Report to next higher level maintenance.
	Step 6. Inspect transfer case for structural damage.	Report to next higher level maintenance.
	Step 7. Inspect pump-jet gearbox for foreign objects.	Perform backflush.

Table 2-2. Unit Troubleshooting Procedures. (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

- | | | |
|----|--|---|
| 3. | Alternator is not charging the batteries. | |
| | Step 1. | Check for broken or slipping alternator belts.
Adjust belts. |
| | Step 2. | Inspect electrical connection continuity between the alternator and voltage regulator.
Repair breaks in continuity as necessary. |
| | Step 3. | Inspect alternator for failure. (Tachometer malfunctions during alternator failure).
If alternator failed, refer to next higher level maintenance for test of voltage regulator. |
| 4. | The diesel engine does not start in cold temperatures. | |
| | Step 1. | Ensure ether supply cylinder is not empty.
Replace the ether supply cylinder. |
| | Step 2. | Inspect ether system temperature switch mounted on the diesel engine for damage.
Replace the temperature switch. |
| | Step 3. | Inspect ether system control valve mounted on the ether supply bottle for damage.
Replace the control valve. |
| 5. | Diesel engine (See Section 15, TM 55-1945-205-24-2 (ENGINE) for Troubleshooting) | |
| 6. | Marine Gear (See Section F, TM 55-1945-205-24-3 (MARINE TRANSMISSION) for Troubleshooting) | |
| 7. | The Transfer Case is operating hot (above 180 °F) | |
| | Step 1. | Inspect for low case oil level.
Add oil to the proper level. |
| | Step 2. | Ensure correct grade of oil for operating temperature.
Check previous lubrication records. Change oil if required for current operating temperature. |
| | Step 3. | Ensure oil cooler ball valve is open.
Place ball valve in open position. |
| | Step 4. | Inspect cooling water system discharge outlet for water.
Check for restrictions/blockages in cooling water lines. |

Table 2-2. Unit Troubleshooting Procedures. (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
8. Pump-Jet is not developing thrust (no water is being delivered).	Step 1. Check tachometer to ensure diesel engine is running.	Start diesel engine.
	Step 2. Ensure Marine Gear is engaged.	Engage transmission.
	Step 3. Check electronic control valve on Marine Gear for proper operation.	Refer to next higher level maintenance to replace electronic control valve.
9. Pump-Jet can only develop a small amount of thrust (not enough water is being delivered).	Step 1. Ensure diesel engine is operating at required speed.	Increase the speed of the diesel engine.
	Step 2. Ensure impeller is not clogged.	Disengage pump-jet and backflush to clear debris.
	Step 3. Notify direct support maintenance.	
10. Engine exhaust has developed water leaks.	Step 1. Inspect for faulty clamps, gaskets, hoses, or exhaust system components	Replace faulty components
11. Engine exhaust has developed exhaust leaks.	Step 1. Inspect for faulty clamps, gaskets, hoses, or exhaust system components	Replace faulty components.
12. Exhaust smoke is consistently white in nature.	Step 1. Inspect water jacketed exhaust system components for water in the exhaust piping.	Repair exhaust system.
13. No exhaust smoke.	Step 1. Check that flapper valve is OPEN.	Open flapper valve.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
13. No exhaust smoke (Cont'd)	Step 2. Inspect for blockage in exhaust system components.	Disassemble, locate and remove the blockage within the exhaust system.
14. High hydraulic fluid pressure.	Step 1. Inspect return line and supply line filters for dirt.	Replace filter element(s). Refer to paragraph 2-28.
	Step 2. Ensure hydraulic valves in way valve assembly are functioning properly.	Replace hydraulic way valve. Refer to figure 2-30.
15. Low hydraulic fluid pressure.	Step 1. Check hydraulic reservoir fluid level.	Fill reservoir to proper level.
	Step 2. Check hydraulic system for leaks.	Repair leaks.
	Step 3. Ensure hydraulic pump is providing sufficient fluid flow.	Notify next higher level maintenance to adjust pump pressure regulator setting. If insufficient fluid flow after adjustment, replace hydraulic pump. Refer to paragraph 2-29.
16. Steering not functioning.	Step 1. Check hydraulic pressure from pump.	Adjust pump pressure regulator setting. Replace hydraulic pump.
	Step 2. Ensure 3/2 ball valve is properly set.	Set 3/2 ball valve handle to proper position.
	Step 3. Ensure bypass needle valve has not been improperly opened.	Close bypass needle valve.
	Step 4. Check voltage to electric control valve connectors at way valve.	Refer to next higher level maintenance. Repair electrical control circuits to control valve.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
16. Steering not functioning (Cont'd)	Step 5. Check electric control valve operation at way valve.	Notify General Support maintenance. Replace electric control valve.
	Step 6. Ensure proper operation of valves in the way valve assembly.	Clean or replace valves as necessary.
17. Steering reacts sluggishly.	Step 1. Check for air in the hydraulic line at test point "M2".	Bleed air from load sensing line.
18. Marine Gear does not function.	Step 1. Check electric control valve electrical connectors.	Repair electric circuits to electric control valve.
	Step 2. Ensure electric control valve is shifting to allow fluid flow to the system.	Replace electric control valve.
	Step 3. Ensure integral Marine Gear hydraulic pump is operating.	Replace hydraulic pump.
19. Diesel engine is not receiving fuel from fuel tank.	Step 1. Ensure fuel tank is not empty.	Fill fuel tank.
	Step 2. Ensure supply and return line shut-off valves are not closed.	Open valves.
	Step 3. Ensure filter element in fuel/water separator is not clogged.	Replace filter element. Replace fuel filter on engine.
	Step 4. Inspect for loose fuel line connections.	Tighten connections as necessary.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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20. Diesel engine is mis-firing caused by clogged or damaged injectors.

Step 1. Ensure there is no water contaminant in fuel system.
Sound tank with detection paste.

21. Bilge pumps will not function in test mode (from bilge junction boxes A5 and A7).

Step 1. Inspect power system.

- a. Ensure main breaker in A6 panel is turned ON.
- b. Ensure bilge pump circuit breakers XA6CB5 - XA6CB10 are turned ON.
- c. Ensure green pump run lights in operator's cab are energized when pump switch is moved to the TEST position. This is a momentary switch and will remain on until released.

Step 2. Check electrical circuits between the pumps and pump control panels:

- a. Inspect for open circuit between the Bilge Pump Control Panel Assembly and the corresponding Junction Box located in the engine compartment.

Check for 24 VDC at the appropriate terminals (tabulated below) in the Bilge Pump Control Panel Assembly. If 24 VDC is present, check wiring between the Bilge Pump Control Panel Assembly and the corresponding Junction Box (tabulated below) located in the engine compartment. Repair/replace wiring if necessary. Refer to Appendix G.

<u>BILGE PUMP</u>	<u>TERMINALS (UNIT XA5)</u>	<u>PANEL</u>	<u>WIRE NOS.</u>
#1	TB1-5/TB1-6	XA7	143/0
#2	TB2-5/TB3-2	XA5	148/0
#3	TB2-10/TB3-2	XA5	153/0
#4	TB4-5/TB3-2	XA5	158/0
#5	TB4-10/TB3-2	XA5	163/0
#6	TB3-10/TB3-2	XA5	168/0

<u>BILGE PUMP</u>	<u>FROM</u>	<u>TO</u>	<u>B2-21B2-1</u>	<u>WIRE NOS.</u>
#1	Bilge Pump Control Panel A7		JB1	143/0
#2	Bilge Pump Control Panel A5		A9	148/0
#3	Bilge Pump Control Panel A5		JB2	153/0
#4	Bilge Pump Control Panel A5		JB8	158/0
#5	Bilge Pump Control Panel A5		JB5	163/0
#6	Bilge Pump Control Panel A5		JB6	168/0

- b. Inspect for open circuit between the junction box and the pump.

If wiring to Junction Box checks OK, check for 24 VDC at B2-2 (brown)/B2-1 (black) motor leads in the appropriate Junction Box as noted above. If 24 VDC is present, check wiring from the junction box to the pump. Repair wiring if necessary. If wiring is good, replace pump. Refer to Appendix G.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

21. Bilge pumps will not function in test mode (from bilge junction boxes A5 and A7) (Cont'd).

- c. Inspect for open circuit in internal wiring of the appropriate switch XA7S1, XA5S1-XA5S5.

If 24 VDC was not present at Unit XA5 or XA7 terminals above, check for 24 VDC at appropriate terminals as listed below in the Bilge Pump Control Panel Assembly. If 24 VDC is present, check wiring and terminations at the appropriate switch XA7S1, XA5S1-XA5S5 located on the cover of the Bilge Pump Control Panel Assembly. Refer to Appendix G.

- d. Inspect for failed switch XA7S1, XA5S1-XA5S5.

If 24 VDC was present and wiring is good, replace switch. Refer to Appendix G.

<u>BILGE PUMP</u>	<u>TERMINALS (UNIT XA5)</u>	<u>PANEL</u>	<u>WIRE NOS.</u>
#1	TB1-3/TB1-6	XA7	142/0
#2	TB2-3/TB3-2	XA5	147/0
#3	TB2-8/TB3-2	XA5	152/0
#4	TB4-3/TB3-2	XA5	157/0
#5	TB4-8/TB3-2	XA5	162/0
#6	TB3-8/TB3-2	XA5	167/0

- e. Inspect for open circuit in cable from the Power Module Circuit Breaker Panel to the Bilge Pump Control Panel Assembly. Refer to Appendix G.

If 24 VDC not present in previous step, check wiring between the Power Module Circuit Breaker Panel (XA6) and the Bilge Pump Control Panel Assembly (XA5 and XA7). Repair/replace wiring if necessary.

Refer to troubleshooting procedures for Unit XA6, Power Module Circuit Breaker Panel.

Repair electrical circuit. Refer to Appendix G.

Replace bilge pumps.

22. Bilge pump will not function in REMOTE mode from operator's cab, on lower panel.

Step 1. Inspect power system.

- a. Ensure main circuit breaker in A6 panel is turned ON.
- b. Ensure bilge pump circuit breakers XA6CB5-XA6CB10, located in the A6 panel, are turned ON.
- c. Check pump system test circuit procedure for pump operation.

NOTE

The pump test switch is a momentary switch. It remains ON until released.

Ensure green pump RUN lights are energized when pump switch is moved to the TEST position.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

22. Bilge pump will not function in REMOTE mode from operator's cab, on lower panel (Cont'd)

Step 2. Inspect for open circuit from the PUMP RUN pushbutton (3A2S10-3A2S17) for Port Power Module, 3A2S16-3A2S20 for Starboard Power Module).

Hold the appropriate PUMP RUN pushbutton and check for 24 VDC at the appropriate terminals (tabulated below) in the Bilge Pump Control Panel Assembly. If 24 VDC is not present, check wiring between the Power Module Junction Box and Bilge Pump Control Panel Assembly. If wiring is good, refer to Operator's Cab troubleshooting procedures for the appropriate PUMP RUN switch (3A2S10-3A2S14 Port Module or 3A2S16-3A2S20 Starboard Module).

<u>BILGE PUMP</u>	<u>PUMP RUN SWITCH</u>		<u>TERMINALS</u>	<u>PANEL</u>	<u>WIRE NOS.</u>
	<u>Port</u>	<u>Stbd</u>			
#1	3A2S9	3A2S15	TB1-1/TB1-6	XA7	145/0
#2	3A2S10	3A2S16	TB2-1/TB3-2	XA5	150/0
#3	3A2S11	3A2S17	TB2-6/TB3-2	XA5	155/0
#4	3A2S12	3A2S18	TB4-1/TB3-2	XA5	160/0
#5	3A2S13	3A2S19	TB4-6/TB3-2	XA5	165/0
#6	3A2S14	3A2S20	TB3-6/TB3-2	XA5	170/0

Step 3. Inspect for open in Bilge Pump Control Panel Assembly internal wiring.

Inspect wiring to components listed below inside the Bilge Pump Control Panel Assembly. Repair if necessary.

<u>BILGE PUMP</u>	<u>COMPONENTS</u>
#1	A7K1, A7S1, A7D1
#2	A5K2, A5S1, A5D3
#3	A5K3, A5S2, A5D4
#4	A5K4, A5S3, A5D5
#5	A5K5, A5S4, A5D6
#6	A5K6, A5S5, A5D7

Step 4. Inspect for open circuit between the Bilge Pump Control Panel Assembly and the corresponding Junction Box located in the engine compartment.

Check for 24 VDC at the appropriate terminals listed below in the Bilge Pump Control Panel Assembly. If 24 VDC is present, check wiring between the Bilge Pump Control Panel Assembly to the corresponding Junction Box located in the engine compartment. Repair/replace wiring if necessary.

<u>BILGE PUMP</u>	<u>TERMINALS</u>	<u>PANEL</u>	<u>WIRE NOS.</u>
#1	TB1-5/TB1-6	XA7	143/0
#2	TB2-5/TB3-2	XA5	148/0
#3	TB2-10/TB3-2	XA5	153/0
#4	TB4-5/TB3-2	XA5	158/0
#5	TB4-10/TB3-2	XA5	163/0
#6	TB3-10/TB3-2	XA5	168/0

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

22. Bilge pump will not function in REMOTE mode from operator's cab, on lower panel (Cont'd).

Step 4 (Cont'd).

<u>BILGE PUMP</u>	<u>FROM</u>	<u>PANEL</u>	<u>TO</u>
#1	Bilge Pump Control Panel	XA7	JB1
#2	Bilge Pump Control Panel	XA5	A9
#3	Bilge Pump Control Panel	XA5	JB2
#4	Bilge Pump Control Panel	XA5	JB8
#5	Bilge Pump Control Panel	XA5	JB5
#6	Bilge Pump Control Panel	XA5	JB6

Step 5. Inspect for open circuit between the junction box and the pump.

Check for 24 VDC at B2-2 (brown)/B2-1 (black) (wire nos. as tabulated in previous step) motor leads in the appropriate Junction Box as noted above. If 24 VDC is present, check wiring from the junction box to the pump. Repair wiring if necessary. If wiring is good, notify general support for pump replacement. If 24 VDC is not present, proceed to the next step.

Step 6. Inspect for open in wiring between the Bilge Pump Control panel Assembly and the appropriate bilge float switch.

Check for 24 VDC at the appropriate test terminals (tabulated below) in the Bilge Pump Control Panel Assembly. Ensure that bilge liquid level is sufficient to actuate the applicable float switch in the engine compartment. If 24 VDC is not present, check the appropriate cable from the Bilge Pump Control Panel Assembly to the corresponding Junction Box located in the engine compartment and the cable to the applicable float switch. Repair wiring if necessary.

Step 7. Inspect for failed Bilge Float Switch XS10-XS15.

If wiring checked OK in previous step, notify general support for float switch replacement.

<u>BILGE PUMP</u>	<u>TERMINALS</u>	<u>WIRE NOS.</u>	<u>FLOAT SWITCH</u>
#1	TB1-1/TB1-6	145/146	S10
#2	TB2-1/TB2-4	150/151	S11
#3	TB2-6/TB2-9	155/156	S12
#4	TB4-1/TB4-4	160/161	S13
#5	TB4-6/TB4-9	165/166	S14
#6	TB3-6/TB3-9	170/171	S15

23. Bilge pump output has reduced flow.

Step 1. Inspect for plugged strainer.

Clean outside of strainer.

Clean debris from around impeller.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
23. Bilge pump output has reduced flow (Cont).	Step 2. Inspect discharge line for obstruction or kinking. Remove debris from the discharge line. Adjust hose to avoid any kinks.	
24. Bilge pump will not shut off.	Step 1. Inspect float switch for plugging with debris or malfunctioning. Remove guard over float switch and remove any debris obstructing operation. Manually jog float switch up and down. If pump fails to stop as expected, replace float switch. Step 2. Inspect for defective switch/indicator in operator's cab. Replace switch/indicator.	
25. Bilge pump status lights not functional.	Step 1. Inspect for bad lamp. Replace lamp. Step 2. Inspect for open circuit in wiring between the Lower Control Panel Assembly and the Power Module Junction Box. With the pump running, check for 24 VDC at terminals in the Power Module Junction Box as tabulated below. Refer to Appendix G. (Test terminals are the same in the port and starboard power module junction boxes.)	

<u>PUMP RUN</u>	<u>TERMINALS (UNIT 2A3, 1A3)</u>	<u>WIRE NOS.</u>
#1 (3A2S9, 3A2S15)	TB1-18/TB3-5	143/0
#2 (3A2S10, 3A2S16)	TB1-20/TB3-5	148/0
#3 (3A2S1 1, 3A2S17)	TB2-2/TB3-5	153/0
#4 (3A2S12, 3A2S18)	TB2-4/TB3-5	158/0
#5 (3A2S13, 3A2S19)	TB2-6/TB3-5	163/0
#6 (3A2S14, 3A2S20)	TB2-8/TB3-5	168/0

If 24 VDC is not present, refer to Bilge Pump Control Panel and Single Bilge Pump Control Assembly and check wiring between the appropriate Bilge Pump Control Panel and the Power Module Junction box.

If 24 VDC is present, check for 24 VDC at terminals tabulated below at the Operator's Cab Terminal Board Assembly (Unit 3A4) with the appropriate pump running.

<u>PUMP RUN</u>	<u>TERMINALS (UNIT 3A4)</u>	<u>WIRE NOS.</u>
#1 Port (3A2S9)	TB2-2/TB10-3	331/0
#2 Port (3A2S10)	TB2-4/TB10-3	333/0
#3 Port (3A2S11)	TB2-6/TB10-3	335/0
#4 Port (3A2S12)	TB2-8/TB10-3	337/0
#5 Port (3A2S13)	TB2-10/TB10-3	339/0
#6 Port (3A2S14)	TB2-12/TB10-3	341/0

Table 2-2. Unit Troubleshooting Procedures (Cont).

**MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION**

25. Bilge pump status lights not functional (Cont).

Step 2 (Cont).

<u>PUMP RUN</u>	<u>TERMINALS (UNIT 3A4)</u>	<u>WIRE NOS.</u>
#1 Stbd (3A2A15)	TB4-2/TB10-3	343/0
#2 Stbd (3A2A16)	TB4-4/TB10-3	345/0
#3 Stbd (3A2A17)	TB4-6/TB10-3	347/0
#4 Stbd (3A2A18)	TB4-8/TB10-3	349/0
#5 Stbd (3A2A19)	TB4-10/TB10-3	351/0
#6 Stbd (3A2A20)	TB4-12/TB10-3	353/0

If no 24 VDC, check interconnect wiring between the Operator's Cab Terminal Board Assembly (Unit 3A4) and the appropriate Power Module Junction Box.

If 24 VDC is present, check wiring between the Operator's Cab Terminal Board Assembly (Unit 3A4) and the appropriate Pump Run pushbutton.

26. Water entering bilge from pump discharge line when pump is not operating.

Step 1. Inspect for defective check valve in discharge line.
Replace check valve.

27. Thermal detector does not trip fire alarm.

Step 1. Ensure circuit breaker is not OFF.
Turn A6CB4 ON

Step 2. Inspect for open circuit in wiring to the detector.
Repair circuit.

Step 3. Inspect for faulty detector.
Test by applying heat to detector. Remove heat source. If bulb stays ON until set point is reached the detector is good, if not, replace the detector. Reconnect good detector to system once it has cooled.

Step 4. Refer to next higher level maintenance.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
28. Clutch FORWARD/DISENGAGE/BACKFLUSH control not operational.		
		NOTE
		Safety contacts are normally closed to allow the engine to start. The engine cannot be started if the clutch is in either the FORWARD or BACKFLUSH positions.
	Step 1. Ensure circuit breaker located in the Power Module Circuit Breaker Panel (machinery compartment) is not OFF.	Turn circuit breaker ON.
29. Clutch control does not function in FORWARD mode.		
	Step 1. Inspect for open circuit between the Operator Cab and the Power Module Junction Box.	
	With the Clutch control in the FORWARD position, check for 24 VDC at terminals TB1-11/TB1-13 (wire nos. 174/0) in the appropriate Power Module Junction Box.	
	If 24 VDC is present, refer to Marine Gear troubleshooting procedures.	
	If no 24 VDC, check wiring between the Power Module Junction Box and the Clutch Control switch 3A2S5 (port), 3A2S6 (stbd).	
	Step 2. Inspect for failed control switch.	
	Check for 24 VDC at 3A2S5-6/3A2DS2-2 port (wire nos. 402/-0), 3A2S6-6/3A2DS2-2 stbd (wire nos. 405/0).	
	If 24 VDC is present, check for 24 VDC at 3A2S5-2/3A2DS2-2 port (wire nos. 401/0), 3A2S5-2/3A2DS2-2 stbd (wire nos. 404/0). If 24 VDC is present, replace switch A2S5 port, A2S6 stbd.	
	If no 24 VDC, check wiring between A2S5-2 (A2S6-2) and the appropriate Power Module Circuit Breaker Panel.	
30. Clutch control does not function in BACKFLUSH mode.		
	Step 1. Inspect for open circuit between the Operator Cab and the Power Module Junction Box.	
	With the Clutch control in the BACKFLUSH position, check for 24 VDC at terminals TB1 -12/TB1-13 (wire nos. 175/0) in the appropriate Power Module Junction Box.	
	If 24 VDC is present, refer to Marine Gear troubleshooting procedures.	
	If no 24 VDC, check wiring between the Power Module Junction Box and the Clutch Control switch 3A2S5 (port), 3A2S6 (stbd).	

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
30. Clutch control does not function in BACKFLUSH mode (Cont).	Step 2. Inspect for failed control switch.	Check for 24 VDC at 3A2S5-1/3A2DS2-2 port (wire nos. 403/0), 3A2S6-1/3A2DS2-2 stbd (wire nos. 406/0). If 24 VDC is present, check for 24 VDC at 3A2S5-2/3A2DS2-2 port (wire nos. 401/0), 3A2S6-2/3A2DS2-2 stbd (wire nos. 404/0). If 24 VDC is present, replace switch A2S5 port, A2S6 stbd. If no 24 VDC, check wiring between A2S5-2 (A2S6-2) and the appropriate Power Module Circuit Breaker Panel.
31. Clutch status light not operational.	NOTE	Clutch status light is energized when clutch is in either FORWARD or BACKFLUSH position.
	Step 1. Ensure circuit breaker A6CB2 located in the Power Module Circuit Breaker Panel (unit 1A6 stbd, 2A6 port) is not OFF.	Turn circuit breaker ON.
	Step 2. Inspect for failed lamp.	Replace lamp.
	Step 3. Inspect for open circuit between the Operator Cab and the Power Module Junction Box.	Check for 24 VDC at TB1 -4/TB1 -13 (wire nos. 111/0) in the appropriate Power Module Junction Box. If no 24 VDC, refer to Power Take-Off for clutch and Neutral Switch troubleshooting procedures. If 24 VDC, check for 24 VDC at 3A4TB2-16/3A4TB10-3 (port, wire nos. 311/0) and 3A4TB4-16/3A4TB10-3 (stbd, 323/0) at the Operator's Cab Terminal Board Assembly (Unit 3A4). If no 24 VDC, check wiring between the Operator's Cab Terminal Board Assembly and the appropriate Power Module Junction Box. If 24 VDC, check wiring between the Operator's Cab Terminal Board Assembly and the appropriate clutch status light A2DS4 port, A2DS5 stbd.
	Step 4. Inspect for failed diode 3A2D1 (port), 3A2D2 (stbd).	For failed diode, notify next higher level maintenance.
32. Clutch will not engage FORWARD or BACKFLUSH - low gear oil pressure.	Step 1. Ensure hydraulic shifting solenoid valves (1A2L2 and 1A2L3 starboard, 2A2L2 and 2A2L3 port) are not staying energized.	

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
32. Clutch will not engage FORWARD or BACKFLUSH - low gear oil pressure (Cont).	Step 1 (Cont).	<p>Isolate clutch control 3A2S5 terminal 12 (port), 3A2S6 terminal 12 (starboard). With the clutch control head in either the FORWARD or BACKFLUSH position, and the associated steering joystick in neutral position, check for 24 VDC at appropriate clutch switch 3A2S5-12/3A2DS2-2 (port, 401/0), 3A2S6-12/3A2DS2-2 (starboard, 404/0). If 24 VDC is present, check switch wiring and replace switch 3A2S5 or 3A2S6 if necessary.</p> <p>If 24 VDC is not present, check wiring to the hydraulic shifting solenoid valves (1A2L2/1A2L3 starboard, 2A2L2/2A2L3 port) for short circuits to 24 VDC.</p> <p>Refer to hydraulic system troubleshooting procedures in TM 55-1945-205-24-3 (MARINE TRANSMISSION).</p>
33. Vent fan will not operate.	Step 1. Ensure circuit breaker A6CB3 located in the Power Module Circuit Breaker Panel is not OFF.	Turn circuit breaker ON.
	Step 2. Ensure fire suppression system is not activated.	<p>Check fire suppression system. Vent fan will not operate if CO2 pressure switch 1S2 (stbd), 2S2 (port) is actuated. With fan control 3A2S21 (port), 3A2S22 (stbd) ON, check for 24 VDC at TB1-14/TB3-5 (wire nos. 134/0) in the appropriate Power Module Junction Box.</p> <p>Reference Fire Suppression System.</p>
	Step 3. Inspect for open circuit between 3A2S21 (port) or 3A2S22 (stbd) and the Operator Cab Terminal Block Assembly (Unit 3A4).	<p>With fan control ON, check for 24 VDC at TB1-14/TB10-3 (port, wire nos. 134/0) and TB3-14/TB10-3 (stbd, wire nos. 373/0) at the Operator's Cab Terminal Block Assembly.</p> <p>If no 24 VDC, check wiring between 3A2S21 and 3A2S22 and the Operator's Cab Terminal Block Assembly.</p>
	Step 4. Inspect for failed vent fan control switch.	If no 24 VDC and wiring checked OK, check for 24 VDC at 3A2S21-2/DS2-2 (port, wire nos. 370/0), 3A2S22-2/DS2-2 (stbd, wire nos. 372/0). If 24 VDC is present, replace 3A2S21, 3A2S22 as applicable.
	Step 5. Inspect for open circuit between Operator Cab Terminal Block Assembly (Unit 3A4) and the Power Module Junction Box.	With fan control ON, check for 24 VDC at TB1-14/TB10-3 (port, wire nos. 134/0) and TB3-14/TB10-3 (stbd, wire nos. 373/0) at the Operator's Cab Terminal Block Assembly. If 24 VDC is present, check for 24 VDC at TB1-15/TB3-5 (wire nos. 135/0) in the appropriate Power Module Junction Box.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
33. Vent fan will not operate (Cont).	Step 5 (Cont).	<p>If no 24 VDC, check interconnect wiring between the Power Module Junction Box and the Operator's Cab Lower Control Panel Assembly 3A2S21 (port) and 3A2S22 (stbd) as appropriate.</p> <p>If 24 VDC is present, refer to Vent Fan controller troubleshooting procedures.</p>
34. Fan operating status light does not illuminate.	Step 1. Inspect for failed lamp.	Replace lamp.
	Step 2. Inspect for open in wiring to status light A2DS6 (port), A2DS7 (stbd).	<p>Check for 24 VDC at 3A2S21-3/3A2DS2-2 (port, wire nos. 371/0)), 3A2S22-3/3A2DS2-2 (stbd, wire nos. 373/0) in the Operator Cab Lower Control Panel Assembly.</p> <p>If 24 VDC is present, check wiring between 3A2S21 and 3A2 DS6 (port) and 3A2S22 and 3A2DS7 (stbd) as applicable.</p>
	Step 3. Inspect for failed diode 3A2D15 (port), 3A2D16 (stbd).	Refer to next higher level maintenance.
35. Fire alarm horn 3A4LS2 does not operate.	Step 1. Inspect for open circuit between 3A2S3 (stbd), 3A2S1 (port) and the Operator Cab Terminal Block Assembly (Unit 3A4).	Check for 24 VDC at 3A4TB5-9/3A4TB10-3 (stbd, wire nos. 358/0), 3A4TB5-11/3A4TB10-3 (port, wire nos. 362/0) at the Operator's Cab Terminal Block Assembly.
	Step 2. Inspect for failed switch 3A2S3 (stbd), 3A2S1 (port).	Check for 24 VDC at 3A2S3-1/3A2DS2-2 (port, wire nos. 357/0) and 3A2S1-1/3A2DS2-2 (stbd, wire nos. 361/0).
	Step 3. Inspect for open circuit in wiring between Operator Cab Lower Control Panel and Power Module Bilge Pump Control Panel Assembly.	If no 24 VDC, check wiring between the Operator's Cab Lower Control panel and the appropriate Power Module Bilge Pump Control Panel Assembly.
	Step 4. Inspect for failed diode 1A5D2 (stbd), 1A5D2 (port).	<p>Refer to higher level maintenance.</p> <p>Refer to Fire Suppression System troubleshooting procedures.</p>

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
35. Fire alarm horn 3A4LS2 does not operate (Cont).	Step 5. Inspect for failed switch 3A2S3 (stbd), 3A2S1 (port) diagnosed at Unit Level.	Replace appropriate switch 3A2S3 or 3A2S1.
36. Fire alarm light 3A2DS3 (stbd) or 3A2DS1 (port) does not illuminate in ALARM mode.	Step 1. Inspect for failed lamp.	Replace lamp. (ALARM/SILENCE/TEST switches 3A2S3 and 3A2S1 can be used to test 3A2DS3 and 3A2DS1 lamps respectively. Lamp should illuminate when the corresponding ALARM/SILENCE/TEST switch is placed in the TEST position.)
	Step 2. Inspect for open circuit between 3A2DS3 and 3A2S3 (stbd), 3A3DS1 and 3A2S1 (port).	Check for 24 VDC at 3A2S1-5/3A2DS1-2 (port, wire nos. 363/460), 3A2S3-5/3A2DS3-2 (stbd, wire nos. 360/0). If 24 VDC is present, check wiring between 3A2DS3 and 3A2S3 and between 3A2DS1 and 3A2S1 as applicable.
	Step 3. Inspect for failed switch 3A2S3 (stbd), 3A2S1 (port).	If no 24 VDC, check for 24 VDC at 3A2S1-6/3A2DS1-2 (port, wire nos. 361/460), 3A2S3-6/3A2DS3-2 (stbd, wire nos. 357/0). If 24 VDC is present but was not present in previous step, replace switch.
	Step 4. Inspect for failed diode 3A2D18.	Refer to next higher level maintenance.
37. Flood alarm beeper does not operate.	Step 1. No 24 VDC at beeper A2LS1.	Check for 24 VDC at beeper terminals 3A2LS1 (+)/3A2LS1 (-) (wire nos. 355/0). If 24 VDC is present, replace beeper.
	Step 2. Inspect for open in beeper circuit.	Check for 24 VDC at 3A2S2-2/3A2LS1(-) (wire nos. 355/0). If 24 VDC is present, check wiring between 3A2S2 and 3A2LS1.
	Step 3. Inspect for failed switch 3A2S2.	If 24 VDC was not present in the previous step, check for 24 VDC at 3A2S2-1/3A2LS1(-) (wire nos. 354/0). If 24 VDC is present, replace switch.
	Step 4. Inspect for open in wiring between Operator Cab Lower Control Panel and Terminal Board Assembly (Unit 3A4).	

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
37. Flood alarm beeper does not operate (Cont).		<p>If 24 VDC was not present in the previous step, check for 24 VDC at 3A4TB4-18/3A4TB10-3 (wire nos. 354/0) at the Operator Cab Terminal Board Assembly. If 24 VDC is present, check wiring.</p> <p>Step 5. Inspect for open in wiring between Operator's Cab Terminal Board Assembly and Power Module Junction Box. If 24 VDC was not present in the previous step, check for 24 VDC at TB1-16/TB3-5 (wire nos. 139/0) in the appropriate Power Module Junction Box. If 24 VDC is present, check wiring.</p> <p>Step 6. Inspect for open in wiring between Bilge Pump Control Panel and Power Module Junction Box. If 24 VDC was not present in the previous step, check for 24 VDC at TB1-3/TB3-2 (wire nos. 139/0) in the appropriate Bilge Pump Control Panel (Unit 1A5, stbd; Unit 2A5, port). If 24 VDC is present, check wiring.</p> <p>Step 7. Inspect for failed diode 1A5D1 (stbd), 2A5D1 (port). Refer to next higher level maintenance.</p>
38. Flood alarm light 3A2DS2 does not illuminate in ALARM mode.		<p>Step 1. Inspect for failed lamp. Replace lamp. (ALARM/SILENCE/TEST switch 3A2S2 can be used to test 3A2DS2. Lamp should illuminate when the ALARM/SILENCE/TEST switch is placed in the TEST position.)</p> <p>Step 2. Inspect for open circuit between 3A2DS2 and 3A2S2. Check for 24 VDC at 3A2S2-5/3A2DS2-2 (wire nos. 356/0). If 24 VDC is present, check wiring between 3A2DS2 and 3A2S2.</p> <p>Step 3. Inspect for failed switch 3A2S2. If no 24 VDC, check for 24 VDC at 3A2S2-6/3A2DS2-2 (wire nos. 354/0). If 24 VDC is present but was not present in previous step, replace switch.</p>
NOTE		
A red flooding alarm location light is illuminated in the operator's cab whenever a float switch senses a flooding condition.		
39. No Clockwise steering control from Operator Cab.		<p>Step 1. Inspect for open in circuit between steering control and Clockwise steering solenoid. With steering control in the Clockwise position, check for 24 VDC at terminals at the Operator's Cab Terminal Board Assembly. If 24 VDC is present, check interconnect wiring between the Operator's Cab and the appropriate Power Module steering solenoid.</p>

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
39. No Clockwise steering control from Operator Cab (Cont).	Step 2. Inspect for failed switch.	If 24 VDC is present, check switch wiring and repair as necessary.
40. No Counterclockwise steering control from Operator Cab.	Step 1. Inspect for open in circuit between steering control and Counterclockwise steering solenoid.	With steering control held in the Counterclockwise position, check for 24 VDC at terminals.
	Step 2. Inspect for failed switch.	If 24 VDC is present, check switch wiring and repair as necessary.
41. No steering control from Operator Cab; low hydraulic system pressure.	Step 1. Ensure hydraulic system solenoid valves (1A2L1 Clockwise, 1A2L2 Counterclockwise Port, 2A2L1 Clockwise, 2A2L2 Counterclockwise, Starboard) are not staying energized. Isolate steering control 3A2S23 terminal 4 (port), 3A2S24 terminal 4 (starboard). With the steering control held in either the Clockwise or Counterclockwise position, check for 24 VDC at appropriate steering switch 3A2S23-4/3A2DS2-2 (port, wire nos. 421/0), 3A2S24-4/3A2DS2-2 (starboard, wire nos. 439/0). If 24 VDC is present, check switch wiring and replace switch 3A2S23 or 3A2S24 as necessary.	If 24 VDC is not present, check wiring to the hydraulic system solenoid valves (1A2L1 Clockwise and 1A2C2 Counterclockwise, port or 2A2L1 Clockwise and 2A2L2 Counterclockwise, starboard) for short circuits to 24 VDC.
42. Gauge and panel lights not operating.	Step 1. Inspect supply voltage to dimmer.	Check for 24 VDC at dimmer leads 3A2R1-red/3A2R1-black (wire nos. 374/0). If no 24 VDC, check wiring between dimmer 3A2R1 and the Operator Cab Circuit Breaker Panel 3A3.
43. Gauge lights will not operate.	Step 1. Inspect for open circuit between dimmer and gauge lights.	Check interconnect wiring between dimmer 3A2R1-blue, 3A2R1-black and gauge lights.
44. Gauge lights will not operate or vary in brightness.	Step 1. Inspect for failed dimmer 3A2R1.	Confirm 24 VDC supply to dimmer at leads 3A2R1-red/3A2R1-black (wire nos. 374/0). Check for variable output 0-24 VDC at dimmer leads 3A2R1-blue/3A2R1-black (wire nos. 375/0). If output does not vary, replace dimmer.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
45. Panel lights will not operate.	Step 1. Inspect for open circuit between dimmer and panel lights. Check interconnect wiring between dimmer 3A2R1-white, 3A2R1-black and panel lights.	
46. Panel lights will not operate or vary in brightness.	Step 1. Inspect for failed dimmer 3A2R1. Confirm 24 VDC supply to dimmer at leads 3A2R1-red/3A2R1-black (wire nos. 374/0). Check for variable output 0-24 VDC at dimmer leads 3A2R1-white/3A2R1-black (wire nos. 329/0). If output does not vary, replace dimmer.	
47. Fan control does not work on LOW.	Step 1. Inspect for open circuit between switch 3A2S4 and heater fan 3B1 A. With 3A2S4 in LOW, check for 24 VDC at 3A4TB5-7/3A4TB10-3 (wire nos. 390/0) at the Operator Cab Terminal Board Assembly. If 24 VDC is present, check wiring between the Operator Cab Terminal Board Assembly and the heater fan 3B1A. If no 24 VDC, check for 24 VDC at 3A2S4-1/3A2DS2-2 (wire nos. 390/0). If 24 VDC, check wiring between 3A2S4 and the Operator's Cab Terminal Board Assembly. Step 2. Inspect for failed switch 3A2S4. If 24 VDC was not present in the previous step, check for 24 VDC at 3A2S4-2/3A2DS2-2 (wire nos. 389/0). If 24 VDC is present, check switch wiring and repair as necessary. If 24 VDC is not present, check wiring between the Operator's Cab Circuit Breaker Panel and switch 3A2S4.	
48. Only fan B1B operates with Heater Fan control in HIGH.	Step 1. Inspect for open circuit between switch 3A2S4 and heater fan 3B1A. Refer to procedures above. Step 2. Inspect for failed switch 3A2S4. Refer to procedures above.	
49. Fan B1B does not operate with Heater Fan control in HIGH.	Step 1. Inspect for open circuit between switch 3A2S4 and heater fan 3B1 B. With 3A2S4 in HIGH, check for 24 VDC at 3A4TB5-8/3A4TB10-3 (wire nos. 391/0) at the Operator's Cab Terminal Board Assembly. If 24 VDC is present, check wiring between the Operator's Cab Terminal Board Assembly and the heater fan 3B1 B. Refer to Appendix G. If no 24 VDC, check for 24 VDC at 3A2S4-6/3A2DS2-2 (wire nos. 391/0). If 24 VDC, check wiring between 3A2S4 and the Operator's Cab Terminal Board Assembly.	

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
49. Fan B1B does not operate with Heater Fan control in HIGH (Cont).	Step 2. Inspect for failed switch 3A2S4.	<p>If 24 VDC was not present in the previous step, check for 24 VDC at 3A2S4-5/3A2DS2-2 (wire nos. 389/0). If 24 VDC is present, check switch wiring and repair as necessary.</p> <p>If 24 VDC is not present, check wiring between the Operator's Cab Circuit Breaker Panel and switch 3A2S4.</p>
50. Defroster fan does not operate.	Step 1. Inspect for open circuit between switch 3A2S25 and defroster fan 3B3.	<p>With 3A2S25 ON, check for 24 VDC at 3A4TB5-15/3A4TB10-3 (wire nos. 442/0) at the Operator Cab Terminal Board Assembly. IF 24 VDC is present, check wiring between the Operator Cab Terminal Board Assembly and the defroster fan 3B3.</p> <p>If no 24 VDC, check for 24 VDC at 3A2S25-3/3A2DS2-2 (wire nos. 442/0). If 24 VDC, check wiring between 3A2S25 and the Operator Cab Terminal Board Assembly.</p>
	Step 2. Inspect for failed switch 3A2S25.	<p>If 24 VDC was not present in the previous step, check for 24 VDC at 3A2S25-2/3A2DS2-2 (wire nos. 389/0). If 24 VDC is present, check switch wiring and repair as necessary.</p> <p>If 24 VDC is not present, check wiring between the Operator's Cab Circuit Breaker Panel and switch 3A2S25.</p>
51. All circuits controlled by 3A3CB1-3A3CB10 are not functioning.	Step 1. Ensure 1A6CB11 circuit breaker and 2A6CB11 circuit breaker located at the stbd and port power module circuit breaker panels (Units 1A6 and 2A6) respectively are not OFF.	Position both circuit breakers ON.
	Step 2. Ensure 24 VDC supply to Operator Cab Circuit Breaker Panel.	<p>Check for 24 VDC at 3A3TB1-3/3A3TB2-1 (wire nos. 300A/0) and at 3A3TB1-2/3A3TB2-1 (wire nos. 300B/0). If 24 VDC is not present check wiring between the Operator's Cab Circuit Breaker Panel 3A3 and the starboard and port power module junction boxes (1A3 and 2A3 respectively). Refer to Appendix G.</p> <p>If 24 VDC is present proceed to the next step.</p>
	Step 3. Inspect for open in D1/D2 circuit.	<p>Check for 24 VDC at 3A3D2 cathode/3A3TB2-1 (wire nos. 300/0). If 24 VDC is not present, verify 3A3D1 and 3A3D2 anode and cathode connections. Refer to Appendix G.</p> <p>If 24 VDC is present, check interconnect wiring from 3A3D2 cathode to 3A3CB7-1 (wire no. 300). Also verify connections between 3A3CB1-1 through 3A3CB10-1.</p>

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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52. A circuit controlled by 3A3CB1 -3A3CB10 is not functioning.

Step 1. Inspect for open in 3A3 internal wiring to the line side of the affected circuit breaker (wire no. 300).

Check for 24 VDC at terminals tabulated below. If 24 VDC is not present, check internal wiring to affected circuit breaker.

If 24 VDC is present, proceed to the next step.

<u>CIRCUIT BREAKER</u>	<u>TERMINALS (UNIT 3A3)</u>
A3CB1	CB1-1/TB2-1
A3CB2	CB2-1/TB2-1
A3CB3	CB3-1/TB2-1
A3CB4	CB4-1/TB2-1
A3CB5	CB5-1/TB2-1
A3CB6	CB6-1/TB2-1
A3CB7	CB7-1/TB2-1
A3CB8	CB8-1/TB2-1
A3CB9	CB9-1/TB2-1
A3CB10	CB10-1/TB2-1

Step 2. Inspect for failed circuit breaker.

With the appropriate breaker ON, check for 24 VDC at terminals tabulated below. If 24 VDC is not present, replace circuit breaker.

If 24 VDC is present refer to specific troubleshooting procedures for the affected circuit.

<u>CIRCUIT BREAKER</u>	<u>TERMINALS (UNIT 3A3)</u>	<u>WIRE NOS.</u>
A3CB1	CB1-2/TB2-1	381/0
A3CB2	CB2-2/TB2-1	362/0
A3CB3	CB3-2/TB2-1	384/0
A3CB4	CB4-2/TB2-1	387/0
A3CB5	CB5-2/TB2-1	389/0
A3CB6	CB6-2/TB2-1	392/0
A3CB7	CB7-2/TB2-1	393/0
A3CB8	CB8-2/TB2-1	394/0
A3CB9	CB9-2/TB2-1	374/0
A3CB10	CB10-2/TB2-1	303/0

53. No voltage at test jacks when using built-in test switch 3A3S1 - 3A3S1 in any position.

Step 1. Inspect for open circuit between 3A3S1 wiper and test jack J2(+).

Check wiring between 3A3S1 COMMON and jack J2(+) - repair as necessary.

Step 2. Ensure isolation resistor 3A3R1 has not failed open.

Replace isolation resistor.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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53. No voltage at test jacks when using built-in test switch 3A3S1 - 3A3S1 in any position (Cont).

Step 3. Inspect for open circuit between TB2-1 and test jack J2(-).

Check wiring between TB2-1 and test jack J2(-) (wire no. 0) - repair as necessary.

54. No voltage at test jacks when using built-in test switch 3A3S1.

Step 1. Inspect for bad connection/wiring between 3A3S1 and TB.

Check wiring as tabulated below for affected 3A3S1 position. Repair as necessary. Refer to Appendix G.

<u>3A3S1 POSITION</u>	<u>WIRING</u>	<u>WIRE NO.</u>
	<u>FROM</u>	<u>TO</u>
1	S1-POS 1	TB2-2 302
2	S1-POS 2	TB2-3 301
3	S1-POS 3	TB2-4 400
4	S1-POS 4	TB2-5 397
5	S1-POS 5	TB2-6 422
6	S1-POS 6	TB2-7 407

55. Spotlight not functioning.

Step 1. Inspect for burned out lamp.

Replace lamp.

Step 2. Inspect for open circuit between Operator's Cab Terminal Board Assembly and Spotlight.

Check for 24 VDC at terminals 3A4TB5-5/3A4TB11-2 (wire nos. 383/0). If 24 VDC is present, check wiring between the Operator's Cab Terminal Board Assembly and the Spotlight. Repair wiring if necessary.

If 24 VDC is not present, refer to Operator's Cab Middle Control Panel troubleshooting procedures for 3A1S11.

56. Diesel Engine does not run properly.

Step 1. Ensure air intake plenum louver assembly is not clogged.

Clean air intake louver assembly.

Step 2. Ensure flapper door contained within the intake plenum is not closed.

Reconnect wire rope from the fire suppression system to hold flapper door in the open position.

57. Propulsion Module becomes hotter than normal operating temperature.

Step 1. Check for fire.

Step 2. Ensure flapper door contained within the intake plenum is not closed.

Reconnect wire rope to the pressure trip mechanism to hold flapper door in the open position.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
57. Propulsion Module becomes hotter than normal operating temperature (Cont).	Step 3. Ensure air intake louver assembly is not clogged	Clean air intake louver assembly.
58. The Ventilation Fan does not work.	Step 1. Ensure the electrical connections to ventilation fan are connected properly.	Repair electrical connections
	Step 2. Ensure switch located in cab is not faulty	Replace defective component
	Step 3. Ensure ventilation fan is not faulty	Replace defective component
	Step 4. Inspect for blown fuses with ventilation fan.	Replace defective component
59. Lamp fixture on main or stub mast not working.	Step 1. Check that breaker on Circuit Breaker Panel A6 is toggled ON.	Turn breaker ON.
	Step 2. Inspect for loose or broken bulb.	Tighten or replace bulb.
	Step 3. Inspect for bad switch.	Replace the switch.
60. Loss of power to main or stub mast.	Step 1. Check that circuit breaker has not been tripped.	Turn breaker ON.
	Step 2. Inspect for loose connection at plug-in points.	Check/tighten connection.
	Step 3. Inspect for short in wire.	Repair or replace affected wiring.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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61. Lamp indicator light on mast enclosure junction box not working.

Step 1. Inspect for loose or broken bulb.

Tighten or replace bulb.

Step 2. Inspect for bad switch.

Replace the switch.

62. None of navigation lights are functioning.

NOTE

When power switch is turned ON, an alarm may sound briefly while a relay switches to the red indicator light.

Step 1. Ensure circuit breaker A3C1 (Operator's cab panel) is not off.

Turn circuit breaker A3C1 ON.

Step 2. Inspect for bad connection between Navigation Lights Terminal Box and Operator's Cab A4 panel.

Check for 24 VDC in navigation lights terminal box on fuse block wire No. 381 and TB6-A7 wire No. 0.

If 24 VDC is present, check cab receptacle J1, located on front of the operator's cab above the window, for proper connection.

63. One or more navigation lights are not functioning.

NOTE

Red lights on control panel indicate mast lights are active. When a mast light burns out an alarm sounds and its associated red light goes out. There are diodes in the circuit to eliminate feedback to other light sources when an alarm is activated. The alarm may be silenced using the ALARM/SILENCE switch.

Step 1. Inspect for blown fuse.

Check the appropriate fuse for the circuit. All fuses are 5 amps. If fuse is blown, check circuit for short and replace fuse. Refer to Appendix G.

FUSE

- A7F1
- A7F2
- A7F3
- A7F4
- A7F5
- A7F6
- A7F7
- A7F8
- A7F9
- A7F10

LIGHTING CIRCUIT

- Anchor Light
- Upper Mast
- Lower Mast
- Port Side Light
- Starboard Side Light
- Upper Port/Starboard Vessel Aground Lights
- Lower Port/Starboard Vessel Aground Lights
- Stub Mast (Unit 5) Stern Light
- Vessel Port/Starboard Task Light
- Spare Fuse

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION		
63. One or more navigation lights are not functioning (Cont).				
	Step 2. Inspect for bad lamp.			
	Replace lamp.			
	Step 3. Inspect for open circuit.			
	Inspect Navigation Lights Switch Box internal wiring.			
	Check for 24 VDC at appropriate terminals (listed below) for the malfunctioning circuit.			
	If 24 VDC is present, refer to Navigation Lights Cable Diagram (Appendix G) and check wiring between the Navigation Lights Switch Box and the appropriate navigation light and repair if necessary.			
	If 24 VDC is not present, check internal Navigation Lights Switch Box wiring between test terminals above and the appropriate switch (or receptacle) and repair if necessary. Proceed to the next step.			
<u>LIGHT</u>	<u>SWITCH</u>	<u>POSITION</u>	<u>TERMINALS</u>	<u>WIRE NOS.</u>
Anchor Light (4DS1)	A7S1	ON	TB1-A11/TB6-A6	501/0
Task Lights - Port (4DS10)	A7S9	ON	TB5-B10/TB6-A6	522/0
Task Lights - Starboard (4DS11)	A7S9	ON	TB5-A18/TB6-A6	522B/0
Upper Masthead Light (4DS2-A)	A7S2	PRIMARY	TB1-B14/TB6-A6	503/0
Upper Masthead Light (4DS2-B)	A7S2	SPARE	TB2-A3/TB6-A6	504/0
Lower Masthead Light (4DS3-A)	A7S3	PRIMARY	TB2-B6/TB6-A6	506/0
Lower Masthead Light (4DS3-B)	A7S3	SPARE	TB2-A14/TB6-A6	507/0
Port Sidelight (4DS4-A)	A7S4	PRIMARY	TB2-B17/TB6-A6	509/0
Port Sidelight (4DS4-B)	A7S4	SPARE	TB3-A4/TB6-A6	510/0
Stbd Sidelight (4DS5-A)	A7S5	PRIMARY	TB3-B7/TB6-A6	512/0
Stbd Sidelight (4DS5-B)	A7S5	SPARE	TB3-A15/TB6-A6	513/0
Upper Port Vessel Aground (4DS6)	A7S6	ON	TB4-B8/TB6-A6	518/0
Upper Stbd Vessel Aground (4DS7)	A7S6	ON	TB4-A16/TB6-A6	518B/0
Lower Port Vessel Aground (4DS8)	A7S7	ON	TB4-B19/TB6-A6	520/0
Lower Stbd Vessel Aground (4DS9)	A7S7	ON	TB5-A7/TB6-A6	520B/0
Stub Mast Stern Light (5DS1-A)	A7S8	PRIMARY	TB3-B18/TB6-A6	515/0
Stub Mast Stern Light (5DS1-B)	A7S8	SPARE	TB4-A5/TB6-A6	516/0

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
--------------------	---------------------------	--------------------------

63. One or more navigation lights are not functioning (Cont).

Step 4. Inspect for failed control switch.

Check for 24 VDC at terminals listed below for the malfunctioning circuit.

<u>LIGHT</u>	<u>TERMINALS</u>	<u>WIRE NOS.</u>
Anchor Light (4DS1)	S1-2/TB6-A6	500/0
Task Lights Port (4DS10)	S9-2/TB6-A6	521/0
Task Lights Starboard (4DS11)	S9-2/TB6-A6	521/0
Upper Masthead Light (4DS2-A, 4DS2-B)	S2-2/TB6-A6	502/0
Lower Masthead Light (4DS3-A, 4DS3-B)	S3-2/TB6-A6	505/0
Port Sidelight (4DS4-A, 4DS4-B)	S4-2/TB6-A6	508/0
Stbd Sidelight (4DSS-A, 4DS5-B)	S5-2/TB6-A6	511/0
Stub Mast Stern Light (5DS1-A, 5DS1-B)	S8-2/TB6-A6	514/0
Upper Port Vessel Aground (4DS6)	S6-2/TB6-A6	517/0
Upper Stbd Vessel Aground (4DS7)	S6-2/TB6-A6	517/0
Lower Port Vessel Aground (4DS8)	S7-2/TB6-A6	519/0
Lower Stbd Vessel Aground (4DS9)	S7-2FTB6-A6	519/0

If 24 VDC is present and was not present in the previous step, replace switch.

If no 24 VDC, check wiring between the control switch and the appropriate fuse. Repair/replace as necessary.

Step 5.

Once mast light has been repaired, return the ALARM/SILENCE switch to the ALARM position.

64. Stub Mast Stern Light not functioning.

Step 1. Inspect for bad J2/P2 connection.

Check plug/receptacle connection of the stub mast umbilical cable to the front of the cab.

Step 2. Inspect for blown fuse.

Check fuse 4A1 F8. If fuse is blown, check circuit for short and replace fuse.

Step 3. Inspect for bad lamp.

Replace lamp.

Table 2-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
--------------------	---------------------------	--------------------------

64. Stub Mast Stern Light not functioning (Cont).

Step 4. Inspect for open circuit.

With 4A1 S8 positioned as indicated, check for 24 VDC at terminals listed below.

<u>4A1S8 POSITION</u>	<u>TERMINALS</u>	<u>WIRE NOS.</u>
PRIMARY	TB3-B18/TB6-A6	515/0
SPARE	TB4-A5/TB6-A6	516/0

Step 5.

Once mast light has been repaired, return the ALARM/SILENCE switch to the ALARM position.

65. Interconnection Cable not working between modules.

Step 1. Inspect for bad or loose connections at plugs.

Replace plugs.

Step 2. Inspect for bad or broken cables.

Replace cables.

66. Handheld Triton radio inoperable.

Step 1. Remove vent panel in cab.

Step 2. Check power for voltage regulator VR1. Ensure main circuit breaker A3 is ON.

Step 3. Check that cab power is ON at A6.

Step 4. Check A3 CB8 is ON.

Step 5. Check that battery charger is supplying 12V output.

Step 6. Check that fuse in converter VR1 on A4 terminal strip is good.

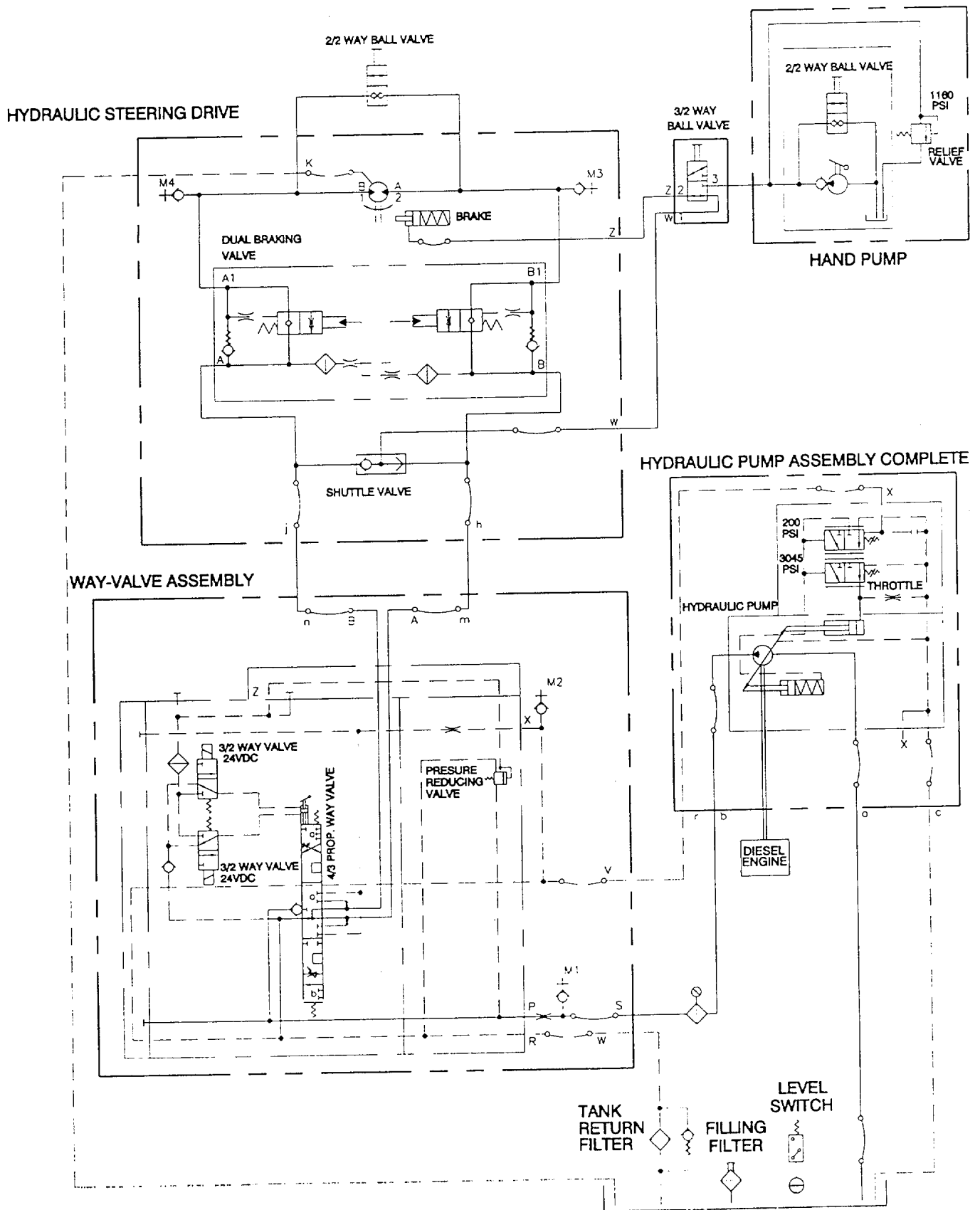


Figure 2-1. Hydraulic Schematic

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2-10. General. This section contains unit maintenance instructions on the Modular Causeway Ferry (MCF) as authorized by the MAC (Appendix B) of this manual.

2-11. Duplex Strainer, Raw Water Cooling System.

This task covers: a. Service b. Remove c. Install d. Adjust

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Duplex Strainer
Gaskets (Item 5, Appendix E)
Body Cover Gasket (Item 1, Appendix E)

a. Service. (figure 2-2).

- (1) Close all valves within the raw water cooling system.
- (2) Place a catch pan under duplex strainer. Remove pipe plugs (1) from duplex strainer and drain.
- (3) Remove yoke handle (2), two yoke studs (3) and yoke (4).
- (4) Remove body cover (5), body cover gasket (6) and basket (7) from the integral body (8).
- (5) Rinse basket with clean water.
- (6) Install basket (7) into integral body (8); and install new gasket (6), and body cover (5).
- (7) Install yoke (4), two yoke studs (3) and yoke handle (2).
- (8) Repeat steps (3) through (7) for the other strainer.
- (9) Install pipe plugs (1) and OPEN all cooling system valves.
- (10) Clean up any spills.

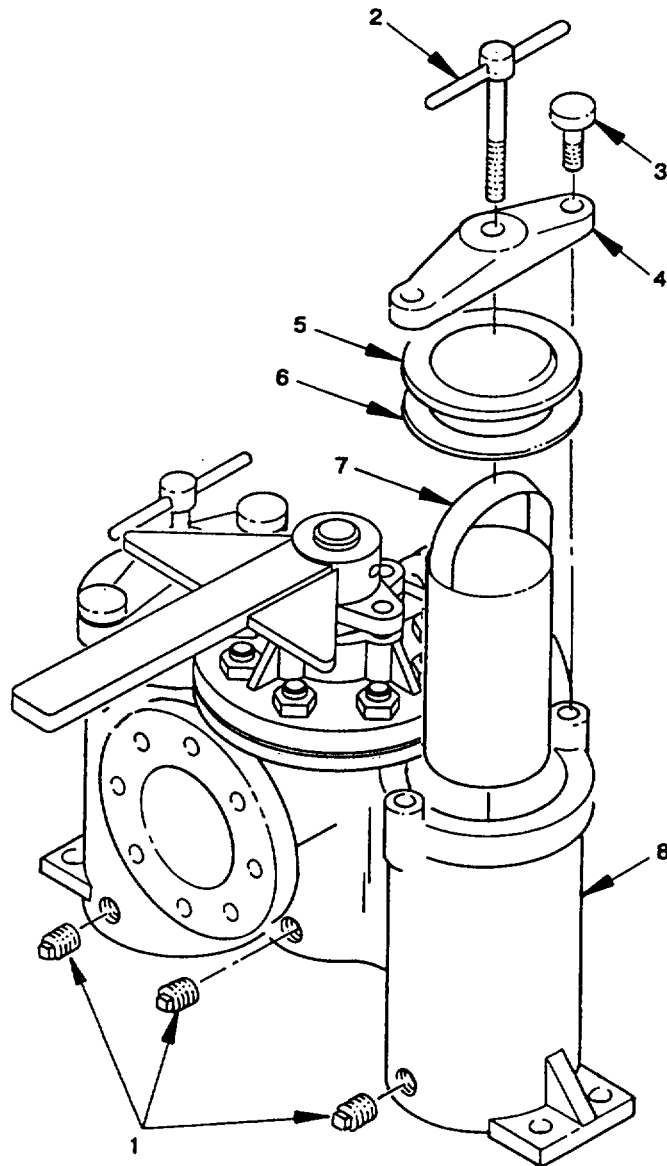


Figure 2-2. Duplex Strainer, Service

2-11. Duplex Strainer, Engine Cooling System (Cont).

b. *Remove.* (figure 2-3)

- (1) Remove nuts (1), capscrews (2) and gasket (3) from flange.
- (2) Remove nuts (4), capscrews (5) and gasket (6).
- (3) Remove nuts (7), capscrews (8), washers (9) and remove duplex strainer (10). For repair of the duplex strainer, refer to next higher level maintenance, paragraph 3-7.

c. *Install.* (figure 2-3)

- (1) Install new duplex strainer (10) and secure with washers (9), capscrews (8) and nuts (7).
- (2) Install new gasket (6), capscrews (5) and nuts (4).
- (3) Install new gasket (3), capscrews (2) and nuts (1).

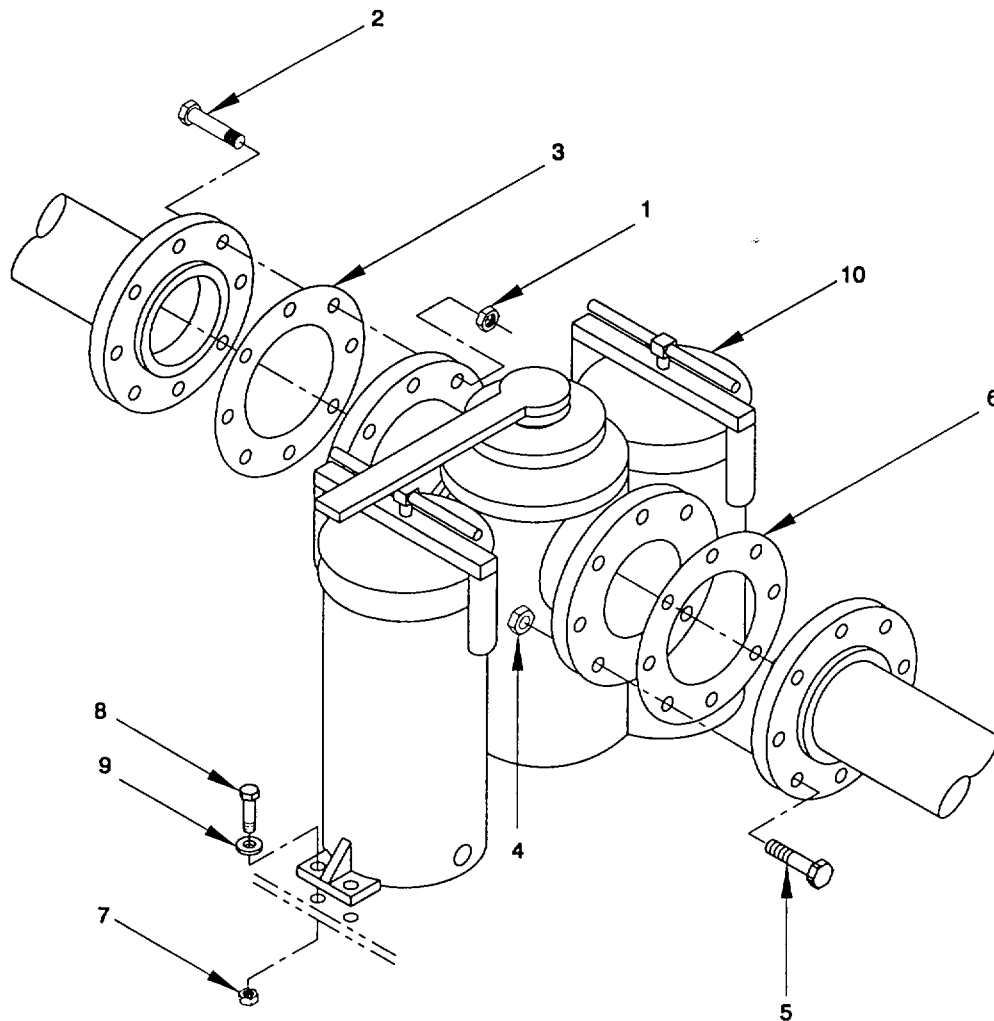


Figure 2-3. Duplex Strainer, Engine Cooling System, Remove/Install.

2-11. Duplex Strainer, Engine Cooling System (Cont).

d. *Adjust.* (Figure 2-4).

This procedure must be followed whenever studs (4) and nuts (1, 5) are removed (during repair), or if the valve plug jams for any reason. (The valve plug is initially factory adjusted).

- (1) Loosen hex nuts (1) slightly and ensure set screw (2) in handle (3) hub is tight.
- (2) a piece of flat stock under the hub of the valve handle (3). Using locking flange stub (6) as a fulcrum, pry firmly so that valve plug (6) is lifted in a vertical direction while the valve housing casting is tapped with a hammer. It may be necessary to tap the underside of the valve handle hub lightly in a vertical direction to break the valve free of its seat.

CAUTION

Never force the valve plug through its cycle of operation. It should move freely without the aid of any additional leverage other than that provided by valve handle. Failure to comply may result in damage to equipment.

- (3) To readjust the valve, tighten hex nuts (1) evenly and a very little at a time. While doing this, constantly try the action of the valve plug (6) by moving the valve handle (3) through its cycle of operation. The valve is in its proper position when the action just begins to feel tight or snug.
- (4) Ensure the valve is not bypassing liquid by removing the cover (7) of the chamber not in use. If the level of liquid in this chamber continues to rise, readjust valve plug (6) per steps 1 through 3.
- (5) Secure with hex jam nuts (5).

FOLLOW ON MAINTENANCE: Install duplex strainer (step 2-11 c).

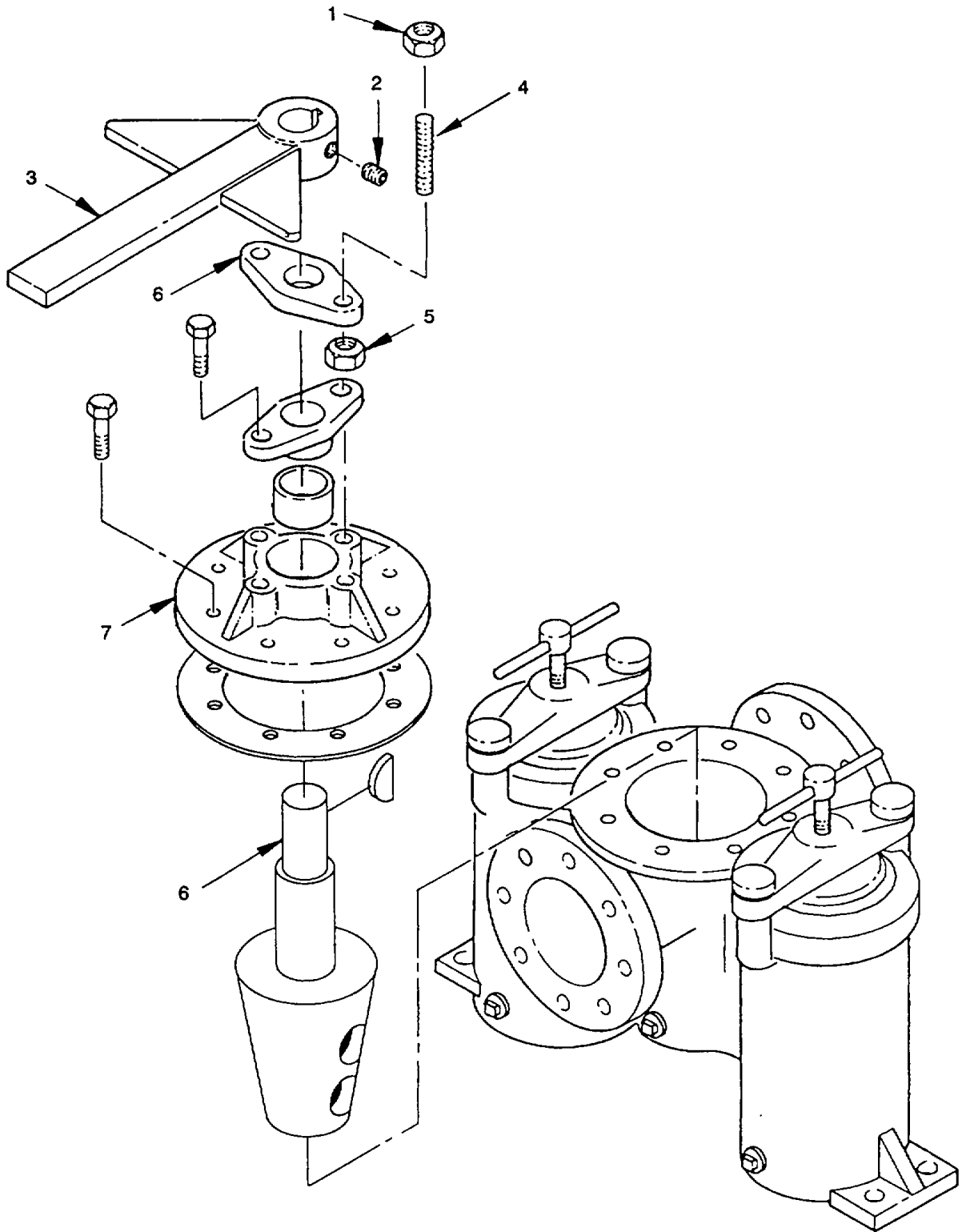


Figure 2-4. Duplex Strainer, Adjust.

2-12. Drive Shafts, Drive Train.

This task covers: a. Inspect b. Service

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Material/Parts

Lubricant (Item 23, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Machinery guards removed (paragraphs 2-24 and 2-25).

Pump-jet exhaust plenum removed (paragraph 2-165).

Hatch cover removed.

a. Inspect.

- (1) Check bolts and mating flanges for tightness and correct seating. To ensure even tightening of bolts, any loose bolts should be tightened in sequence, alternating sides and moving around the flange in only one direction. Re-torque in accordance with settings listed in Appendix D, Table D-1.
- (2) Check for play in the cross and bearing and slip spline before regreasing. If any looseness or play is felt the shaft must be overhauled.
- (3) While running, listen for abnormal noise and check for unusual vibration. The source of any such noise or vibration should be located, reported and corrected immediately.

b. Service. (figure 2-5)

- (1) lubricant to bearing assemblies until it appears at all journal cross bearing seals.
- (2) If all seals do not "purge" when being lubed, move the driveshaft laterally in all four directions, or tap on the yoke lugs with a soft faced hammer while applying pressure to the alemite fitting.

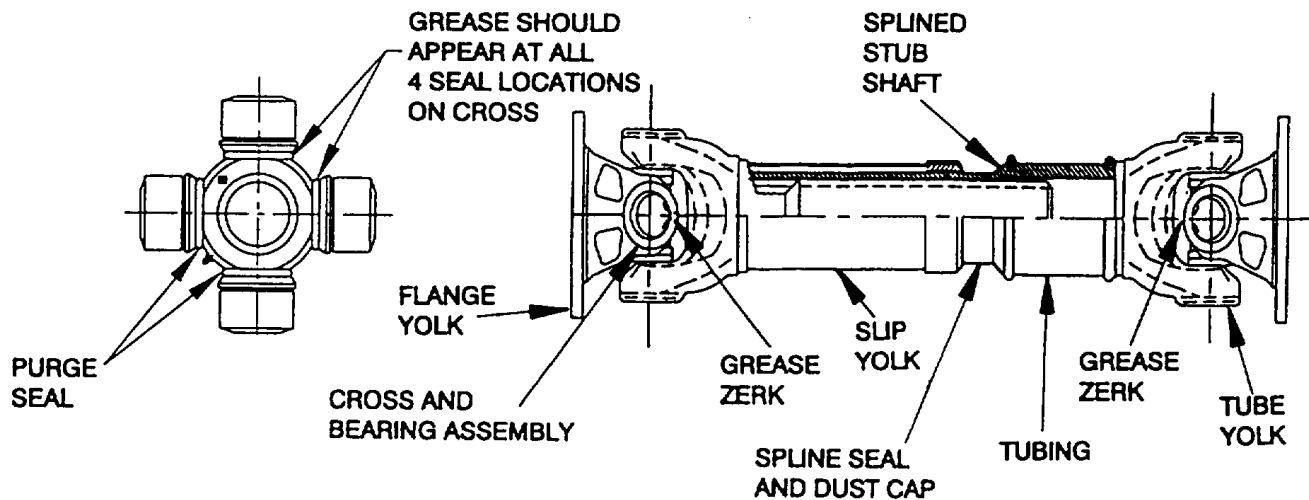


Figure 2-5. Drive Shafts, Service.

2-13. Diesel Engine.

This task covers:	Inspect Service Test Adjust	Reference TM 55-1945-205-24-2 (ENGINE) Reference TM 55-1945-205-24-2 (ENGINE) and paragraph 2-14. Reference TM 55-1945-205-24-2 (ENGINE) Reference TM 55-1945-205-24-2 (ENGINE)
Air Box Drains	Remove Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 1.1.2 Reference TM 55-1945-205-24-2 (ENGINE), Section 1.1.2
Fuel Filter/Lines	Remove Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 2.3 Reference TM 55-1945-205-24-2 (ENGINE), Section 2.3
Oil Filter	Remove Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 4.2 Reference TM 55-1945-205-24-2 (ENGINE), Section 4.2
Oil Filler	Remove Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 1.2.4 Reference TM 55-1945-205-24-2 (ENGINE), Section 1.2.4
Dip Stick	Remove Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 4.6 Reference TM 55-1945-205-24-2 (ENGINE), Section 4.6
Water Outlet Manifold	Remove Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.2 Reference TM 55-1945-205-24-2 (ENGINE), Section 5.2
Water Coolant Filter	Remove Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.7 Reference TM 55-1945-205-24-2 (ENGINE), Section 5.7
Starting Motor	Remove Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 7.3 Reference TM 55-1945-205-24-2 (ENGINE), Section 7.3
Tachometer Drive	Remove Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 7.4 Reference TM 55-1945-205-24-2 (ENGINE), Section 7.4

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)
Torque Wrench (NSN 5120-00-230-6380)
Torque Wrench (NSN 5120-00-554-7292)
Torque Wrench (NSN 5120-00-542-5577)
Engine Tools as Listed in TM 55-1945-205-24-2 (ENGINE)

Materials/Parts

Listed in TM 55-1945-205-24-2 (ENGINE), Appendix E

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Engine deck hatch removed.

References

TM 55-1945-205-24-2 (ENGINE)

2-14. Crankcase Oil, Diesel Engine.

This task covers: a. Service

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

*Materials/Parts*Engine Oil (Item 34, Appendix F)
FLOCS Evacuation Unit (Provided by Army)*Equipment Condition*

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

*References*LO-55-1945-205-12

WARNING

Engine oil is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. Service. (figure 2-6).

- (1) Position fast lube system evacuation unit sufficiently close to fast lube oil change system (FLOCS) to reach it with evacuation unit's hose.
- (2) Remove dust cap (1) from coupling half (3).
- (3) Connect evacuation unit quick disconnect coupling half (2) to matching coupling half (3) of fast lube system.
- (3) Evacuate oil from crankcase using evacuation unit.
- (4) Disconnect coupling half (2) of evacuation unit from matching coupling half (3) of FLOCS.
- (5) Replace dust cap (1) on coupling half (3).
- (6) Discard spent engine oil, now contained within evacuation unit, in accordance with approved procedures.

FOLLOW ON MAINTENANCE: Fill diesel engine with oil (LO 55-1945-205-12).

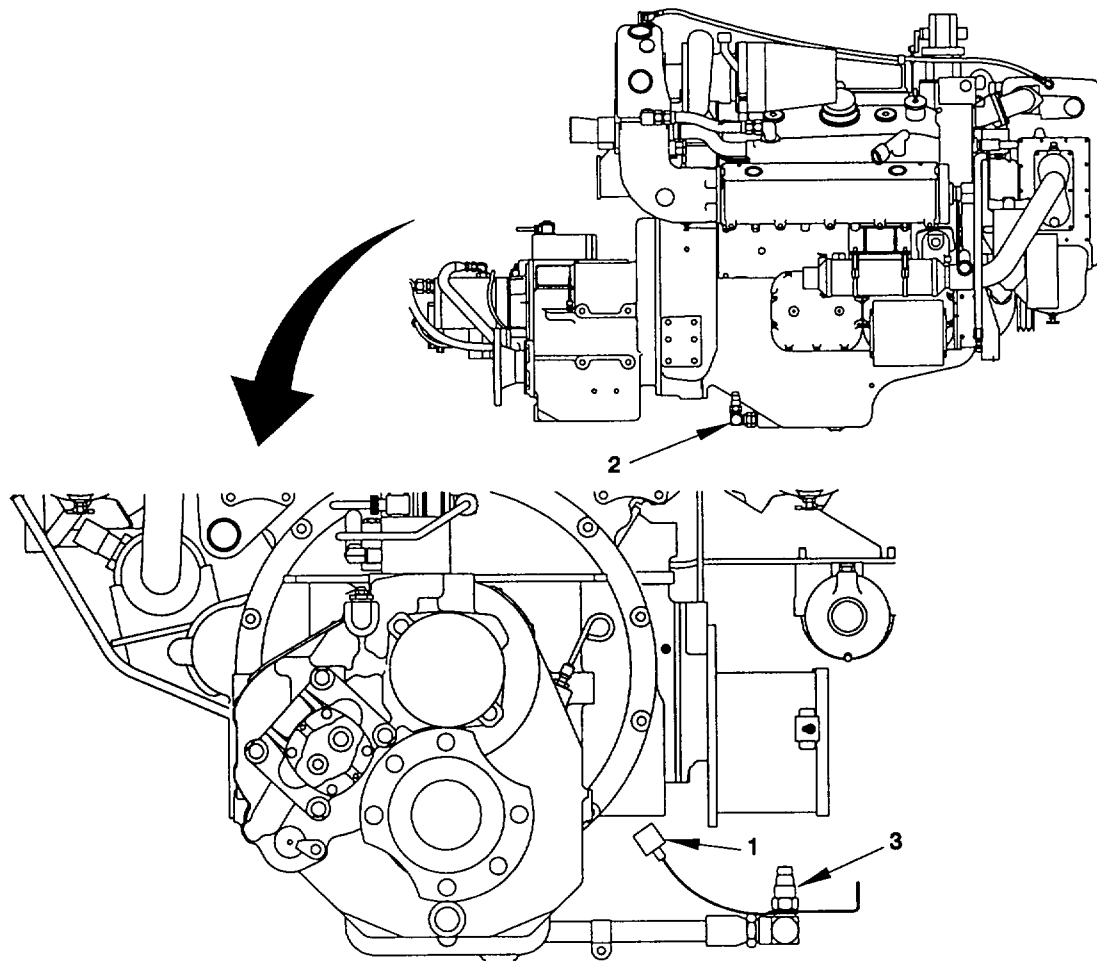


Figure 2-6. Crankcase, Service.

2-15. Alternator V-Belts.

This task covers: a. Adjust b. Remove c. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Torque Wrench (NSN 5120-00230-6380)

Materials/Parts

V-Belts

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE.

Alternator belt guard removed (refer to paragraph 2-26).

WARNING**When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.**a. Adjust. (figure 2-7)

- (1) Disconnect and tag electrical connections to the alternator and tag for installation.
- (2) Loosen capscrews (1 and 2). Rotate alternator (3) along the adjustment link (4) to tension the V-belts (5)
- (3) Tension V-belts with proper deflection as shown in Figure 2-7.
- (4) Once V-belt is properly tensioned, tighten capscrews (1 and 2) to 85 ft-lbs.
- (5) Reconnect electrical wiring previously tagged and removed.

b. Remove. (figure 2-8)

- (1) Disconnect and tag electrical connections to the alternator and tag for installation.
- (2) Loosen capscrews (1 and 2). Rotate alternator (3) along the adjustment link (4) and remove two V-belts (5)

c. Install. (figure 2-8)

- (1) Install two new V-belts (5).
- (2) Perform adjustment (step a).

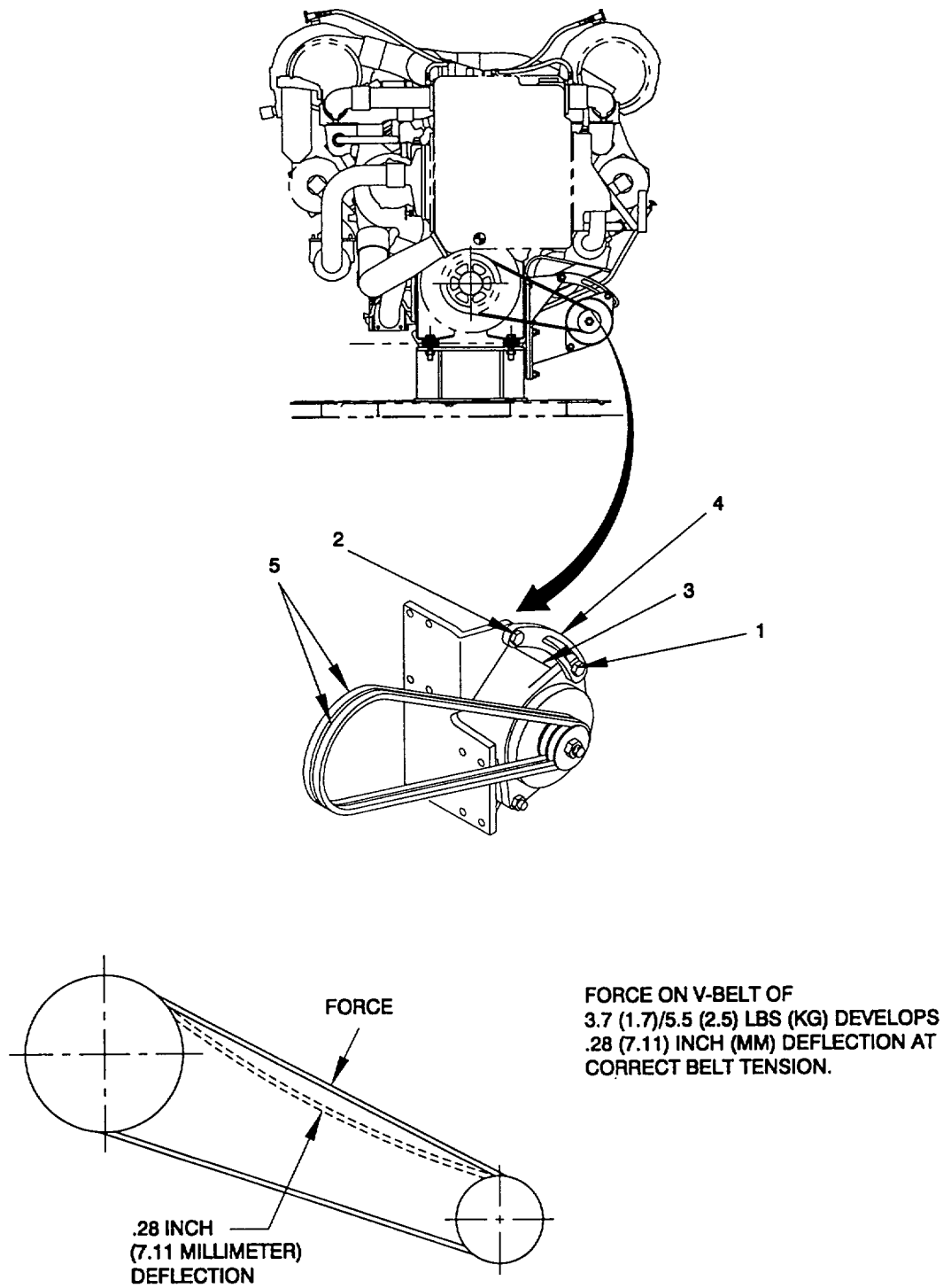


Figure 2-7. V-Belts, Adjust

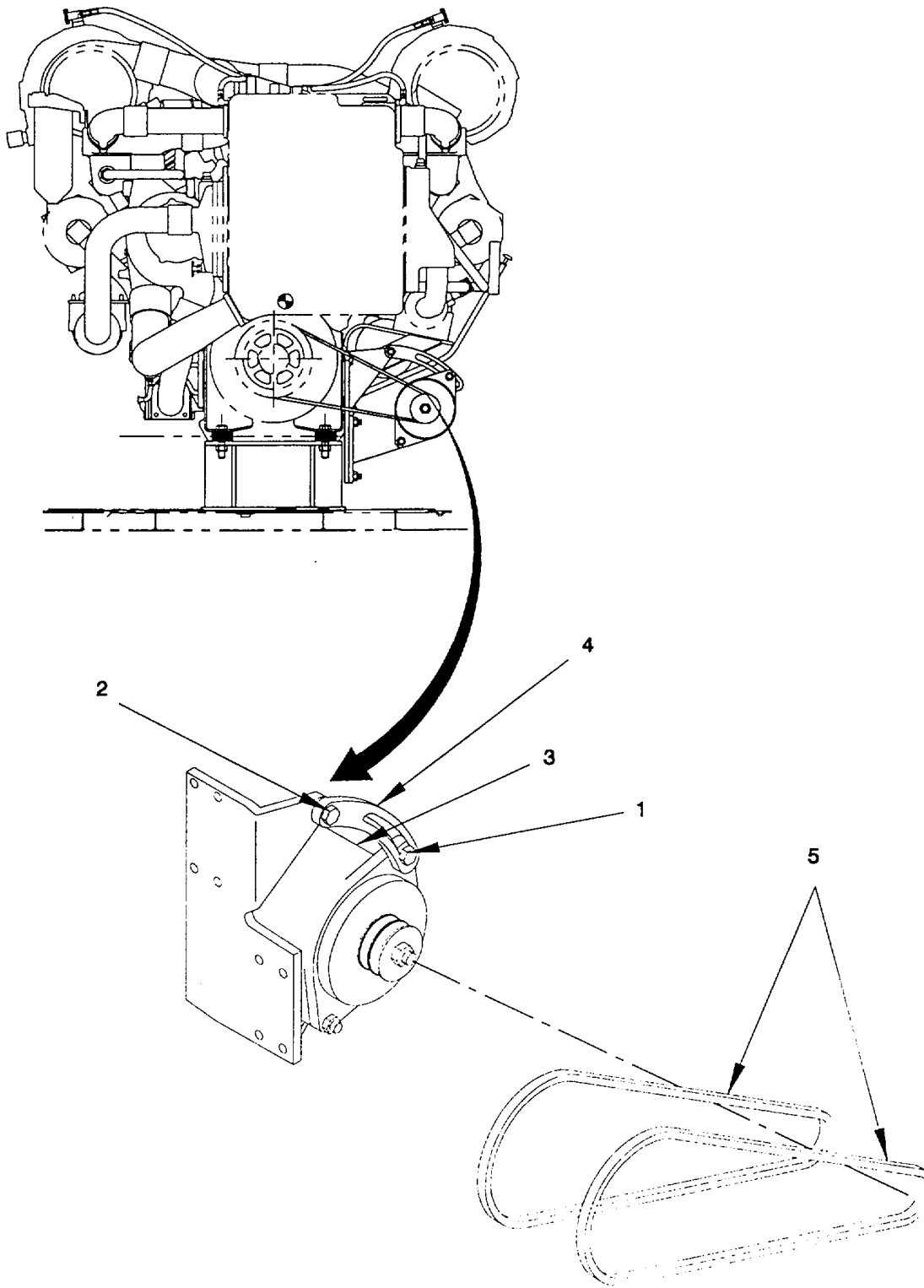


Figure 2-8. V-Belts, Remove/Install

2-16. Alternator.

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)
Torque Wrench (NSN 5120-00-230-6380)

Materials/Parts

Alternator

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE.

Alternator belt guard cover removed (refer to paragraph 2-26).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-9)

- (1) Disconnect and tag electrical connections from alternator. Tag for installation.
- (2) Loosen capscrews (1), (2) and (4) and hex nut (3). Rotate alternator (7) to loosen the V-belts (5).
- (3) Remove the V-belts (5).
- (4) Remove capscrews (1) and (2), hex nut (3) and move adjustment link (6) out of way of alternator. Remove alternator (7).

b. *Install.* (figure 2-9)

- (1) Install new alternator (7). Move adjustment link (6) in place and secure alternator to link with capscrew (2) and hex nut (3). Start capscrew (4).
- (2) Install the V-belts (5).
- (3) Align V-belts in accordance with paragraph 2-15.
- (4) Tighten capscrews (1) and capscrews (2) and (4) to 85 ft-lbs.
- (5) Reconnect electrical wiring previously tagged and removed.

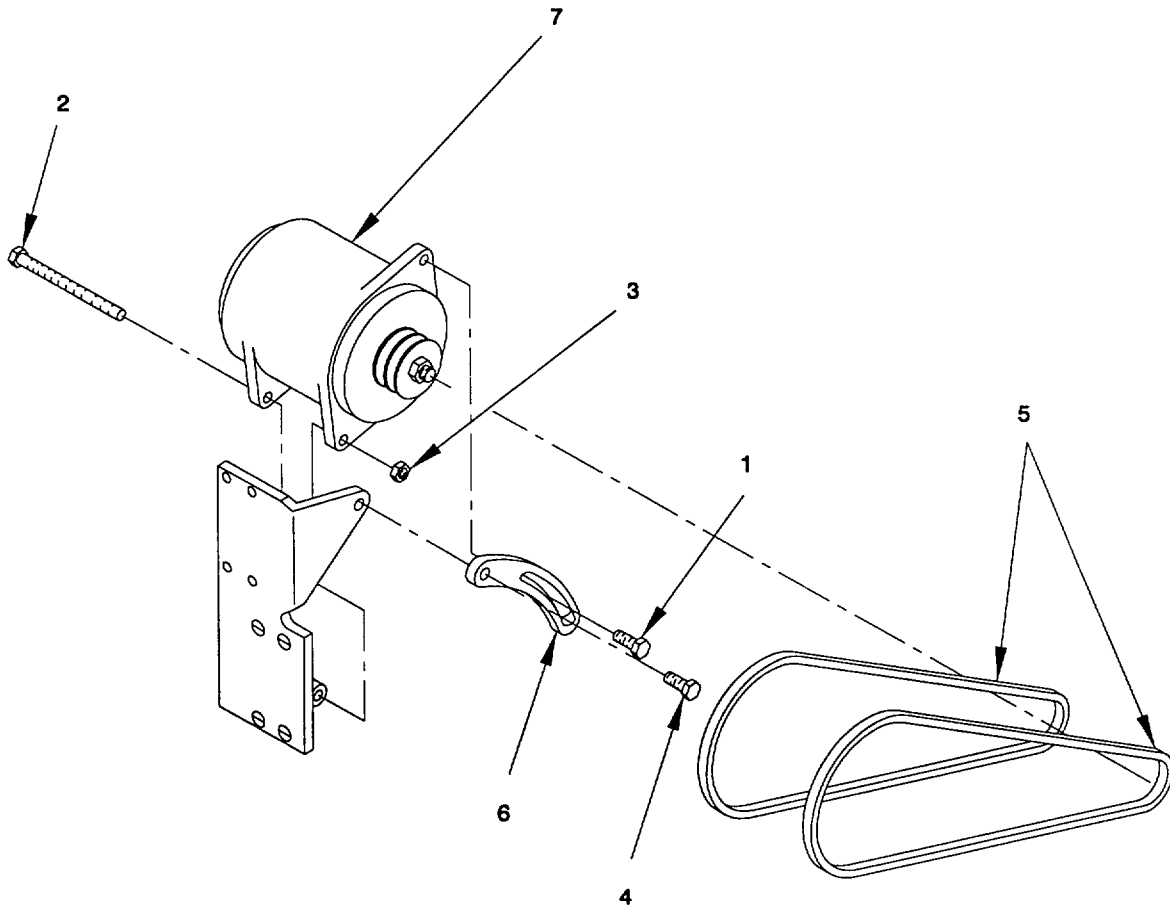


Figure 2-9. Alternator, Remove/Install

2-17. Water Bypass Tube, Diesel Engine.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Water Bypass Tube
Hose Removal Tool

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Engine deck hatch removed.

WARNING

Ensure cooling system is cool before performing maintenance. Failure to comply can result in serious injury to personnel.

Cooling system contains antifreeze (ethylene glycol). Ethylene glycol is a skin and eye irritant. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. *Remove.* (figure 2-10)

- (1) Loosen hose clamps (1).
- (2) Remove hose (2) and tube (3) from thermostat housing.

b. *Install.* (figure 2-10)

- (1) Install hose clamps (1).
- (2) Install hose (2) and tube (3) on thermostat housing. Secure by tightening hose clamps (1).

FOLLOW ON MAINTENANCE: Install engine deck hatch.

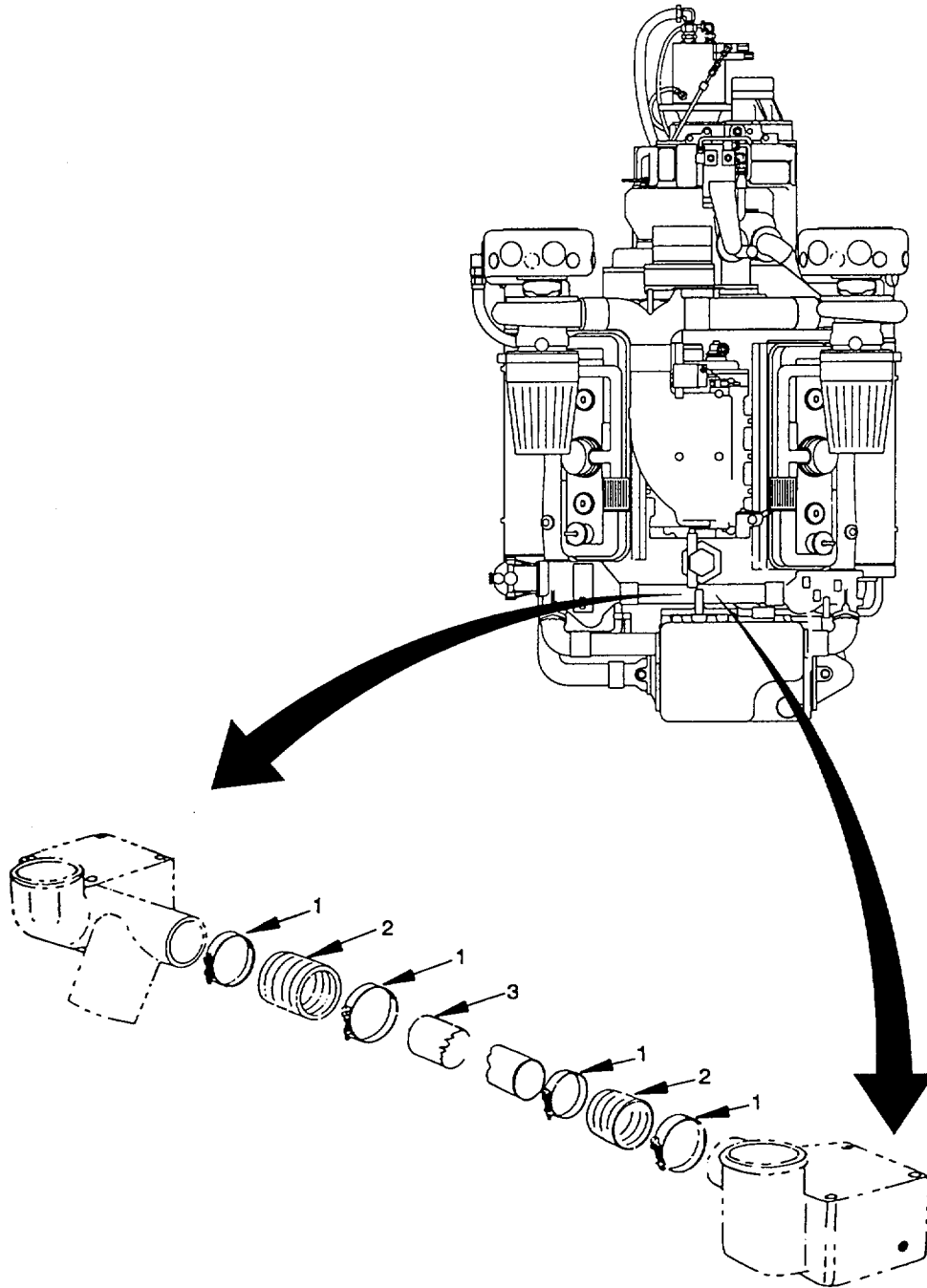


Figure 2-10. Water Bypass Tube, Diesel Engine, Remove/install

2-18. Cold Pack Starting Aid, Diesel Engine.

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

*Materials/Parts*Fluid Cylinder
Valve Gasket (Item 3, Appendix E)*Equipment Condition*

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Engine deck hatch removed.

WARNING

The engine starting fluid used in cold pack starting aid systems contains ethyl ether and is extremely flammable and toxic. It can be harmful or fatal if swallowed. Avoid contact with skin and eyes or breathing fumes. If swallowed, do not induce vomiting. Call a physician immediately. If fluid enters eyes or if fumes irritate eyes, they should be washed with large quantities of clean water for 15 minutes. A physician, preferably an eye specialist, should be contacted.

Use extreme caution when removing and installing. Bottle is under extremely high pressure. Failure to comply can result in serious injury to personnel.

Contents of cylinder are under pressure. Store in a cool, dry area. Do not incinerate, puncture or attempt to remove cores from cylinder. Failure to comply can result in serious injury to personnel.

CAUTION

Most times the fluid cylinder is shelf stored in a position (large end down) opposite of its use when installed on a valve, therefore, when it is first installed onto a valve, its contents are agitated due to the turning over. Because of flux residue remaining from the manufacturing and brazing of the raw cylinder, the contents of the cylinder should be allowed to settle back down before a system is functioned. This takes approximately 15 to 20 minutes. Failure to allow this settling often causes premature clogging of the system and necessitates cleaning or replacement of the valve's metering orifice filter. When installing the system, it is recommend that time be allowed for this settling to take place before testing the system to see if it is functioning correctly. The design of the cylinder is such that the 1" - 20 screw fitting also functions as a small standpipe; therefore, once the flux residue settles it will not enter the valve and cause clogging.

a. *Remove.* (figure 2-11)

- (1) Clean all dirt from neck of cylinder and top of valve before removing the fluid cylinder.
- (2) Loosen cylinder clamp (1).
- (3) Remove cylinder (2) by turning counterclockwise. Protect top of valve from dirt when cylinder is removed by installing the yellow valve cap.

2-18. Cold Pack Starting Aid, Diesel Engine (Cont).b. *Install.* (figure 2-11)

- (1) Install a new valve gasket each time cylinder is replaced. All replacement cylinders will have a new valve gasket inside the thread protecting white cap on the cylinder.
- (2) Remove old gasket from the valve and discard. Be sure only one gasket is used.
- (3) Spread a light film of clean oil on new gasket when installing.

CAUTION

Do not overtighten cylinder or remove cap on top of cylinder. Failure to comply can result in damage to equipment.

- (4) Coat the new cylinder (2) threads with clean oil and install the engine starting fluid cylinder (2) by turning cylinder in direction of arrow (clockwise) until the cylinder dirt and moisture seal contacts valve. Tighten an additional 1-1/2 turns.
- (5) Re-tighten cylinder clamp to 45 in. lbs.

FOLLOW ON MAINTENANCE: Install engine deck hatch.

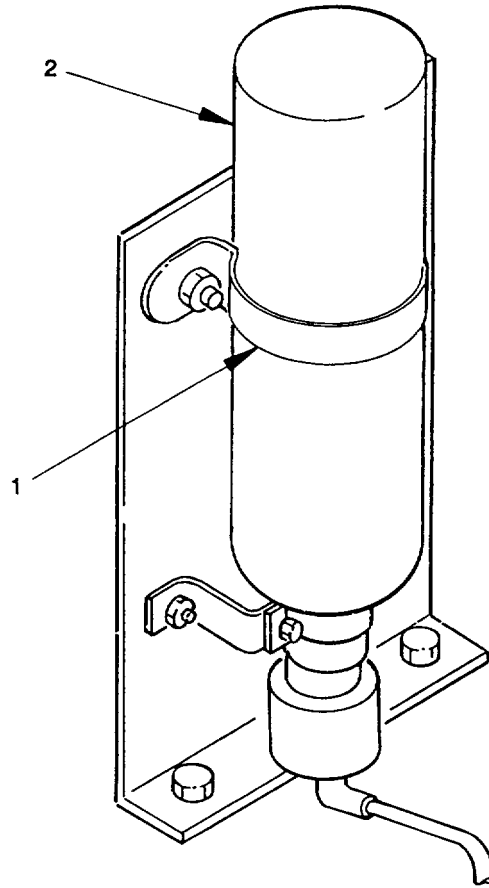


Figure 2-11. Cold Pack Starting Aid, Diesel Engine, Remove/Install.

2-19. Fuel Priming Pump.

This task covers: a. Removal b. Install

INITIAL SETUP:

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Fuel Priming Pump

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Deck hatch removed.

Fuel supply line closed out at fuel tank.

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

Fuel lines contain residual fuel. When removing fuel lines, precautions shall be taken to collect the residual fuel in an appropriate container. Fuel is flammable, keep sparks and open flame away from area. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-12)

- (1) Remove fuel line (1) from fitting (2) and fuel line (3) from fitting (4).
- (2) Remove fittings (2 and 4) from pump tube (7).
- (3) Loosen retaining nut on primer pump (6) and remove primer pump (6).
- (4) Loosen nuts (5) on pump tube (7) and remove outside nut (5) and pump tube (7) from bracket (8).

b. Install. (figure 2-12)

- (1) Position pump tube (7) through bracket (8). Secure with nuts (5).
- (2) Install primer pump (6) onto pump tube (7) and tighten retaining nut on primer pump (6).
- (3) Install fittings (2 and 4) on pump tube (7).
- (4) Reconnect fuel line (1) to fitting (2) and fuel line (3) to fitting (4).
- (5) Open fuel supply line.
- (6) Check for leaks after engine has been run.

FOLLOW ON MAINTENANCE: Install deck hatch.

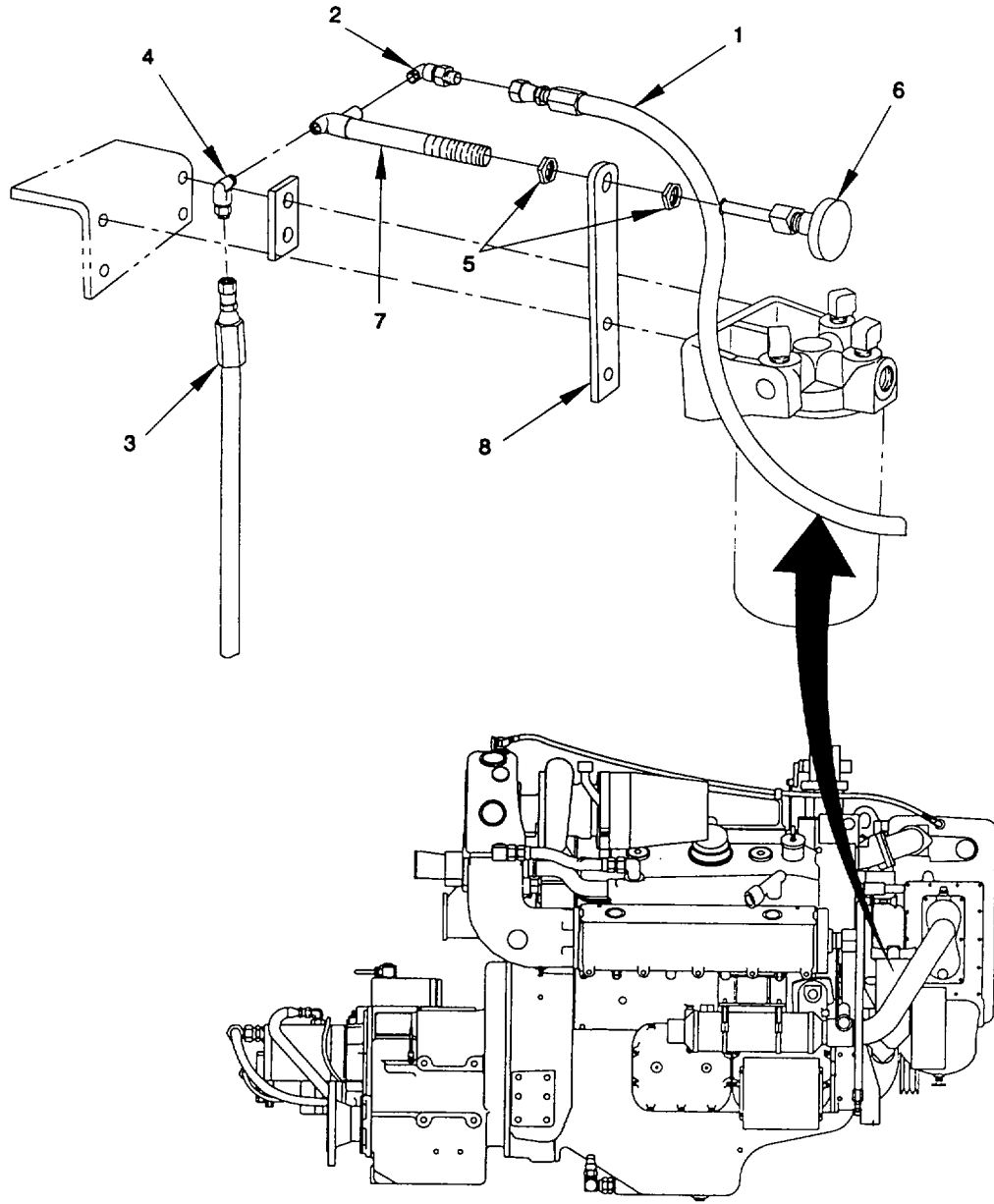


Figure 2-12. Fuel Priming Pump, Remove/Install

2-20. Marine Gear.

This task covers: Inspect Reference TM 55-1945-205-24-3 (MARINE TRANSMISSION), Section J
 Service Reference TM 55-1945-205-24-3 (MARINE TRANSMISSION), Section E, J

INITIAL SETUP:

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

As defined in TM 55-1945-205-24-3 (MARINE TRANSMISSION)

References

TM 55-1945-205-24-2 (ENGINE)
 TM 55-1945-205-24-3 (MARINE TRANSMISSION)

WARNING

When performing maintenance, the diesel engine should be shut off and tagged to prevent inadvertent operation. Failure to comply may result in personnel injury or death.

When performing maintenance, the electrical system should be disconnected and tagged to prevent inadvertent operation. Failure to comply may result in personnel injury or death.

Pump-jet marine gear components and the hydraulic motor will reach temperatures up to 180° F during normal operation. Wait for system to cool prior to performing maintenance. Failure to comply may result in personnel injury or death.

Service.

Refer to TM 55-1945-205-3 (MARINE TRANSMISSION), Section E for service procedures for the marine gear.

2-21. Pump-Jet

This task covers: Service

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

*Materials/Parts*Oil Suction Device
Preformed Packing, P/N 1020506
Cloth, Lint-free (Item 7, Appendix F)*Reference*LO 55-1945-205-12

Service. (figure 2-13)**WARNING**

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

When performing maintenance, the diesel engine should be shut off and tagged to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

- (1) Remove filler/breather plug (1) from primary and auxiliary planetary gearboxes. Remove drain plug (2) and drain oil into appropriate container.
- (2) Drain expansion tank (3) assembly by removing lower hose (4). Refer to paragraph 2-23. Inspect inside and outside of tank for structural damage, corrosion or cracks. Clean inside with a lint-free cloth.
- (3) Remove twelve capscrews (5), cover (6) and preformed packing (7) from top of pump-jet.
- (4) Insert elastic tube of oil suction device (8) through opening as deeply as possible and pump oil into an appropriate container.
- (5) Remove suction device (8), position new preformed packing (7) and replace cover (6). Secure with capscrews (5), by tightening in sequence, alternating sides of cover and moving to bolts in one direction only (refer to Appendix D, Table D-2 for proper torque values).
- (6) Replace caps (5 and 6) and plug (2) and fill gearboxes and tank with oil in accordance with Lubrication Order LO 55-1945-205-12.

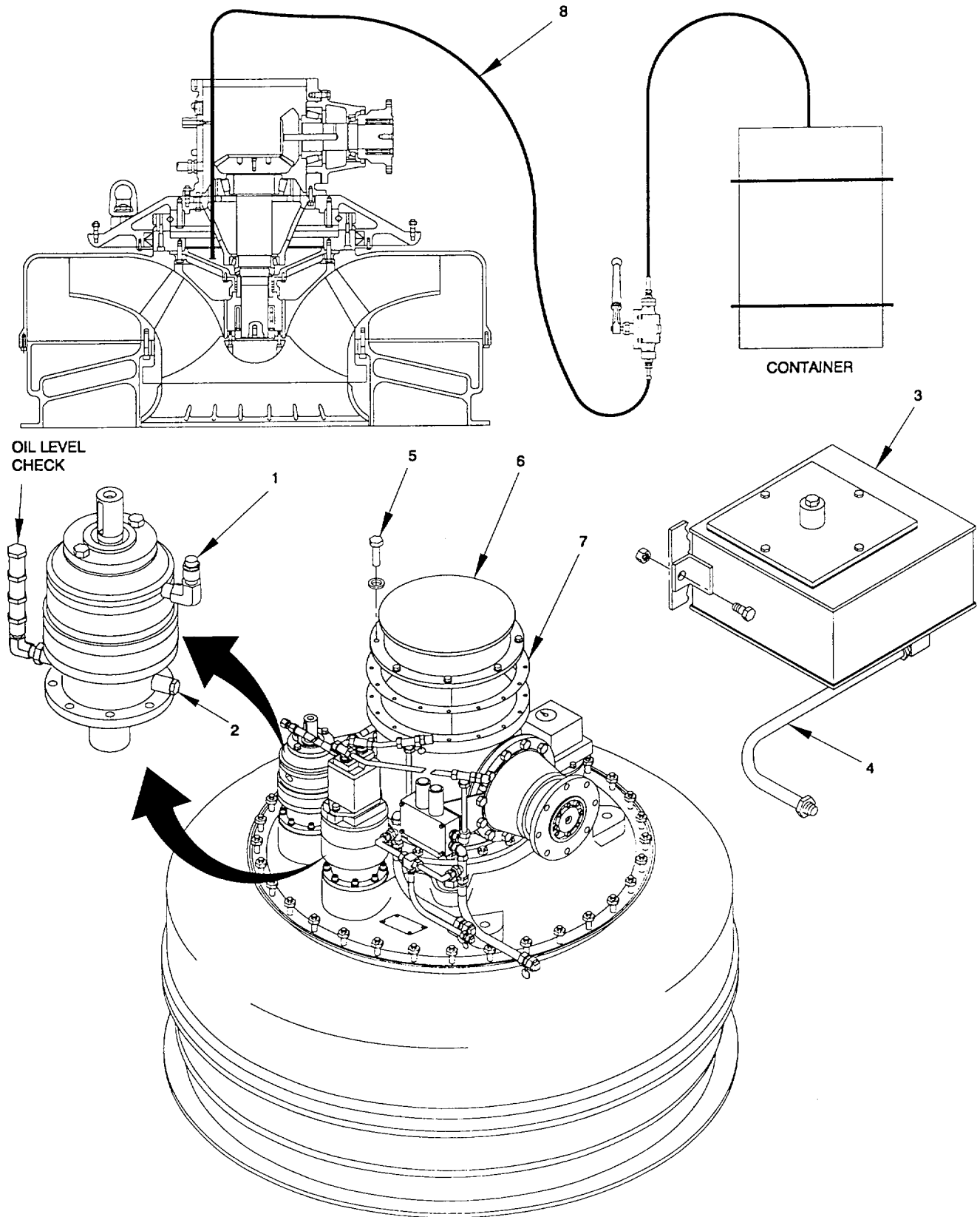


Figure 2-13. Pump-Jet Assembly, Service

2-22. Fast Lube System.

 This task covers: a. Removal b. Install c. Repair d. Install

INITIAL SETUP:

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Material/Parts

Fast Lube System
Hose Assembly (Item 55, Appendix E)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Diesel engine oil drained.

References

LO 55-1945-205-12

WARNING

Engine oil is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

- a. Remove. (figure 2-14)
 - (1) Remove two hex head capscrews (1) and two hex head nuts (2) from bracket (3).
 - (2) Remove 90° swivel fitting (4) from straight fitting (5), and straight fitting (5) from oil pan of fast lube system.
- b. Inspect.
 - (1) Inspect for wear, damage and leaks. Verify that fittings are tight.
 - (2) Correct deficiencies. Repair is limited to replacement of parts as required.
- c. Repair. (figure 2-15)
 - (1) Pull off dust cap (2) from half coupling (1). Unscrew half coupling (1) from 90° adaptor (3).
 - (2) Remove dust cap (2) and 90° adaptor (3) from bracket (4).
 - (3) Remove hose clamp (5) and unscrew hose assembly (6) from attaching hardware.
 - (4) Remove 90° swivel fitting (7) from straight fitting (8), then straight fitting (8) from oil pan.
 - (5) Attach straight fitting (8) to oil pan and 90° swivel fitting (7) to straight fitting (8).
 - (6) Attach new hose assembly (6) to 90° swivel fitting (7) and to the 907 adaptor (2).
 - (7) Attach hose clamp (5) to hose assembly (6).
 - (8) Position 90° adaptor (3) and dust cap (2) in hole in bracket (4).

2-22. Fast Lube System (Cont).

(9) Attach half coupling (1) to the 90° adaptor (3).

(10) Put dust cap (2) on half coupling (1).

d. *Install.* (figure 2-14)

(1) Install 90° swivel fitting (5) and straight fitting (4) to fast lube system and align bracket (3) with mounting holes.

(2) Secure fast lube to mounting using two hex head nuts (2) and two hex head capscrews (1).

FOLLOW ON MAINTENANCE: Fill diesel engine with oil (LO 55-1945-205-12).

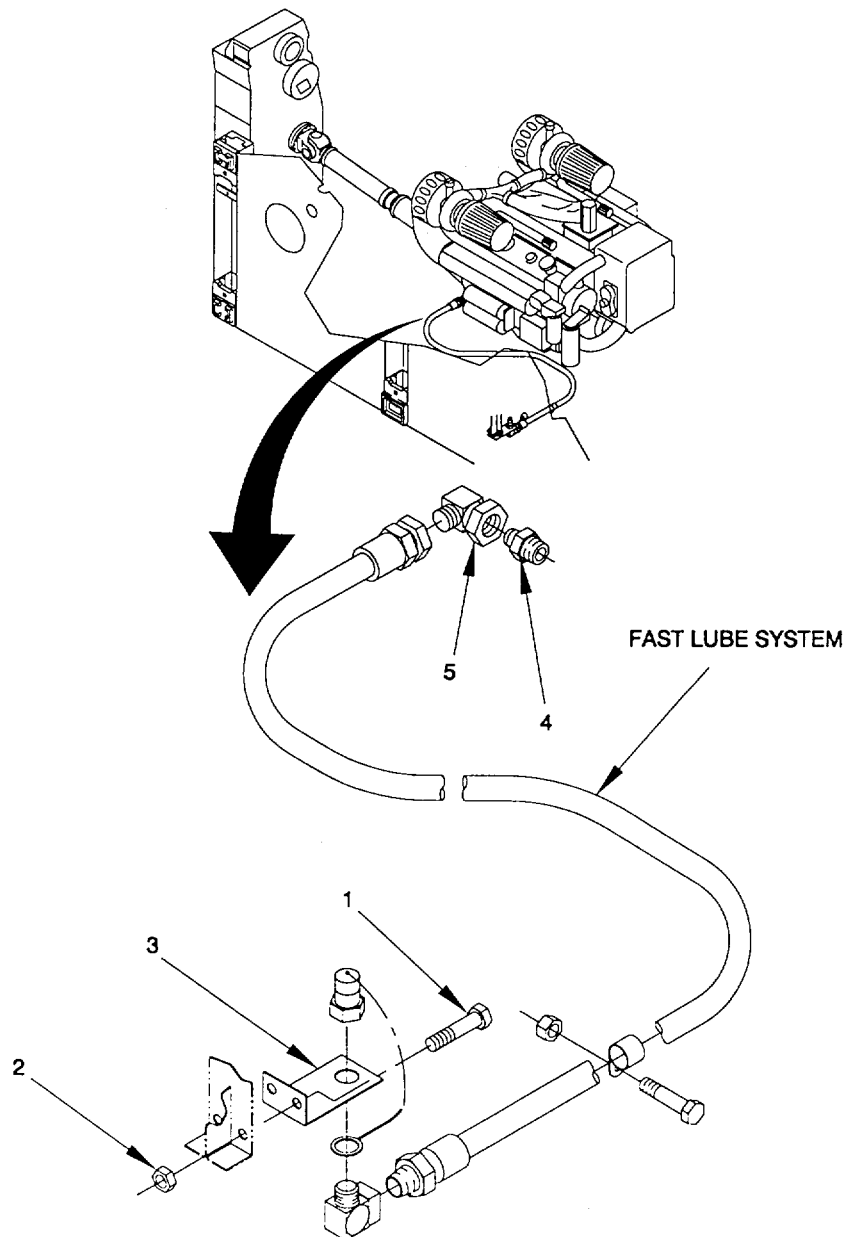


Figure 2-14. Fast Lube System Remove/Install.

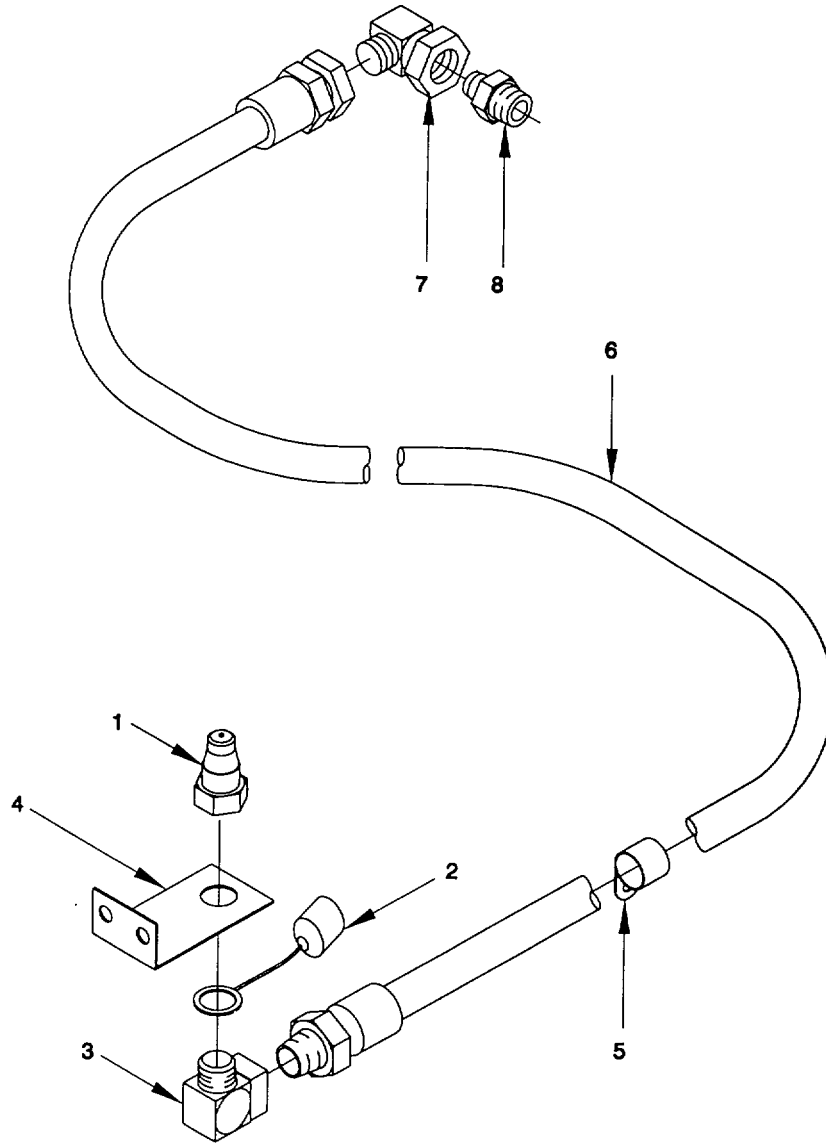


Figure 2-15. Fast Lube System, Repair

2-23. Tank, Expansion, Pump-Jet.

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Material/Parts

Expansion Tank Assembly
Gasket (Item 57, Appendix E)
Vent, Air (Item 58, Appendix E)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Tank drained.

WARNING

Hydraulic fluid is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. *Remove.* (figure 2-16)

- (1) Disconnect hydraulic hose (1) and elbow (2) from underside of tank (7).
- (2) Remove bolt (3) and collect air vent (4).
- (3) Remove four hex head capscrews (5), tank cover (6) and gasket (7).
- (4) Support tank (8), remove two hex nuts (9) and capscrews (10).

b. *Install.* (figure 2-16)

- (1) Clean tank with lint-free cloth. Remove all oil accumulations, dirt and other foreign substances.
- (2) Position tank (8) and attach with capscrews (10) and hex nuts (9).
- (3) Position gasket (7), cover (6) and secure with four hex head capscrews (5).
- (4) Clean air vent and install vent (4). Secure with bolt (3).
- (5) Install elbow (2) and hose (1) to underside of tank (7).

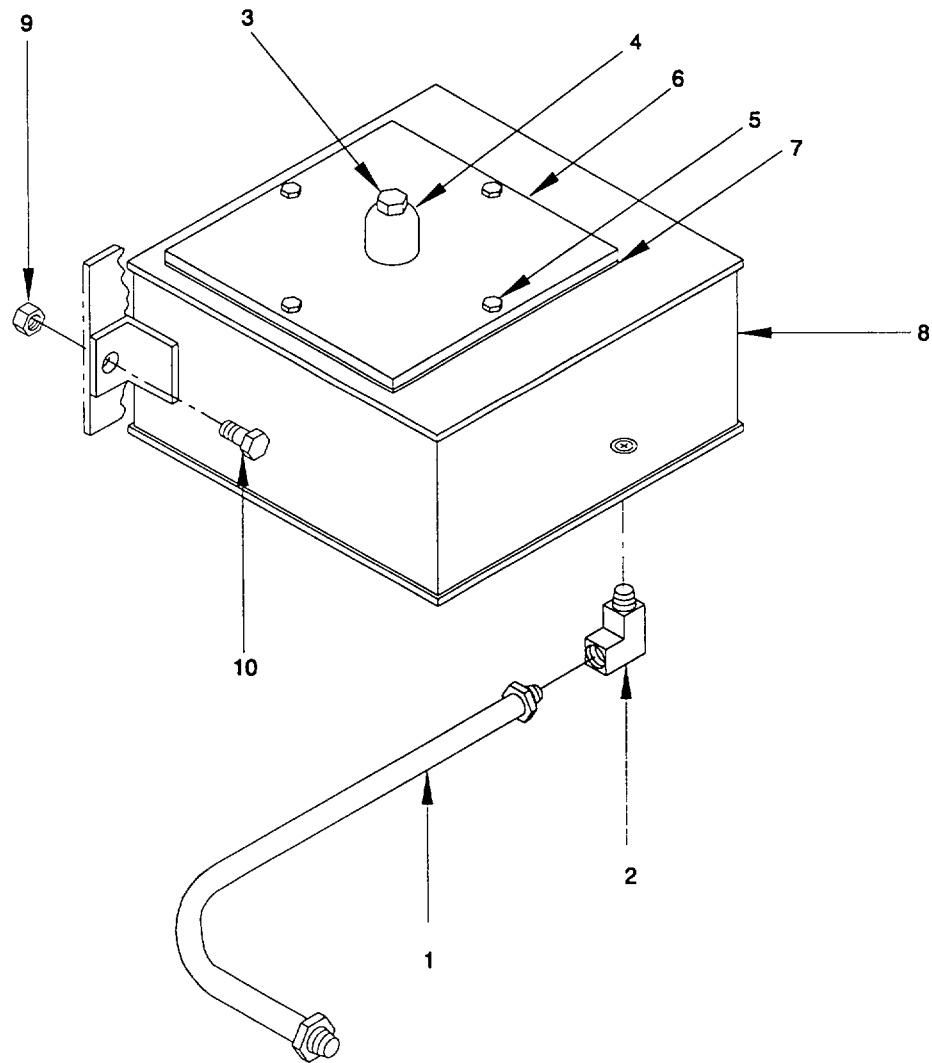


Figure 2-16. Pump-Jet Expansion Tank Remove/install.

2-24. Machinery Guards. Transfer Case to Pump-Jet.

This task covers: a. Remove b. Install

INITIAL SETUP:

*Tools*General Mechanic's Tool Kit, Rail and Marine (NSN
5180-00-629-9783)*Equipment Condition*All power off to all equipment. All equipment and
control/indicators tagged OUT OF SERVICE*Materials/Parts*Guard, Machinery
Guard, Cover

a. *Remove.* (figure 2-17)

- (1) Remove ten hex nuts (1) and ten hex head capscrews (2) to free cover guard (3) from machinery guard (10).
- (2) Remove two self-locking hex nuts (4), two hex head capscrews (5) from mount plate (6).

WARNING**Machinery Guard weighs 95 lbs. Use appropriate lifting equipment when handling. Failure to comply may result in serious injury to personnel.**

- (3) With appropriate lifting equipment supporting machinery guard (10), remove four self-locking hex nuts (7) and four hex head capscrews (8) from machine guard bracket (9). Lift off machinery guard (10).

b. *Install.* (figure 2-17)**WARNING****Machinery Guard weighs 95 lbs. Use appropriate lifting equipment when handling. Failure to comply may result in serious injury to personnel.**

- (1) Using appropriate lifting equipment, position machinery guard (10) over drive shaft, between pump-jet and transfer case. Secure to machine guard bracket (9) using four self-locking hex nuts (7) and four hex head capscrews (8).
- (2) Secure machinery guard (10) to mount plate (6) using two self-locking hex nuts (4) and two hex head capscrews (5).
- (3) Position cover guard (3) and secure to machinery guard (10) using ten hex nuts (1) and ten hex head capscrews (2).

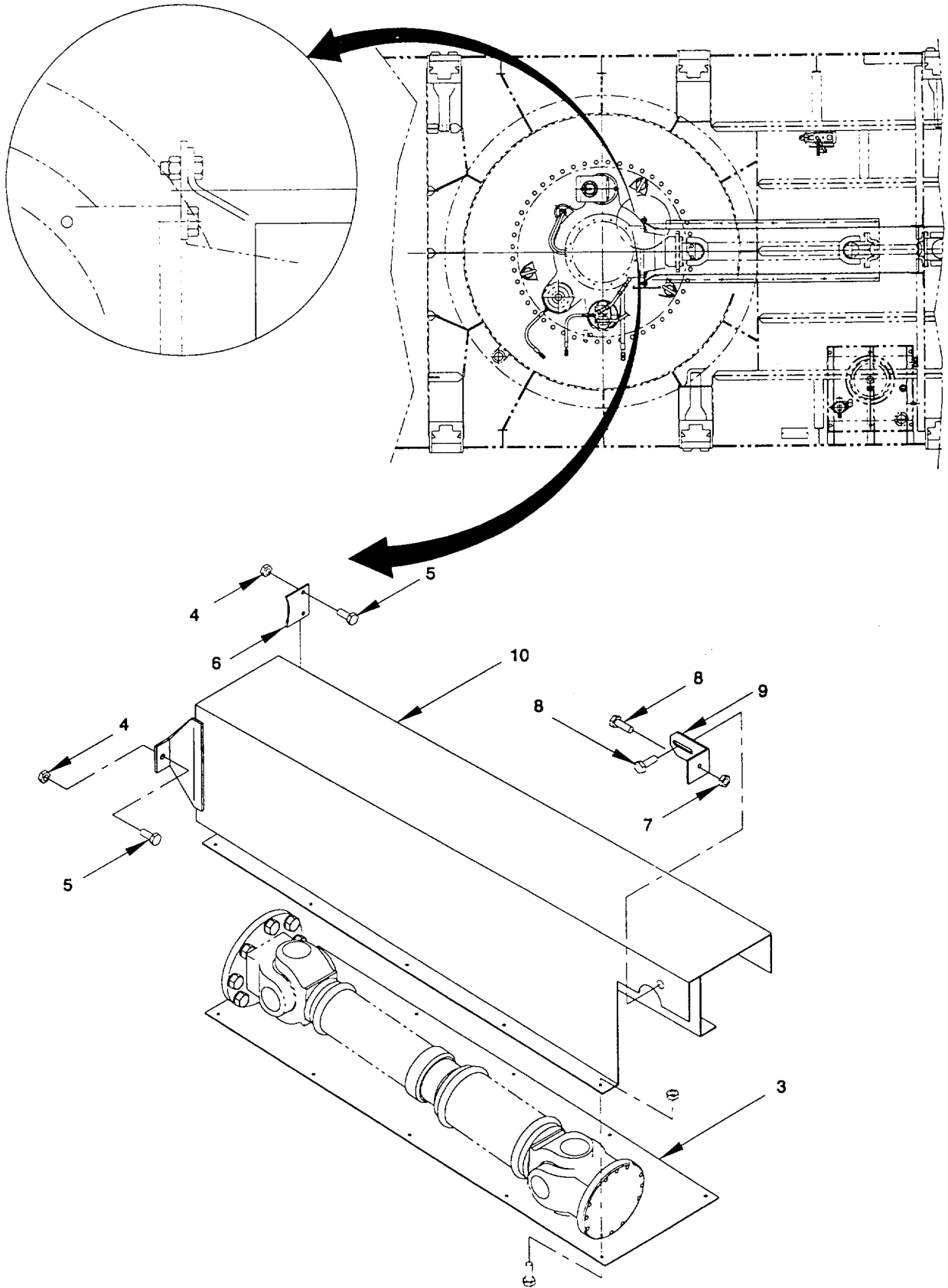


Figure 2-17. Machinery Guard, Transfer Case to Pump-Jet, Remove/Install.

2-25. Machinery Guards, Marine Gear to Transfer Case.

This task covers: a. Remove b. Install

INITIAL SETUP:

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

*Materials/Parts*Guards, Machinery (2)

WARNING**Upper machinery guard weighs 57 lbs. and lower machinery guard weighs 54 lbs. Use appropriate lifting equipment when handling. Failure to comply may result in serious injury to personnel.**a. *Remove.* (figure 2-18)

- (1) Support upper machinery guard (5) using appropriate lifting equipment. Remove two hex nuts (1) from tack-welded capscrews (2) at base of guard.
- (2) Remove two hex nuts (3) and two capscrews (4) to free upper machinery guard (5).
- (3) Remove four hex nuts (6) from four tack-welded capscrews (7) to free lower machinery guard (8).

WARNING**Upper machinery guard weighs 57 lbs. and lower machinery guard weighs 54 lbs. Use appropriate lifting equipment when handling. Failure to comply may result in serious injury to personnel.**b. *Install.* (figure 2-18)

- (1) Position lower machinery guard (8) and secure to deck using four capscrews (7) and four hex nuts (6).
- (2) Position upper machinery guard (5), overlapping lower machinery guard, aligning two holes in engine side of upper guard with two holes in lower machinery guard (8). Secure both upper and lower guards at location near middle of drive shaft using two capscrews (4) and two hex nuts (3).
- (3) Secure top of upper machinery guard (5) with two hex nuts (1) on tack-welded screws (2) at base of guard (5).

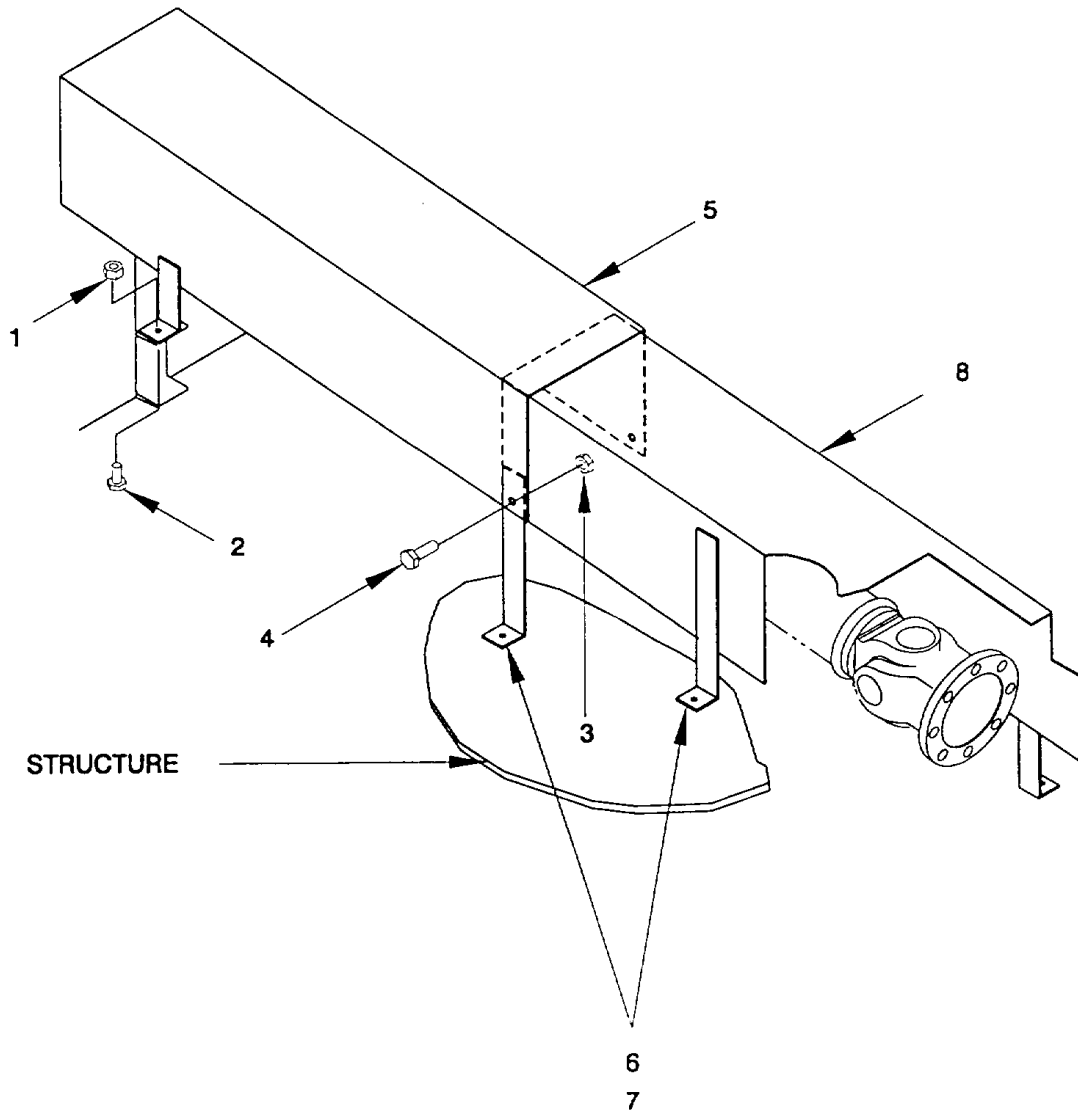


Figure 2-18. Machinery Guards, Marine Gear to Transfer Case, Remove/Install.

2-26. Alternator Belt Guard.

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Guard, Alternator Belt

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

a. Remove. (figure 2-19)

Remove four hex head capscrews (1) and four hex nuts (2) securing alternator belt guard (3). Remove alternator belt guard (3).

b. Install. (figure 2-19)

Install new alternator belt guard (3). Secure with four hex head capscrews (1) and four hex nuts (2).

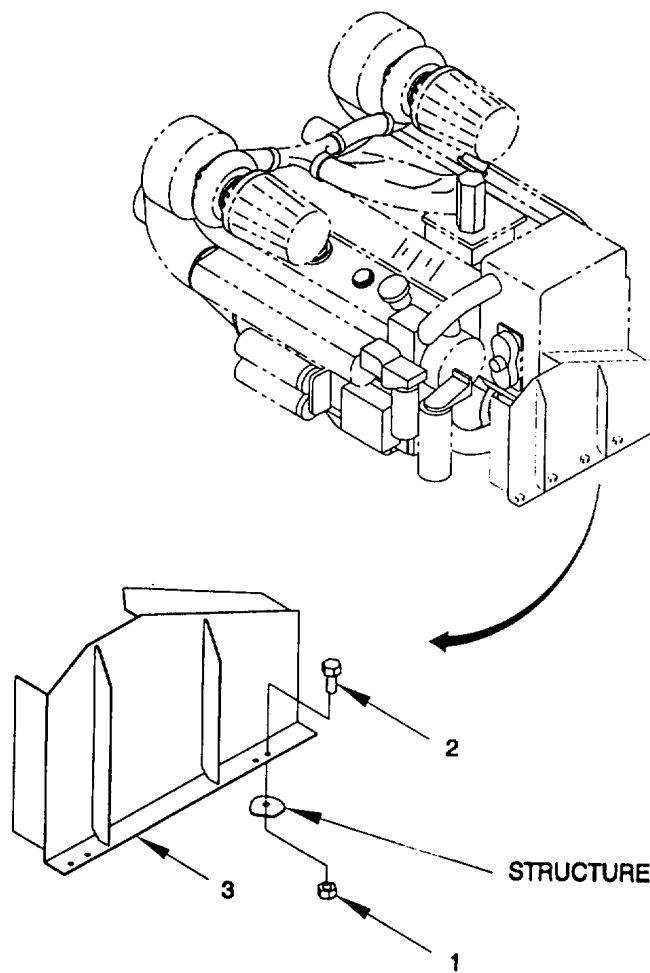


Figure 2-19. Alternator Belt Guard, Remove/Install.

2-27. Engine Exhaust System.

 This task covers: a. Service b. Repair c. Remove d. Install

INITIAL SETUP:

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)
Torque wrench (NSN 5120-00-554-7292)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE.
Propulsion Module dry-docked.

Materials/Parts

Gasket, Exhaust Port (Item 61, Appendix E)
Gasket (Item 62, Appendix E)
Gasket (Item 63, Appendix E)

WARNING

Ensure exhaust system is cool before performing maintenance. Failure to comply can result in serious injury to personnel.

a. Service.

Lubricate hinge pins (figure 2-20)

b. Remove. (figure 2-20)

- (1) Loosen two hose clamps (4) at both ends of each of two hoses (1) between elbow exhausts (7, 8) and tee (3). Loosen two hose clamps (5) at tee (3) end of hose (2).
- (2) Remove hoses (1), hose (2), tee (3), and hose clamps (4 and 5).
- (3) Loosen eight T-bolt clamps (10) securing two hump hoses (9).
- (4) Remove two turbo install kits (6) from left hand (7) and right hand (8) elbow exhausts. Remove elbow exhausts (7, 8) and collect hoses (9) and T-bolt clamps (10).
- (5) Remove four T-bolt clamps (12) securing hoses (11) between muffler assembly and thru-hull housing (23).
- (6) Remove capscrews (13), lockwashers (14) and flatwashers (15) from both block off plate (16) and elbow (17). Collect gaskets (18).
- (7) Remove nuts (19), capscrews (20) and flatwashers (21) securing flapper retainer (22) and thru-hull housing (23). Collect gasket (24).
- (8) Remove hex nuts (23), hex head capscrews (24), and collect cover (25) and gasket (26).

c. Inspect. (figure 2-20)

- (1) Inspect gaskets (18, 24 and 26) for weakened integrity and damage. Replace if damaged or worn.

2-27. Engine Exhaust System (Cont).

- (2) Inspect muffler body, thru-hull housing (23) and thru-hull assembly for corrosion, holes or other damage. Replace if damaged.
- (3) Inspect hoses (2 and 9) for punctures or cracks. Replace if damaged.

d. Install. (figure 2-20)

- (1) Position gasket (26), cover (25) and secure with hex head capscrews (24) and nuts (23).
- (2) Position gasket (24) and install thru-hull housing (23). Secure with flat washers (21), nuts (19) and capscrews (20).
- (3) Position flapper retainer (22) and secure with capscrews (20) and nuts (19).
- (4) Position gaskets (18), block off plate (16) and elbow (19). Secure with lockwashers (14), flatwashers (15) and capscrews (13).
- (5) Install T-bolt clamps (12) around hoses (11). Position hoses (11) between muffler assembly and thru-hull housing (23).
- (6) Position elbow exhausts (7 and 8) and install T-bolt clamps (10) loosely around hump hoses (9). Install hoses (9) on left hand (7) and right hand (8) elbow exhausts using turbo install kits (6). Secure clamps (10).
- (7) Install hose clamps (4 and 5) and hoses (2), tee (3) and hoses (1). Tighten clamps (4 and 5) at tee (3) and elbow exhaust (7 and 8) to secure hoses (1).

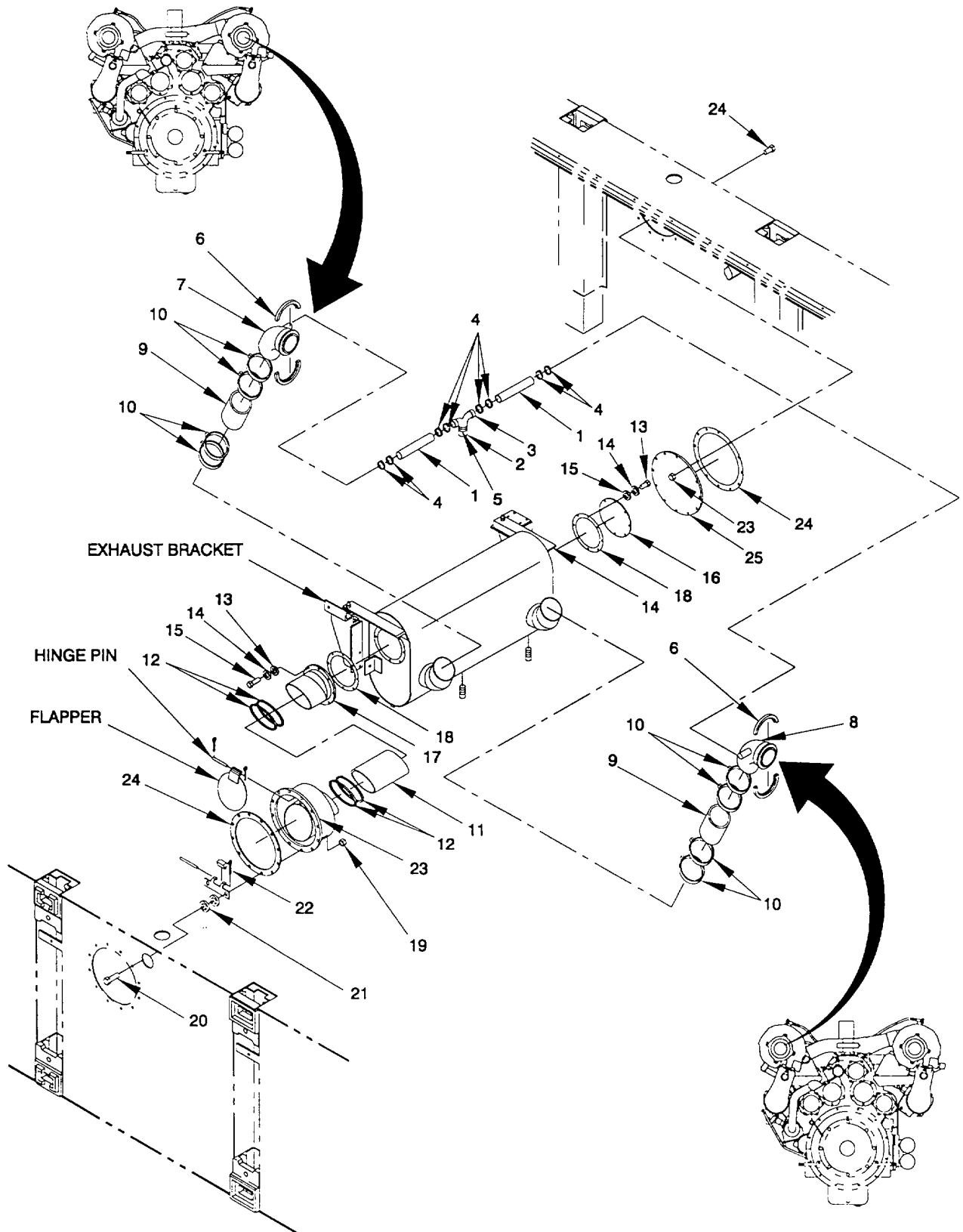


Figure 2-20. Engine Exhaust System, Remove/Install.

2-28. Hydraulic System.

This task covers: a. Service b. Adjust

INITIAL SETUP

<i>Tools</i>	Filter Element (Item 109, Appendix E)
General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)	<i>Equipment Condition</i>
Filter Unit with Pump (NSN 4330-01-079-9276)	All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE (Step a)
<i>Materials/Parts</i>	Equipment operable
Cloth, Lint Free (Item 7, Appendix F)	<i>Reference</i>
Oil, Lubricating (Item 30, Appendix F)	LO 55-1945-205-12
Rings (4) (Item 75, Appendix E)	
Brush, Soft Bristle (Item 6, Appendix F)	

WARNING

Hydraulic lines may contain residual hydraulic pressure. Ensure pressure is relieved before performing maintenance. Failure to comply can result in serious injury to personnel.

Hydraulic fluid is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

CAUTION

Hydraulic systems can be damaged through the use of incompatible or dirty hydraulic fluid. Prior to adding or replacing hydraulic fluid, verify the type of fluid currently used in the system and filter all fluid as it is added.

During hydraulic component removal or replacement, precautions shall be taken to prevent foreign matter from entering the hydraulic system. Covers and caps should be metal or plastic; materials subject to lint, splinters, flaking, crumbling, etc. should not be used.

a. Service. (figure 2-21)

- (1) Remove filler/breather cap (1) from top of reservoir.
- (2) Loosen capscrew (2) securing inspection cover (3) and bar (4) to reservoir. Do not loosen too much or bar (4) will fall into reservoir. With rubber gloves on, slide cover (3) to one side until bar (4) is free Remove lift cover (3) gasket(s) and bar (4).
- (3) Provide 30 gallon container and pump old oil into container.
- (4) Remove square head plug (6) from reservoir (7).
- (5) Disconnect hose (8) and remove tank strainer (9) from reservoir. Clean accumulations of dirt and debris from strainer.

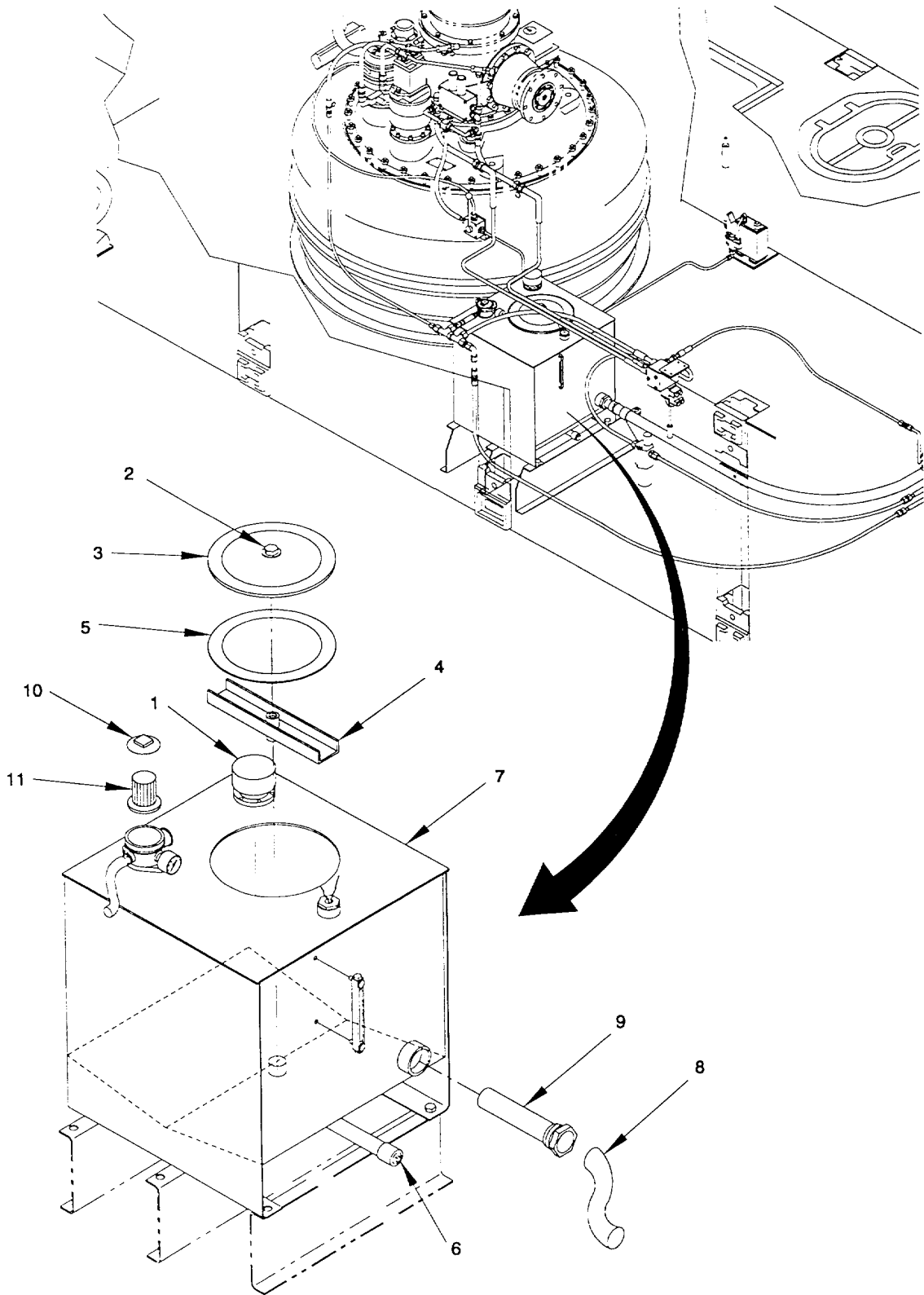


Figure 2-21. Hydraulic System, Service and Adjust (Sheet 1 of 2).

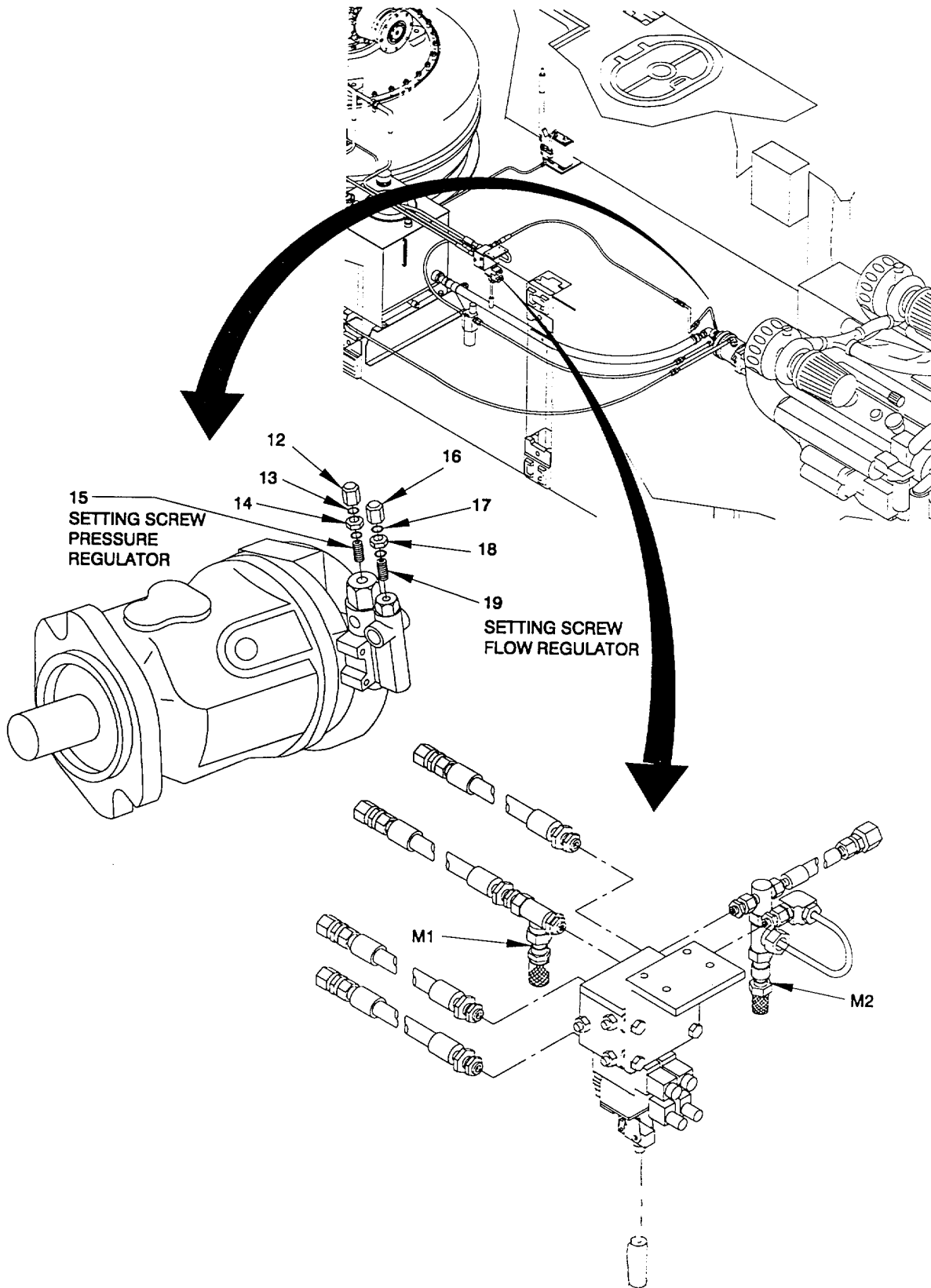


Figure 2-21. Hydraulic System, Service and Adjust (Sheet 2 of 2).

2-28. Hydraulic System (Cont).

- (6) Using soft bristle brush, loosen sludge in reservoir (7).
- (7) Rinse reservoir (7) with clean oil. Clean underside of cover (3).
- (8) Unscrew return filter cover (10) and remove filter element (11).
- (9) Install new filter element (11) and screw filter cover (10) back on reservoir top.
- (10) Inspect inside of reservoir for foreign matter, dirt, rust, corrosion, and loose or broken parts. Repair is limited to replacement of components.
- (11) Install square head plug (6) in reservoir (7).
- (12) Test that level sensor float moves freely up and down through its full limit of travel.
- (13) Install strainer (9) in reservoir and connect hose (8).
- (14) Holding inspection cover (3) with gasket (5) and bar (4), loosely secure slide bar (4) under top of reservoir and position cover (3) on opening in top of reservoir. Tighten capscrew (2) tightly.
- (15) Using filter unit, pump new oil into reservoir (7). Refer to LO 55-1945-205-12.
- (16) Install filler/breather cap (1).
- (17) Vent system (Adjust, Step b).
- (18) Wipe up any oil spillage.

b. Adjust. (Figure 2-21).

- (1) Vent all air from the hydraulic system.
 - (a) Check the oil level by sighting through the inspection glass on the hydraulic reservoir.
 - (b) Install a test hose to test port "M2" and hold it into a container. Dispose of spent fluid in accordance with proper environmental procedures.
 - (c) Start the system and operate the hydraulic way-valve manually until hydraulic fluid runs out of test port "M2" without air bubbles.
 - (d) Remove the test hose. Close the test port.
 - (e) Repeat steps b, c and d with test hose connected to test port "M1".
 - (f) Check oil level.

2-28. Hydraulic System (Cont).

- (2) Set pressure regulation.

NOTE**Test gauge assemblies are stowed in the Operator's Cab.**

- a. Connect test gauge on port M1 of way-valve. Disconnect all wiring to solenoids on way valve. Start the system and control solenoid function using the control lever.
 - b. Remove 17mm hex head nut (12) and collect Preformed packing (13).
 - c. Loosen 17mm hex nut (14).
 - d. Turn setting screw (15) by turning with 4mm hex socket head wrench. Set pressure to 210 bar (3046 psi). Fully open way valve by moving handle as far aft as possible to obtain proper reading on test gauge.

Increase pressure by turning screw clockwise. Decrease pressure by turning screw counterclockwise. One turn of setting screw corresponds to 725 psi (50 bar) within a pressure range 290 psi (20 bar) to 3625 psi (250 bar).
 - e. Holding setting screw (15) in position with socket head wrench, secure screw (15) in position using 17mm hex nut (14).
 - f. Install new Preformed packing (13) and 17mm hex head nut (12). Tighten hex head nut to a torque value of 21 Nm (15.4 ft-lbs.).
 - g. Stop the system.
 - h. Remove the test gauge and cover the test port.
 - i. Reconnect electrical wiring to solenoids.
- (3) Set flow regulation.
- a. Disconnect all connectors from the solenoid valves.
 - b. Install test hose assembly to test port "MI" on way-valve and start hydraulic system.
 - c. Read the hydraulic pressure on the pressure gauge. Proper reading should be 19 bar (275 psi). If necessary, adjust the flow rate in accordance with steps (c) through (f).
 - d. Remove 13mm hex head nut (16) and collect Preformed packing (17).
 - e. Undo 13mm hex locknut (18).
 - f. Set flow range by turning flow setting screw (19) with 3mm socket wrench. Proper reading should be 19 bar (275 psi). Increase flow by turning screw clockwise. Decrease flow by turning screw counterclockwise.
 - g. Holding setting screw (19) in position with socket head wrench, lock setting screw (19) with 13mm hex locknut (18).

2-28. Hydraulic System (Cont).

- (3) Set flow regulation (Cont.).
 - h. Install new ring (17) 13mm hex nut (16). Tighten to a torque value of 8.5 Nm (6.3 ft-lbs.).
 - i. Stop system.
 - j. Remove test assembly and cover test port.
 - k. Reconnect electrical connectors in accordance with wiring diagrams (refer to Appendix G).

2-29. Hydro-Pump.

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Hydraulic Pump
Gasket (Item 110, Appendix E)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

All pressure relieved from hydraulic system.

WARNING

Hydraulic lines may contain residual hydraulic pressure. Ensure pressure is relieved before performing maintenance. Failure to comply can result in serious injury to personnel.

Hydraulic fluid is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

Do not work on hydraulic system immediately after equipment shutdown as the fluid will be very hot. Failure to comply may result in serious injury to personnel.

CAUTION

Hydraulic systems can be damaged through the use of incompatible or dirty hydraulic fluid. Prior to adding or replacing hydraulic fluid, verify the type of fluid currently used in the system and filter all fluid as it is added.

During hydraulic component removal or replacement, precautions shall be taken to prevent foreign matter from entering the hydraulic system. Covers and caps should be metal or plastic; materials subject to lint, splinters, flaking, crumbling, etc. should not be used.

a. Remove. (figure 2-22)

- (1) Position drain container below hydro-pump (6) and disconnect and cap the following tubes and hoses connected to the hydro-pump.
 - (a) Hose L1 (1), from hydro-pump suction (port "a") to reservoir suction.
 - (b) Tube L2 (2), from hydro-pump pressure (port "b") to pressure filter.
 - (c) Tube L8B (3), from hydro-pump return line (port "C") to reservoir return line.
 - (d) Tube L9 (4), from hydro-pump (port "r") to Way Valve.
- (2) Remove two capscrews (5) to separate the hydro-pump from Marine Gear.
- (3) Remove hydro-pump (6) and dispose of gasket (7).

2-29. Hydro-Pump (Cont).b. *Install.* (figure 2-22)

- (1) Install new gasket (7) onto hydro-pump (1)
- (2) Position and secure hydro-pump to the Marine Gear with two capscrews (6).
- (3) Using the hydraulic schematic, reconnect and cap the following tubes and hoses to the hydro-pump.
 - (a) Hose L1 (2), from hydro-pump suction (port "a") to reservoir suction.
 - (b) Tube L2 (3), from hydro-pump pressure (port "b") to pressure filter.
 - (c) Tube L8B (4), from hydro-pump return line (port "C") to reservoir return line.
 - (d) Tube L9 (5), from hydro-pump (port "r") to Way Valve.
- (4) Ensure hydraulic system lines leading to the hydro-pump (1) have been adequately tightened. Slowly allow fluid pressure to return to lines. Watch for leakage. If leaking is observed, shutdown the system.
- (5) Allow system to cool and replace leaking fittings, connections, or lines.
- (6) Energize hydraulic system and functionally test hydro-pump. When test is successfully completed, return hydro-pump to normal position.

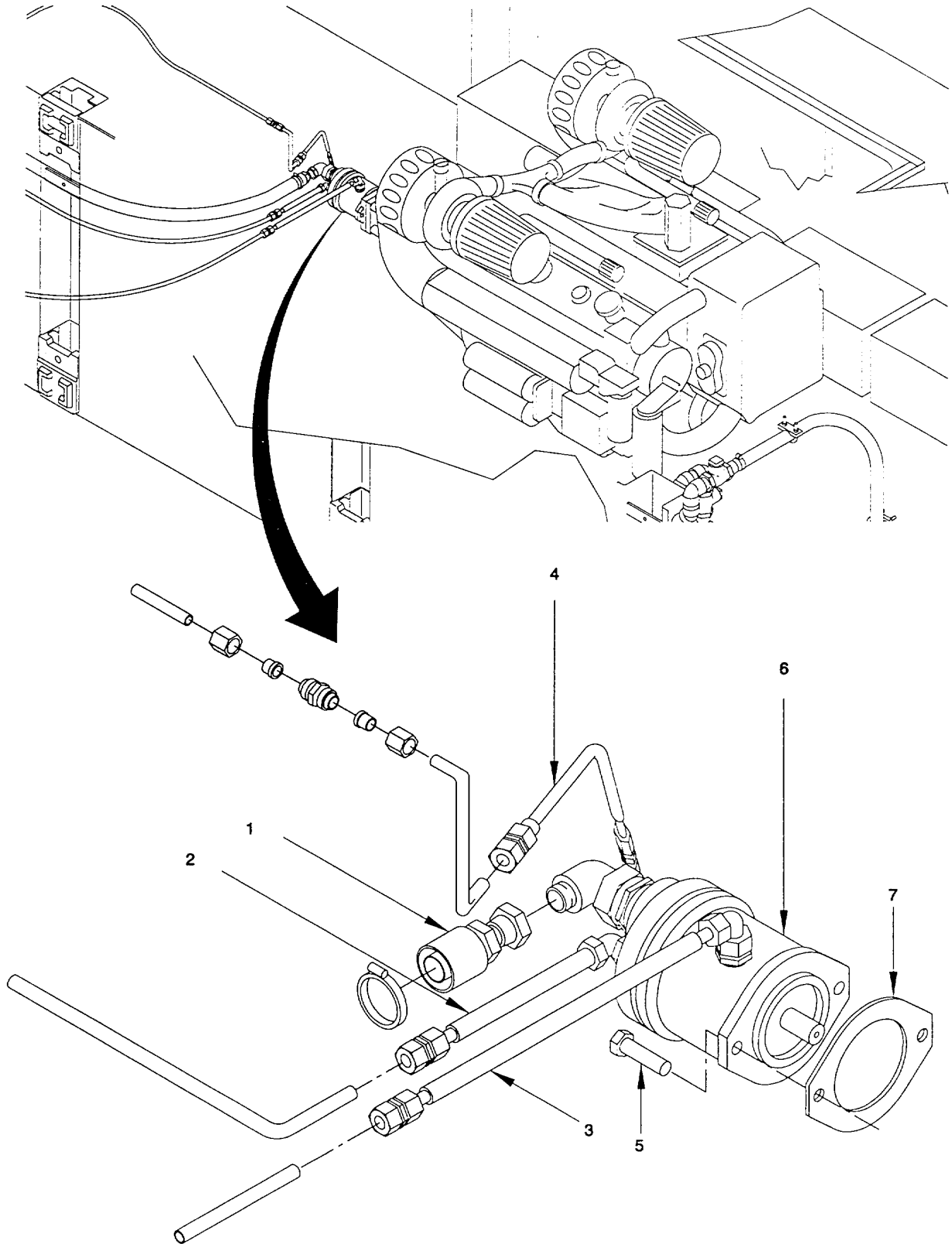


Figure 2-22. Hydro-Pump, Remove/Install.

2-30. Valve, Way, Hydraulic System.

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Way Valve

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

All pressure relieved from hydraulic system.

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

When performing maintenance, the diesel engine should be shut off and tagged to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

a. *Remove.* (figure 2-23)

- (1) Before removing any hydraulic piping, tag all connections to Way Valve.
- (2) To disconnect hydraulic lines from the Way Valve, remove two straight thread connectors (1), one nut run swivel tee (2), and two tube end reducers (3) from the Way Valve (4). Protect open hose ends and ports on the Way Valve from contamination.
- (2) Remove four capscrews (5), four self locking nuts (6) and collect Way Valve (4).

b. *Install.* (figure 2-23)

- (1) Align Way Valve (4) with mounting holes and install four capscrews (5) and four self-locking nuts (6).
- (2) Connect two tube end reducers (3), one nut run swivel tee (2) and two straight connectors (1) to Way Valve (4).

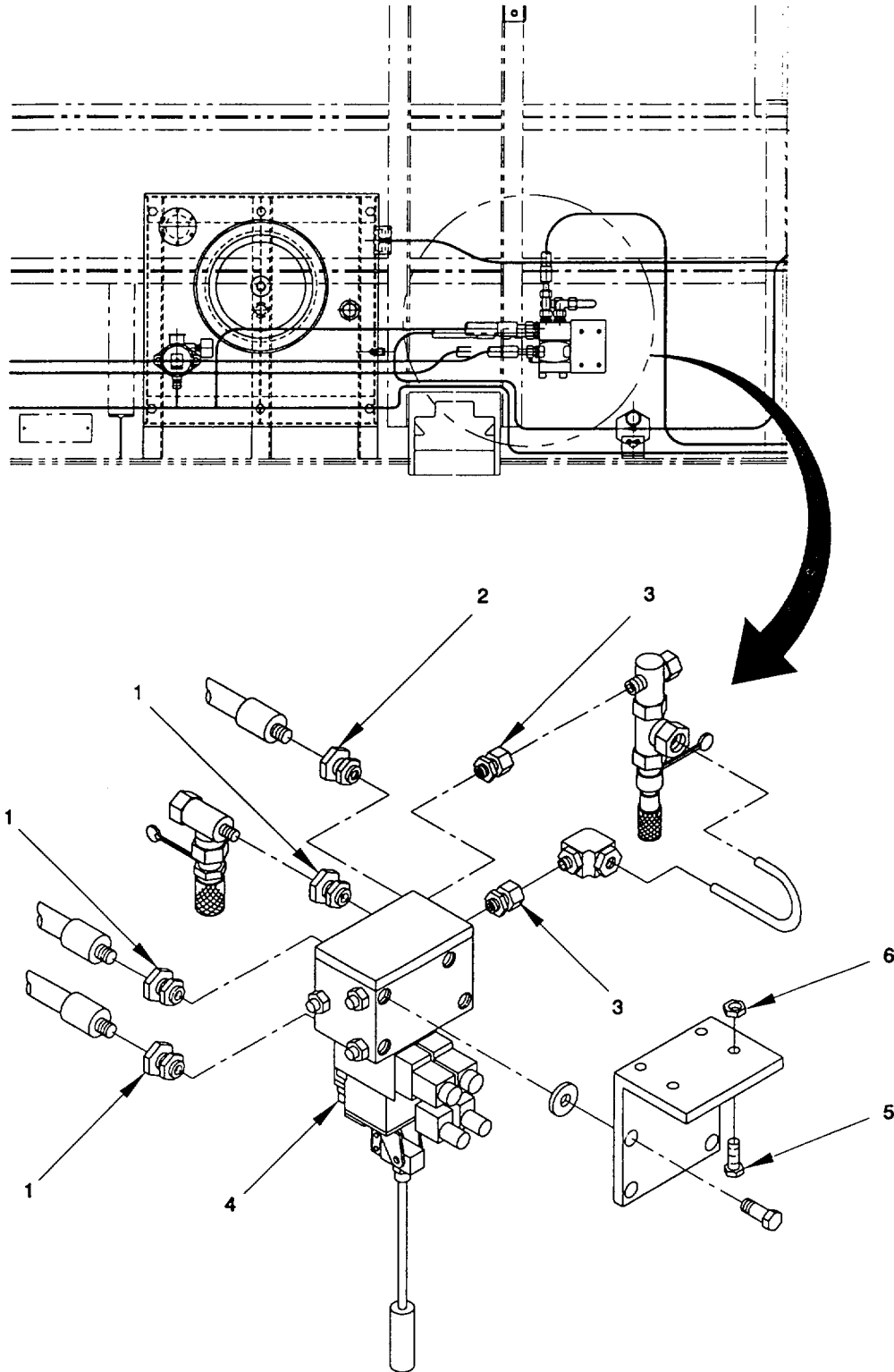


Figure 2-23. Way Valve, Remove/Install.

2-31. Hydro-Handpump, Hydraulic System.

This task covers: a. Remove b. Service c. Repair d. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Hydro-handpump
 Preformed packings (Items 94-96, 98, Appendix E)
 Gasket (Item 97, Appendix E)
 Seal Ring (Item 97, Appendix E)
 Air Filter (Item 100, Appendix E)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

All fluid drained from hydraulic system.

All pressure relieved from hydraulic system.

Hydraulic lines to hydro-handpump disconnected.

WARNING

When performing maintenance, the electrical system system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

When performing maintenance, the diesel engine should be shut off and tagged to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

Hydraulic lines may contain residual pressure. Ensure pressure is relieved before performing maintenance. Failure to comply may result in serious injury to personnel.

Hydraulic fluid is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. Remove. (figure 2-24)

- (1) Loosen and remove mounting bolts (1) to gather hand pump from pump-jet system and compartment.
- (2) Disconnect hand pump handle (2).
- (3) Remove and clean air filter (3).
- (4) Loosen and remove straight male stud fitting (4) and hydro pipe (5).
- (5) Loosen and remove straight male stud fitting (6) with adjustable elbow fitting (7), adjustable barrel tee fitting (8), straight stud standpipe adaptor (9), banjo fitting (10), and relief valve (11). Disassemble parts.
- (6) Remove hexagon screw (12) and cover (13). Replace sealing ring (14).

b. Service

- (1) Inspect for casting cracks, wearing, and corrosion.

2-31. Hydro-Handpump, Hydraulic System (Cont).

- (2) Inspect hydro-pipe for holes or kinking.
- (3) Inspect piston for scoring or marring of surface.
- (4) Clean out casting, air filter, and hydro-pipe with solvent.
- (5) Clean off old grease and lubricate moving parts.

c. Repair. (figure 2-24)

Repair is limited to replacement of preformed packings, seal ring (14), gaskets, springs, piston, and air filter (3).

d. Install. (figure 2-24)

- (1) Replace sealing ring (14). Install cover (13) and hexagon screw (12).
- (2) Assemble and install straight male stud fitting (6) with adjustable elbow fitting (7), adjustable barrel tee fitting (8), straight stud standpipe adaptor (9), banjo fitting (10), and relief valve (11).
- (3) Install hydro pipe (5) onto straight male stud fitting (4) and tighten.
- (4) Install air filter (3).
- (5) Connect hand pump (2) handle.
- (6) Install and tighten mounting bolts (1) to secure hand pump to pump-jet system.

FOLLOW-ON MAINTENANCE: Refill hydraulic handpump, reference LO55-1945-205-12, Card 26.

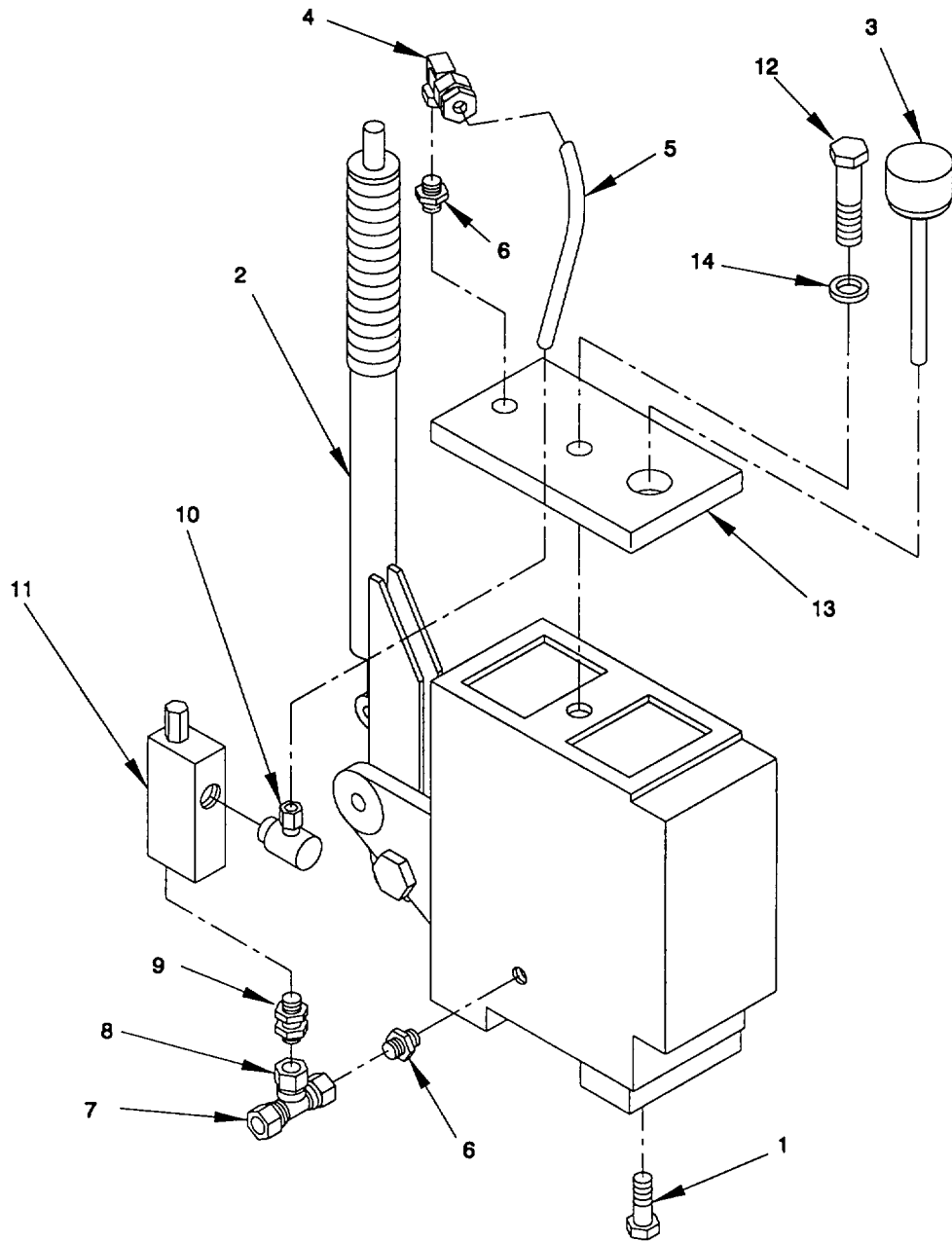


Figure 2-24. Hydro-Hand Pump, Remove/Repair/Install

2-32. 3/2 Ball Valve, Hydraulic System.

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

3/2 Ball Valve

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

All pressure relieved from hydraulic system.

WARNING

When performing maintenance, the electrical system system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

When performing maintenance, the diesel engine should be shut off and tagged to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

Do Not work on the hydraulic system immediately after equipment shutdown as the fluid will be very hot. Failure to allow cooling of system could result in serious injury to maintenance personnel

Hydraulic lines may contain residual hydraulic pressure. Ensure pressure is relieved before performing maintenance. Failure to comply can result in serious injury to personnel.

Hydraulic fluid is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

CAUTION

Ensure area around hydraulic system is clean. Failure to cap or cover lines and ports could cause contaminants to enter the system and damage to hydraulic parts and equipment.

a. Remove. (figure 2-25)

- (1) Ensure hydraulic system lines leading to ball valve (1) has been shutoff and bled, if possible.
- (2) Using the hydraulic schematic, disconnect and cap the following tubes and hoses connected to the ball valve.
 - (a) Tube L6 (2), from ball valve (port "3") to hand pump.
 - (b) Tube L7 (3), from ball valve (port "2Z") to thruster hydraulic brake.
 - (c) Hose L5 (4), from ball valve (port "1W") to thruster manifold.
- (3) Remove nuts (5) and capscrews (6) to separate collect ball valve from bulkhead.

2-32. 3/2 Ball Valve, Hydraulic System (Cont)b. *Install.* (figure 2-25)

- (1) Position and secure ball valve to MCF with nuts (5) and capscrews (6), and tighten.
- (2) Using the hydraulic schematic, uncap and connect and cap the following tubes and hoses to the ball valve.
 - (a) Tube L6 (2), from ball valve (port "3") to hand pump.
 - (b) Tube L7 (3), from ball valve (port "2Z") to thruster hydraulic brake.
 - (c) Hose L5 (4), from ball valve (port "1W") to thruster manifold.
- (3) Ensure hydraulic system lines leading to ball valve (1) have been adequately tightened. Slowly allow fluid pressure to return to lines. Watch for leakage. If leaking is observed, shutdown the system.
- (4) Allow system to cool and replace leaking fittings, connections, or lines.
- (5) Energize hydraulic system and functionally test ball valve. When test is successfully completed, return ball valve to normal position.

FOLLOW-ON MAINTENANCE: Fill to fluid level in reservoir in accordance with paragraph 2-28.

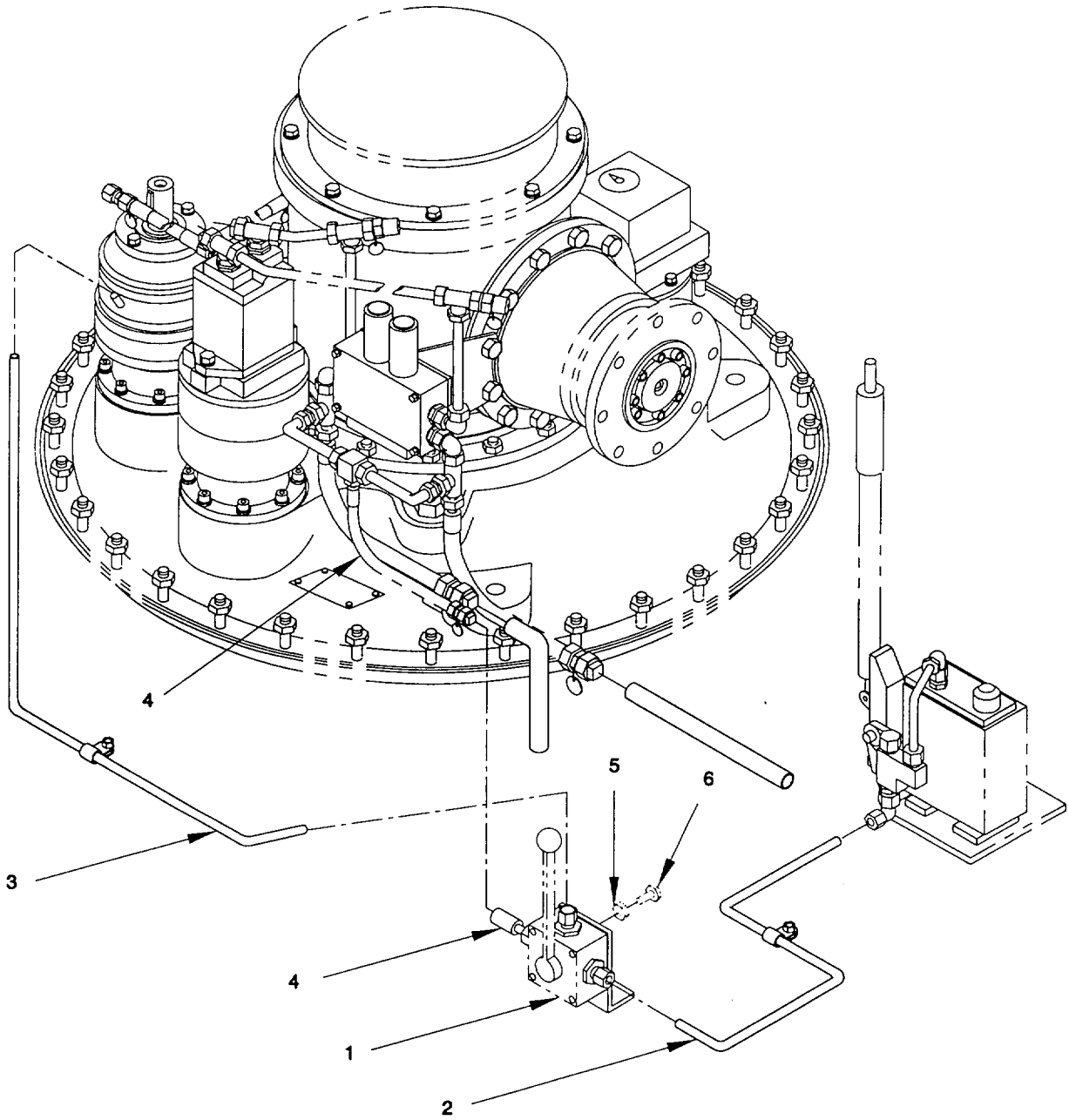


Figure 2-25. 3/2 Ball Valve, Hydraulic System, Remove/Install.

2-33. Hydraulic Reservoir.

This task covers: a. Service b. Inspect c. Remove d. Clean e. Install f. Test

INITIAL SETUP

<i>Tools</i>	Cloth, Lint Free (Item 7, Appendix F)
General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)	<i>Equipment Condition</i>
Torque Wrench (NSN 5120-00-554-7292)	All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE.
<i>Materials/Parts</i>	Hydraulic System drained.
Hydraulic Reservoir Sealant, Hydraulic Pipe (Item 43, Appendix F)	Equipment Operable.

WARNING

Hydraulic lines may contain residual hydraulic pressure. Ensure pressure is relieved before performing maintenance. Failure to comply can result in serious injury to personnel.

Hydraulic fluid is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

CAUTION

Hydraulic systems can be damaged through the use of incompatible or dirty hydraulic fluid. Prior to adding or replacing hydraulic fluid, verify the type of fluid currently used in the system and filter all fluid as it is added.

During hydraulic component removal or replacement, precautions shall be taken to prevent foreign matter from entering the hydraulic system. Covers and caps should be metal or plastic; materials subject to lint, splinters, flaking, crumbling, etc. should not be used.

a. Service.

Service reservoir in accordance with paragraph 2-28.

b. Inspect.

- (1) Inspect for leaks around cover gasket and pipe joints.
- (2) Inspect for corrosion, deterioration, broken or loose parts, and dirt in reservoir or hydraulic fluid.
- (3) Inspect electrical connections and components for loose connections, or frayed or broken wire.

2-33. Hydraulic Reservoir (Cont).c. Remove. (figure 2-26)

- (1) Position drain container below plumbing connections and remove hose assembly (1), 90° male elbow (2) and pipe nipple (3) from hydraulic reservoir (6).
- (2) Remove six hex head capscrews (4) and six hex nuts (5) securing hydraulic reservoir (6). Remove reservoir (6).

d. Clean.

Loosen sludge in reservoir, using a soft bristle brush, whenever the hydraulic fluid is replaced, or sooner, according to the Lubrication Order.

e. Repair.

Repair is limited to replacement of components as determined by inspection.

f. Install. (figure 2-26)

- (1) Position new hydraulic reservoir (6) and secure with six hex head capscrews (4) and six hex nuts (5).
- (2) Apply sealant to pipe threads on pipe nipple (3) and 90° male elbow (2). Install pipe nipple (3), 90° male elbow (2) and hose assembly (1) on hydraulic reservoir (6).
- (3) Fill hydraulic reservoir with hydraulic fluid. Refer to paragraph 2-28 for filling procedures.
- (4) Prime hydraulic pump and vent air from system. Refer to paragraph 2-28.
- (5) Wipe up any hydraulic fluid spillage.

g. Test.

- (1) Energize hydraulic system and controls/indicators.
- (2) Check for leaks at all pipe joints and connections.
- (3) Check that dirt alarm gauge is indicating normal dirt levels or lower.
- (4) Check that level of fluid records within HIGH range on gauge.
- (5) Check that level sensor alarm in Operator's Cab is not illuminated.

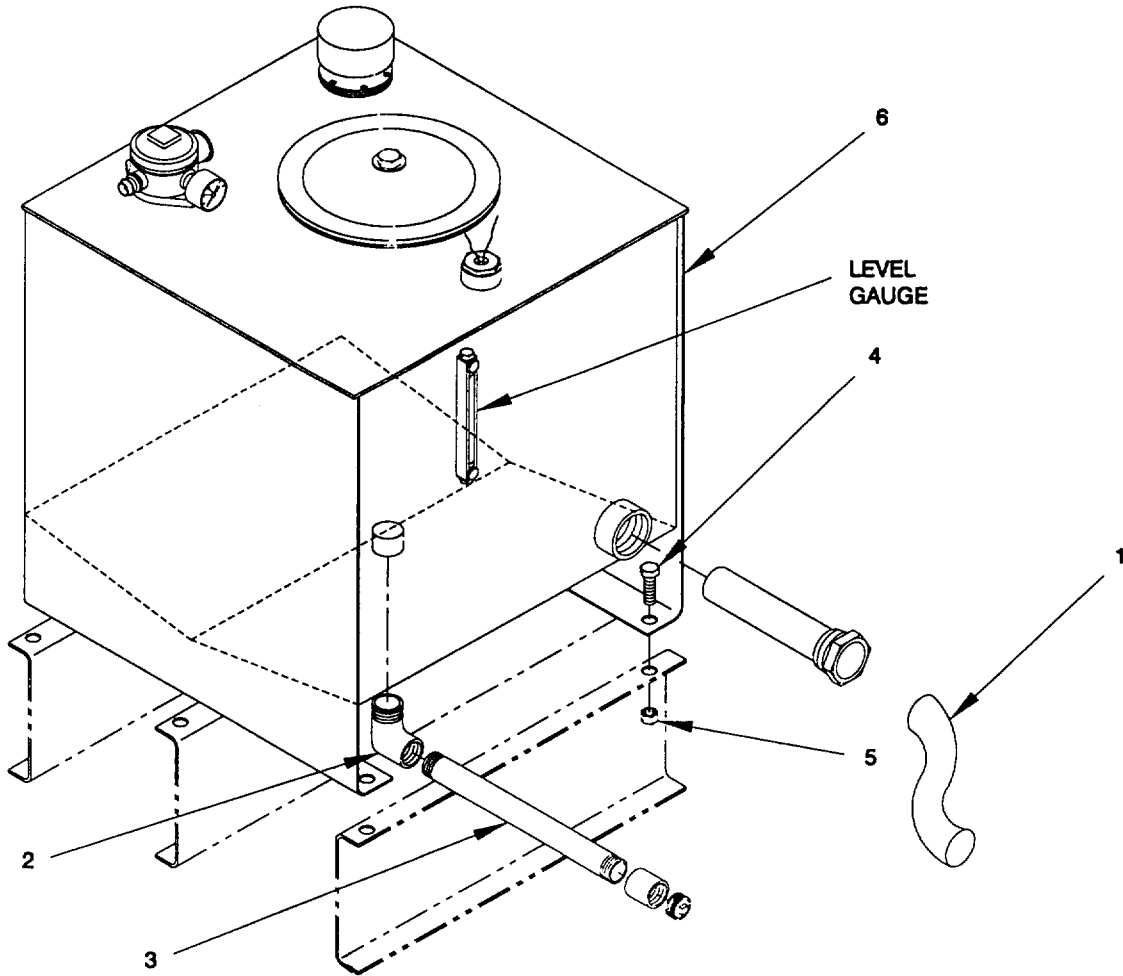


Figure 2-26. Hydraulic Reservoir, Remove/Install

2-34. Level Sensor Subassembly, Hydraulic Reservoir Assembly.

This task covers: a. Remove b. Install c. Test

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Level Sensor

Equipment Condition

All power off to equipment. All equipment and controls/indicators tagged OUT OF SERVICE.

Hydraulic reservoir system drained of hydraulic fluid per paragraph 2-28. Inspection cover, bar and capscrew removed.

- a. Remove. (figure 2-27)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply may result in serious injury to personnel.

Hydraulic lines may contain residual hydraulic pressure. Ensure pressure is relieved before performing maintenance. Failure to comply can result in serious injury to personnel.

Hydraulic fluid is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

Hydraulic systems can be damaged through the use of incompatible or dirty hydraulic fluid. Prior to adding or replacing hydraulic fluid, verify the type of fluid currently used in the system and filter all fluid as it is added.

During hydraulic component removal or replacement, precautions shall be taken to prevent foreign matter from entering the hydraulic system. Covers and caps should be metal or plastic; materials subject to lint, splinters, flaking, crumbling, etc. should not be used.

- a. Remove. (figure 2-27).

- (1) Tag equipment OUT OF SERVICE.
- (2) Disconnect and tag electrical wiring to level sensor to aid in reassembly. Refer to Appendix G.
- (3) Remove adapter (1) from reservoir and lift out level sensor subassembly.
- (4) Unscrew level sensor (2) from pipe coupling (3).

2-34. Level Sensor (Cont).b. Test. (figure 2-27).

- (1) Raise sensor (2) out of tank and, with float (4) in resting position, check that light in cab illuminates to indicate a low level of hydraulic fluid. If not, check integrity of electrical connections.
- (2) Move float (4) to its upper limit of travel on the subassembly. The hydraulic fluid indicator light should go OUT in the operator's cab.

c. Install. (figure 2-27).

- (1) Replace level sensor (2) on pipe coupling (3) and tighten.
- (2) Insert level sensor (2) subassembly into position in reservoir and secure with adapter (1).
- (3) Connect electrical wiring as tagged. Refer to Appendix G.
- (4) Test per step (c). Remove OUT OF SERVICE tags.

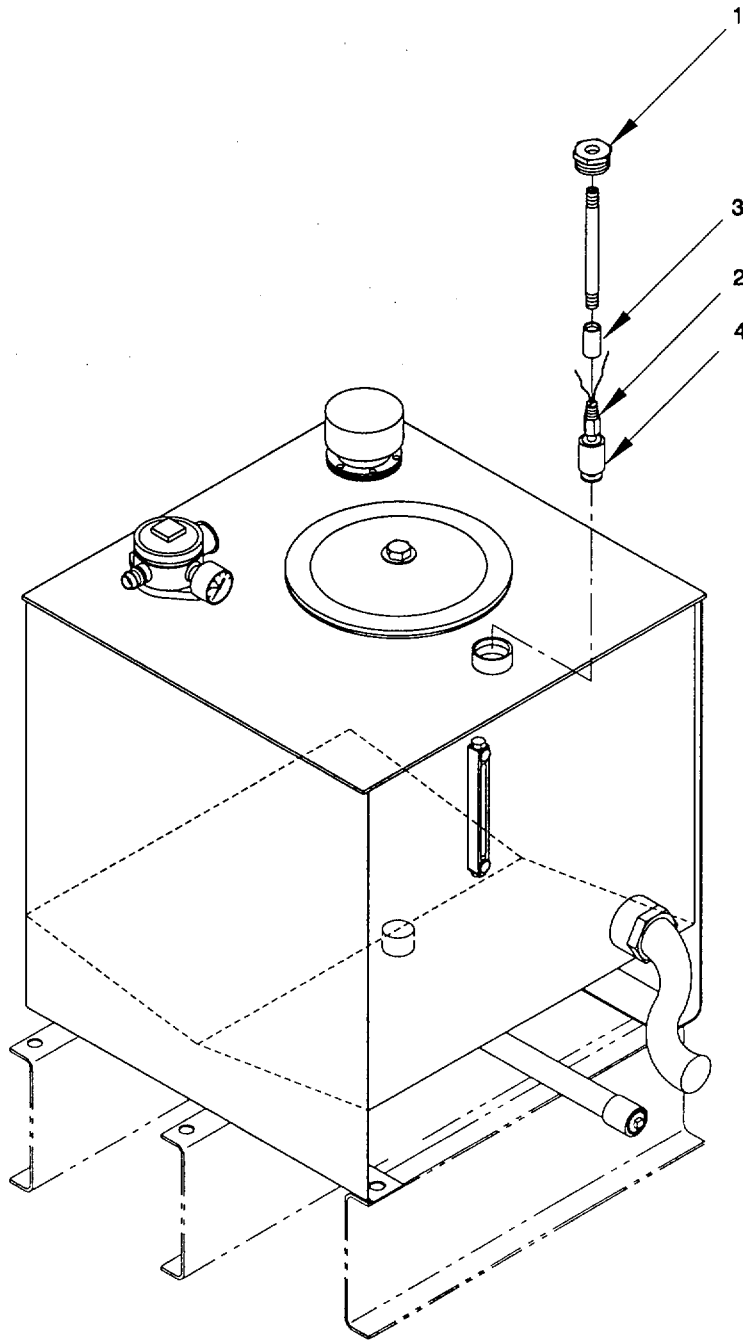


Figure 2-27. Level Sensor Subassembly, Remove/Install/Test.

2-35. Bilge Pump.

This task covers: a. Inspect b. Remove c. Clean d. Install e. Test

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Cloth, Lint Free (Item 7, Appendix F)
Sealant, Thread (Item 42, Appendix F)
Pump, Bilge

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

NOTE

All six bilge pumps and all six switches must be tested and inspected in accordance with the following procedures.

a. Inspect.

- (1) Inspect all components for clogging, accumulations, or deposits of material that restricts the flow of water through the pump.
- (2) Inspect hoses and piping for cracks, deterioration and leaks.
- (3) Inspect pump electrical leads for corrosion, deterioration, dirt, or loose hardware or frayed, loose, or broken electrical wiring connections.
- (4) Inspect for damage to any components. Determine if replacement is necessary for proper operation. Repair of the pump is limited to replacement of components.

b. Remove. (figure 2-28)**NOTE**

Tag electrical wires before removing to aid in reassembly.

- (1) Tag and disconnect electrical wires to bilge pump (3). Refer to Appendix G, for wiring information.
- (2) Remove hose clamp (1) connecting hose (2) to bilge pump (3).
- (3) Remove pump (3) from strainer (4) by depressing the lock tabs on both sides of the pump (3).

2-35. Bilge Pump (Cont).

- (4) Remove four hex head machine screws (5) and four flat washers (6) securing bilge pump strainer (4) to the foundation.

c. Clean.

Remove or scrape accumulations or deposits of material from the outside or the inside of strainer base of bilge pump. This will allow a free flow of water through the strainer and into the pump.

d. Install. (figure 2-28)

- (1) Apply thread sealant to threads on four hex head machine screws (5).
- (2) Secure new bilge pump strainer (4) to foundation with four flat washers (6) and four hex head machine screws (5).
- (3) Install new bilge pump (3) on strainer (4) and lock in place with lock tabs.
- (4) Install hose (2) on pump (3) and secure with hose clamps (1).
- (5) Reconnect electrical wires, as tagged, to bilge pump (3). Refer to Appendix G, for wiring information.

e. Test.

Test operation of bilge pump system by manually operating system from the cab and from the controls below deck. The float switch must be held in the ON (floating) position to verify its operation.

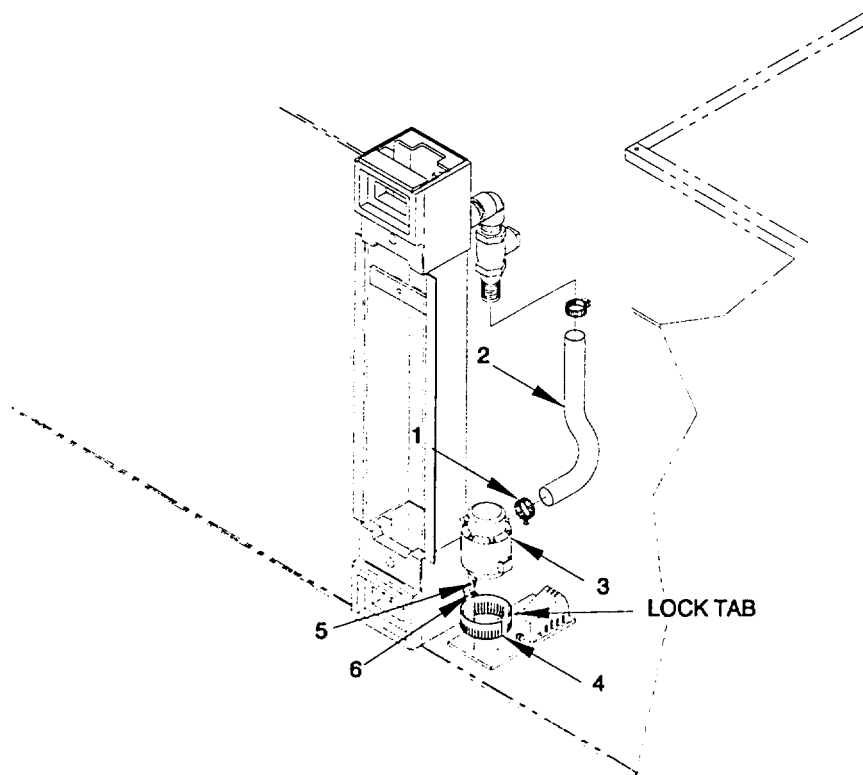


Figure 2-28. Typical Bilge Pump, Remove/Install

2-36. Float Switch with Guard, Bilge.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/Indicators tagged OUT OF SERVICE

Materials/Parts

Lint Free Cloth (Item 7, Appendix F)
Sealant, Thread (Item 43, Appendix F)
Float Switch with Guard

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. Remove. (figure 2-29)

NOTE**Tag electrical wires before removing to aid in reassembly.**

- (1) Deenergize electrical power to bilge pumps.
 - (2) Remove two hex head machine screws (1) and two flat washers (2) securing float switch cover (3) to foundation. Remove float switch cover (3).
 - (3) Tag and disconnect electrical wires to float switch (4). Refer to Appendix G, figure G-1 for wiring information..
 - (4) Remove float switch (4).
- b. Install. (figure 2-29)
- (1) Install new float switch (4) and reconnect wires, as tagged, to float switch (4). Refer to Appendix G.
 - (2) Apply thread sealant to threads of two hex head machine screws (1).
 - (3) Install new float switch cover (3) on foundation over float switch (4). Secure cover with two flat washers (2) and two hex head machine screws (1).
 - (4) Test operation of switch and bilge pump in accordance with paragraph 2-35.

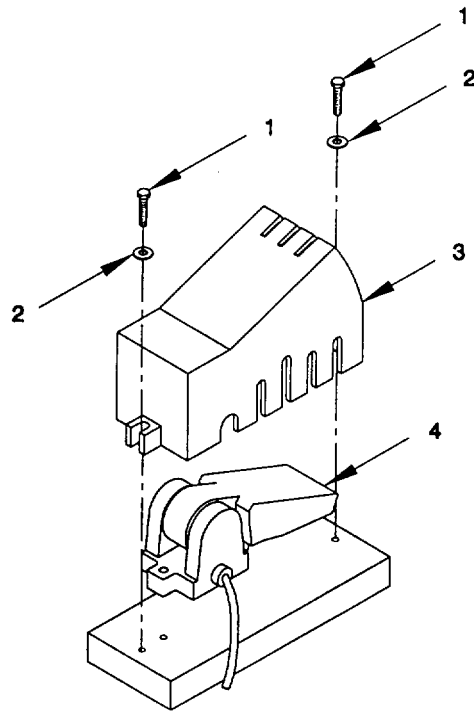


Figure 2-29. Float Switch w/Guard, Bilge, Remove/Install

2-37. Check Valve, Bilge.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)
Monkey Wrench (NSN 5120-00-277-3020)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Cloth, Lint Free (Item 7, Appendix F)
Sealant, Pipe Thread (Item 41, Appendix F)
Check Valve

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-30)

- (1) Deenergize electrical power to bilge pumps and tag OUT OF SERVICE.
- (2) Remove hose clamp (1) securing hose (2) to nipple (3).
- (3) Remove hose (2) from nipple (3).
- (4) Remove nipple (3) from check valve (4).
- (5) Remove check valve (4).

b. *Install.* (figure 2-30)

- (1) Apply pipe thread sealant to pipe threads on check valve (4) and nipple (3).
- (2) Install new check valve (4).
- (3) Install nipple (3) on check valve (4).
- (4) Connect hose (2) to nipple (3). Secure with hose clamp (1).
- (5) Test by operating bilge pump with water to check for leaks in hose or at locations of clamps and pipe joints.
- (6) Once performing normally, energize the pumps and remove OUT OF SERVICE tags.

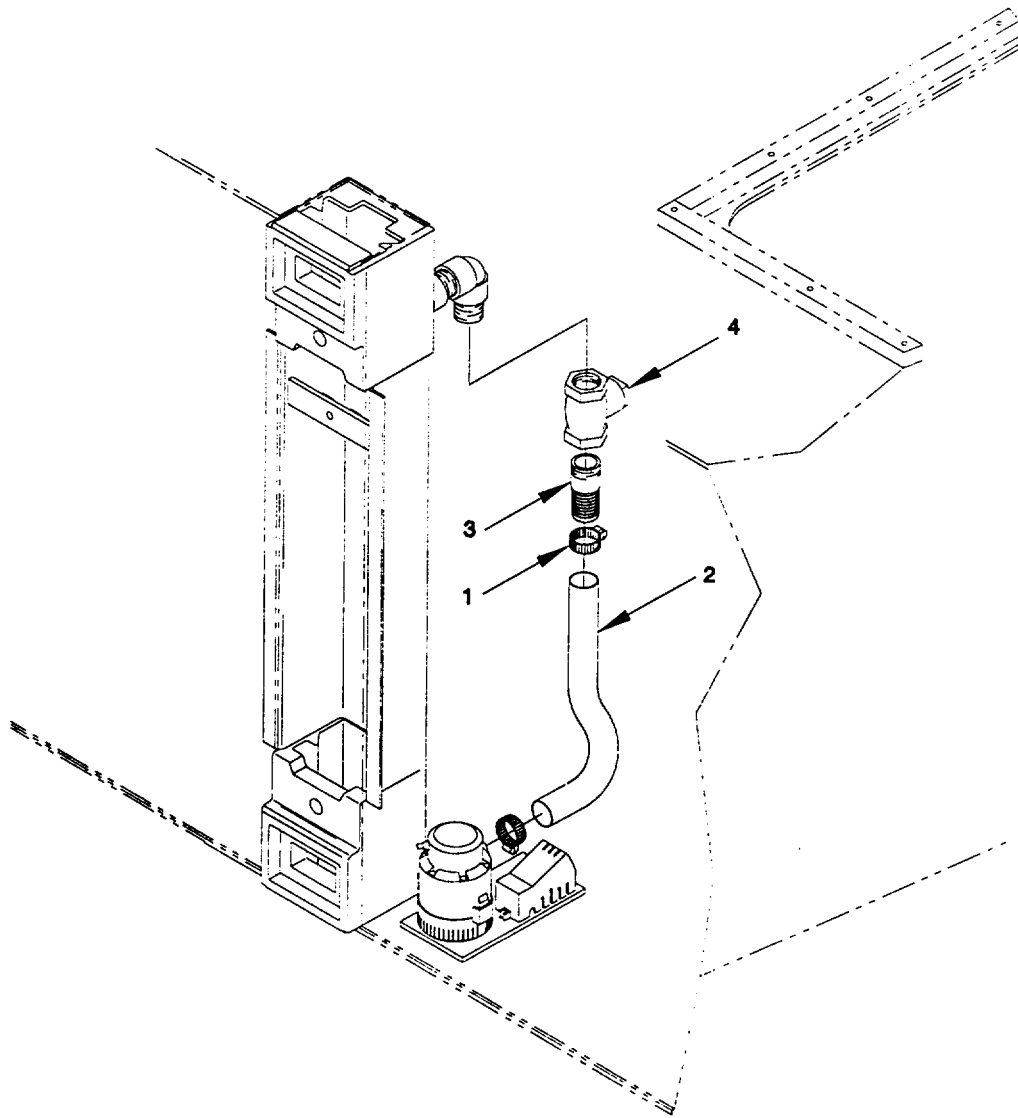


Figure 2-30. Check Valve, Bilge. Remove/Install

2-38. Fire Suppression System.

This task covers: a. Inspect b. Test

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Cloth, Lint Free (Item 7, Appendix F)
Solvent, Cleaning (Item 46, Appendix F)
Scale, 200 lb. capacity

- a. *Inspect.* (figure 2-31)

WARNING

The carbon dioxide gases used in this system is stored in cylinders at extremely high pressures equipped with high rate discharge valves, which when actuated, will open, remain open and cannot be closed. An uncontrolled release of this high pressure gas from an accidental discharge, improper handling, or damage to parts can result in a violent and rapid propulsion of the cylinder(s), capable of causing severe equipment damage, personal injury, or death to personnel. All warnings and instructions noted shall be followed for the safe handling, installation, transportation, service and inspection of the cylinders.

Because CO2 reduces the available oxygen in the atmosphere, it will not support life. Extreme caution shall be used when handling or servicing components of the system. Accidental discharge of this agent can cause serious injury or death to personnel.

- (1) Make a general inspection survey of all cylinders and equipment for damaged or missing parts. Replace all parts determined questionable.
- (2) Ensure access to areas, remote cable pull stations, discharge nozzles, and cylinders are unobstructed and that there are no obstructions to affect the operation of the equipment or distribution of CO2.
- (3) Inspect all hoses for loose fittings, damage, cracks, distortion, cuts, dirt and frayed wire braid. Tighten loose fittings, replace hoses that indicate damage.
- (4) Remove dirt from metallic parts using a lint-free cloth moistened with dry cleaning solvent. Dry parts with clean, dry, lint-free cloth or air blow dry. Wipe nonmetallic parts with clean, dry lint-free cloth. Remove corrosion with crocus cloth.
- (5) Inspect CO2 cylinders and controls heads for physical damage, deterioration, corrosion, distortion, cracks, dirt and loose couplings. Tighten loose couplings. Replace control head if damage is found. Clean as necessary.
- (6) Inspect cylinder straps, cradles and attaching hardware for loose, damaged, or broken parts, corrosion, oil, grease, grime, etc. Tighten loose hardware, replace damaged parts. Clean as necessary.

2-38. Fire Suppression System (Cont).

CAUTION

Nozzles shall never be painted. The part number of each nozzle is stamped on the nozzle. Nozzles shall always be replaced by nozzles of the same part number. Nozzles shall never be interchanged, since random interchanging of nozzles could adversely affect proper CO₂ distribution within a protected area.

- (7) Inspect discharge nozzles for dirt and physical damage. Replace damaged nozzles. If nozzles are dirty or clogged, clean outside of nozzles with rag or soft brush. Examine discharge orifices for damage or blockage. If they appear to be blocked, unscrew nozzles and clean by immersing in dry cleaning solvent and drying thoroughly with lint-free cloth. Replace all damaged nozzles.
- (8) Inspect pressure switches for deformation, cracks, dirt or other damage. Replace switch if damage is found.
- (9) Inspect all piping, fittings and connections for deformation, corrosion, cracks, dirt or other damage. Replace if damage is found.

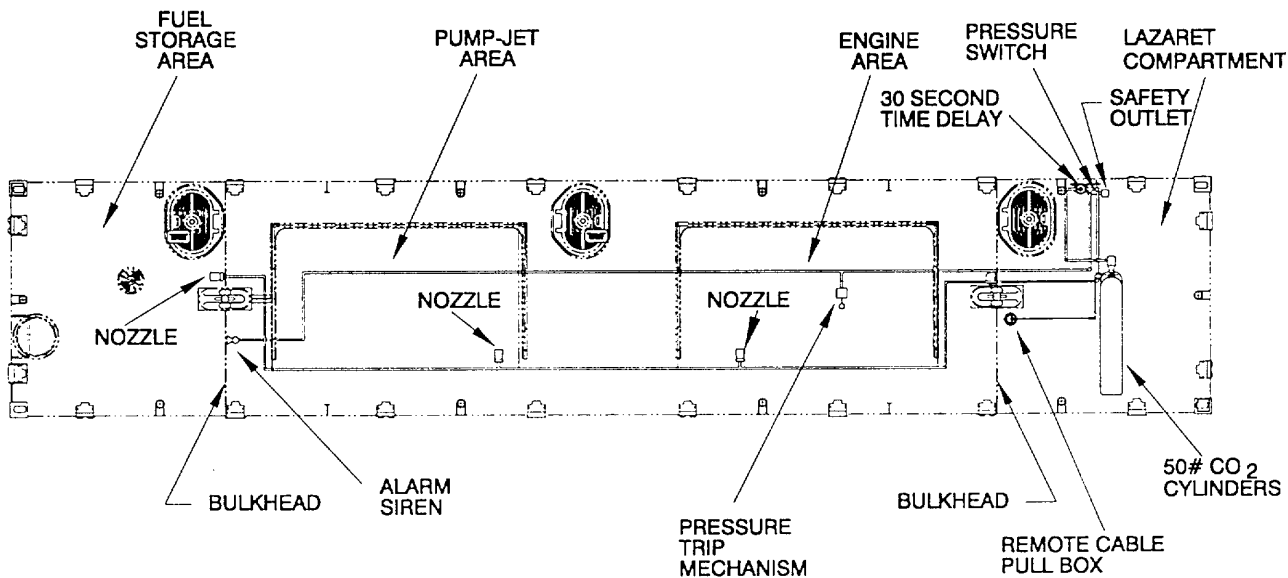


Figure 2-31. Fire Suppression System, Inspect.

2-38. Fire Suppression System (Cont).c. Test. (figure 2-32)

- (1) Turn power ON. DO NOT RUN ENGINE.
- (2) Manually operate the pressure switch by pulling up on plunger to "OPERATED" position and verify engine Emergency Stop trips and exhaust fan shuts down.
- (3) If switch did not operate properly, replace pressure switch.
- (4) Return switch to "SET" position by depressing plunger.
- (5) Reset engine air flapper valve.

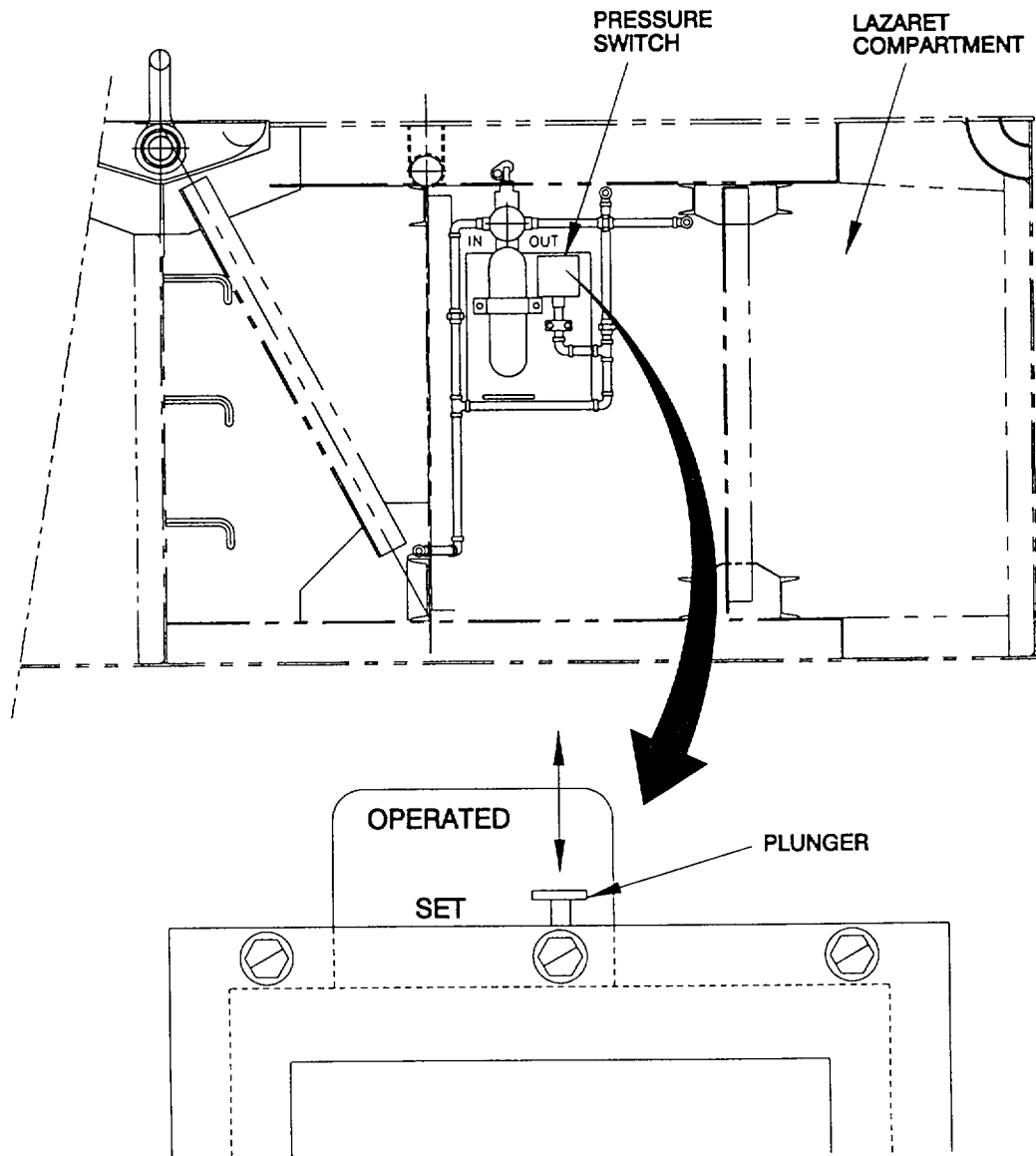


Figure 2-32. Fire Suppression System, Test.

2-39. Cable Control Head, Fire Suppression System.

This task covers:

a. Remove

b. Install

INITIAL SETUP:

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

a. Remove. (figure 2-33)

WARNING

Prior to performing any maintenance on the fire suppression system, all personnel shall be removed from the engine, thruster and fuel storage compartments. Failure to do so with accidental discharge of CO₂ during maintenance will result in serious injury or death to personnel.

- (1) Loosen swivel nut (1) on control head and remove from cylinder valve port.
- (2) Remove cover from control head, loosen setscrews on wheel (2) and free cable (3) from control head.
- (3) Separate control head from cable pipe (4), remove pipe locknut (5) and discard.

b. Install. (figure 2-33)

- (1) Remove cover from replacement control head, take out wheel assembly, cable pipe locknut and closure disc.
- (2) Make sure plunger is below surface of control head body. Position control head at valve control port with arrow pointing in direction of pull.
- (3) Assemble cable pipe locknut (5) to cable pipe (4) and place cable pipe in position to control head body.
- (4) Slide wheel assembly (2) on control cable to proper SET position. Tighten setscrews securely. Make sure wheel assembly is at start of stroke.
- (5) If a new cable (3) has been installed, cut off excess control cable close to wheel assembly.
- (6) Insert closure disc (6) and replace cover on control head. Control head is now armed.

CAUTION

To ensure that the manual lever does not snag or trap cable, the local manual release lever must be in the SET position with locking pin and seal wire installed before assembling control head cover to body.

- (7) Assemble control head to cylinder valve actuation port. Tighten swivel nut securely.

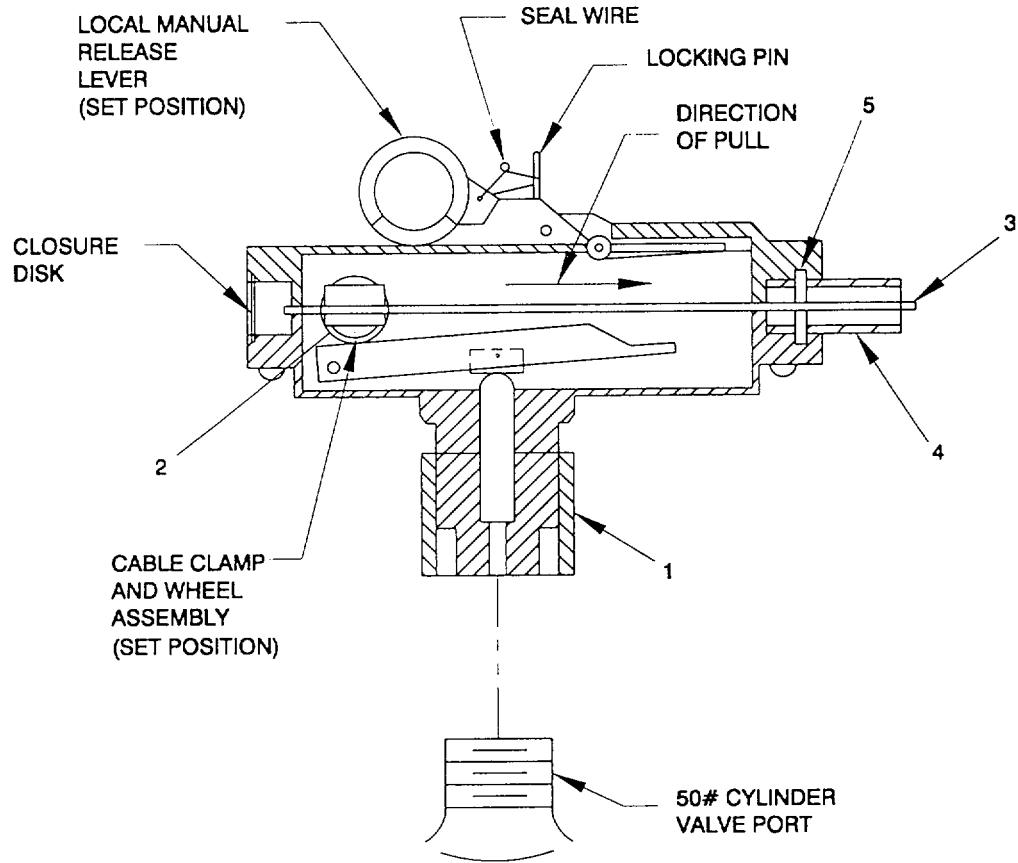


Figure 2-33. Cable Control Head, Fire Suppression System, Remove/Install

2-40. Discharge Head, Fire Suppression System.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Cloth, Lint Free (Item 7, Appendix F)
Solvent, Cleaning (Item 46, Appendix F)

a. Remove. (figure 2-34)

- (1) Remove flexible hose (1) from discharge head (2).
- (2) Unscrew discharge head from cylinder valve and discard.

b. Install. (figure 2-34)

- (1) Wipe off cylinder valve sealing surface.
- (2) Verify that preformed packings are installed in the mating surface grooves at the bottom of the swivel nut cavity on the replacement discharge head. Preformed packings must be free of dirt or other contaminants.
- (3) Make certain the discharge port is clean and unobstructed.
- (4) Install replacement discharge head (2) on cylinder valve. Tighten securely.
- (5) Reconnect flexible hose (1) to discharge head and secure tightly.

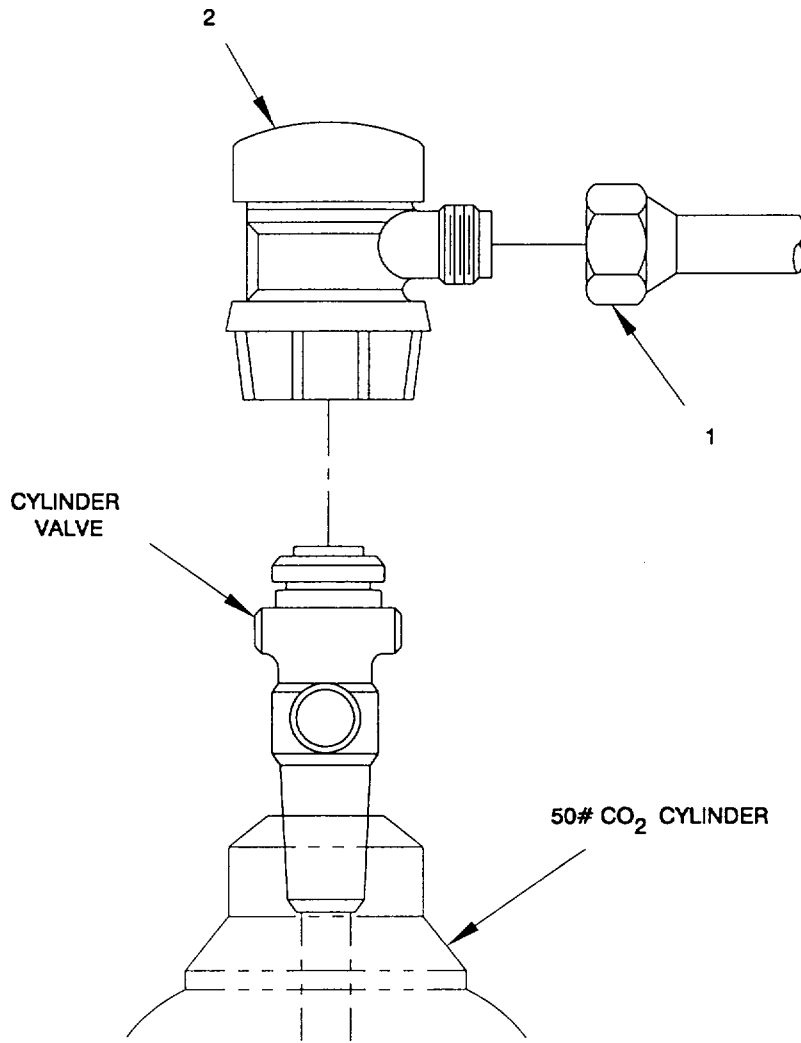


Figure 2-34. Discharge Head, Fire Suppression System, Remove/Install.

2-41. Remote Cable Pull Box and Cable, Fire Suppression System.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools**Equipment Condition*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

- a. Remove. (figure 2-35)

WARNING

Prior to removing and replacing either the remote cable pull box and/or cable, maintenance personnel shall disconnect the cable operated control head from the 50# CO2 cylinder. Failure to do so, could result in accidental discharge of the fire suppression system resulting in injury or death to personnel.

- (1) Disconnect the cable operated control head from the 50# CO2 cylinder and disconnect cable from control head. Refer to paragraph 2-41.
- (2) Remove palnut (1) below deck from underside of cable pull box (2).
- (3) Remove three attaching screws (3) on cable pull box (2) above deck, freeing cable pull box and cable
- (4). Lift cable pull box with cable free from recess on deck and discard.

- b. Install. (figure 2-35)

- (1) Attach replacement cable (4) to replacement cable pull box (2) with cable fastener (5).
- (2) Feed cable end into recess opening continuing below deck through all cable pulleys and cable tubes until cable end exits at control head end. Cable pulleys are equipped with removable covers to aid in feeding of cable through system.
- (3) Attach cable pull box (2) to recess bottom with new attaching screws (3).
- (4) Attach palnut (1) to underside of cable pull box (2) below deck.
- (5) Connect cable (4) to control head and reconnect control head to 50# cylinder in accordance with paragraph 2-39.

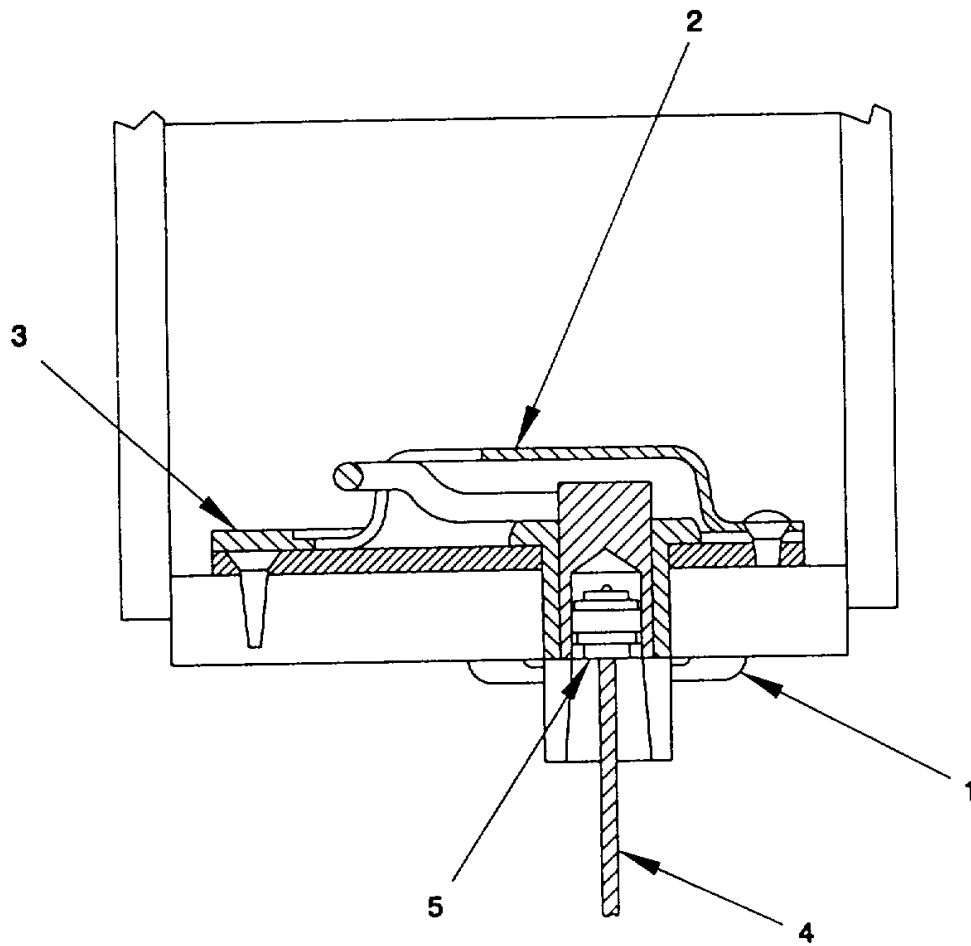


Figure 2-35. Remote Cable Pull Box and Cable, Fire Suppression System, Remove/Install

2-42. Time Delay Cylinder, Control Head and Pressure Switch, Fire Suppression System.

This task covers: a. Remove b. Install

INITIAL SETUP
Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Tape, Teflon (Item 47, Appendix F)

a. Remove. (figure 2-36)

- (1) Disconnect all electrical connections at pressure switch (1). Refer to Appendix G.
- (2) Remove capscrews (2) from strap (3).
- (3) Remove capscrews (4) from pipe support (5).
- (4) Free 30 second time delay cylinder (6), pressure switch (1) with all associated piping by separating unions (7).
- (5) To disassemble the plumbing associated with the time delay cylinder in the correct sequence, remove pipe (8), elbow (9), pipe (10), pipe (11), tee (12), pipe (13), elbow (14), pipe (15), pipe (16), tee (17), pipe (18), elbow (19), reducer (20), pipe (21), and reducer (22).
- (6) Remove control head (23) from top of time delay cylinder by loosening swivel nut.
- (7) Remove pipe (8) from pressure switch (1).

b. Install. (figure 2-36)

- (1) Apply Teflon tape to all male fitting and piping ends.
- (2) Install pipe (8) in pressure switch (1).
- (3) Install control head (23) in top of time delay cylinder (6) by tightening swivel nut.
- (4) Assemble reducer (22), pipe (21), reducer (20), elbow (19), pipe (18), tee (17), pipe (16), pipe (15), elbow (14), pipe (13), tee (12), pipe (11), pipe (10), elbow (9), and pipe (8) to reassemble the plumbing associated with the time delay cylinder (6).
- (5) Position time delay cylinder (6) and pressure switch with all associated piping and secure with unions (7).
- (6) Install capscrews (4) in pipe support (5) and capscrews (2) in strap (3).
- (7) Reconnect all electrical connections to pressure switch (1). Refer to Appendix G.

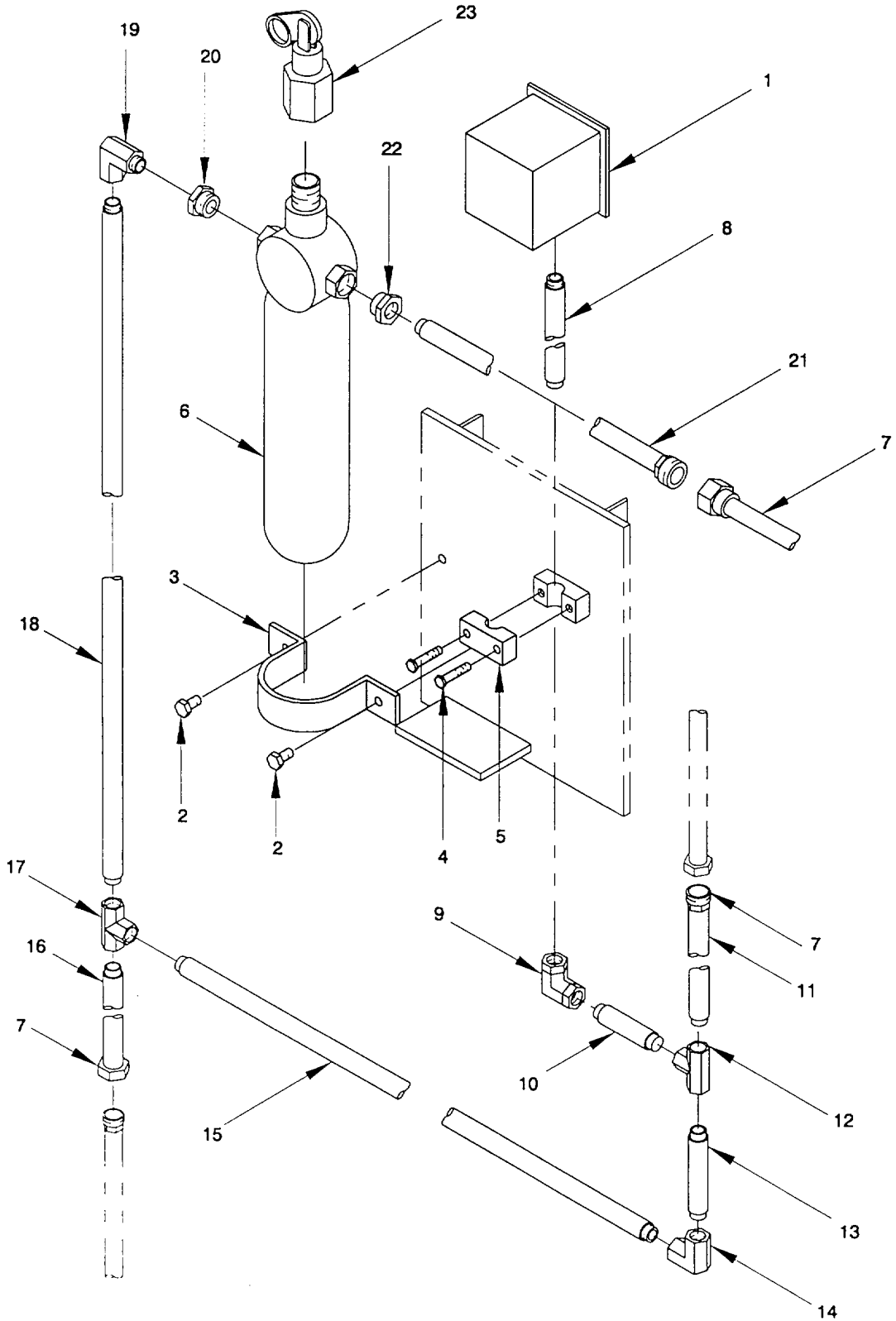


Figure 2-36. Time Delay Cylinder, Control Head & Pressure Switch, Fire Supp. System, Remove/Install

2-43. Safety Outlet, Fire Suppression System.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Tape, Teflon (Item 47, Appendix F)

a. Remove. (figure 2-37)

Unscrew safety outlet (1) and discard.

b. Install. (figure 2-37)

Apply Teflon tape to male pipe thread, install new safety outlet (1) and secure tightly.

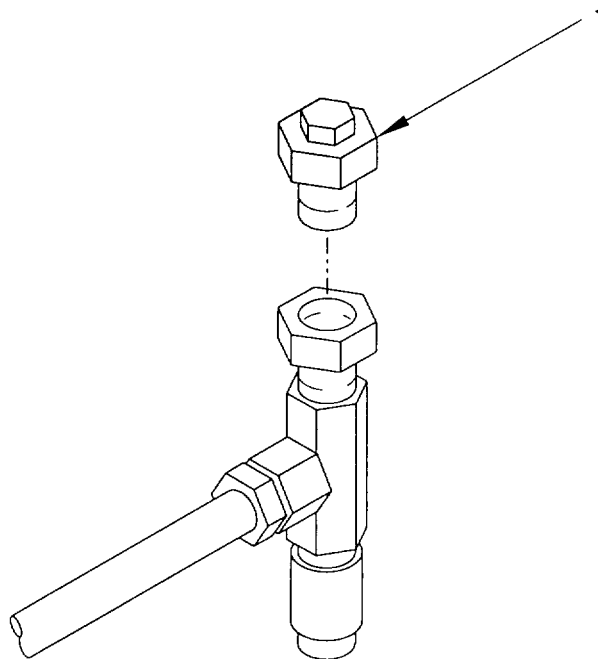


Figure 2-37. Safety Outlet, Fire Suppression System, Remove/Install

2-44. Alarm Siren, Fire Suppression System.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Tape, Teflon (Item 47, Appendix F)

a. Remove. (figure 2-38)

- (1) Remove self-locking hex nuts (1), and capscrews (2) freeing siren (3) from bulkhead bracket.
- (2) Separate union (4), pipe (5), pipe cap (6), pipe (7), tee (8), and nipple (9) from siren (3).

b. Install. (figure 2-38)

- (1) Apply Teflon tape to all male fittings and piping ends.
- (2) Install nipple (9), tee (8), pipe (7), pipe cap (6), pipe (5) and union (4) on siren (3).
- (3) Position siren (3) on bulkhead bracket. Secure with capscrews (2) and self locking hex nuts (1).

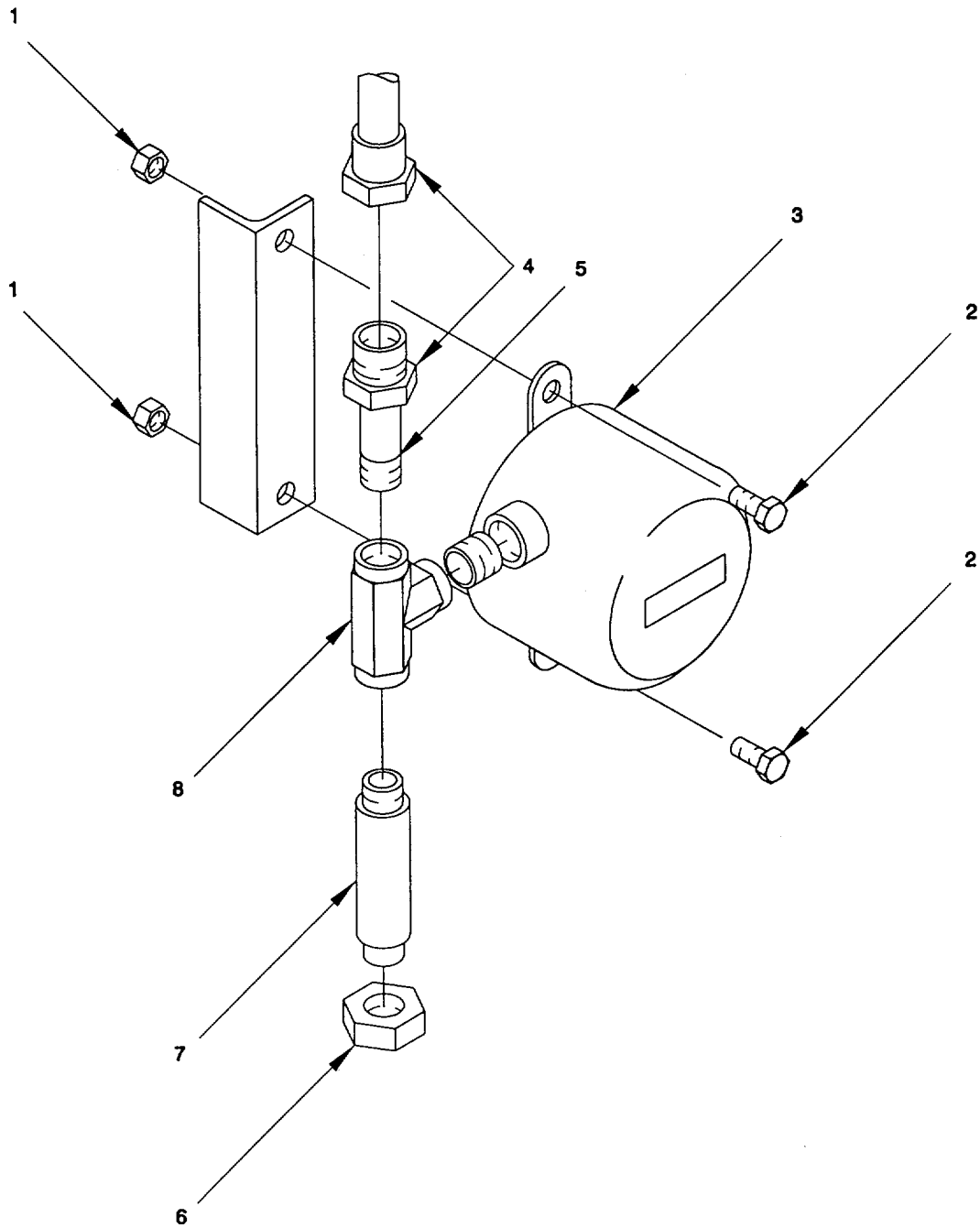


Figure 2-38. Alarm Siren, Fire Suppression System, Remove/Install

2-45. Discharge Nozzle, Fire Suppression System.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Tape, Teflon (Item 47, Appendix F)

- a. *Remove.* (figure 2-39)

CAUTION

The part number of each nozzle is stamped on the nozzle. Nozzles shall always be replaced by nozzles of the same part number. Nozzles shall never be interchanged, since random interchanging of nozzles could adversely affect proper CO2 distribution within a protected area.

- (1) Unscrew discharge nozzle (1) and discard.

- b. *Install.* (figure 2-39)

- (1) Apply Teflon tape to male pipe threads.

- (2) Install new discharge nozzle (1) and secure tightly.

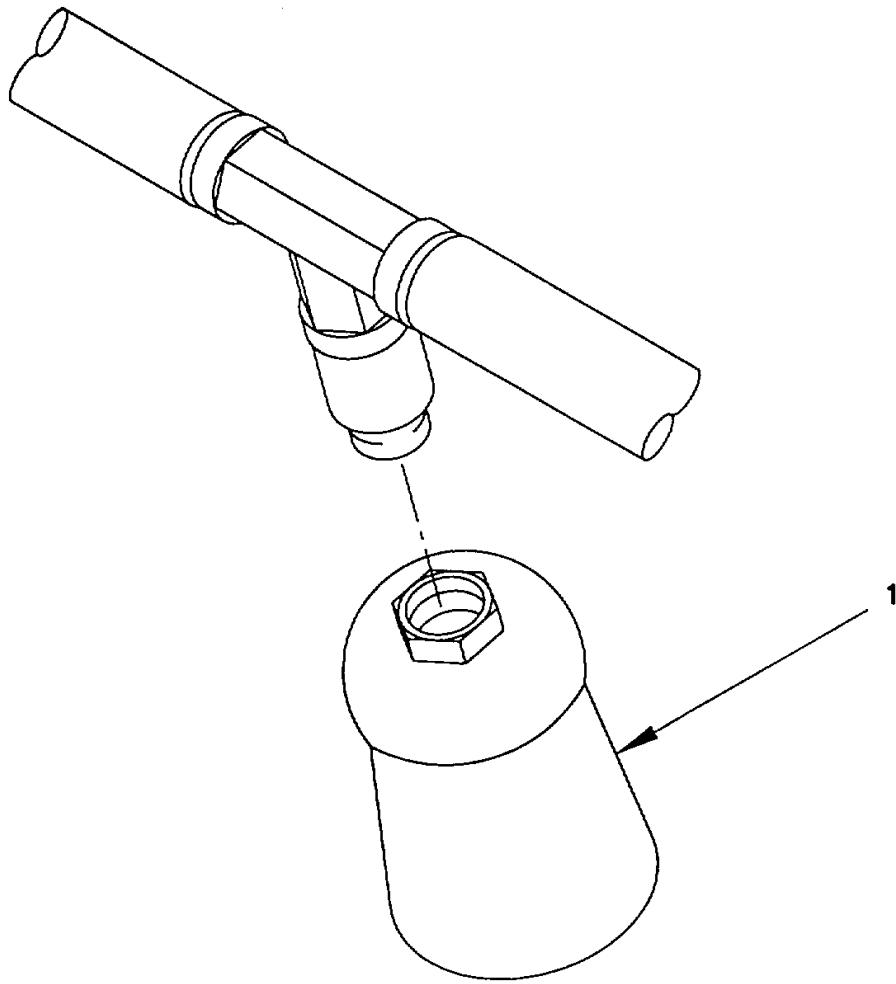


Figure 2-39. Discharge Nozzle, Fire Suppression System, Remove/Install.

2-46. Pressure Operated Trip Mechanism, Fire Suppression System.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Tape, Teflon (Item 47, Appendix F)

a. Remove. (figure 2-40)

- (1) Remove hex nut (1), capscrew (2) freeing pressure trip mechanism (3) from support brace.
- (2) Unscrew pressure trip mechanism and discard.

b. Install. (figure 2-40)

- (1) Apply Teflon tape to male pipe thread.
- (2) Install new pressure trip mechanism (3) and secure tightly to support brace with capscrew (2) and hex nut (1).

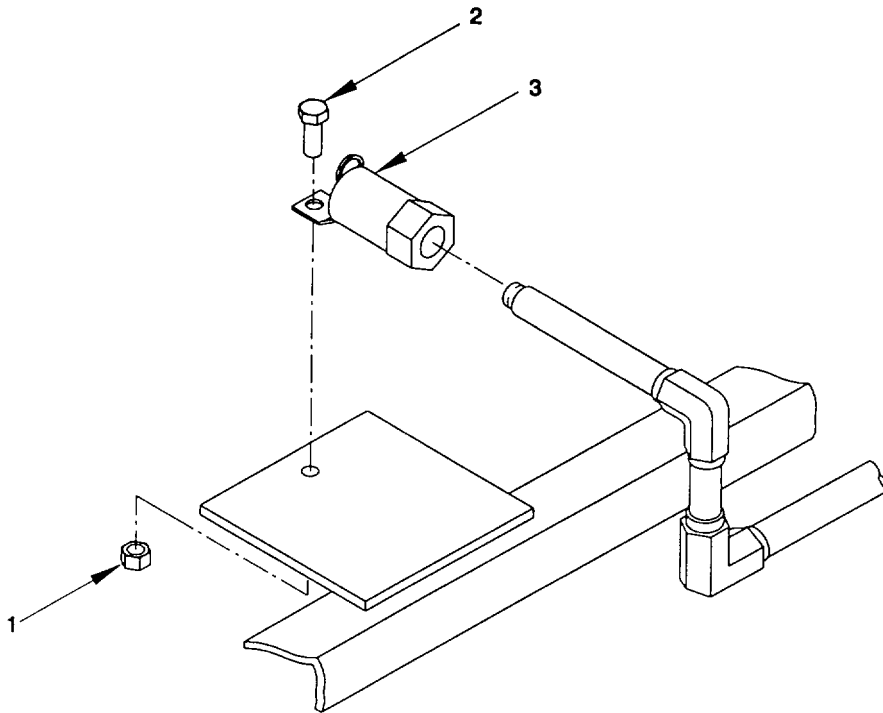


Figure 2-40. Pressure Operated Trip Mechanism, Fire Suppression System, Remove/Install.

2-47. Filler Neck Strainer, Fuel System.

This task covers: a. Remove b. Install

INITIAL SETUP*Materials/Parts**Equipment Condition*

Filler Neck Strainer

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

Diesel fuel is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. Remove. (figure 2-41)

- (1) Remove cover (1) from tank (3).
- (2) Lift out filler neck strainer (2), using bail bar.

b. Service.

- (1) Clean strainer (2) to free contaminants from screen (4). Ensure no contaminants are present.
- (2) Dispose of contaminated fuel in accordance with proper military practices.

b. Install. (figure 2-41)

- (1) Install filler neck strainer (2) into tank (3) filler neck.
- (2) Install cover (1) on tank (3).

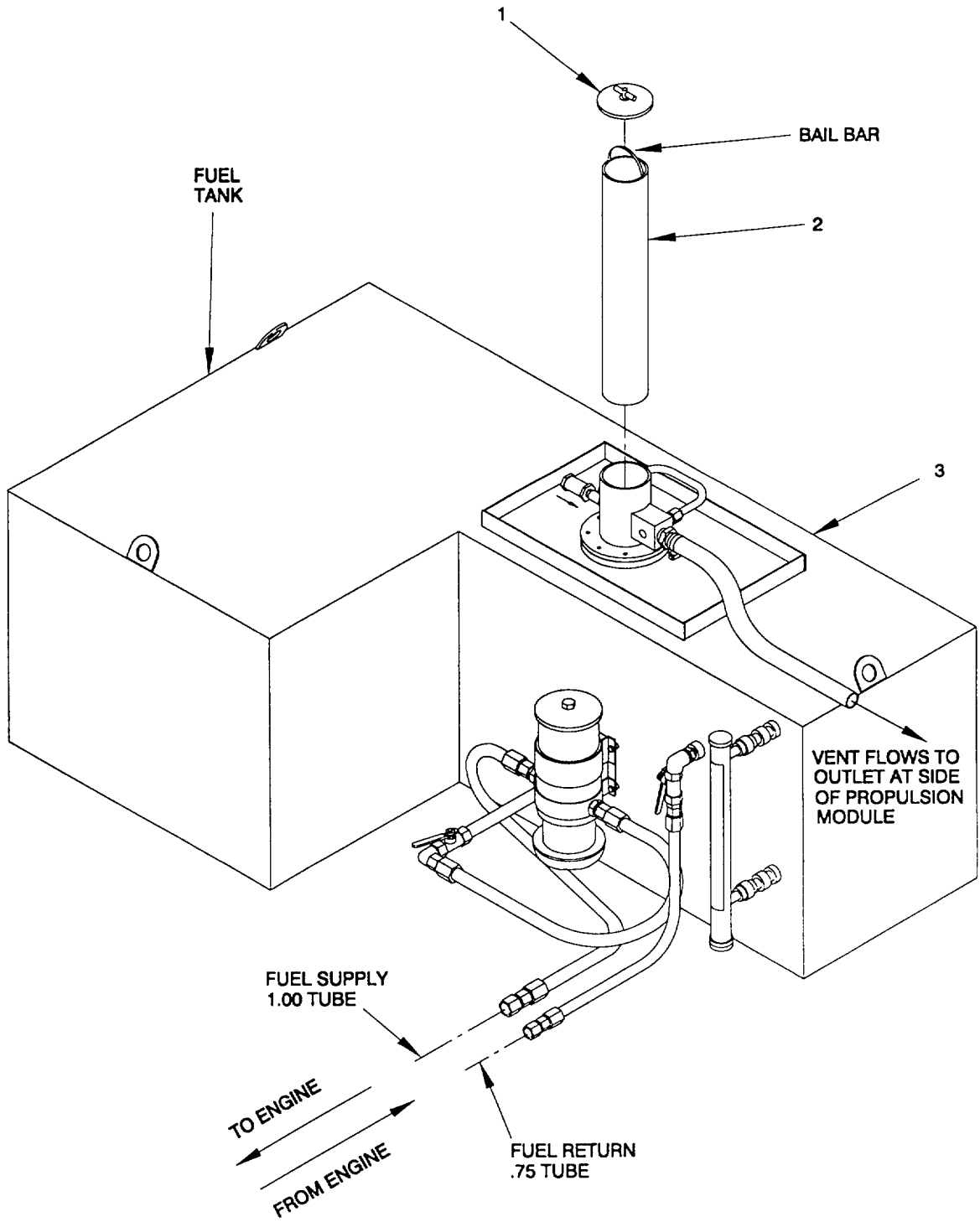


Figure 2-41. Filler neck strainer, Remove/Install

2-48. Check Valve, Fuel System.

 This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE.

Materials/Parts

Fuel lines and tank drained of fuel.

Check Valves (Fuel/Separator (2) and Fuel Return Line (1))

Sealant (Item 41, Appendix F)

WARNING

Diesel fuel is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

Fuel and engine oil are highly flammable. Sparks or open flames should be kept away. Failure to comply may result in serious injury or death to personnel.

Use approved procedures when cleaning up fuel spills. Take proper precautions when removing or installing any fuel system component. Failure to comply may result in serious injury or death to personnel.

The diesel engine and electrical system should be shut off and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply may result in serious injury or death to personnel.

a. Remove. (figure 2-42)

- (1) Ensure that all equipment is deenergized and tagged OUT OF SERVICE, and that fuel tank and fuel lines are drained completely of fuel.
- (2) Remove tube (1) from male connectors (2).
- (3) Remove male connector (2) from check valve (3).
- (4) Remove two check valves (3) from male pipe tee (4).
- (5) Remove check valve (5) from male connector (6).

b. Install. (figure 2-42)

- (1) Apply sealant to pipe threads on male connectors (2, 6) and male pipe tee (4).
- (2) Install check valve (5) on male connector (6).
- (3) Install two new check valves (3) on male pipe tee (4).

2-48. Check Valve, Fuel System - (Cont).

- (4) Install male connector on check valve (3).
- (5) Install tube on male connector (2).

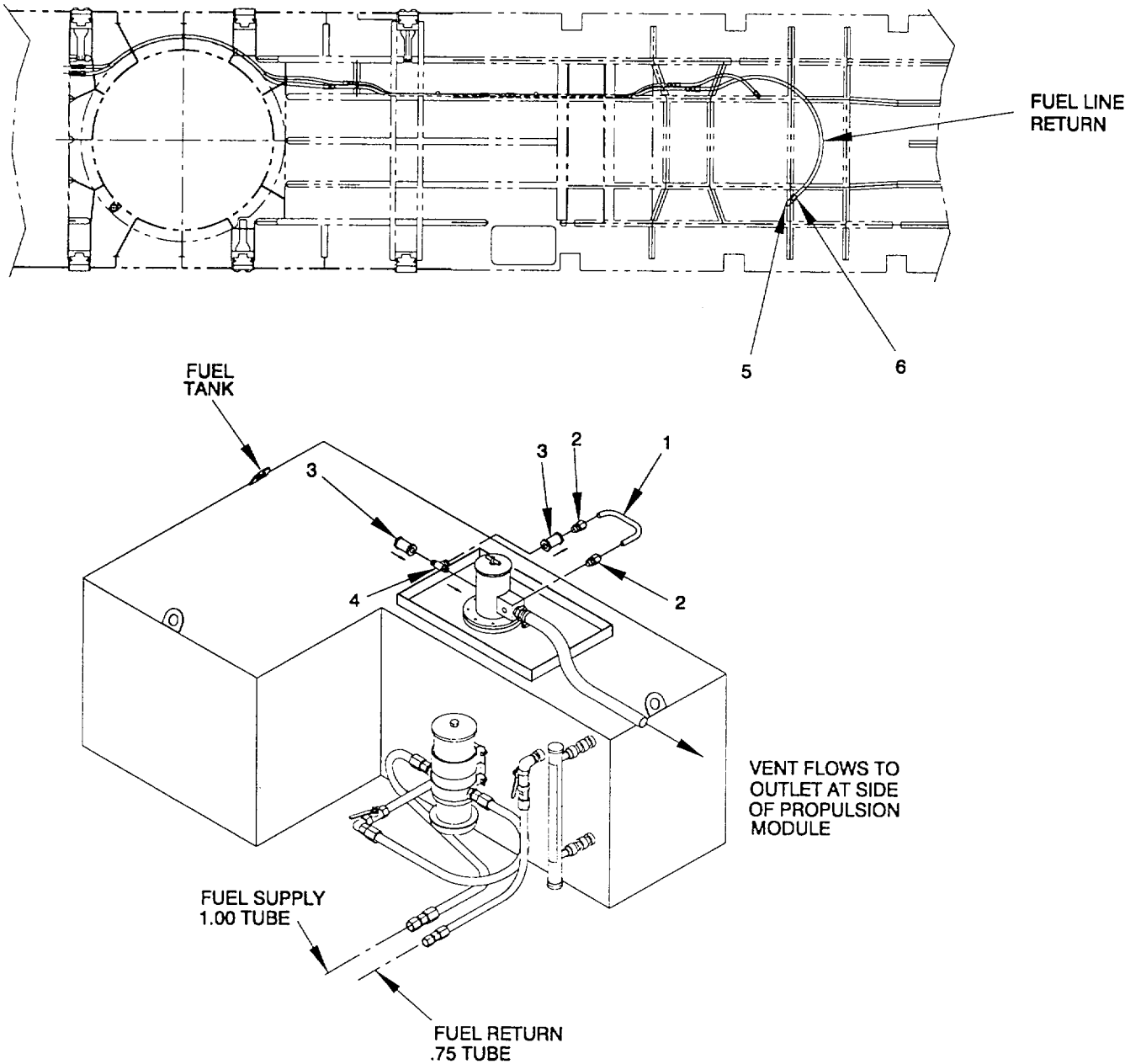


Figure 2-42. Check Valve, Fuel System, Remove/Install

2-49. Fuel Water Separator.

 This task covers: a. Service b. Remove c. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE.

Materials/Parts

Fuel inlet line valve closed (refer to paragraph 2-50).

Filter

Fuel Water Separator

Filter Element (Item 67, Appendix E)

Gasket (Item, Appendix E)

WARNING

Diesel fuel is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

Fuel and engine oil are highly flammable. Sparks or open flames should be kept away. Failure to comply may result in serious injury or death to personnel.

Use approved procedures when cleaning up fuel spills. Take proper precautions when removing or installing any fuel system component. Failure to comply may result in serious injury or death to personnel.

The diesel engine and electrical system should be shut off and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply may result in serious injury or death to personnel.

a. *Service.* (figure 2-43)

- (1) Loosen the vent plug in the top lid (3) to break the vacuum within the unit. Remove drain plug (1) and drain water and contaminants from collection bowl (2).
- (2) Replace drain plug (1).
- (3) Remove lid (3) from fuel water separator.
- (4) Remove filter element (4) from fuel water separator by slowly pulling upward with a twisting motion on the molded handle.
- (5) Apply a coating of clean fuel to the seal of the new lid gasket (5).
- (6) Install new filter element (4) in fuel water separator.
- (7) Fill the fuel water separator with clean fuel.
- (8) Install lid (3) on fuel water separator and tighten snugly by hand (10 ft.-lbs. maximum).

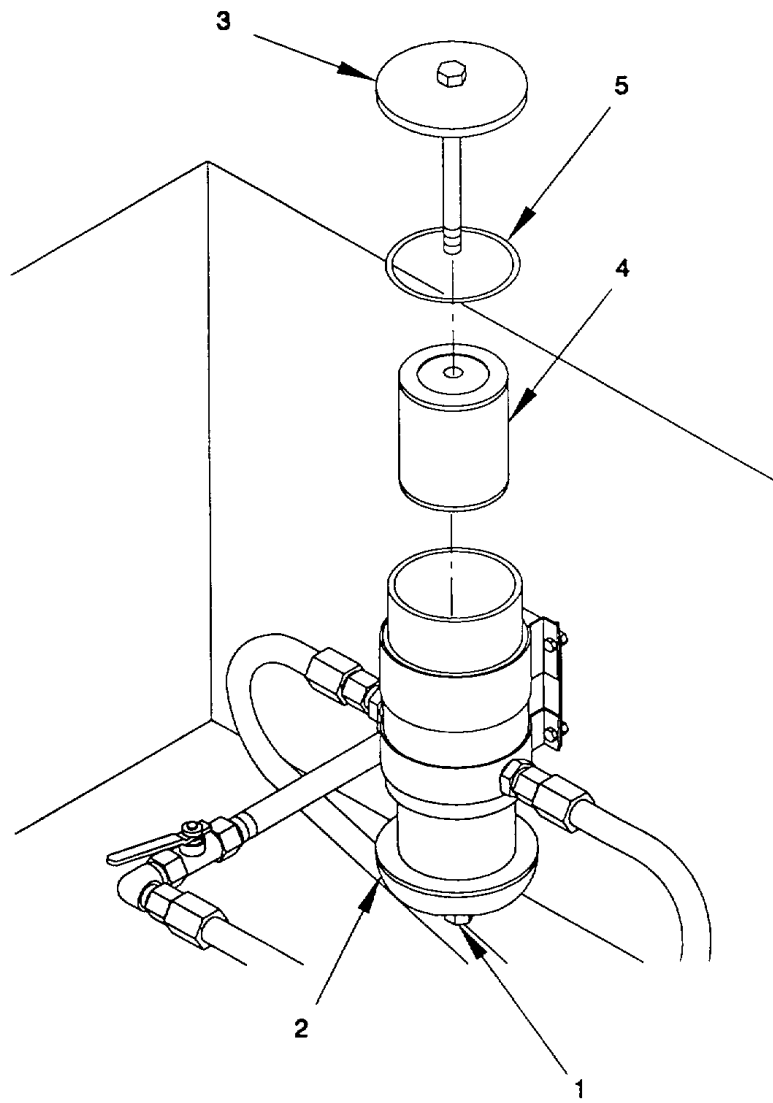


Figure 2-43. Fuel Water Separator, Service

2-49. Fuel Water Separator (Cont).

(9) Open ball valve in fuel inlet line to fuel water separator.

b. Remove. (figure 2-44)

(1) Remove two hoses (2), two hose fittings (3) and two external thread reducers (4).

(2) Remove four hex head capscrews (5) and four hex nuts (6) securing fuel water separator (7) to fuel tank. Remove fuel water separator (7).

c. Install. (figure 2-44)

(1) Position new fuel water separator (7) on fuel tank. Secure with four hex head capscrews (5) and four hex nuts (6).

(2) Install two external thread reducers (4), two hose fittings (3) and two hoses (2).

(3) Open ball valve (1) in fuel inlet line to fuel water separator (7).

(4) Check for leaks.

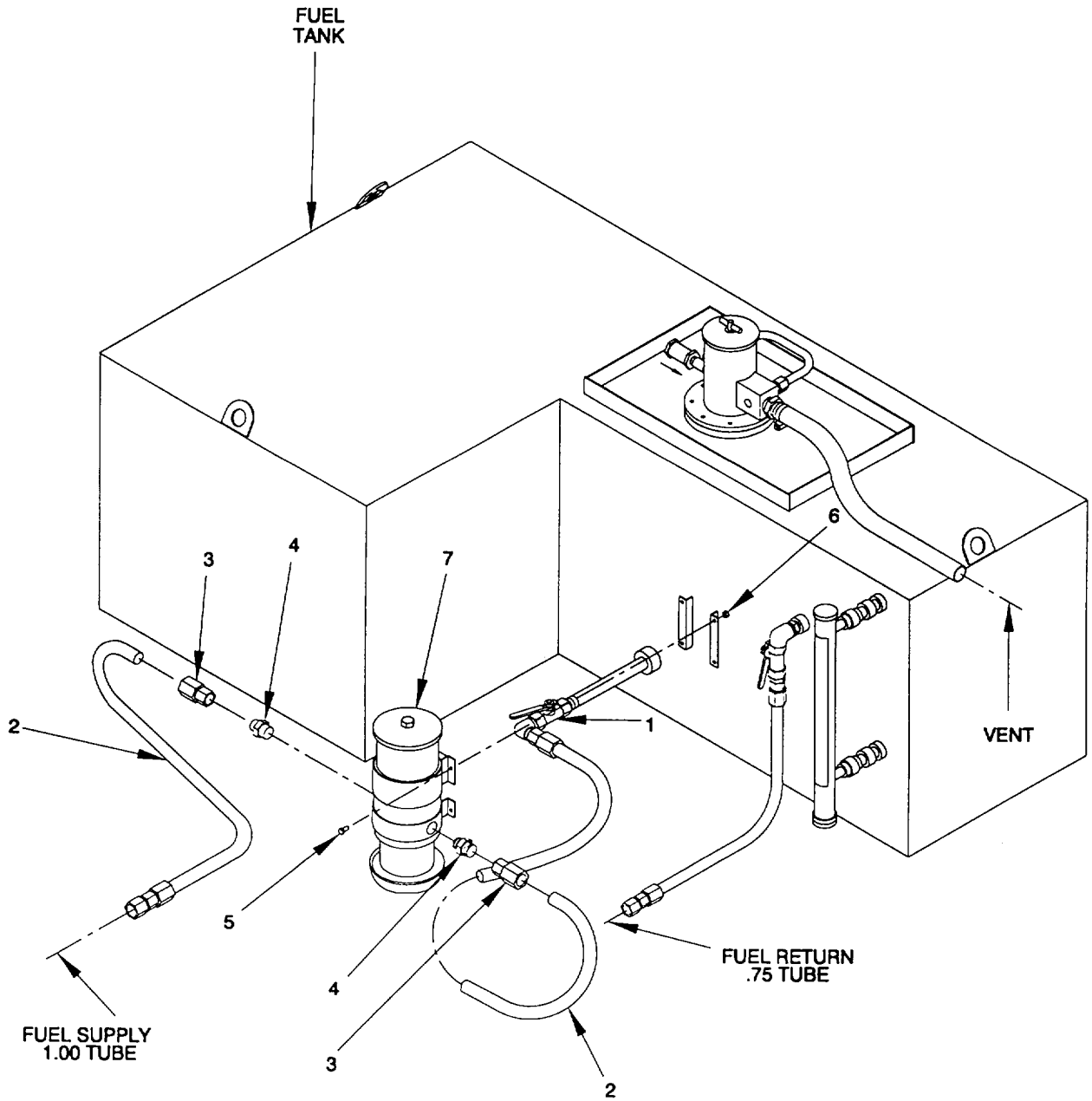


Figure 2-44. Fuel Water Separator, Remove/Install

2-50. Ball Valve, Fuel System.

 This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Ball Valve
Sealant (Item 41, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Fuel tank drained when replacing supply ball valve. (When replacing return ball valve, tank does not need Ball Valve to be drained).

WARNING

Diesel fuel is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

Fuel and engine oil are highly flammable. Sparks or open flames should be kept away. Failure to comply may result in serious injury or death to personnel.

Use approved procedures when cleaning up fuel spills. Take proper precautions when removing or installing any fuel system component. Failure to comply may result in serious injury or death to personnel.

The diesel engine and electrical system should be shut off and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply may result in serious injury or death to personnel.

a. Remove. (figure 2-45)

Remove hose (1), hose fitting (2), 90° elbow (3), fuel supply line ball valve (4), hose fitting (5), straight adapter (6) and fuel return line ball valve (7).

b. Install. (figure 2-45)

- (1) Apply sealant to pipe threads on 90° elbow (3), ball valves (4 and 7) and straight adapter (6).
- (2) Install new fuel return line ball valve (7), straight adapter (6), hose fitting (5), fuel supply line ball valve (4), 90° elbow (3), hose fitting (2) and two hoses (1).
- (3) Fill fuel tank.
- (4) Check for leaks.

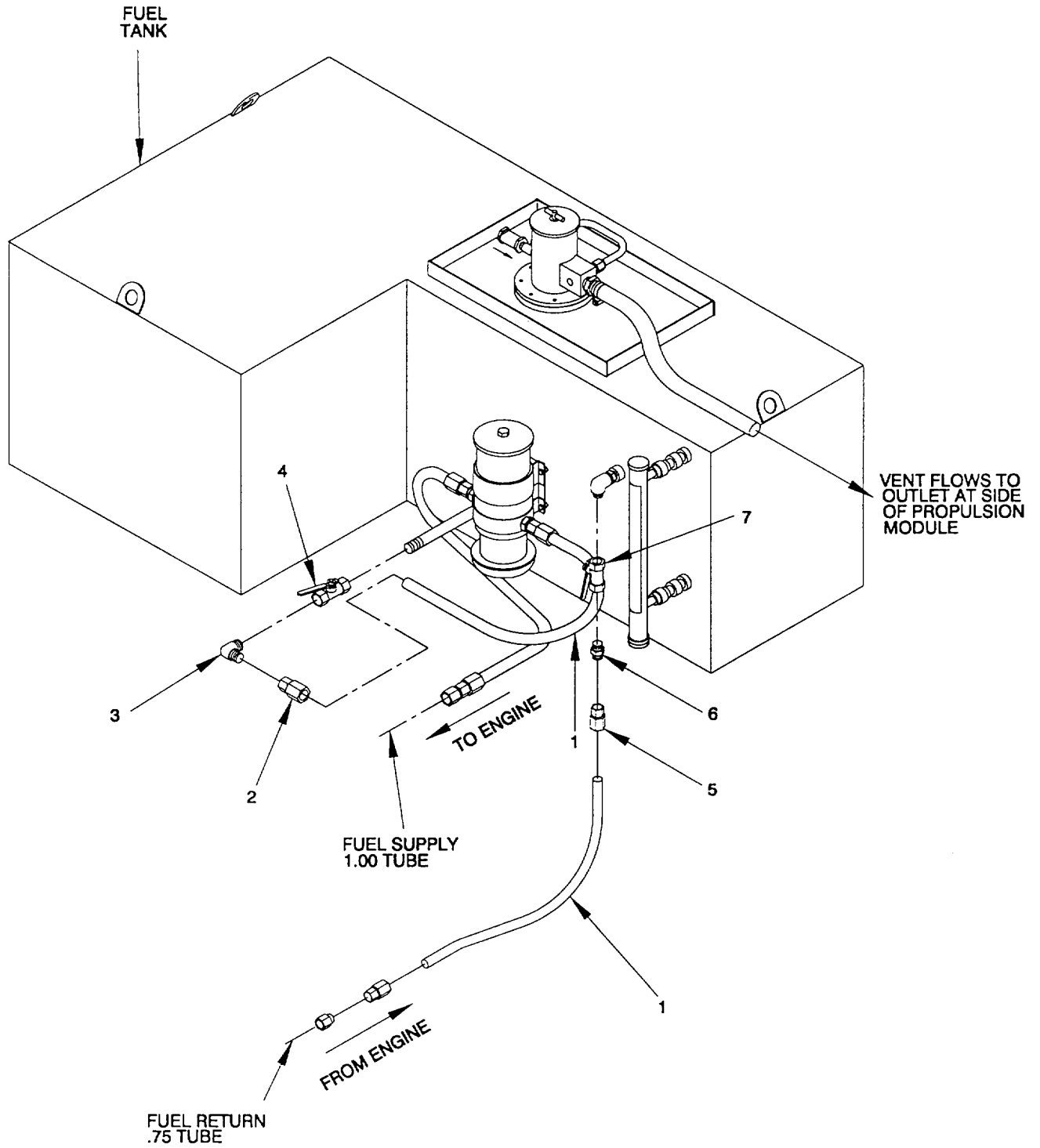


Figure 2-45. Ball Valve, Fuel System, Remove/Install.

2-51. Inspection Covers, Fuel System.

 This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Fuel tank drained when inspecting tank.

Fuel Tank

WARNING

Diesel fuel is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

Fuel and engine oil are highly flammable. Sparks or open flames should be kept away. Failure to comply may result in serious injury or death to personnel.

Use approved procedures when cleaning up fuel spills. Take proper precautions when removing or installing any fuel system component. Failure to comply may result in serious injury or death to personnel.

The diesel engine and electrical system should be shut off and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply may result in serious injury or death to personnel.

a. Remove. (figure 2-46)

- (1) Remove hex head capscrew (1) and collect washer (2), locking bar (3), rubber seal (4), and domed cover (5).
- (2) Inspect inside of fuel tank for corrosion, damage, or accumulation of foreign matter. Clean as required. Inspect rubber seal (4) for damage or deterioration.

b. Install. (figure 2-46).

- (1) Position rubber seal (4) and domed cover (5) over fuel tank. Secure with locking bar (3), washer (2), and hex head capscrew (1).

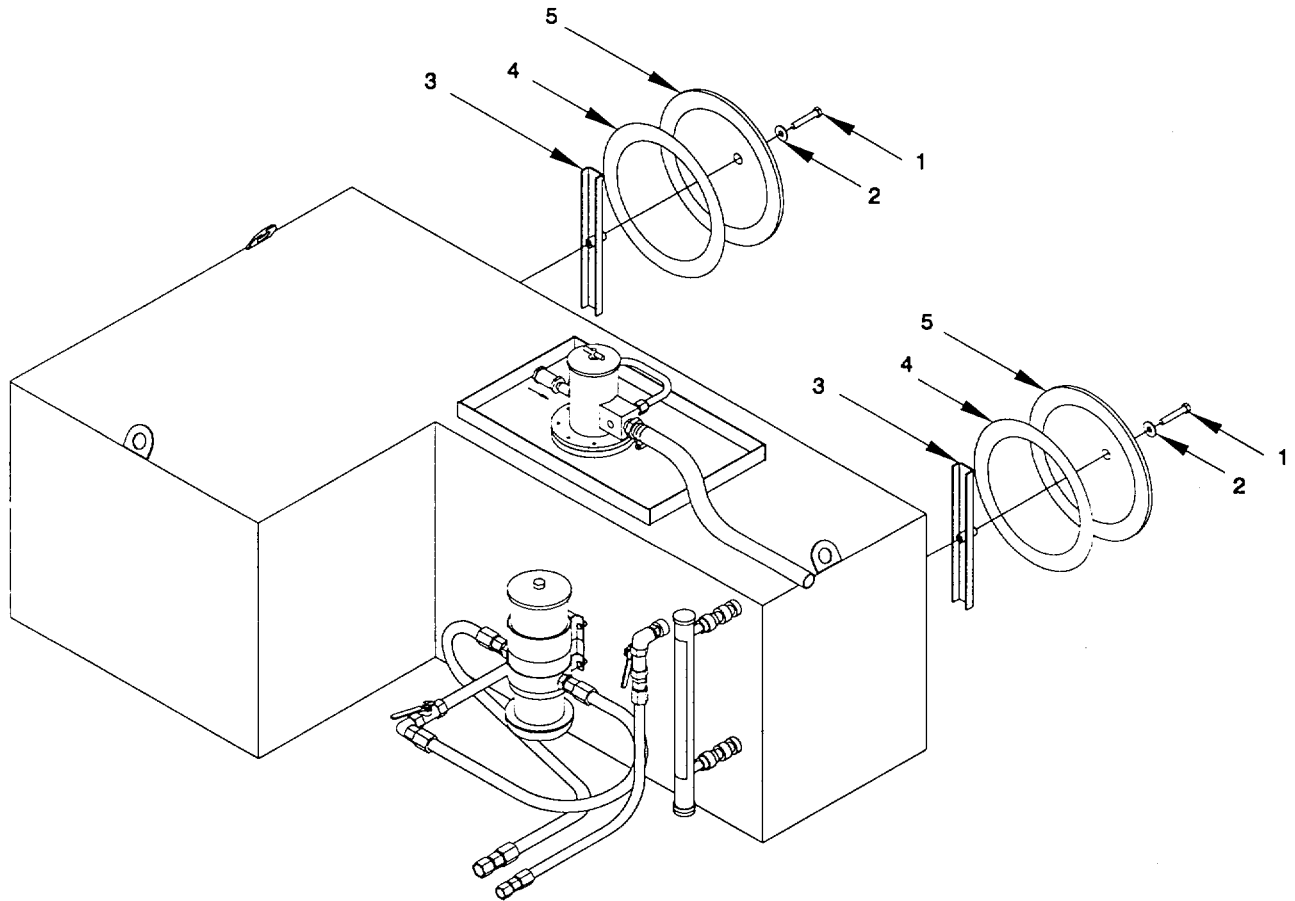


Figure 2-46. Inspection Covers, Fuel System, Remove/install.

2-52. Thermal Detector, Electrical System.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Thermal Detector
Wrap, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove*, (figure 2-47)

- (1) Remove two screws (1), lock washers (2), and flat washers (3). Collect box cover (4) from electrical box (5).
- (2) Disconnect and tag electrical wiring to thermal detector. Refer to Appendix G.
- (3) Remove two thin self locking nuts (6) from thermal detector (7) and box cover (4).

b. *Install*. (figure 2-47)

- (1) Install a thin self locking nut (6) to thermal detector (7). Install thin self locking nut (6) and the thermal detector (7), both, into mounting hole in box cover (4). Install a thin self locking nut (6) to the opposite side of the box cover (4), to the thermal detector (7) and tighten.
- (2) Reconnect electrical wiring, as tagged, to thermal detector. Refer to Appendix G. Use tie wraps to secure any loose wires.
- (3) Install box cover (4) and thermal detector (7) onto electrical box (5). Install two flat washers (3), two lock washers (2), and two screws (1) into electrical box (5).

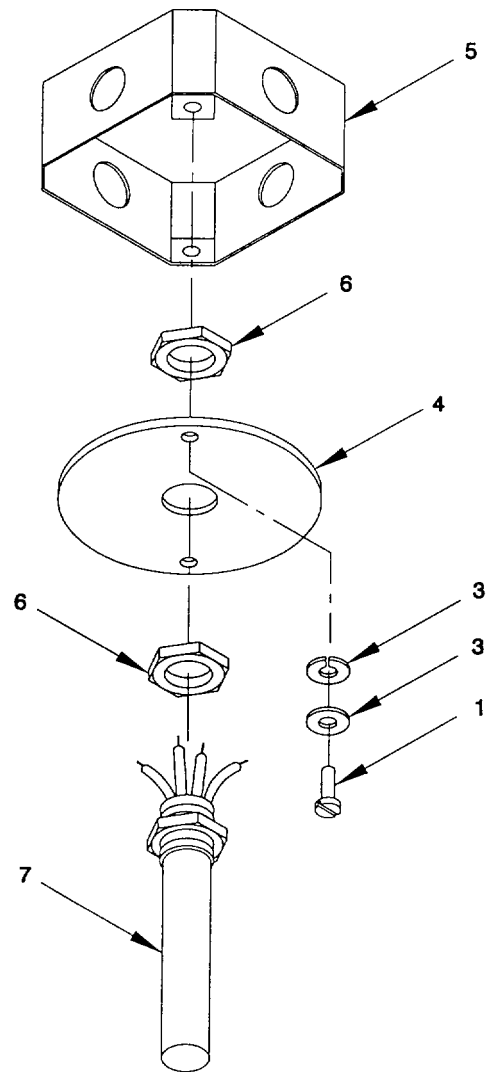


Figure 2-47. Thermal Detector, Electrical System, Remove/Install

2-53. Bilge Pump Control Assembly "A5".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)
control/indicators tagged OUT OF SERVICE

Equipment Condition

All power off to all equipment. All equipment and

Materials/Parts

Sealing Compound (Item 12, Appendix F)
Enclosure

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-48)

- (1) Remove six screws (1) and six latches (2) from enclosure (8).
- (2) Open hinged door (3) to gain access to electrical components within the enclosure.
- (3) Inspect all electrical components for corrosion, deterioration, dirt, condensation, loose hardware or electrical wiring connections, or other damage. Repair is limited to replacement of components.
- (4) Tag all electrical connections before disconnecting electrical wiring. Refer to Appendix G, for wiring list and terminal layout.
- (5) Disconnect and remove all incoming electrical wiring connections to the enclosure (8).
- (6) Clean inside of enclosure to remove condensation or loose dirt.
- (7) Remove and collect six capscrews (4), six nuts (5), six flat washers (6), six lock washers (7) and enclosure (8).

b. Install. (figure 2-48)

- (1) Align enclosure (8) with the mounting hardware holes.
- (2) Coat all fasteners with sealing compound before installation of mounting hardware.
- (3) Install six capscrews (4) with six attaching flat washers (6) to the enclosure (8) and secure with six lock washers (7) and six nuts (5).
- (4) Reconnect all tagged electrical connections within the enclosure (8).
- (5) Shut door (3) and install six latches (2) and six screws (1).
- (6) Verify the Single Bilge Pump Control Assembly is properly functioning.

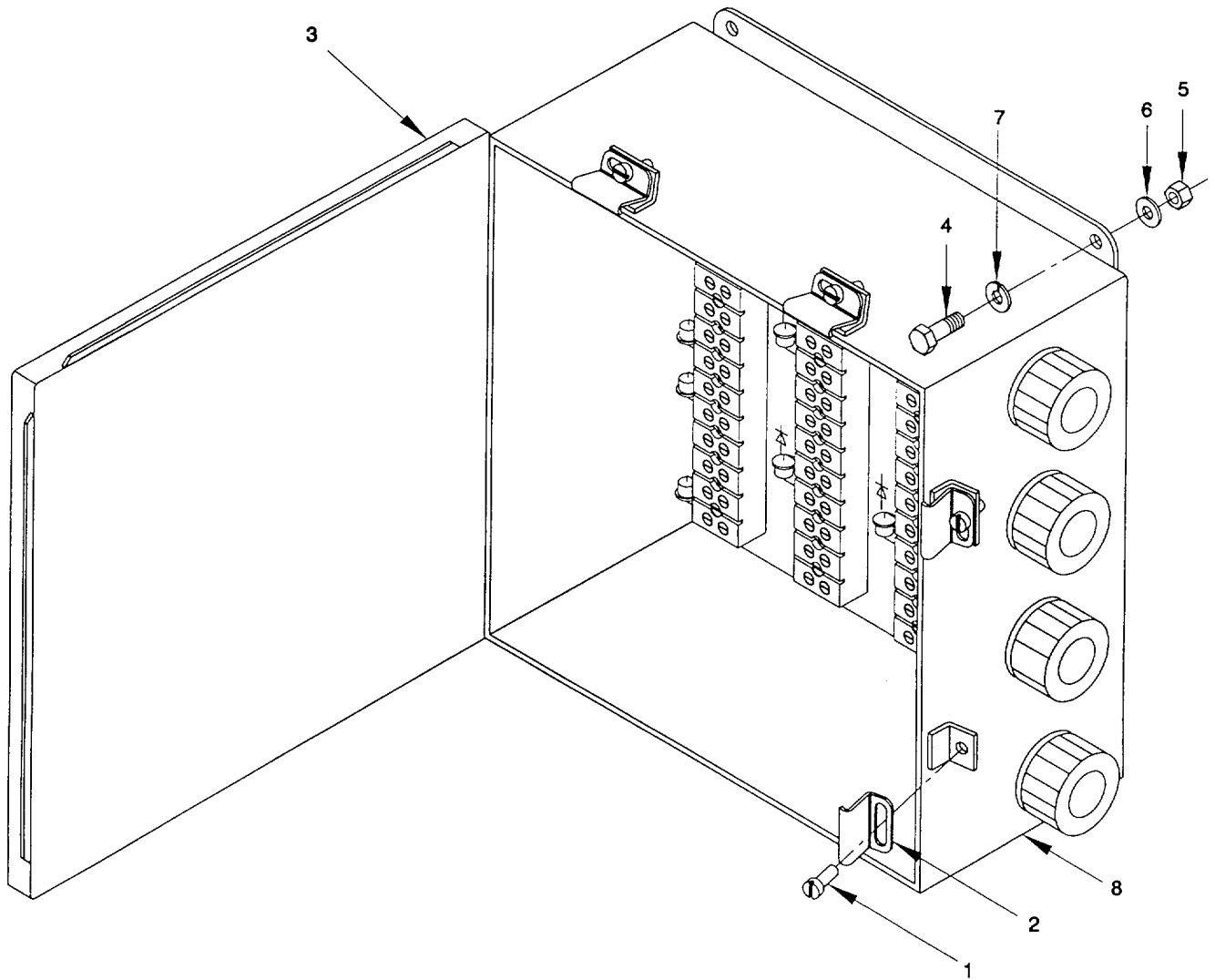


Figure 2-48. Bilge Pump Control Assembly "A5", Remove/Install

2-54. Relay, Relay Terminal and Relay Socket Repair, Bilge Pump Control Assembly "A5".

This task covers a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Sealing Compound (Item 12, Appendix F)

Relay

Relay Terminal

Relay Socket

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-49)

NOTE

This procedure is typical for all of the following relays, relay terminals, and relay sockets.

- (1) Remove six screws (1) and six latches (2) from enclosure (8).
- (2) Open hinged door (3) to gain access to electrical components within the enclosure.
- (3) Inspect all electrical components leading from the relay, relay terminal, and relay socket for corrosion and deterioration. Repair is limited to replacement of components, as necessary.
- (4) Tag all electrical connections leading from the relay, relay terminal, relay socket before disconnecting electrical wiring. Refer to Appendix G.
- (5) Remove screw (4) and nut (5) from panel.
- (6) Remove relay (6) and relay socket (7). Remove relay terminal (8) from relay (6).

- b. *Install.* (figure 2-49)

- (1) Install relay terminal (8) to relay (6).
- (2) Install relay socket (7) and relay (6) to relay terminal (8).
- (3) Coat all fasteners with antiseize compound.
- (3) Position nut (5) and tighten screw (4) to panel in enclosure.
- (4) Reconnect all tagged electrical connections. Refer to Appendix G.

2-54. Relay, Relay Terminal and Relay Socket, Bilge Pump Control Assembly "A5" (Cont).

- (5) Close enclosure door. position six latches (2) over lip of door and tighten six screws (1).
- (6) Verify the Bilge Pump Control Assembly is properly functioning.

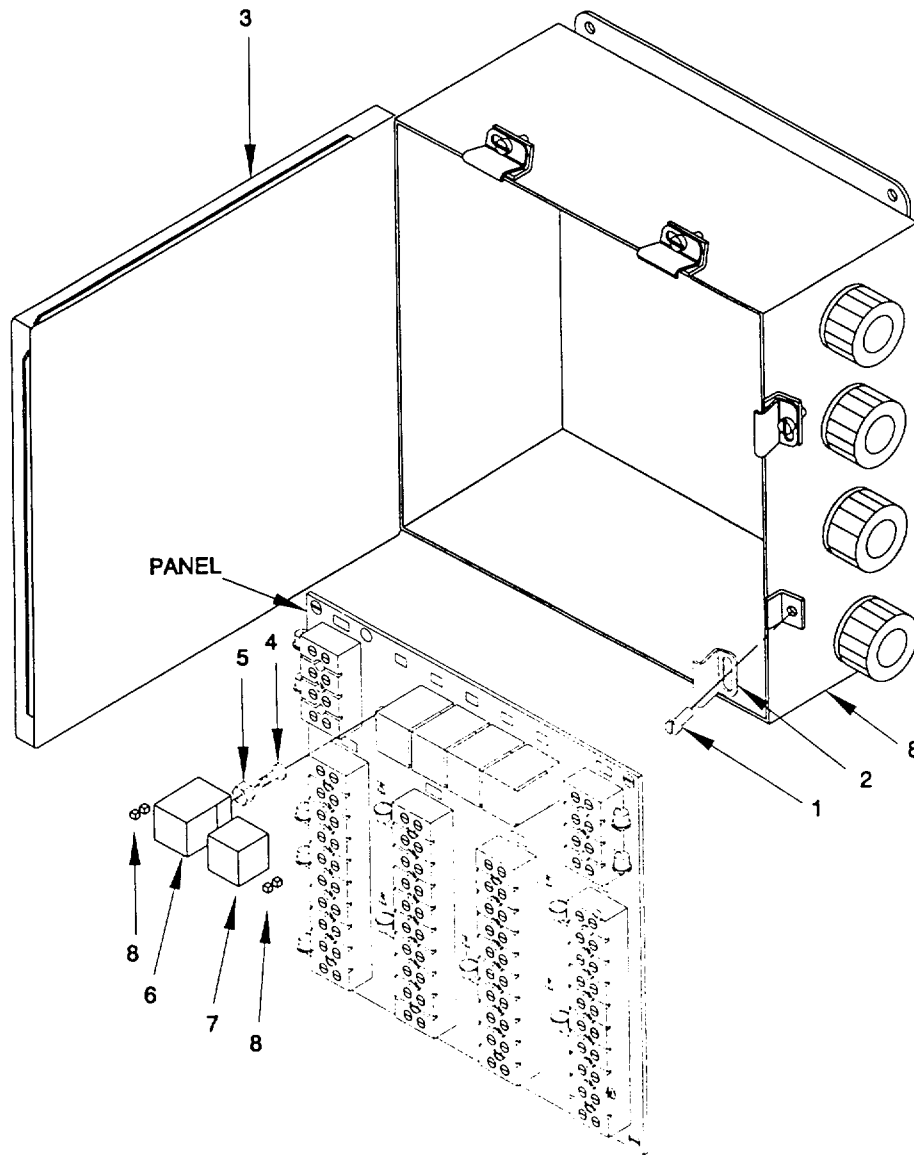


Figure 2-49. Relay, Relay Terminal, and Relay Socket, Bilge Pump Control Assembly 'AS'. Remove/Install

2-55. Toggle Switch, Bilge Pump Control Assembly "A5".

This task covers a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit (NSN 5180-00-629-9783)
control/indicators tagged OUT OF SERVICE
Materials/Parts

Sealing Compound (Item 12, Appendix F)
Toggle Switch
Toggle Seal Boot

Equipment Condition

All power off to all equipment. All equipment and

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-50)

NOTE

This procedure is typical for all of the following toggle seal boots and toggle switches.

- (1) Open enclosure (1) by removing six screws (2) and six latches (3).
 - (2) Open door (4) to gain access to electrical components within the enclosure (1).
 - (3) Inspect all electrical components leading to the toggle switch for corrosion and deterioration. Repair is limited to replacement of components, as necessary.
 - (4) Tag and disconnect all electrical connections leading to the toggle switch (12) before disconnecting electrical wiring. Refer to Appendix G, for wiring list and terminal layout.
 - (5) Remove capscrews (5), washers (6), and guard (7) from standoffs (8).
 - (6) Remove toggle seal boot (9) from toggle switch (12).
 - (7) Remove two attaching nuts (10) and washers (11) and collect toggle switch (12) from the enclosure's door (4).
- b. *Install.* (figure 2-50)
- (1) Install toggle switch (12) to panel door (4).
 - (2) Attach two washers (11), nuts (10), and toggle seal boot (9) to toggle switch (12)
 - (3) Reconnect all tagged electrical connections to the toggle switch (12).
 - (4) Install guard (7) onto standoff (8) and attach with washer (6) and capscrew (5).

2-55. Toggle Switch, Bilge Pump Control Assembly "A5" (Cont).

- (5) Close enclosure door (4) and attach six latches (3) and six screws (2).
- (6) Turn toggle switch from TEST to REMOTE to verify that switch and Bilge Pump Control Assembly are functioning properly. position is momentary.

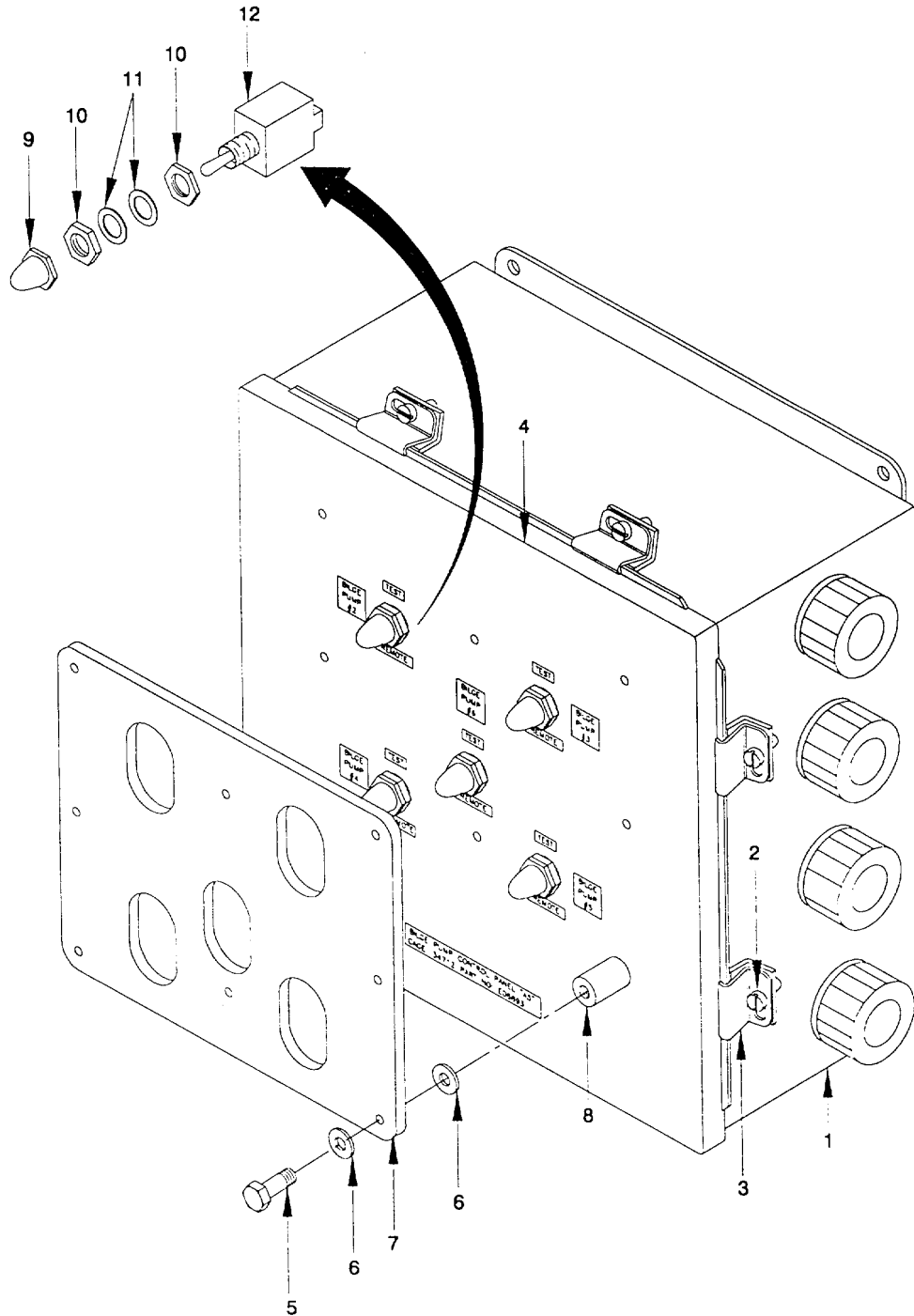


Figure 2-50. Toggle Switch, Bilge Pump Control Assembly "A5". Remove/Install

2-56. Single Bilge Pump Control Assembly "A7".

This task covers a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Sealing Compound (Item 12, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-51)

- (1) Open enclosure (1) by removing three screws (2) and three latches (3).
- (2) Open door (4) to gain access to electrical components within the enclosure (1).
- (3) Inspect all electrical components for rust, corrosion, deterioration, dirt or condensation, or loose hardware or loose, frayed, or broken electrical wiring connections. Seal boot must form a watertight cover over switch. Repair is limited to replacement of components, as necessary.
- (4) Tag all electrical connections before disconnecting electrical wiring. Refer to Appendix G, for wiring list and terminal layout.
- (5) Disconnect and remove all incoming electrical wiring connections the enclosure (1).
- (6) Clean inside of enclosure to remove condensation or loose dirt.
- (7) Remove four capscrews (5), four nuts (6) and collect four flat washers (7), four lock washers (8), and enclosure (1)

b. *Install.* (figure 2-51)

- (1) Align enclosure (1) with holes in mounting hardware.
- (2) Coat all fasteners with antiseize compound before installation of mounting hardware.
- (3) Install four capscrews (5) with four attaching flat washers (7) to the enclosure and secure with four lock washers (8) and four nuts (6).
- (4) Reconnect all tagged electrical connections within the enclosure (1). Refer to Appendix G, for wiring list and terminal layout.
- (5) Shut door (4) and install three latches (3) and three screws (2).

2-56. Single Bilge Pump Control Assembly "A7" (cont).

- (6) Turn toggle switch from TEST to REMOTE to verify that Single Bilge Pump Control Assembly is functioning properly.

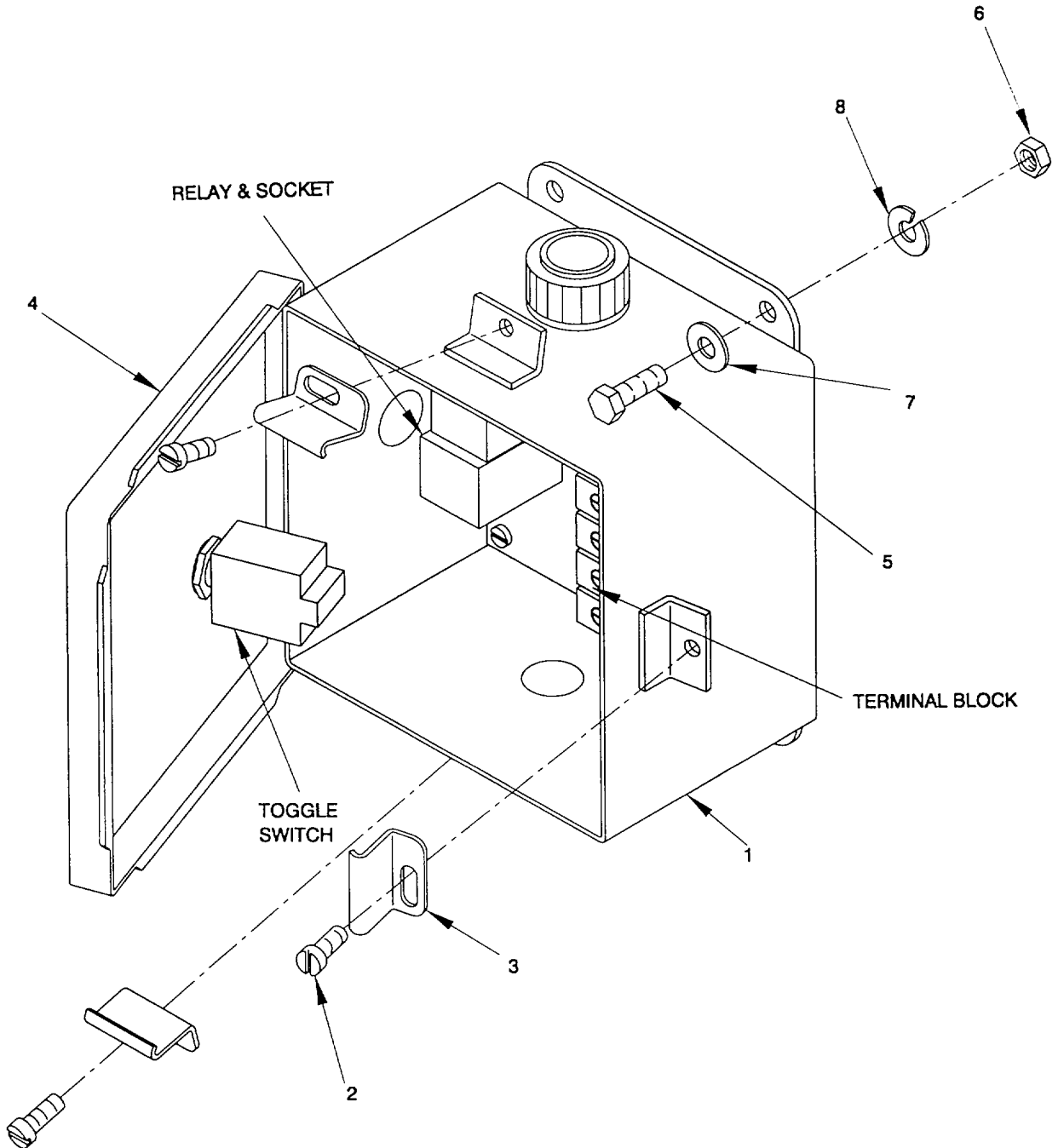


Figure 2-51. Single Bilge Pump Control Assembly, Remove/Install

2-57. Relay, Relay Terminal and Relay Socket, Single Bilge Pump Control Assembly "A7".

 This task covers a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Sealing Compound (Item 12, Appendix F)

Relay

Relay Terminal

Relay Socket

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE.

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. Remove. (figure 2-52)

NOTE

This procedure is typical for all of the following relays, relay terminals, and relay sockets.

- (1) Remove three screws (1) and three latches (2).
- (2) Open door (3) to gain access to electrical components within the enclosure.
- (3) Inspect electrical components for rust, corrosion, deterioration, dirt or condensation, or loose hardware or loose, frayed, or broken electrical wiring connections. Repair is limited to replacement of components, as necessary.
- (4) Tag all electrical connections before disconnecting electrical wiring. Refer to Appendix G, for wiring list and terminal layout.
- (5) Remove screw (4), nut (5) and collect lockwasher (6).
- (6) Remove relay (7) and relay socket (8) from panel. Remove relay terminal (9) from relay (7).

- b. Install. (figure 2-52)

- (1) Apply antiseize compound to all mounting screws for relay terminal and socket. Install relay terminal (9) to relay (7).
- (2) Install relay socket (8) and relay (7) to panel.
- (3) Secure relay socket to panel with screw (4), lockwasher (6) and nut (5).

2-57. Relay, Relay Terminal and Relay Socket, Single Bilge Pump Control Assembly "A7" (Cont).

- (4) Reconnect all tagged electrical connections. Refer to Appendix G, for wiring list and terminal layout.
- (5) Close enclosure door (3). Position three latches (2) over lip on door and tighten three screws (1).
- (6) Verify the Single Bilge Pump Control Assembly is properly functioning.

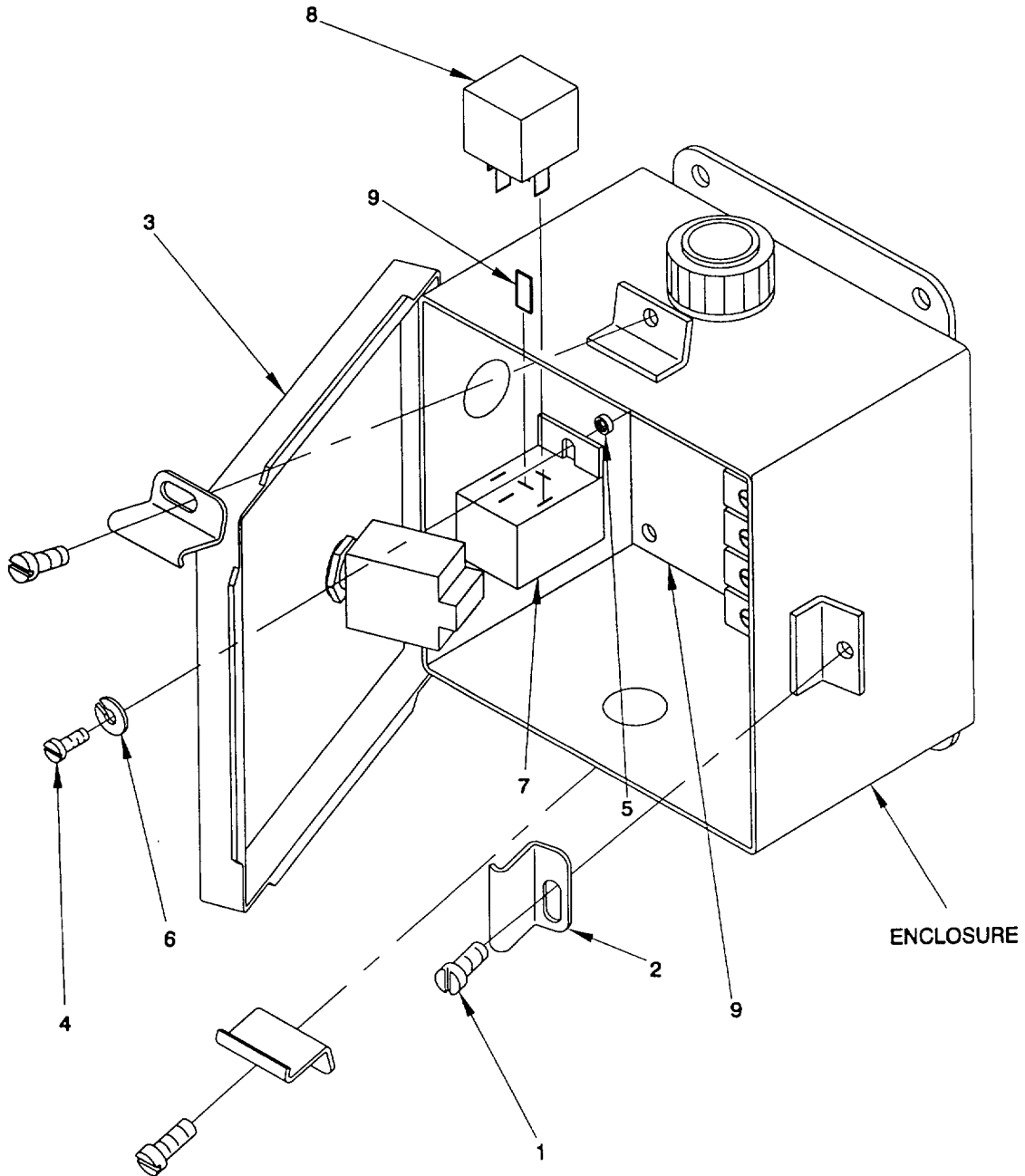


Figure 2-52. Relay, Relay Terminal, Relay Socket, Single Bilge Pump Control Assy. "A7", Remove/install

2-58. Toggle Switch, Single Bilge Pump Control Assembly "A7".

This task covers a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Sealing Compound (Item 12, Appendix F)

Toggle Switch

Toggle Seal Boot

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-53)

NOTE

This procedure is typical for all of the following toggle seal boots and toggle switches.

- (1) Remove six screws (1) and six latches (2) from enclosure.
 - (2) Open door (3) to gain access to electrical components within the enclosure.
 - (3) Inspect all electrical components for rust, corrosion, deterioration, dirt or condensation, or loose hardware or loose, frayed, or broken electrical wiring connections. Seal boot must form a watertight cover over switch. Repair is limited to replacement of components, as necessary.
 - (4) Tag all electrical connections leading to the toggle switch (7) before disconnecting electrical wiring. Refer to Appendix G, for wiring list and terminal layout.
 - (5) Disconnect all electrical wiring connections to the toggle switch.
 - (6) Remove toggle seal boot (4) from toggle switch (7).
 - (7) Remove two attaching nuts (5) and washers (6) and collect toggle switch (7) from the enclosure's door (3)
- b. *Install.* (figure 2-53)
- (1) Position toggle switch (7) in enclosure door (3).
 - (2) Coat all fasteners with antiseize compound before installation of mounting hardware.
 - (3) Secure toggle switch (7) with two nuts (5) and washers (6).

2-58. Toggle Switch, Single Bilge Pump Control Assembly "A7" (Cont).

- (4) Install toggle seal boot (4) to toggle switch (7).
- (5) Reconnect all tagged electrical connections to the toggle switch (7). Refer to Appendix G, for wiring list and terminal layout.
- (6) Close enclosure door (3) and attach three latches (2) over lip on door and tighten three screws (1).
- (7) Verify the Single Bilge Pump Control Assembly is functioning properly.

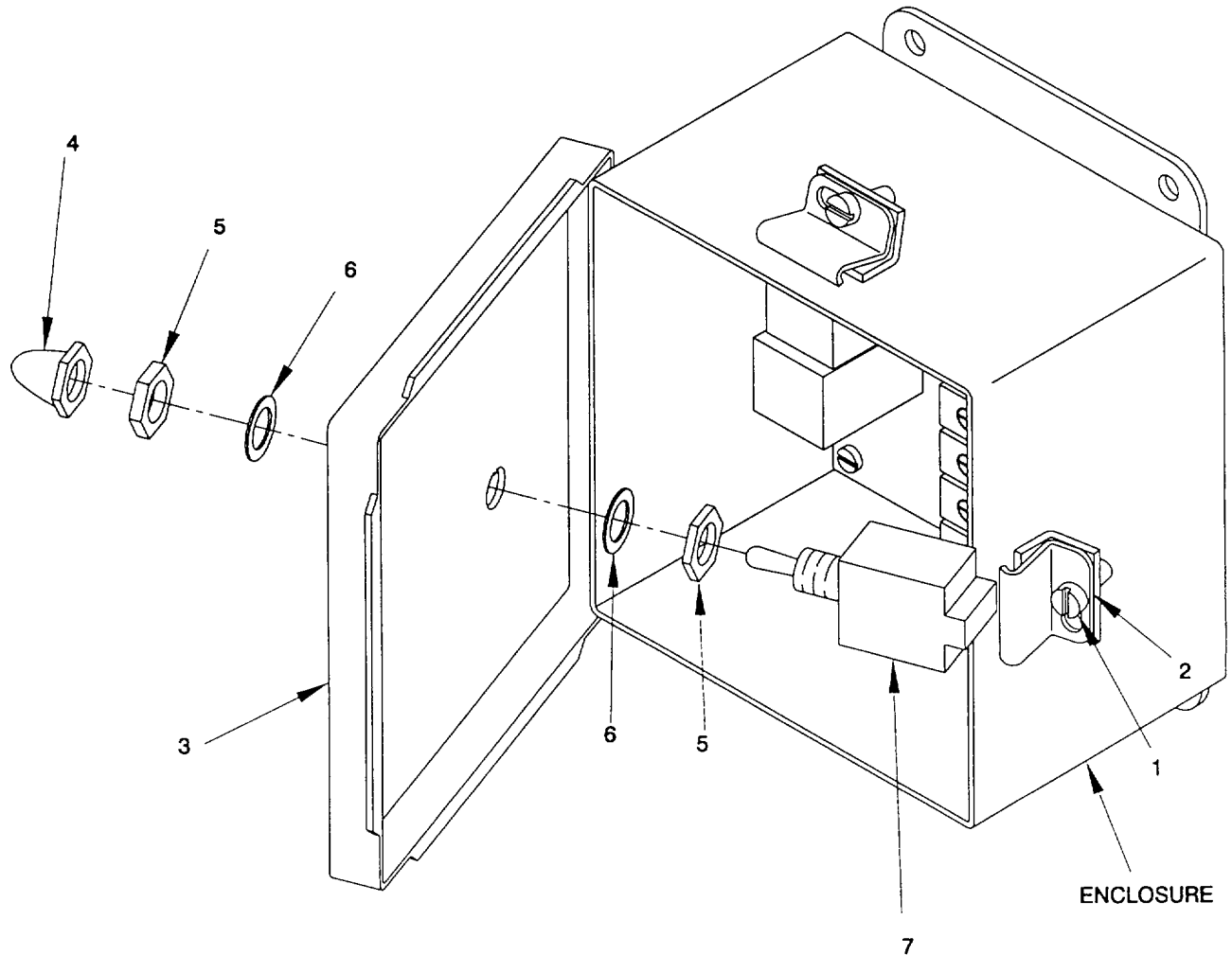


Figure 2-53. Toggle Switch, Single Bilge Pump Control Assembly "A7", Remove/Install

2-59. Engine Junction Box Assembly "A4".

This task covers: a. Remove b. Inspect c. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

*Materials/Parts*Junction Box
Compound, Sealing (Item 12, Appendix F)
Wrap, Tie (Item 57, Appendix F)

WARNING**When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.**

- a. *Remove.* (figure 2-54)
- (1) Remove six screws (1) and six clamps (2) securing cover (3) to enclosure (8). Swing cover (3) open.
 - (2) Disconnect and tag electrical wiring to engine junction box. Refer to Appendix G.
 - (3) Remove four hex head capscrews (4), four hex nuts (5), four flat washers (6) and four lock washers (7) securing enclosure (8). Remove engine junction box.
- b. *Inspect.*
- (1) Visually inspect all junction box components for corrosion, damage, and loose, frayed or broken electrical wiring.
 - (2) Check that door moves freely and that Emergency Stop is operable. Tighten any loose components.
- c. *Install.* (figure 2-54)
- (1) Apply antiseize compound to capscrews (4) and screws (1).
 - (2) Position new engine junction box and secure with four hex head capscrews (4), four flat washers (6), four lock washers (7) and four hex nuts (5).
 - (3) Reconnect electrical wiring, as tagged, to engine junction box. Refer to Appendix G. Use tie wraps to secure any loose wires.
 - (4) Close cover (3) and secure with six clamps (2) and six screws (1).

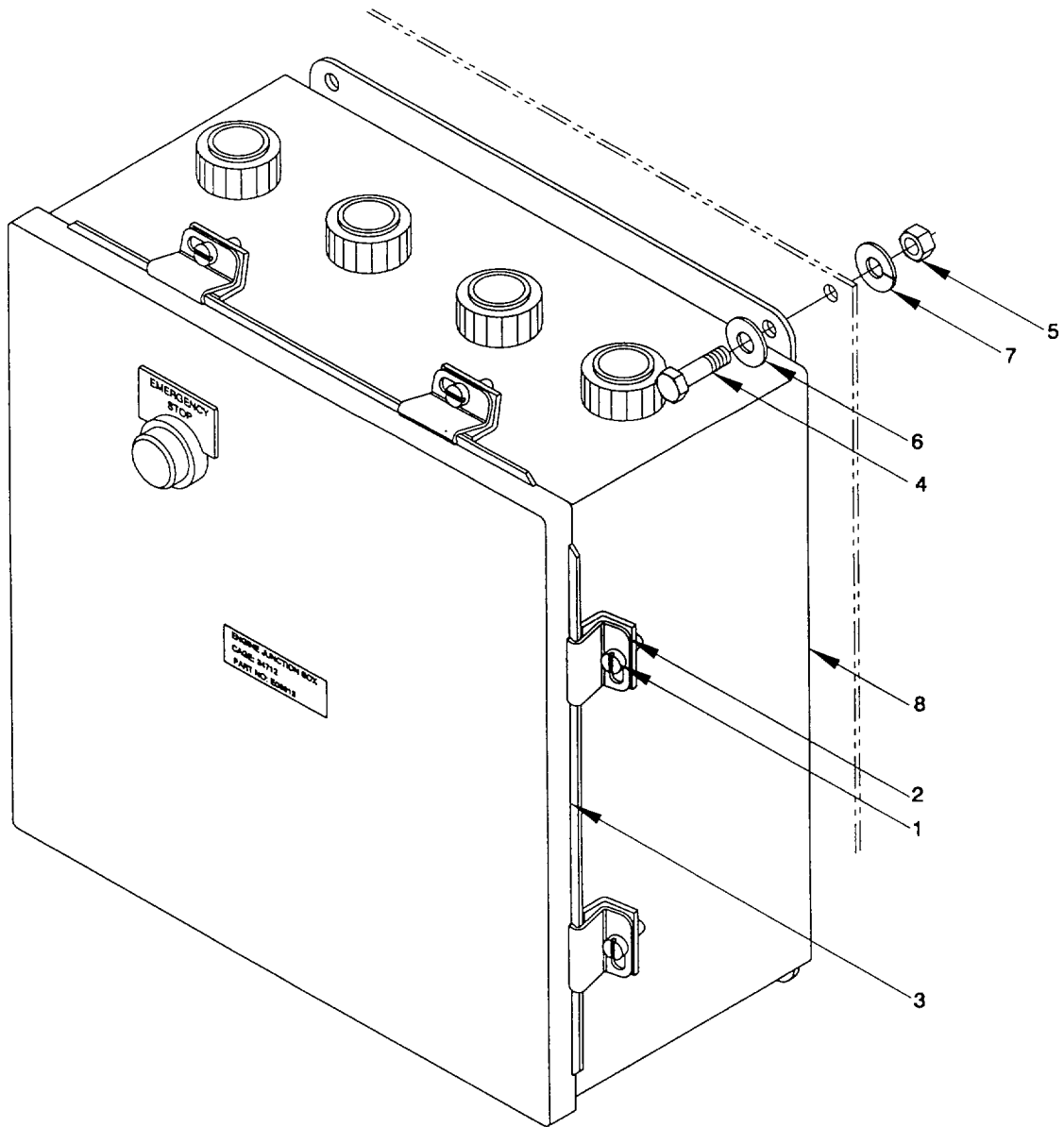


Figure 2-54. Engine Junction Box "A4", Remove/Install

2-60. Terminal Block, Engine Junction Box "A4".

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

*Materials/Parts*Terminal Block
Compound, Sealing (Item 12, Appendix F)
Wrap, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove*, (figure 2-55)

- (1) Remove six screws (1) and six clamps (2) securing cover (3) to enclosure (14). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to terminal block (8 and/or 10). Refer to Appendix G.
- (3) Remove four screws (4) securing panel (5) to enclosure (14). Lift panel (5) enough to access the rear of the panel (5)
- (4) Remove four pan head screws (6) and four nuts (7) securing terminal block (8 and/or 10) to panel (5). Remove terminal block (8 and/or 10) and marker strip (9 and/or 11).
- (5) Remove resistor (12) and two jumpers (13) from terminal block (10).

b. *Install*, (figure 2-55)

- (1) Apply antiseize compound to screws (1,4 and 6).
- (2) Install resistor (12) and two jumpers (13) on new terminal block (10).
- (3) Install marker strips (9 and/or 11) and new terminal blocks (8 and/or 10) on panel. Secure terminal blocks (8 and/or 10) with four pan head screws (6) and four nuts (7).
- (4) Install panel (5) in enclosure (14). Secure panel (5) with four screws (4).
- (5) Reconnect electrical wiring, as tagged, to terminal blocks (8 and/or 10). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (6) Close cover (3) and secure with six clamps (2) and six screws (1).

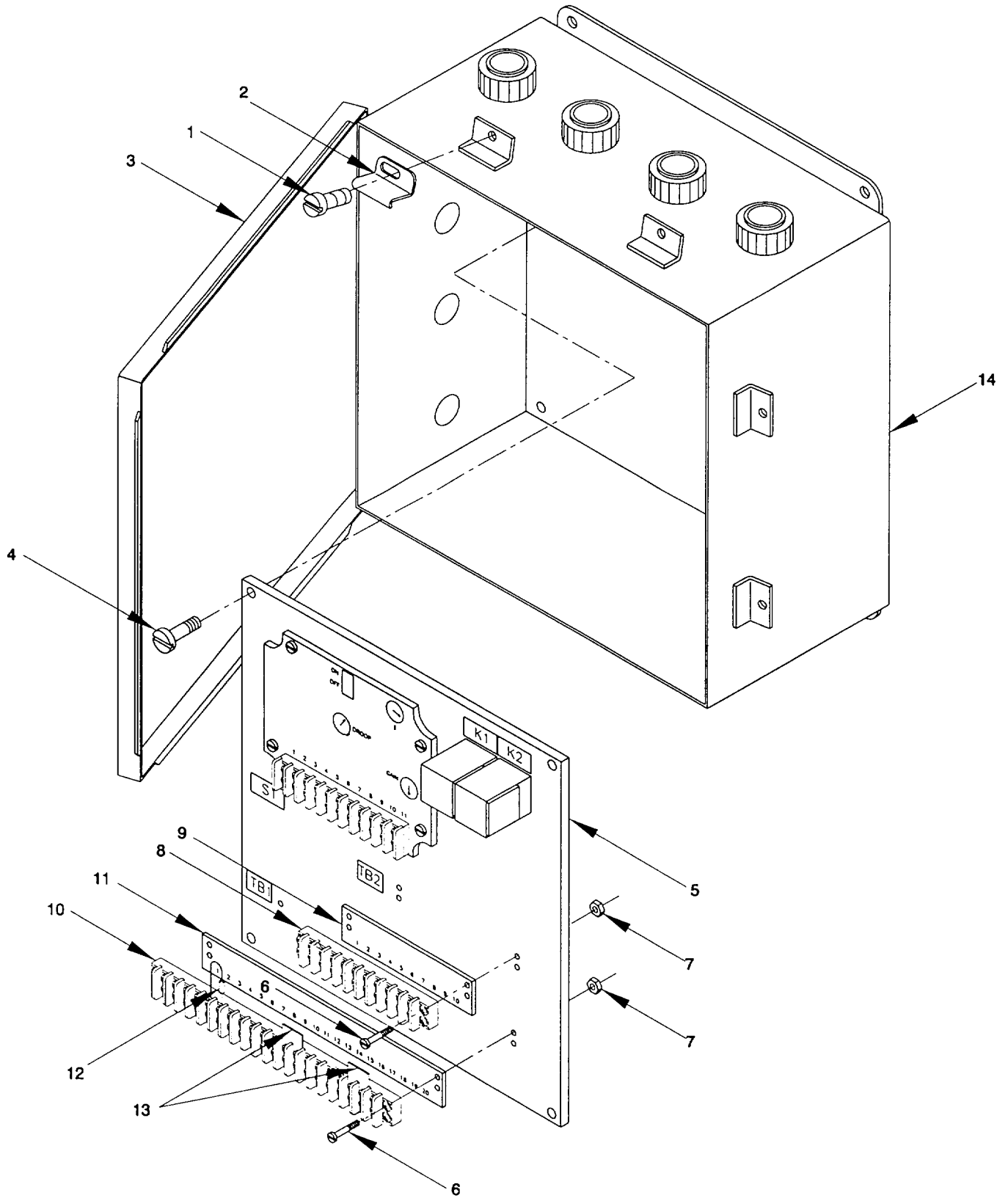


Figure 2-55. Terminal Block, Engine Junction Box "A4", Remove/Install

2-61. Relay, Engine Junction Box "A4".

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Relay

Compound, Sealing (Item 12, Appendix F)

Wrap, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-56)

- (1) Remove six screws (1) and six clamps (2) securing cover (3) to enclosure (12). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to relays (6). Refer to Appendix G.
- (3) Remove four screws (4) securing panel (5) to enclosure (12). Lift panel (5) enough to access the rear of the panel (5)
- (4) Remove two relays (6) from two relay sockets (11).
- (5) Remove two pan head screws (7), two lock washers (8) and two insert nuts (9) securing two relay sockets (10) to panel (5). Remove relay sockets (10).
- (6) Remove relay terminals (11).

b. *Install.* (figure 2-56)

- (1) Apply antiseize compound to screws (1, 4 and 7).
- (2) Install relay terminals (11).
- (3) Install two relay sockets (10) on panel (5). Secure relay sockets (10) with two pan head screws (7), two lock washers (8) and two insert nuts (9).
- (4) Install two new relays (6) in relay sockets (10).
- (5) Install panel (5) in enclosure (12). Secure panel (5) with four screws (4).

2-61. Relay, Engine Junction Box "A4" (Cont).

- (6) Reconnect electrical wiring, as tagged, to relays (6). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (7) Close cover (3) and secure with six clamps (2) and six screws (1).

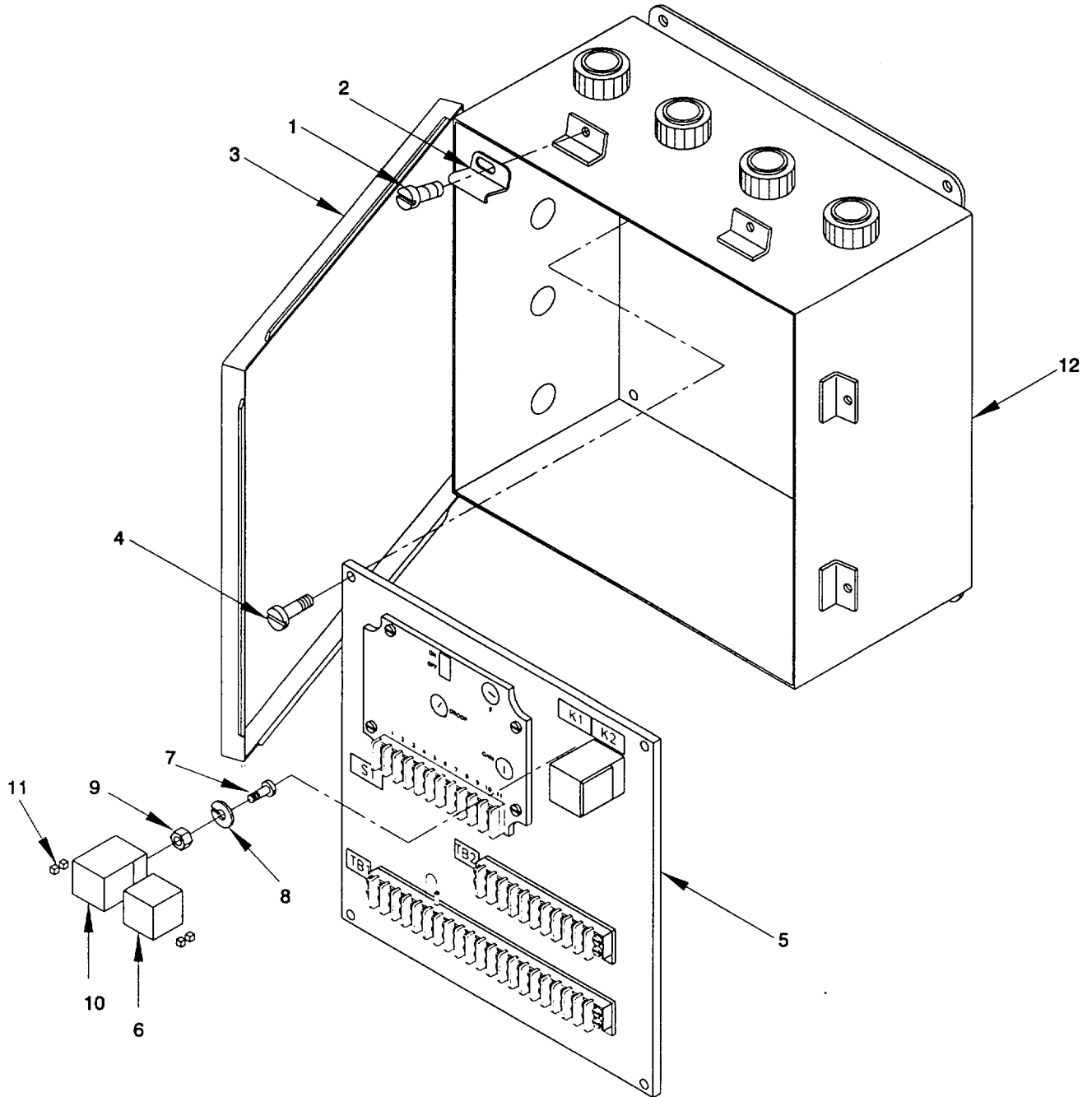


Figure 2-56. Relay, Engine Junction Box "A4", Remove/install

2-62. Governor Controller, Engine Junction Box "A4".

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Governor Controller
Compound, Sealing (Item 12, Appendix F)
Wrap, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-57)

- (1) Remove six screws (1) and six clamps (2) securing cover (3) to enclosure (10). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to governor controller (9). Refer to Appendix G.
- (3) Remove four screws (4) securing panel (5) to enclosure (10). Lift panel (5) enough to access the rear of the panel (5).
- (4) Remove four pan head screws (6), four lock washers (7) and four insert nuts (8) securing governor controller (9) to panel (5). Remove governor controller (9).

b. Install. (figure 2-57)

- (1) Apply antiseize compound to screws (1, 4 and 6).
- (2) Install new governor controller (9) on panel (5). Secure governor controller (9) with four pan head screws (6), four lock washers (7) and four insert nuts (8).
- (3) Install panel (5) in enclosure (10). Secure panel (5) with four screws (4).
- (4) Reconnect electrical wiring, as tagged, to governor controller (9). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (5) Adjust governor controller (9). Refer to Direct Support Maintenance.
- (6) Close cover (3) and secure with six clamps (2) and six screws (1).

FOLLOW-ON MAINTENANCE: Adjust Governor Controller (DS level)

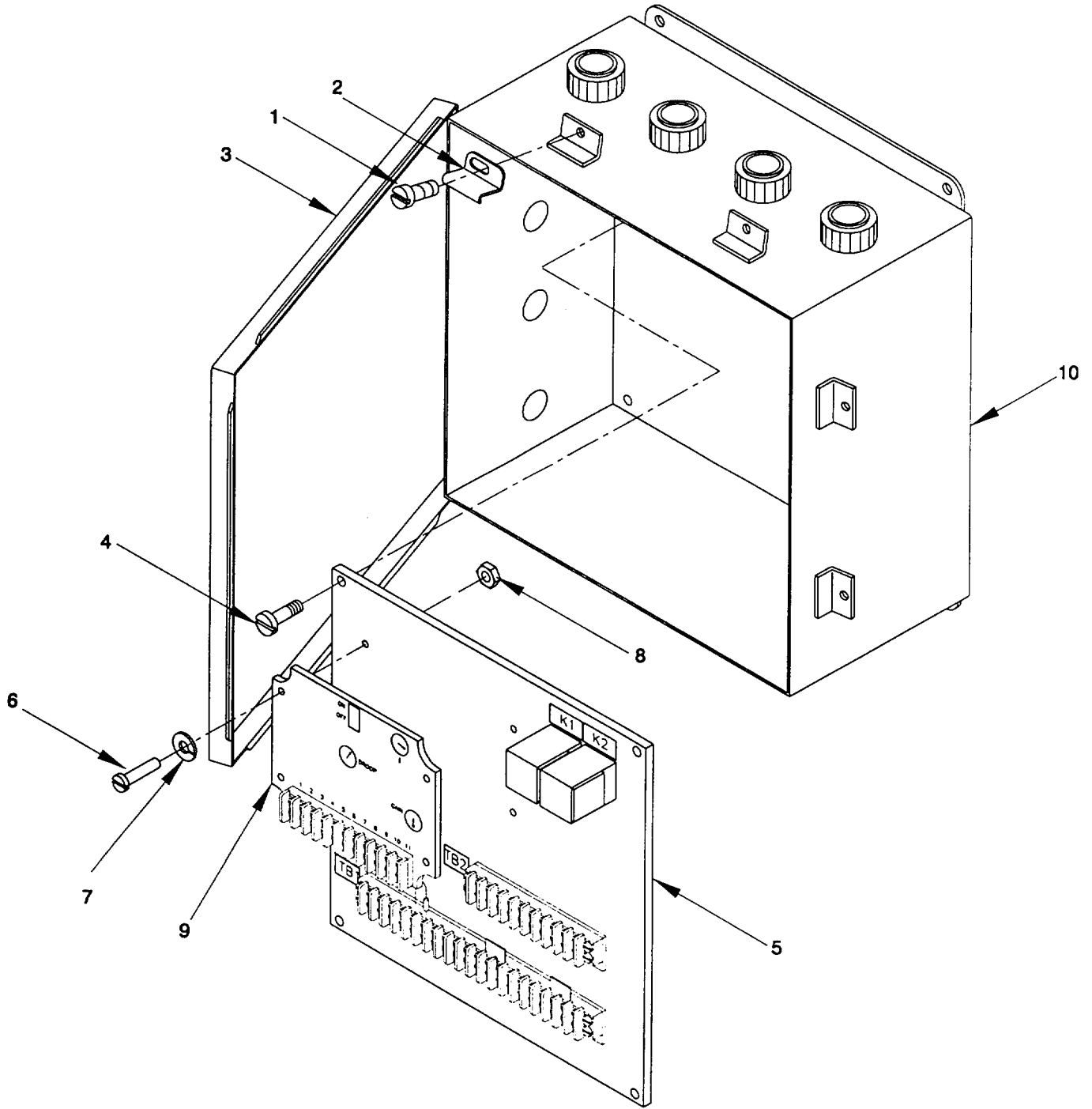


Figure 2-57. Governor Controller, Engine Junction Box "A4", Remove/Install

2-63. Pushbutton, Emergency Stop, Engine Junction Box "A4".

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Pushbutton
Compound, Sealing (Item 12, Appendix F)
Wrap, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-58)
- (1) Remove six screws (1) and six clamps (2) securing cover (3) to enclosure (5). Swing cover (3) open.
 - (2) Disconnect and tag electrical wiring to pushbutton (4). Refer to Appendix G.
 - (3) Remove pushbutton (4) by unscrewing back from large nut on front side of panel.
- b. *Install.* (figure 2-58)
- (1) Apply antiseize compound to screws (1).
 - (2) Install new pushbutton (4) on cover (3).
 - (3) Reconnect electrical wiring, as tagged, to pushbutton (4). Refer to Appendix G. Use tie wraps to secure any loose wires.
 - (4) Close cover (3) and secure with six clamps (2) and six screws (1).

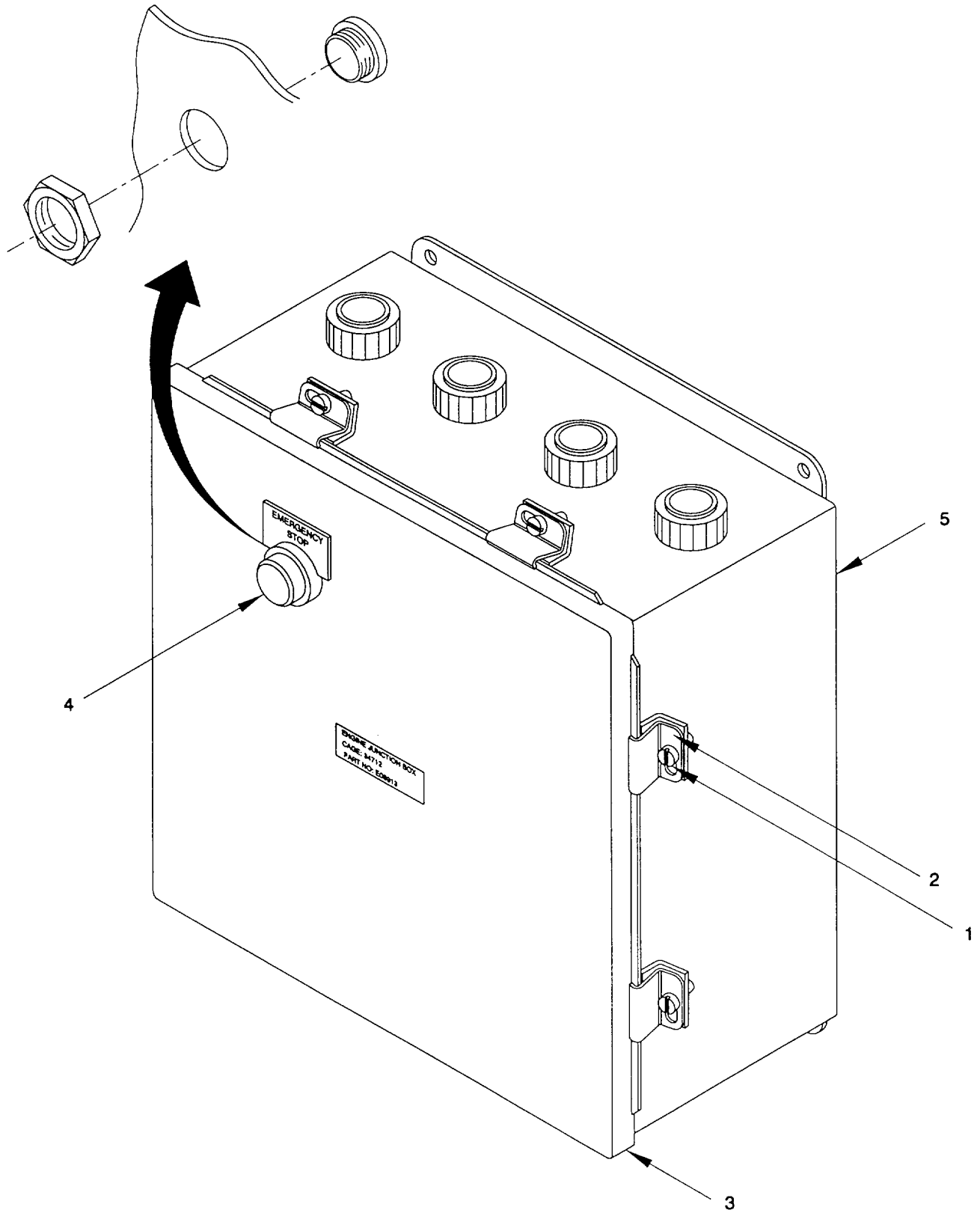


Figure 2-58. Pushbutton, Engine Junction Box "A4", Remove/Install

2-64. Propulsion Module Junction Box "A3".

This task covers: a. Remove b. Install

INITIAL SETUP:

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Power module interconnect cables removed.

Junction Box

Compound, Sealing (Item 12, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-59)

- (1) Remove seven screws (1) and seven clamps (2) securing cover (3) to enclosure (8). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to junction box. Refer to Appendix G.
- (3) Remove four hex head capscrews (4), four hex nuts (5), eight flat washers (6) and four lock washers (7) securing enclosure (8). Remove junction box.

b. *Install.* (figure 2-59)

- (1) Apply antiseize compound to capscrews (4) and screws (1).
- (2) Position new junction box and secure with four hex head capscrews (4), eight flat washers (6), four lock washers (7) and four hex nuts (5).
- (3) Reconnect electrical wiring, as tagged, to junction box. Refer to Appendix G.
- (4) Close cover (3) and secure with seven clamps (2) and seven screws (1).

FOLLOW ON MAINTENANCE: Install power module interconnect cables.

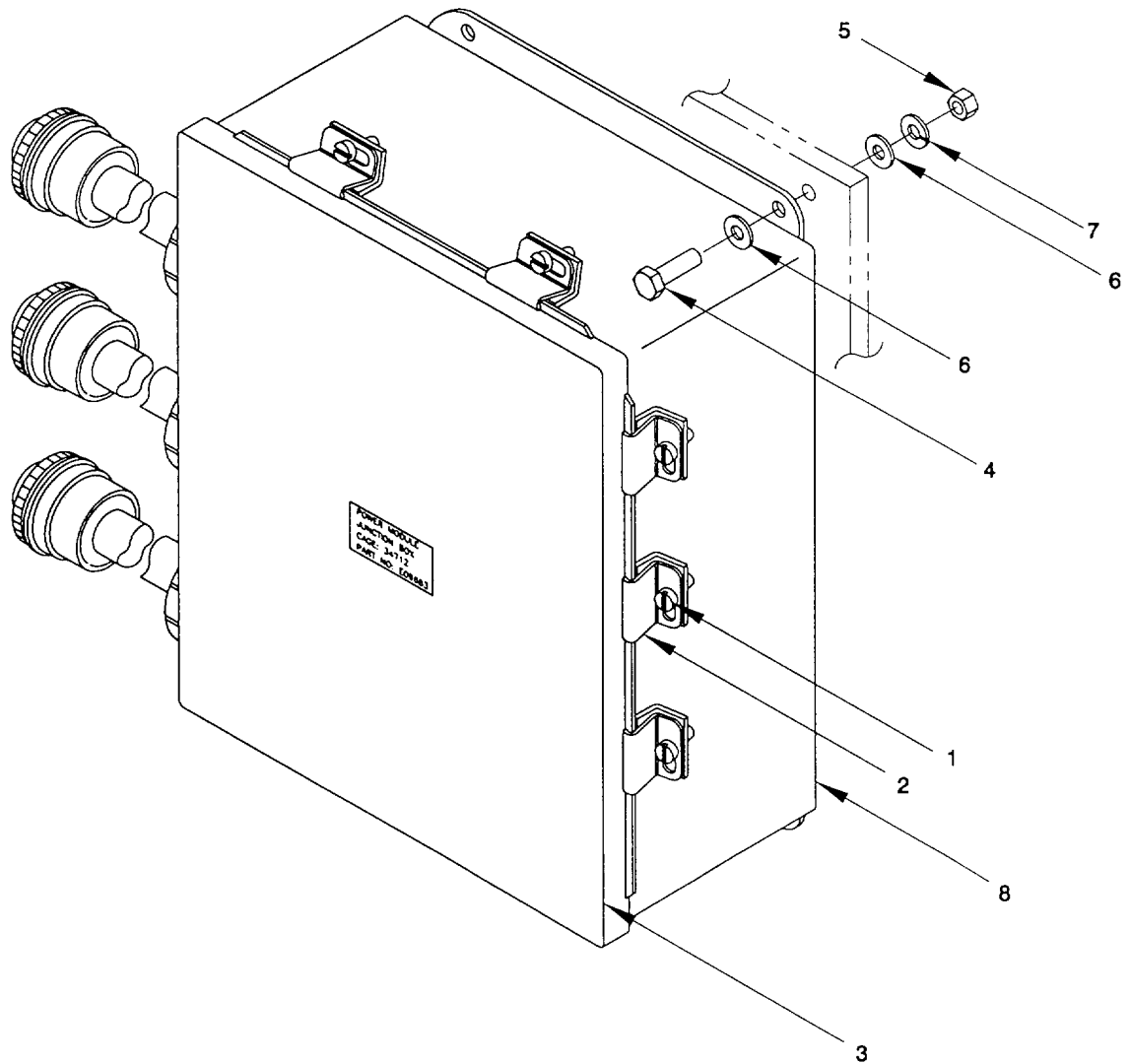


Figure 2-59. Power Module Junction Box "A3", Remove/Install

2-65. Terminal Block, Propulsion Module Junction Box "A3".

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Terminal Block
Compound, Sealing (Item 12, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-60)

- (1) Remove or loosen seven screws (1) and seven clamps (2) securing cover (3) to enclosure (11). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to terminal block (9). Refer to Appendix G.
- (3) Remove four screws (4) securing panel (5) to enclosure (11). Lift panel (5) enough to access the rear of the panel (6).
- (4) Remove four pan head screws (6), four insert nuts (7) and four lock washers (8) securing terminal block (9) to panel (5). Remove terminal block (9) and marker strip (10).

b. *Install.* (figure 2-60)

- (1) Apply sealing compound to screws (1 and 4).
- (2) Install marker strip (10) and new terminal block (9). Secure terminal block (9) with four pan head screws (6), four lock washers (8) and four insert nuts (7).
- (3) Install panel (5) in enclosure (11). Secure panel (5) with four screws (4).
- (4) Reconnect electrical wiring, as tagged, to terminal block (9). Refer to Appendix G.
- (5) Close cover (3) and secure with seven clamps (2) and seven screws (1).

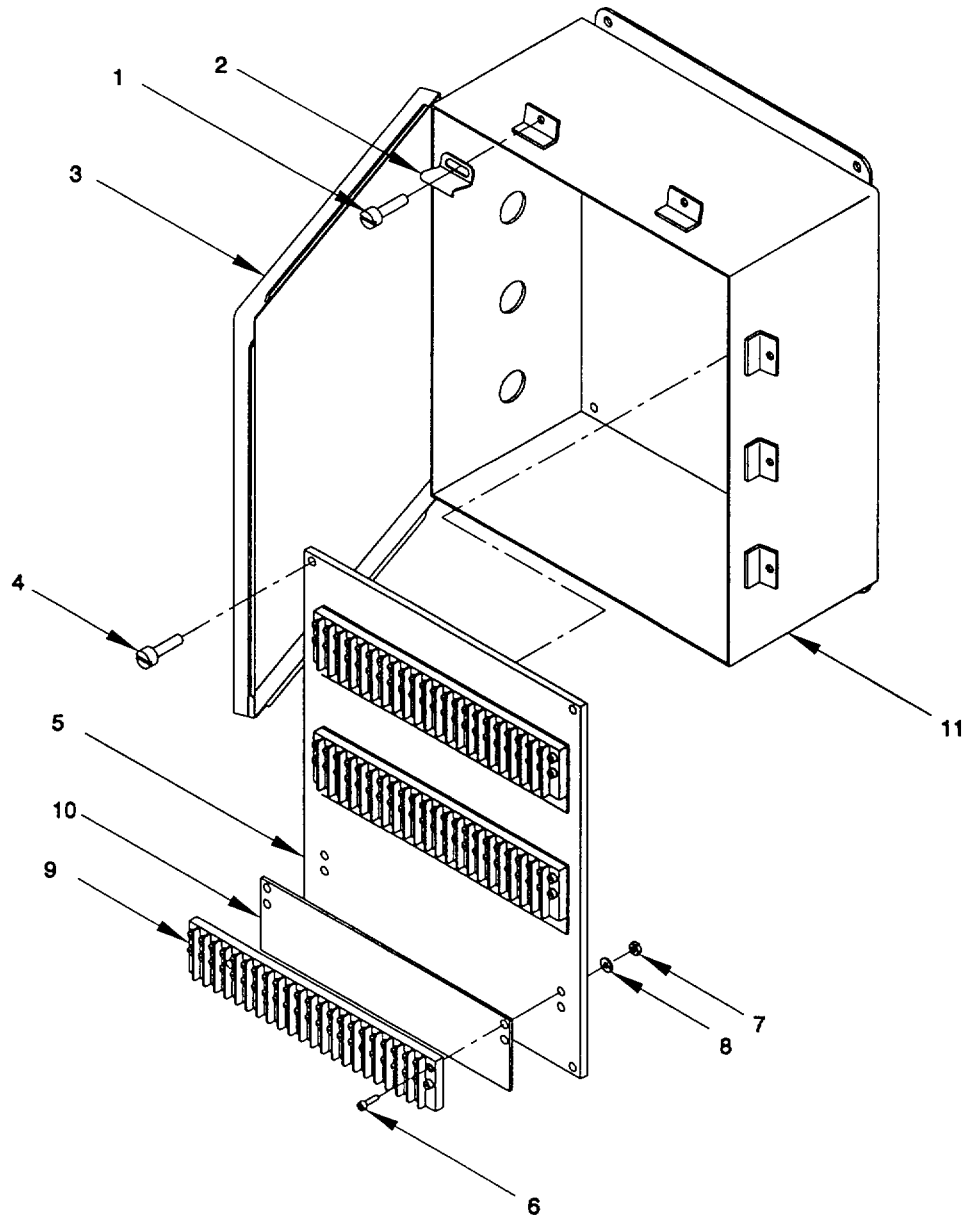


Figure 2-60. Terminal Block, Propulsion Module Junction Box "A3". Remove/Install

2-66. Cable Assembly, Propulsion Module Junction Box "A3".

 This task covers: a. Remove b. Install

INITIAL SETUP:

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN
5180-00-629-9783)

Materials/Parts

Cable
Stuffing Tube

Packing

Solder Sleeves
Adhesive (Item 2, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and
control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-61)

- (1) Loosen seven screws (1) securing cover (2) to enclosure. Swing cover open.
- (2) Disconnect and tag electrical wiring to terminal block. Refer to Appendix G.
- (3) Unscrew stuffing tube cap (3) and collect packings (4) and (5). Remove cable (6).
- (4) Remove stuffing tube nut (7), packing (8), and insert (9) from enclosure.
- (5) Repeat above steps for other cable assemblies.

b. *Install.* (figure 2-61)

- (1) Position nut (9) through enclosure. Install packing (8) and secure with stuffing tube nut (7).
- (2) Slide cable (6) end through stuffing tube cap (3), packings (4) and (5). Insert wire ends through stuffing tube nut (7) into enclosure. Tighten stuffing tube cap (3) until secure.
- (3) Connect tagged electrical wiring to terminal block. Refer to Appendix G.
- (4) Close cover (2), apply antiseize compound to seven screws (1), and secure.

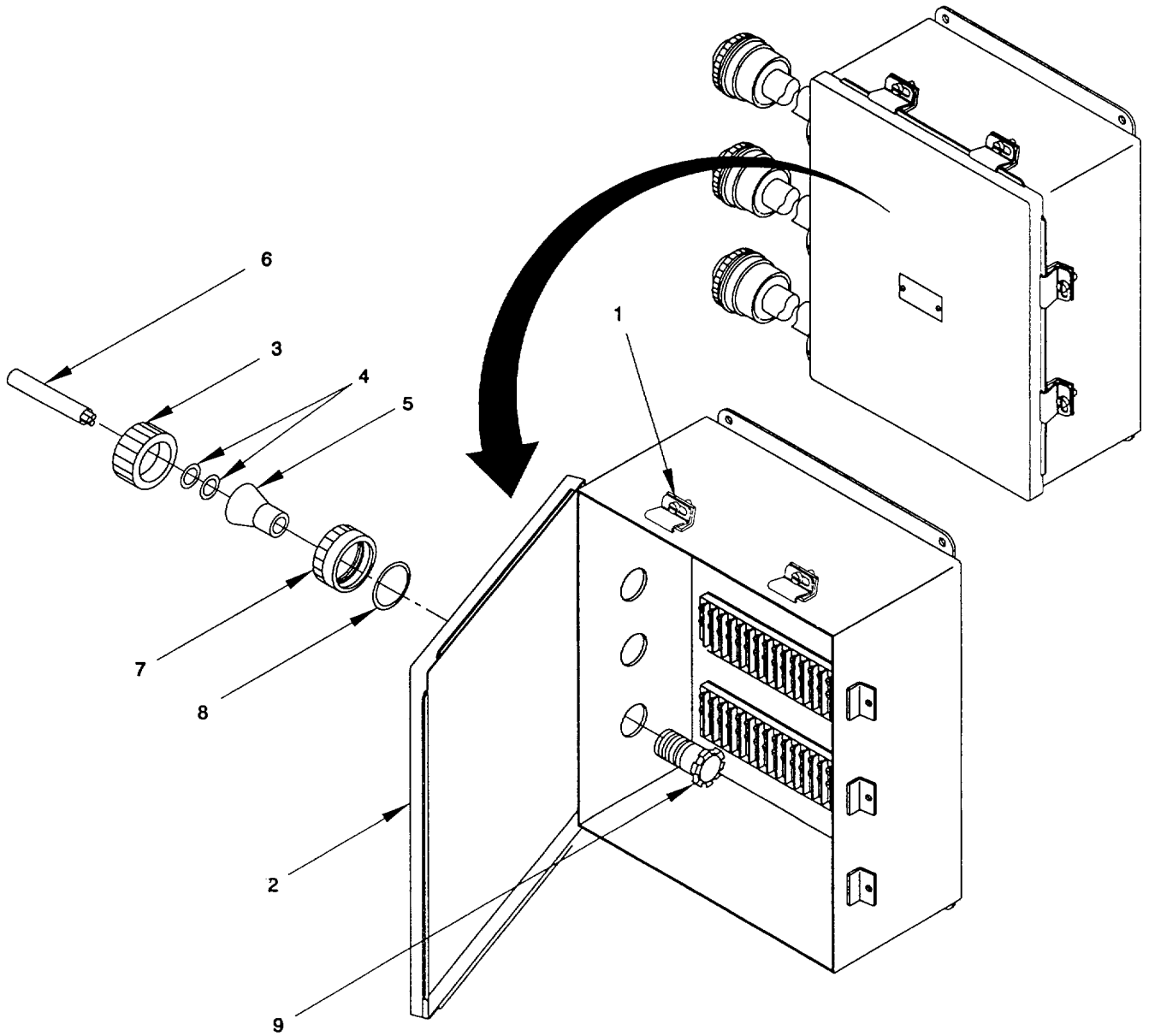


Figure 2-61. Cable Assembly, Power Module Junction Box "A3", Remove/Install.

2-67. Propulsion Module Circuit Breaker Panel "A6".

This task covers: a. Remove b. Inspect c. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Circuit Breaker Panel Assembly
Compound, Sealing (Item 12, Appendix F)
Wrap, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-62)

- (1) Remove six screws (1) and six clamps (2) securing cover (3) to enclosure (8). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to circuit breaker panel. Refer to Appendix G.
- (3) Remove four hex head capscrews (4), four hex nuts (5), four flat washers (6) and four lock washers (7) securing enclosure (8). Remove circuit breaker panel.

b. *Inspect.*

- (1) Visually inspect all circuit breaker panel components for corrosion, damage or frayed or broken electrical wiring.
- (2) Check that door moves freely and that all switches cycle from "on" to "off". Tighten any loose components.

c. *Install.* (figure 2-62)

- (1) Apply sealing compound to capscrews (4) and screws (1).
- (2) Position new circuit breaker panel and secure with four hex head capscrews (4), four flat washers (6), four lock washers (7) and four hex nuts (5).
- (3) Reconnect electrical wiring, as tagged, to circuit breaker panel. Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wires.
- (4) Close cover (3) and secure with six clamps (2) and six screws (1).

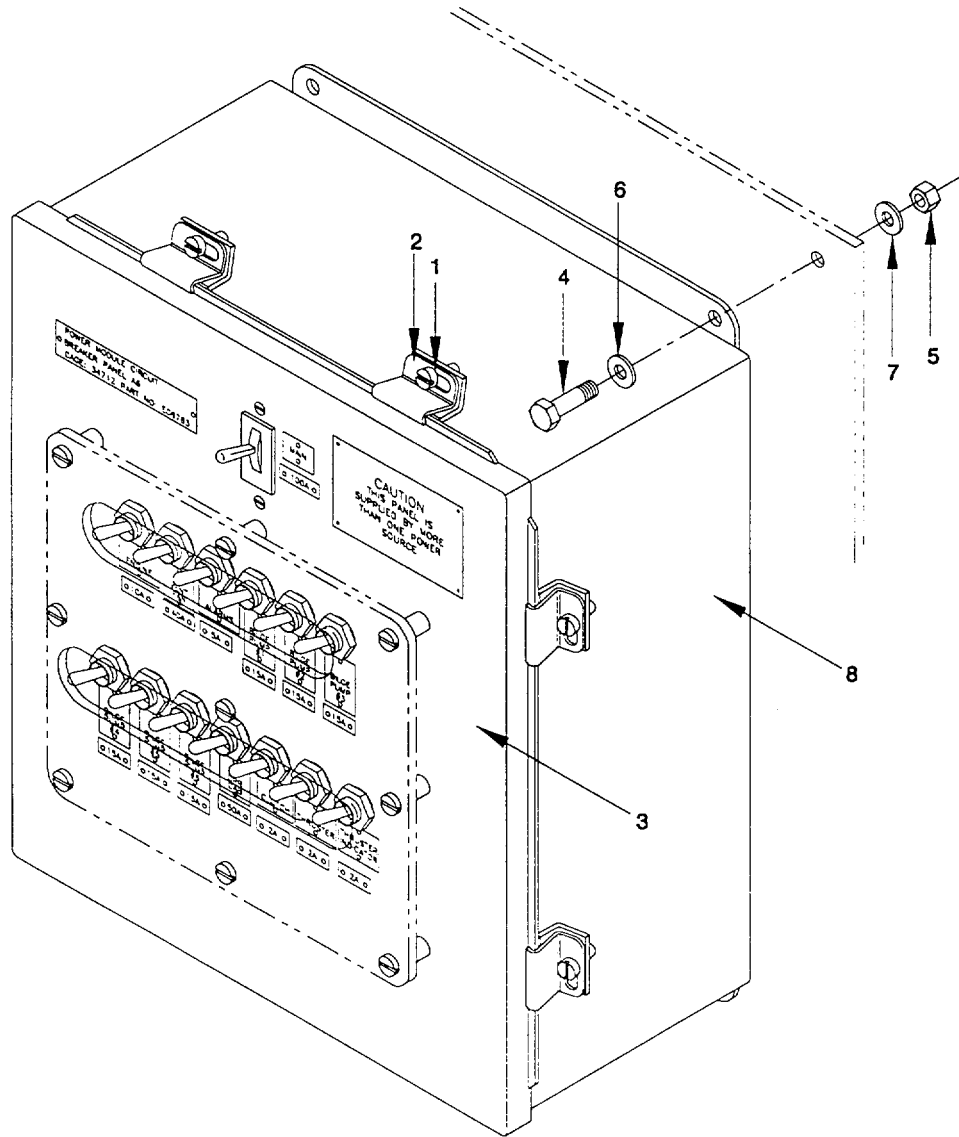


Figure 2-62. Propulsion Module Circuit Breaker Panel "A6", Remove/install

2-68. Circuit Breaker, Propulsion Module Circuit Breaker Panel "A6".

 This task covers: a. Remove b. Install

INITIAL SETUP:

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Circuit Breaker
Compound, Sealing (Item 12, Appendix F)
Wrap, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-63)

- (1) Remove six screws (1) and six clamps (2) securing cover (3) to enclosure (10). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to circuit breakers (11 and 14). Refer to Appendix G.
- (3) Remove nine pan head screws (4), nine self locking hex nuts (5), nine flat washers (6) and remove guard (8) and nine standoffs (7).
- (4) Remove two pan head screws (9) and two lock washers (10) securing circuit breaker (11) to cover (3). Remove circuit breaker (11).
- (5) Remove two nuts (12) and two washers (13) securing circuit breaker (14) to cover (3). Remove circuit breaker (14).

b. *Install.* (figure 2-63)

- (1) Apply sealing compound to screws (1, 4 and 9) and nuts (12).
- (2) Install new circuit breaker (14) in cover (3) and secure with two washers (13) and two nuts (12).
- (3) Install new circuit breaker (11) in cover (3) and secure with two lock washers (10) and two pan head screws (9).
- (4) Position nine standoffs (7) and guard (8) on cover (3). Secure with nine pan head screws (4), nine flat washers (6) and nine self locking hex nuts (5).

2-68. Circuit Breaker, Propulsion Module Circuit Breaker Panel "A6" (Cont).

- (5) Reconnect electrical wiring, as tagged, to circuit breakers (11 and 14). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (6) Close cover (3) and secure with six clamps (2) and six screws (1).

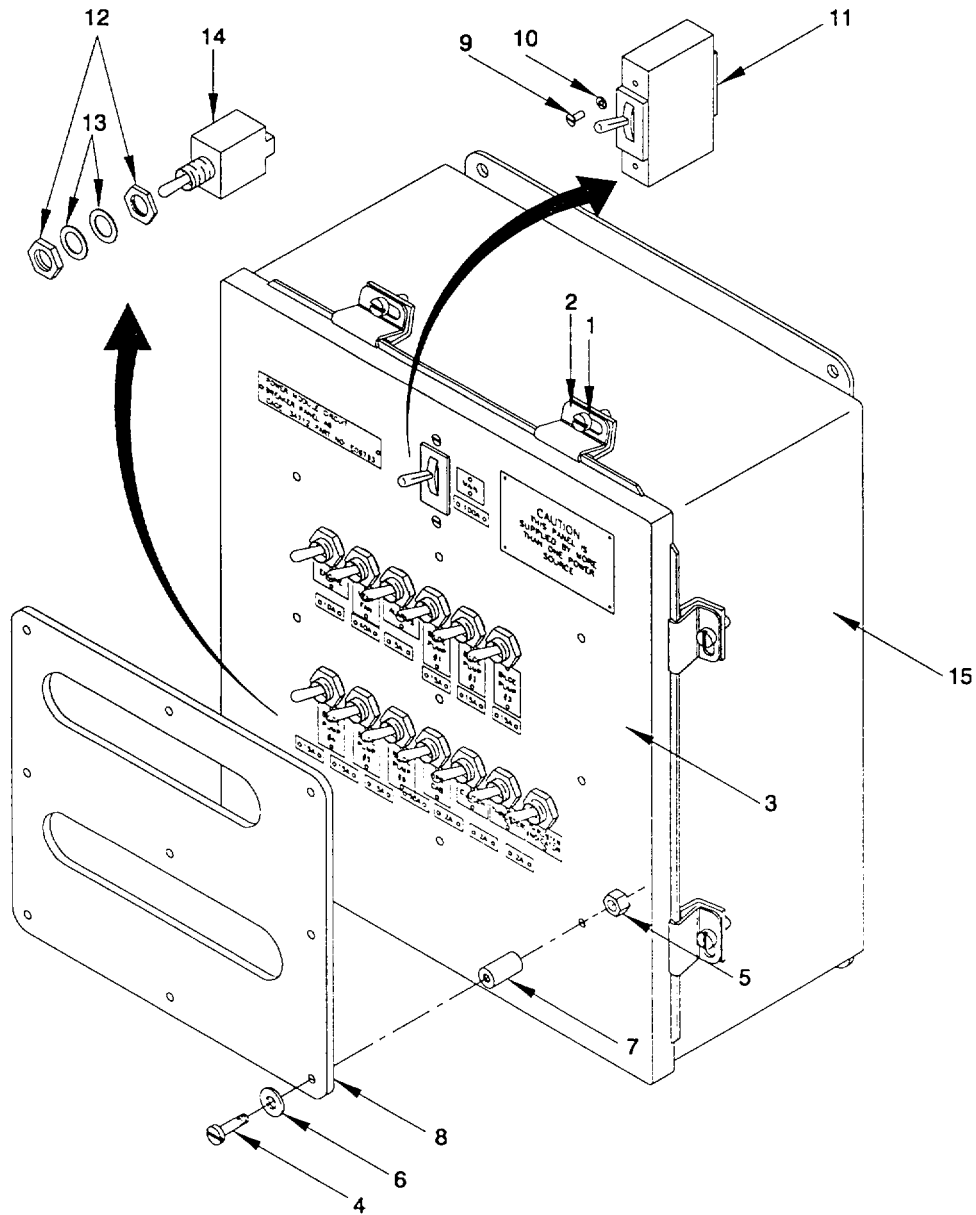


Figure 2-63. Circuit Breaker, Propulsion Module Circuit Breaker Panel 'A6", Remove/Install

2-69. Terminal Block, Propulsion Module Circuit Breaker Panel "A6".

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Terminal Block
Compound, Sealing (Item 12, Appendix F)
Wrap, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-64)

- (1) Remove six screws (1) and six clamps (2) securing cover (3) to enclosure (10). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to terminal boards (8 and/or 9). Refer to Appendix G.
- (3) Remove four screws (4) securing panel (5) to enclosure (10). Lift panel (5) enough to access the rear of the panel (5).
- (4) Remove two round head screws (6) and two nut inserts (7) securing terminal board (8) and/or two round head screws (6) and two nut inserts (7) securing terminal board (8). Remove terminal boards (8 and/or 9).

b. *Install.* (figure 2-64)

- (1) Apply Sealing compound to screws (1, 4 and 6).
- (2) Install new terminal boards (8 and/or 9). Secure each terminal board (8 and/or 9) with two nut inserts (7) and two round head screws (6).
- (3) Install panel (5) in enclosure (10). Secure panel (5) with four screws (4).
- (4) Reconnect electrical wiring, as tagged, to terminal boards (8 and/or 9). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (5) Close cover (3) and secure with six clamps (2) and six screws (1).

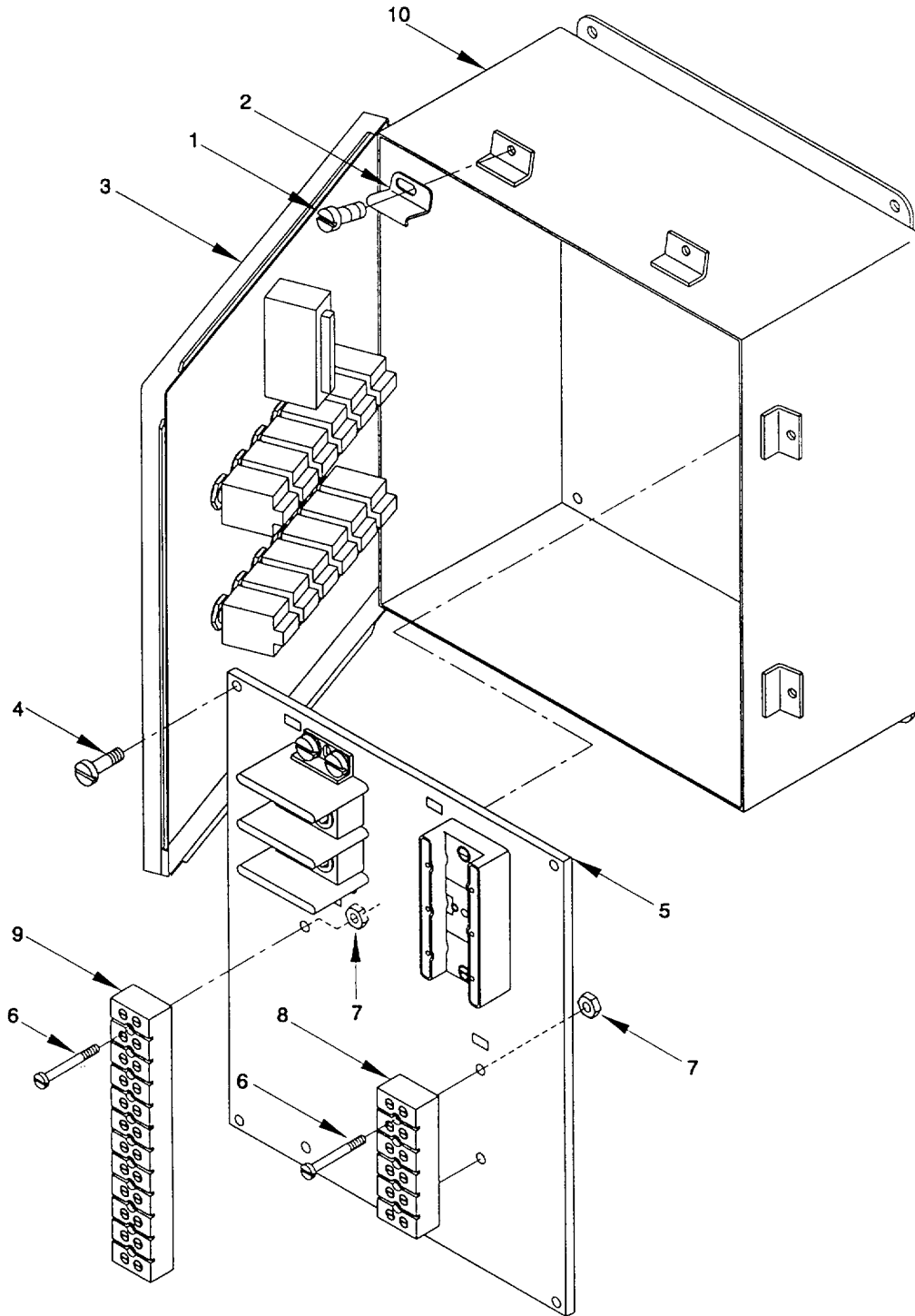


Figure 2-64. Terminal Block, Propulsion Module Circuit Breaker Panel "A6", Remove/Install

2-70. Power Block, Propulsion Module Circuit Breaker Panel "A6".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Power Block
Compound, Sealing (Item 12, Appendix F)
Wrap, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-65)

- (1) Remove six screws (1) and six clamps (2) securing cover (3) to enclosure (10). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to power block (9). Refer to Appendix G.
- (3) Remove four screws (4) securing panel (5) to enclosure (10). Lift panel (5) enough to access the rear of the panel (5).
- (4) Remove four round head screws (6), four insert nuts (7) and four flat washers (8) securing power block (9). Remove power block (9).

b. Install. (figure 2-65)

- (1) Apply sealing compound to screws (1, 4 and 6) and connection compound to terminals on power block (9).
- (2) Install new power block (9). Secure power block (9) with four round head screws (6), four insert nuts (7) and four flat washers (8).
- (3) Install panel (5) in enclosure (10). Secure panel (5) with four screws (4).
- (4) Reconnect electrical wiring, as tagged, to power block (9). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (5) Close cover (3) and secure with six clamps (2) and six screws (1).

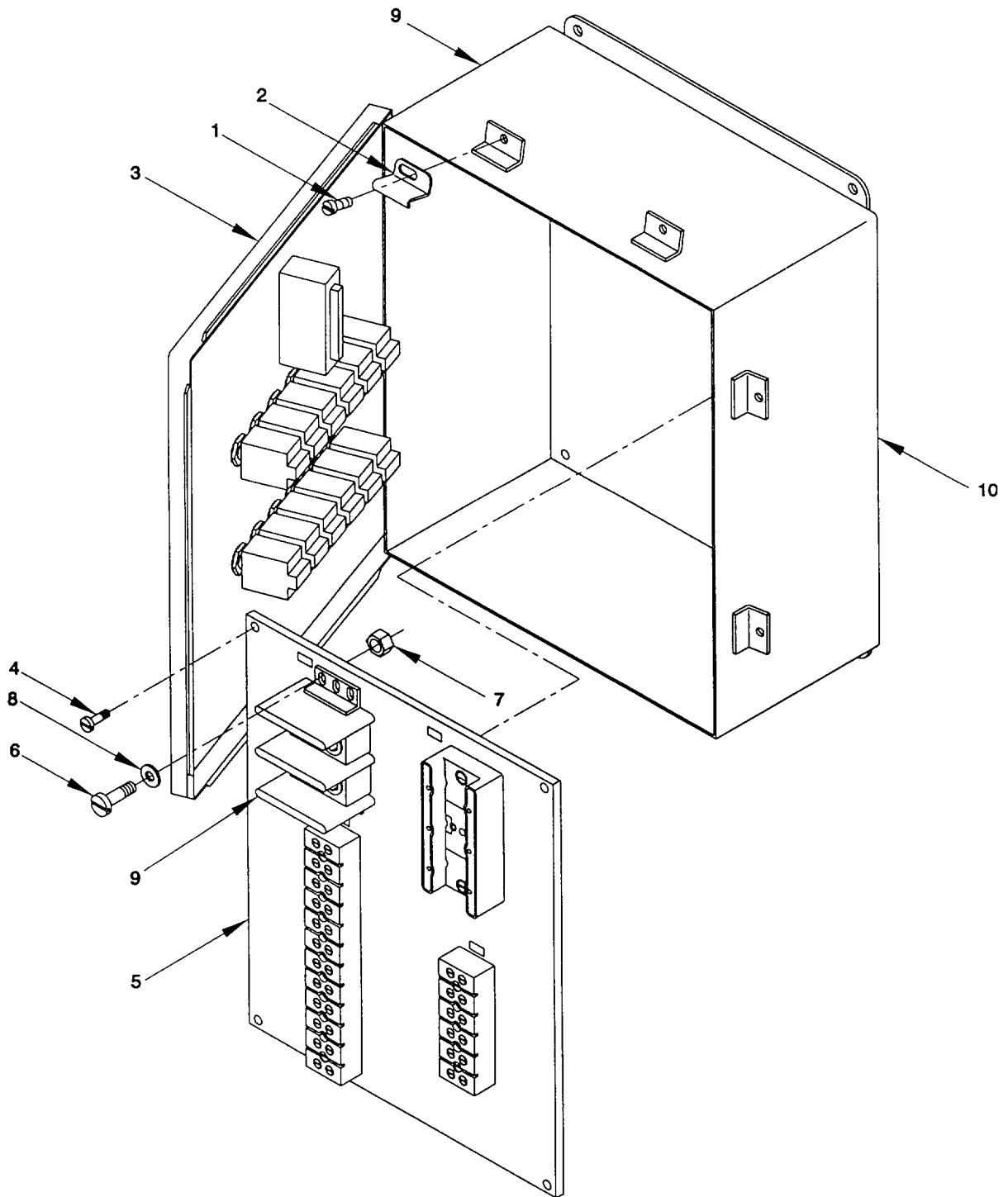


Figure 2-65. Power Block, Propulsion Module Circuit Breaker Panel "A6", Remove/Install

2-71. Power Distribution Block, Propulsion Module Circuit Breaker Panel "A6".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Power Distribution Block
Compound, Sealing (Item 12, Appendix F)
Wrap, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-66)

- (1) Remove six screws (1) and six clamps (2) securing cover (3) to enclosure (9). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to power distribution block (8). Refer to Appendix G.
- (3) Remove four screws (4) securing panel (5) to enclosure (9). Lift panel (5) enough to access the rear of the panel (5).
- (4) Remove two round head screws (6) and two insert nuts (7) securing power distribution block (8). Remove power distribution block (8).

b. Install. (figure 2-66)

- (1) Apply antiseize compound to screws (1, 4 and 6).
- (2) Install new power distribution block (8). Secure power distribution block (8) with two round head screws (6) and two insert nuts (7).
- (3) Install panel (5) in enclosure (9). Secure panel (5) with four screws (4).
- (4) Reconnect electrical wiring, as tagged, to power distribution block (8). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (5) Close cover (3) and secure with six clamps (2) and six screws (1).

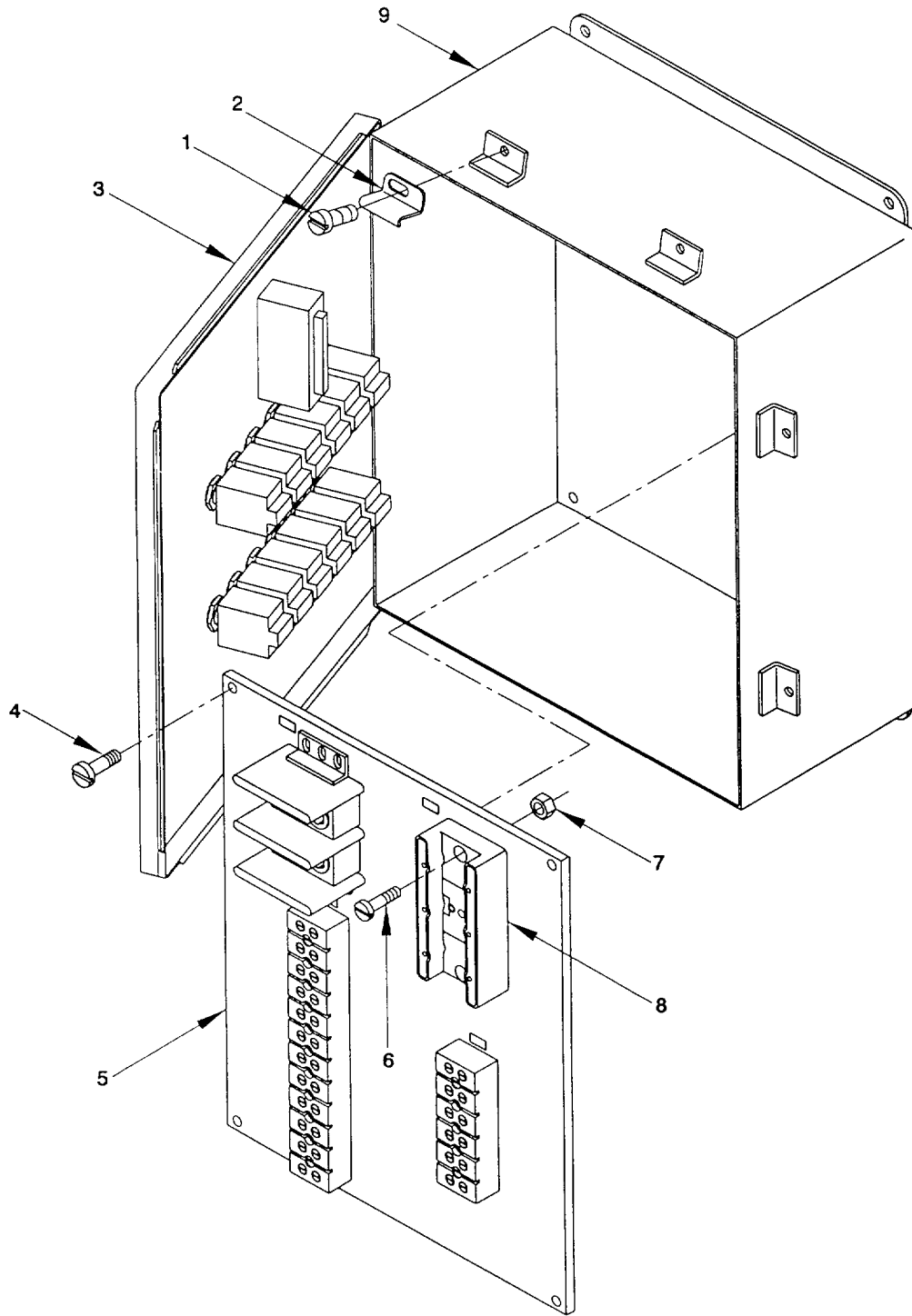


Figure 2-66. Power Distribution Block, Propulsion Module Circuit Breaker Panel "A6", Remove/Install

2-72. Battery.

This task covers: a. Test b. Service c. Inspect d. Remove e. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Water, Distilled (Item 54, Appendix F)
Baking Soda (Item 45, Appendix F)
Grease (Item 20, Appendix F)

WARNING

Before going below deck for maintenance, ventilate the compartment being entered. Maintain adequate ventilation below deck while performing maintenance. Extinguish open flames, heat sources, and smoking materials. Keep batteries from sparks or other sources of ignition. Wear protective clothing including acid resistant aprons, boots and safety glasses with side shields. Batteries produce hydrogen gas, especially when charging. Hydrogen gas may explode if ignited. Failure to comply may result in serious injury or death to personnel.

Batteries contain sulfuric acid. Do not ingest or inhale fumes. Failure to comply can result in injury to personnel.

If battery case is broken, avoid direct contact with internal components. If battery acid is released or spilled, dilute spill cautiously with five to six volumes of water and gradually neutralize with sodium bicarbonate, soda ash or lime. Failure to comply may result in serious injury to personnel.

In the event of fire, use a Class ABC, CO2 and/or Halon fire extinguishers to extinguish. Cool battery if exposed to fire to prevent rupture. The acid mist and vapors in a fire situation are corrosive. Wear special respiratory protection (SCBA) and clothing. Failure to comply may result in serious injury to personnel.

Battery weighs approximately 96 lbs. Use appropriate lifting devices when handling. Failure to comply can result in serious injury to personnel.

NOTE

Lead-acid batteries are completely recyclable. For information on returning batteries, refer to Unit SOP. Batteries are completely recyclable. Return batteries IAW Maintenance SOP.

The battery installation consists of four battery boxes, each containing one battery. The following procedure addresses one battery box and battery. This procedure is typical for the remaining three battery boxes and batteries.

a. Test. (figure 2-67)

(1) Perform hydrometer test on all battery cells. Log results in vessel logbook.

b. Service. (figure 2-68)

(1) Remove the top cover of the battery box (2) for access to the battery (1).

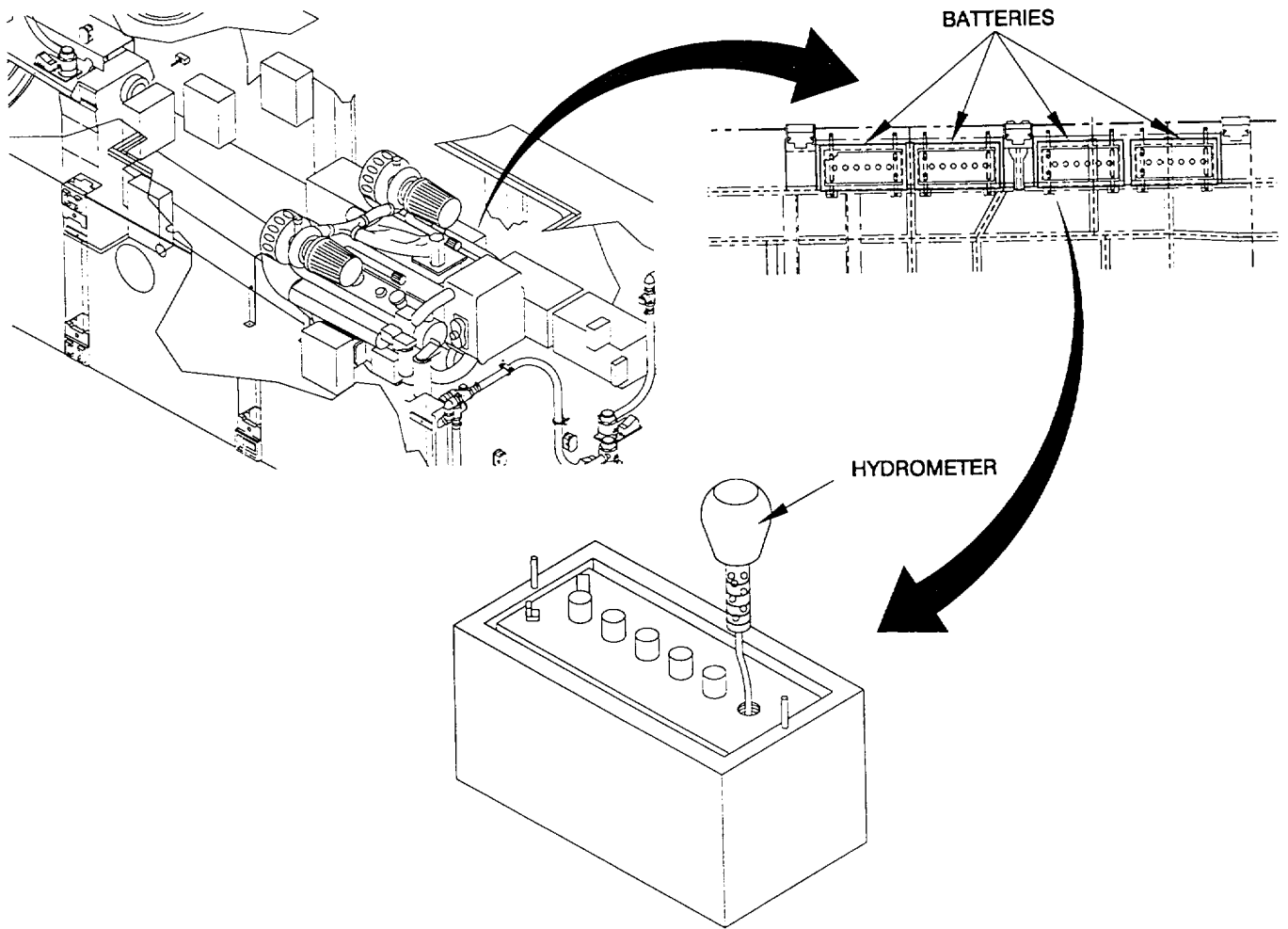


Figure 2-67. Battery, Test.

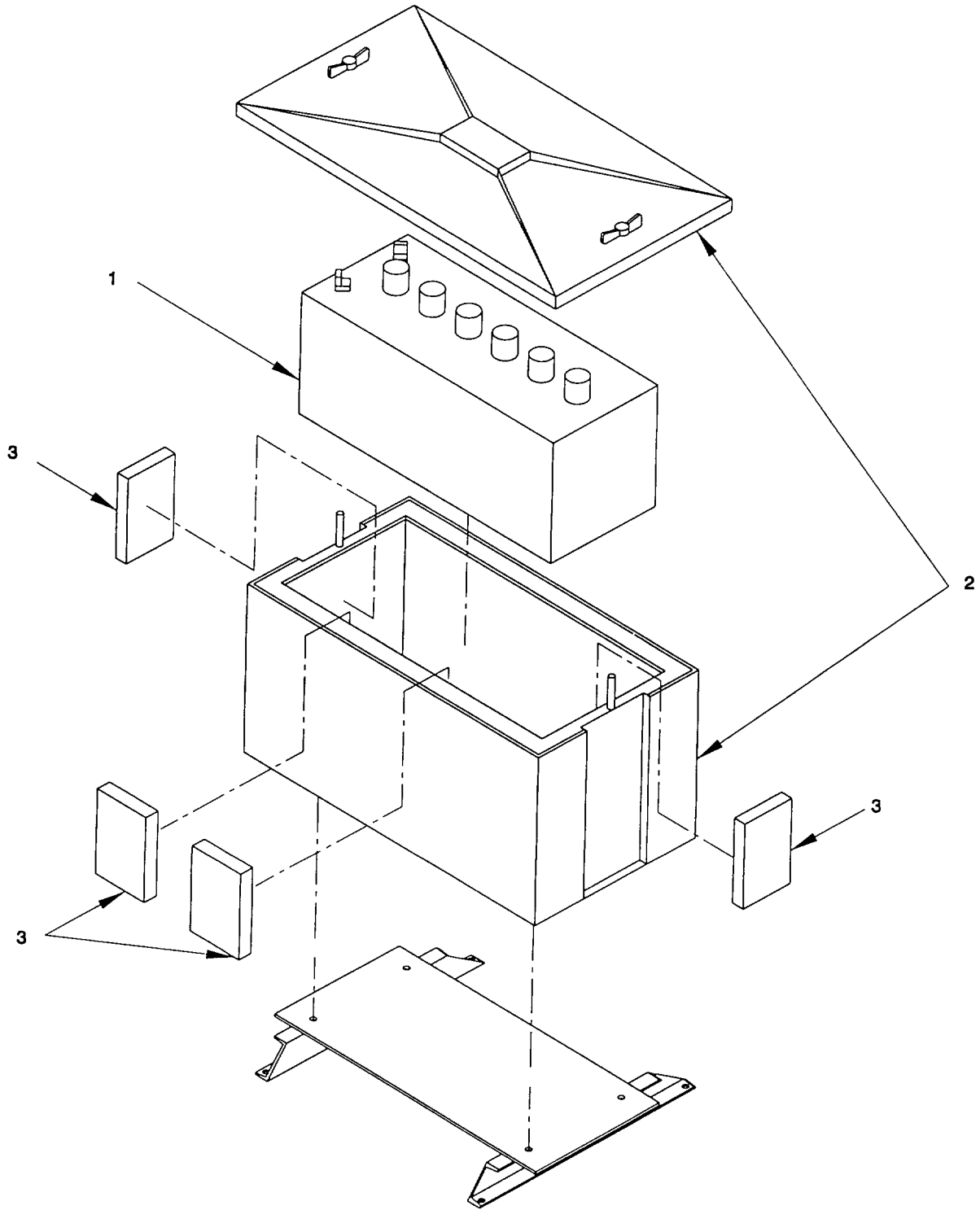


Figure 2-68. Battery, Service/Remove/Install

2-72. Battery (Cont).

- (2) Clean the connections at the battery (1) terminals with baking soda and water. Brush the terminals and clamps with a wire brush to remove any corrosion. Apply a coat of grease to battery (1) terminals.
- (3) Tighten the clamps and connections at the battery (1) terminal.
- (4) Bring the level of the electrolyte in each cell of the battery (1) to at least cover the top of the plates. Add distilled water if necessary.
- (5) Batteries should be charged to indicate 12.72 volts output or a specific gravity of 1.265 at 77° F. Charge, as necessary, at 10-20 amperes for approximately 2 hours.

c. *Remove.* (figure 2-68)

- (1) Remove the top cover of the battery box (2) for access to the battery (1).
- (2) Tag and disconnect wiring to the battery (1). Refer to Appendix G.
- (3) Remove battery (1) and collect four wooden blocks (3).

d. *Install.* (figure 2-68)

- (1) Install battery (1) and four wooden blocks (3) in battery box (2).
- (2) Reconnect wiring, as tagged to battery (1). Refer to Appendix G.
- (3) Install top cover of battery box (2).

2-73. Vent Fan Relay Enclosure Assembly "A8".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Junction Box
Compound, Sealing (Item 12, Appendix F)
Wrap Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-69)

- (1) Remove three screws (1) and three clamps (2) securing cover (3) to enclosure (8). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to Vent Fan Relay Enclosure Assembly. Refer to Appendix G.
- (3) Remove four hex head capscrews (4), four hex nuts (5), four flat washers (6) and four lock washers (7) securing enclosure. Remove Vent Fan Relay Enclosure (8).

b. Install. (figure 2-69)

- (1) Apply sealing compound to capscrews (4) and screws (1).
- (2) Position Vent Fan Relay Enclosure (8) and secure with four hex head capscrews (4), four flat washers (6), four lock washers (7) and four hex nuts (5).
- (3) Reconnect electrical wiring, as tagged, to Vent Fan Relay Enclosure Assembly. Refer to Appendix G. Use tie wraps to secure any loose wires.
- (4) Close cover (3) and secure with three clamps (2) and three screws (1).

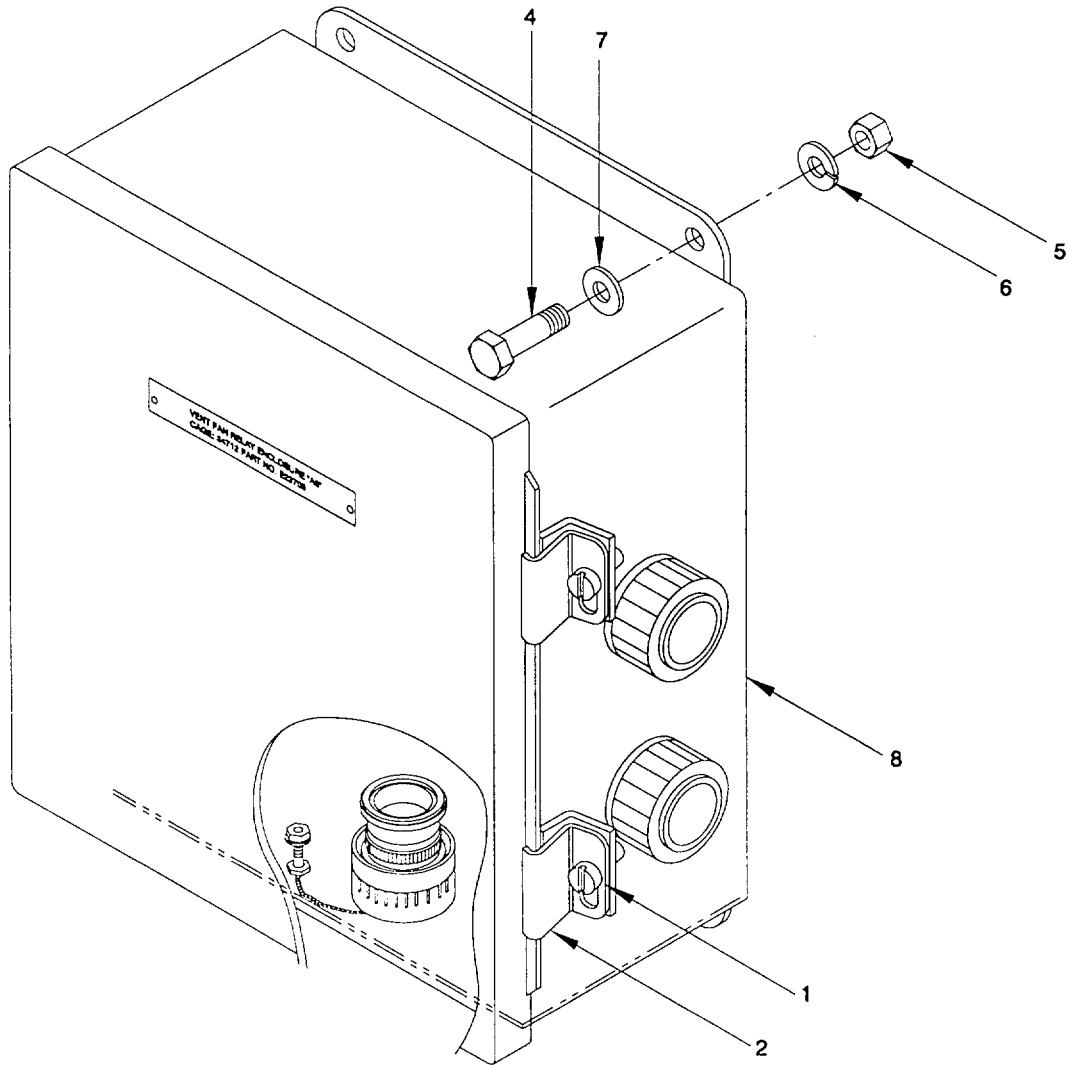


Figure 2-69. Vent Fan Relay Enclosure Assembly "A8", Remove/Install

2-74. Terminal Block, Vent Fan Relay Enclosure.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Terminal Block
Compound Sealing (Item 12, Appendix F)
Wrap Tie (Item 57, Appendix F)
Heat Shrink Tubing (Items 49-53, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-70)

- (1) Remove three screws (1) and three clamps (2) securing cover (3) to enclosure (4). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to terminal block (9). Refer to Appendix G.
- (3) Remove four screws (5) and pull panel (6) out far enough to access rear of panel.
- (4) Remove two round head screws (7) and two insert nuts (8) securing terminal block (9). Remove terminal block (9) from panel.

b. Install. (figure 2-70)

- (1) Apply antiseize compound to screws (1, 5 and 7).
- (2) Position terminal block (9) and secure with two round head screws (7) and two insert nuts (8).
- (3) Position panel (6) and secure with four screws (5).
- (4) Reconnect electrical wiring, as tagged, to terminal block (9). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (5) Close cover (3) and secure with three clamps (2) and three screws (1).

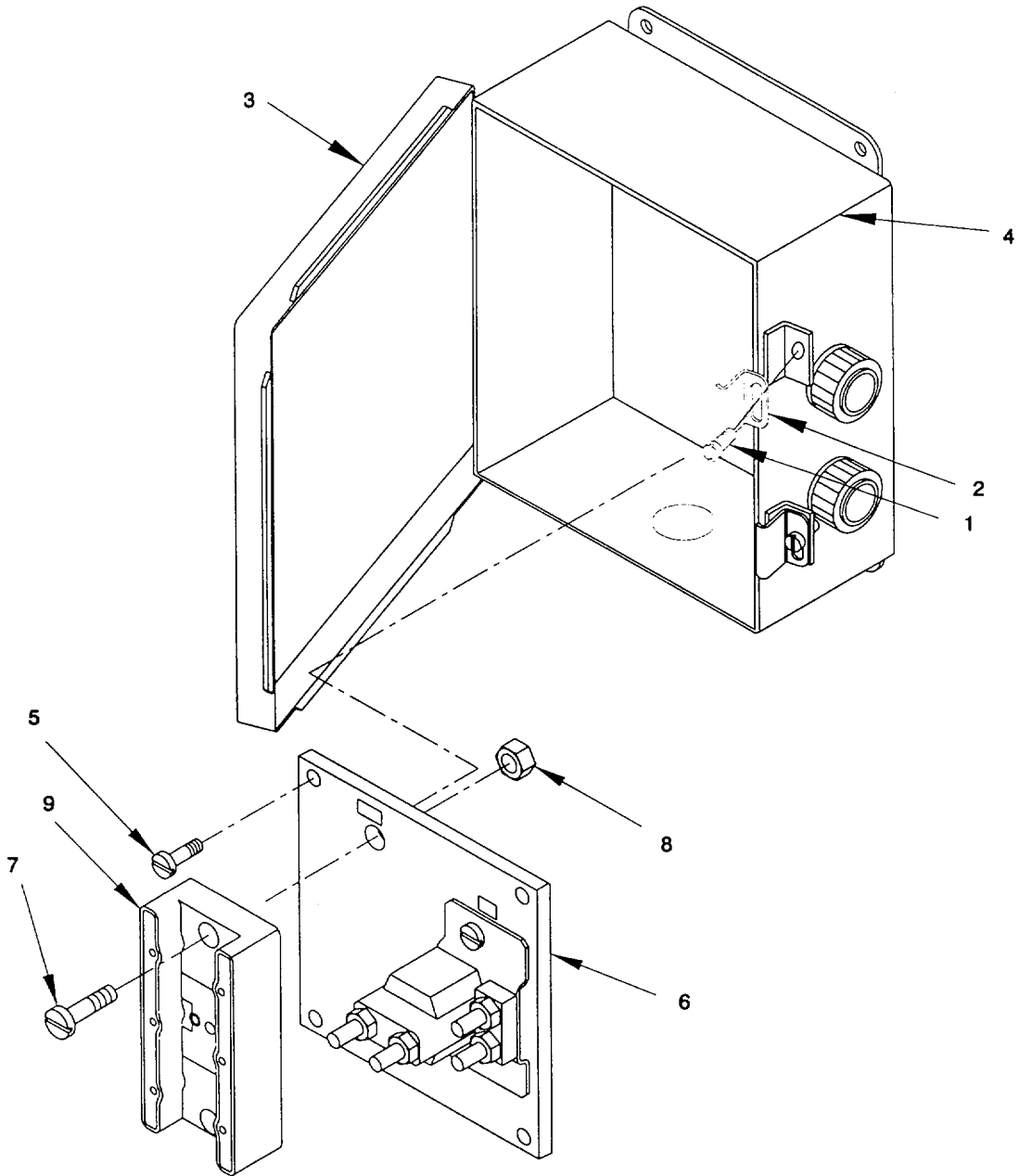


Figure 2-70. Terminal Block, Vent Fan Relay Enclosure, Remove/Install

2-75. Relay, Vent Fan Relay Enclosure.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Relay

Compound Sealing (Item 12, Appendix F)

Wrap Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-71)

- (1) Remove three screws (1) and three clamps (2) securing cover (3) to enclosure (4). Swing cover (3) open.
- (2) Disconnect and tag electrical wiring to the relay (10). Refer to Appendix G.
- (3) Remove four screws (5) and pull panel (6) out far enough to access rear of panel.
- (4) Remove two insert nuts (7), two pan head screws (8) and two flat washers (9) securing relay (10) to panel (6). Remove relay (10).

b. *Install.* (figure 2-71)

- (1) Apply sealing compound to screws (1, 5 and 8).
- (2) Position relay (10) on panel (6) and secure with two pan head screws (8), two flat washers (9) and two insert nuts (7).
- (3) Position panel (6) and secure with four screws (5).
- (4) Reconnect electrical wiring, as tagged, to relay (10). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (5) Close cover (3) and secure with three clamps (2) and three screws (1).

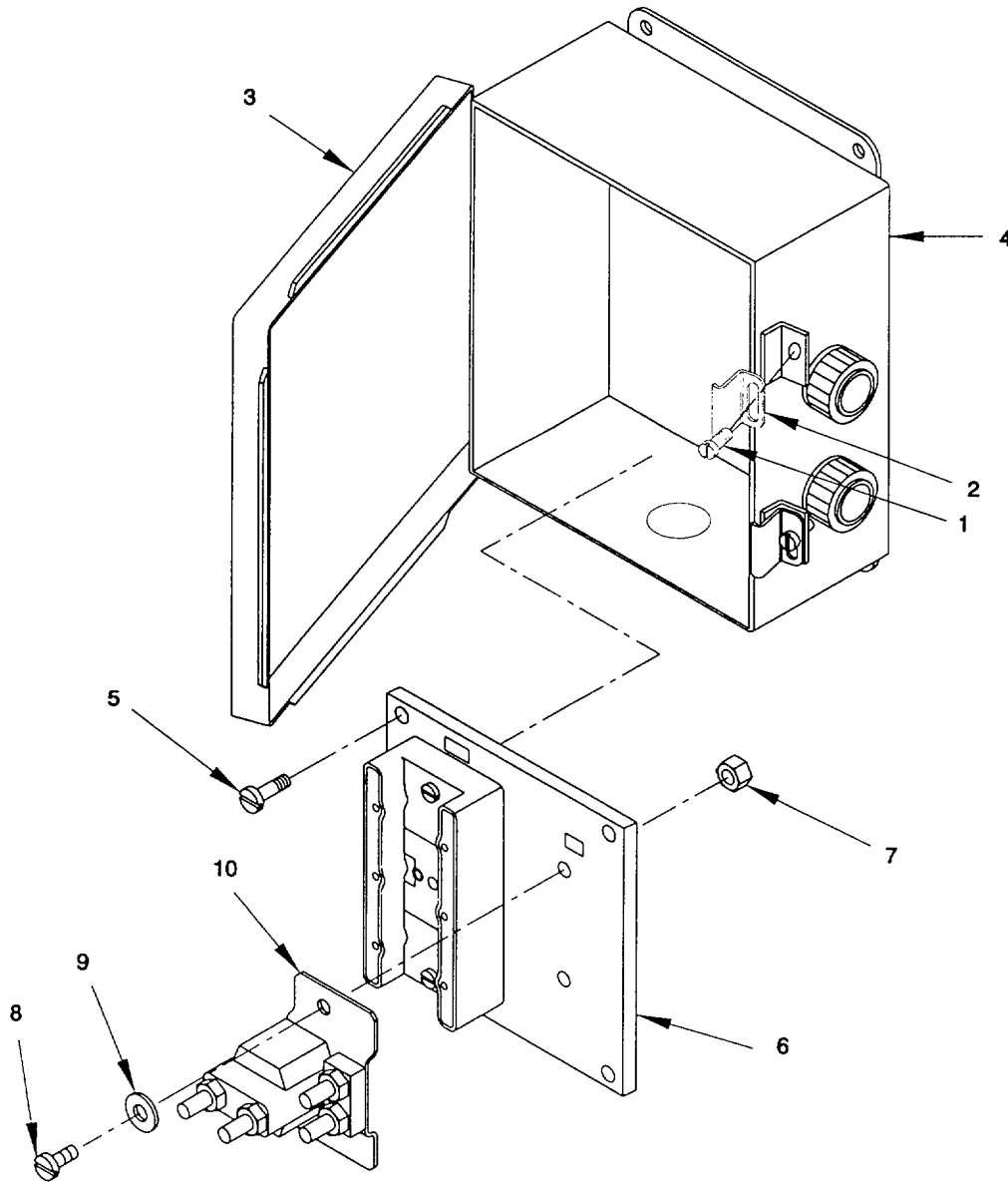


Figure 2-71. Relay, Vent Fan Relay Enclosure, Remove/Install

2-76. Receptacle, Vent Fan Relay Enclosure.

This task covers: a. Inspect b. Remove c. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Receptacle
Compound Sealing (Item 12, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Inspect.* (figure 2-72)

Inspect receptacle (9) for broken or loose pins. Replace receptacle as necessary.

b. *Remove.* (figure 2-72)

(1) Remove three screws (1) and three clamps (2) securing cover (3) to enclosure (4). Swing cover (3) open.

(2) Disconnect and tag electrical wiring to the receptacle (9).

(3) Unscrew cap (5) and remove.

(4) Remove nuts (6), capscrews (7) and collect washers (8) to free receptacle (9).

c. *Install.* (figure 2-72)

(1) Apply sealing compound to screws (1 and 6).

(2) Position receptacle (9) on enclosure (4) and secure with four screws (6), four washers (8) and four nuts (7).

(3) Reconnect electrical wiring, as tagged, to receptacle (9). Refer to Appendix G.

(4) Close cover (3) and secure with three clamps (2) and three screws (1).

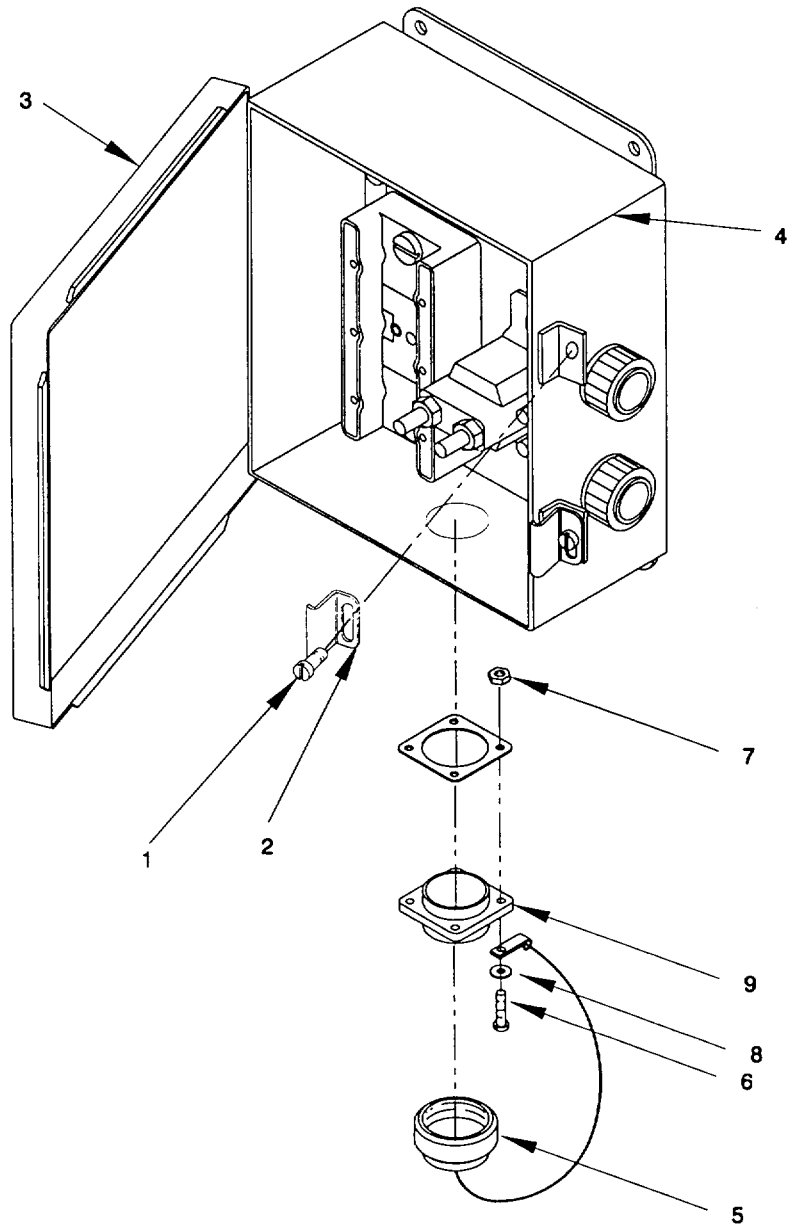


Figure 2-72. Receptacle, Vent Fan Relay Enclosure. Remove/Install

2-77. Pump-Jet Junction Box "A2".

This task covers: a. Remove b. Inspect c. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Pump-jet Junction Box "A2"

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-73)

- (1) Turn door latch (1) 90° and open door to junction box (6).
- (2) Disconnect and tag all wiring to the pump-jet junction box. Refer to Appendix G.
- (3) Remove four capscrews (2), four flat washers (3), four lock washers (4) and four nuts (5) securing junction box (6) to hull. Remove junction box (6).

b. Inspect.

- (1) Visually inspect all junction box components for corrosion, damage, and loose, frayed or broken electrical wiring.
- (2) Check that door and door latch moves freely. Tighten any loose components.

c. Install. (figure 2-73)

- (1) Position junction box A2 (6) and secure to hull with four capscrews (2), four flat washers (3), four lock washers (4) and four nuts (5).
- (2) Connect all wiring to the pump-jet junction box. Refer to Appendix G.
- (3) Close door to junction box. Turn door latch (1) 90° to hold door closed.

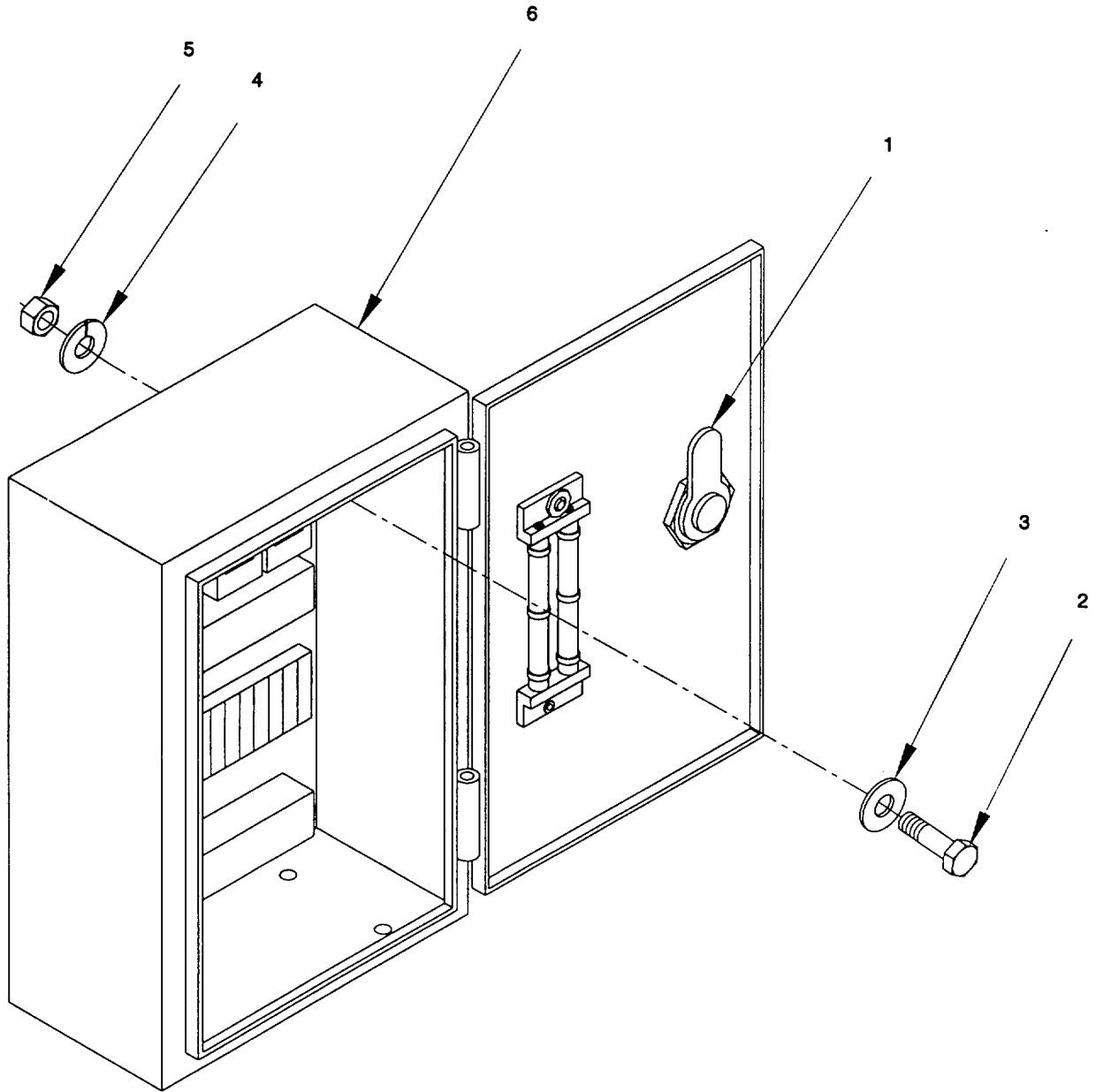


Figure 2-73. Pump-Jet Junction Box "A2", Remove/Install.

2-78. Circuit Breaker, Pump-Jet Junction Box "A2".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Circuit Breaker CB1

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-74)

- (1) Turn door latch (1) 90° and open door to junction box (3).
- (2) Disconnect and tag all wiring to the pump-jet junction box. Refer to Appendix G.
- (3) Remove circuit breaker CB1 (2).

b. *Install.* (figure 2-74)

- (1) Insert new circuit breaker (2) in panel within box (3).
- (2) Connect all wiring to the pump-jet junction box (3).
- (3) Close door to junction box (3) and turn door latch (1) 90° to hold closed.

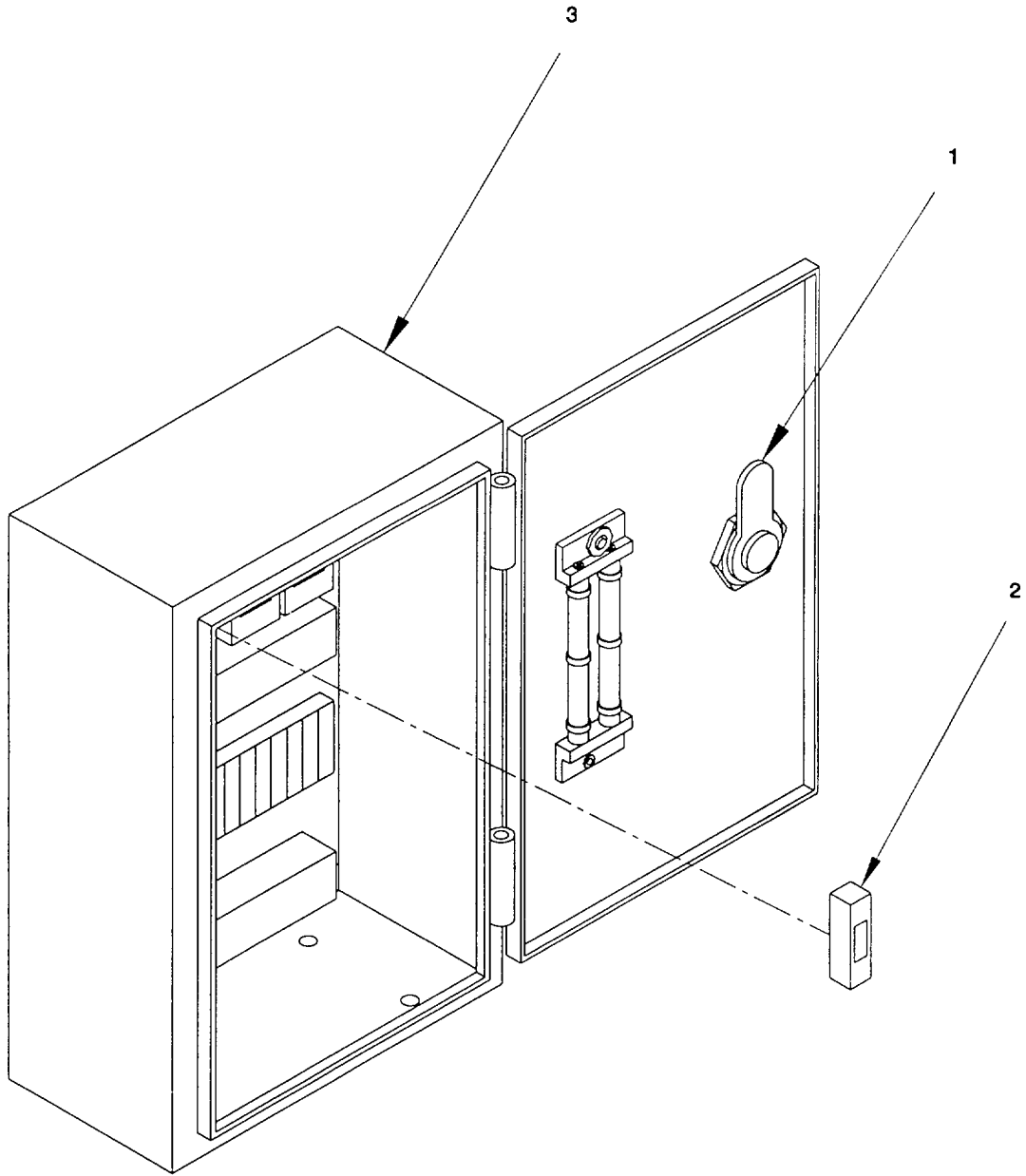


Figure 2-74. Circuit Breaker, Pump-Jet Junction Box "A2", Remove/Install.

2-79. Relay, Pump-Jet Junction Box "A2".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE (Step a)

Materials/Parts

Relay

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-75)

- (1) Turn door latch (1) 90° and open door to junction box (4).
- (2) Disconnect and tag all wiring to the pump-jet junction box. Refer to Appendix G.
- (3) Remove relay (2 or 3).

b. Replace. (figure 2-75)

- (1) Insert new relay (2 or 3) in fuse holder.
- (2) Connect all wiring to the pump-jet junction box (4).
- (3) Close door to junction box (4) and turn door latch (1) 90° to hold closed.

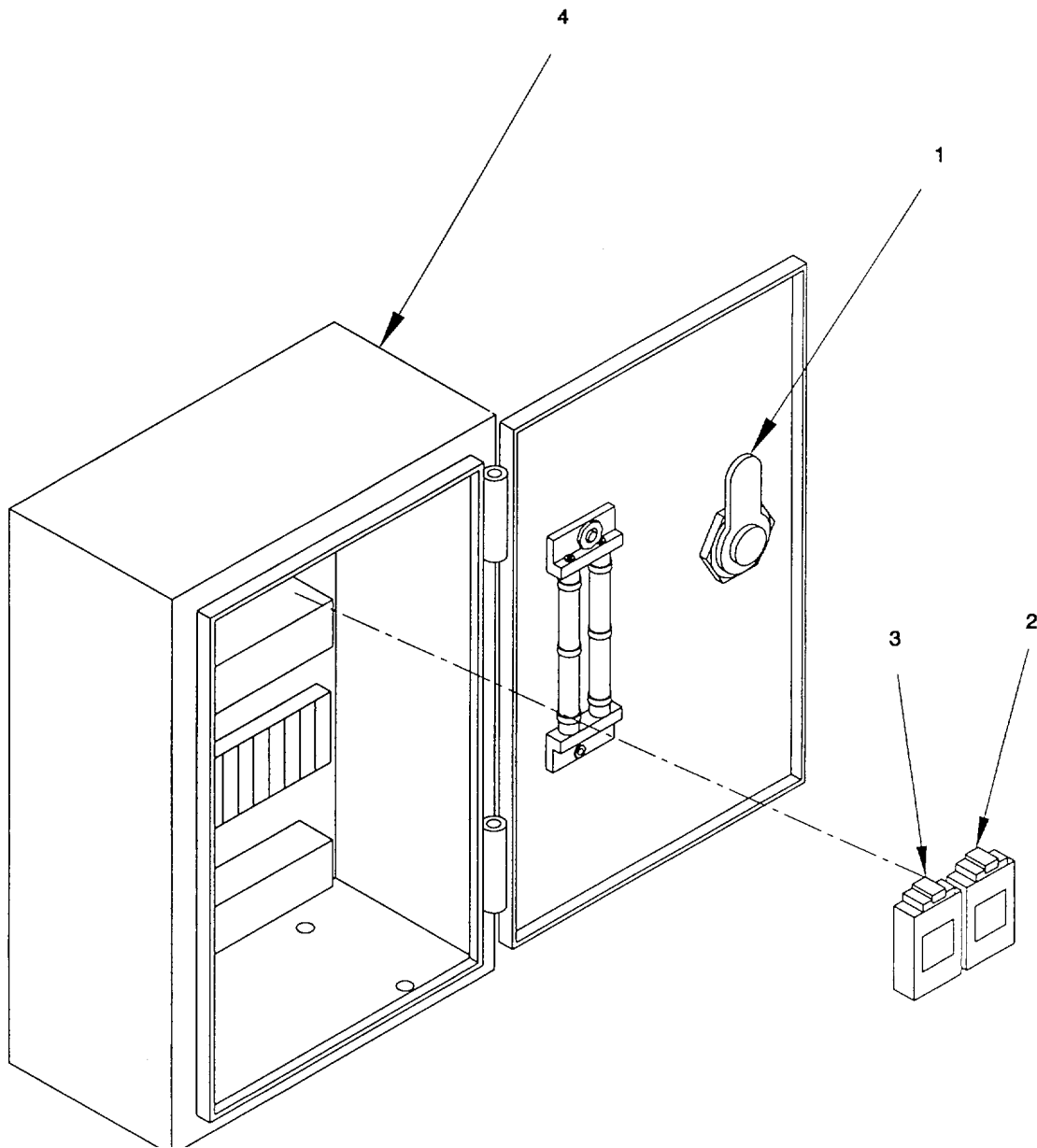


Figure 2-75. Relay, Pump-Jet Junction Box "A2". Remove/Install.

2-80. Pump-Jet Direction/Auxiliary Battery Junction Box "A9".

This task covers: a. Remove b. Inspect c. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Cloth, lint-free (Item 7, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-76)

- (1) Open enclosure door to access interior of junction box (1).
- (2) Disconnect electrical wiring to junction box A9 (1) and tag OUT OF SERVICE.
- (3) Remove four sets of hardware (2) securing junction box to hull.

b. Inspect.

- (1) Inspect all electrical components for corrosion, deterioration, dirt, condensation, loose hardware or electrical wiring connections, or other damage. Repair is limited to replacement of components.
- (2) Remove any dirt or condensation with a clean, lint-free cloth.

c. Install. (figure 2-76)

- (1) Position junction box A9 against hull and secure with four sets of hardware (2).
- (2) Connect electrical wiring to junction box A9 (1). Refer to Appendix G.
- (3) Close junction box (1).

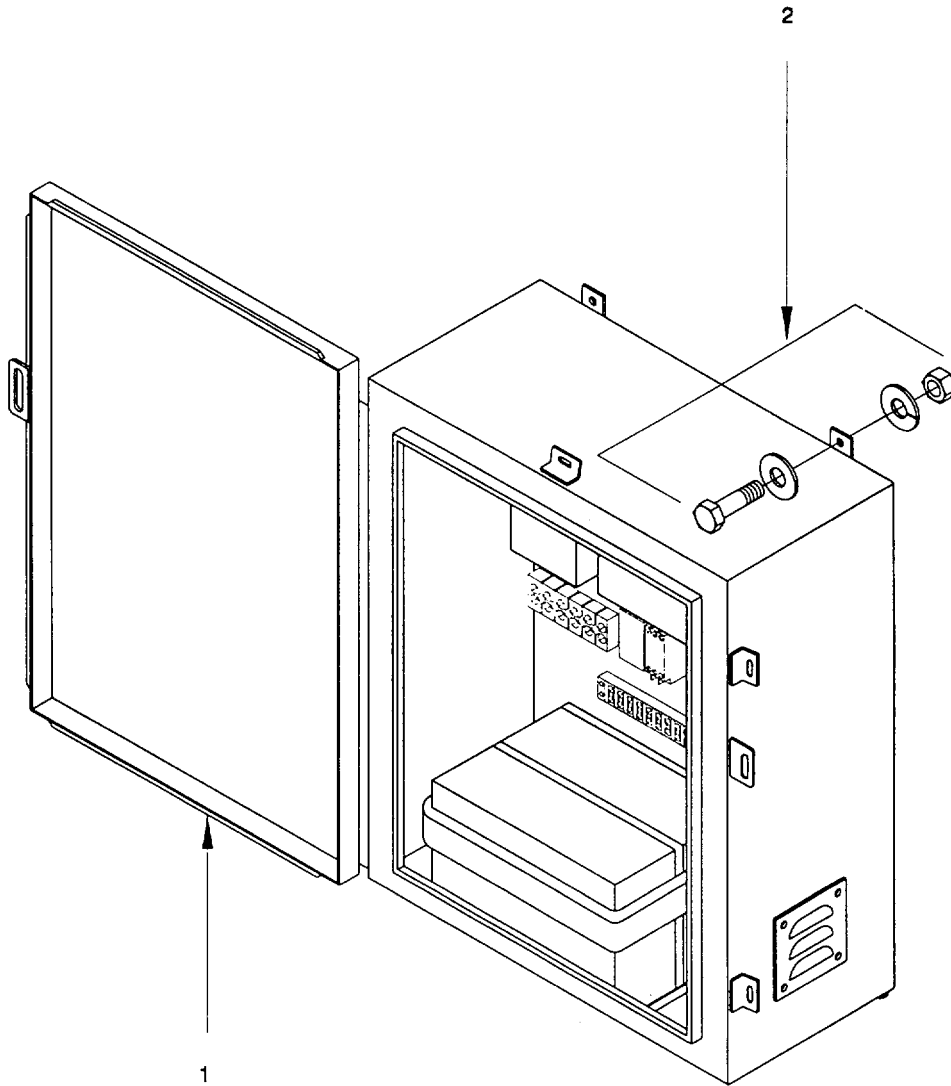


Figure 2-76. Pump-Jet Direction/Auxiliary Junction Box "A9", Remove/Install.

2-81. Voltage Regulator, Pump-Jet Direction/Auxiliary Battery Junction Box "A9".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE (Step a)

Materials/Parts

Voltage Regulator VR1

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-77)

- (1) Open enclosure door to access interior of junction box (1).
- (2) Disconnect electrical wiring to junction box A9 (1) and tag OUT OF SERVICE.
- (3) Remove two pan head screws (2) and collect flat washers (3) freeing voltage regulator (4).

b. *Install.* (figure 2-77)

- (1) Position voltage regulator (4) in junction box A9 (1) and secure with two pan head screws (2) and flat washers (3).
- (2) Connect electrical wiring to junction box A9 (1). Refer to Appendix G.
- (3) Close door to junction box (1).

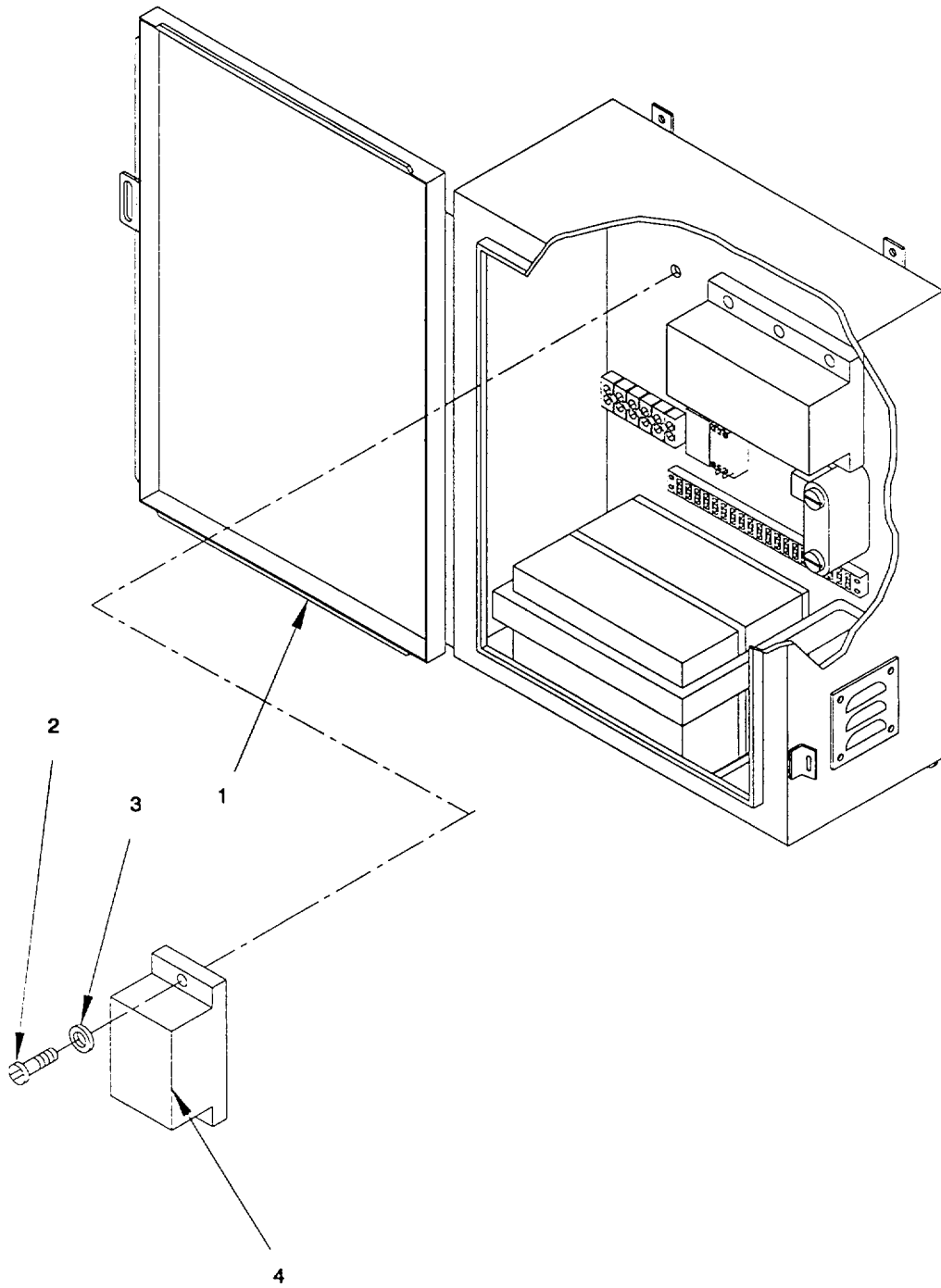


Figure 2-77. Voltage Regulator, Pump-Jet Direction/Auxiliary Battery Junction Box "A9", Remove/Install.

2-82. Isolator, Pump-Jet Direction/Auxiliary Battery Junction Box "A9".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Isolator IS1 (supplied with diesel engine)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-78)

- (1) Open enclosure door to access interior of junction box (1).
- (2) Disconnect electrical wiring to junction box A9 (1) and tag OUT OF SERVICE.
- (3) Remove six pan head screws (2) and collect flat washers (3) freeing isolator (4).

b. *Install.* (figure 2-78)

- (1) Position isolator (4) in junction box A9 (1) and secure with six pan head screws (2) and flat washers (3).
- (2) Connect electrical wiring to junction box A9 (1). Refer to Appendix G.
- (3) Close door to junction box (1).

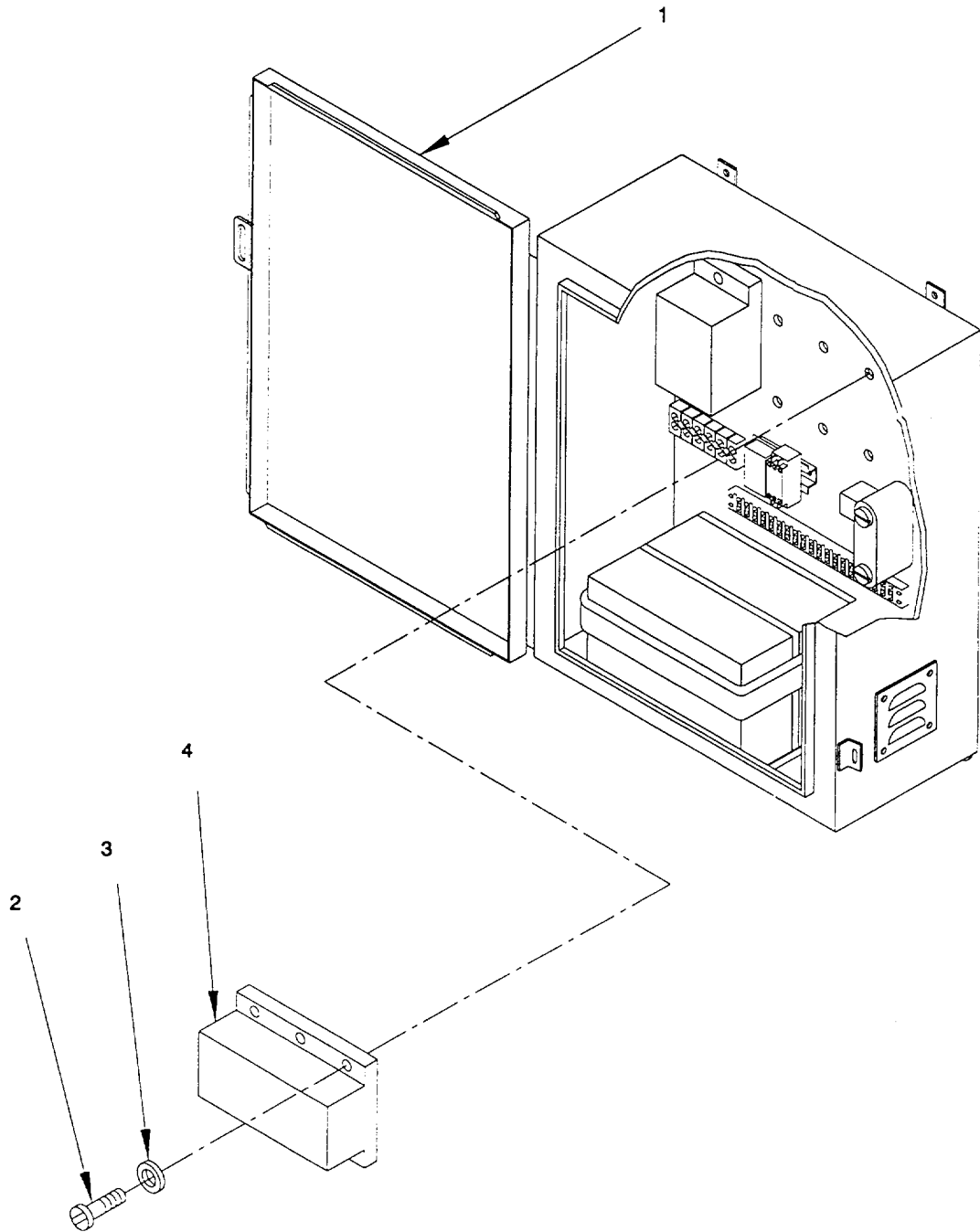


Figure 2-78. Isolator, Pump-Jet Direction/Auxiliary Battery Junction Box "A9", Remove/Install.

2-83. Terminal Block, Pump-Jet Direction/Auxiliary Battery Junction Box "A9".

This task covers: a. Remove b. Install

INITIAL SETUP**Tools**

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Terminal Block TB1 or TB2

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-79)

- (1) Open enclosure door to access interior of junction box (1).
- (2) Disconnect electrical wiring to junction box A9 (1) and tag OUT OF SERVICE.
- (3) To remove terminal block TB1, remove two pan head screws (2) freeing terminal block (3).
- (4) To remove terminal block TB2, remove four pan head screws (4) freeing terminal block (5).

b. *Install.* (figure 2-79)

- (1) To install terminal block TB2, position terminal block (5) in junction box A9 (1) and secure with four pan head screws (4).
- (2) To remove terminal block TB1, position terminal block (3) in junction box A9 (1) and secure with two pan head screws (2).
- (3) Connect electrical wiring to junction box A9 (1). Refer to Appendix G.
- (4) Close door to junction box (1).

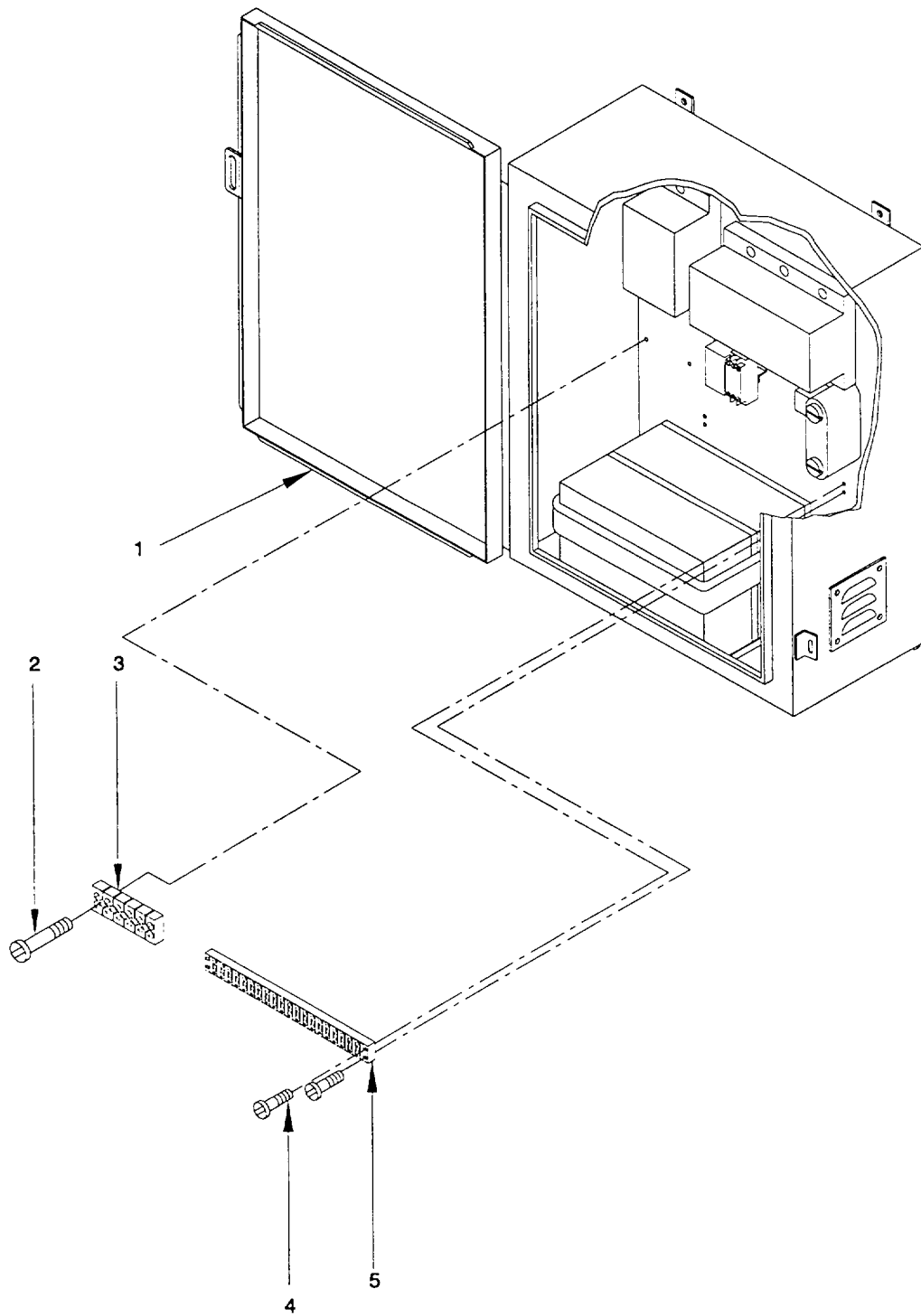


Figure 2-79. Terminal Block. Pump-Jet Direction/Auxiliary Battery Junction Box "A9", Remove/Install.

2-84. Batteries, Pump-Jet Direction/Auxiliary Battery Junction Box "A9".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Batteries (2)
Battery Cushions (2)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-80)

- (1) Open enclosure door to access interior of junction box (1).
- (2) Disconnect electrical wiring to junction box A9 (1) and tag OUT OF SERVICE.
- (3) Remove battery strap (2) freeing batteries BT5 and BT6 (3). Collect battery pad (4).

b. Install. (figure 2-80)

- (1) Position battery pad (4) on bottom inside of junction box (1).
- (2) Position batteries (3) in junction box A9 (1) and secure with rubber battery strap (2).
- (3) Connect electrical wiring to junction box A9 (1). Refer to Appendix G.
- (4) Close door to junction box (1).

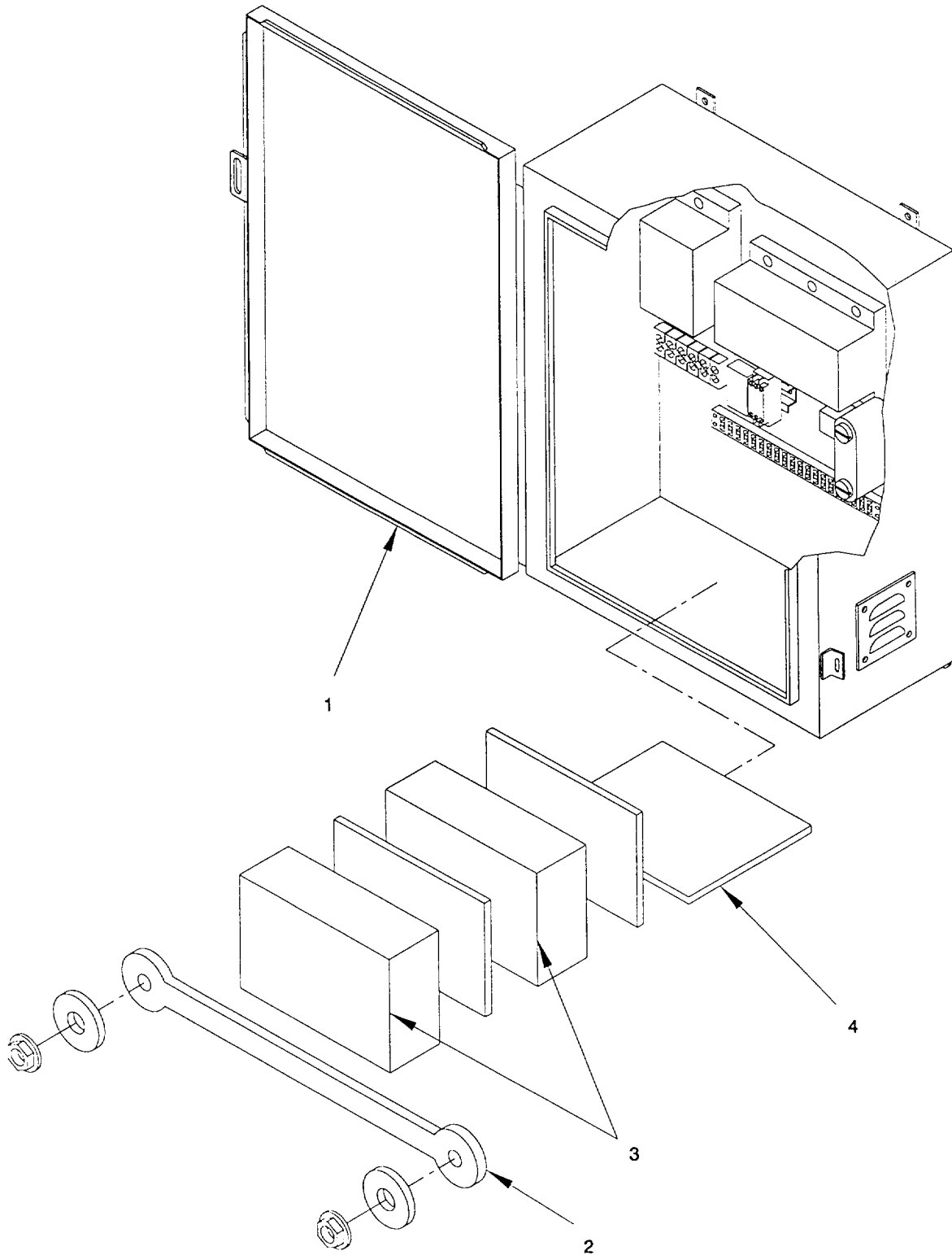


Figure 2-80. Batteries, Pump-Jet Direction/Auxiliary Battery Junction Box "A9", Remove/Install.

2-85. Transformer, Pump-Jet Direction/Auxiliary Battery Junction Box "A9".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Transformer VR2 (supplied with Pump-Jet)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-81)

- (1) Open enclosure door to access interior of junction box (1).
- (2) Disconnect electrical wiring to junction box A9 (1) and tag OUT OF SERVICE.
- (3) Remove two pan head screws (2) to free din rail (3) and transformer (4).

b. Install. (figure 2-81)

- (1) Position transformer (4) and din rail (3) and secure with two pan head screws (2).
- (2) Connect electrical wiring to junction box A9 (1). Refer to Appendix G.
- (3) Close door to junction box (1).

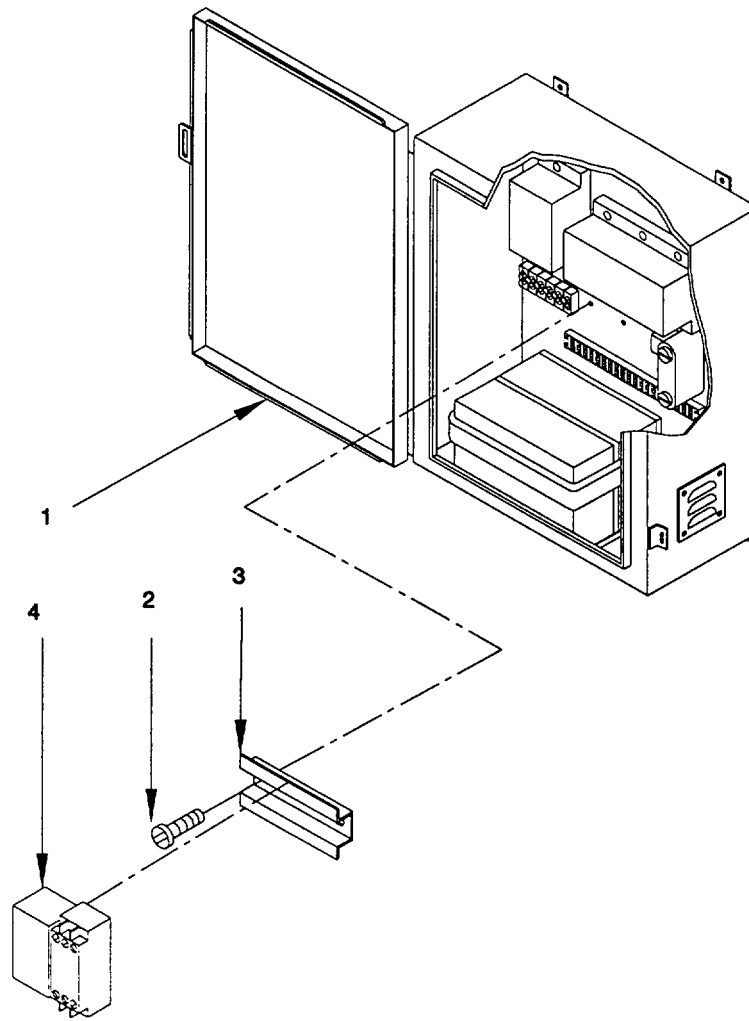


Figure 2-81. Transformer, Pump-Jet Direction/Auxiliary Battery Junction Box "A9", Remove/Install.

2-86. Shunt, Pump-Jet Direction/Auxiliary Battery Junction Box "A9".

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Shunt

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-82)
 - (1) Open door to access interior of junction box (1).
 - (2) Disconnect electrical wiring to junction box A9 (1) and tag OUT OF SERVICE.
 - (3) Remove two pan head screws (2), freeing ammeter shunt (3).
- b. *Install.* (figure 2-82).
 - (1) Position shunt (3) in junction box "A9" and secure with two pan head screws (2).
 - (2) Connect electrical wiring to junction box "A9" (1). Refer to Appendix G.
 - (3) Close door to junction box (1).

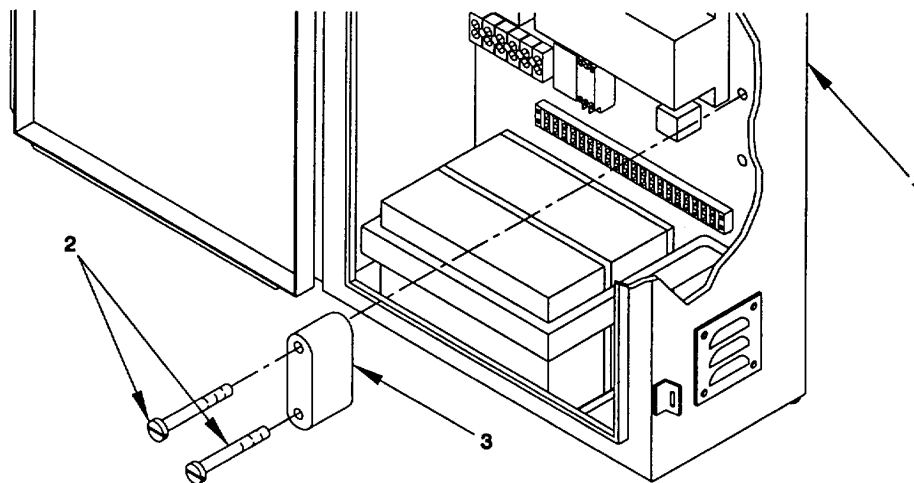


Figure 2-82. Shunt, Pump-Jet Directional/Auxiliary Battery Junction Box "A9", Remove/Install.

2-87. Emergency Steering Unit.

This task covers: a. Remove b. Service c. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

Normal steering malfunctions.

Materials/Parts

Bearing Flange
Grease (Item 23, Appendix F)

a. Remove. (figure 2-83) (Removal from use - not from stowed position)

- (1) Remove three hatch deck flat head screws (3) to free emergency steering unit (1) from pump-jet/thruster hatch (2) Remove unit (1). Replace three flathead screws (3) for storage.
- (2) Secure unit (1) in stowed position located in lazaret compartment with washers (4) and nuts (5).

WARNING

Replace emergency steering hatch on pump-jet/thruster hatch. Failure to comply may result in serious injury to personnel.

- (3) Replace emergency steering hatch cover (6) to pump-jet/thruster hatch (2) and secure with T-wrench.

b. Service. (figure 2-83)

- (1) Grease bearing flange.

c. Install. (figure 2-83)

- (1) Remove three screws and nuts to allow removal of emergency steering hatch (6) from pump-jet/thruster hatch (2) using T-wrench.
- (2) Remove emergency steering unit (1) from lazaret compartment by removing three washers (4) and hatch deck nuts (5) from their storage position in unit. Install washers (4) and hatch deck nuts (5) in unit.

2-87. Emergency Steering Unit (Cont).

NOTE

Do not tighten screws until alignment of steering assembly is completed.

- (3) Position emergency steering unit (1) on pump-jet/thruster hatch (2) while aligning steering unit drive shaft (7) to motor shaft adapter (8). Install three flathead screws (3) to secure unit (1). Do not tighten.
- (4) Check emergency steering unit (1) for proper vertical alignment of driveshaft (7) to assure that binding will not occur when unit is operated.
- (5) When alignment is satisfactory, tighten flat head screws (3). Retain screws (3) and align.

2-221

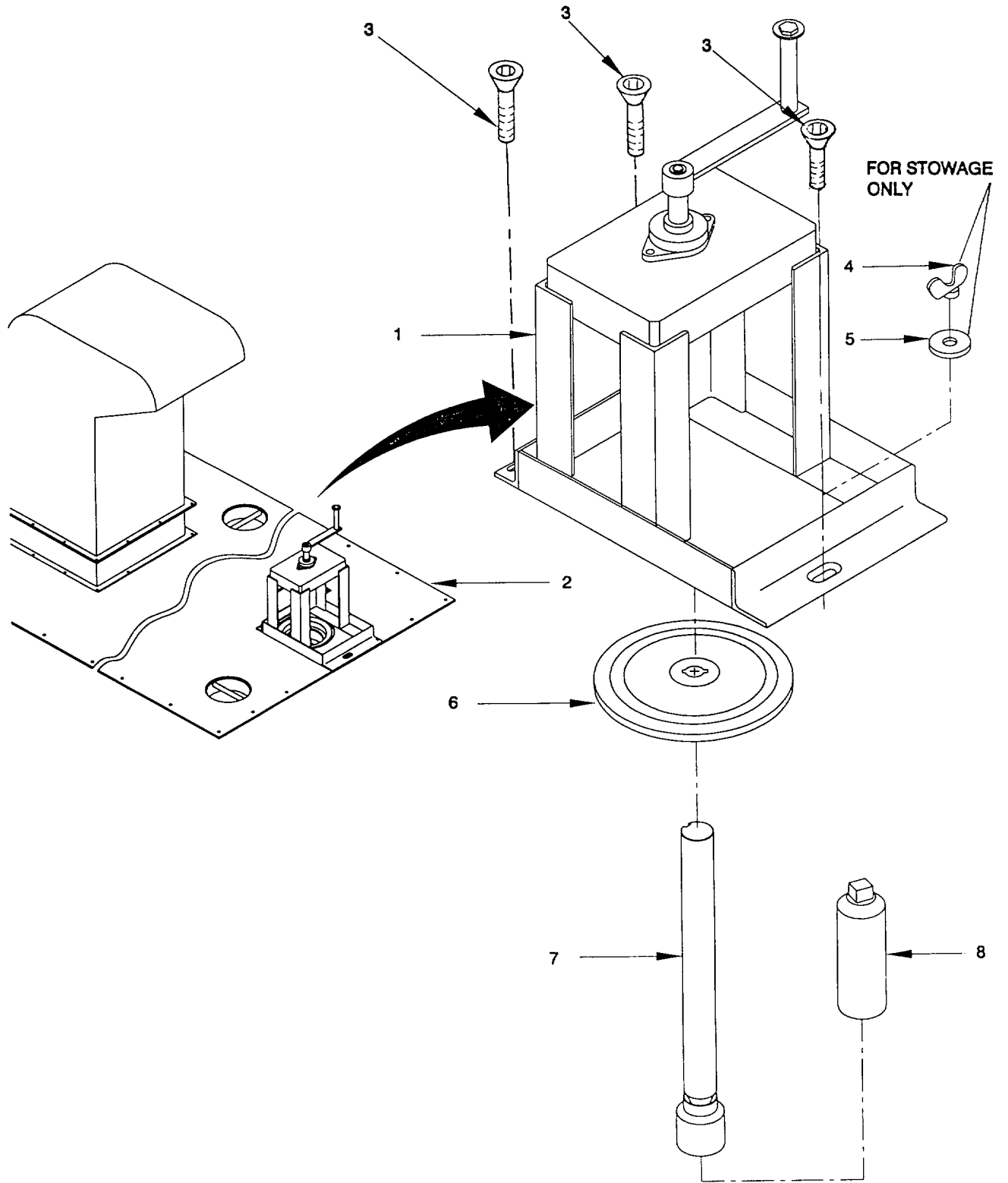


Figure 2-83. Emergency Steering Unit, Remove/Install.

2-88. Emergency Steering Adapter.

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN
5180-00-629-9783)

Equipment Condition

No special conditions.

a. Remove. (figure 2-84)

(1) Loosen setscrew (1) and slide adapter (2) from planetary gear reducer (3). Collect key (4).

b. Install. (figure 2-84)

(1) Position key (4) into planetary gear reducer shaft (3).

(2) Slide adapter (2) onto shaft and secure with setscrew (1).

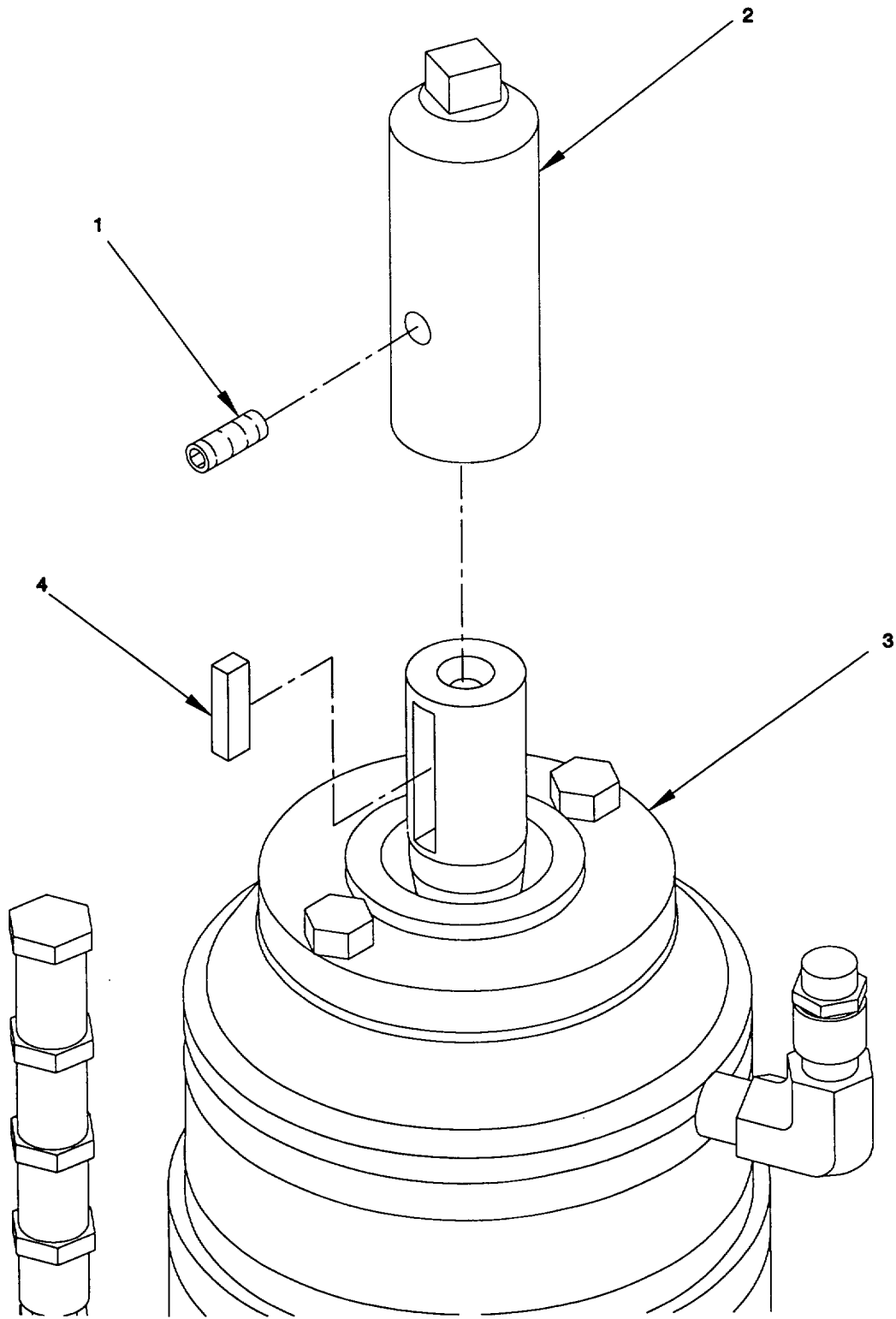


Figure 2-84. Emergency Steering Adapter, Remove/Install.

2-89. P40 40' Non-Powered Pontoon Assembly.

This task covers: a. Service b. Repair c. Adjust d. Test

INITIAL SETUP

Tools

General Mechanics Tool Kit (NSN 5180-00-629-9783)

Material/Parts

Grease, Lubriplate (Item 22, Appendix F)
 Paint, Mid Graphite Grey (Item 37, Appendix F)
 Compressed air source (3 psi)
 Integrity Test Set-up (Figure 2-83 or equivalent)
 Compound, Antiseize (Item 9, Appendix F)

Equipment Condition

Module separated from all other modules.

Module out of water.

WARNING

Grease is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. Service. (figure 2-85)

- (1) Check connector assemblies.
- (2) Push up on retainer on underside of connector pin to release pin from male connector assembly housing. Remove connector pin to expose deployment spring. Remove spring and inspect spring for cracks or cuts (replace as necessary) Lubricate spring using a light coat of lubriplate grease.
- (3) Use a sponge to remove water from lift shackles.
- (4) Wire brush and spot paint any exposed or rusting surfaces.

b. Repair. (figure 2-85)

- (1) Remove interlock connector (1) and connector pin spring (2) in two places from each connector.
- (2) Remove hex nut (3), hex bolt (4), locking plate (5) to free interconnect guillotine (6).
- (3) Remove pipe plug (7) from module (8).
- (4) Replace pipe plug (7) into module (8).
- (5) For each of the six connectors, replace interconnect guillotine (6), position locking plate (5), and secure with hex bolt (4) and hex nut (3).
- (6) Grease each connector pin spring (2). Replace spring (2) and interlock connector (1) in two places on each connector subassembly.

2-89. P40 40' Non-Powered Pontoon Assembly (Cont.)

- c. Adjust. (figure 2-86)

NOTE

Friction Plates apply a force against the guillotine bars, holding them in the up position when raised with pry bars. Do not over tighten friction plate. This will make guillotine bar operation difficult.

- (1) Locate the friction plate for a connector assembly.
- (2) Adjust tightness of the bolt located at each connector location using two standard wrenches, as shown in (Figure 2-82) One standard wrench is used to hold the nut of the friction plate while the other wrench loosens or tightens the assembly.

- d. Test. (figure 2-87)

- (1) Remove pipe plug (7) from one of three locations at side of module (8).
- (2) Install pressure fitting and gauge (typical setup shown in figure 2-87) into module through chosen pipe plug location.

WARNING

Do Not operate air compressor without first observing all safety warnings and carefully reading the operating and maintenance manual. Failure to comply may result in serious injury or death to personnel.

An air pressure regulating valve and a low pressure gauge must be used when pressuring modules. Use 3 psi pressure. Higher pressures may cause explosion. Failure to comply may result in serious injury to personnel.

When performing a pneumatic pressure test of MCF modules, the air compressor operator shall use proper eye protection. Failure to comply may result in serious injury to personnel.

NOTE

Modules may be pressurized and a liquid leak detector applied to weld seams. Leaks can be readily identified where liquid starts to bubble.

Leaky joints must be sealed or welded before use. Water leaking into MCF structure may cause corrosion and metal deterioration.

- (3) Apply pressure with compressor at 3 psi by attaching air hose with test setup (figure 2-87) through MCF module pipe plug location. Hold pressure in module for 5 minutes.
- (4) If 3 psig internal pressure cannot be maintained, apply liquid leak detector to all external seams and weld joints. Inspect all seams for evidence of leakage. Mark modules at all areas of observed leakage. Report any leakage to the next higher maintenance level. Seams must be welded watertight before proceeding with assembly for mission.
- (5) When test is completed satisfactorily, release the pressure from the module.
- (6) Reinstall the plug to the module test location.

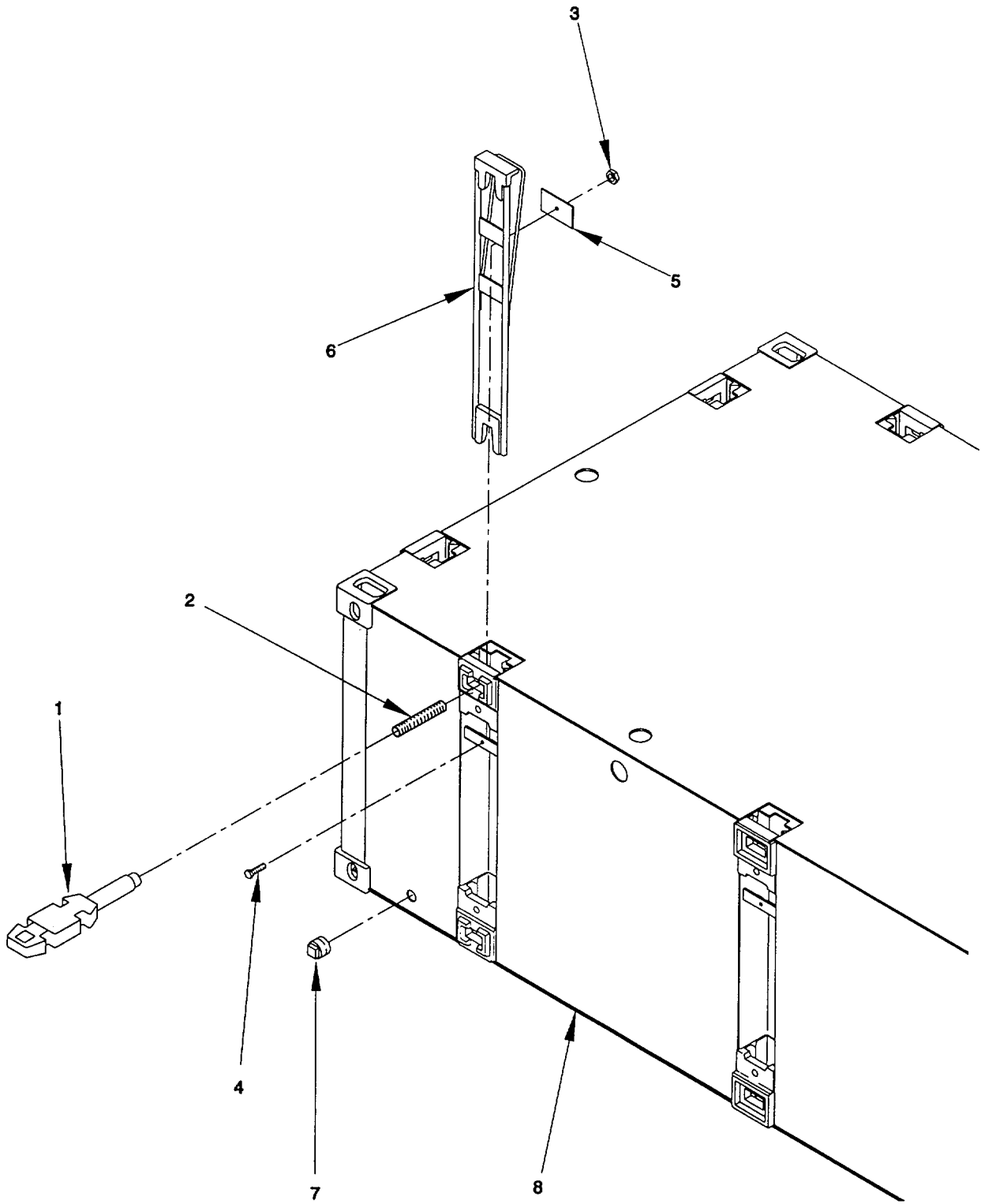


Figure 2-85. P40 40' Non-Powered Pontoon Assembly, Service/Repair

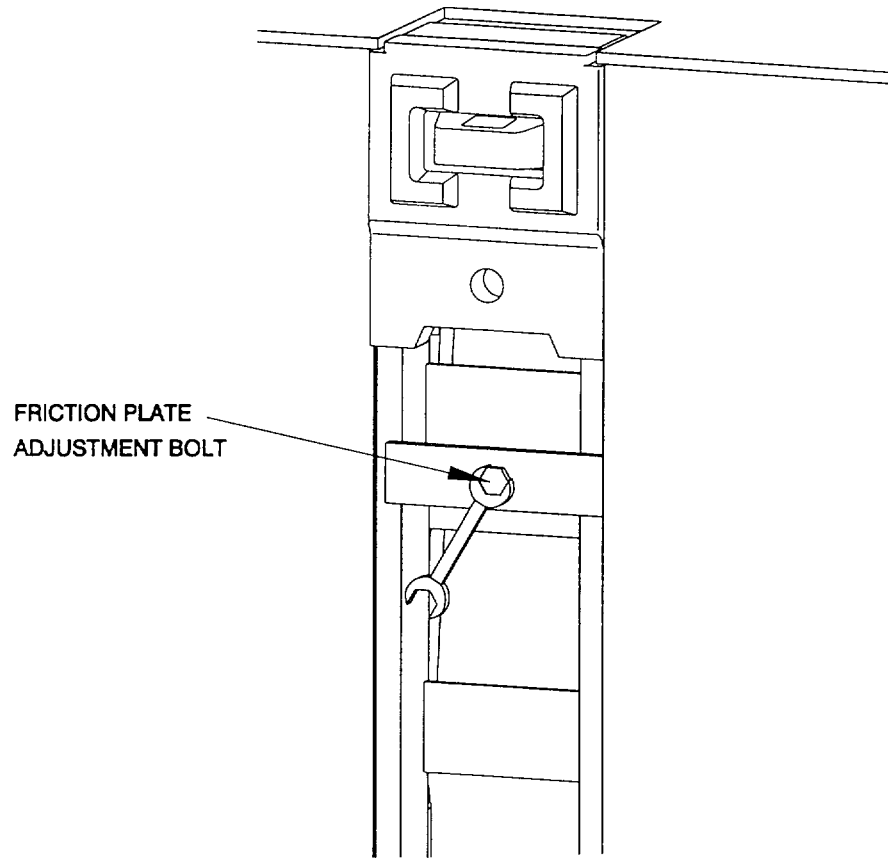


Figure 2-86. P40 40' Non-Powered Pontoon Assembly, Adjustment.

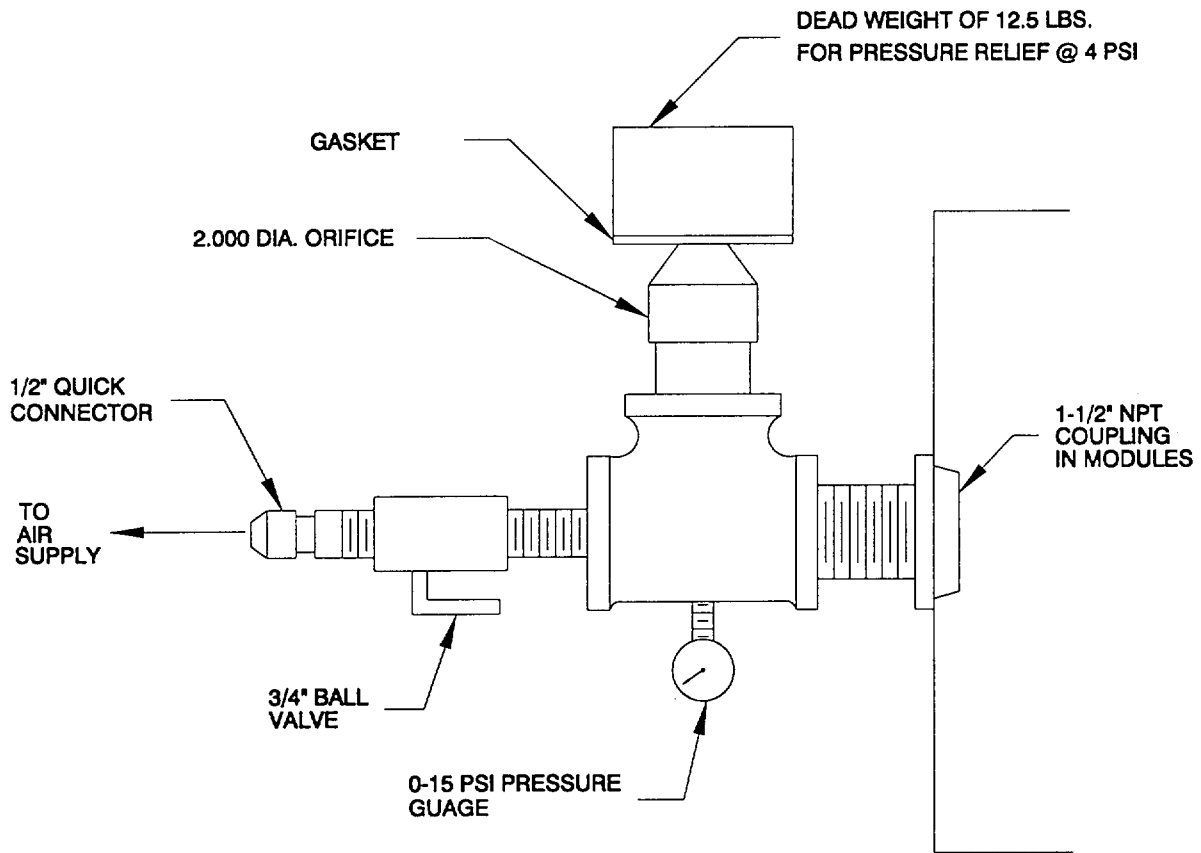


Figure 2-87. Typical Pneumatic Test Setup.

2-90. P20LR 20' Left Raked Pontoon Assembly.

This task covers: a. Service b. Repair c. Adjust d. Test

INITIAL SETUP

Tools

General Mechanics Tool Kit (NSN 5180-00-629-9783)

Material/Parts

Grease, Lubriplate (Item 22, Appendix F)
 Paint, Mid Graphite Grey (Item 37, Appendix F)
 Compressed air source (3 psi)
 Integrity Test Set-up (Figure 2-83 or equivalent)

Equipment Condition

Module separated from all other modules.

Module out of water

WARNING

Grease is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. Service. (figure 2-88)

- (1) Lubricate end rake hatches and hinges.
- (2) Check connector assemblies.
- (3) Push up on retainer on underside of connector pin to release pin from male connector assembly housing. Remove connector pin to expose deployment spring. Remove spring and inspect spring for cracks or cuts (replace as necessary) Lubricate spring using a light coat of lubriplate grease. (4) Use a sponge to remove water from lift shackles.
- (5) Wire brush and spot paint any exposed or rusting surfaces.

b. Repair. (figure 2-88)**NOTE**

For removal of the guillotine and flexor connector assemblies from module, see TM 55-1945-205-10.

- (1) Remove two anchor shackles (1) from chain (2).
- (2) Remove flexor guillotine (3) and hatch assembly (4) from module (12).
- (3) Remove interlock connector (5) and connector pin spring (6) in two places from each connector.
- (4) Remove hex nut (7), hex bolt (8), locking plate (9) to free interconnect guillotine (10).
- (5) Remove pipe plug (11) from module (12).

2-90. P20LR 20' Left Raked Pontoon Assembly (Cont).

- (6) Replace pipe plug (11) into module (12).
- (7) For each of the six connectors, replace interconnect guillotine (10), position locking plate (9), and secure with hex bolt (8) and hex nut (7).
- (8) Grease each connector pin spring (6). Replace spring (6) and interlock connector (5) in two places on each connector subassembly.
- (9) Install hatch assembly (4) and the flexor guillotine (3) onto module (12).
- (10) Install two shackles (1) onto the ends of the chain (2).
- (11) Install shackles (1) and chain (2) to the flexor guillotine (3).

c. Adjust.**NOTE**

Friction Plates apply a force against the guillotine bars, holding them in the up position when raised with pry bars. Do not over tighten friction plate. This will make guillotine bar operation difficult.

- (1) Locate the friction plate for a connector assembly.
- (2) Adjust tightness of the bolt located at each connector location using two standard wrenches, as shown in (Figure 2-86) One standard wrench is used to hold the nut of the friction plate while the other wrench loosens or tightens the assembly.

d. Test.

- (1) Remove pipe plug (11) from one of three locations at side of module (12).
- (2) Install pressure fitting and gauge (typical setup shown in figure 2-87) into module through chosen pipe plug location.

WARNING

Do Not operate air compressor without first observing all safety warnings and carefully reading the operating and maintenance manual. Failure to comply may result in serious injury or death to personnel.

An air pressure regulating valve and a low pressure gauge must be used when pressuring modules. Use 3 psi pressure. Higher pressures may cause explosion. Failure to comply may result in serious injury to personnel.

When performing a pneumatic pressure test of MCF modules, the air compressor operator shall use proper eye protection. Failure to comply may result in serious injury to personnel.

NOTE

Modules may be pressurized and a liquid leak detector applied to weld seams. Leaks can be readily identified where liquid starts to bubble.

Leaky joints must be sealed or welded before use. Water leaking into MCF structure may cause corrosion and metal deterioration.

- (3) Apply pressure with compressor at 3 psi by attaching air hose with test setup (figure 2-87) through MCF module pipe plug (11) location. Hold pressure in module for 5 minutes.

2-90. P20LR 20' Left Raked Pontoon Assembly (Cont).

- (4) If 3 psig internal pressure cannot be maintained, apply liquid leak detector to all external seams and weld joints.
- (5) Inspect all seams for evidence of leakage. Mark modules at all areas of observed leakage.
- (6) Report any leakage to the next higher maintenance level. Seams must be welded watertight before proceeding with assembly for mission.
- (7) When test is completed satisfactorily, release the pressure from the module.
- (8) Reinstall the plug (11) to the module test location.

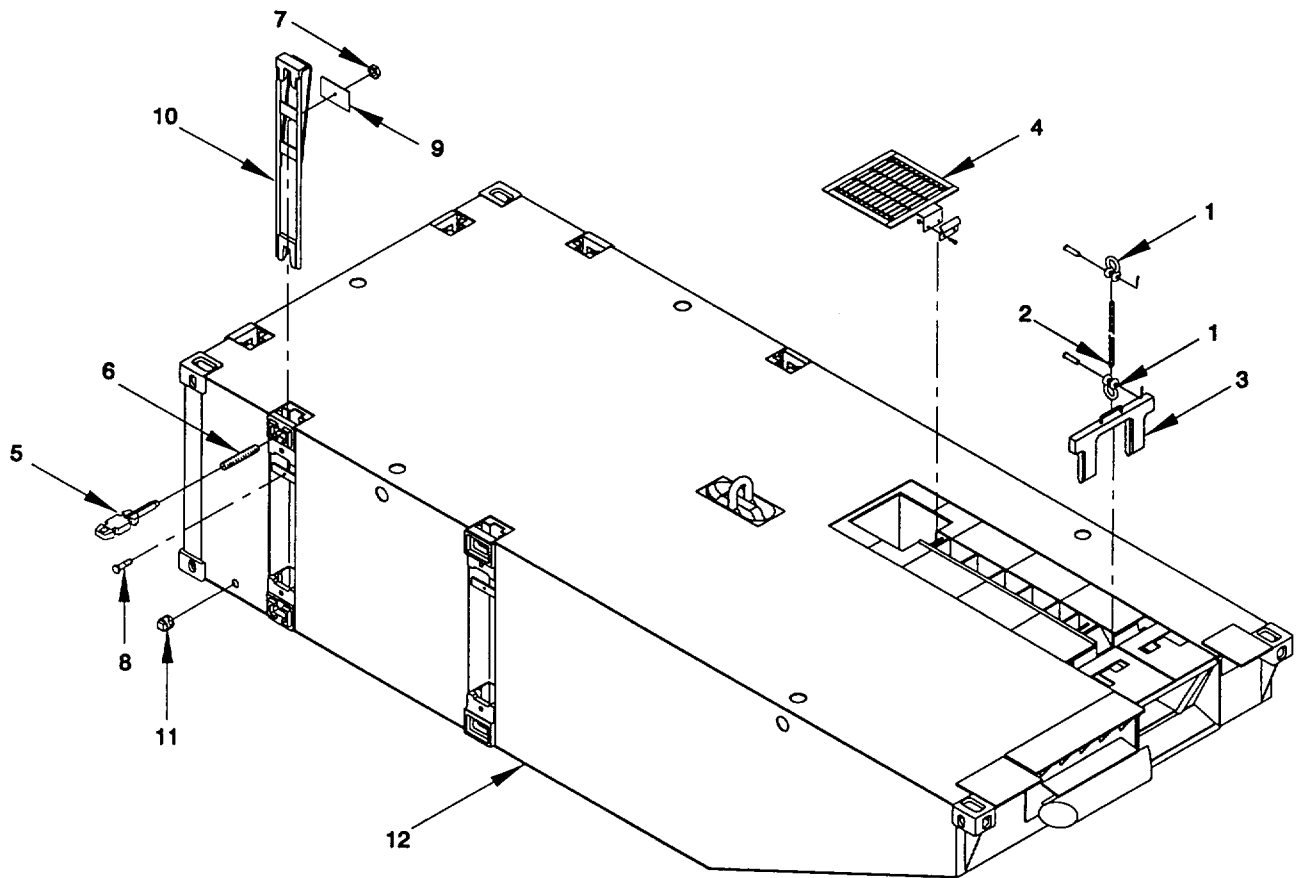


Figure 2-88. P20LR 20' Left Raked Pontoon Assembly, Service/Repair.

2-91. P20CR 20' Center Raked Pontoon Assembly.

 This task covers: a. Service b. Repair c. Adjust d. Test

INITIAL SETUP

Tools

General Mechanics Tool Kit (NSN 5180-00-629-9783)

Equipment Condition

Module separated from all other modules.

Material/Parts

Module out of water.

Grease, Lubriplate (Item 22, Appendix F)

Paint, Mid Graphite Grey (Item 37, Appendix F)

Compressed air source (3 psi)

Integrity Test Set-up (Figure 2-83 or equivalent)

WARNING

Grease is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. Service. (figure 2-89)

(1) Check connector assemblies.

(2) Push up on retainer on underside of connector pin to release pin from male connector assembly housing. Remove connector pin to expose deployment spring. Remove spring and inspect spring for cracks or cuts (replace as necessary) Lubricate spring using a light coat of lubriplate grease.

(3) Use a sponge to remove water from lift shackles.

(4) Wire brush and spot paint any exposed or rusting surfaces.

b. Repair. (figure 2-89)**NOTE**

For removal of the guillotine and flexor connector assemblies from module, see TM 55-1945-205-10.

(1) Remove interlock connector (1) and connector pin spring (2) in two places from each connector.

(2) Remove hex nut (3), hex bolt (4), locking plate (5) to free interconnect guillotine (6).

(3) Remove pipe plug (7) from module (8).

(4) Replace pipe plug (7) into module (8).

(5) For each of the six connectors, replace interconnect guillotine (6), position locking plate (5). And secure with hex bolt (4) and hex nut (3).

2-91. P20CR 20' Center Raked Pontoon Assembly (Cont).

- (6) Grease each connector pin spring (2). Replace spring (2) and interlock connector (1) in two places on each connector subassembly.

c. Adjust.**NOTE**

Friction Plates apply a force against the guillotine bars, holding them in the up position when raised with pry bars. Do not over tighten friction plate. This will make guillotine bar operation difficult.

- (1) Locate the friction plate for a connector assembly.
- (2) Adjust tightness of the bolt located at each connector location using two standard wrenches, as shown in (Figure 2-86) One standard wrench is used to hold the nut of the friction plate while the other wrench loosens or tightens the assembly.

d. Test.

- (1) Remove pipe plug (7) from one of three locations at side of module (8).
- (2) Install pressure fitting and gauge (typical setup shown in figure 2-87) into module through chosen pipe plug location.

WARNING

Do Not operate air compressor without first observing all safety warnings and carefully reading the operating and maintenance manual. Failure to comply may result in serious injury or death to personnel.

An air pressure regulating valve and a low pressure gauge must be used when pressuring modules.

Use 3 psi pressure. Higher pressures may cause explosion. Failure to comply may result in serious injury to personnel.

When performing a pneumatic pressure test of MCF modules, the air compressor operator shall use proper eye protection. Failure to comply may result in serious injury to personnel.

NOTE

Modules may be pressurized and a liquid leak detector applied to weld seams. Leaks can be readily identified where liquid starts to bubble.

Leaky joints must be welded before use. Water leaking into MCF structure may cause corrosion and metal deterioration.

- (3) Apply pressure with compressor at 3 psi by attaching air hose with test setup (figure 2-87) through MCF module pipe plug location. Hold pressure in module for 5 minutes.
- (4) If 3 psig internal pressure cannot be maintained, apply liquid leak detector to all external seams and weld joints. Inspect all seams for evidence of leakage. Mark modules at all areas of observed leakage. Report any leakage to the next higher maintenance level. Seams must be welded watertight before proceeding with assembly for mission.

2-91. P20CR 20' Center Raked Pontoon Assembly (Cont).

- (5) When test is completed satisfactorily, release the pressure from the module.
- (6) Reinstall the plug to the module test location.

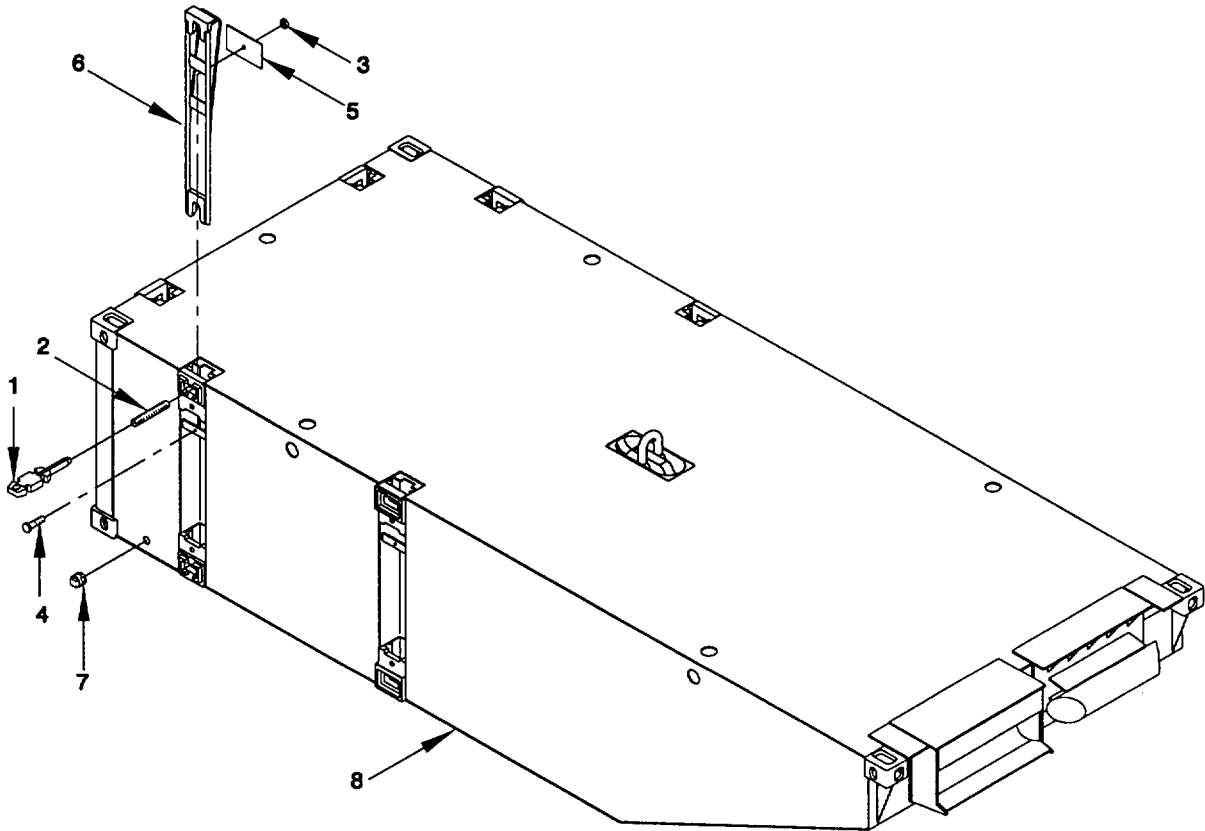


Figure 2-89. P20CR 20' Center Raked Pontoon Assembly, Service/Repair.

2-92. P20RR 20' Right Raked Pontoon Assembly.

This task covers: a. Service b. Repair c. Adjust d. Test

INITIAL SETUP*Tools*

General Mechanics Tool Kit (NSN 5180-00-629-9783)

Material/Parts

Grease, Lubriplate (Item 22, Appendix F)
 Paint, Mid Graphite Grey (Item 37, Appendix F)
 Compressed air source (3 psi)
 Integrity Test Set-up (Figure 2-83 or equivalent)

Equipment Condition

Module separated from all other modules.

Module out of water.

WARNING

Grease is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. Service. (figure 2-90)

- (1) Lubricate end rake hatches (4) and hinges.
- (2) Check connector (5) assemblies.
- (3) Push up on retainer on underside of connector pin to release pin from male connector assembly housing. Remove connector pin to expose deployment spring. Remove spring and inspect spring for cracks or cuts (replace as necessary) Lubricate spring using a light coat of lubriplate grease.
- (4) Use a sponge to remove water from lift shackles.
- (5) Wire brush and spot paint any exposed or rusting surfaces.

b. Repair. (figure 2-90)**NOTE**

For removal of the guillotine and flexor connector assemblies from module, see TM 55-1945-205-10.

- (1) Remove two anchor shackles (1) from chain (2).
- (2) Remove flexor guillotine (3) and hatch assembly (4) from module (12).
- (3) Remove interlock connector (5) and connector pin spring (6) in two places from each connector.
- (4) Remove hex nut (7), hex bolt (8), locking plate (9) to free interconnect guillotine (10).
- (5) Remove pipe plug (11) from module (12).

2-92. P20RR 20' Right Raked Pontoon Assembly (Cont).

- (6) Replace pipe plug (11) into module (12).
- (7) For each of the six connectors, replace interconnect guillotine (10), position locking plate (9), and secure with hex bolt (8) and hex nut (7).
- (8) Grease each connector pin spring (6). Replace spring (6) and interlock connector (5) in two places on each connector subassembly.
- (9) Install hatch assembly (4) and the flexor guillotine (3) onto module (12).
- (10) Install two shackles (1) onto the ends of the chain (2).
- (11) Install shackles (1) and chain (2) to the flexor guillotine (3).

c. Adjust.**NOTE**

Friction Plates apply a force against the guillotine bars, holding them in the up position when raised with pry bars. Do not over tighten friction plate. This will make guillotine bar operation difficult.

- (1) Locate the friction plate for a connector assembly.
- (2) Adjust tightness of the bolt located at each connector location using two standard wrenches, as shown in (Figure 2-86) One standard wrench is used to hold the nut of the friction plate while the other wrench loosens or tightens the assembly.

d. Test.

- (1) Remove pipe plug (7) from one of three locations at side of module (8).
- (2) Install pressure fitting and gauge (typical setup shown in figure 2-87) into module through chosen pipe plug location.

2-92. P20RR 20' Right Raked Pontoon Assembly (Cont).**WARNING**

Do Not operate air compressor without first observing all safety warnings and carefully reading the operating and maintenance manual. Failure to comply may result in serious injury or death to personnel.

An air pressure regulating valve and a low pressure gauge must be used when pressuring modules.

Use 3 psi pressure. Higher pressures may cause explosion. Failure to comply may result in serious injury to personnel.

When performing a pneumatic pressure test of MCF modules, the air compressor operator shall use proper eye protection. Failure to comply may result in serious injury to personnel.

NOTE

Modules may be pressurized and a liquid leak detector applied to weld seams. Leaks can be readily identified where liquid starts to bubble. Leaky joints must be sealed or welded before use. Water leaking into MCF structure may cause corrosion and metal deterioration.

- (3) Apply pressure with compressor at 3 psi by attaching air hose with test setup (figure 2-87) through MCF module pipe plug location. Hold pressure in module for 5 minutes.
- (4) If 3 psig internal pressure cannot be maintained, apply liquid leak detector to all external seams and weld joints. Inspect all seams for evidence of leakage. Mark modules at all areas of observed leakage. Report any leakage to the next higher maintenance level. Seams must be welded watertight before proceeding with assembly for mission.
- (5) When test is completed satisfactorily, release the pressure from the module.
- (6) Reinstall the plug to the module test location.

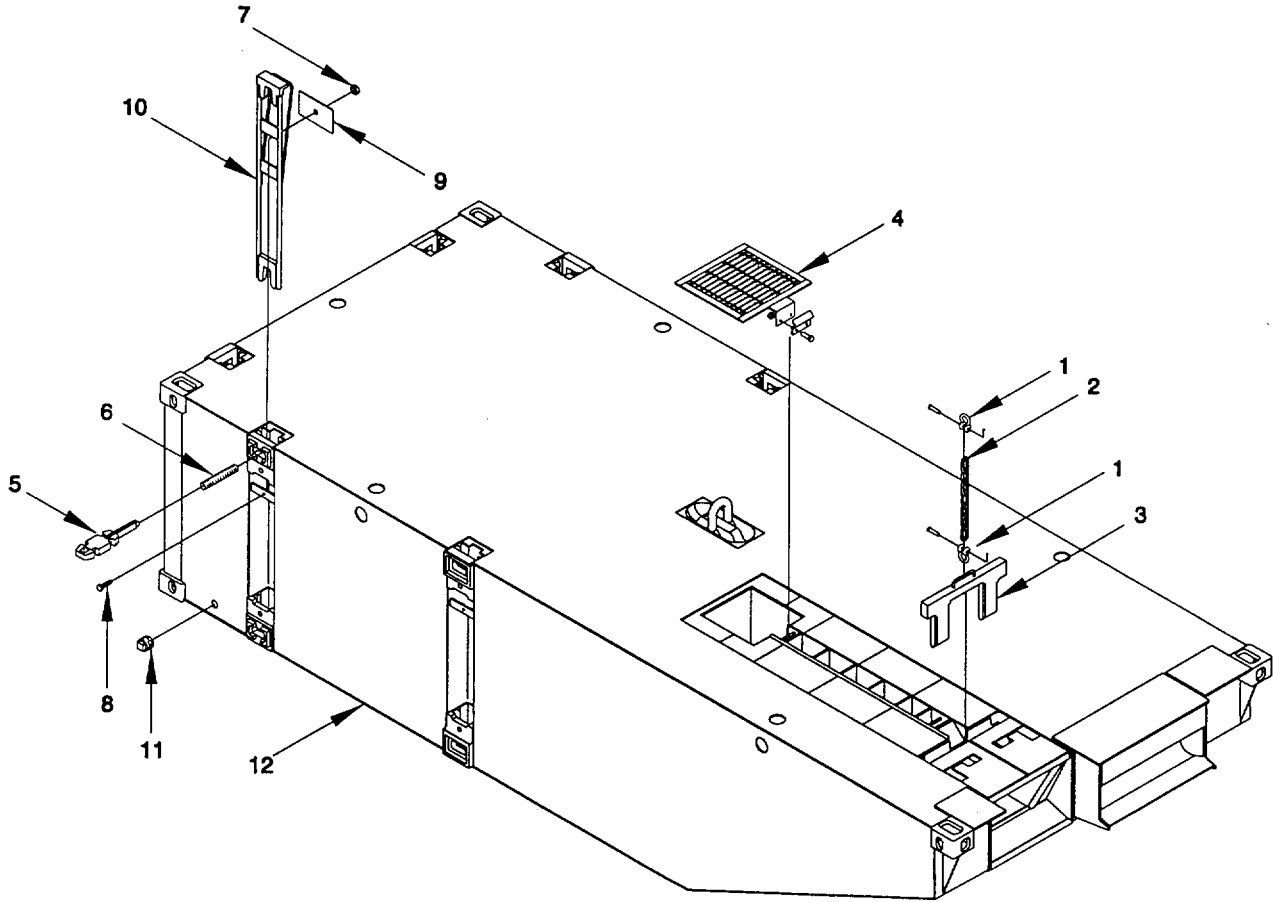


Figure 2-90. P20RR 20' Right Raked Pontoon Assembly, Service/Repair.

2-93. Flexor Assembly, Pontoon Assemblies.

This task covers: a. Inspect

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Flexor Assembly

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE.

Flexor Separated from Pontoon Assembly..

a. *Inspect.* (figure 2-91)

- (1) Inspect middle polyurethane section of flexor connector for peeling or absence of chunks of polyurethane. Flexor must be discarded if any is noted.
- (2) Check that joints between metal ends and polyurethane mid-section of flexor is not separating. If separation is noted, flexor must be discarded.
- (3) Check that metal ends are not cracked, bent or corroded. If any bends, cracks or corrosion is noted, flexors must be discarded.

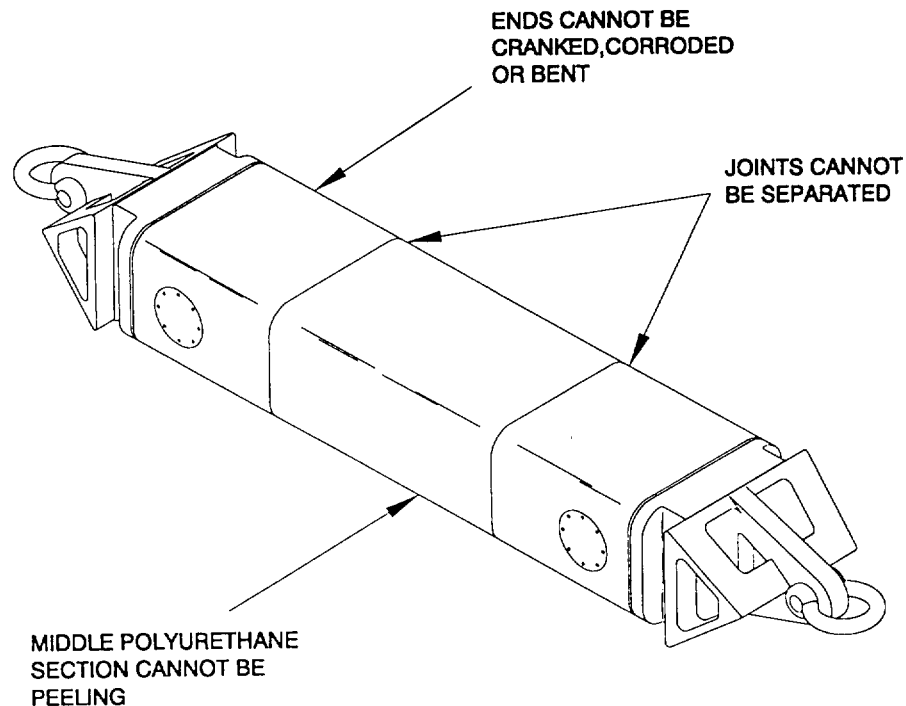


Figure 2-91. Flexor, Pontoon Assemblies, Inspect.

2-94. Pontoon Assemblies, Pneumatic Test.

 This task covers: a. Test

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Compressed air source (3 psi)
Integrity Test Set-up (Figure 2-87 or equivalent)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE.

Module separated from all other modules.

Module out of water.

a. Test. (figure 2-87)

- (1) Remove pipe plug (7) from one of three locations at side of module (8).
- (2) Install pressure fitting and gauge (typical setup shown in figure 2-87) into module through chosen pipe plug location.

WARNING

Do Not operate air compressor without first observing all safety warnings and carefully reading the operating and maintenance manual. Failure to comply may result in serious injury or death to personnel.

An air pressure regulating valve and a low pressure gauge must be used when pressuring modules.

Use 3 psi pressure. Higher pressures may cause explosion. Failure to comply may result in serious injury to personnel.

When performing a pneumatic pressure test of MCF modules, the air compressor operator shall use proper eye protection. Failure to comply may result in serious injury to personnel.

NOTE

Modules may be pressurized and a liquid leak detector applied to weld seams. Leaks can be readily identified where liquid starts to bubble.

Leaky joints must be sealed or welded before use. Water leaking into MCF structure may cause corrosion and metal deterioration.

- (3) Apply pressure with compressor at 3 psi by attaching air hose with test setup (figure 2-87) through MCF module pipe plug location. Hold pressure in module for 5 minutes.
- (4) If 3 psig internal pressure cannot be maintained, apply liquid leak detector to all external seams and weld joints. Inspect all seams for evidence of leakage. Mark modules at all areas of observed leakage. Report any leakage to the next higher maintenance level. Seams must be welded watertight before proceeding with assembly for mission.

2-94. Pontoon Assemblies, Pneumatic Test (Cont).

- (5) When test is completed satisfactorily, release the pressure from the module.
- (6) Reinstall the plug to the module test location.

2-95. Operator Cab Assembly.

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Operator Cab Assembly

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Main mast assembly removed (paragraph 2-169).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

Operator's cab weighs approximately 2600 lbs. Use appropriate lifting devices when removing or installing. Failure to comply can result in serious injury to personnel.

Ensure heater hoses are cool before removing. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-92)

- (1) Remove twelve hex head capscrews (1) and twelve lockwashers (2) to remove two access covers (3) and two gasket (4).
- (2) Tag and disconnect the six electrical connectors (Port P1, P2, P3; Stbd P1, P2, P3) connecting the cab to the powered modules. Refer to Appendix G.
- (3) Remove four hex nuts (5) and four lockwashers (6) to remove module electrical interconnect assembly from the cab.
- (4) Disconnect the wire rope assembly (7) from the fire suppression pressure trip.
- (5) Disconnect the two heater hose assemblies (8) from the diesel engine at the male quick disconnect (9) and female quick disconnect (10).
- (6) Remove fourteen hex head capscrews (11) securing cab assembly (12). Using adequate lifting devices, remove the cab assembly (12) and gasket (13).
- (7) For shipment of the assembled cab (12), the interconnect cover (14) and gasket (15) cover the access opening for the module electrical interconnect assembly.

b. *Install.* (figure 2-92)

- (1) Position gasket (13) on module and lower cab assembly (12) using adequate lifting devices. Secure cab assembly (12) with fourteen hex head capscrews (11).

2-95. Operator Cab Assembly (Cont).

- (2) Reconnect two heater hose assemblies (8) to the diesel engine with the male quick disconnect (9) and female quick disconnect (10)
- (3) Reconnect wire rope assembly (7) to fire suppression pressure trip.
- (4) Remove four hex nuts (5) and four lock washers (6) securing interconnect cover (14) and gasket (15). Replace interconnect cover (14) and gasket (15) with module electrical interconnect assembly and secure with four lock washers (6) and four hex nuts (5).
- (5) Reconnect six electrical connectors (Port P1, P2, P3; Stbd P1, P2, P3), as tagged, to the powered modules. Refer to Appendix G.
- (6) Position two gaskets (4) and two access covers (3) and secure with twelve hex head capscrews (1) and twelve lock washers (2)

FOLLOW ON MAINTENANCE: Install main mast assembly (paragraph 2-169).

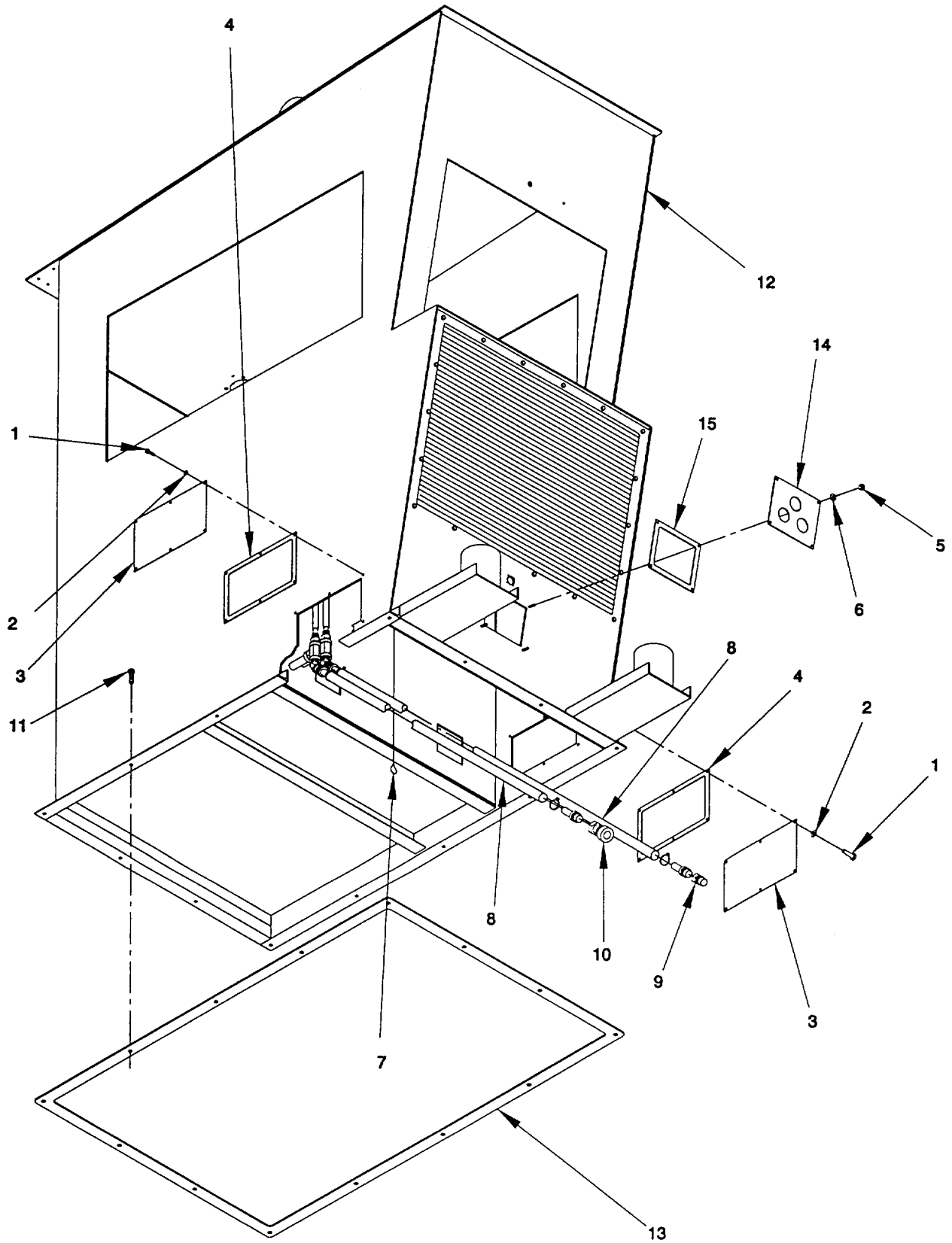


Figure 2-92. Operator Cab Assembly, Remove/install

2-96. Navigational Horn.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Navigational Horn
Compound, Antiseize (Item 9, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-93)

- (1) Remove the three self locking hex nuts (1) and lift the navigational horn (2) from the studs on the roof of the cab.
- (2) Unscrew pipe reducer (3) and stuffing tube (4) from horn. Unscrew cap of horn and remove to access wiring. Disconnect the three electrical leads (5). Tag all horn electrical wires.
- (3) Remove the cable (6) from pipe reducer (3), stuffing tube (4), packing (7), and grounding gasket (8).

b. Install. (figure 2-93)

- (1) The entrance of the cable (1) from the navigational horn (3) into the cab shall be grounded and bonded with grounding gasket (8) antiseize compound and adhesive. Refer to Appendix G.
- (2) Thread electrical cable (6) through the grounding gasket (8), packing (7), stuffing tube (4) and pipe reducer (3) to the horn.
- (3) Reconnect three leads (5), as tagged, to horn and install horn cap. Refer to Appendix G for proper wiring information.
- (4) The Position new navigational horn (2) on roof of cab and secure with three self locking hex nuts (1).

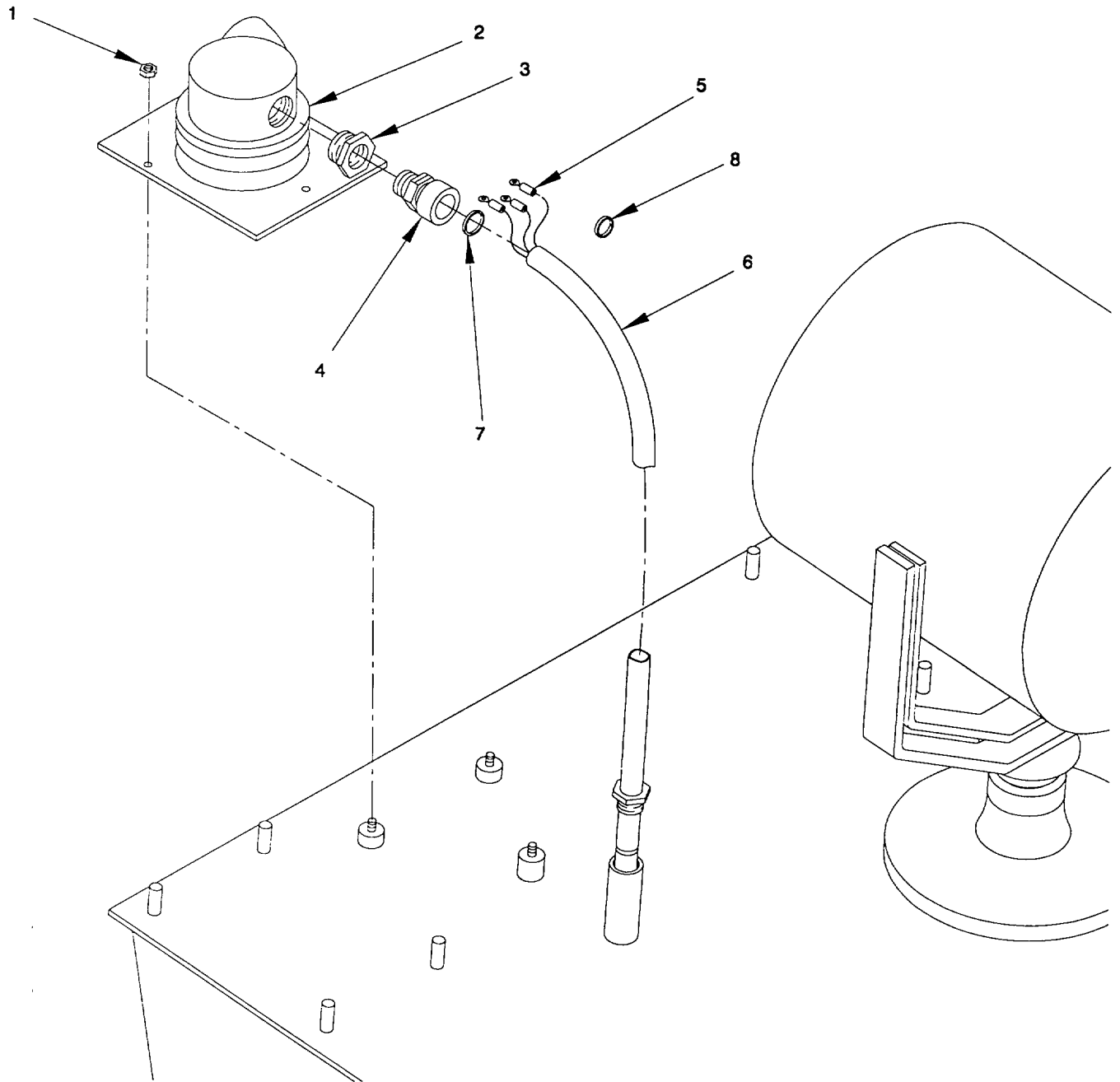


Figure 2-93. Navigational Horn, Remove/Install

2-97. Battle Lantern.

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Battle Lantern

a. *Remove.* (figure 2-94)

Unhook battle lantern (1) from battle lantern stowage bracket (2) in cab.

b. *Install.* (figure 2-94)

Replace battle lantern (1) by hooking new battle lantern (1) on battle lantern stowage bracket (2) in cab.

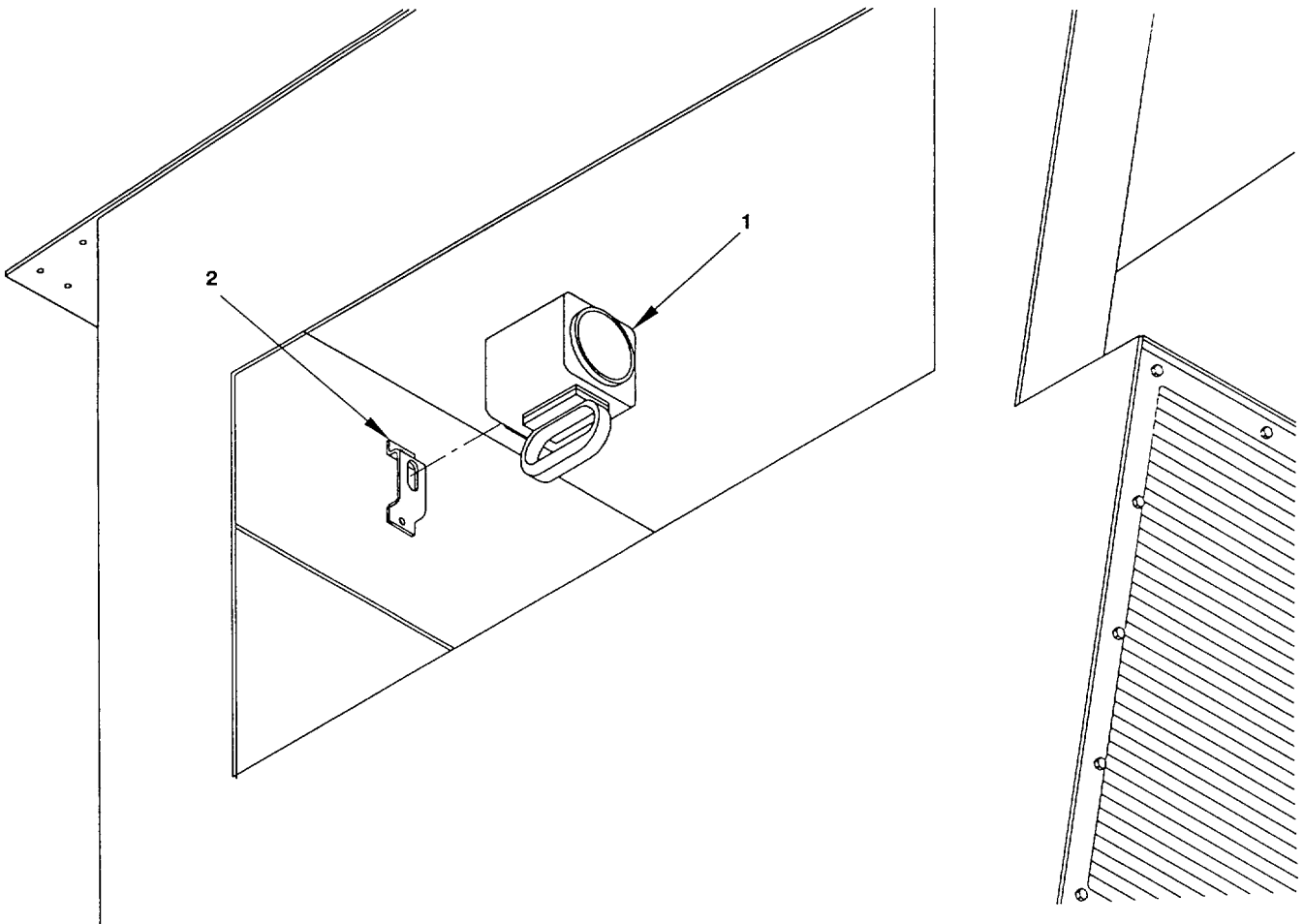


Figure 2-94. Battle Lantern, Remove/Install.

2-98. Battery, Battle Lantern.**This task covers:****a. Remove****b. Install****INITIAL SETUP:**

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

Battle lantern removed (paragraph 2-97)

Materials/Parts

Battery
Lamp**a. *Remove.*** (figure 2-95)

- (1) Remove four cover screws (1) and remove cover (2) from lamp (3) and body assembly (5).
- (2) Remove lamp (3) from body assembly (5). Replace lamp (3), as necessary.
- (3) Remove two batteries (4) from body assembly (5).
- (4) Dispose of batteries per appropriate MSDS.

b. *Install.* (figure 2-95)

- (1) Install new batteries (4) in body assembly (5).
- (2) Install lamp (3) in body assembly (5).
- (3) Install cover (2) on lamp (3) and body assembly (5). Secure cover (2) with four cover screws (1).

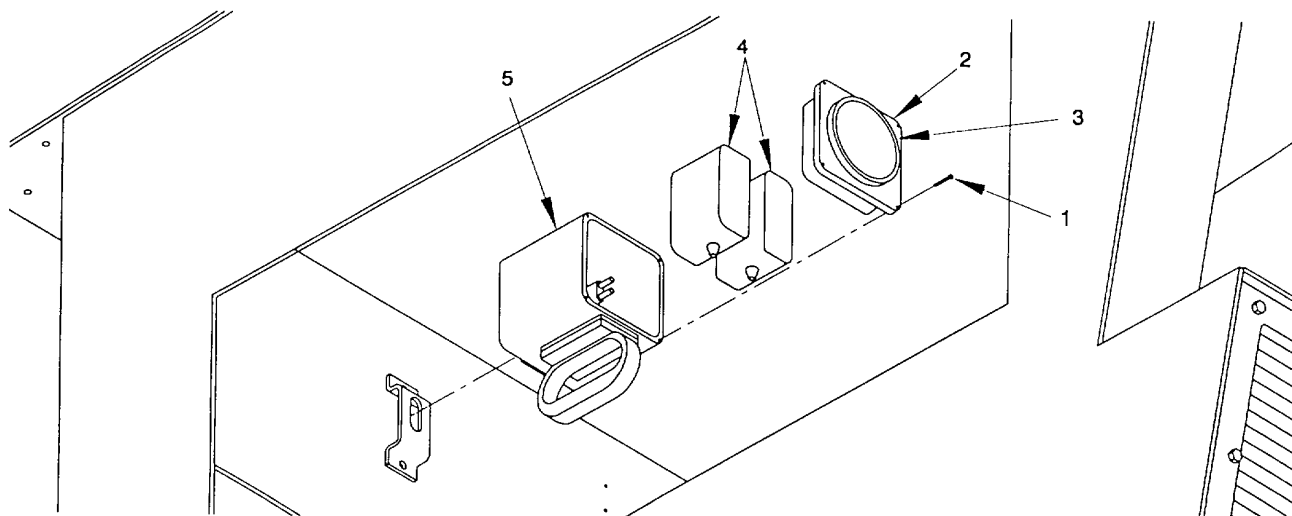


Figure 2-95. Battery, Battle Lantern, Remove/Install
2-249

2-99. Compass.

This task covers:**a. Remove****b. Install**

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

No special conditions.

*Materials/Parts*Compass

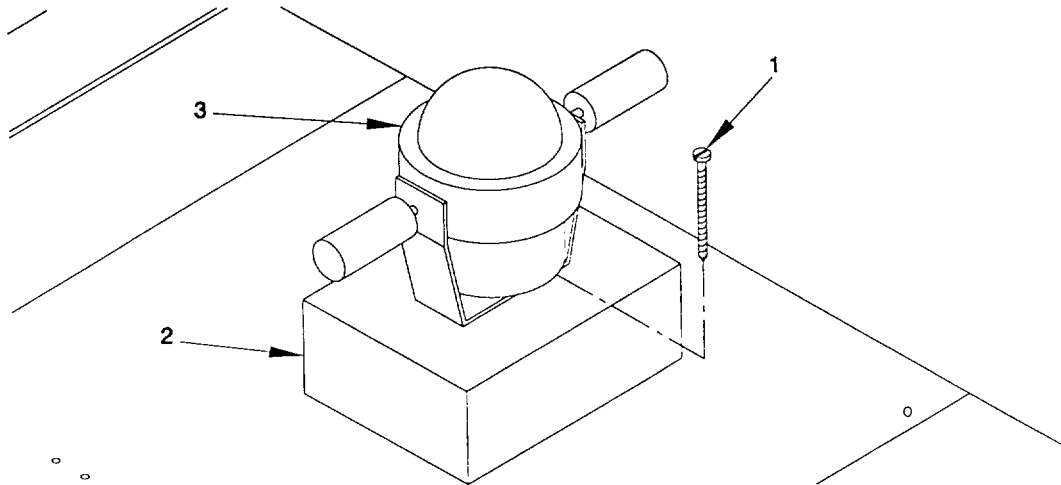
a. Remove. (figure 2-96)

(1) Remove two pan head screws (1) from wooden base (2) to remove the compass (3),

b. Install. (figure 2-96)

(1) Position wooden base (2) and new compass (3). Secure with two pan head screws (1).

(2) Reassess deviation card.

*Figure 2-96. Compass, Remove/Install.*

2-100. Windshield Wiper Motor.

This task covers:**a. Remove****b. Install**

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

*Materials/Parts*Windshield Wiper Motor
Compound, Antiseize (Item 9, Appendix F)*Equipment Condition*

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Windshield wiper arm removed (paragraph 2-101)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-97)

- (1) Tag and disconnect electrical wires to windshield wiper motor (4). Refer to Appendix G.
- (2) To remove the windshield wiper motor (4), remove the lock nut (1) from the motor output shaft and remove the pan head screw (2) and lockwasher (3). Remove the windshield wiper motor (4) from the interior or the cab.

b. *Install.* (figure 2-97)

- (1) Apply antiseize compound to pan head screw (2).
- (2) Position new windshield wiper motor (4) from interior of cab. Secure with pan head screw (2), lock washer (3) and lock nut (1).
- (3) Reconnect electrical wires, as tagged, to windshield wiper motor (4). Refer to Appendix G.

FOLLOW ON MAINTENANCE: Install windshield wiper arm (paragraph 2-101)

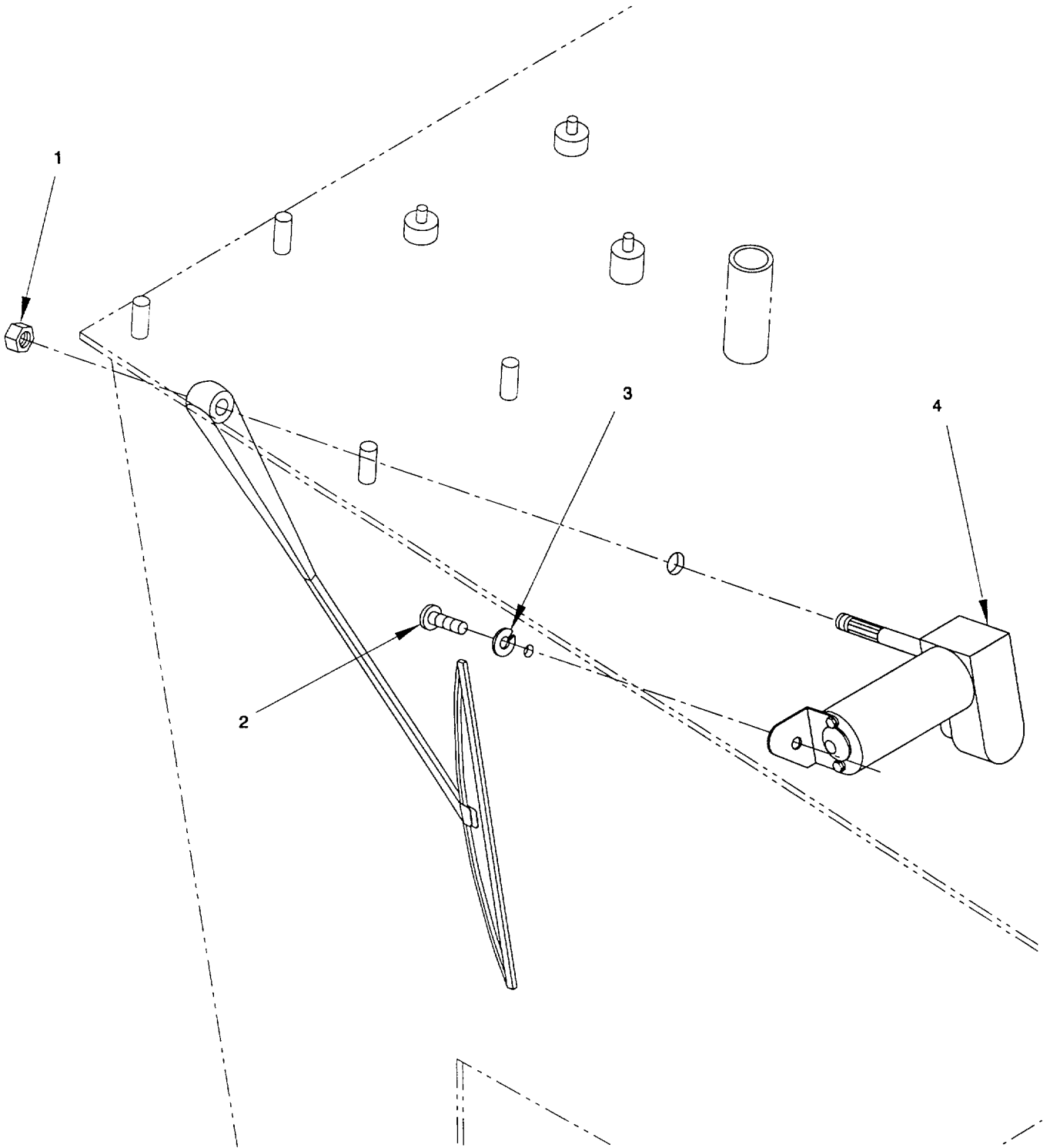


Figure 2-97. Windshield Wiper Motor, Remove/Install

2-101. Wiper Arm.

This task covers:

a. Remove

b. Install

INITIAL SETUP:

Tools

General Mechanic's Tool Kit, Rail and Marine
5180-00-629-9783)

Materials/Parts

(NSN Wiper Arm

a. Remove. (figure 2-98)

- (1) Remove wiper blade (1) from wiper arm (2).
- (2) Remove wiper arm (2) from windshield wiper motor (3).

b. Install. (figure 2-98)

- (1) Install new wiper arm (2) on windshield wiper motor (3).
- (2) Install wiper blade (1) on wiper arm (2).

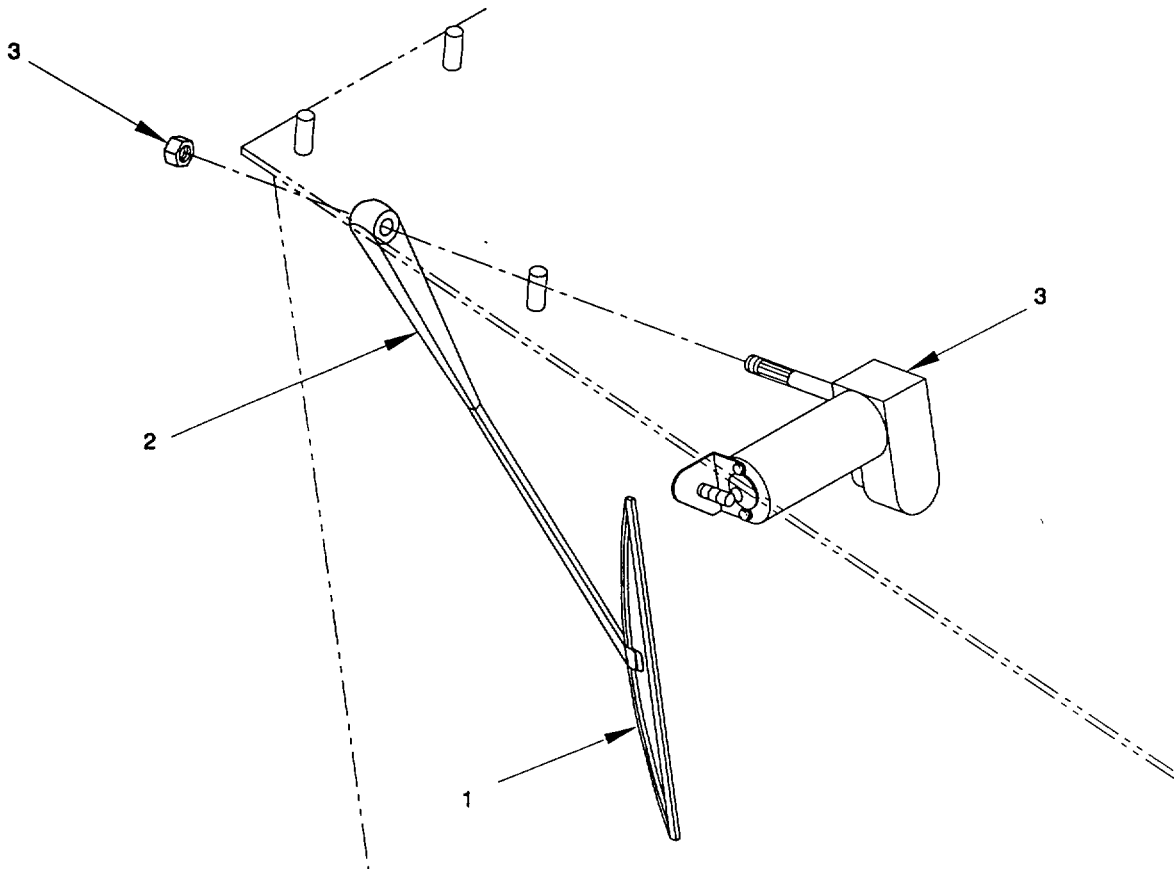


Figure 2-98. Wiper Arm, Remove/Install

2-102. Wiper Blade.

This task covers:

a. Remove

b. Install

INITIAL SETUP:

Tools

Materials/Parts

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Wiper Blade

a. Remove. (figure 2-99)

Remove wiper blade (1) from wiper arm (2).

b. Install. (figure 2-99)

Install new wiper blade (1) on wiper arm (2).

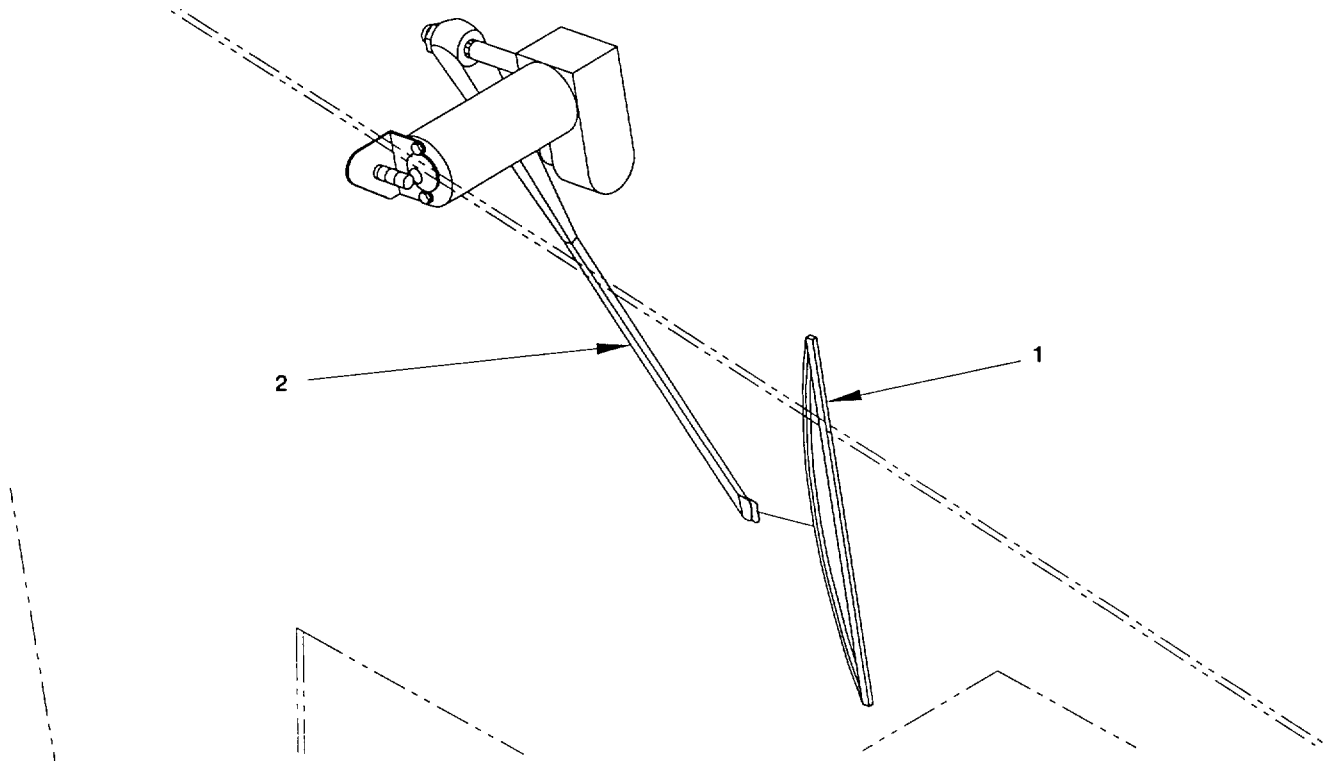


Figure 2-99. Wiper Blade, Remove/Install

2-103. Receiver/ Transmitter (Triton).**This task covers:** a. **Remove** b. **Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

Power off to battery charger.

Materials/Parts

Receiver/Transmitter

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-100)

- (1) Remove receiver/transmitter (1) from battery charger (2).
- (2) If removing charger (3), disconnect electrical wiring at the A3 panel and remove through grommet near compass on control console. Refer to Appendix G for electrical wiring information.

b. *Install.* (figure 2-100)

- (1) If installing new wiring, thread it through the grommet in the control console to the charger (3).
- (2) Install new receiver/transmitter (1) in battery charger (2).
- (3) Connect electrical wiring in accordance with Appendix G.

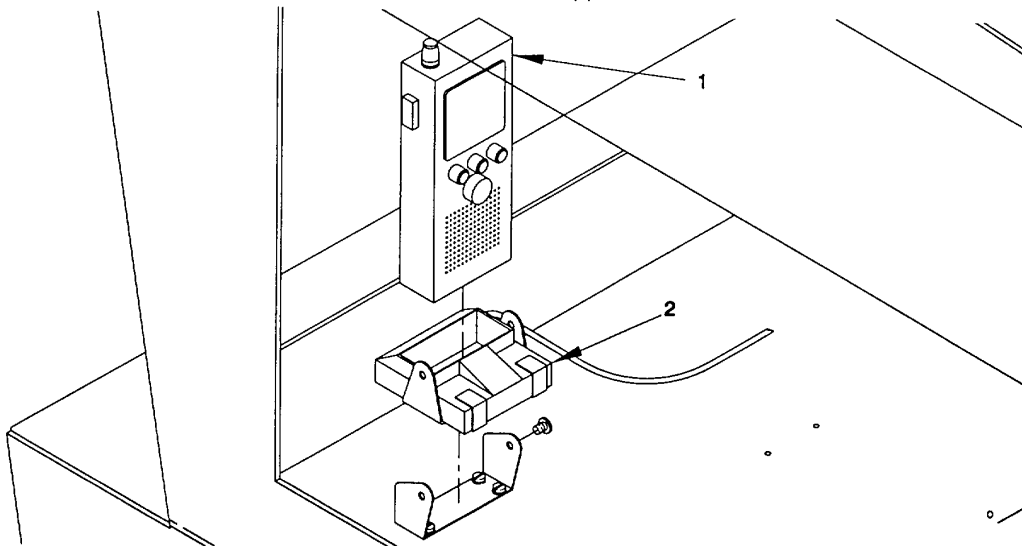


Figure 2-100. Receiver/Transmitter (Triton), Remove/install.

2-104. Battery Pack, Triton Receiver/ Transmitter.**This task covers:****a. Remove****b. Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN
5180-00-629-9783)

Equipment Condition

Power off to battery charger.

Receiver/transmitter removed (paragraph 2-103).

Materials/Parts

Battery Pack

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-101)

- (1) Remove cover on receiver/transmitter (1).
- (2) Remove battery pack (2) from receiver/transmitter (1).

b. *Install.* (figure 2-101)

- (1) Install new battery pack (2) in receiver/transmitter (1).
- (2) Install cover on receiver/transmitter (1).

FOLLOW ON MAINTENANCE: Install receiver/transmitter (paragraph 2-103).

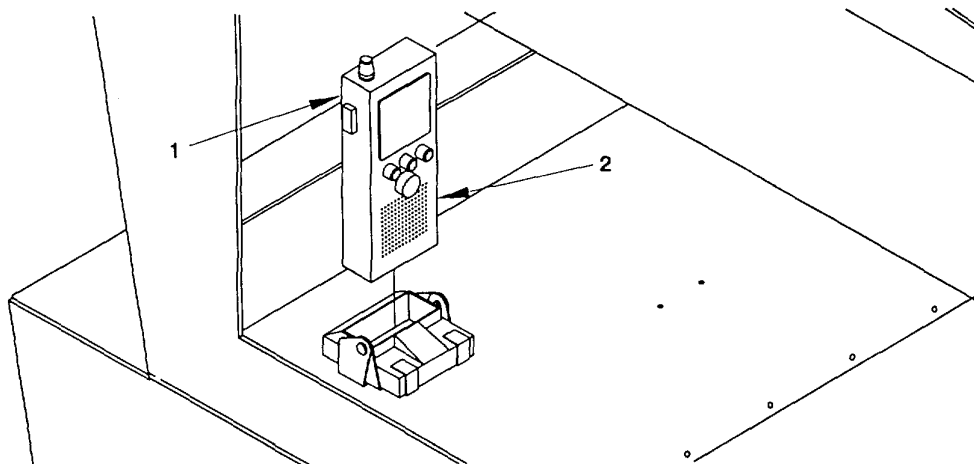


Figure 2-101. Battery Pack, Triton Receiver/Transmitter, Remove/Install

2-105. Navigation Bell.**This task covers:****a. Remove****b. Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN
5180-00-629-9783)

Materials/Parts

Navigation Bell
Compound, Antiseize (Item 9, Appendix F)

a. Remove. (figure 2-102)

- (1) Remove the four pan head capscrews (1) and four lock washers (2) securing navigation bell (3). Remove navigation bell (3).
- (2) Remove rope (4) from navigation bell (3).

b. Install. (figure 2-102)

- (1) Apply antiseize compound to threads on pan head capscrews (1).
- (2) Install rope (4) on new navigation bell (3).
- (3) Position navigation bell (3) on cab. Secure with four pan head capscrews (1) and four lock washers (2).

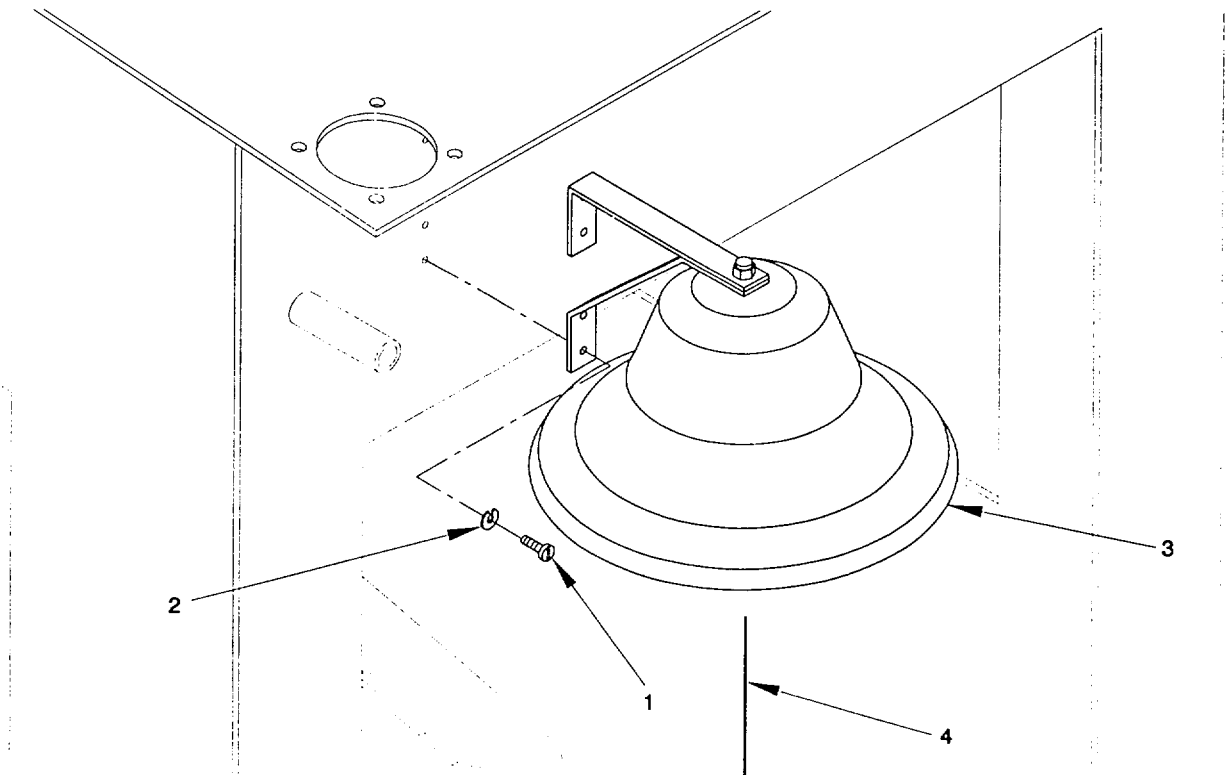


Figure 2-102. Navigation Bell, Remove/Install.

2-106. Battery Charge, Triton Receiver/ Transmitter.

This task covers:**a. Remove****b. Install**

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

*Materials/Parts*Battery Charger
Compound. Antiseize (Item 9, Appendix F)*Equipment Condition*

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Receiver/transmitter removed (paragraph 2-103).

WARNING**When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.****a. *Remove.*** (figure 2-103)

- (1) Tag and disconnect electrical wiring to battery charger (4). Refer to Appendix G.
- (2) Remove the four pan head screws (1) and four lock washers (2) securing bracket (3). Remove bracket (3) and battery charger (4).

b. *Install.* (figure 2-103)

- (1) Apply antiseize compound to threads on pan head screws (1).
- (2) Position new battery charger (4) and bracket (3). Secure with four pan head screws (1) and four lock washers (2).
- (3) Reconnect electrical wiring, as tagged, to battery charger (4). Refer to Appendix G.

FOLLOW ON MAINTENANCE: Install receiver/transmitter (paragraph 2-103).

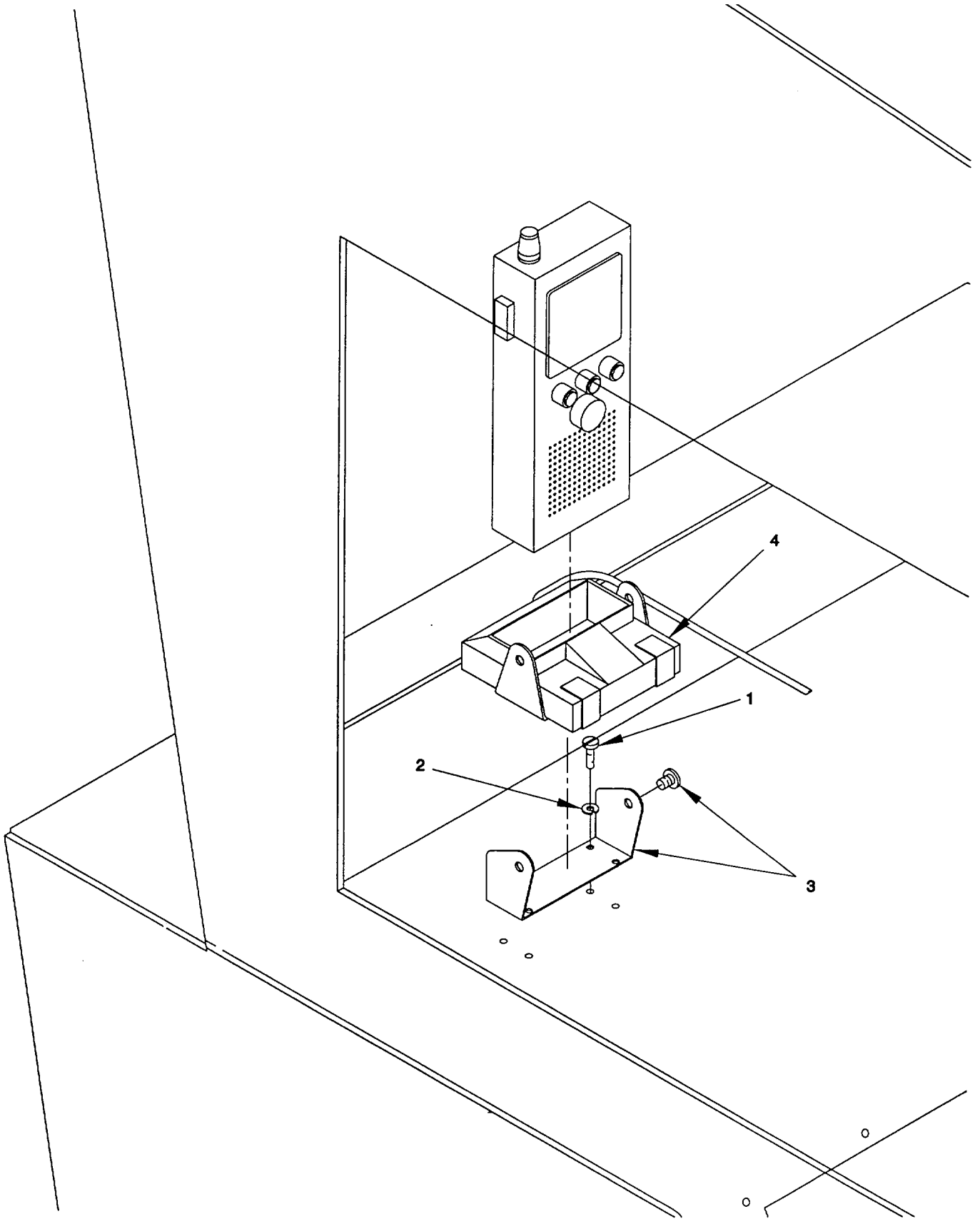


Figure 2-103. Battery Charger, Triton Receiver/Transmitter, Remove/Install
2-259

2-107. Convertor (VHF-FM).

This task covers:**a. Remove****b. Install**

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Convertor
Compound, Antiseize (Item 9, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-104)
- (1) Tag and disconnect electrical wiring between junction box (3) and convertor (2). Refer to Appendix G.
 - (2) Remove four pan head screws (1) securing convertor (2) to junction box (3). Remove convertor (2).
- b. *Install.* (figure 2-104)
- (1) Apply antiseize compound to theads on pan head screws (1).
 - (2) Position convertor (2) on junction box (3). Secure convertor (2) with four pan head screws (1).
 - (3) Reconnect electrical wiring, as tagged, between junction box (3) and convertor (2). Refer to Appendix G.

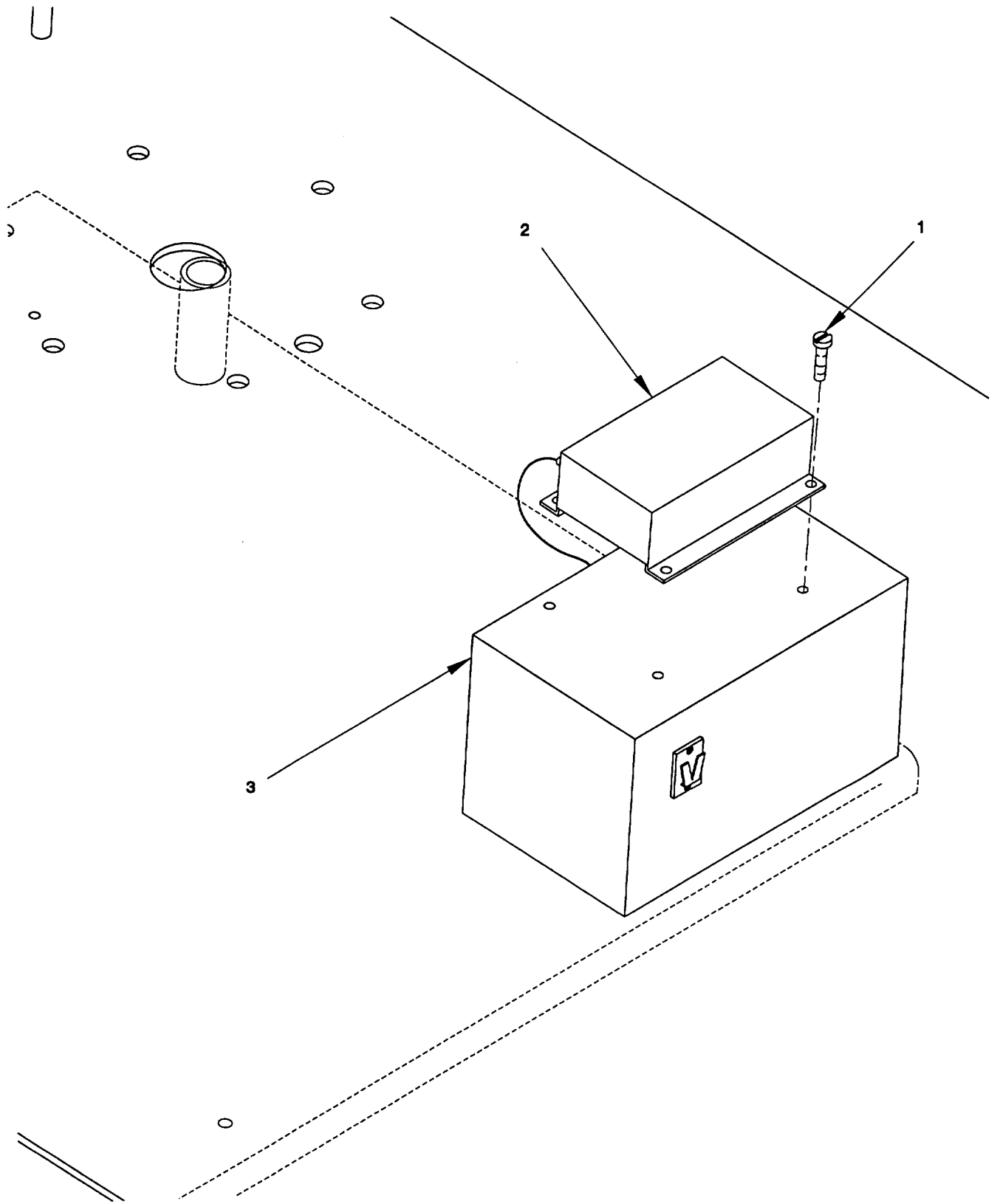


Figure 2-104. Converter (VHF-FM), Remove/Install
2-261

2-108. Receiver / Transmitter (VHF- FM).**This task covers:****a. Remove****b. Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN
5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and
control/indicators tagged OUT OF SERVICE

Materials/Parts

Receiver/Transmitter
Compound, Antiseize (Item 9, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-105)

- (1) Tag and disconnect electrical wiring to receiver/transmitter (3). Refer to Appendix G.
- (2) Remove four pan head screws (1) and four lock washers (2) securing receiver/transmitter (3). Remove receiver/transmitter (3).

b. *Install.* (figure 2-105)

- (1) Apply antiseize compound to threads on pan head screws (1).
- (2) Position new receiver/transmitter (3). Secure with four pan head screws (1) and four lock washers (2).
- (3) Reconnect electrical wiring, as tagged, to receiver/transmitter (3). Refer to Appendix G.

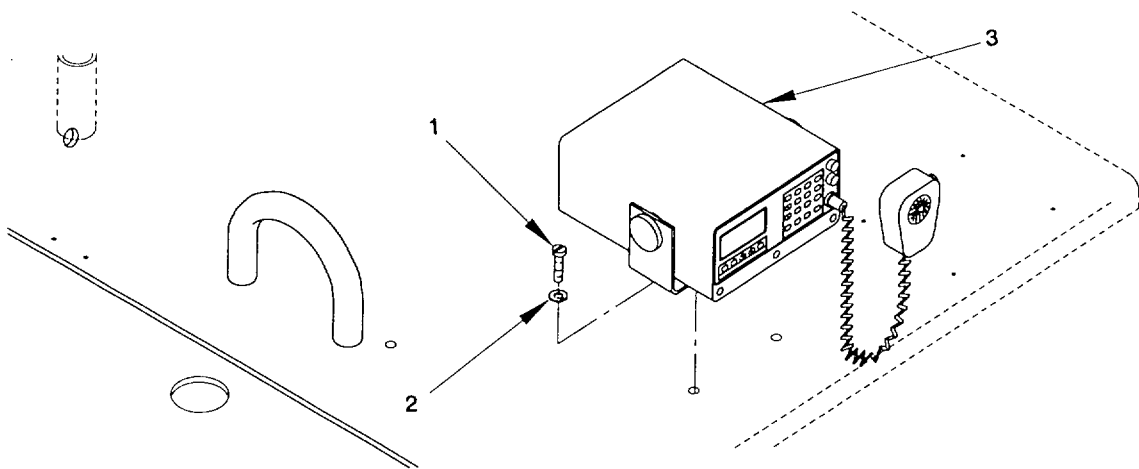


Figure 2-105. Receiver/Transmitter (VHF-FM), Remove/Install

2-109. Antenna (VHF-FM).

This task covers:**a. Remove****b. Install**

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

*Materials/Parts*Antenna
Compound, Antiseize (Item 9, Appendix F)*Equipment Condition*

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Antenna power cables removed (paragraph 2-110)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-106)

Remove the four capscrews (1) and four hex nuts (2) securing the antenna and antenna mount (3) to the cab. Remove antenna and antenna mount (3).

b. *Install.* (figure 2-106)

(1) Apply antiseize compound to threads on capscrews (1).

(2) Install new antenna and antenna mount (3) on cab. Secure with four capscrews (1) and four hex nuts (2).

FOLLOW ON MAINTENANCE: Install antenna power cables (paragraph 2-110).

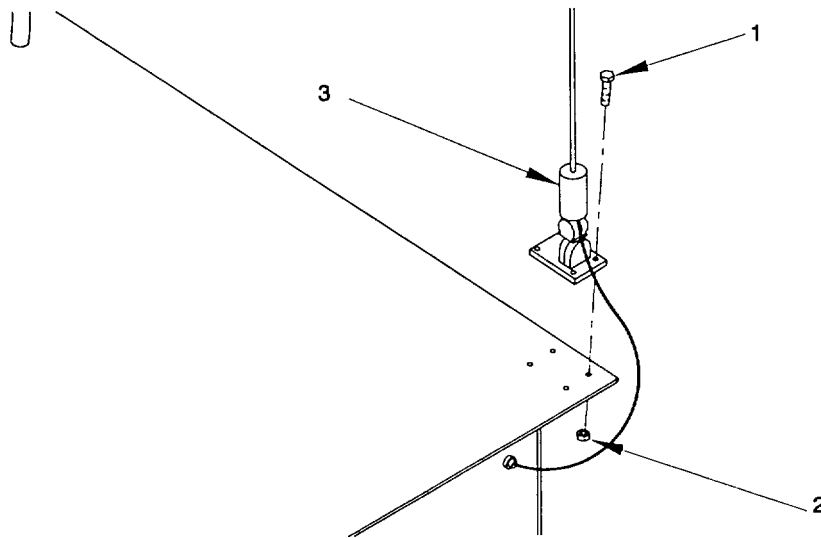


Figure 2-106. Antenna (VHF-FM), Remove/Install

2-110. Antenna Power Cable (VHF-FM).

This task covers:**a. Remove****b. Install**

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Antenna Power Cable

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-107)

- (1) Disconnect antenna power cable (1) at UHF plug (2) and antenna (3). Remove antenna power cable (1). Install cap (4) on UHF plug (2) if antenna power cable (1) will be removed for a period of time.
- (2) Remove cover (5) from junction box (6).
- (3) Remove UHF plug (2), terminal tube (7), flat washer nut (8) and UHF bulkhead feedthrough (9).
- (4) Inspect UHF plugs (2), terminal tube (7) and UHF bulkhead feedthrough (9) for damage. Replace as necessary.
- (5) To remove cap (4), remove pan head screw (10) and lock washer (11) securing cap (4) to structure.

b. Install. (figure 2-107)

- (1) Install cap (4), if removed, by securing to structure with lock washer (11) and pan head screw (10).
- (2) Install UHF bulkhead feedthrough (9), flat washer nut (8), terminal tube (7) and UHF plug (2) on junction box (6).
- (3) Replace cover (5) on junction box (6).
- (4) Connect new antenna power cable (1) at UHF plug (2) and antenna (3).

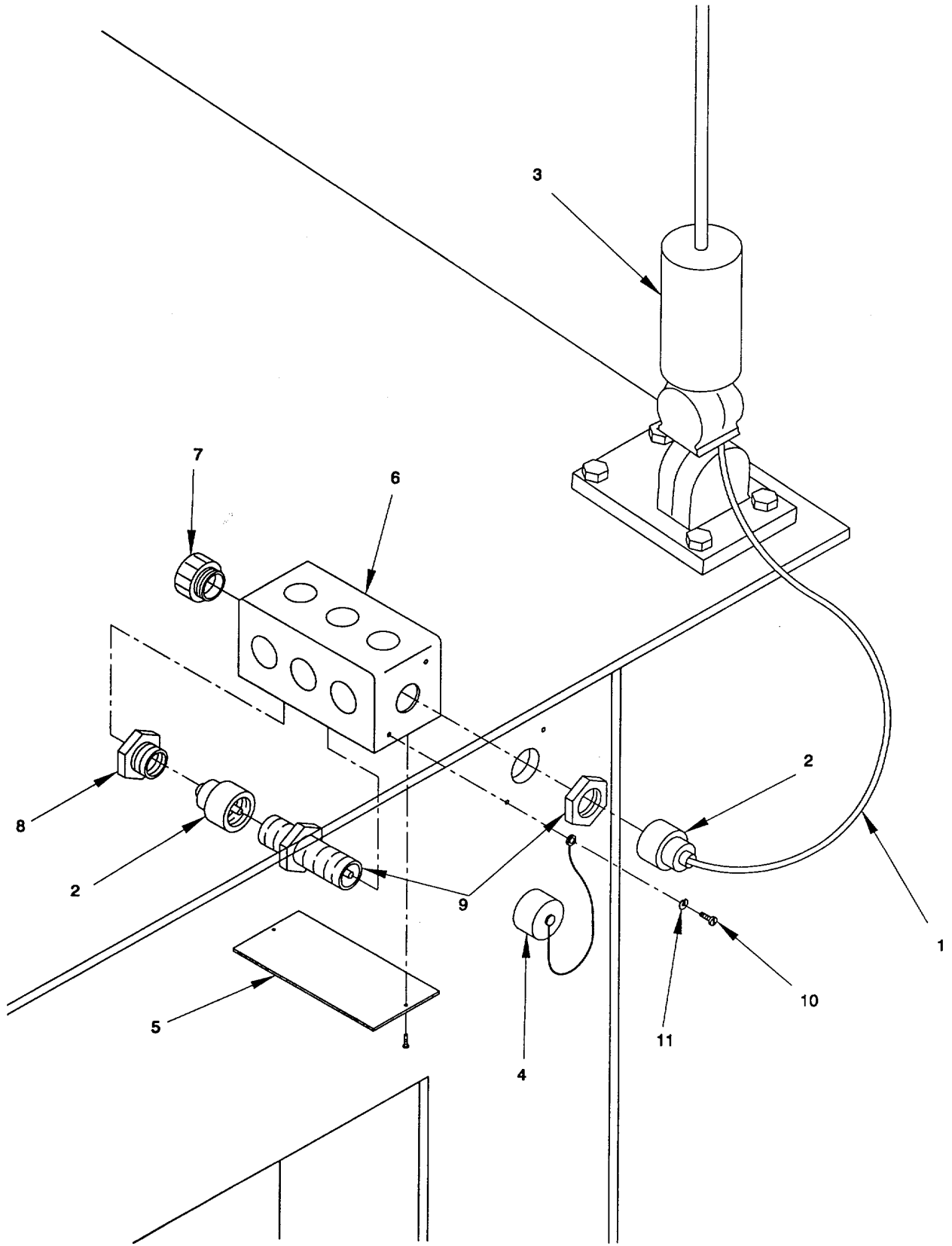


Figure 2-107. Antenna Power Cable (VHF-FM), Remove/Install

2-111. SINCGARS Radio.

This task covers:

a. Remove

b. Install

INITIAL SETUP:

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

SINCGARS Radio

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

References

TB 11-5820-890-20-23

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-108)

Refer to Department of the Army Technical Bulletin TB 11 -5820-890-20-23 for removal of the SINCGARS radio (1)

- b. *Install.* (figure 2-108)

Refer to Department of the Army Technical Bulletin TB 11 -5820-890-20-23 for removal of the SINCGARS radio (1).

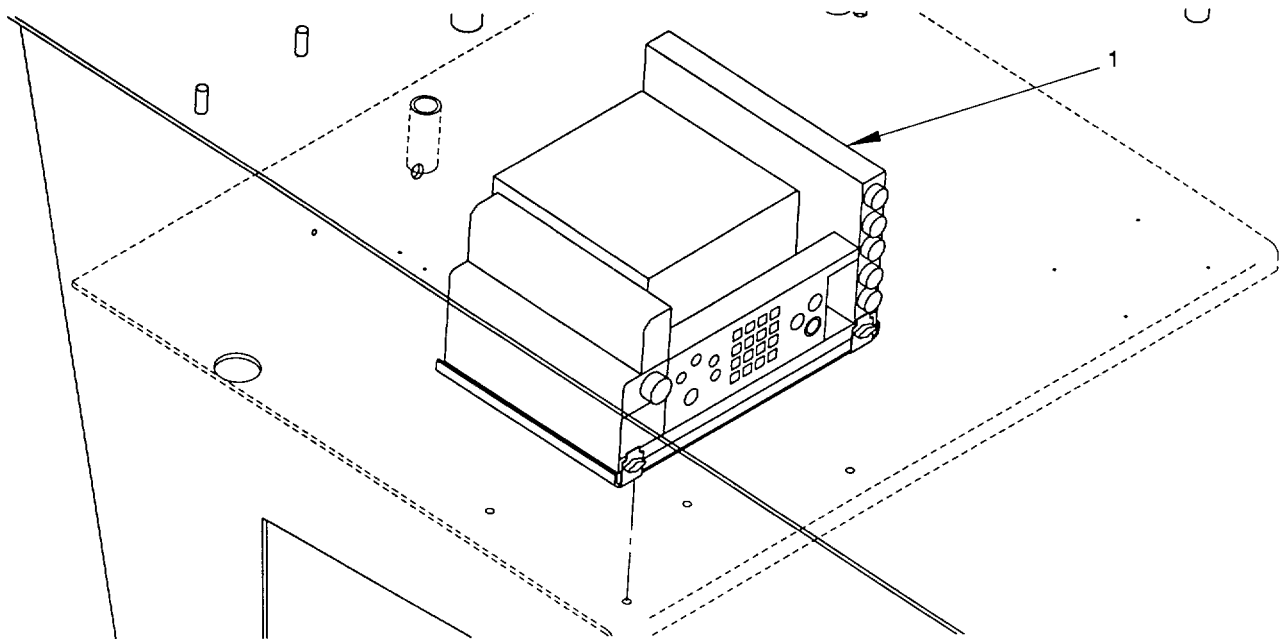


Figure 2-108. SINCGARS Radio, Remove/Install

2-112. Remote and Microphone (SINGARS).

This task covers: **a. Remove** **b. Install**

INITIAL SETUP:

<i>Tools</i>	<i>Equipment Condition</i>
General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)	All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE
<i>Materials/Parts</i>	<i>References</i>
Remote and Microphone	TB 11-5820-890-20-23

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-109)

Refer to Department of the Army Technical Bulletin TB 11-5820-890-20-23 for removal of the remote and microphone (1).

- b. *Install.* (figure 2-109)

Refer to Department of the Army Technical Bulletin TB 11-5820-890-20-23 for removal of the remote and microphone (1).

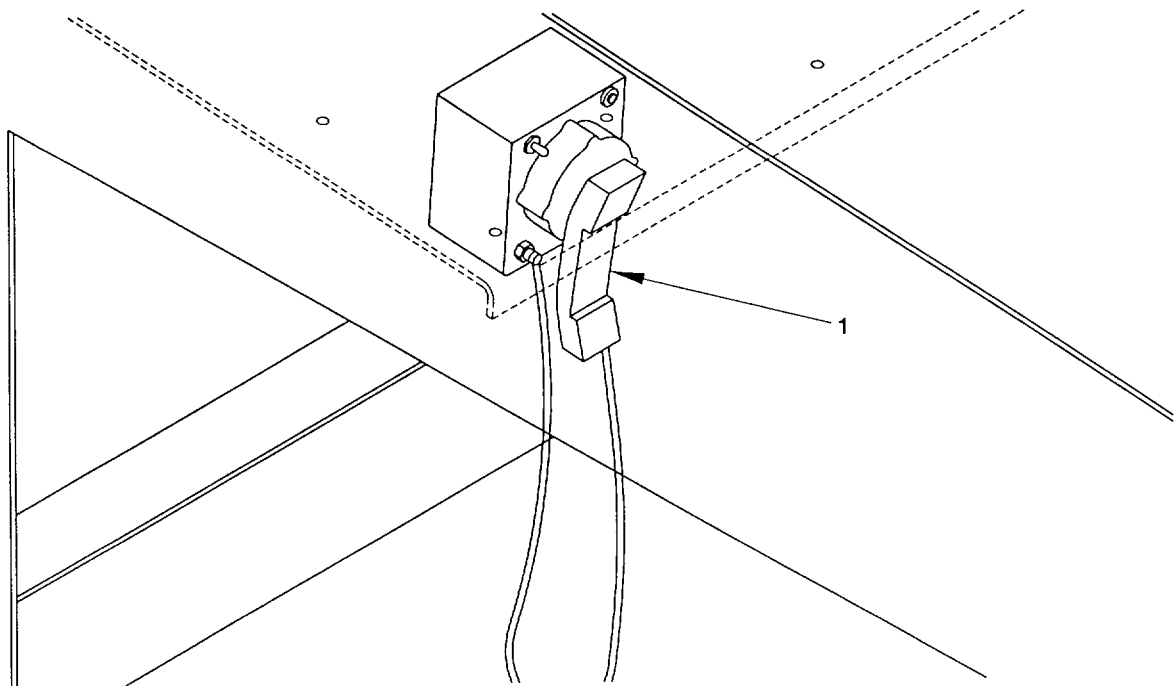


Figure 2-109. Remote and Microphone (SINGARS), Remove/Install

2-113. Antenna (SINGARS).**This task covers:****a. Remove****b. Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Antenna

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

References

TB 11-5820-890-20-23

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-110)

Refer to Department of the Army Technical Bulletin TB 1 1-5820-890-20-23 for removal of the antenna (1).

b. *Install.* (figure 2-110)

Refer to Department of the Army Technical Bulletin TB 11-5820-890-20-23 for removal of the antenna (1).

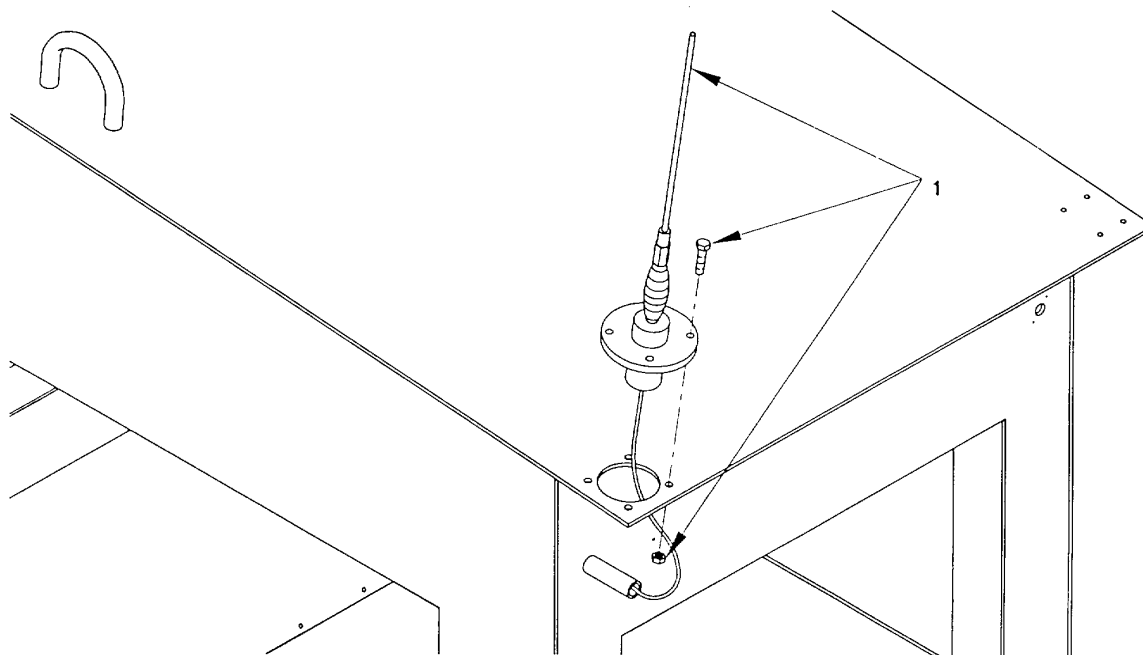


Figure 2-110. Antenna (SINGARS), Remove/Install

2-114. Heater and Heater Valve.**This task covers:****a. Remove****b. Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Heater
Heater Valves
Sealant, Pipe (Item 41, Appendix F)
Compound, Antseize (Item 9, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Cooling system cool to the touch.

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

Cooling system contains antifreeze (ethylene glycol). Ethylene glycol is a skin and eye irritant. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. *Remove.* (figure 2-111)

- (1) Disconnect electrical wiring to heater fans at the A3 panel. Refer to Appendix G.
- (2) Provide drain container below connections to contain spillage.
- (3) Disconnect water lines at quick disconnect couplings below cab.
- (4) Loosen two hose clamps (1) securing two hoses (6) at two hose nipples (2). Disconnect two hoses (6) from two hose nipples (2).
- (5) Remove two hose nipples (2) from two heater valves (3).
- (6) Remove two heater valves (3) from pipe nipple (4) and 90° male elbow (5).
- (7) Remove four capscrews (7) and lockwashers (8) from underside of heater (9). Remove heater (9).
- (8) Remove four screws (10) and rear grille (11) of heater to access inside of heater.
- (9) Disconnect electrical leads (13) inside housing of heater by removing hex nut (12), lead (13), hex nut (14), lockwasher (15), machine screw (16), motor mounting cap (17) from mounting bracket (18).

b. *Install.* (figure 2-111)

- (1) Connect electrical leads (13) to heater by positioning motor mounting cap (17) on bracket (18) and securing hardware with machine screw (16) lockwasher (15), hex nut (14), lead (13), and hex nut (12).

2-114. Heater and Heater Valves (Cont).

- (2) Position rear grille (11) and secure with four screws (10).
- (3) Position heater (9) on mounting bracket. Apply antiseize compound to threads on capscrews (7). Secure heater with lockwashers (7) and capscrews (8).
- (4) Apply pipe sealant to threads and install pipe nipple (4) and 90° male elbow (5).
- (5) Install two heater valves (3) on pipe nipple (4) and 90° male elbow (5).
- (6) Apply pipe sealant and install two hose nipples (2) on two heater valves (3).
- (7) Install two hoses (6) on two hose nipples (2). Secure hoses (6) to hose nipples (2) with two hose clamps (1).
- (8) Reconnect water lines at quick disconnect couplings below cab.
- (9) Reconnect electrical wiring to defroster as tagged. Refer to Appendix G.

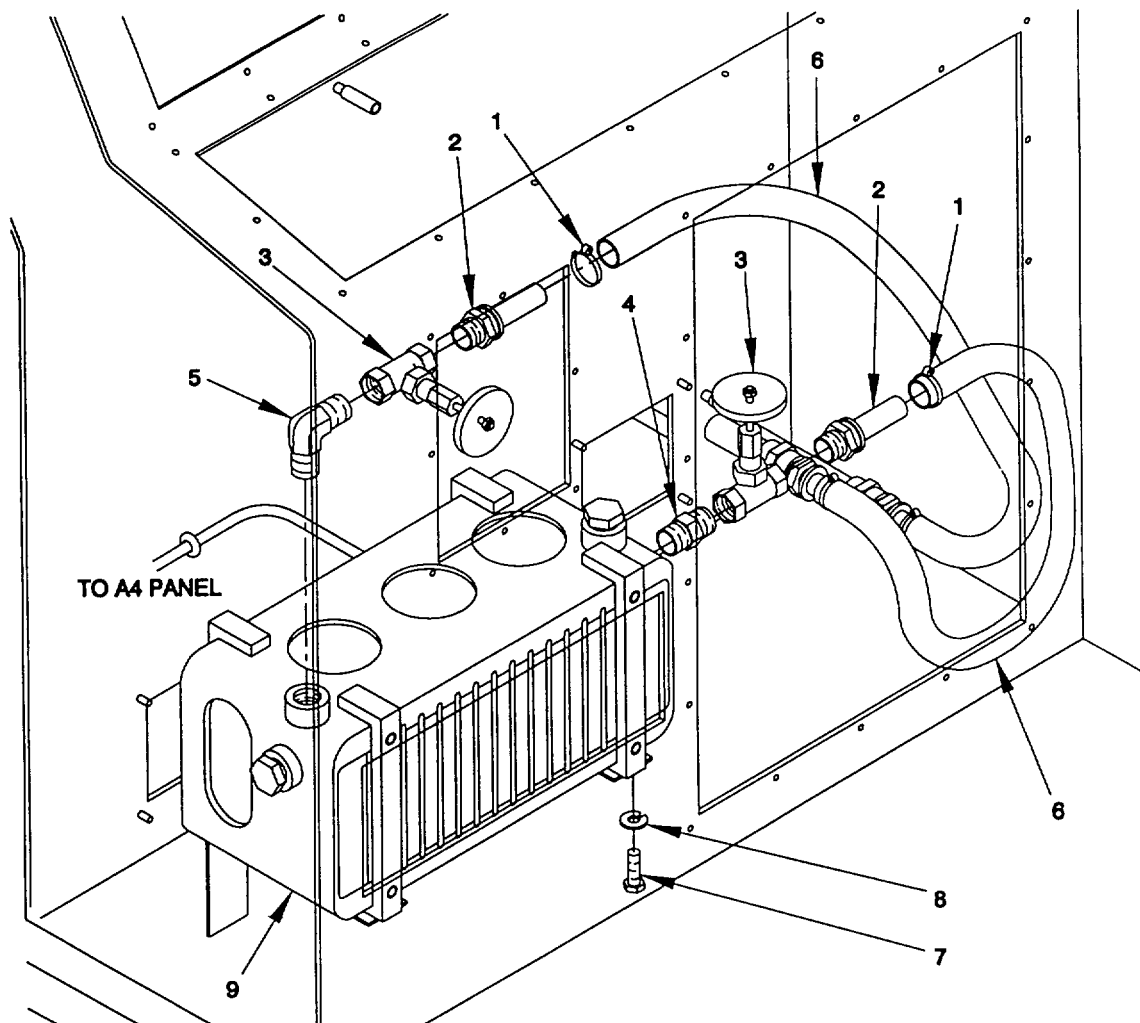


Figure 2-111. Heater and Heater Valve, Remove/Install (Sheet 1 of 2).

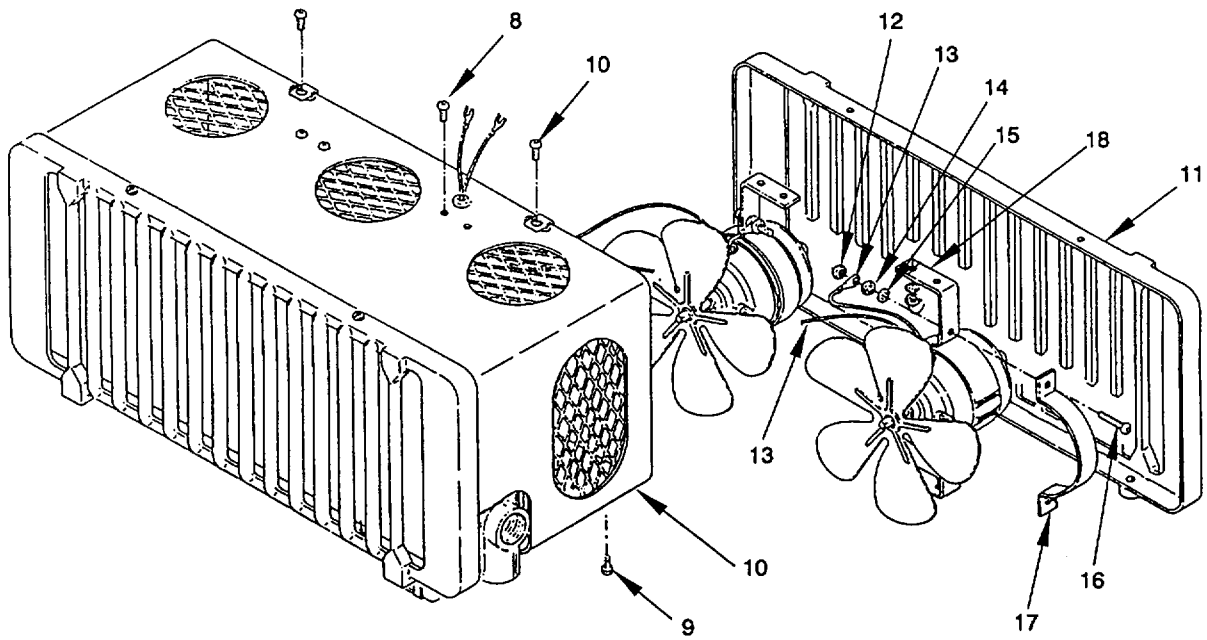


Figure 2-111. Heater and Heater Valve, Remove/Install (Sheet 2 of 2).

2-115. Defroster and Defroster Valve.**This task covers:** **a. Remove** **b. Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Cooling system cool to the touch.

Defroster
Defroster Valve
Sealant, Pipe (Item 41, Appendix F)
Compound, Antiseize (Item 9, Appendix F)**WARNING**

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

Cooling system contains antifreeze (ethylene glycol). Ethylene glycol is a skin and eye irritant. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. Remove. (figure 2-112)

- (1) Disconnect and tag electrical wiring to defroster fans at Operator's Cab Circuit Breaker Panel A3. Refer to Appendix G.
- (2) Separate top (2) and bottom (3) housings of defroster by removing two screws (1). Disconnect motor leads and remove leads (4) from housing.
- (3) Provide drain container below connections to contain spillage.
- (4) Disconnect water lines at quick disconnect couplings below cab.
- (5) Loosen two hose clamps (5) securing two hoses (6) at two hose nipples (7). Disconnect two hoses (6).
- (6) Remove two hose nipples (7) from female pipe tees (8).
- (7) Remove female pipe tee (8) and pipe nipple (9) from defroster valves (10).
- (8) Remove two defroster valves (10) from two pipe nipples (11).
- (9) Remove two hex head capscrews (12) and two lockwashers (13) securing defroster (14). Remove defroster (14).

2-115. Defroster and Defroster Valve (Cont).b. *Install.* (figure 2-112)

- (1) Position defroster (14) on mounting brackets. Apply antiseize compound to threads on capscrews (12). Secure defroster with lockwashers (13) and capscrews (12).
- (2) Apply pipe sealant to threads on hose nipples (7) and pipe nipples (11).
- (3) Install two new defroster valves (10) on two pipe nipples (11).
- (4) Install pipe nipple (9) and female pipe tee (8) on defroster valves (10).
- (5) Install two hose nipples (7) on female pipe tee (8) and defroster valves (10).
- (6) Install two hoses (6) on two hose nipples (7). Secure with two hose clamps (5).
- (7) Reconnect water lines at quick disconnect couplings below cab.
- (8) Connect motor leads (4) within housing, position top (2) and bottom (3) of housing together and secure using two screws (1).
- (9) Reconnect electrical wiring from junction box JB1 to defroster fans as tagged. Refer to Appendix G.

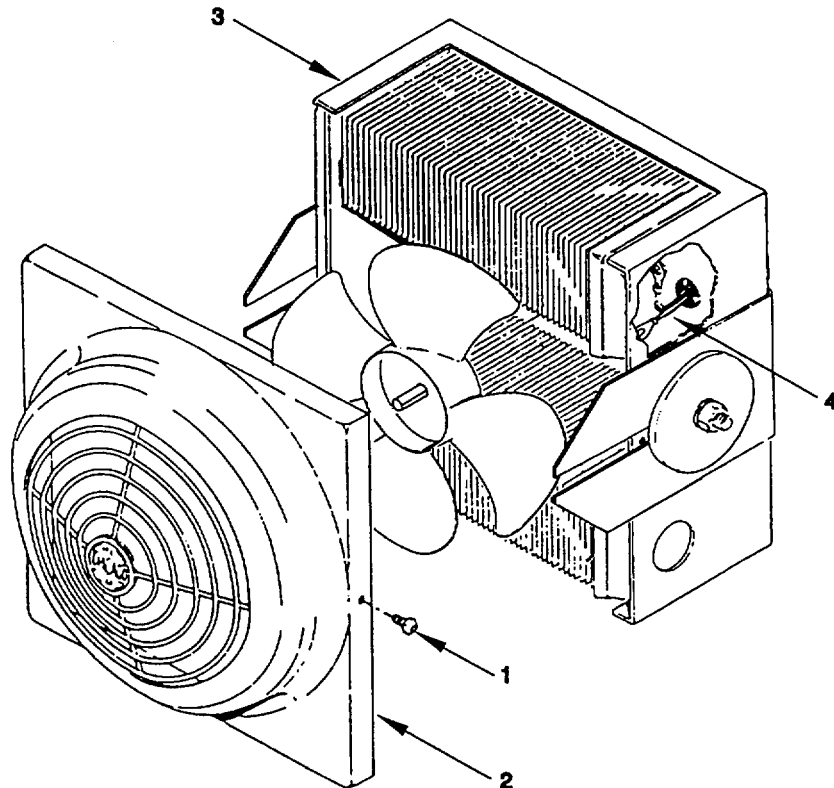


Figure 2-112. Defroster/Needle Valve, Remove/Install (Sheet 1 of 2).

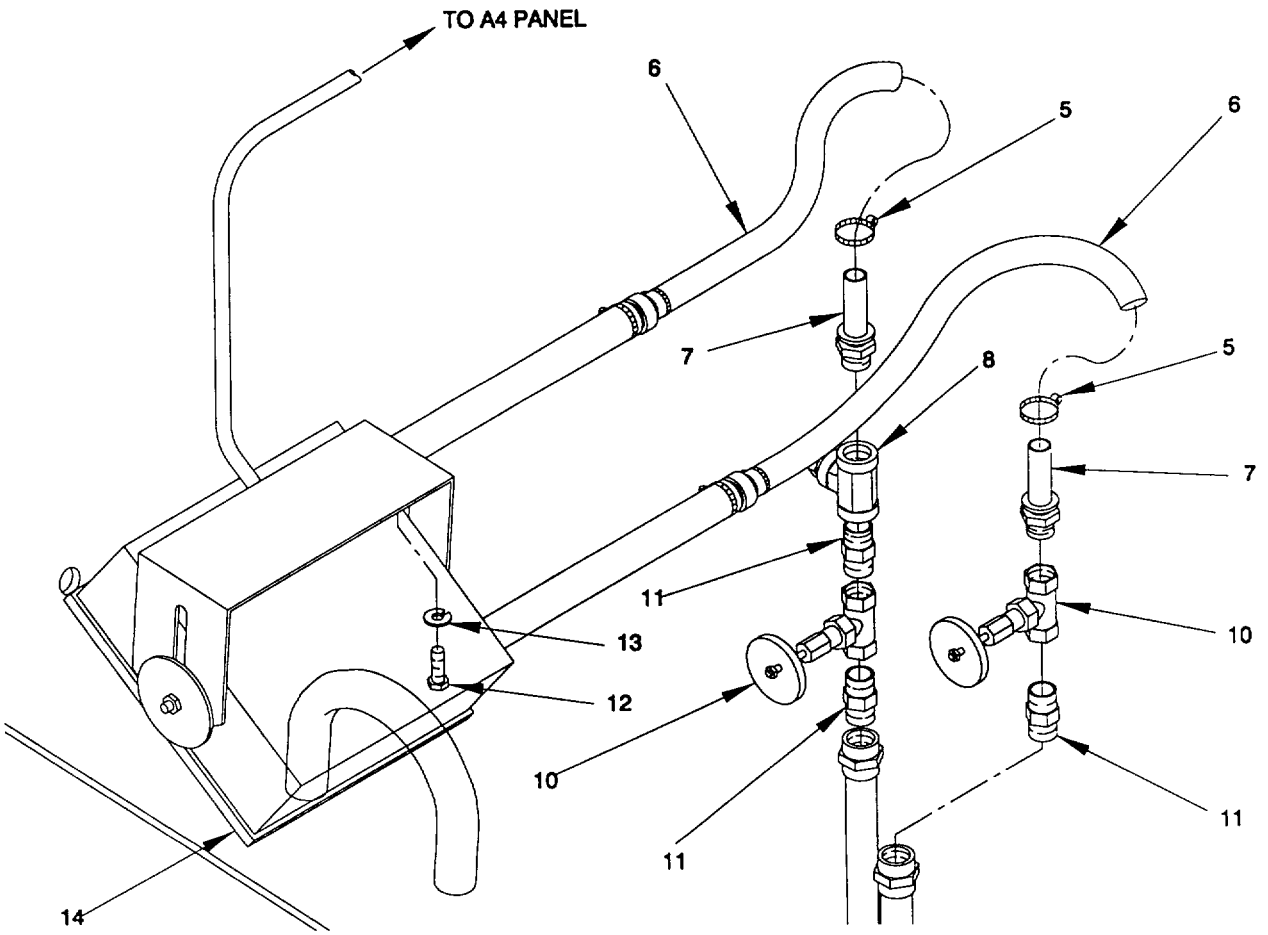


Figure 2-112. Defroster/Needle Valve, Remove/Install (Sheet 2 of 2).

2-116. Window.

This task covers:**a. Remove****b. Install**

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

*Materials/Parts*Window
Sealant (Item 42, Appendix F)

a. *Remove.* (figure 2-113)

Remove eight flat head screws (1) from each window (2, 3 and 4). Remove slide window P-1 (2), slide window S-1 (3) or fixed window (4).

b. *Install.* (figure 2-113)

- (1) Apply a sufficient bead of sealant around the entire window frame to achieve a continuous water tight seal.
- (2) Position slide window P-1 (2), slide window S-1 (3) or fixed window (4) in window frame. Secure each window (2, 3 and 4) with eight flat head screws (1).

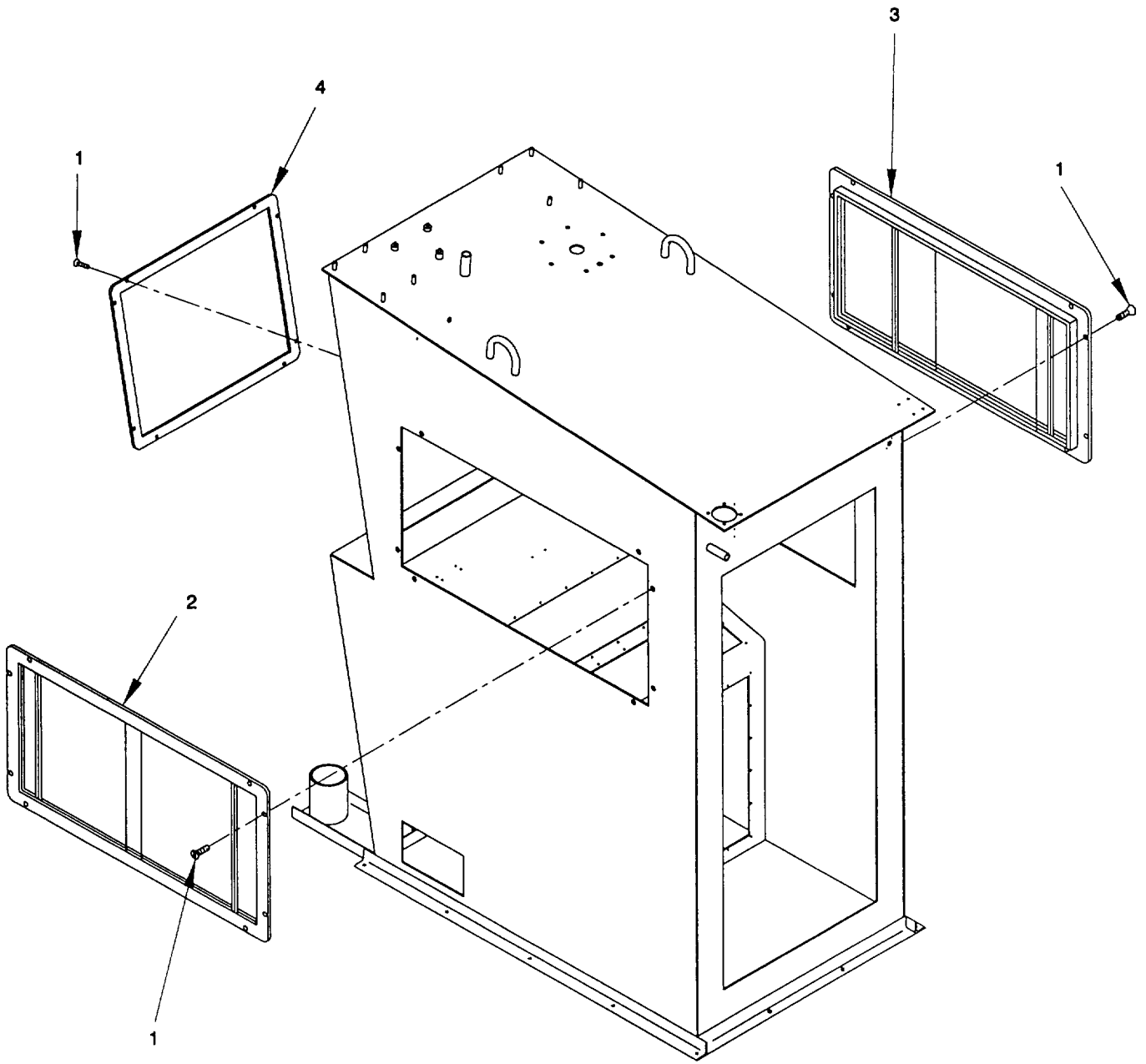


Figure 2-113. Window, Remove/Install.

2-117. Middle Control Panel "A1".**This task covers: a. Remove b. Inspect c. Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Middle Control Panel
 Compound, Antiseize (Item 9, Appendix F)
 Wrap, Spiral (Item 56, Appendix F)
 Wrap, Spiral (Item 55, Appendix F)
 Wraps, Tie (Item 57, Appendix F)
 Tubing, Heat Shrink (Item 49, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. Remove. (figure 2-114)
- (1) Disconnect and tag electrical wires to middle control panel (3). Refer to Appendix G.
 - (2) Remove eighteen pan head screws (1) and eighteen lockwashers (2) securing middle control panel (3).
 - (3) Lift out panel (3) being careful not to bend or chafe wiring.
 - (4) Inspect per step b. Cut a sufficient length of heat shrink tubing to cover exposed surfaces of female terminals. Spiral wrap is used to bundle the wires into a wiring harness. Wiring is held in place with tie wraps and mounting bases as necessary. The electrical connector is used to connect jumper wires for termination of intermediate devices. Heat shrink tubing is used to cover terminals.
- b. Inspect. Inspect inside of panel for loose, frayed or broken wires, or damaged components.
- c. Install. (figure 2-114)
- (1) Apply antiseize compound to pan head screws (1).
 - (2) Position middle control panel (3). Secure with eighteen lockwashers (2) and eighteen pan head screws (1).
 - (3) Reconnect electrical wiring, as tagged. Refer to Appendix G. Use cable ties and mounting bases to secure any loose wiring.

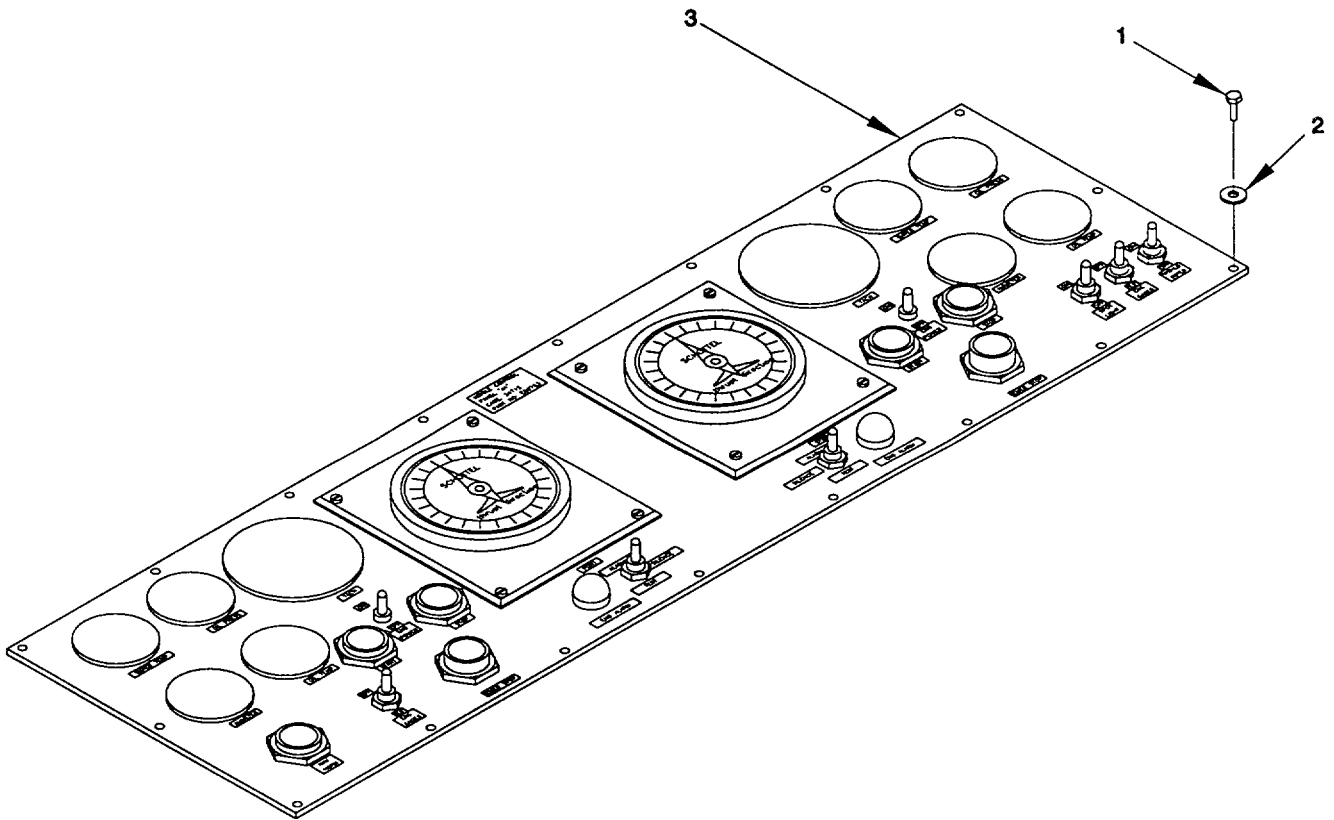


Figure 2-114. Middle Control Panel "A1", Remove/Install

2-118. Gauges, Middle Control Panel "A1"**This task covers:** **a. Remove** **b. Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

*Materials/Parts*Gauge
Wraps, Tie (Item 57, Appendix F)*Equipment Condition*

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Middle control panel lifted off console (paragraph 2-117)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

NOTE

Ammeter is wired in series with system tachometer.

a. *Remove.* (figure 2-115)

- (1) For removal of the tachometer gauges M5 and M6 (1), tag and disconnect the wiring from the gauge. Refer to Appendix G.
- (2) Remove the hex nut (2) and bracket (3) securing tachometer gauge (1). Remove tachometer gauge (1).
- (3) For removal of the oil pressure gauges M3 and M9 (4), water temperature gauges M1 and M7 (5), and oil temperature gauges M4 and M10 (6), tag and disconnect the wiring from the gauges. Refer to Appendix G.
- (4) Remove the hex nut (7) and bracket (8) from each gauge (4, 5 and 6) and remove gauges (4, 5 and 6).
- (5) Tachometer gauges (1), oil pressure gauges (4), water temperature gauges (5) and oil temperature gauges (6) are fitted with a resistor and 24 VDC bulb. The resistor is installed to the positive (+) terminal of the gauge. The 24 VDC bulb and red filter (10) replaces the 12 VDC bulb supplied with each gauge.
- (6) For removal of the ammeter gauges (11), tag and disconnect the wiring from the gauge. Refer to Appendix G.
- (7) Remove the hex nut (7) and bracket (8) from each gauge (11) and remove gauge (11).
- (8) Ammeter gauges (11) are fitted with red filters (10). The filter covers the 24VDC bulb within the gauge.

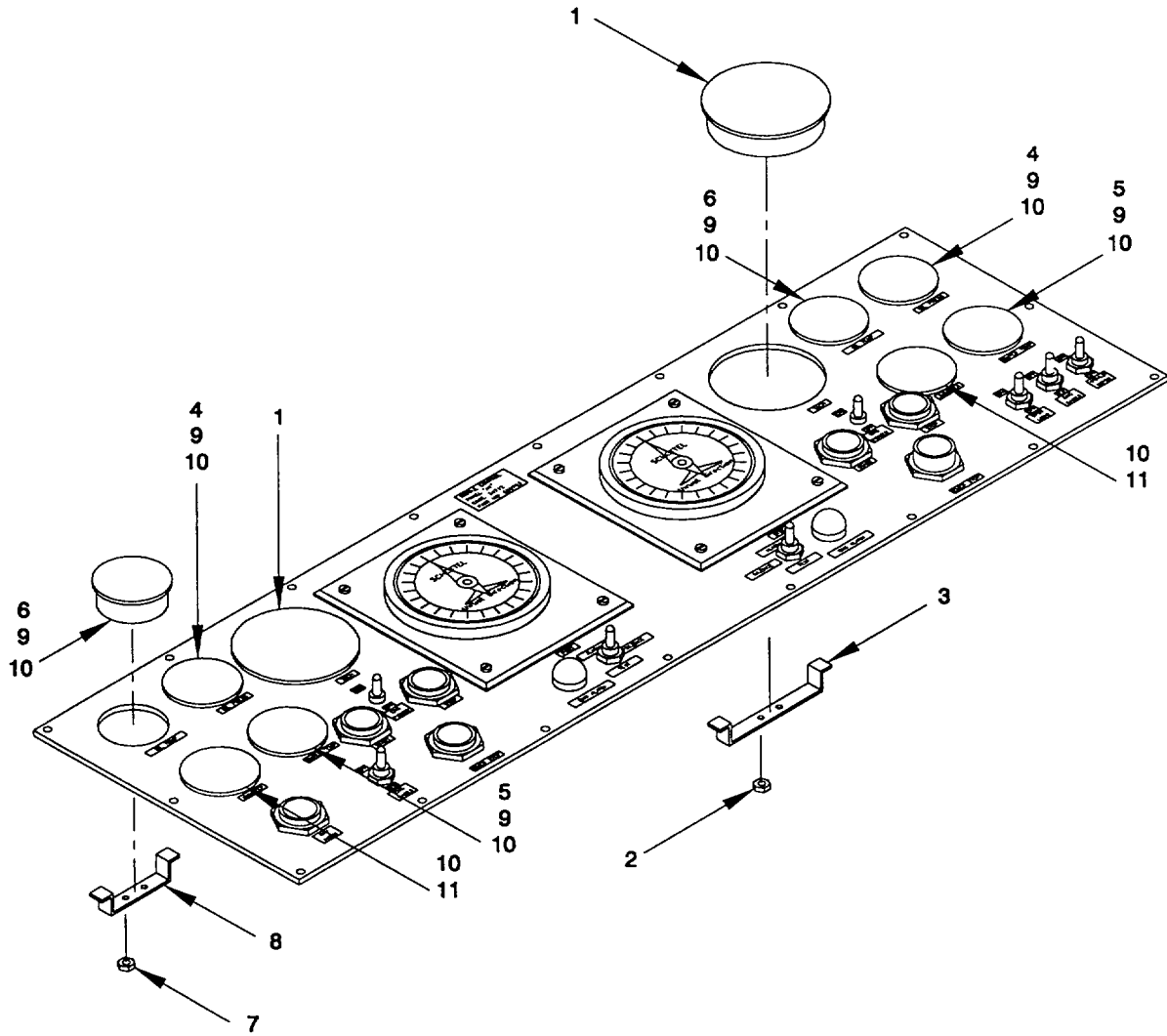


Figure 2-115. Gauge, Middle Control Panel "A1", Remove/Install

2-118. Gauges, Middle Control Panel (Cont).b. *Install.* (figure 2-110)

- (1) Refer to Appendix G for wiring of panel gauges. Refer to this drawing for cable types and termination methods. Heat shrink tubing is used to cover terminals. Spiral wrap is used to bundle the wires into a wiring harness. Use cable ties and mounting bases to secure loose wiring.
- (2) To replace ammeter gauges (11), position red filters (10) so that it covers the 24VDC lamp built within the gauge. Secure with bracket (8) and hex nut (7) (included with voltmeter gauge (11)) from the underside of panel. Connect ammeter gauge wiring as previously tagged. Refer to Appendix G.
- (3) Replacement 24VDC bulb and red filter (11) replaces 12VDC bulbs supplied with tachometer gauges (1), oil pressure gauges (4), water temperature gauges (5), oil temperature gauges (6) and ammeter gauges (11). A resistor is installed to the positive (+) terminal of the gauge. To replace resistor into harness wires, go to (+) side of terminal of gauges. Use one female disconnect terminal and one male disconnect terminal and length of wire to make connection from cable to resistor. Refer to Appendix G.
- (4) To replace the oil pressure gauges (4), water temperature gauges (5), and oil temperature gauges (6), position gauges from the underside of the panel and secure with hex nut (7) and bracket (8) (included with gauges). Connect wiring to gauges as previously tagged. Refer to Appendix G.
- (5) For replacement of tachometer gauges (1), position gauge from underside of panel and secure with hex nut (2) and bracket (3) (included with gauges). Connect wiring to gauges as previously tagged. Refer to Appendix G.

FOLLOW ON MAINTENANCE: Install middle control panel (paragraph 2-117).

2-119. Engine Alarm Indicator, Middle Control Panel "A1".

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Indicator Base
Lamp
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Middle control panel lifted off console (paragraph 2-117).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-116)

- (1) Tag and disconnect electrical wiring to indicator base (6). Refer to Appendix G.
- (2) Remove red cap (1) along with two preformed packing seals (2) and washer (3).
- (3) Remove nut (4) and washer (5) securing indicator base (6) to middle control panel (8). Remove indicator base (6) with lamp (7).

b. Install. (figure 2-116)

- (1) Install new indicator base (6) with new lamp (7) in middle control panel (8). Secure indicator base (6) with washer (5) and nut (4).
- (2) Install preformed packing seal (2), washers (3), preformed packing seal (2) and red cap (1) on indicator base (6).
- (3) Reconnect electrical wires, as tagged, to indicator base (6). Refer to Appendix G. Use cable ties and mounting bases to secure any loose wires.

FOLLOW ON MAINTENANCE: Install middle control panel (paragraph 2-117).

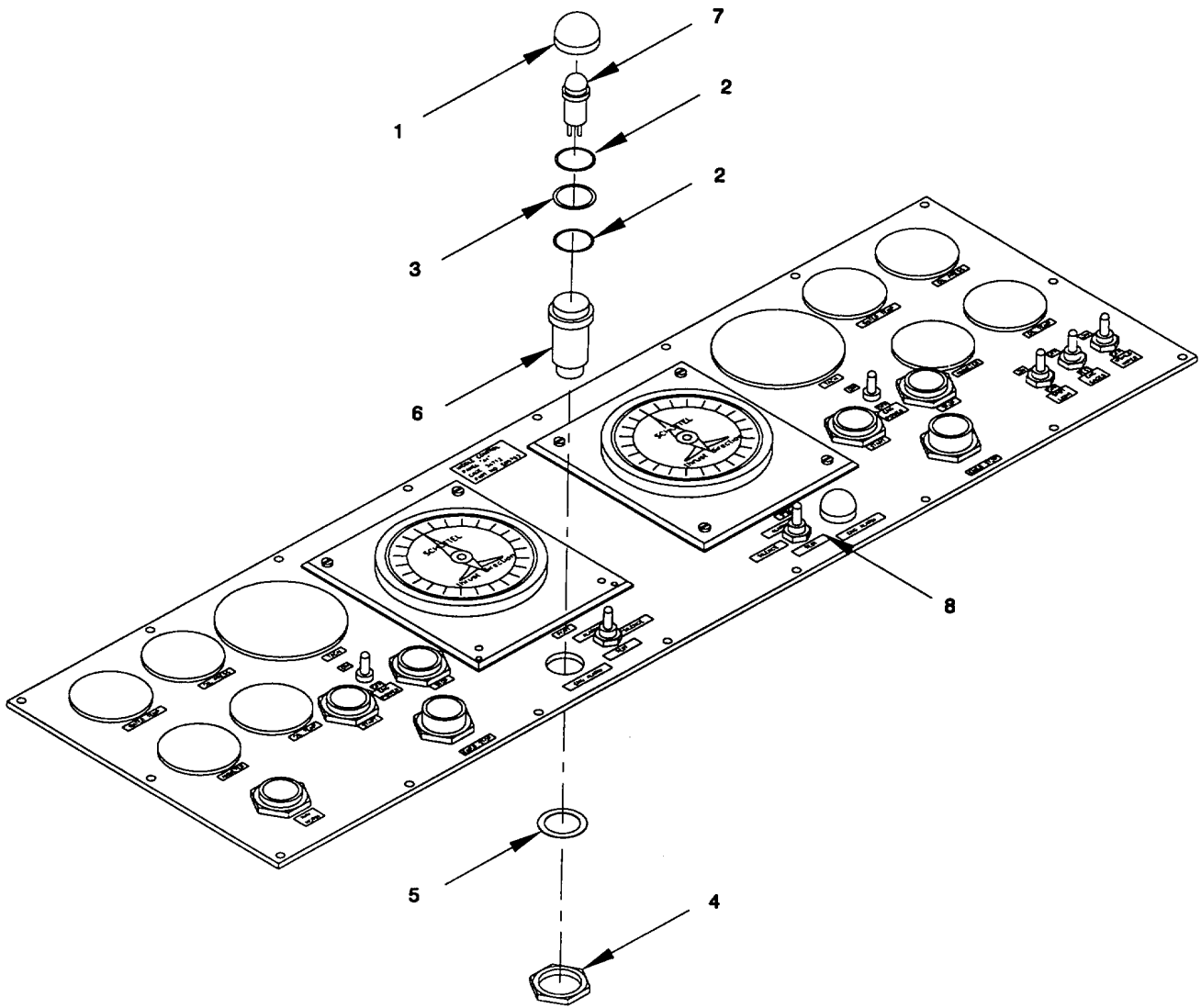


Figure 2-116. Engine Alarm Indicator, Middle Control Panel "A1", Remove/Install.

2-120. Pushbuttons, Middle Control Panel "A1".

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Pushbutton
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Middle control panel lifted off console (paragraph 2-117).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-117)

- (1) For removal of the two diesel engine start pushbuttons S2 and S7 (1), two diesel engine stop pushbuttons S3 and S9 (2), and the navigation horn pushbutton S10 (3), tag and disconnect the electrical wiring from the pushbuttons (1, 2 and 3). Refer to Appendix G.
- (2) Remove the hex nut (4) (supplied with each pushbutton) from the top of the panel. (7)
- (3) For removal of the two emergency stop pushbuttons S4 and S8 (5), tag and disconnect the electrical wiring from the pushbutton. Refer to Appendix G.
- (4) Remove the hex nut (6) (supplied with each pushbutton) from the top of the panel (7).

b. Install. (figure 2-117)

- (1) To replace the two emergency stop pushbuttons S4 and S8 (5), position the pushbuttons (5) from the underside of the panel (7) and secure with hex nut (4) (supplied with pushbutton) from the top of the panel (7).
- (2) To replace the two diesel engine start pushbuttons S2 and S7 (1), two diesel engine stop pushbuttons S3 and S9 (2), and the navigation horn pushbutton S10 (3), position each from the underside of the panel (7) and secure with hex nut (4) (supplied with each button) from the top of the panel (7).
- (3) Reconnect pushbutton electrical wiring as previously tagged. Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wiring.

FOLLOW ON MAINTENANCE: Install middle control panel (paragraph 2-117).

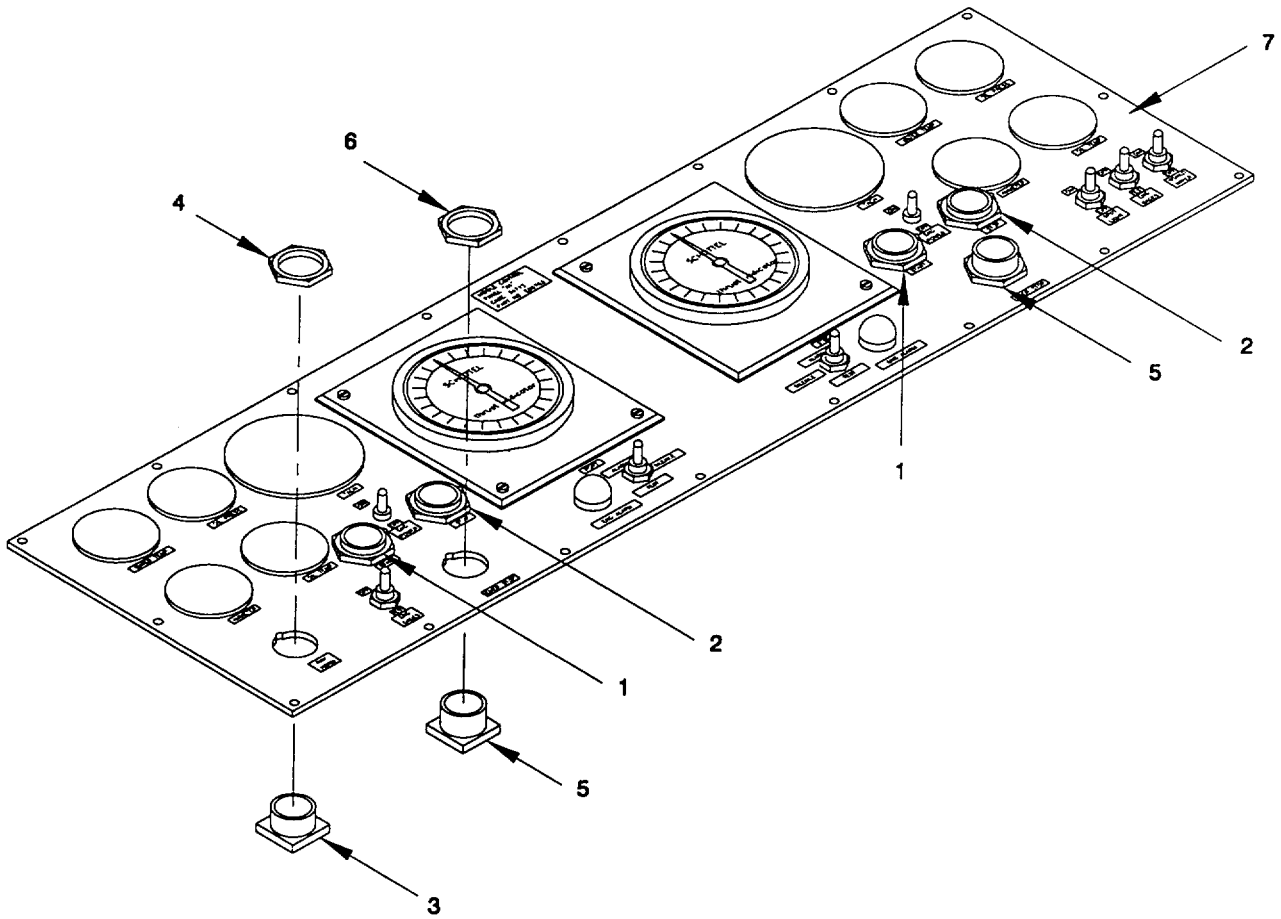


Figure 2-117. Pushbutton, Middle Control Panel "A1", Remove/Install.

2-121. Toggle Switch, Middle Control Panel "A1".

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Toggle Switch
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Middle control panel lifted off console (paragraph 2-117).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-118)

- (1) For removal of the toggle switches, diesel engine power S1 and S6 (1), spotlight S11 (2), windshield wiper S12 (3), engine alarm silence S5 (4), and engine gauges/test S13 and S15 (5). tag and disconnect the electrical wiring from the switch. Refer to Appendix G.
- (2) Remove two hex nuts (6), lockwasher (7), locking ring (8) (items 6, 7, and 8 supplied with each switch) securing switch to panel (9). Remove toggle switch (1, 2, 3 4, and/or 5).

b. Install. (figure 2-118)

- (1) To replace the toggle switches for diesel engine power S1 and S6 (1), spotlight S11 (2), windshield wiper S12 (3), engine alarm silence S5 (4), and engine gauges/test S13 and S 5, position switch from underside of panel (9) and secure with hex nuts (6), lockwasher (7). locking ring (8) (items 6, 7, and 8 supplied with each switch).
- (2) Reconnect electrical wiring as previously tagged. Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wiring.

FOLLOW ON MAINTENANCE: Install middle control panel (paragraph 2-117).

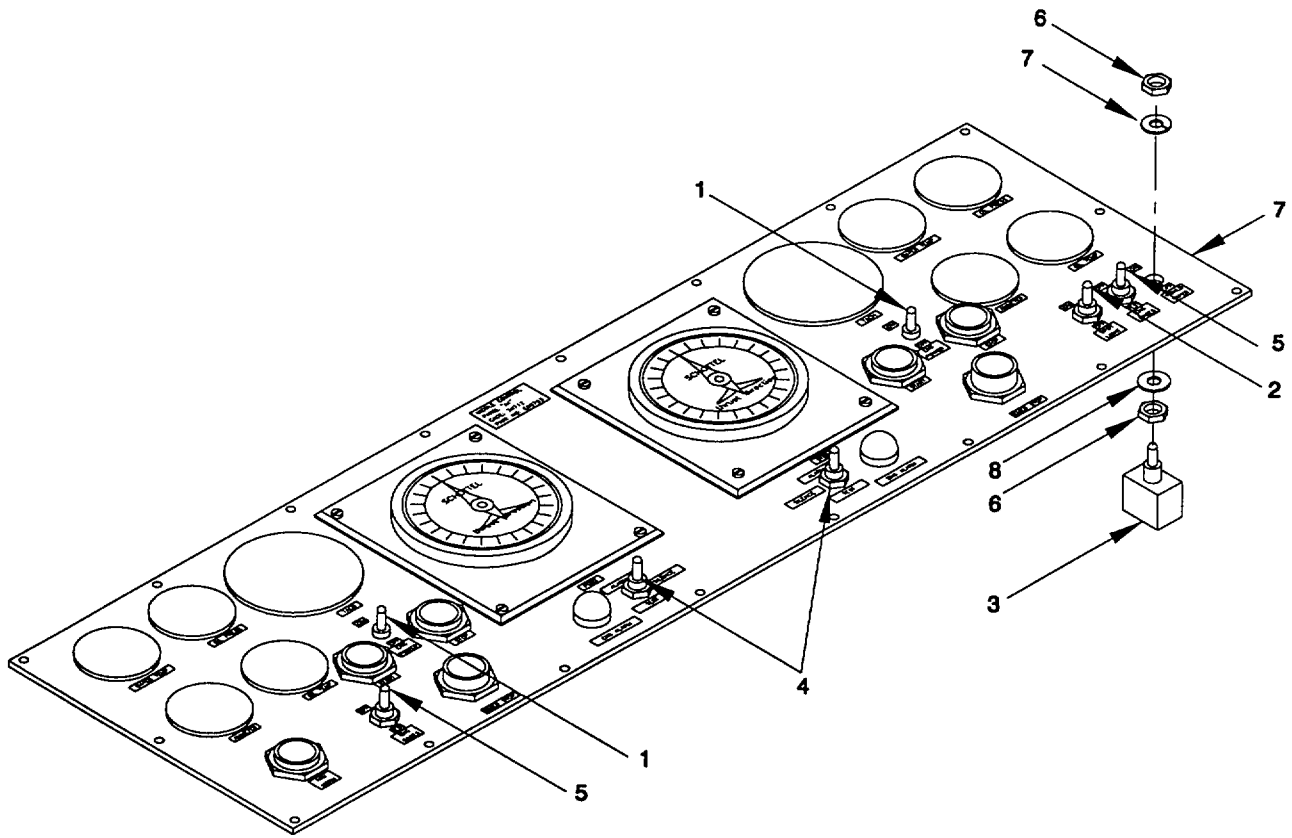


Figure 2-118. Toggle Switch, Middle Control Panel "A1", Remove/Install.

2-122. Thrust Direction Indicating Device, Middle Control Panel "A1".

This task covers: a. Remove b. Inspect c. Adjust d. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Indicating Device, Thrust Direction
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Middle control panel lifted off console (paragraph 2-117).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-119)

- (1) Disconnect and tag OUT OF SERVICE all electrical wiring to the thrust direction indicating device.
- (2) Remove four screws (1) and hex nuts (2) from each of two thrust direction indicating devices (4) and collect washers (3).
- (3) Remove thrust direction indicating device (4) from panel.

b. Inspect.

- (1) Inspect gasket material within frame for tears, breaks, deterioration. Replace entire frame unit if gasket does not provide a watertight seal.
- (2) Inspect control display for frayed, broken or loose wires or connections and replace as required.

c. Adjust. (figure 2-119)

Adjustment of the indicating devices are accomplished through adjustment of the feedback (sending) unit, located on the pump-jet assembly.

- (1) Remove four screws (5) and housing cover (6) to access indicator (7).
- (2) Align pump-jet nozzle to an easy-to-reference position (straight ahead, straight back, or similar).
- (3) Loosen slotted cheese head screw (8) and move indicator into proper alignment for position of pumpjet. Tighten screw when in proper position.
- (4) Position cover (6) and secure with four screws (5).

2-122. Thrust Direction Indicating Device, Middle Control Panel "A1" (Cont).

b. *Install.* (figure 2-119)

- (1) Position thrust direction indicating devices (4) on middle control panel "A1".
- (3) Secure each of two thrust direction indicating devices (4) on panel with four screws (1), fiat washer (3) and hex nuts (2).

FOLLOW ON MAINTENANCE: Install middle control panel (paragraph 2-117).

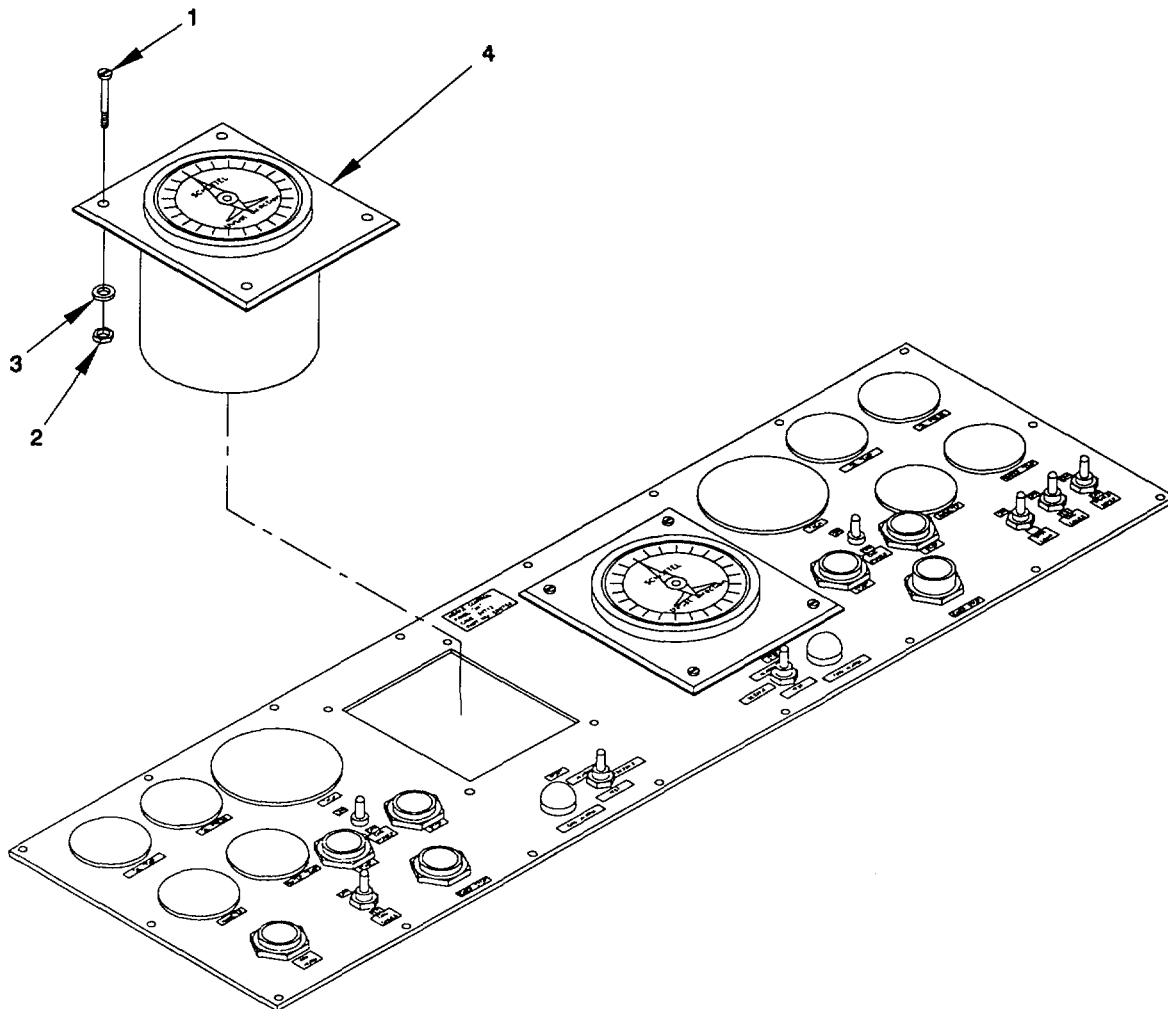


Figure 2-119. Thrust Direction Indicating Device, Middle Control Panel "A1", Remove/Install/Adjust. (Sheet 1 of 2).

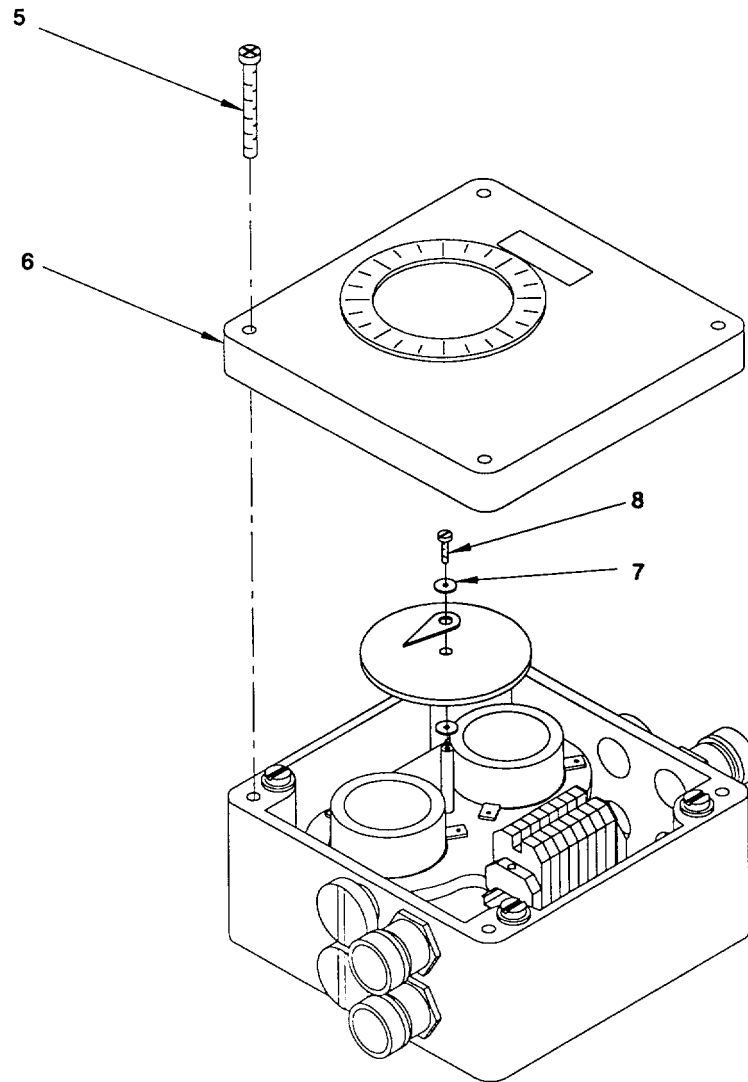


Figure 2-119. Thrust Direction Indicating Device, Middle Control Panel "A1", Remove/Install/Adjust. (Sheet 2 of 2).

2-123. Bulb, Thrust Direction Indicating Device, Middle Control Panel "A1".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Bulb
Wraps, Tie (Item 57, Appendix F)
Bases, Mounting

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Thrust Direction Indicating Device removed (paragraph 2-122)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-120)

Unscrew bulb (1) from lamp socket (2).

- b. *Install.* (figure 2-120)

Replace bulb (1) in lamp socket (2) and screw in bulb.

FOLLOW ON MAINTENANCE: Install Thrust Direction Indicating Device (paragraph 2-122).

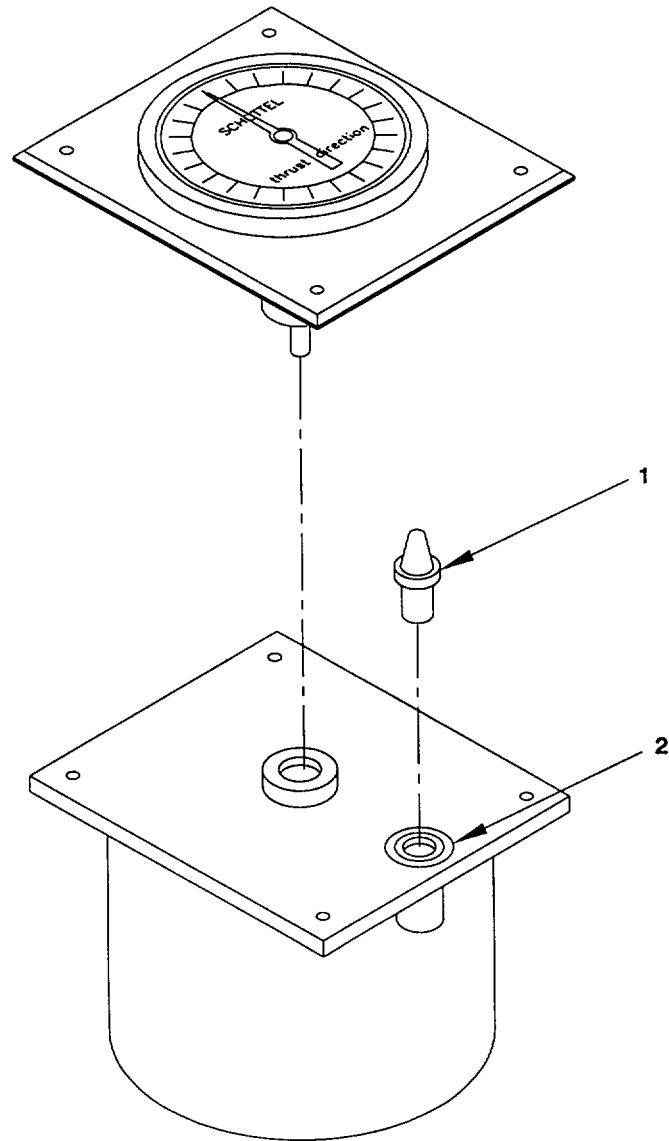


Figure 2-120. Bulb, Thrust Direction Indicating Device, Middle Control Panel "A1", Remove/Install.

2-124. Servo Unit, Thrust Direction Indicating Device, Middle Control Panel "A1".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Servo Unit
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Thrust direction indicating device removed (paragraph 2-122).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 121)

Access back of thrust direction indicating device (1) and remove four self-tapping screws (2). Separate servo unit (3) from rest of device (1) and remove bulb (4).

b. *Install.* (figure 121)

Position servo unit (3) and secure to rest of thrust direction indicating device (1) using four self-tapping screws (2) and install bulb (4).

FOLLOW ON MAINTENANCE: Install Thrust Direction Indicating Device (paragraph 2-122).

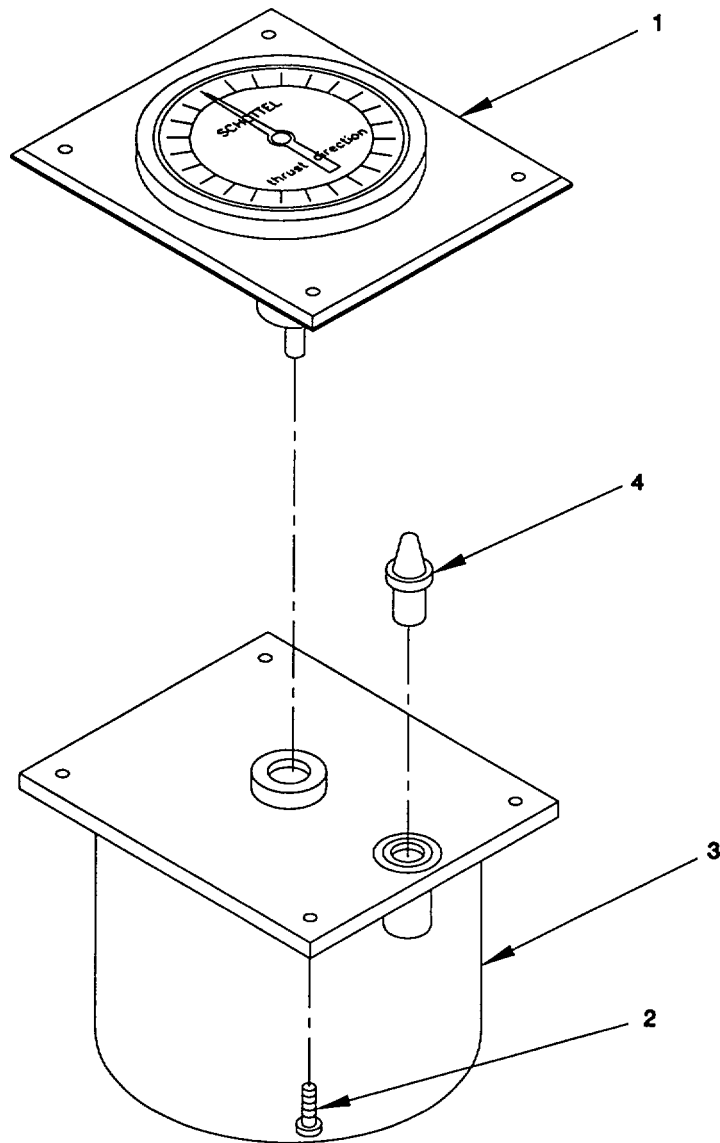


Figure 2-121. Servo Unit, Thrust Direction Indicating Device, Middle Control Panel "A1", Remove/install.

2-125. Lower Control Panel "A2".

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Lower Control Panel
Compound, Antiseize (Item 9, Appendix F)
Wrap, Spiral (Item 55 and 56, Appendix F)
Wraps, Tie (Item 57, Appendix F)
Tubing, Heat Shrink (Item 49 thru 53, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-122)

- (1) Remove 18 pan head screws (1) and 18 lock washers (2) securing lower control panel (3). Lift lower control panel (3) to access wiring.
- (2) Tag and disconnect electrical wiring to lower control panel (3). Refer to Appendix G.
- (3) Lift out panel (3) being careful not to bend or chafe wiring.

b. Inspect.

Inspect inside of panel for loose, frayed, or broken wires, or damaged components.

c. Install. (figure 2-122)

- (1) Cut a sufficient length of heat shrink tubing to cover exposed surfaces of forked terminals. Use spirao wrap to bundle the wires into a wiring harness. Use tie wraps and mounting bases, as necessary, to hold wiring in place.
- (2) Apply antiseize compound to pan head screws (1).
- (3) Position lower control panel (3). Secure with eighteen lockwashers (2) and eighteen pan head screws (1).
- (4) Reconnect electrical wiring, as tagged. Refer to Appendix G. Use cable ties and mounting bases to secure any loose wiring.

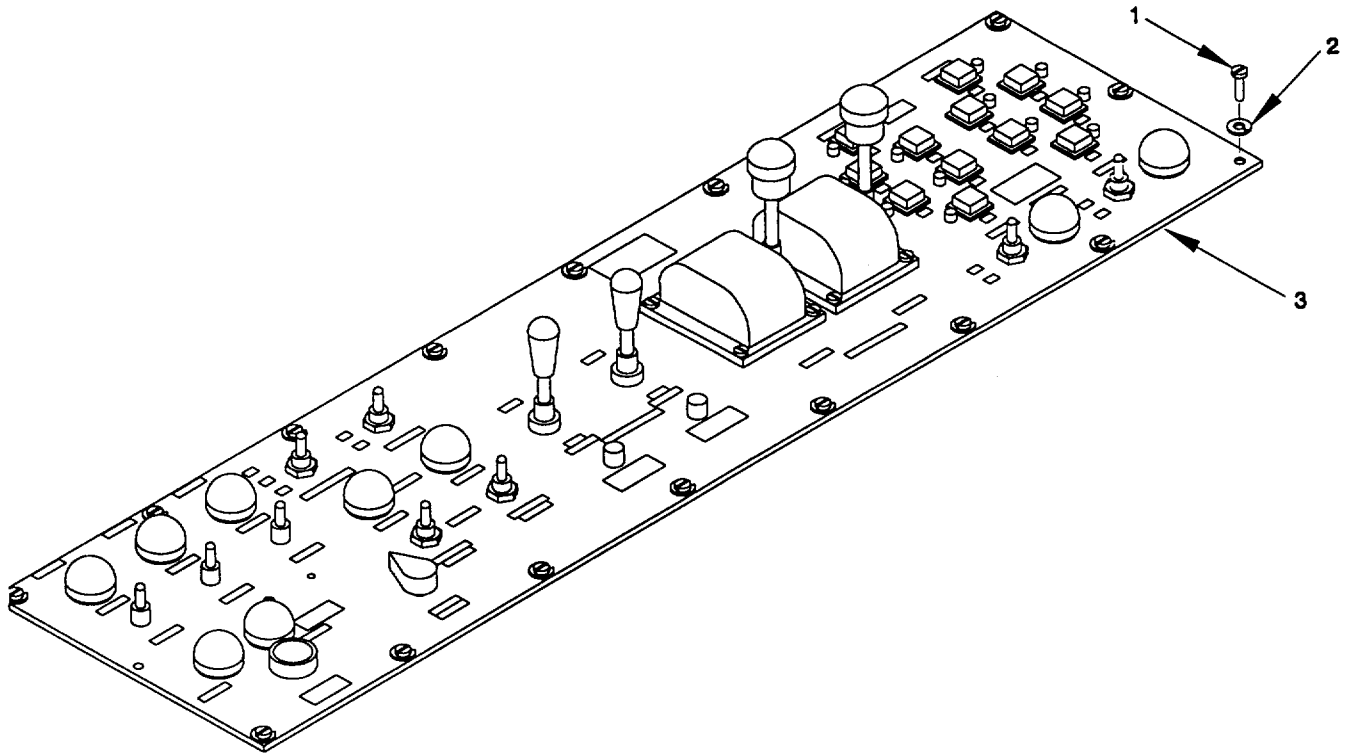


Figure 2-122. Lower Control Panel "A2", Remove/Install.

2-126. Throttle Control, Lower Control Panel "A2".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Throttle Control
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Lower control panel lifted off console (paragraph 2-125)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-123)

- (1) Tag and disconnect electrical wiring to throttle control (4). Refer to Appendix G.
- (2) Remove four pan head screws (1), four flat washers (2) and four hex nuts (3) securing throttle control (4) to lower control panel (5). Remove throttle control (4).

b. *Install.* (figure 2-123)

- (1) Position new throttle control (4) on lower control panel (5). Secure throttle control (4) with four pan head screws (1), four flat washers (2) and four hex nuts (3).
- (2) Reconnect electrical wiring to throttle control (4). Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wiring.

FOLLOW ON MAINTENANCE: Install lower control panel (paragraph 2-125).

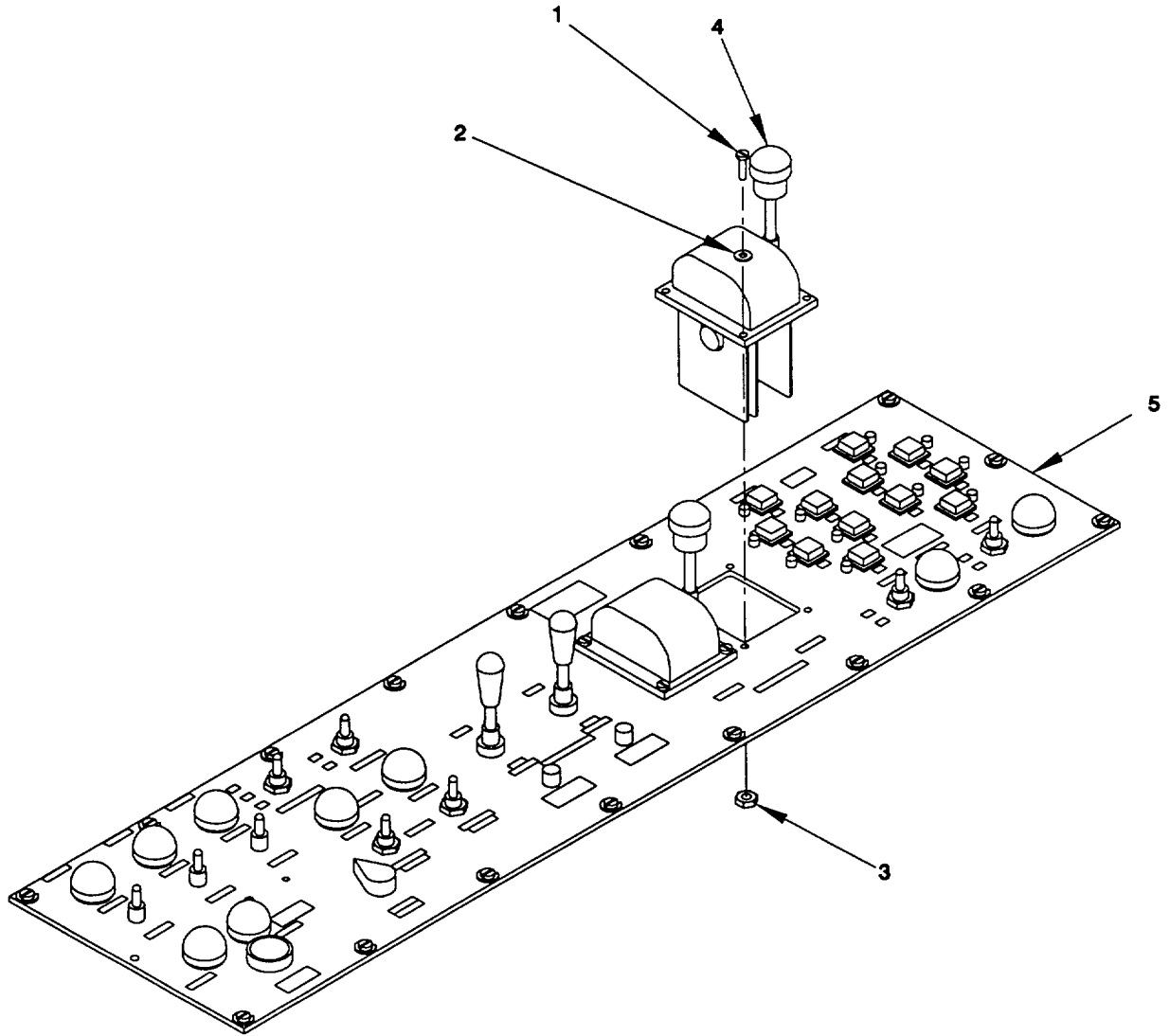


Figure 2-123. Throttle Control, Lower Control Panel "A2", Remove/Install.

2-127. Toggle Switches, Lower Control Panel "A2".

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Toggle Switch
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Lower control panel lifted off console or removed (paragraph 2-125).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-124)

- (1) Tag and disconnect electrical wiring to toggle switch. Refer to Appendix G.
- (2) For removal of the toggle switches (P/S vent fan switch S21 and S22 (2), P/S clutch engage switch S5 and S6 (3), defroster switch S25 (4), cab heater switch S4 (5), P/S fire alarm silence switch S1 and S3 (6), and flood alarm silence switch S2 (7)), remove the hex nut (1) (supplied with each switch) from the top side of the lower control panel (8). Remove the toggle switch from the bottom side of the lower control panel (8).

b. Install. (figure 2-124)

- (1) Position a new toggle switch (P/S vent fan switch S21 and S22 (2), P/S clutch engage switch S5 and S6 (3), defroster switch S25 (4), cab heater switch S4 (5), P/S fire alarm silence switch S1 and S3 (6), and flood alarm silence switch S2 (7) through the bottom side of the lower control panel (8). Secure with nut (1) (supplied with each switch) from the top side of the lower control panel (8).
- (2) Reconnect electrical wiring, as tagged, to toggle switch. Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wiring.

FOLLOW ON MAINTENANCE: Install lower control panel (paragraph 2-125).

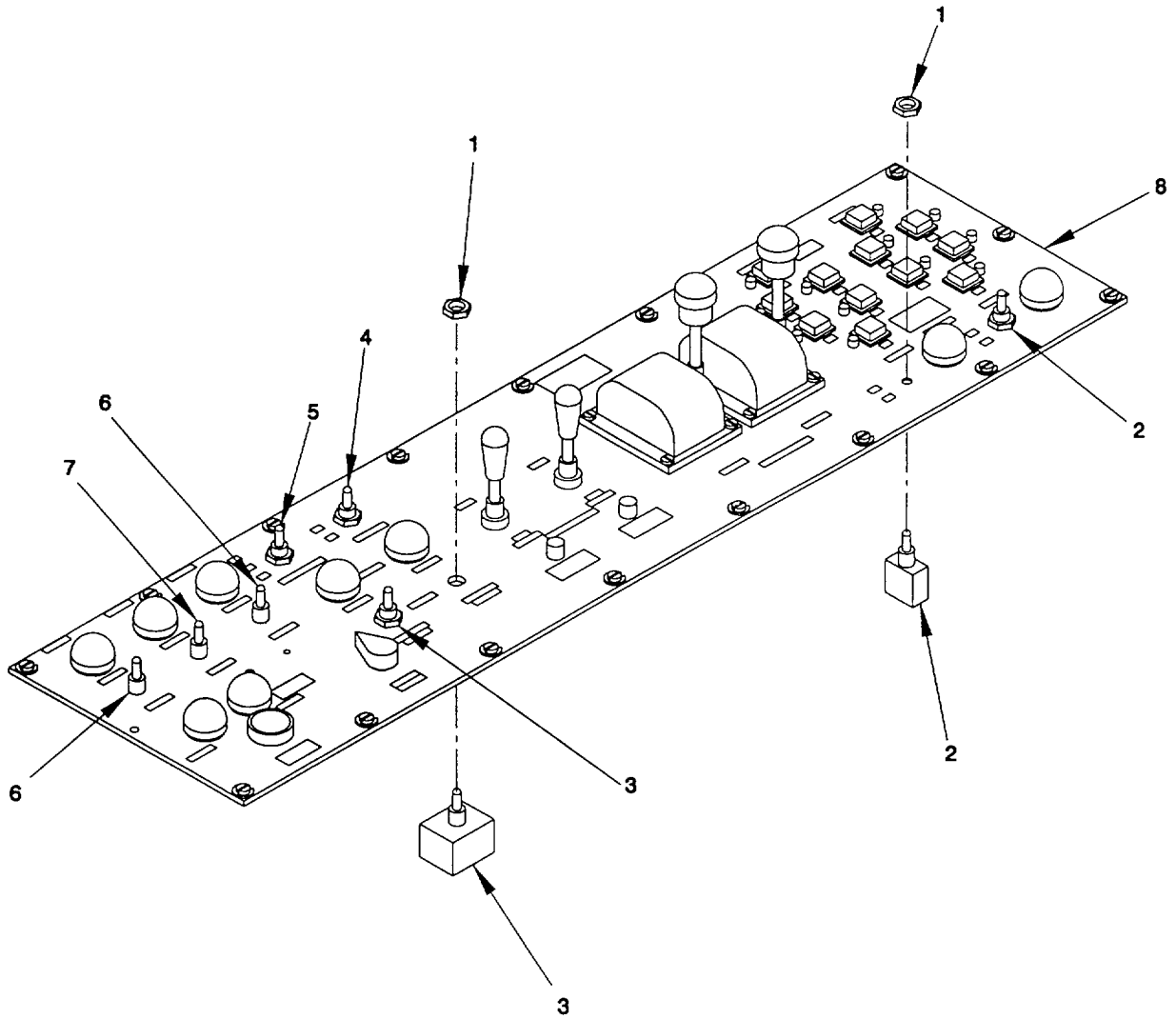


Figure 2-124. Toggle Switches, Lower Control Panel "A2", Remove/Install.

2-128. Dimmer, Lower Control Panel "A2".

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Dimmer
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Lower control panel lifted off console or removed (paragraph 2-125).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-125)

- (1) Tag and disconnect electrical wiring to dimmer rheostat (3) and power controller (8). Refer to Appendix G.
- (2) For removal of the dimmer control R1 rheostat (3), loosen the setscrew in the control knob (1) and remove the knob (1).
- (3) Remove the hex nut (2) from the top of the rheostat (3) and pull the rheostat (3) through the under side of the lower control panel (4).
- (4) For removal of the dimmer control R1 power controller (8), remove the two pan head screw (5), two hex nuts (6) and two lock washers (7). Remove power controller (8) from under side of lower control panel (4).

b. Install. (figure 2-125)

- (1) Position dimmer control R1 power controller (8) on under side of lower control panel (4). Secure with two pan head screw (5), two lock washers (7) and two hex nuts (6).
- (2) Position dimmer control R1 rheostat (3) on under side of lower control panel (4). Secure with hex nut (3) from the top side of the lower control panel (4).
- (3) Position control knob (1) on rheostat (3). Tighten setscrew in control knob (1) to secure.
- (4) Reconnect electrical wiring, as tagged to rheostat (3) and power controller (8). Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wiring.

FOLLOW ON MAINTENANCE: Install lower control panel (paragraph 2-125).

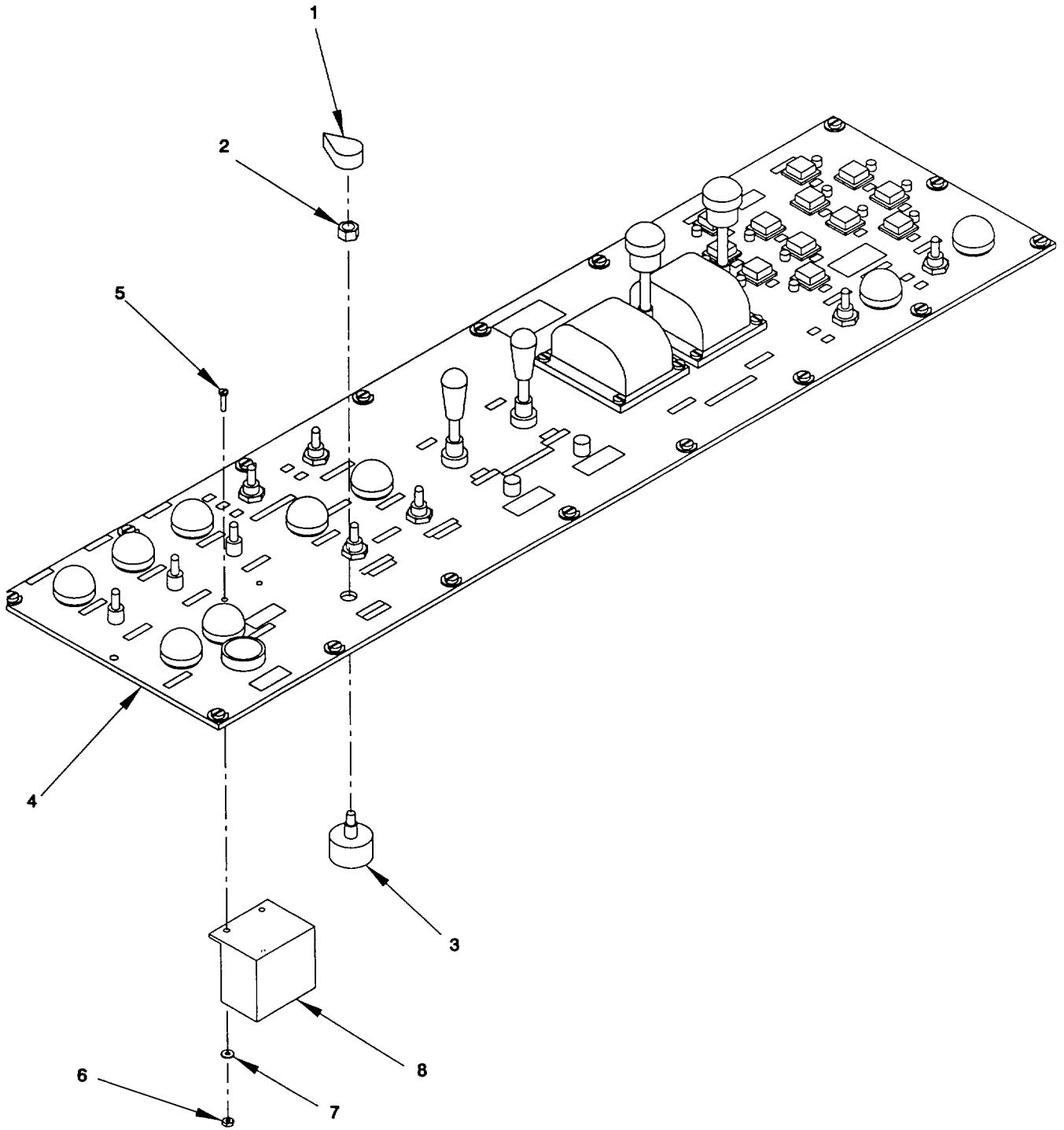


Figure 2-125. Dimmer, Lower Control Panel "A2", Remove/Install.

2-129. Indicators, Lower Control Panel "A2".

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Indicators

Lamps

Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Lower control panel lifted off console or removed (paragraph 2-125).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-126)

- (1) Tag and disconnect electrical wiring to indicator base (8). Refer to Appendix G.
- (2) For removal of the indicator bases (8) (P/S flooding alarm port and starboard indicators DS8 and DS9, P/S vent fan indicator DS6 and DS7, P/S clutch engaged indicator DS4 and DS5, P/S fire alarm indicators DS1 and DS3 and flood alarm indicator DS2), remove hex nut (4) and washer (5) (supplied with the indicator base (8)) from the underside of the lower control panel (9).
- (3) Remove the green caps (1), amber caps (2), and red caps (3), seals (6) and washers (7) from the indicator (8). Remove indicator base (8) from lower control panel (9).
- (4) Remove lamp (10) from indicator base (8).

b. *Install.* (figure 2-126)

- (1) Position the indicator bases (6) (P/S flooding alarm port and starboard indicators DS8 and DS9, P/S vent fan indicator DS6 and DS7, P/S clutch engaged indicator DS4 and DS5, P/S fire alarm indicators DS1 and DS3, and flood alarm indicator DS2) through the underside of the lower control panel (8). Install lamp (10) in indicator base (8).
- (2) Replace the two seals (6), washer (7) and green caps (1), amber caps (2), and red caps (3).
- (3) Secure indicator base (8) with washer (5) and hex nut (4).
- (4) Reconnect electrical wiring, as tagged, to indicator base (8). Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wiring.

FOLLOW ON MAINTENANCE: Install lower control panel (paragraph 2-125).

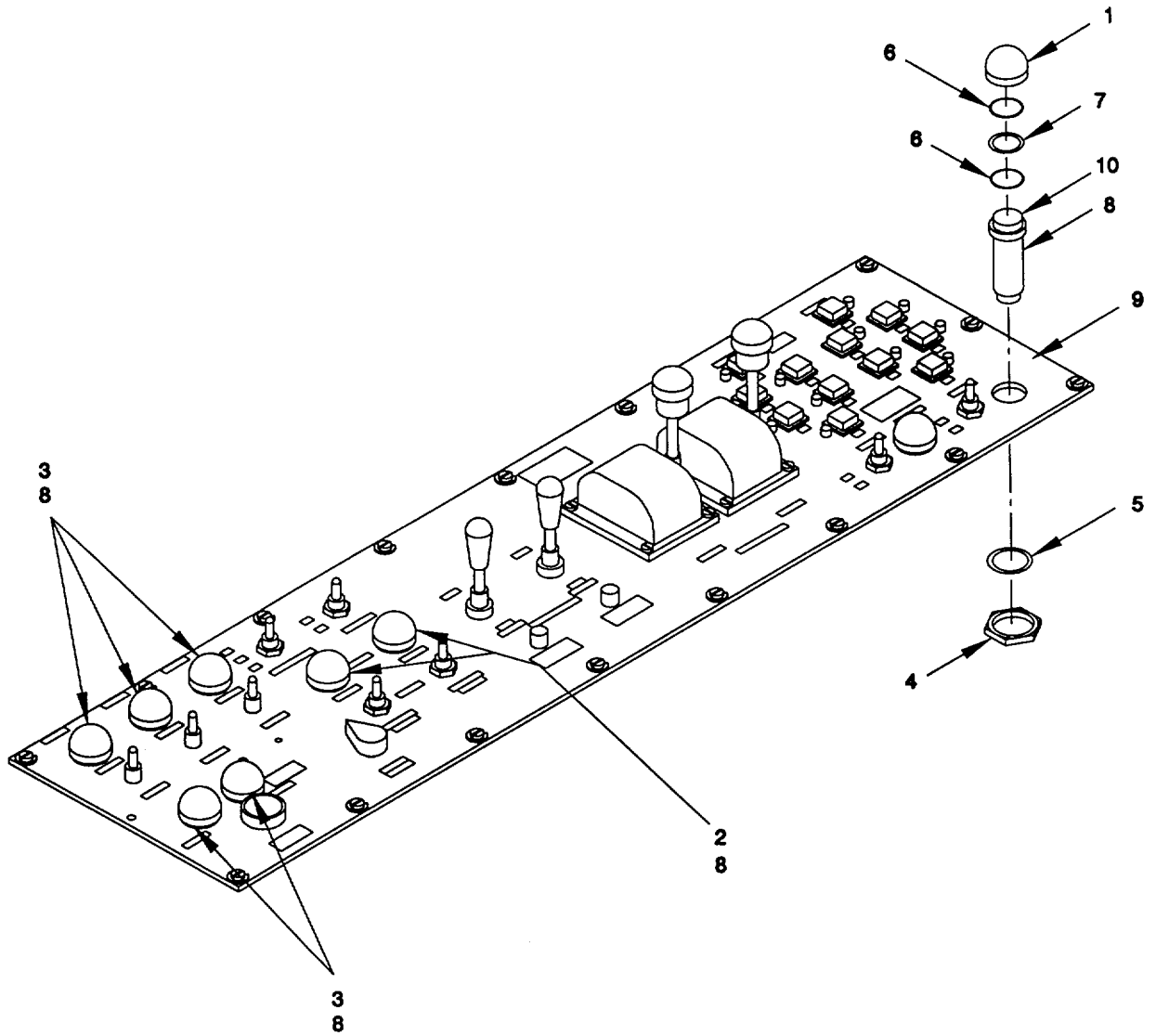


Figure 2-126. Indicators, Lower Control Panel "A2", Remove/Install.

2-130. Sonalert Beeper, Lower Control Panel "A2".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Sonalert Beeper
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Lower control panel lifted off console or removed (paragraph 2-125).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-127)

- (1) Tag and disconnect electrical wiring to sonalert beeper (2). Refer to Appendix G.
- (2) For removal of the sonalert beeper LS1 (2), remove the knurled nut (1) from the top side of the lower control panel (3) and pull the sonalert beeper (2) through the bottom side of the lower control panel (3).

b. *Install.* (figure 2-127)

- (1) Position new sonalert beeper LS1 (2) from the under side of the lower control panel (3). Secure with the knurled nut (1) on the top side of the lower control panel (3).
- (2) Reconnect electrical wiring, as tagged, to sonalert beeper (2). Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wires.

FOLLOW ON MAINTENANCE: Install lower control panel (paragraph 2-125).

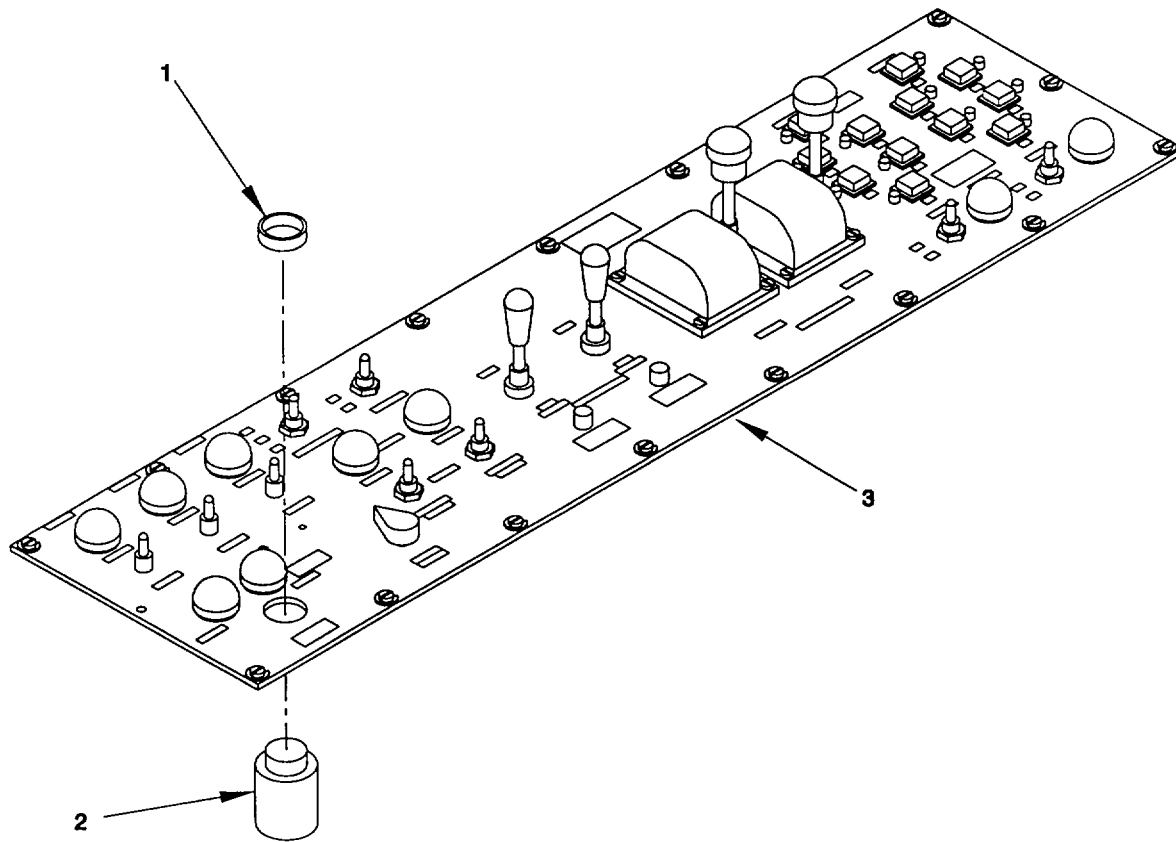


Figure 2-127. Sonalert Beeper, Lower Control Panel "A2", Remove/Install.

2-131. Indicator Lights, Bilge Pump System, Lower Control Panel "A2".

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Lamps

Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Lower control panel lifted off of console or removed (paragraph 2-125).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-128)

- (1) Tag and disconnect electrical wiring to bilge system indicator lights (DS15 through DS26). Refer to Appendix G.
- (2) For replacement of the indicator lights (Port Bilge lights DS15 through DS20, Starboard Bilge lights DS21 through DS26), remove lens cap (1), lockwasher (2), hex nut (3), and bushing (4). Remove light base (5) from back side of panel (7) (since it is flanged).
- (3) Unscrew lamp (6) from indicator light assembly.

b. *Install.* (figure 2-128)

- (1) Screw replacement lamp (6) into indicator light assembly.
- (2) Position light base (5) from back side of lower panel (7) through appropriate hole in panel and secure with bushing (4), hex nut (3) and lockwasher (2).
- (3) Screw in lens cap (1).
- (4) Reconnect electrical wiring, as tagged, to indicator lights. Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wiring.

FOLLOW ON MAINTENANCE: Install lower control panel (paragraph 2-125).

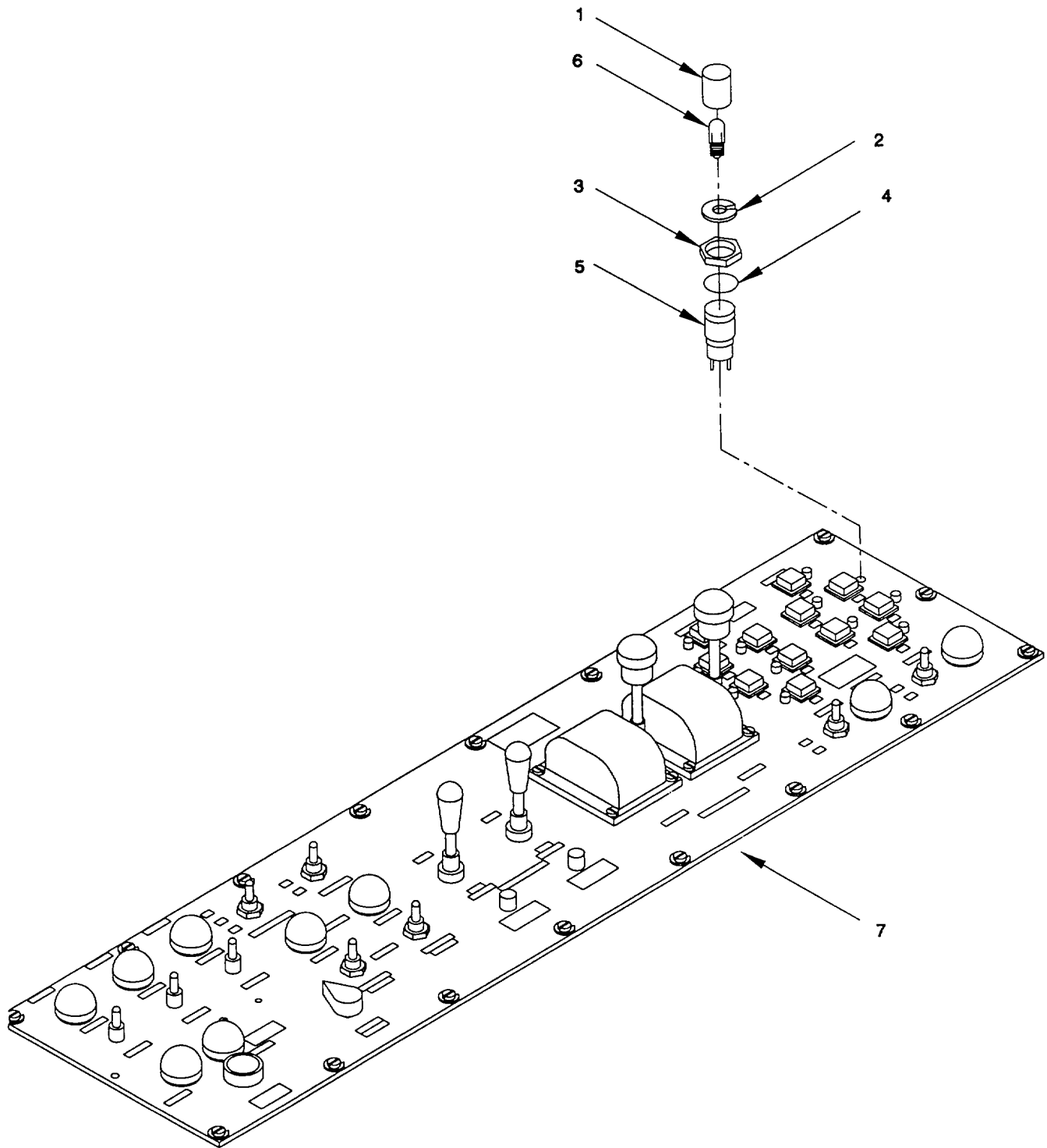


Figure 2-128. Indicator Lights, Bilge Pump System, Lower Control Panel "A2", Remove/Install.

2-132. Indicators, Thruster Gearbox Low Oil, Lower Control Panel "A2".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Lamps

Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Lower control panel removed (paragraph 2-125).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-129)

- (1) Tag and disconnect electrical wiring to indicator base (5). Refer to Appendix G.
- (2) For removal of the indicator bases (5) (Thruster Gearbox Oil Low indicators DS10 (Port) and DS11 (Starboard)), remove hex nut (1) and lockwasher (2) from back of lower panel (6).
- (3) Remove the red cap (3), and Preformed packings (4) from indicator base (5). Remove indicator base (5) from lower control panel (6).
- (4) Remove lamp (7) from indicator base (5).

b. Install. (figure 2-129)

- (1) Position the indicator base (5) (Thruster Gearbox Oil Low indicators DS10 (Port) and DS11 (Starboard)) through back of lower control panel (6). Install lamp (7) in indicator base (5).
- (2) Install the two Preformed packings (4) and red cap (3). Replace Preformed packings if damaged.
- (3) Secure indicator base (5) with lockwasher (2) and hex nut (1) on front of panel (6).
- (4) Reconnect the electrical wiring, as tagged, to indicator base (5). Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wiring.

FOLLOW ON MAINTENANCE: Install lower control panel (paragraph 2-125).

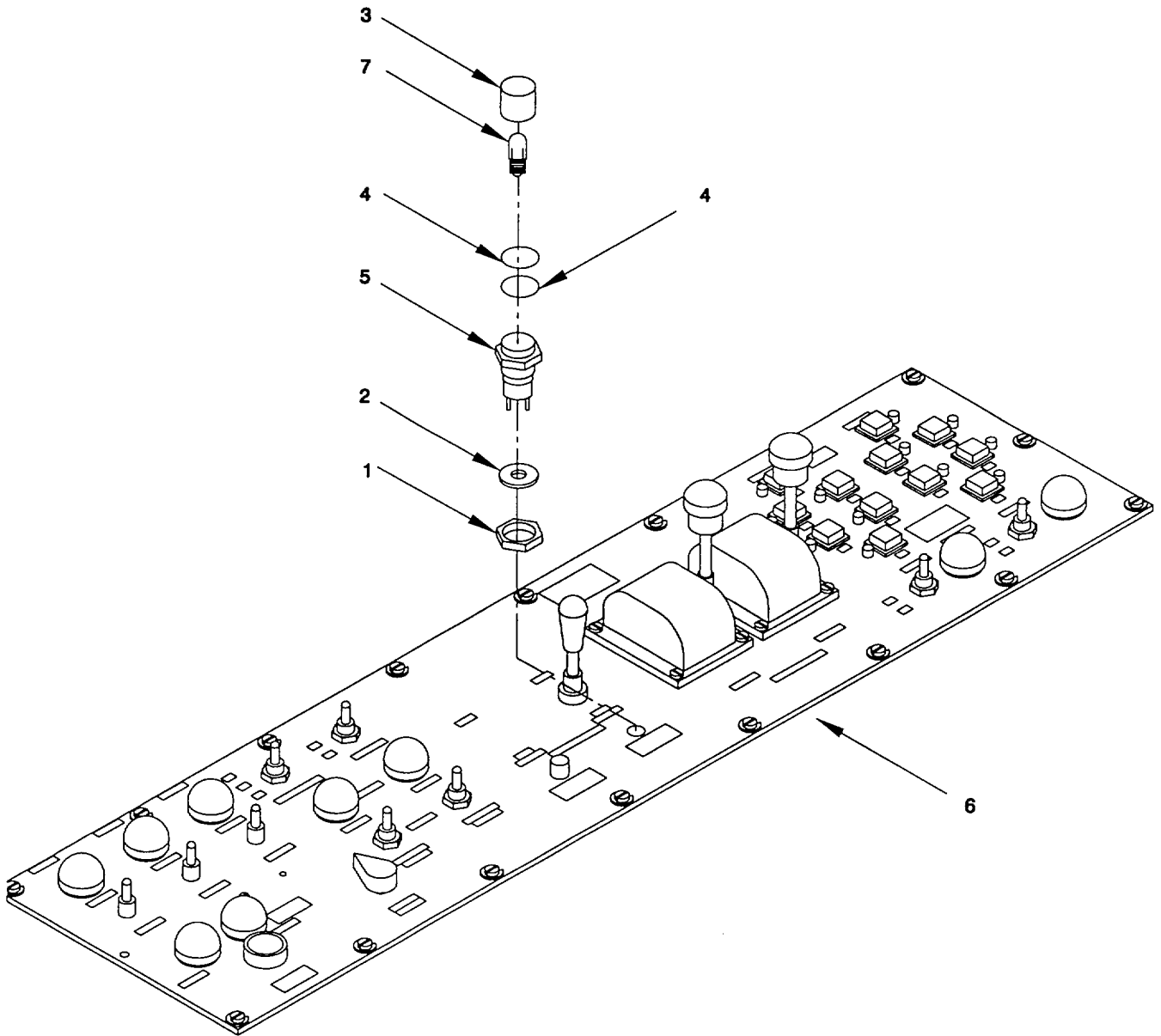


Figure 2-129. Indicators, Thruster Gearbox Oil Low, Lower Control Panel "A2", Remove/Install.

2-133. Operator's Cab Circuit Breaker Panel "A3".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Circuit Breaker Panel
Compound, Antiseize (Item 9, Appendix F)
Wraps, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-130)

- (1) Remove eight pan head screws (1) and hex nuts (2) to remove the circuit breaker panel A3, being careful when pulling away from cab not to cut, chafe, stretch or bend excessively the wiring secured to the panel.
- (2) Disconnect all electrical wiring, tag each per wiring diagrams in Appendix G. and tag OUT OF SERVICE to prevent inadvertent operation.

b. *Install.* (figure 2-130)

- (1) Apply antiseize compound to pan head screws (1).
- (2) Reconnect electrical wiring, as tagged. Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wiring.
- (3) Position circuit breaker panel on Operator's Cab and install eight pan head screws (1) and hex nuts (2).

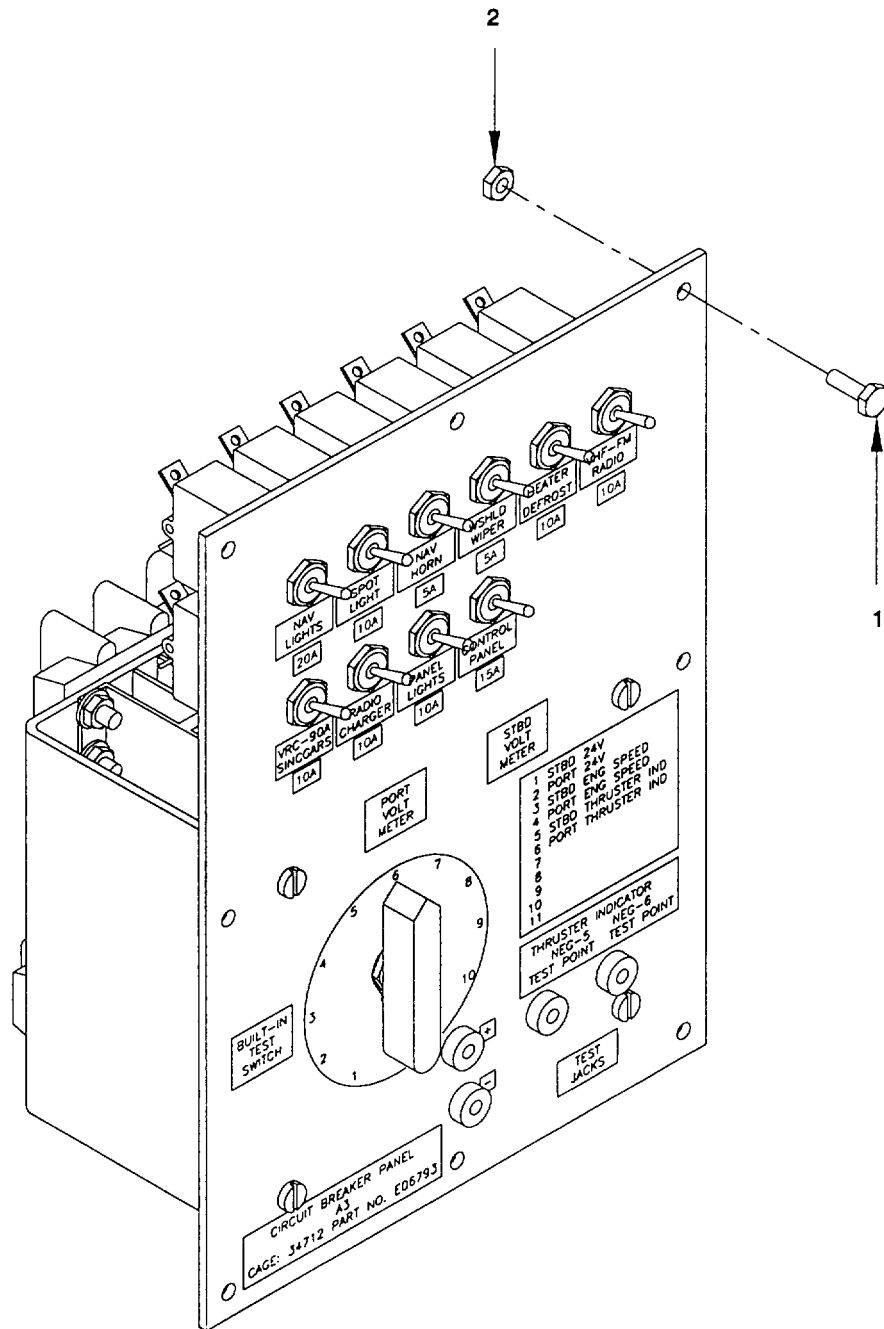


Figure 2-130. Operator Cab Circuit Breaker Panel "A3", Remove/Install.

2-134. Circuit Breaker, Operator's Cab Circuit Breaker Panel "A3".

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Circuit breaker panel lifted off console or removed (paragraph 2-133)

Circuit Breaker

Compound, Antiseize (Item 9, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-131)

- (1) Tag and disconnect the wiring from the circuit breaker.
- (2) For removal of the circuit breakers (3) (navigation lights CB1 20A, spotlight CB2 10A, navigation horn CB3 5A, windshield wiper CB4 5A, heater/defroster CB5 10A, VHF-FM radio CB6 10A, SINCGARS radio CB7 10A, radio charger CB8 5A, panel lights CB9 10A, control panel CB10 15A), remove the hex nut (1) and washer (2), supplied with each circuit breaker (3), from the top side of the panel (4).

b. Install. (figure 2-131)

- (1) Replace the circuit breakers (9)(navigation lights CB1 20A, spotlight CB2 10A, navigation horn CB35A, windshield wiper CB4 5A, heater/defroster CB5 10A, VHF-FM radio CB6 10A, SINCGARS radio CB7 10A, radio charger (CB8 5A), panel lights CB9 10A, control panel CB10 15A, replace the hex nut (1) and washer (2), both supplied with the circuit breaker (3) at the top of the panel (4).
- (2) Reconnect electrical wiring as tagged. Refer to Appendix G.

FOLLOW ON MAINTENANCE: Install circuit breaker panel (paragraph 2-133).

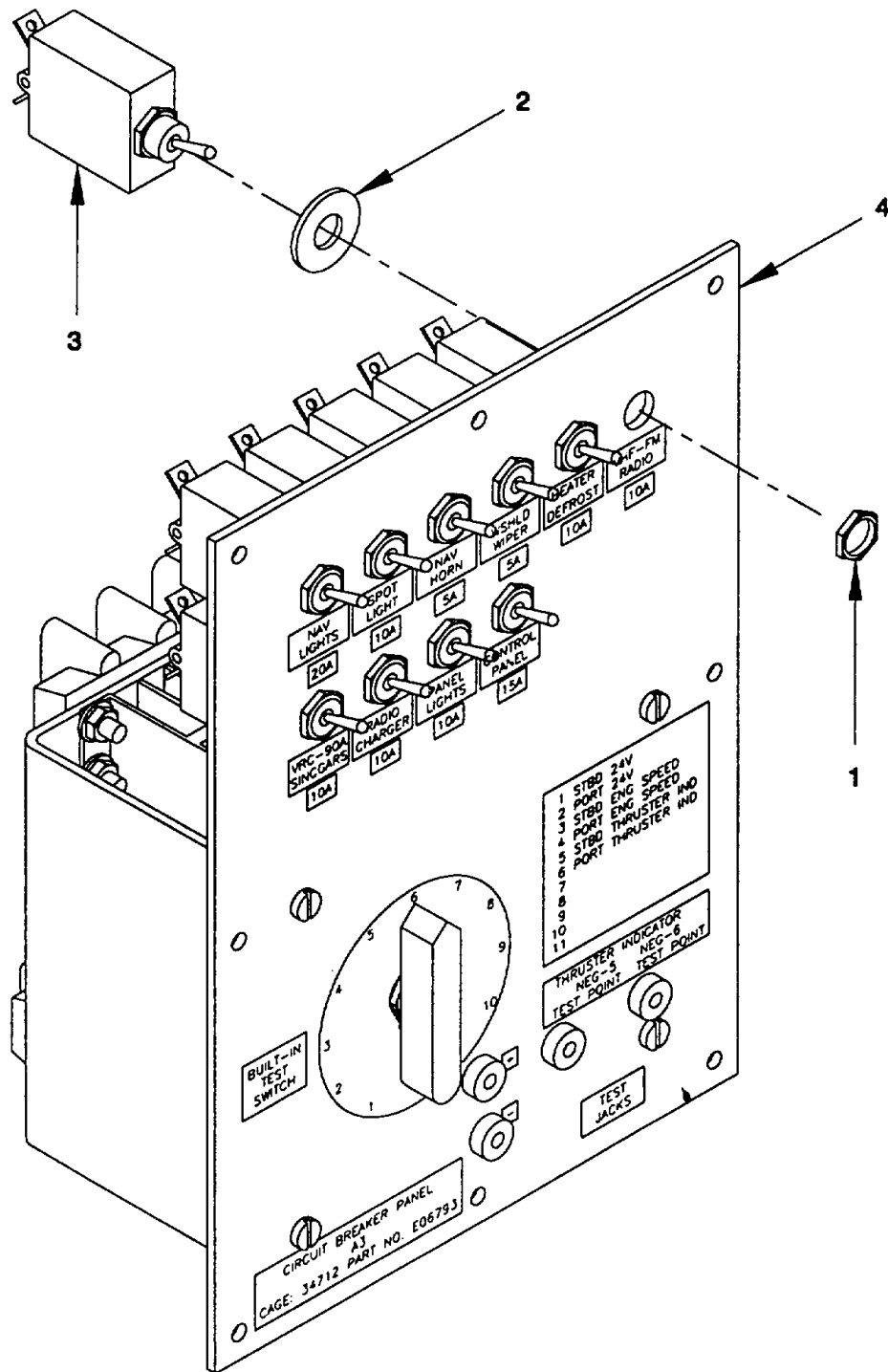


Figure 2-131. Circuit Breaker, Operator's Cab Circuit-Breaker Panel "A3", Remove/install.

2-135. Rotary Switch, Operator's Cab Circuit Breaker Panel "A3".

This task covers: a. Remove b. Install

INITIAL SETUP
Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Rotary Switch
Compound, Antiseize (Item 9, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Circuit breaker panel lifted off console or removed (paragraph 2-133)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. Remove. (figure 2-132)
- (1) Remove pan head screws (1), lock washers (2), hex nuts (3) and lift heat sink and bracket assembly (4) from the front panel (9).
 - (2) Disconnect electrical wiring to switch and tag OUT OF SERVICE. Remove the bar pointer knob (5) from the shaft of the switch. To remove the built-in rotary switch S1 (8), remove hex nut (6) and washer (7), supplied with each switch, from the front side of the panel (9).
- b. Install. (figure 2-132)
- (1) Apply antiseize compound to threads on pan head screws (1) and hex nut (6).
 - (2) Position the rotary switch S1 (8) and replace the hex nut (6) and washer (7). supplied with each switch, to the front side of the panel (9). Replace the bar pointer knob (5) on the shaft of the switch. Reconnect the wiring as previously tagged.
 - (3) Position the heat sink and bracket assembly (4) on the front panel (9) and secure with pan head screws (1), lock washers (2) and hex nuts (3).

FOLLOW ON MAINTENANCE: Install circuit breaker panel (paragraph 2-133).

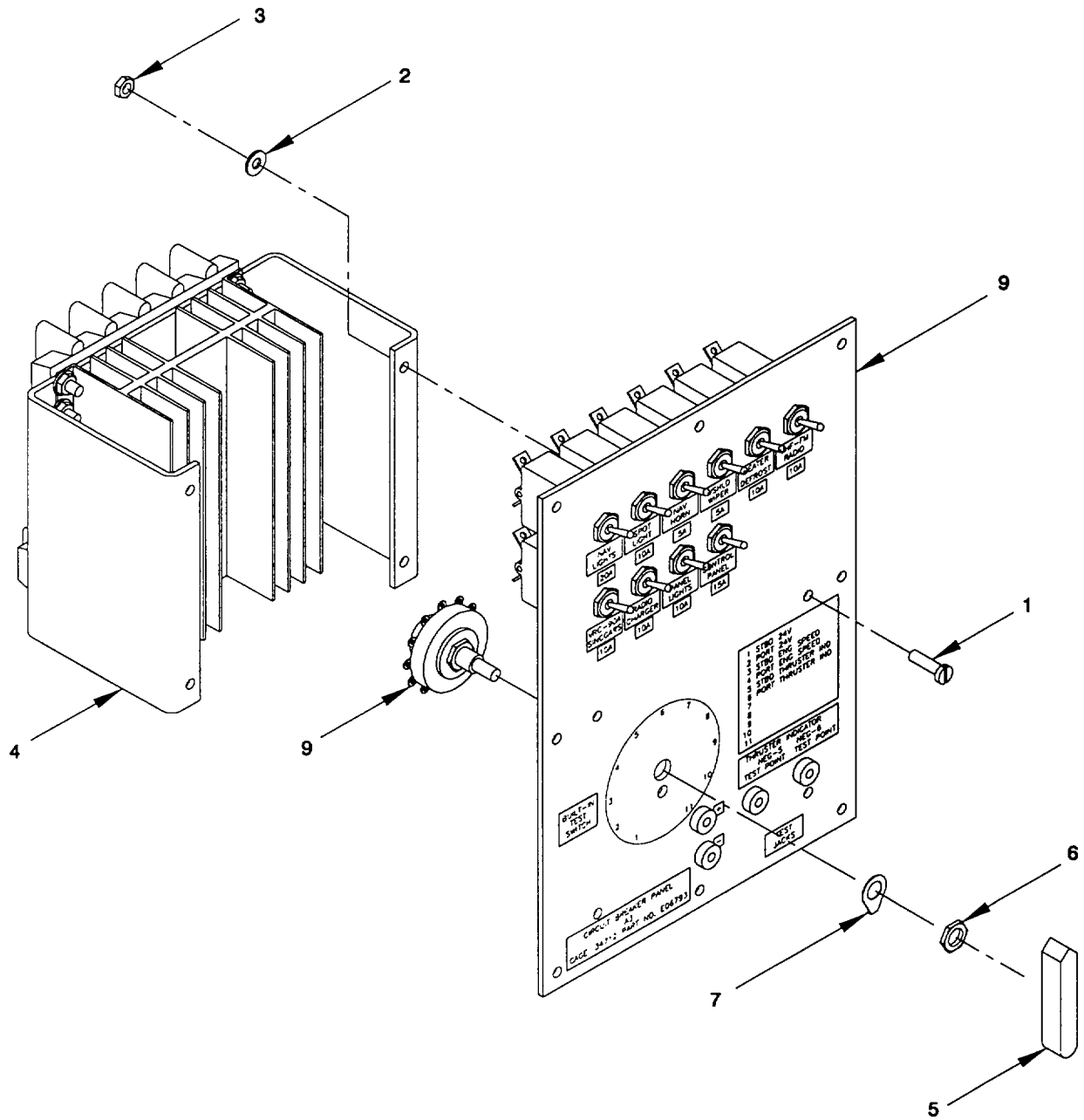


Figure 2-132. Rotary Switch, Operator's Cab Circuit Breaker Panel "A3", Remove/Install.

2-136. Testing with the Operator's Cab Circuit Breaker Panel "A3".

This task covers: a. Test

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

Normal, operating condition.

Materials/Parts

Propulsion Module

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. Test, Propulsion Module. (figure 2-133)

NOTE

The following test indicates power TO the various units described.

- (1) Insert plus (+) or minus (-) leads of a multimeter into banana test jacks (1) or (2), matching polarity of leads to polarity of test jacks. If Thruster Indicator is desired, insert test jacks in NEG-5 or NEG-6 test point jacks.
- (2) Turn bar pointer knob (2) to select test desired (see label on front left of panel):
 - "1" - Starboard 24 V
 - "2" - Port 24 V
 - "3" - Stbd Eng Speed
 - "4" - Port Eng Speed
 - "5" - Stbd Thruster Ind.
 - "6" - Port Thruster Ind.
- (3) Select appropriate scale on multimeter. Take reading. It should read approximately 24 volts. If not, proceed to appropriate troubleshooting section of this manual.
- (4) Remove multimeter leads when done.

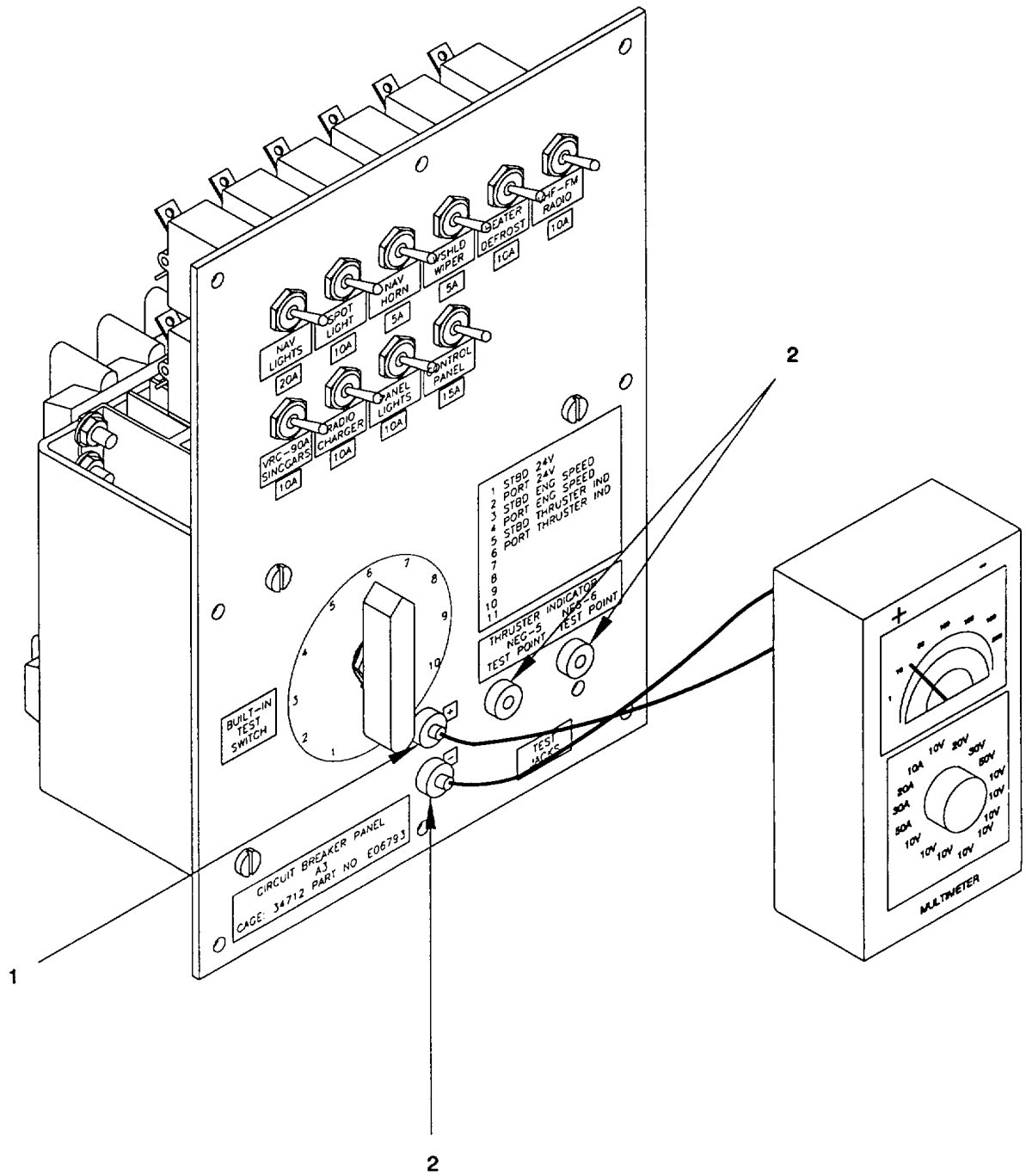


Figure 2-133. Circuit Breaker Panel "A3", Operator Cab, Test.

2-137. Terminal Strip "A4" Assembly.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Terminal Strip Assembly
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Cab access panel removed.

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. Remove. (figure 2-134)
- (1) Disconnect and tag electrical wiring to terminal strip assembly (2). Refer to Appendix G.
 - (2) Remove four self locking hex head capscrews (1) securing terminal strip assembly (2). Remove terminal strip assembly (2).
- b. Install. (figure 2-134)
- (1) Position terminal strip assembly (2). Secure with four self locking hex head capscrews (1).
 - (2) Reconnect electrical wiring, as tagged, to terminal strip assembly (2). Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wiring.

FOLLOW ON MAINTENANCE: Install cab access panel.

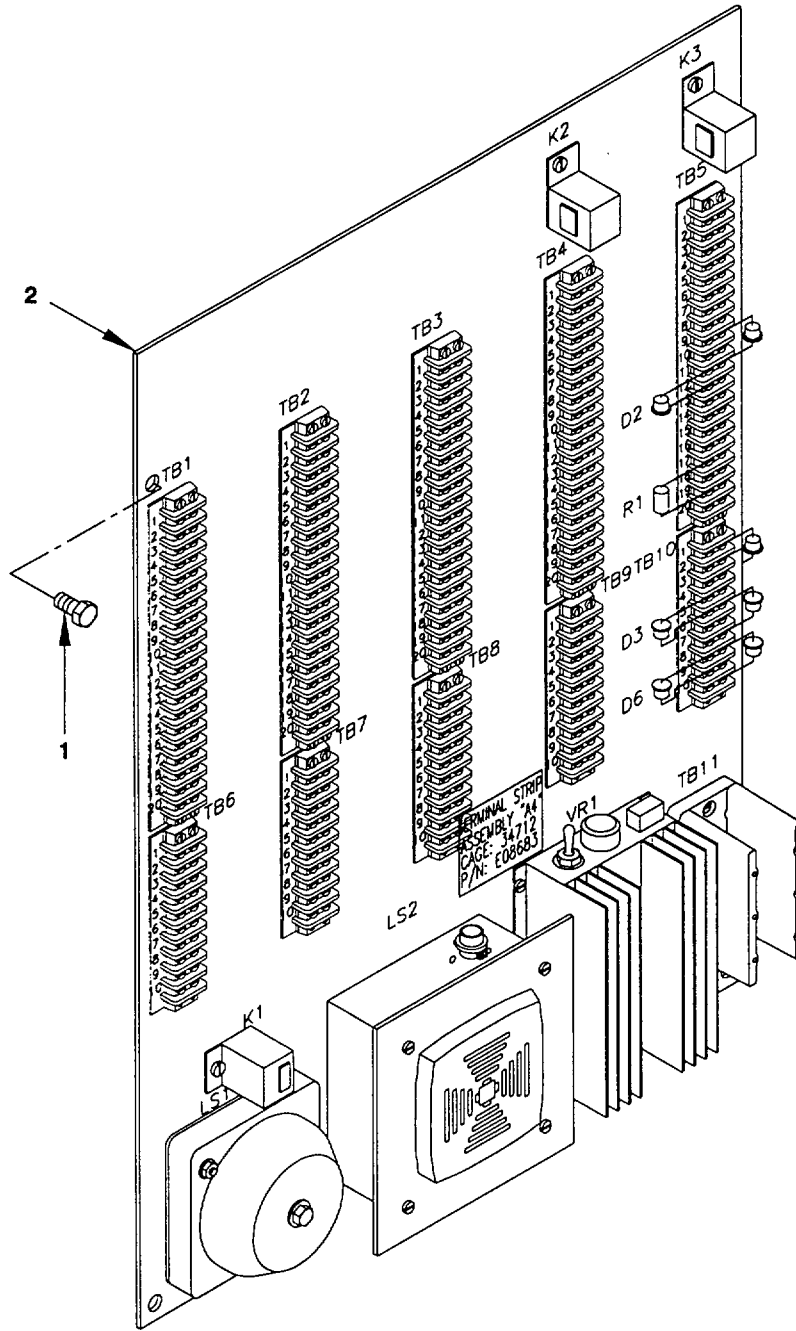


Figure 2-134. Terminal strip "A4" Assembly, Remove/Install.

2-138. Alarm Bell, Engine Malfunction, Terminal Strip "A4".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Terminal strip assembly removed (paragraph 2-137).

Alarm Bell

Compound, Antizeize (Item 9, Appendix F)

Wraps, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-135)

- (1) Remove the capscrew (1), washer (2), and bell (3) to expose the bell solenoid (4).
- (2) Tag and disconnect the wiring from the solenoid (4).
- (3) Remove nut (5) and washer (6) to free solenoid (4) from base (7).
- (4) Remove round head screw (8) to free base from terminal plate.

b. Install. (figure 2-135)

- (1) Position base (7) on terminal plate and secure with round head screw (7).
- (2) Position solenoid (4) and secure with washer (6) and nut (5).
- (3) Connect wiring on solenoid (4) as previously tagged. Refer to the Terminal Strip A4 Assembly in Appendix G for wiring diagrams. Use tie wraps and mounting bases to secure any loose wiring.
- (4) Position bell (3) on solenoid (4) and secure with washer (2) and capscrew (1).

FOLLOW ON MAINTENANCE: Install terminal strip assembly (paragraph 2-137).

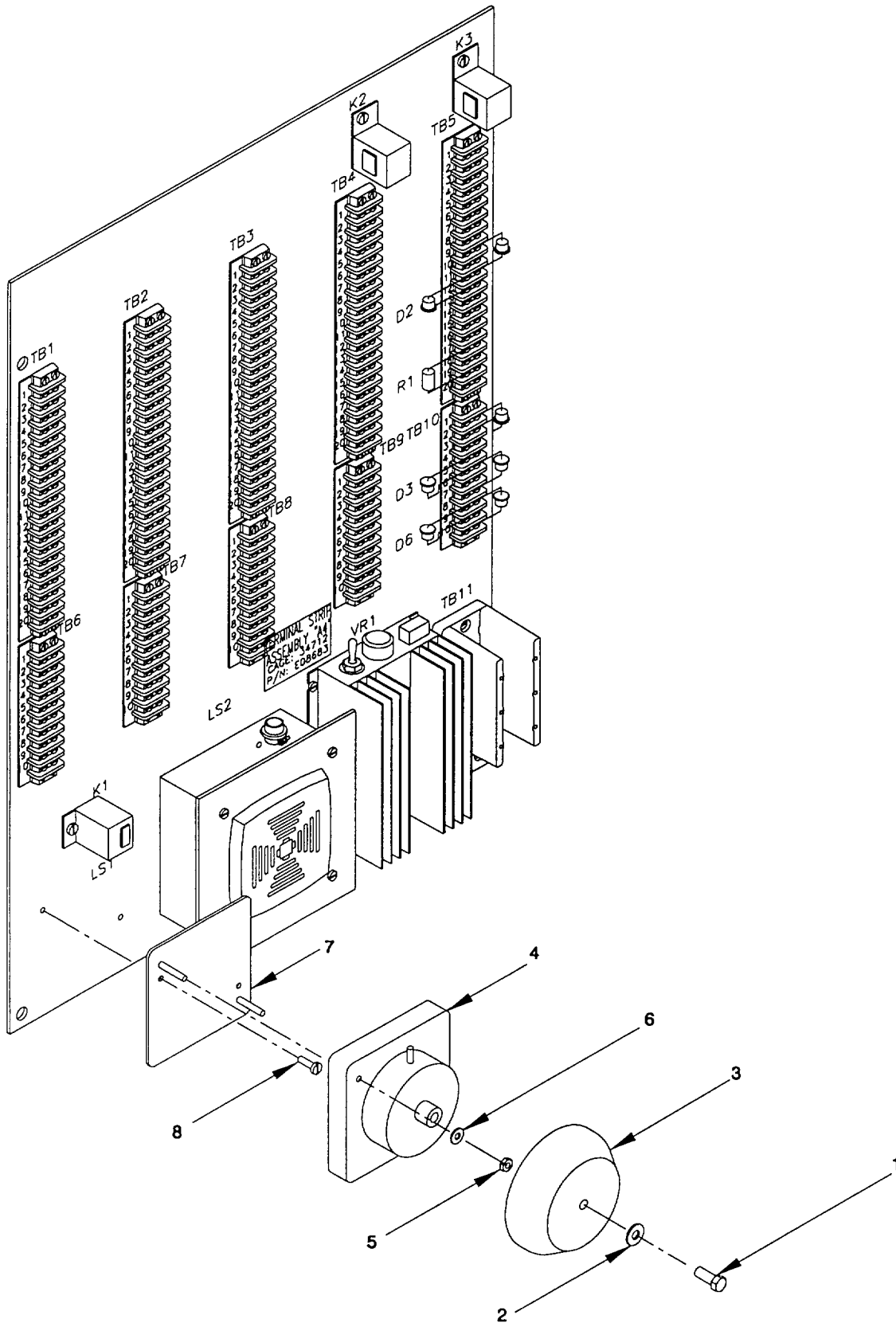


Figure 2-135. Alarm Bell, Engine Malfunction, Terminal Strip "A4", Remove/install.

2-139. Fire Alarm Horn, Terminal Strip.

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

*Materials/Parts*Fire Alarm Horn
Compound, Antiseize (Item 9, Appendix F)
Wraps, Tie (Item 57, Appendix F)*Equipment Condition*

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Terminal strip 'A4" assembly removed (paragraph 2-137).

WARNING**When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.**a. Remove. (figure 2-136)

- (1) Remove round head screws (1) (supplied with horn) which hold the horn (2) to the junction box (4).
- (2) Tag and disconnect the wiring from the horn (2).
- (3) To remove the junction box (4) from the terminal plate, remove the round head screw (3).

b. Install. (figure 2-136)

- (1) Apply antiseize compound to round head screws (3). Position junction box (4) on terminal plate and secure with round head screws (3).
- (2) Connect wiring to horn as previously tagged. Refer to Terminal Strip "A4" Assembly in Appendix G for wiring diagrams. Use tie wraps and mounting bases to secure any loose wiring.
- (3) Apply antiseize compound to four round head screws (1). Position horn (2) on junction box (4) and secure with round head screws (1).

FOLLOW ON MAINTENANCE: Install terminal strip "A4" assembly (paragraph 2-137).

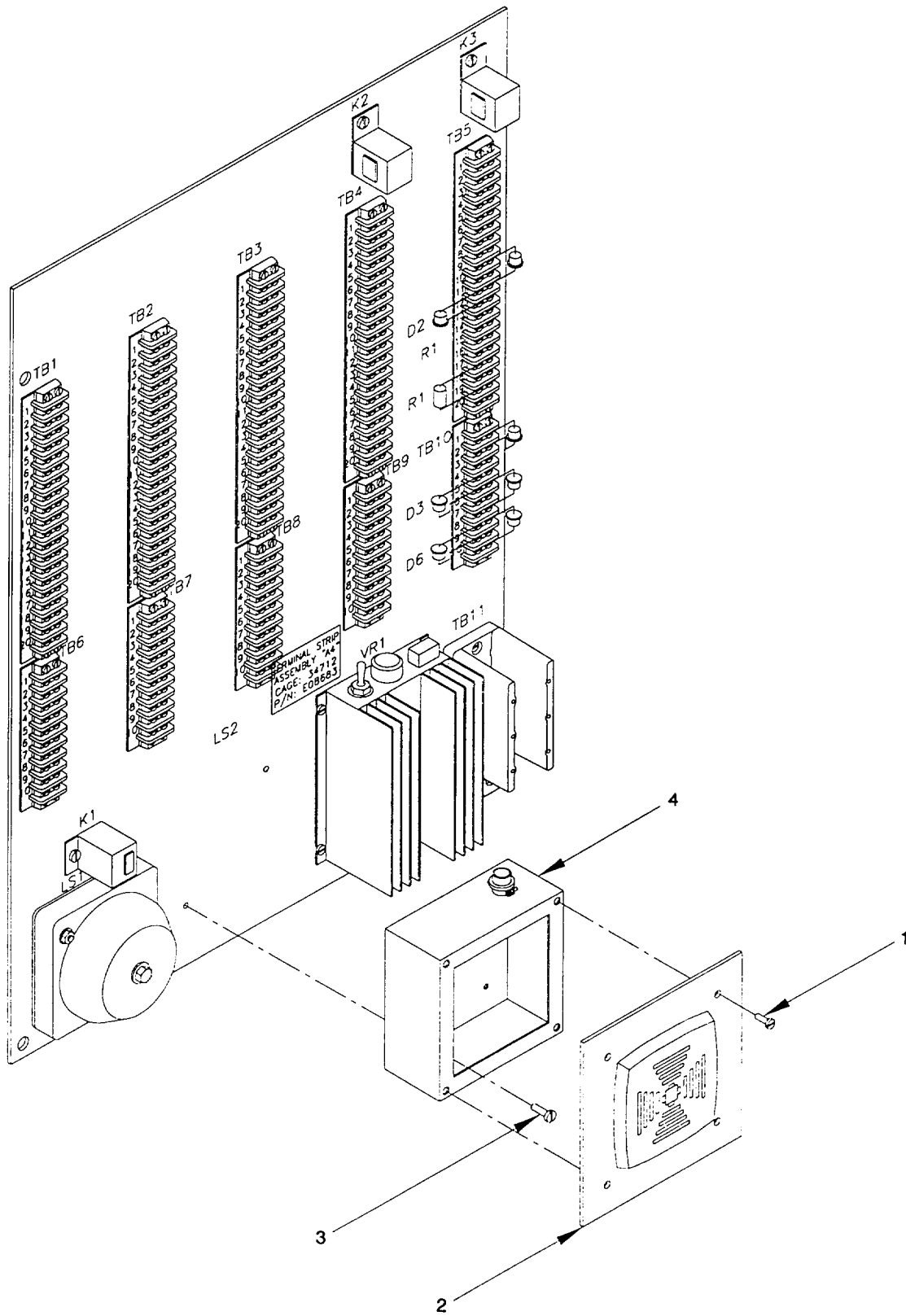


Figure 2-136. Fire Alarm Horn, Terminal Strip, Remove/Install.

2-140. Relay, Terminal Strip "A4".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Relay
Compound, Antiseize (Item 9, Appendix F)
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Cab access panel removed.

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-137)

- (1) Unlatch relay retainer (1) and remove relay (2) from the relay socket (3).
- (2) To remove the relay socket (3) and terminals (5), remove the round head screw (4).

b. Install. (figure 2-137)

- (1) Apply antiseize compound to screws (4). Position relay socket (3) and terminals (5) and secure with round head screw (4).
- (2) Position relay (2) on relay socket (3) and latch relay retainer (1).

FOLLOW ON MAINTENANCE: Install cab access panel.

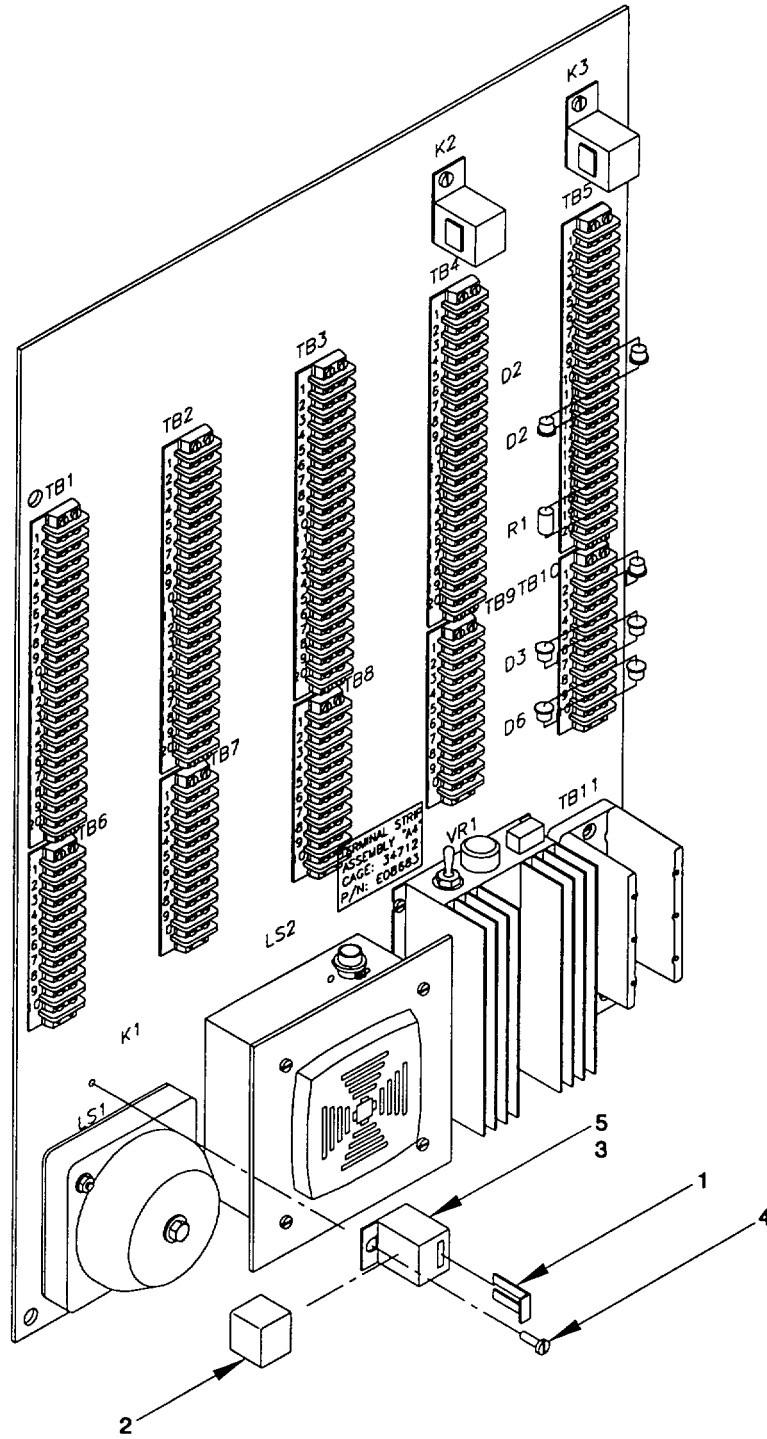


Figure 2-137. Typical Relay, Terminal Strip "A4", Remove/Install.

2-141. Converter, Terminal Strip "A4".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Converter
Compound, Antiseize (Item 9, Appendix F)
Wraps, Tie (Item 57, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Terminal Strip "A4" assembly removed (paragraph 2-137).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. Remove. (figure 2-138)
 - (1) Tag and disconnect wiring from the converter (1).
 - (2) Remove the pan head screw (2) to free the converter (1) from the terminal plate.
- b. Install. (figure 2-138)
 - (1) Apply antiseize compound to pan head screws (2), position the converter (1) on the terminal plate, and secure with pan head screws (2).
 - (2) Connect wiring to converter (1) as previously tagged. Refer to Terminal Strip A4 Assembly in Appendix G for wiring diagrams. Use tie wraps and mounting bases to secure any loose wiring.

FOLLOW ON MAINTENANCE: Install terminal Strip assembly (paragraph 2-137).

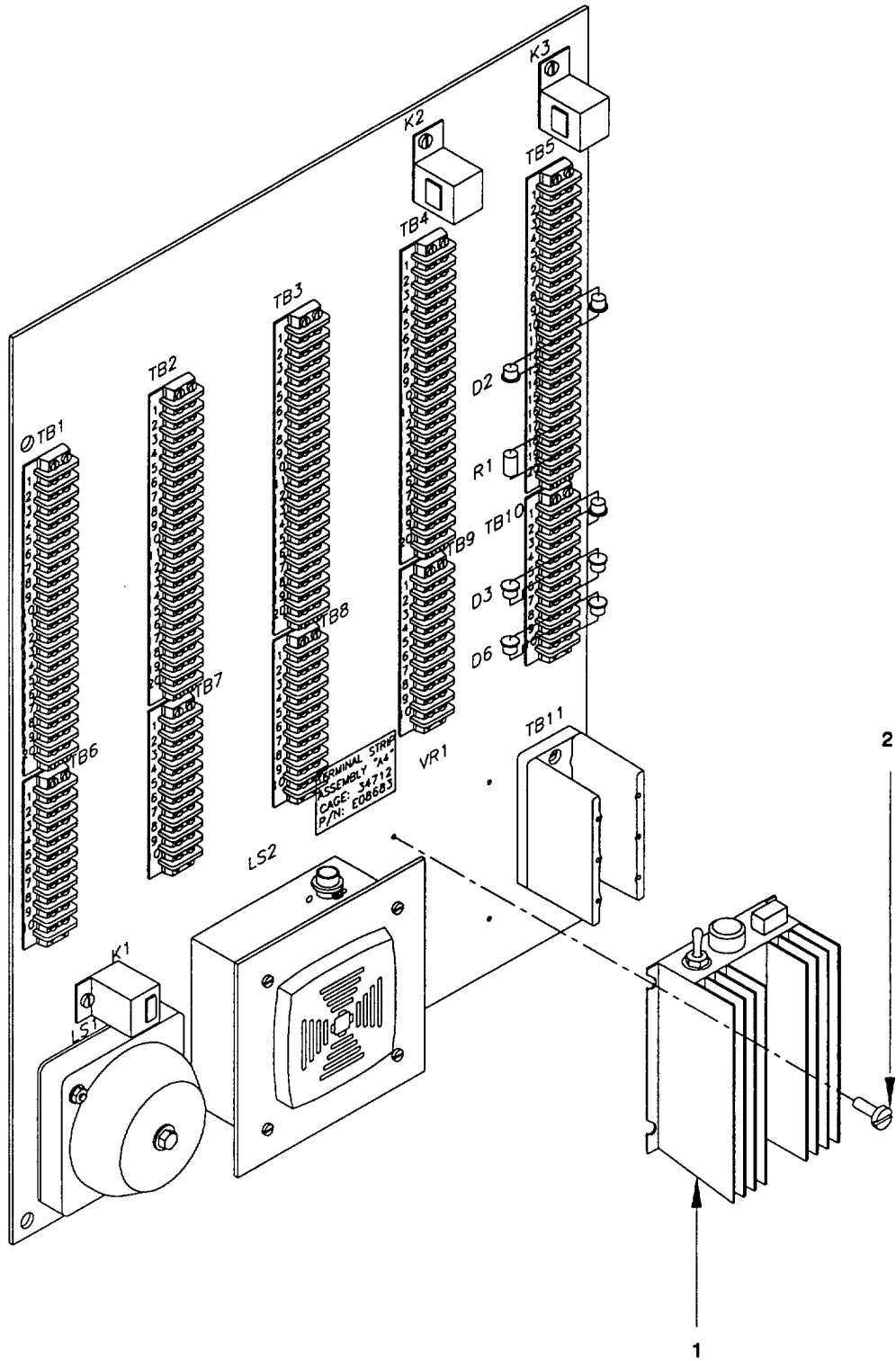


Figure 2-138. Converter, Terminal Strip "A4", Remove/Install.

2-142. Fuse, Converter, Terminal Strip "A4".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

None

Materials/Parts

Fuse

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-139)
 - (1) Troubleshoot cause of blown fuse before removing and replacing fuse.
 - (2) Unscrew fuse cap (1) and remove fuse (2) from converter (3).
- b. *Install.* (figure 2-139)
 - (1) Insert new fuse (2) in converter.
 - (2) Screw fuse cap (1) into converter (3).

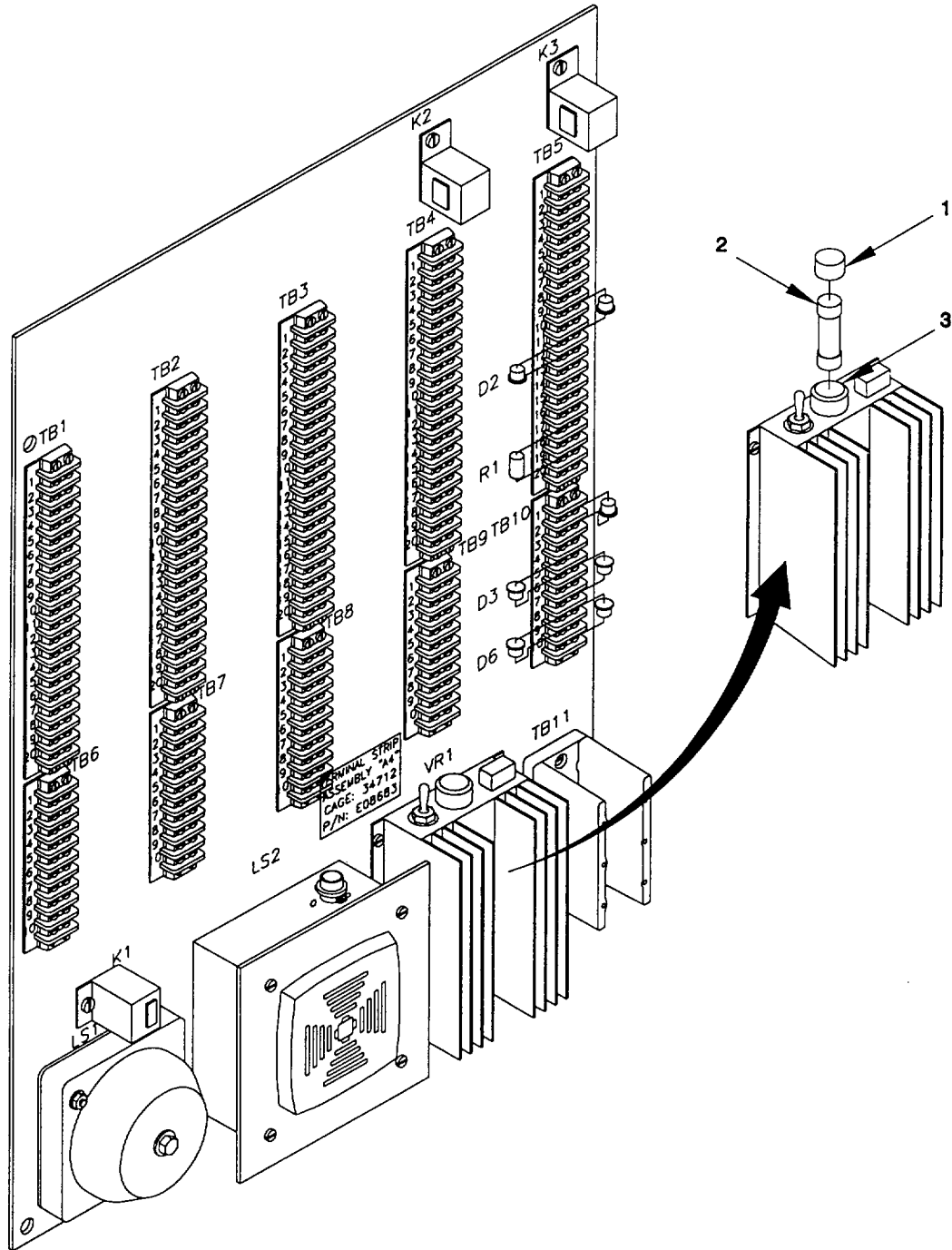


Figure 2-139. Fuse, Converter, Terminal Strip "A4", Remove/Install.

2-143. Power Distribution Block, Terminal Strip "A4".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Power Distribution Block
Compound, Antiseize (Item 9, Appendix F)
Wraps, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-140)
 - (1) Tag and disconnect wiring from the block (1).
 - (2) Remove pan head screw (2) to free the block (1).
- b. *Install.* (figure 2-140)
 - (1) Position block (1) on terminal plate. Apply antiseize compound to four pan head screws (2). Secure each terminal block (1) with four pan head screws (2).
 - (2) Connect wiring to block (1) as previously tagged. Refer to Terminal Strip "A4" Assembly in Appendix G for wiring diagrams. Use tie wraps and mounting bases to secure any loose wiring.

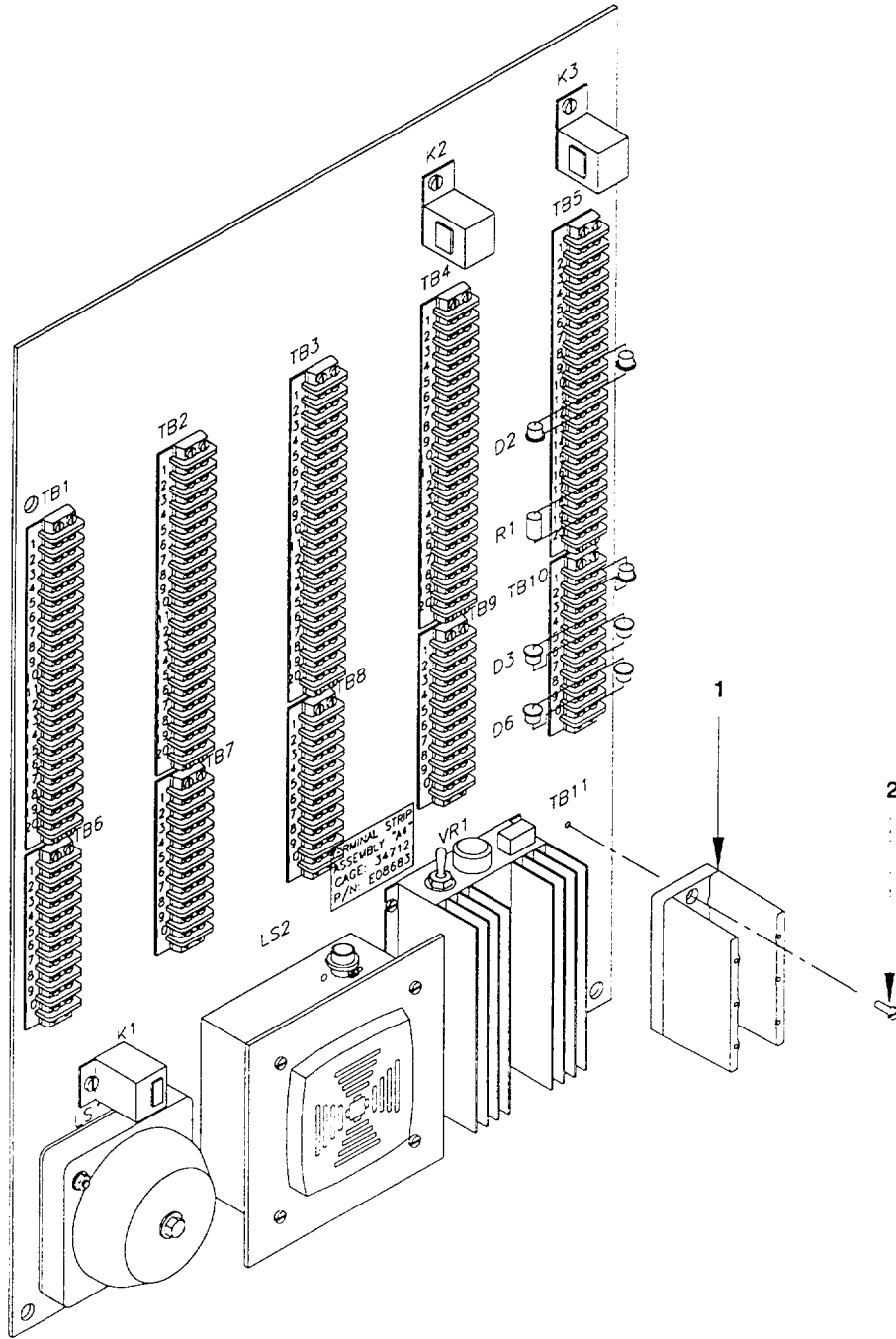


Figure 2-140. Power Distribution Block, Terminal Strip "A4". Remove/install

2-144. Terminal Block, Terminal Strip "A4".

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Terminal Block
Compound, Antiseize (Item 9, Appendix F)
Wraps, Tie (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. Remove. (figure 2-141)
 - (1) Tag and disconnect the wiring from the block (1 or 2).
 - (2) Remove pan head screw (3) to remove the block (1 or 2) from the terminal plate. The marker Strips (4) or (5) are removed with each terminal block (1 or 2). The diodes (6) are connected to the terminal blocks (1 or 2).
- b. Install. (figure 2-141)
 - (1) Position marker Strips (4 or 5) over terminal block (1 or 2). Apply antiseize compound to four screws (3). Secure terminal blocks (1 or 2) to plate with pan head screws (3).
 - (2) Connect wiring as previously tagged. Refer to Terminal Strip "A4" Assembly in Appendix G for wiring diagrams. Use tie wraps and mounting bases to secure any loose wiring.

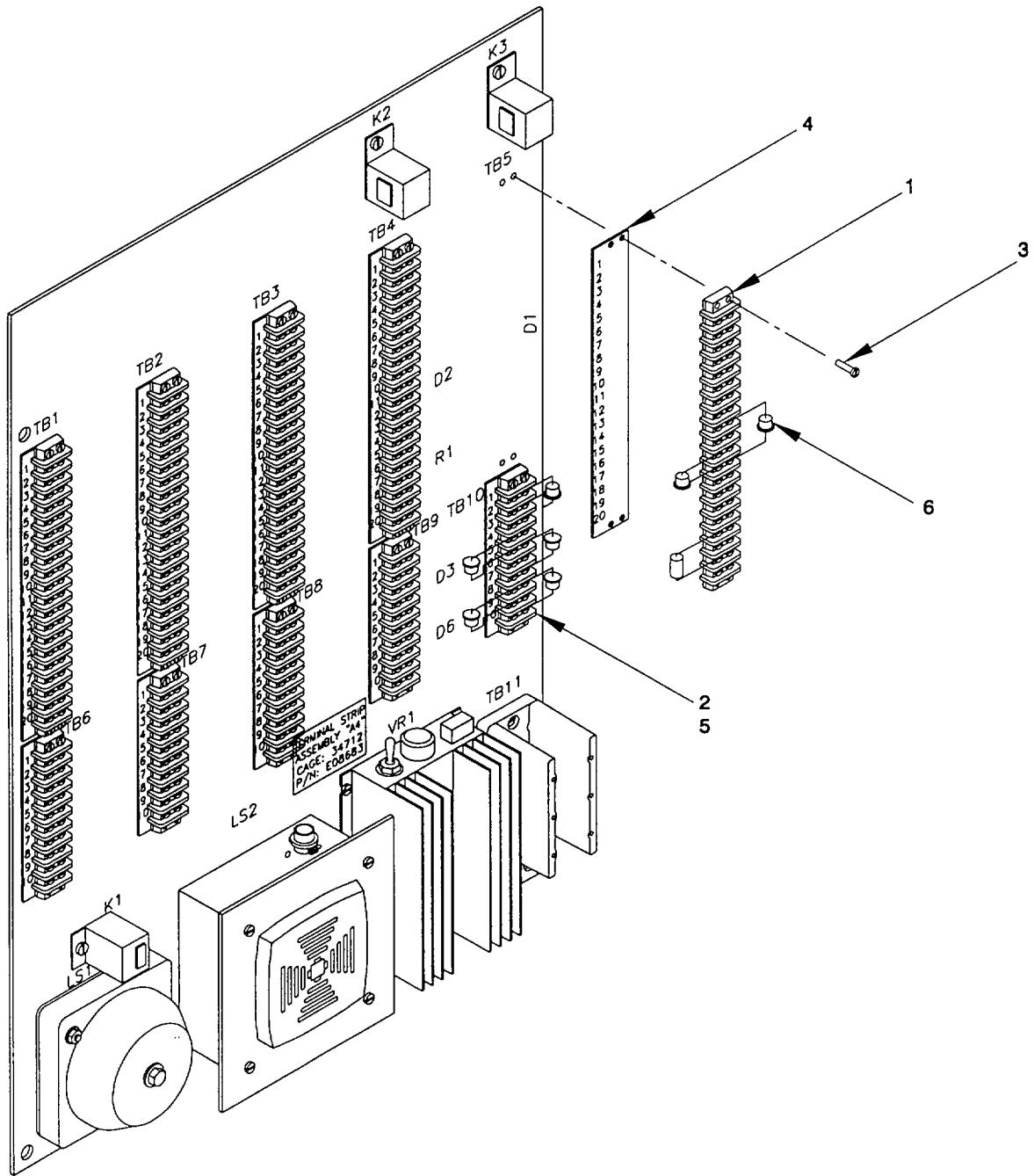


Figure 2-141. Terminal Block, Terminal Strip "A4", Remove/Install

2-145. Starboard Receptacle "A5"/Port Receptacle "A6" Assembly.

This task covers: a. Inspect b. Remove c. Repair d. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)
 Crimping Tool (NSN 5120-00-225-5206)
 Insertion Tool (E12368-2, CAGE 34712)
 Extraction Tool (NSN 5120-01-394-0296)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Starboard Receptacle
 Port Receptacle
 Gaskets
 Pins
 Sockets

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Inspect.*
- (1) Inspect for broken or bent pins or receptacles. Repair as required.
 - (2) Inspect for corrosion, deterioration, or broken or loose electrical wiring. Repair as required.
- b. *Remove.* (figure 2-142)

NOTE

Wiring to receptacle pins is either soldered or crimped. Disassembly of the receptacle assembly should be performed only in the event of electrical problems (open circuits, short circuits) with the wiring harness or physical damage to the receptacles.

- (1) Disconnect and tag electrical wiring to the receptacle assembly (4). Refer to Appendix G.
 - (2) Remove the four capscrews (1), four lock washers (2) and nuts (3) securing receptacle assembly (4). Remove receptacle assembly (4).
 - (3) Inspect wiring for loose or broken connections. Replace or repair as necessary to restore to working condition.
- c. *Repair.* (figure 2-143)
- (1) Remove receptacle assembly per step b.

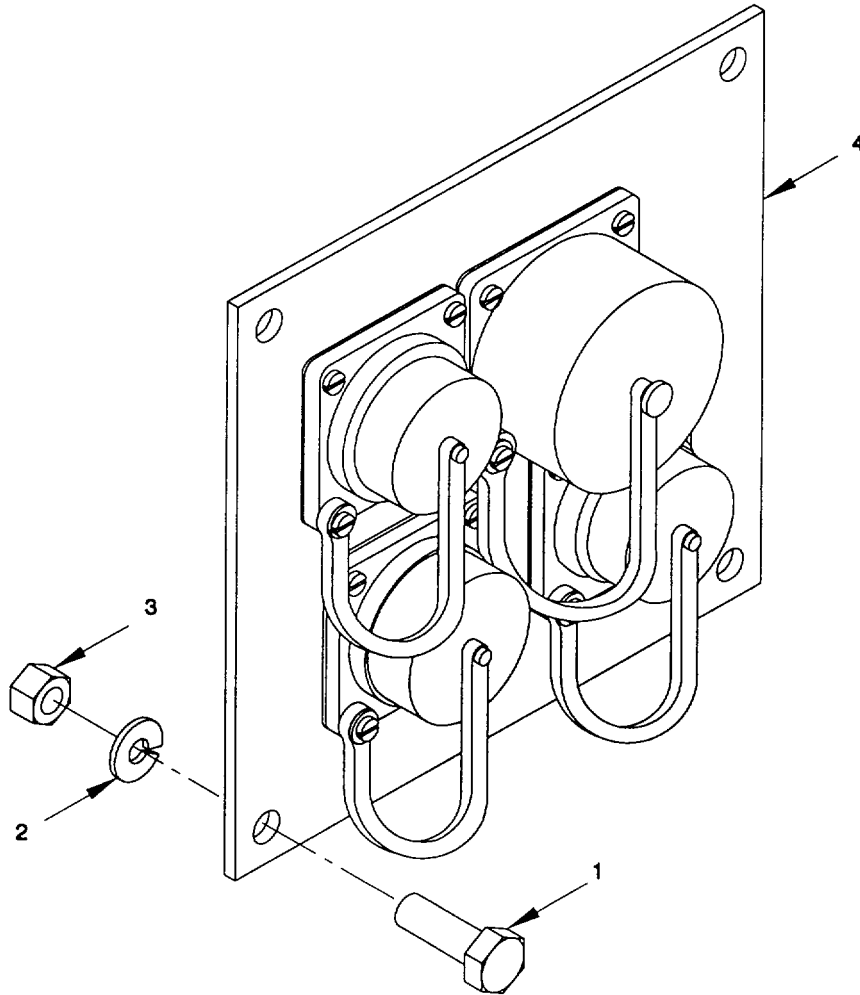


Figure 2-142. Typical Starboard Receptacle "A5"/Port Receptacle "A6" Assembly, Remove/Install

2-145. Starboard Receptacle "A5"/Port Receptacle "A6" Assembly (Cont).

- (2) Remove receptacle in need of pin replacement.
 - (a) For removal of the reverse (socket) receptacle 3A5J2 or 3A6J2 (4). remove four pan head screws (1) securing reverse receptacle 3A5J2 or 3A6J2 (4). Remove receptacle (4) with cap (3) and gasket (5). Remove sockets (6) from receptacle (4).
 - (b) For removal of the standard (pin) receptacle 3A5J3 or 3A6J3 (7). remove four pan head screws (1). Remove receptacle (7) with cap (3) and gasket (5).
 - (c) For removal of the receptacle 3A5J1 or 3A6J1 (9), remove four pan head screws (1). Remove receptacle (9) with cap (10) and gasket (11).
 - (d) For removal of the standard (pin) receptacle 3A5J4 or 3A6J4 (13), remove four pan head screws (12). Remove receptacle (13) with cap (14) and gasket (15).
- (3) Extract pins (8) from receptacle (7) with extraction tool.
- (4) Insert replacement pins (8) in receptacle (7) using insertion tool.
- (5) Crimp connections to the 3A6J2 sockets and 3A6J3 pins using crimping tool. Refer to Appendix G.
- (6) Install receptacle:
 - (a) For installation of receptacle 3A6J1, replace receptacle (9), gasket (11) and cap (10). Apply locking compound to pan head screws (1), Secure receptacle with four pan head screws (1).
 - (b) For installation of receptacles 3A6J2 and 3A6J3, position receptacle (4 or 7), gasket (5) and cap (3). Apply locking compound to pan head screws (1), Secure with four pan head screws (1).
 - (c) For installation of receptacle 3A5J4 or 3A6J4, replace receptacle (13), gasket (15) and cap (14). Apply locking compound to pan head screws (12), Secure with four pan head screws (12).
- (7) Replace receptacle assembly as per step b.
- d. Install. (figure 2-142)
 - (1) Position receptacle assembly (4). Secure with four capscrews (1), lockwashers (2) and nuts (3).
 - (2) Reconnect electrical wiring, as tagged, to receptacle assembly (4). Refer to Appendix G.

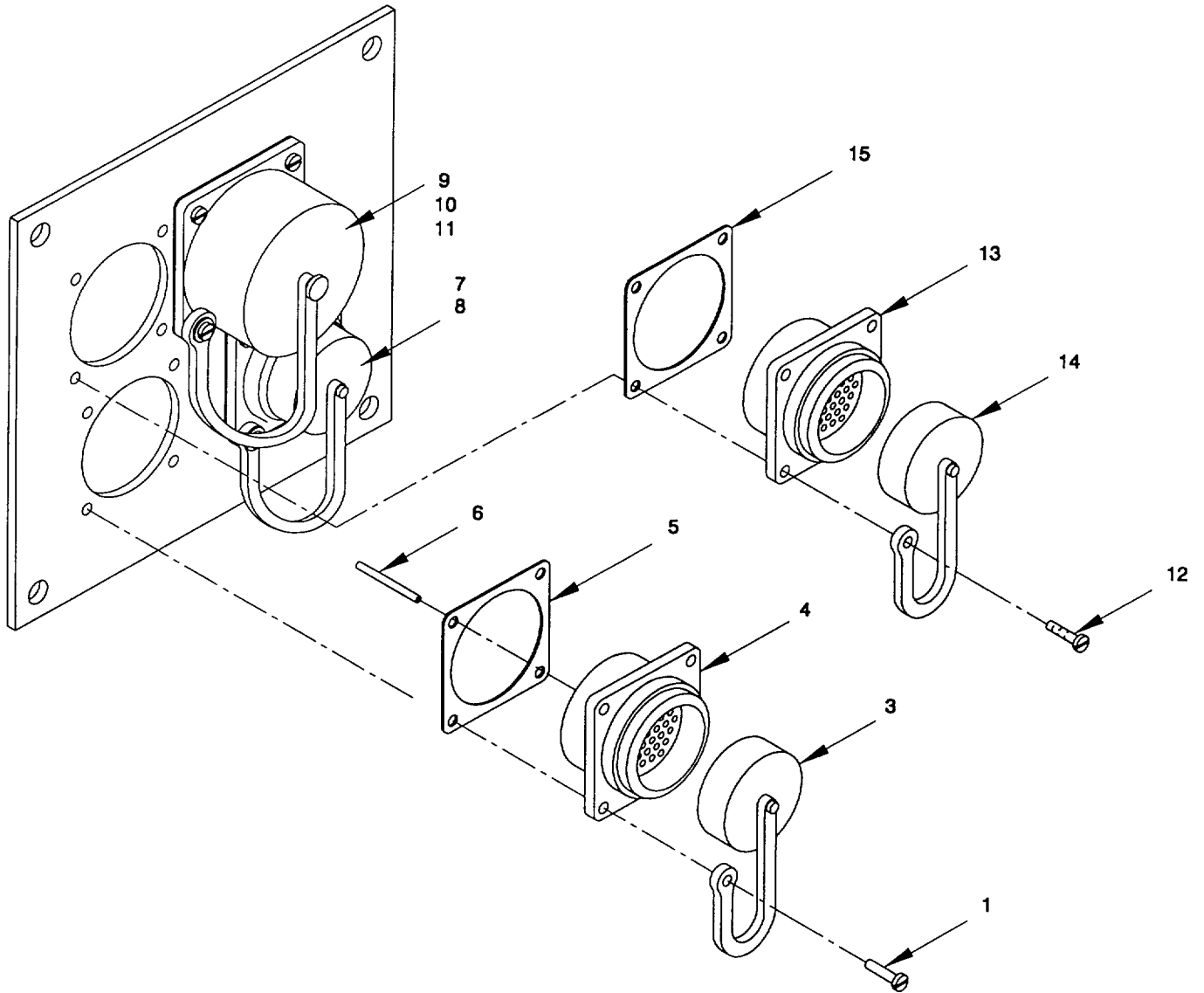


Figure 2-143. Typical Starboard Receptacle "A5"/Port Receptacle "A6" Assembly, Repair.

2-146. Spotlight.

This task covers: a. Adjust b. Service c. Remove d. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Spotlight

RTV Adhesive (Item 4, Appendix F)

Grounding Gasket

Oil, Machine (Item 27, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Adjust. (figure 2-144)

- (1) Release the stainless steel latch (2) by pushing the safety catch back with the thumb while lifting the toggle with the forefinger.
- (2) After replacing the lamp, refocus it by projecting a beam on a flat surface approximately 50 feet away. Use the knob (1) at the bottom of the searchlight to focus. The searchlight is in focus when the beam pattern is smallest.
- (3) Adjust latch (2) tension and gasket (3) compression by changing the length of the hooks on the latches as desired by turning.

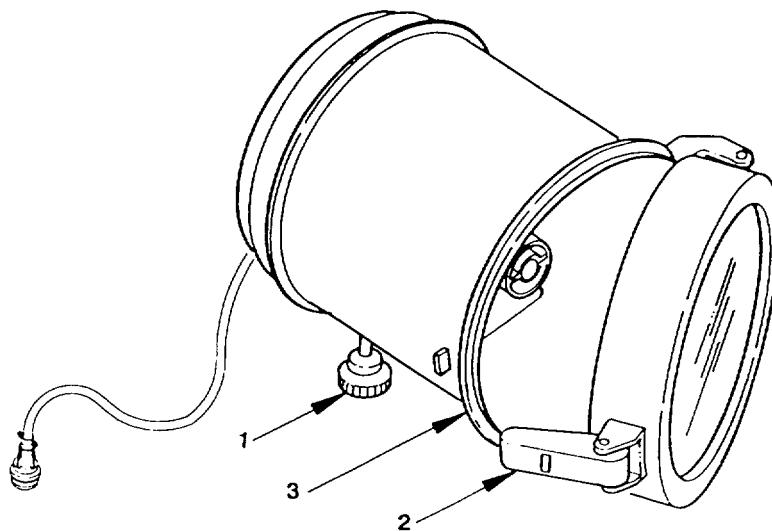


Figure 2-144. Spotlight, Adjust.

2-146. Spotlight (Cont).b. Service. (figure 2-145)

- (1) Monthly, lightly lubricate the connecting link (1), lever pin (2) and push-rod (marked "L") (3) of lever assembly with a few drops of machine oil.
- (2) Every six months, add grease through the grease fitting (4) provided in the roof flange. This will provide added water protection.

c. Remove. (figure 2-146)

- (1) Disconnect the electrical cable (1) to the spotlight (9) at the junction box JB1 (located inside the cab). Refer to Appendix G.
- (2) Remove the control lever (3) from the bottom of the spotlight control tube (4). Remove the lower flange (5) (located inside the cab) from the control tube (4).
- (3) Remove capscrews (6) and lock washers (7) securing the upper flange (8) (located on the roof of the cab).
- (4) Pull the spotlight (9), gasket (10), upper flange (8), and control tube (4) out of the roof of the cab.

d. Install. (figure 2-146)

- (1) Position the spotlight (9), gasket (10), upper flange (8), and control tube (4) in the roof of the cab. Replace capscrews (6), lock washers (7) and tighten to secure the upper flange (8) to the roof of the cab.
- (2) Position the lower flange (5) on the control tube (4) inside the cab. Replace the control lever (3) into the bottom of the control tube.
- (3) Connect the electrical cable (1) to the spotlight at Junction Box JB-1 (located inside the cab). Refer to Appendix G. Make sure spotlight cable (1) has sufficient slack for full spotlight rotation and elevation.

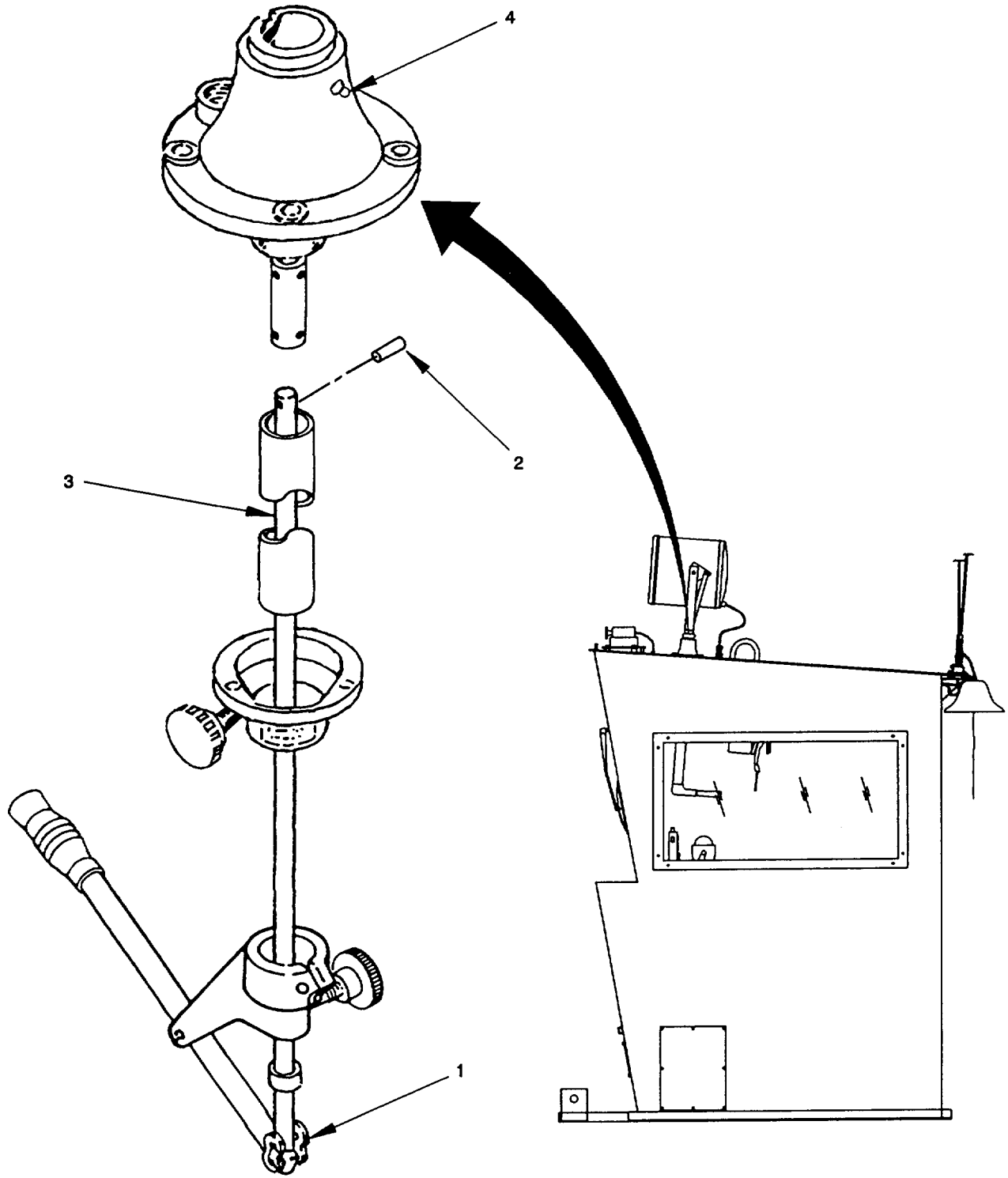


Figure 2-145. Spotlight, Service.

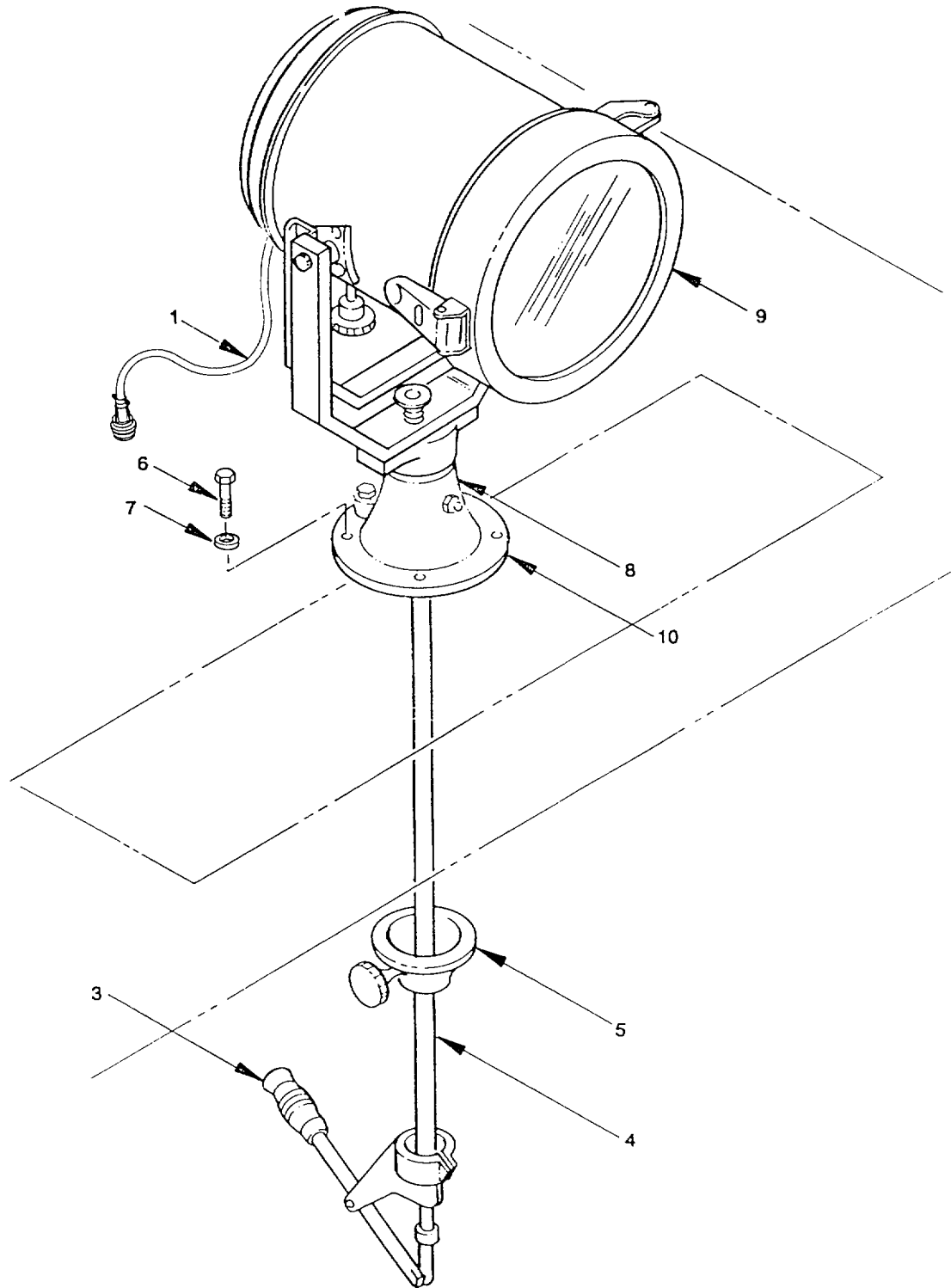


Figure 2-146. Spotlight. Remove/Install.

2-147. Lamp, Spotlight.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Lamp

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-147)

CAUTION

The lamp must be cleaned per instructions on the carton. Handle the halogen lamp only with the wrapper attached. Failure to comply may result in skin oils causing premature lamp failure.

- (1) Open the tension latch (1) to access the lamp (2).
 - (2) Remove the lamp (2) by turning slightly.
- b. *Install.* (figure 2-147)
- (1) Install a new lamp (2) with the use of the small pin on the right side of the lamp holder.
 - (2) After replacing the lamp, refocus it by projecting a beam on a flat surface approximately 50 feet away. Use the knob (3) at the bottom of the searchlight to focus. The searchlight is in focus when the beam pattern is smallest.

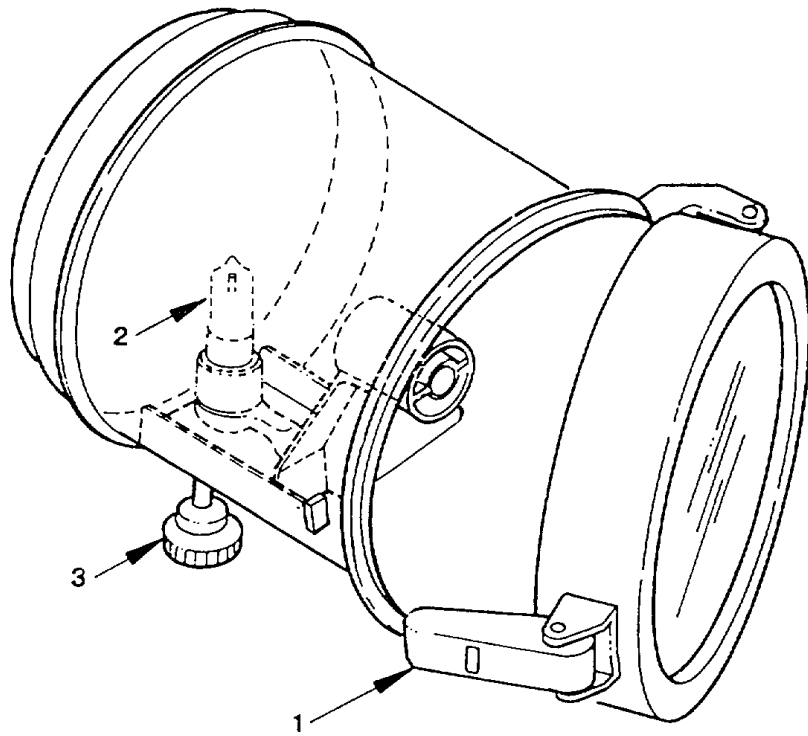


Figure 2-147. Lamp, Spotlight, Remove/Install.

2-148. Push-Rod Packing, Spotlight.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Push-Rod Packing

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-148)

(1) Disconnect all power to the spotlight..

(2) Remove the two screws (1), slide the packing flange (2) up the push-rod (4) and remove the push-rod packing (3).

b. *Install.* (figure 2-148)

(1) Wind the 10 inch length of replacement push-rod packing (3) around the push-rod (4) and work it tightly into the pocket in the harp (5).

(2) Slide the packing flange (2) back down the push-rod (4) and tighten the screws (1) to compress the packing (3).

(3) Connect all power to the spotlight.

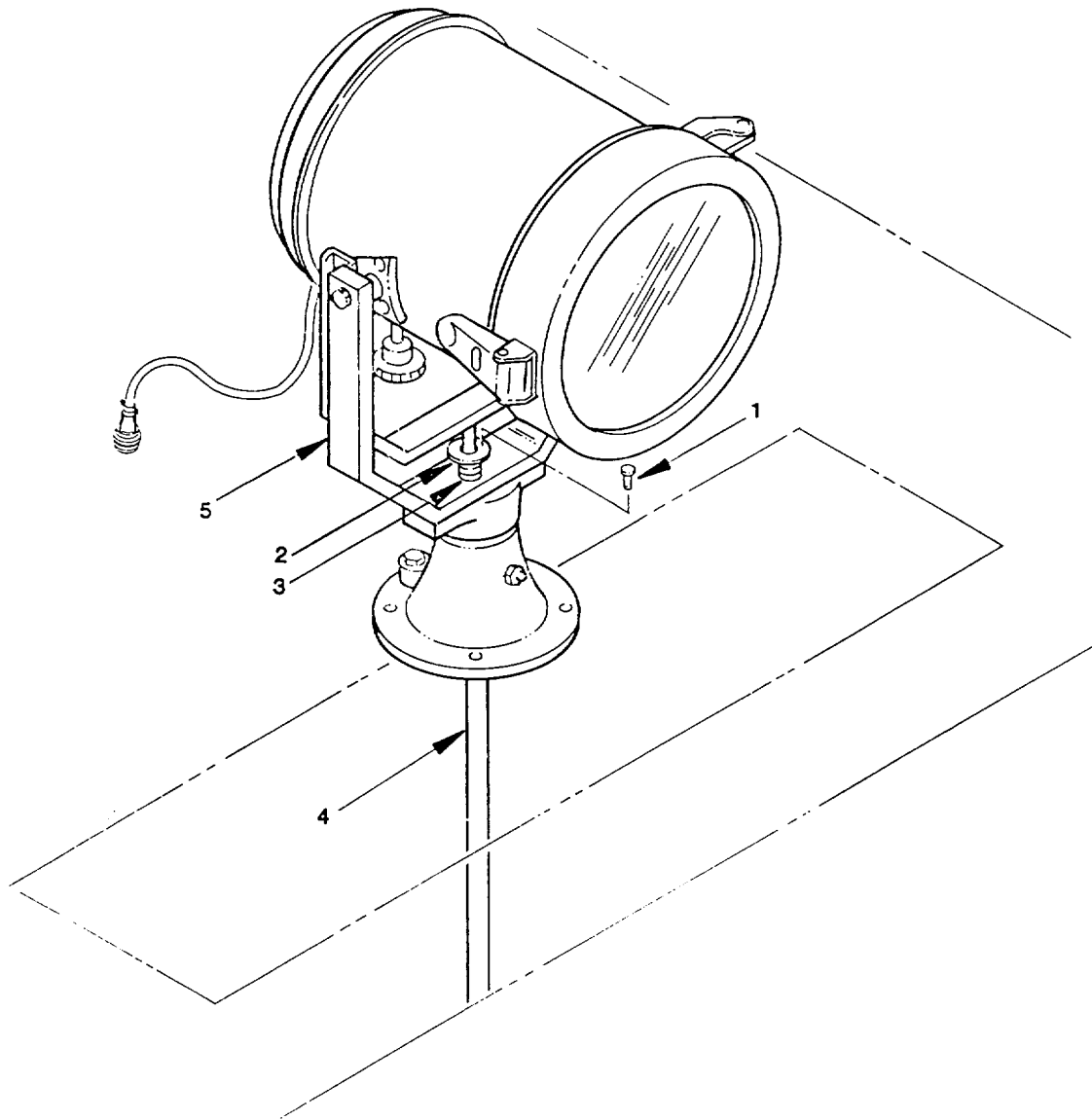


Figure 2-148. Push-Rod Packing, Spotlight. Remove/Install.

2-149. Junction Box Assembly JB1, Cab Assembly.

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Junction Box
Compound, Antiseize (Item 9, Appendix F)

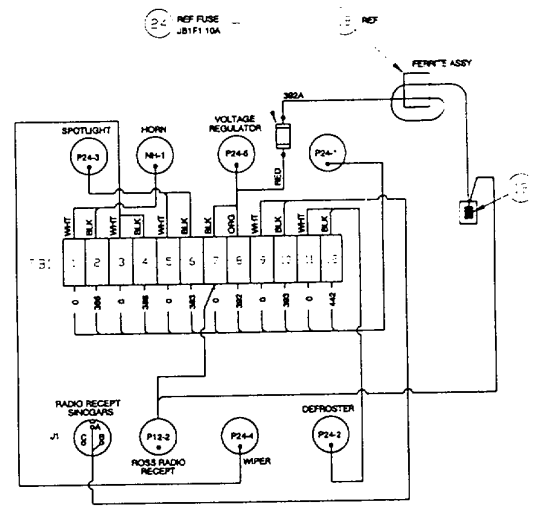
Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE.

WARNING

When performing maintenance, the electrical system should be deenergized, disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-149)
- (1) Loosen two door screws securing hinged front of junction box (3). Open front to access inside of box.
 - (2) Tag and disconnect electrical wiring to junction box (3). Refer to box wiring diagram in figure 2-149 and Appendix G.
 - (3) Remove four pan head capscrews (1) and four hex nuts (2) securing junction box (3) to cab structure. Remove junction box (3).
- b. *Install.* (figure 2-149)
- (1) Apply antiseize compound to threads on pan head capscrews (1).
 - (2) Position junction box (3) on cab structure. Secure with four pan head capscrews (1) and four hex nuts (2).
 - (3) Reconnect electrical wiring, as tagged, to junction box (1). Refer to box wiring diagram in figure 2-149 and Appendix G.
 - (4) Close front and tighten two door screws to secure.



BOX WIRING DIAGRAM

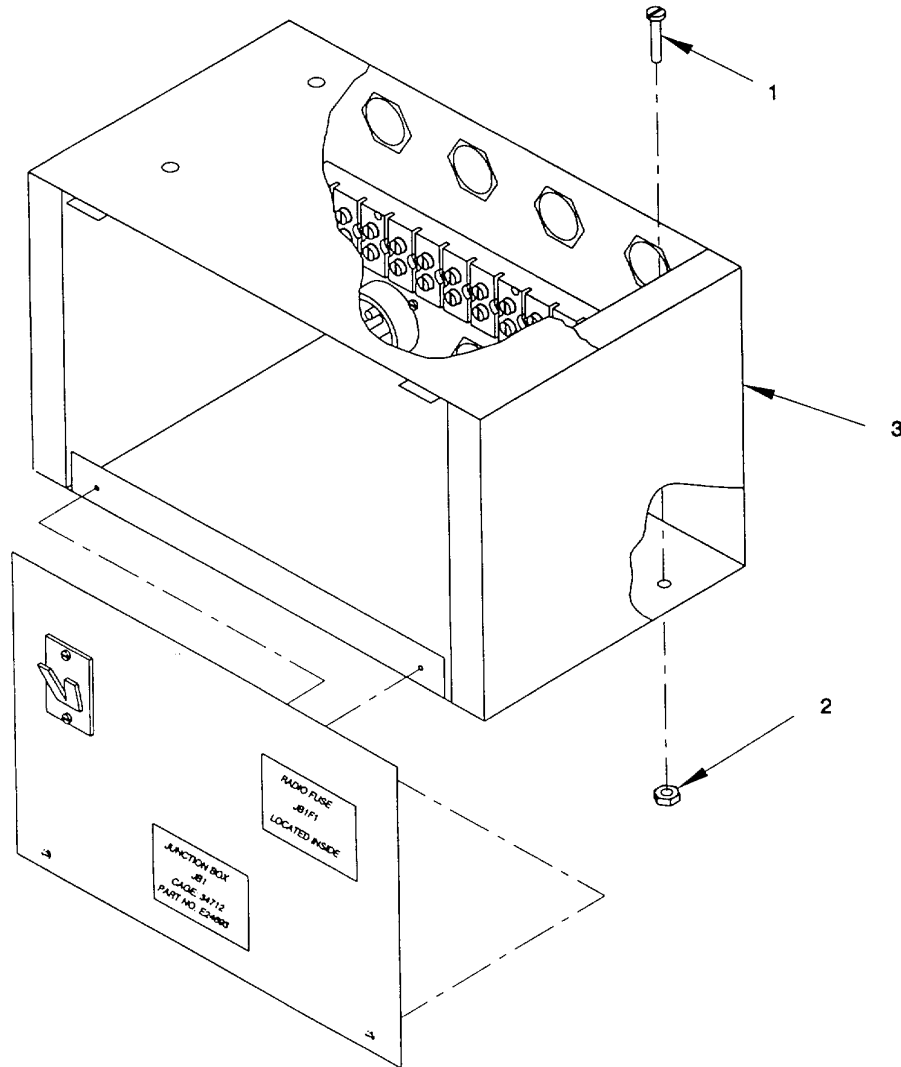


Figure 2-149. Junction Box Assembly "JB1", Remove/Install.

2-150. Terminal Board, Junction Box "JB1", Cab Assembly.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Terminal Board
Compound, Antiseize (Item 9, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE.

WARNING

When performing maintenance, the electrical system should be deenergized, disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-150)
- (1) Loosen two front door screws securing front door. Open door.
 - (2) Tag and disconnect electrical wiring to terminal board (3). Refer to Appendix G.
 - (3) Remove three round head screws (1) and three insert nuts (2) securing terminal board (3) to rear of junction box (4). Remove terminal board (3).
- b. *Install.* (figure 2-150)
- (1) Apply antiseize compound to threads on round head screws (1).
 - (2) Position terminal board (3) on junction box (4). Secure with three round head screws (1) and three insert nuts (2).
 - (3) Reconnect electrical wiring, as tagged, to terminal board (3). Refer to Appendix G.
 - (4) Close front door and tighten two screws to secure door.

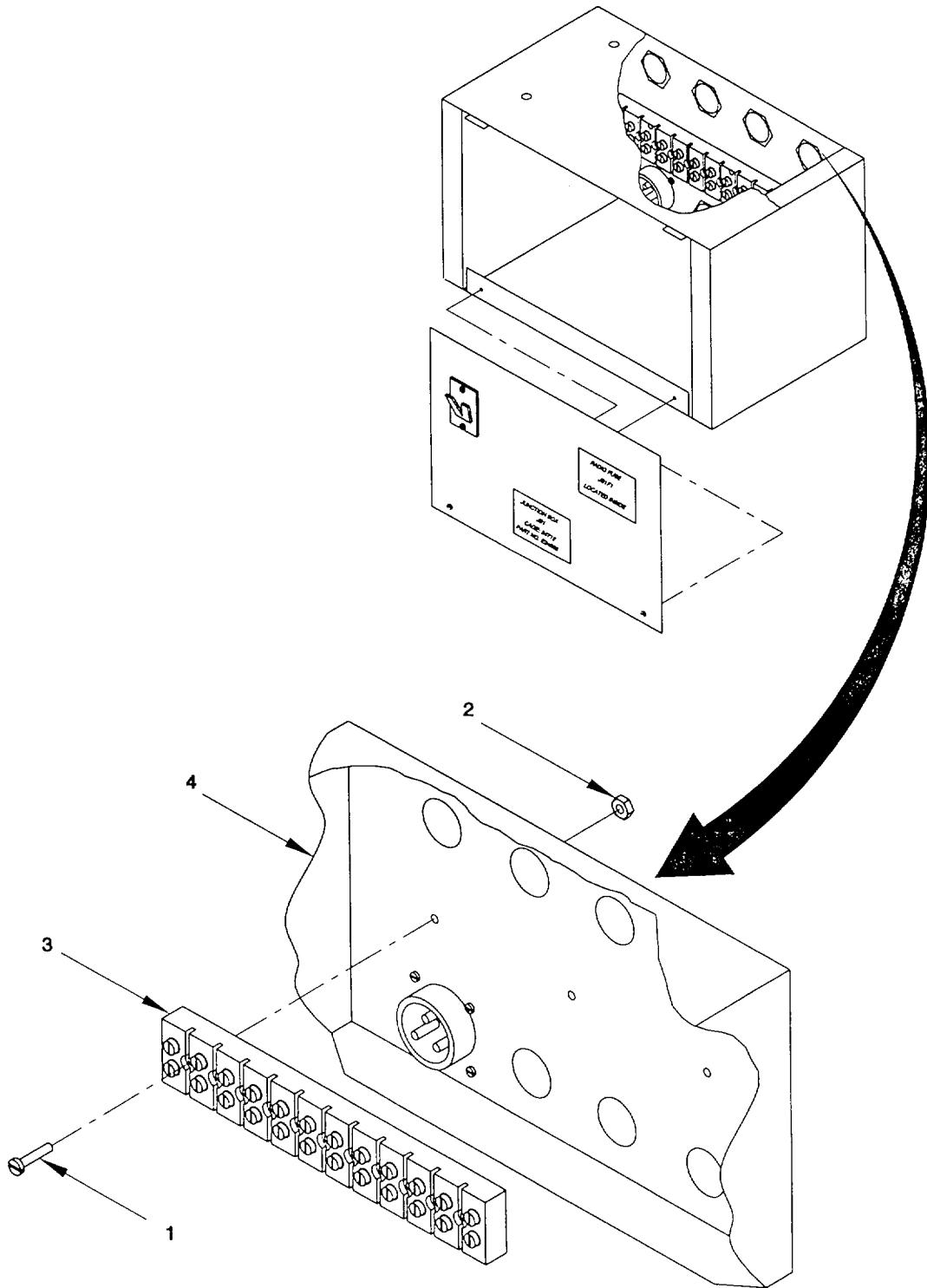


Figure 2-150. Terminal Board. Cab Junction Box "JB1". Remove/Install.

2-151. Receptacle, Junction Box "JB1", Cab Assembly.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Receptacle

Compound, Antiseize (Item 9, Appendix F)

WARNING

When performing maintenance, the electrical system should be deenergized, disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-151)
- (1) Loosen two screws securing front door. Open door.
 - (2) Tag and disconnect electrical wiring to receptacle (3). Refer to Appendix G.
 - (3) Remove four pan head capscrews (1) and four hex nuts (2) securing receptacle (3) to junction box (4). Remove receptacle (3).
- b. *Install.* (figure 2-151)
- (1) Apply antiseize compound to threads on pan head capscrews (1).
 - (2) Position receptacle (3) on junction box (4). Secure with four pan head capscrews (1) and four hex nuts (2).
 - (3) Reconnect electrical wiring, as tagged, to receptacle (3). Refer to Appendix G.
 - (4) Close door and secure with two attached screws.

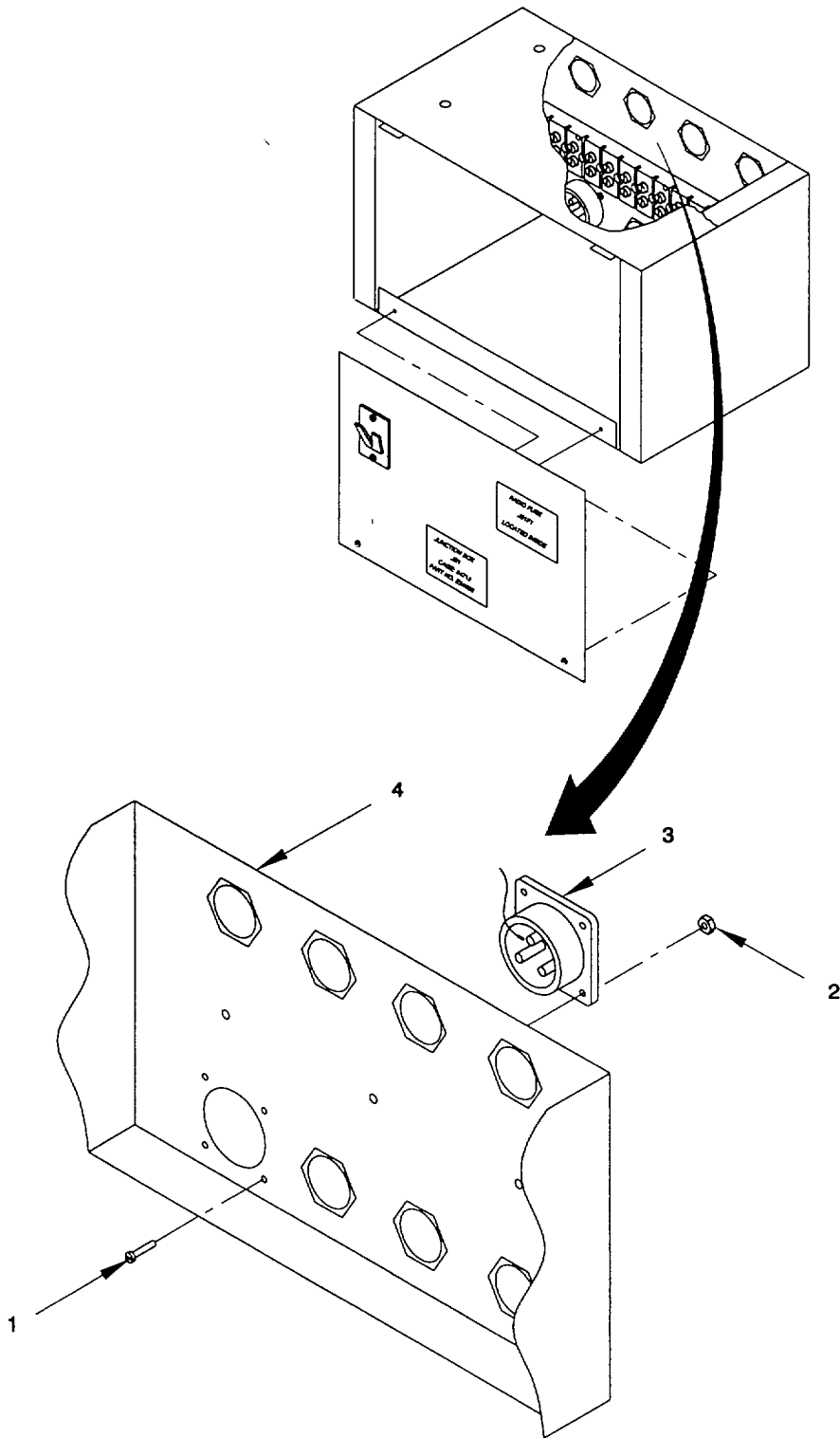


Figure 2-151. Receptacle, Cab Junction Box "JB1", Remove/Install.

2-152. Fuse Replacement, Junction Box "JB1", Cab Assembly.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to equipment. All equipment and controls/indicators tagged OUT OF SERVICE.

Materials/Parts

Fuse, AGC-10 (JB1F1)
Compound, Antiseize (Item 9, Appendix F)

a. Remove. (figure 2-152)

- (1) Loosen two door screws securing hinged front of junction box. Open front to access inside of box.
- (2) Locate fuse holder (2) inside of JB1, inline with red wire 392A. Twist two parts of fuse holder in opposite directions and slide apart. Remove fuse (1). Refer to figure 2-149 and Appendix G for electrical wiring diagrams and schematics.

b. Install. (figure 2-152)

- (1) Position replacement fuse (1) in fuse holder (2), slide two parts of holder together and twist to secure. Refer to figure 2-152 and Appendix G for electrical wiring diagrams and schematics. Wire 392A must be looped twice through the ferrite (3) core.
- (2) Close front and tighten two door screws to secure.

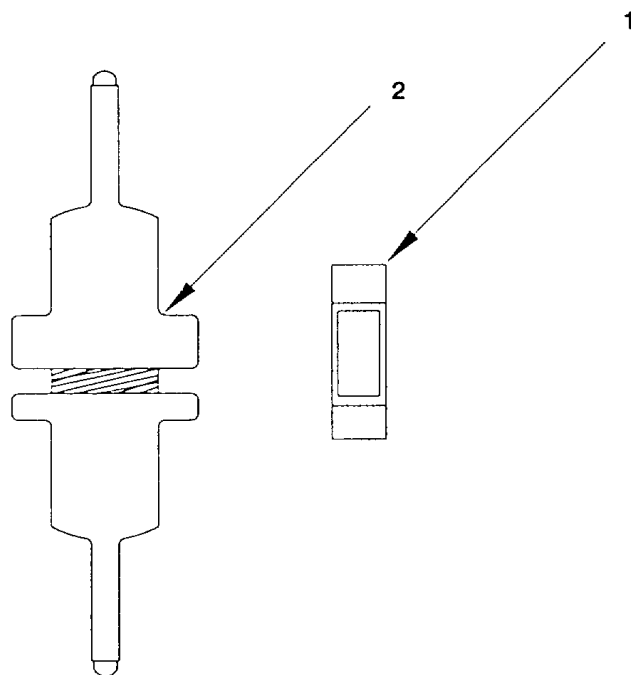
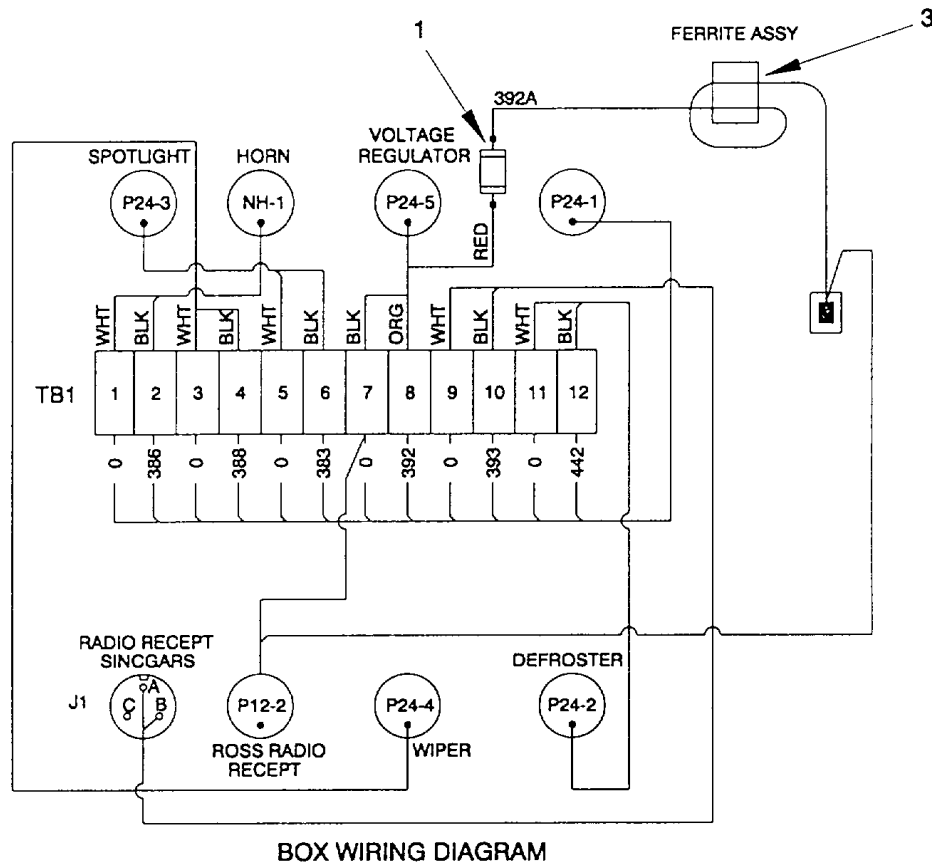


Figure 2-152. Fuse Replacement, Junction Box "JB1". Cab Assembly.

2-153. Mast Enclosure.

This task covers: a. Remove b. Inspect c. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to equipment. All equipment and controls/indicators tagged OUT OF SERVICE.

Materials/Parts

Mast Enclosure

Clean, lint-free cloth (Item 7, Appendix F)

Tie Wraps (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be deenergized, disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. Remove. (figure 2-153)
 - (1) Remove three screws (1) and three clamps (2) securing door (3) to mast enclosure.
 - (2) Open enclosure door (3) to access interior of enclosure.
 - (3) Disconnect electrical wiring to enclosure and tag OUT OF SERVICE.
 - (4) Remove four sets of hardware including a washer (4), a hex nut (5) and a tubing spacer (6) securing mast enclosure (7) to hull.
- b. Inspect.
 - (1) Inspect all electrical components for corrosion, deterioration, dirt, condensation, loose hardware or electrical wiring connections, or other damage. Repair is limited to replacement of components.
 - (2) Remove any dirt or condensation with a clean, lint-free cloth.
- c. Install. (figure 2-153)
 - (1) Position mast enclosure (7) against hull and secure with tubing spacer (6), washer (4), and hex nut (5).
 - (2) Connect electrical wiring to mast enclosure. Refer to Appendix G.
 - (3) Close mast enclosure door (3) and secure with three clamps (2) and three screws (1).

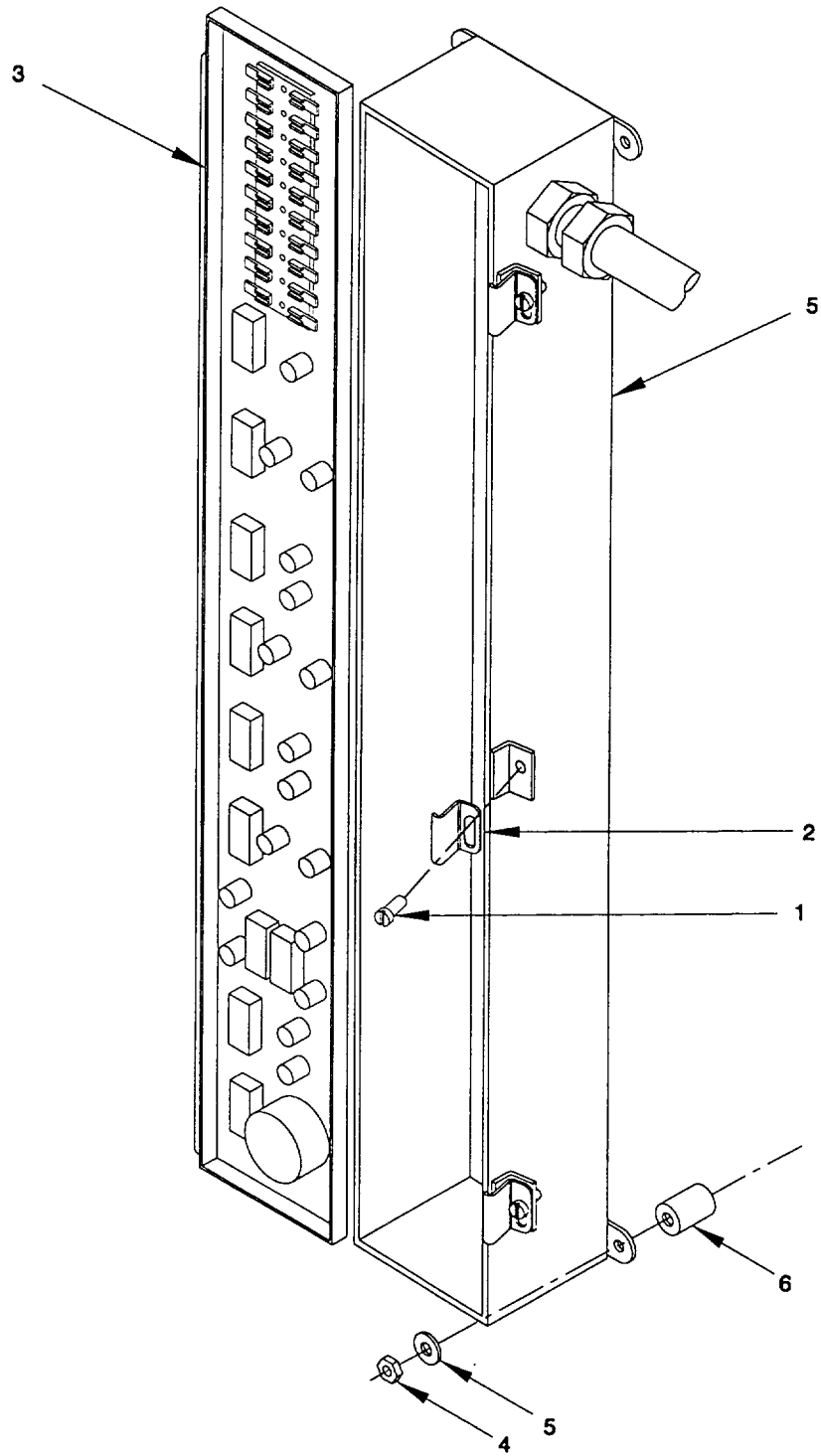


Figure 2-153. Mast Enclosure, Remove/Install.

2-154. Toggle Switch, Mast Enclosure.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to equipment. All equipment and controls/indicators tagged OUT OF SERVICE.

Materials/Parts

Toggle Switch, 3 position
Toggle Switch, 2 position
Tie Wraps (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be deenergized, disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

NOTE

The following remove and install procedures apply to both 2- and 3-position toggle switches.

- a. *Remove.* (figure 2-154)
- (1) Remove three screws (1) and three clamps (2) securing door (3) to mast enclosure (7).
 - (2) Open enclosure door to access interior of mast enclosure (7).
 - (3) Disconnect electrical wiring to enclosure (7) and tag OUT OF SERVICE. Refer to Appendix G.
 - (4) Remove the hex nut (4) (supplied with each switch) to free toggle switch (5) from enclosure door (3). Collect lockwasher (6) (also supplied with switch).
- b. *Install.* (figure 2-154)
- (1) Position toggle (5) switch with lockwasher (6) (supplied with each switch) on enclosure door (3) and secure with hex nut (4) (supplied with each switch).
 - (2) Connect electrical wiring to mast enclosure (7). Refer to Appendix G.
 - (3) Close mast enclosure door (3) and secure with three clamps (2) and three screws (1).

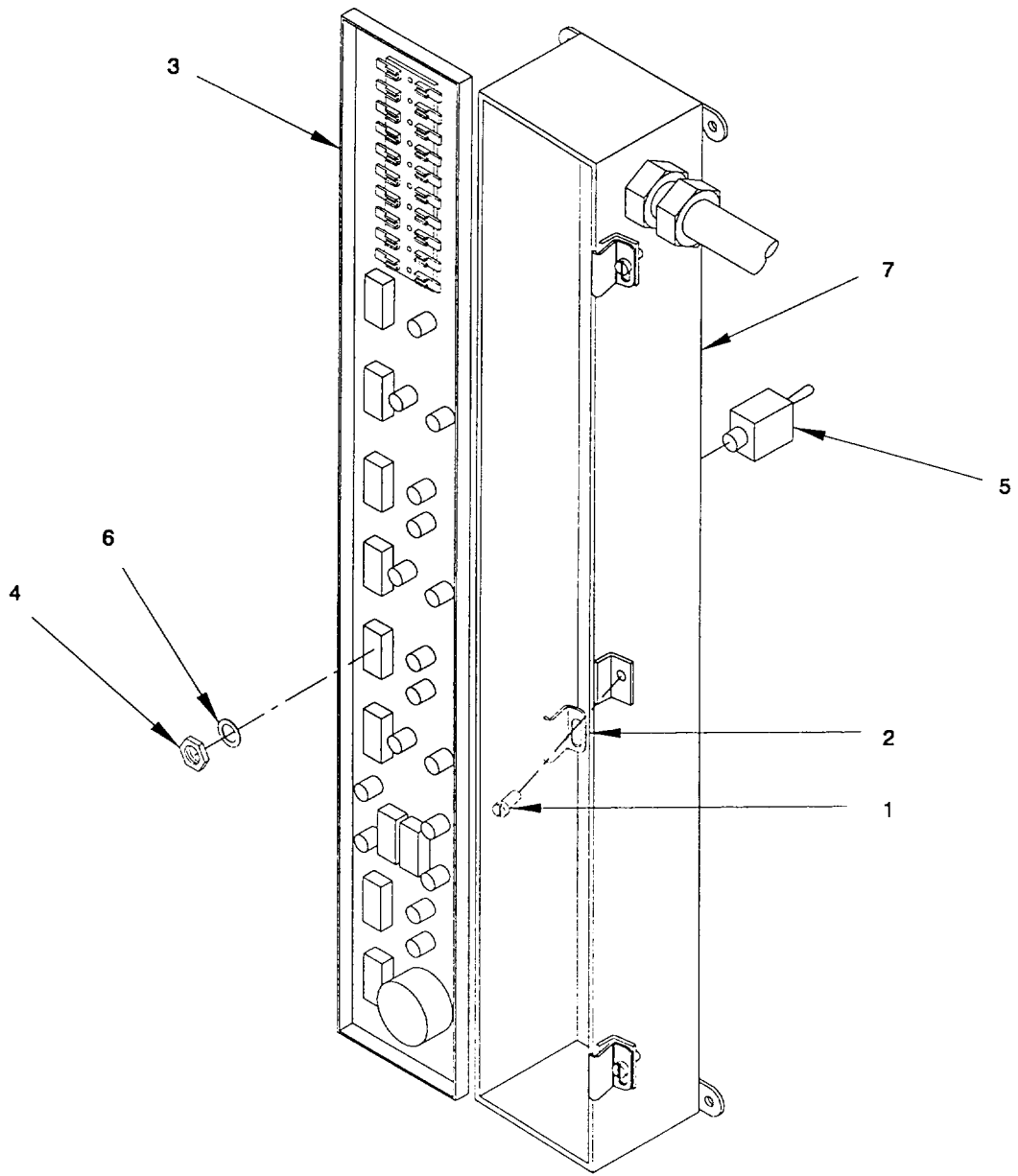


Figure 2-154. Toggle Switch, Mast Enclosure, Remove/Install.

2-155. Sonalert Beeper, Mast Enclosure.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Sonalert Beeper
Tie Wraps (Item 57, Appendix F)

Equipment Condition

All power off to equipment. All equipment and controls/indicators tagged OUT OF SERVICE.

WARNING

When performing maintenance, the electrical system should be deenergized, disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-155)
- (1) Remove three screws (1) and three clamps (2) securing door (3) to mast enclosure (6).
 - (2) Open enclosure door (3) to access interior of mast enclosure (6).
 - (2) Disconnect electrical wiring to sonalert beeper (4) and tag OUT OF SERVICE. Refer to Appendix G.
 - (3) Remove the knurled nut (4) from the front side of the mast enclosure door (3) and pull the sonalert beeper (5) through the back side of the mast enclosure door (3).
- b. *Install.* (figure 2-155)
- (1) Position new sonalert beeper LS1 (2) from back side of the enclosure (1) door. Secure with the knurled nut (1) on the front side of the enclosure door.
 - (2) Connect electrical wiring, as tagged, to sonalert beeper (2). Refer to Appendix G. Use tie wraps to secure any loose wires.
 - (3) Close mast enclosure door (3) and secure with three clamps (2) and three screws (1).

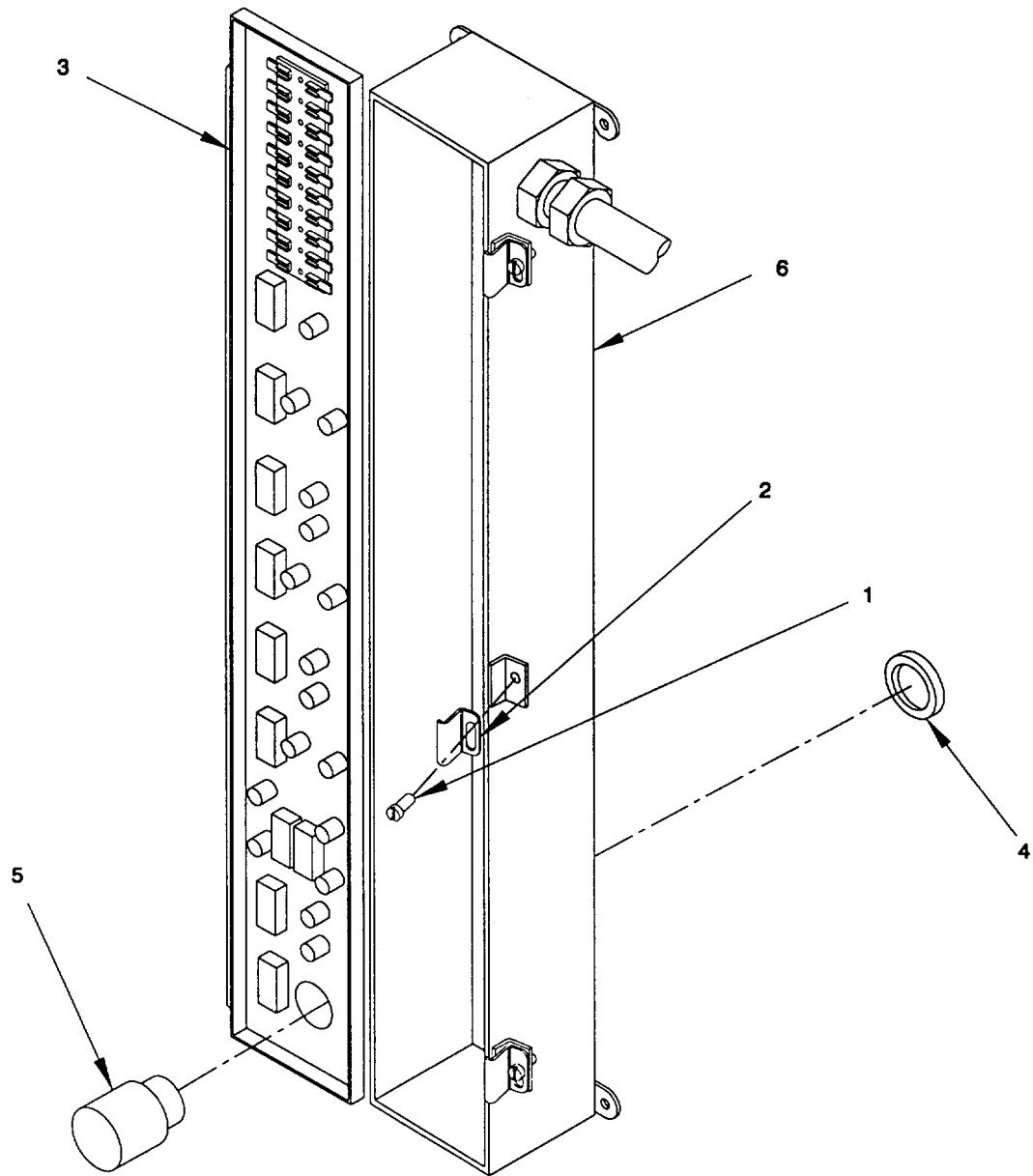


Figure 2-155. Sonalert Beeper, Mast Enclosure, Remove/Install.

2-156. Fuses, Mast Enclosure.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to equipment. All equipment and controls/indicators tagged OUT OF SERVICE.

Materials/Parts

Fuses (250 Volt, 5 amp)
Tie Wraps (Item 57, Appendix F)
Fuse Puller

WARNING

When performing maintenance, the electrical system should be deenergized, disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-156)

- (1) Remove three screws (1) and three clamps (2) securing door (3) to mast enclosure (5).
- (2) Open enclosure door to access interior of mast enclosure (5).
- (2) Remove fuse (4) to be replaced.

b. *Install.* (figure 2-156)

- (1) Insert a replacement fuse (4) of the proper amperage and voltage (per Appendix G). Use tie wraps to secure any loose wires.
- (2) Close mast enclosure door (3) and secure with three clamps (2) and three screws (1).

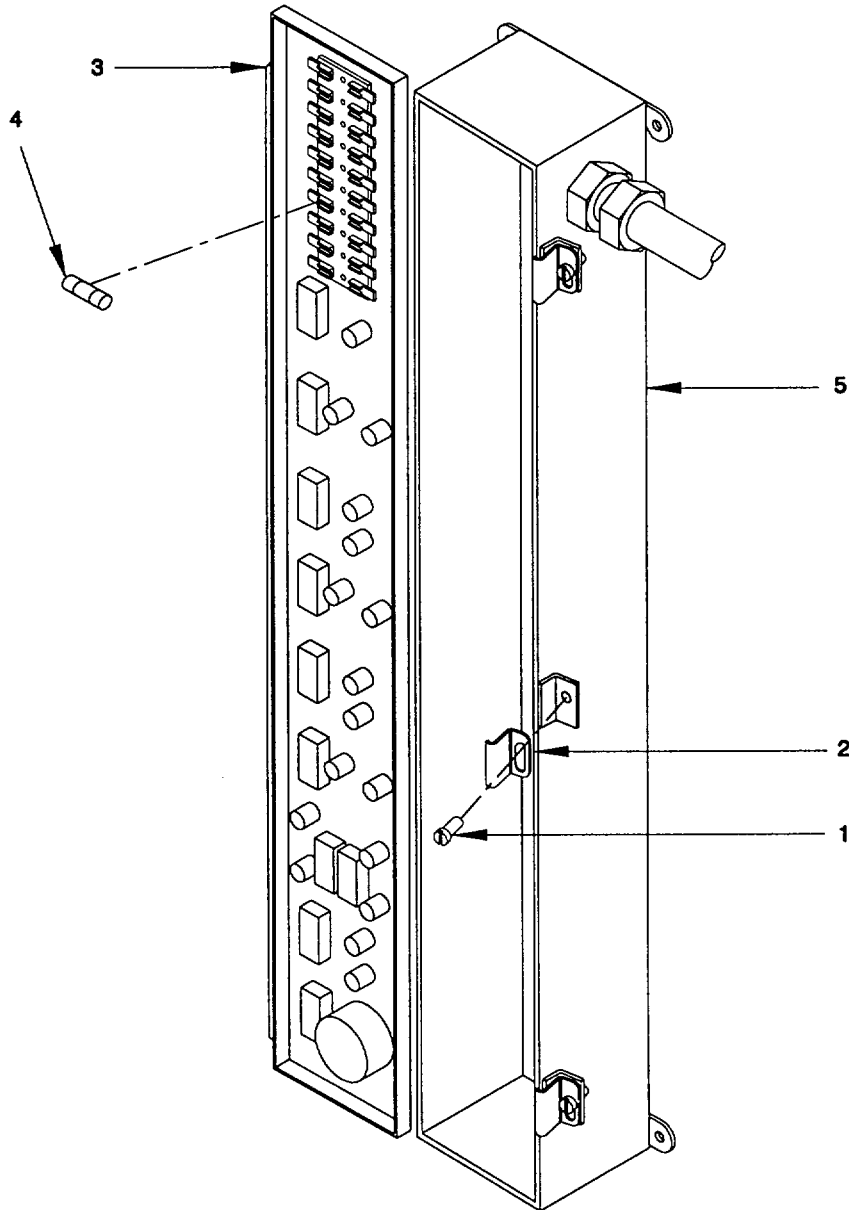


Figure 2-156. Fuses, Mast Enclosure, Remove/Install.

2-157. Reed Switch Assembly, Mast Enclosure.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Reed Switch Assemblies
Tie Wraps (Item 57, Appendix F)

Equipment Condition

All power off to equipment. All equipment and controls/indicators tagged OUT OF SERVICE.

WARNING

When performing maintenance, the electrical system should be deenergized, disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-157)

- (1) Remove three screws (1) and three clamps (2) securing door (3) to mast enclosure (9).
- (2) Open enclosure door (3) to access interior of mast enclosure (9).
- (3) Disconnect and tag all electrical connections to the reed assembly (10) and back plate (8) before disconnecting wiring. Refer to Appendix G for wiring list and terminal layout.
- (4) Remove eight pan head screws (4), eight hex nuts (5), and eight lockwashers (6) and eight standoffs (7), freeing back plate (8) from enclosure (9).

NOTE

Repair is limited to replacement of an entire reed switch assembly. There are 17 total assemblies used within the mast enclosure.

- (5) Remove the reed switch assembly (10) from clip (11) along with the four wires leading to it.

b. Install. (figure 2-157)

- (1) Insert reed switch assembly (10) into clip (11).
- (2) Secure back plate (8) to enclosure (9) using eight standoffs (7), eight pan head screws (4), eight lock washers (6) and hex nuts (5).
- (3) Connect all four wires leading from the reed switch assembly (4) and other electrical connections leading to the back plate (8). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (4) Close mast enclosure door (3) and secure with three clamps (2) and three screws (1).

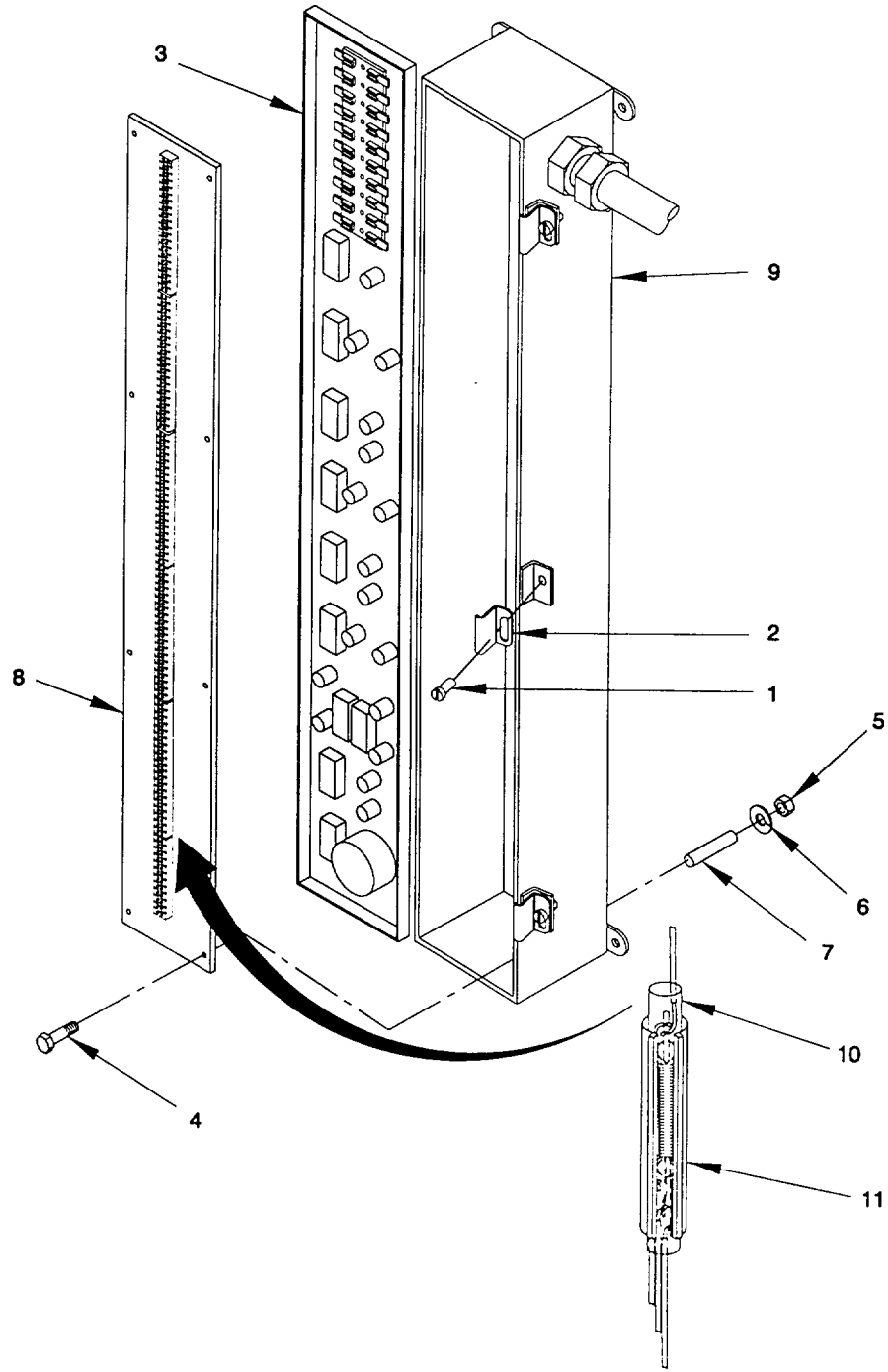


Figure 2-157. Reed Switch Assembly, Mast Enclosure, Remove/install.

2-158. Terminal Blocks, Mast Enclosure.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to equipment. All equipment and controls/indicators tagged OUT OF SERVICE.

Materials/Parts

Terminal Blocks (One 12 Terminal, five 20 terminal)
Tie Wraps (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be deenergized, disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-158)

- (1) Remove three screws (1) and three clamps (2) securing door (3) to mast enclosure (9).
- (2) Open enclosure door (3) to access interior of mast enclosure (9).
- (3) Disconnect and tag all electrical connections to the terminal block(s) (12) to be replaced (TB1 through TB6) and back plate (8) before disconnecting wiring. Refer to Appendix G for wiring list and terminal layout.
- (5) Remove eight pan head screws (4), eight hex nuts (5), and eight lockwashers (6) and eight standoffs (7), freeing back plate (8) from enclosure (9).
- (6) Remove two pan head screws (10) and hex head nuts (11) to free each terminal block (12) from back plate (8).

b. Install. (figure 2-158)

- (1) Position terminal block (12) on back plate (8) and secure with two pan head screws (10) and hex head nuts (11).
- (2) Secure back plate (8) to enclosure (9) using eight standoffs (7), eight pan head screws (4), eight lock washers (6) and hex nuts (5).
- (3) Connect all electrical wiring to terminal block (12) and back plate (8). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (3) Close mast enclosure door (3) and secure with three clamps (2) and three screws (1).

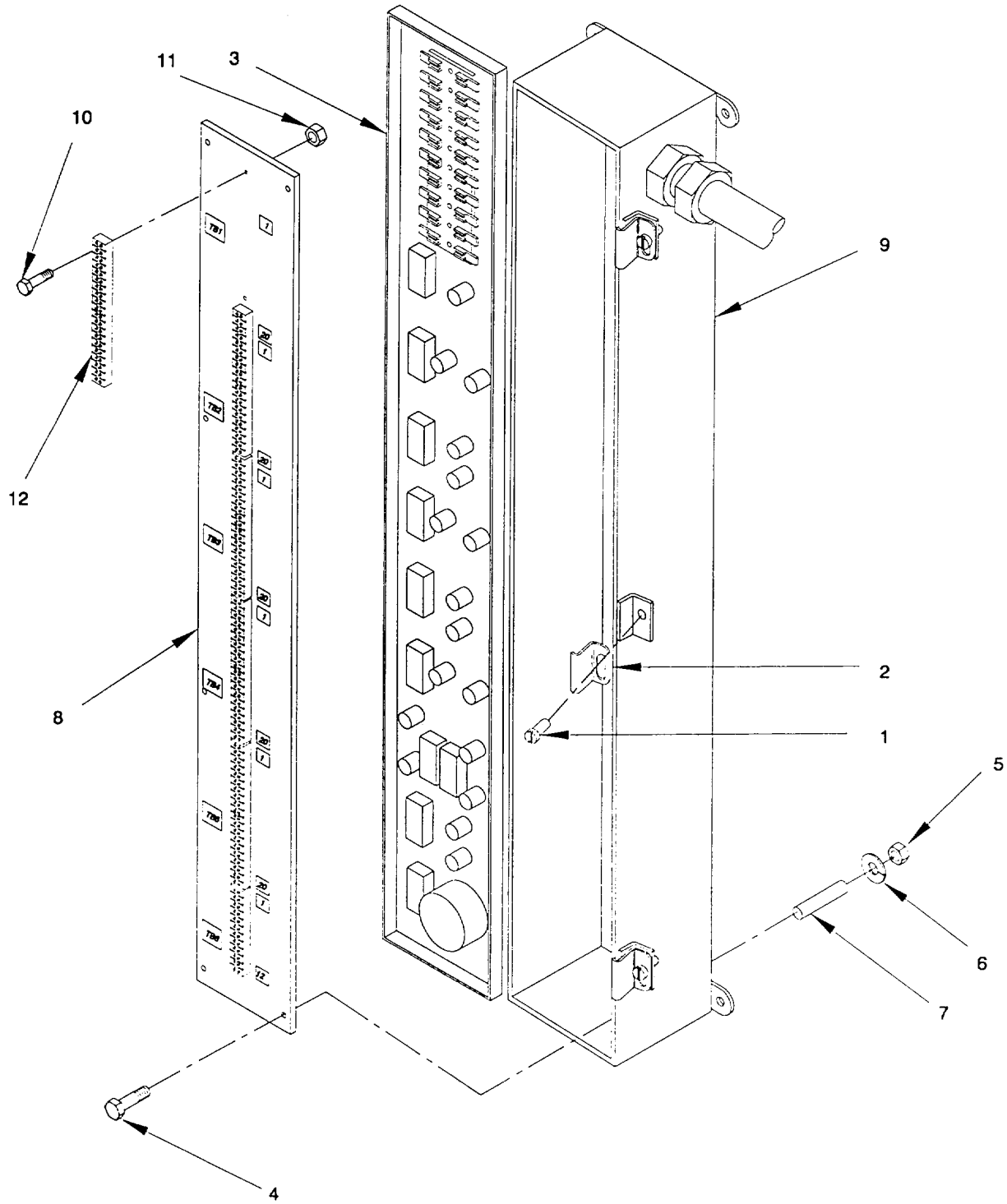


Figure 2-158. Terminal Blocks, Mast Enclosure, Remove/Install.

2-159. Indicator Light, Mast Enclosure.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to equipment. All equipment and controls/indicators tagged OUT OF SERVICE.

Materials/Parts

Indicator Light
Tie Wraps (Item 57, Appendix F)

WARNING

When performing maintenance, the electrical system should be deenergized, disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-159)

- (1) Remove three screws (1) and three clamps (2) securing door (3) to mast enclosure (9).
- (2) Open enclosure door (3) to access interior of mast enclosure (8).
- (3) Disconnect and tag all electrical connections to the indicator light (7). Refer to Appendix G for wiring list and terminal layout.
- (4) Remove hex nut (4), lock washer (5) and knurled flange nut (6) to free indicator light (7) from mast enclosure door (3).

b. Install. (figure 2-159)

- (1) Position indicator light (7) in enclosure door (3) and secure with knurled flange nut (6), lock washer (5), and hex nut (4).
- (2) Connect all electrical wiring to indicator light (7). Refer to Appendix G. Use tie wraps to secure any loose wires.
- (3) Close mast enclosure door (3) and secure with three clamps (2) and three screws (1).

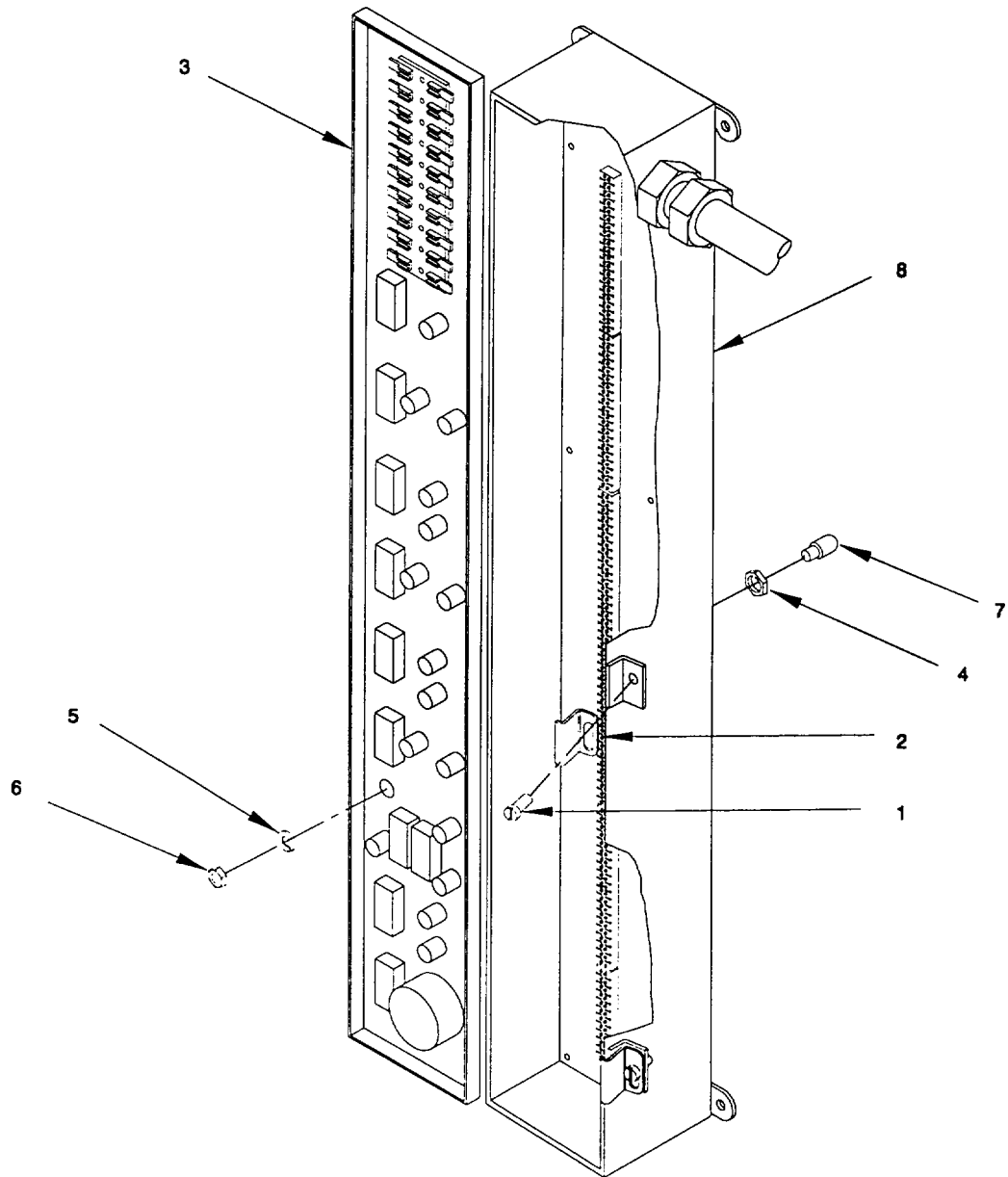


Figure 2-159. Indicator Light, Mast Enclosure, Remove/Install.

2-160. Intake Plenum Assembly.

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Intake Plenum Assembly
Single Groove Hand Tool
Oval Splicing Sleeve

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Module Interconnect Assembly detached.

Operator's Cab removed.

WARNING

Intake plenum weighs approximately 519 lbs. Use appropriate lifting devices when removing or installing. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-160)

CAUTION

Use care in handling the neoprene gasket to prevent tearing or ripping.

- (1) Disconnect wire rope (4) at pressure trip unit below deck in the lazaret compartment.
 - (2) Remove fourteen hex head capscrews (1) securing intake plenum (2). Remove intake plenum (2) and gasket (3).
- b. *Install.* (figure 2-160)

- (1) Position gasket (3) and new intake plenum (2). Secure intake plenum (2) with fourteen hex head capscrews (1).

NOTE

After activation of the fire suppression system, or whenever the wire rope is installed or replaced, the rope must be reset so that the louver door is in the OPEN position.

- (2) Reconnect wire rope (4) at pressure trip unit below deck in the lazaret compartment. Wire must be long enough to allow louver door to be in OPEN position.

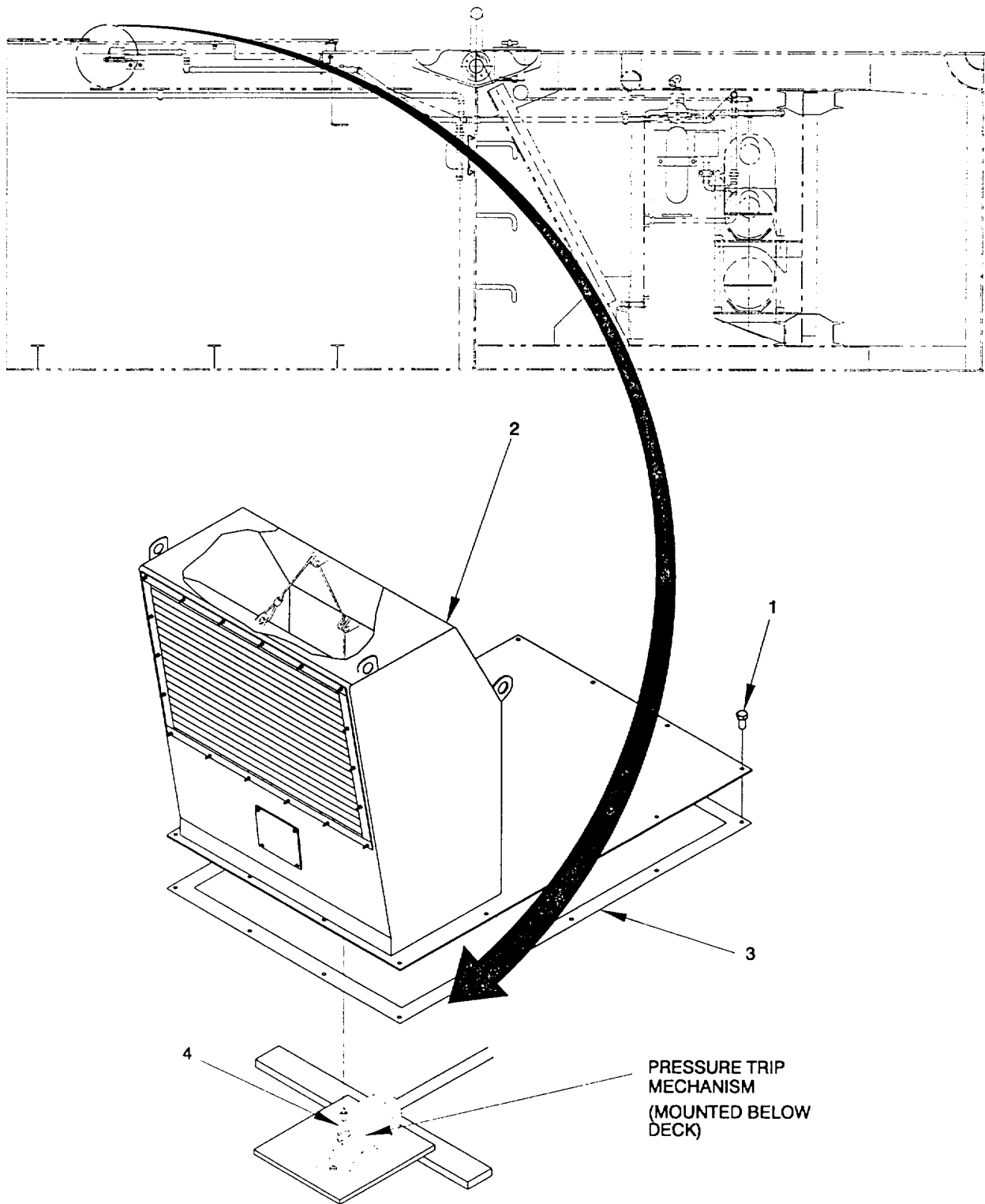


Figure 2-160. Intake Plenum Assembly, Remove/Install.

2-161. Wire Rope, Intake Plenum.

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Wire Rope
Single Groove Hand Tool (P/N 3507T12)
Oval Splicing Sleeve

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Module Interconnect Assembly detached.

Operator's Cab removed.

- a. *Remove.* (figure 2-161)

CAUTION

Use care in handling the neoprene interconnect gasket to prevent tearing or ripping.

- (1) Remove 22 capscrews (1) and collect air intake louver (2) and interconnect cover (3) with interconnect gasket (4) from intake plenum (7).
- (2) Remove oval splicing sleeve (5) from wire rope (6).
- (3) Disconnect wire rope (6) from air intake louver (2) and at pressure trip unit below deck in the lazaret compartment. Remove wire rope (6).

- b. *Install.* (figure 2-161)

NOTE

After activation of the fire suppression system, or whenever the wire rope is installed or replaced, the rope must be reset so that the louver door is in the OPEN position.

- (1) Connect new wire rope (6) to air intake louver (2) and at pressure trip unit below deck in the lazaret compartment. Louver door of intake plenum assembly must be in OPEN position with wire in normal, untripped position.

NOTE

Whenever the wire rope is installed or replaced, the oval splicing sleeves must be compressed using the single groove hand tool.

- (2) Install oval splicing sleeve (5). Compress oval sleeves onto wire rope with single groove hand tool.
- (3) Position interconnect gasket (4), interconnect cover (3) and air intake louver (2) on intake plenum (7). Secure with 22 capscrews (1).

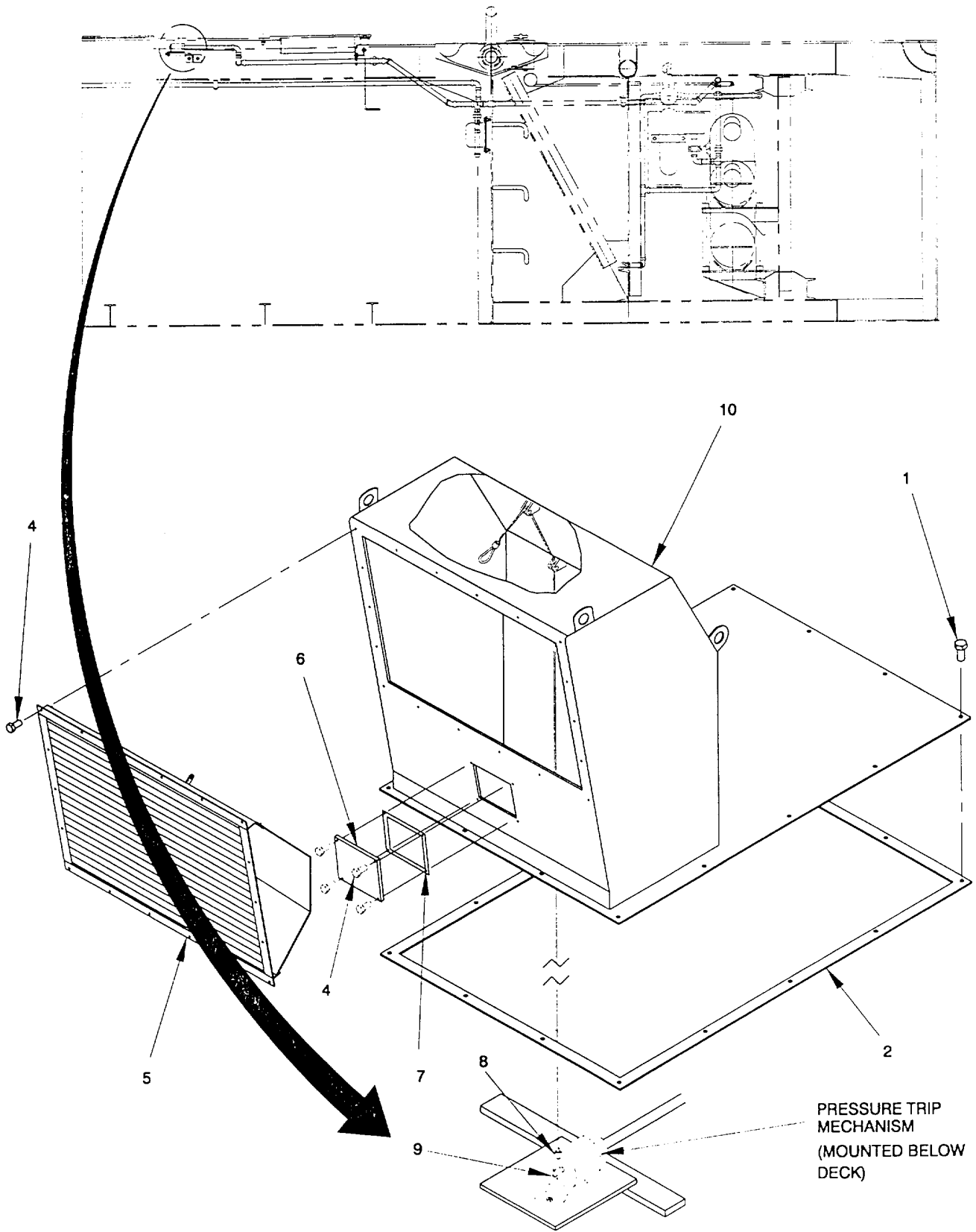


Figure 2-161. Wire Rope, Intake Plenum, Remove/Install.

2-162. Fender Assembly.

This task covers: Repair

INITIAL SETUP

Tools

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

*Materials/Parts*Wire rope

Repair. (figure 2-162)

- (1) Loosen one wire rope clip (1) holding 50" long wire rope to deck cleat to free entire fender assembly.
- (2) Remove all clips (1) from wire ropes (2 and 3) and from around thimbles (4) and clips. Collect thimbles (4) and pear link (5).
- (3) Remove 138" wire rope (3) from pipe (6) and fender (7). Remove round pipe (6) from fender (7). Replace wire rope as needed.
- (4) Insert pipe (6) into 1" hole in fender (7). Thread wire rope (3) through pipe (6).
- (5) Loop ends of wire rope (3) around thimbles (4), through pear link (5), and secure with clips (1).
- (6) Thread wire rope (2) around thimbles (4), deck cleat and secure with clips (1).

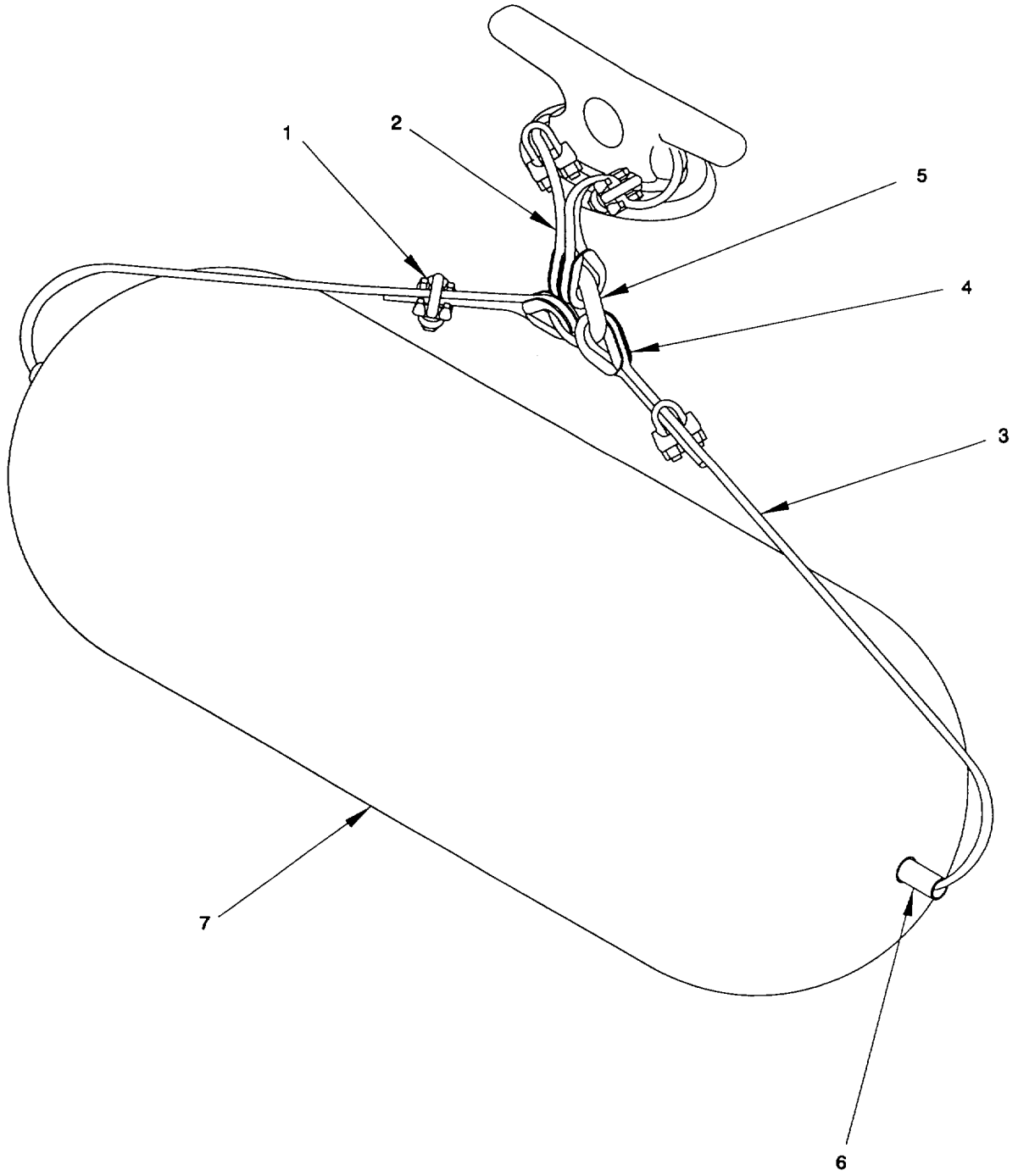


Figure 2-162. Fender Assembly, Repair.

2-163. Mooring Cleat.

This task covers: a. Remove b. Inspect c. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Mooring Cleat

Compound, Antiseize (Item 9, Appendix F)

a. Remove. (figure 2-163)

- (1) Remove hex head bolt (1), keeper plate (2) and hex nut (3).
- (2) Remove cleat weldment (4) from deck.

b. Inspect.

Check that welds on cleat weldment are free of cracks, corrosion, and rust. Replace as necessary.

c. Install. (figure 2-163)

- (1) Position cleat weldment (4) through holes on deck and sides.
- (2) Apply antiseize to bolt (1) before assembly.
- (3) Position hex nut (3), keeper plate (2) and secure with hex head bolt (1).

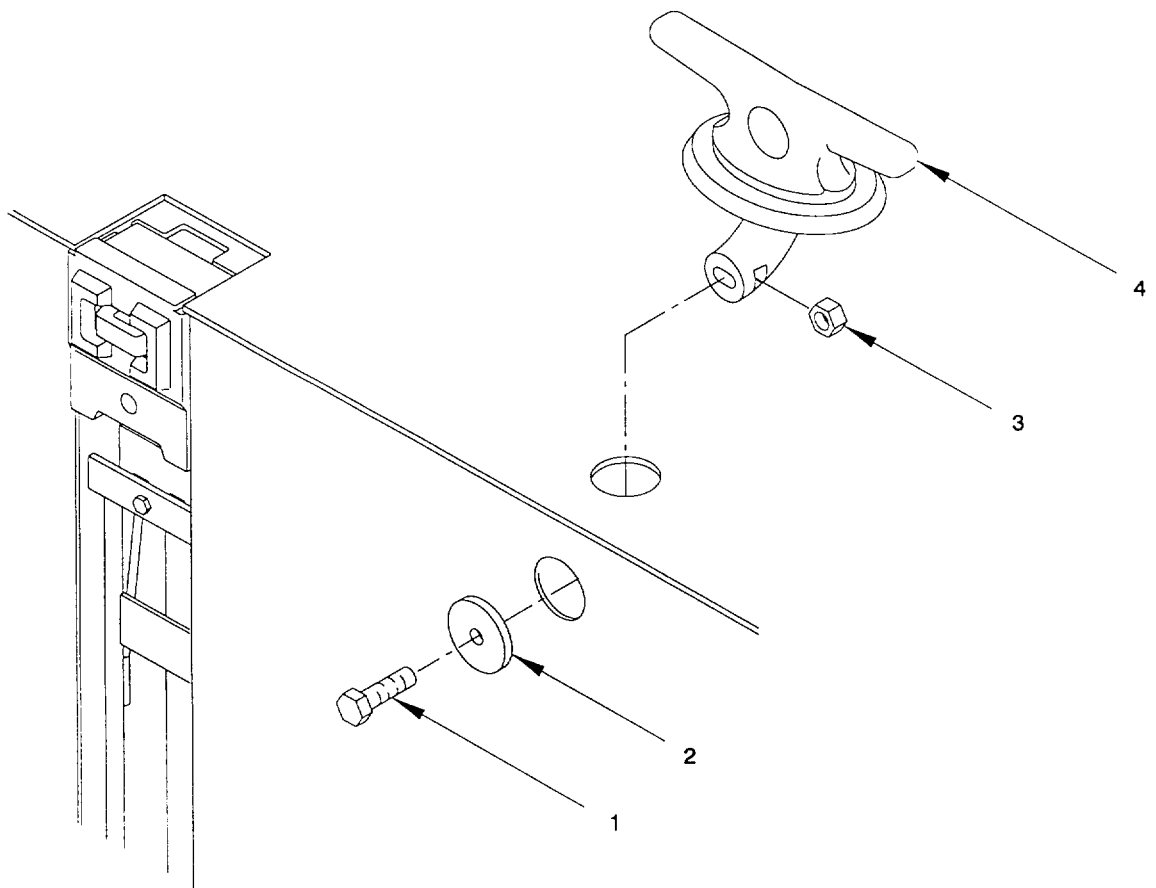


Figure 2-163. Mooring Cleat, Remove/Install.

2-164. Mooring D-Ring.

This task covers: a. Remove b. Inspect c. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Mooring D-Ring
Compound, Antiseize (Item 9, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

a. Remove. (figure 2-164)

- (1) Remove hex head bolt (1), keeper plate (2) and hex nut (3).
- (2) Remove D-ring weldment (4) from deck.

b. Inspect.

Check that welds on D-ring weldment, holding strap to mooring base casting, are free of cracks, corrosion, and rust. Replace as necessary.

c. Install. (figure 2-164)

- (1) Position D-ring weldment (4) through holes in deck and sides.
- (2) Apply antiseize to bolt (1) prior to assembly.
- (3) Position hex nut (3), keeper plate (2) and secure with hex head bolt (1).

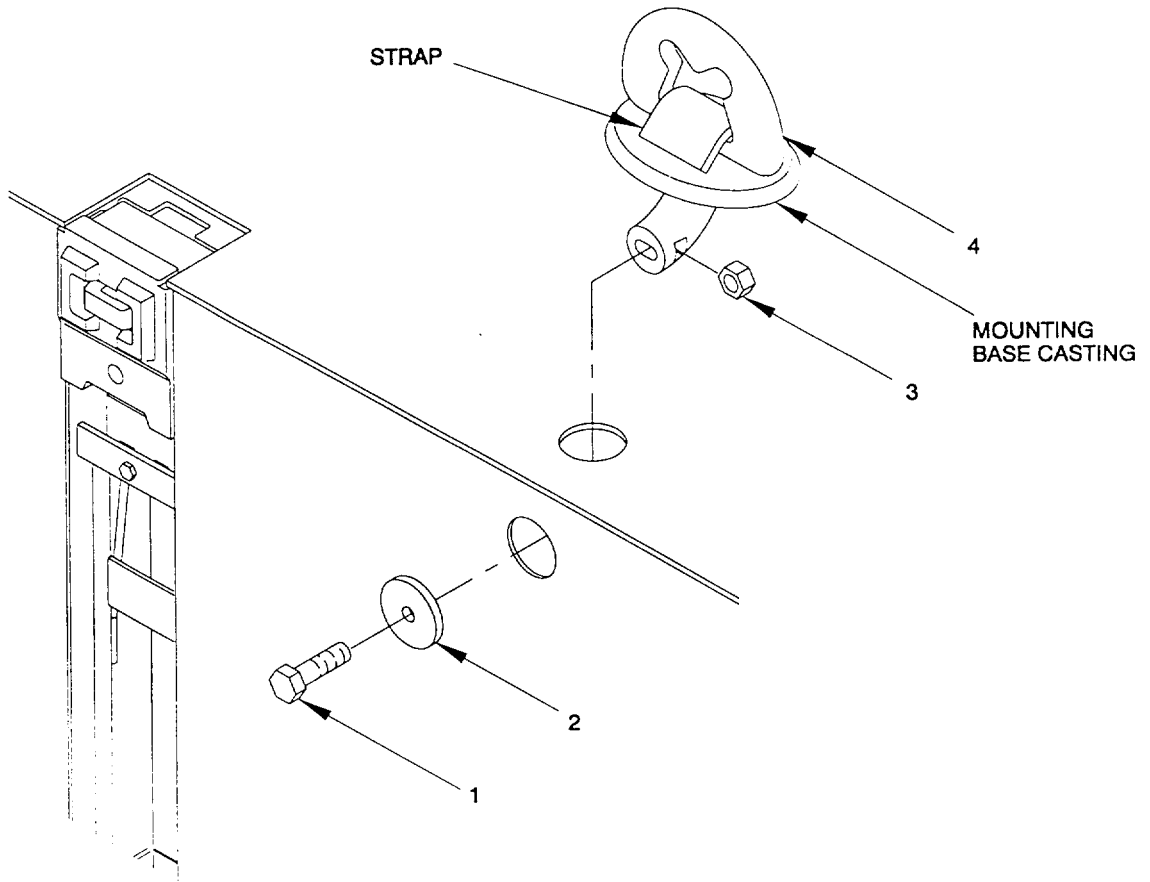


Figure 2-164. Mooring D-Ring. Remove/Install.

2-165. Exhaust Plenum Assembly.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Exhaust Plenum Assembly

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

Exhaust plenum weighs approximately 408 lbs. Use appropriate lifting devices when removing or installing. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-165)

- (1) Tag and disconnect electrical wiring to Ventilation Fan (6). Refer to Appendix G.
- (2) Remove 12 hex head capscrews (1) and hex nuts (2) securing exhaust plenum (3). Remove exhaust plenum (2) using appropriate lifting equipment attached through lift eyes, gasket (4), and T-wrench (5) keeping ventilation fan (6) attached to plenum.

b. *Install.* (figure 2-165)

- (1) Position gasket (4) and exhaust plenum (3) assembly using appropriate lifting equipment attached through lift eyes. Ensure T-wrench (5) is in position on plenum.
- (2) Secure exhaust plenum (3) with 12 hex head capscrews (1) and hex nuts (2).
- (2) Reconnect electrical wiring, as tagged, to ventilation fan (6). Refer to Appendix G.

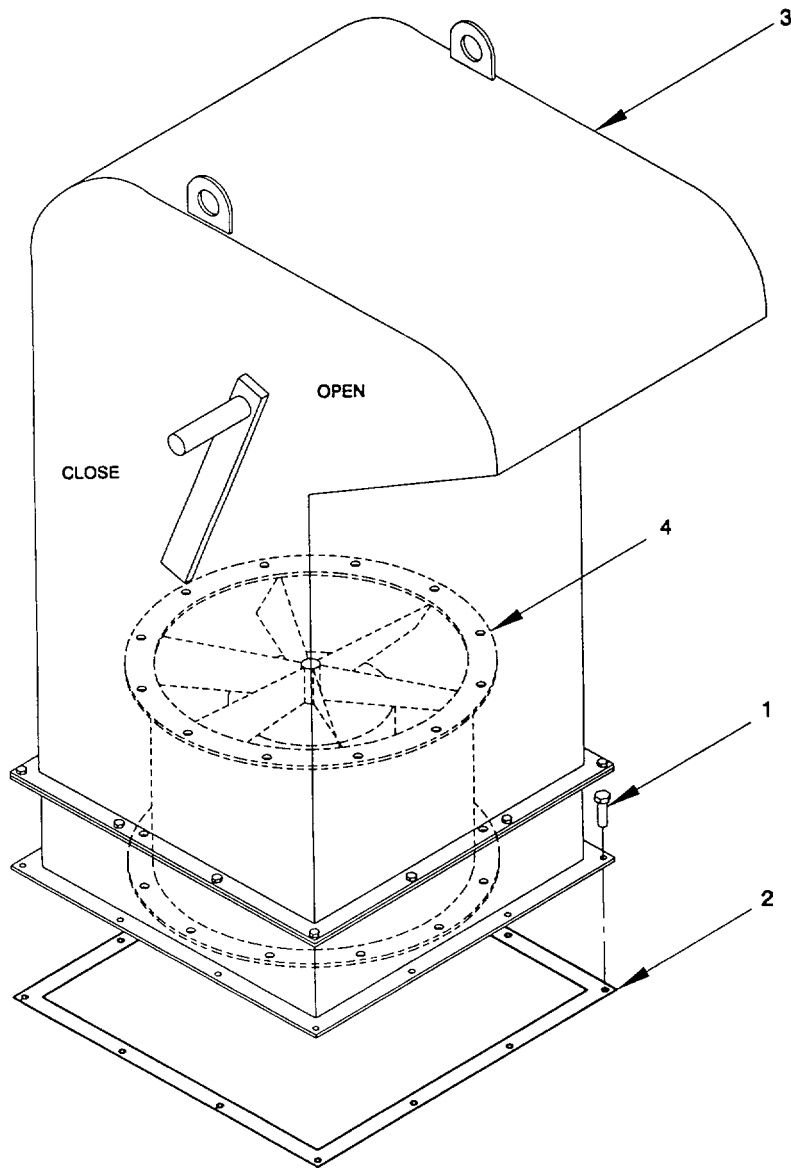


Figure 2-165. Exhaust Plenum Assembly, Remove/Install.

2-166. Ventilation Fan, Exhaust Plenum.

 This task covers: a. Remove b. Service c. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Ventilation Fan

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Exhaust Plenum removed (paragraph 2-165)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

Ventilation Fan weighs approximately 112 lbs. Ventilation Fan should be lifted by using straps around the blower housing only. Use appropriate lifting devices when removing or installing. Failure to comply can result in serious injury to personnel.

DO NOT lift ventilation fan by motor, motor base, propeller or flanges.

a. Remove. (figure 2-166)

- (1) Tag and disconnect electrical wiring to ventilation fan (6). Refer to Appendix G.
- (2) Remove 12 hex head capscrews (1) and twelve hex nuts (2) securing exhaust plenum (3) to exhaust blower mount (4) Remove exhaust plenum (3).
- (3) Remove 12 hex nuts (5) securing ventilation fan (3) to exhaust blower mount (4). Remove ventilation fan (6)

b. Service.

- (1) Check the blower impeller for any buildup of foreign material or wear from abrasion. Replace the blower if excessive wear is noticed.
- (2) Clean the blower impeller of any foreign material.
- (3) Tighten all bolts and setscrews on the ventilation fan assembly.

c. Install. (figure 2-166)

- (1) Position ventilation fan (6) on exhaust blower mount (4). Secure ventilation fan (6) with 12 hex nuts (4)
- (2) Position exhaust plenum (3) on exhaust blower mount (4). Secure exhaust plenum (3) with 12 hex head capscrews (1) and 12 hex nuts (2).
- (3) Reconnect electrical wiring, as tagged, to ventilation fan (6). Refer to Appendix G.

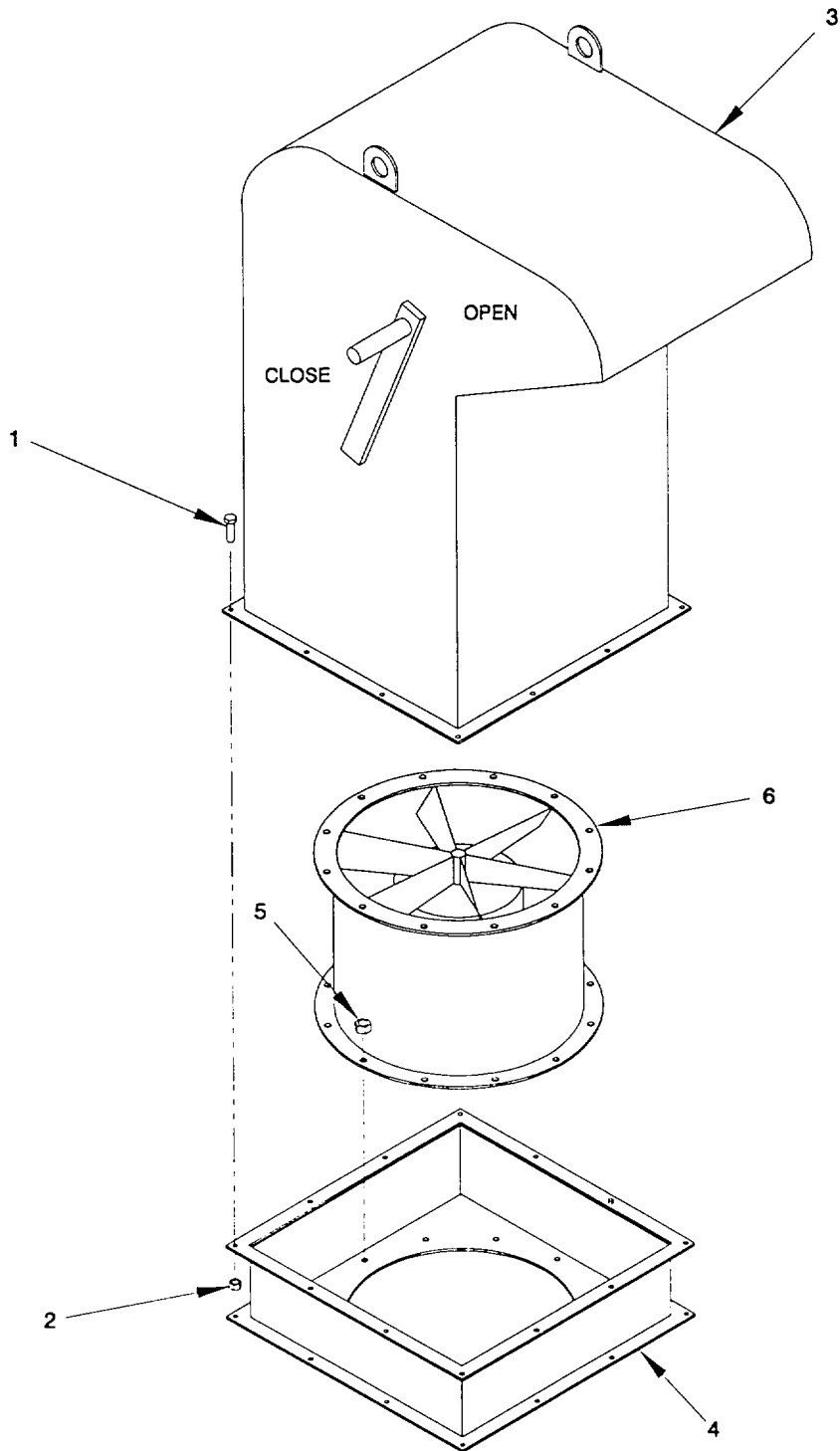


Figure 2-166. Ventilation Fan. Exhaust Plenum. Remove/Install.

2-167. Locking Handle, Exhaust Plenum.

This task covers: a. Remove b. Install

INITIAL SETUP

*Tools*General Mechanic's Tool Kit, Rail and Marine (NSN
5180-00-629-9783)*Equipment Condition*All power off to all equipment. All equipment and
control/indicators tagged OUT OF SERVICE*Materials/Parts*Locking Handle

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.* (figure 2-167)

- (1) Remove eight hex head capscrews (1) securing exhaust plenum cover (2) to exhaust plenum (8). Remove exhaust plenum cover (2)
- (2) Remove two drive pins (3) securing exhaust plenum door (4) to locking handle (7).
- (3) Remove cotter pin (5) and flat washer (6) securing locking handle (7) to exhaust plenum (8). Support exhaust plenum door (4) and remove locking handle (7).

b. *Install.* (figure 2-167)

- (1) Hold exhaust plenum door (4) in place and install locking handle (7) through exhaust plenum (8) and exhaust plenum door (4) When in the closed position, door must contact stop and seal bars.
- (2) Secure locking handle (7) with flat washer (6) and cotter pin (5).
- (3) Secure exhaust plenum door (4) to locking handle (7) with two drive pins (3).
- (4) Position exhaust plenum cover (2) on exhaust plenum (8) and secure with eight hex head capscrews (1)

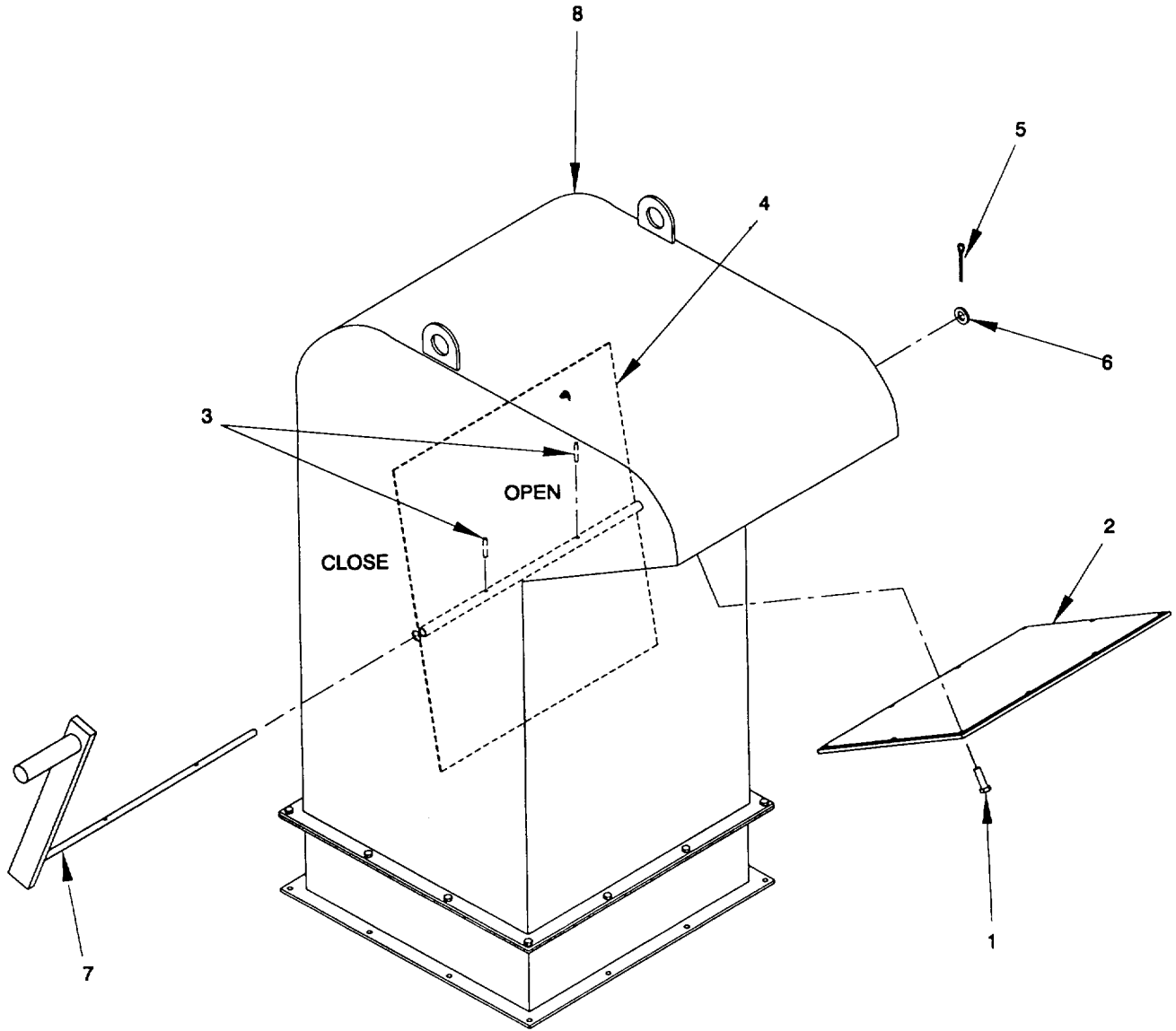


Figure 2-167. Locking Handle, Exhaust Plenum, Remove/Install.

2-168. Stub Mast Navigation Assembly.

 This task covers: a. Remove b. Inspect c. Repair d. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit (NSN 5180-00-177-7033)

Materials/Parts

Dual Light
 Bulb, Single/Dual Lamp
 Gasket, Rubber
 Cloth, Lint Free (Item 7, Appendix F)

Equipment Conditions

All power cables to Stub Mast are disconnected and tagged "OUT OF SERVICE"

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Remove.

(1) Cables and Enclosure Assembly (figure 2-168).

(a) Unscrew and disconnect pigtails (1) and portable cable (2) from the enclosure assembly (3).

(b) Remove hex nuts (4), flat washers (5), and clamps (6) that secure the pigtails (1) between the stern light (7) and the enclosure assembly (3) to the mast (8).

(c) Remove the self locking hex nuts (9) and capscrews (10) that secure the enclosure assembly (3) to the mast.

(2) Stern Light (figure 2-169)

(a) Remove stern lamp by removing cable inserts (1).

(b) Remove hex nuts (2), capscrews (3), flat washers (4), plastic washers (5), and lockwashers (6).

b. Inspect. (figure 2-170)

(1) Open and visually inspect inside of junction box enclosure (1) for moisture and broken wiring connections. Resolder connections or replace wires if necessary. Remove any moisture with a clean, lint-free cloth.

(2) Inspect connector receptacles (2) for corrosion, bent pins, or dirty plugs. Clean off corrosion, straighten pins, clean out plugs.

(3) Inspect pigtails (3) from stern light (4) for corrosion, connection separation, insulation cracking. Bent pins and dirty plugs. Clean off corrosion, straighten pins, clean out plugs.

2-168. Stub Mast Navigation Assembly (Cont).

- (4) Inspect portable cable assembly (5) for corrosion, connection separation, insulation cracking, bent pins and dirty plugs. Clean off corrosion, straighten pins, clean out plugs.

c. Repair. (figure 2-171)

- (1) To replace lamp light bulbs (3 and 13), loosen safety knob screw (1) and turn cover (2) by its handle to the left and lift up the cover. The topmost bulb (3) may then be changed from the top.
- (2) Replace cover gasket (4) if damaged or worn.
- (3) Replace screens (5), if damaged, by removing screws (6).
- (4) To reach bottom bulb (13), the top mounting plate (12) must be removed. Remove top bulb (3) to prevent damage to it while removing top mounting plate. Loosen screws (7) securing clamp (8) to allow cable (9) to move freely. Loosen three phillips head screws (10), rotate plate so screw heads slide through sliding screw holes in mounting plate (12) and separate two halves of connector plug (11) while removing plate (12). Lift out top mounting plate (12). Change bottom bulb (13).

c. Install.

(1) Cables and Enclosure Assembly. (figure 2-168)

- (a) Install enclosure assembly (3) and secure with capscrews (10) and hex nuts (9) to the mast (8).
- (b) Connect and secure pigtails (1) and portable cable (2) to the enclosure assembly (3).
- (c) Install clamps (6), flat washers (5), and hex nuts (4) to secure the pigtails (1) between the stern light (7) and the enclosure assembly (3) to the mast (8).

(2) Stern Light (figure 2-169)

- (a) Install stern light onto mast by placing lockwashers (6), plastic washers (5), lined up with holes, between light and mast. Install capscrews (3), flat washers (4). Secure by tightening hex nuts (2) to no more than maximum torque of 35 ft.-lbs..
- (b) Reconnect cable inserts (1).
- (c) Verify that the dual lamp fixture is properly mounted on the mast and that the screens are in the correct orientation.
- (d) Verify that the lamp fixture operates correctly prior to installation.
- (e) Insure that the wiring and grounding connections are tight.

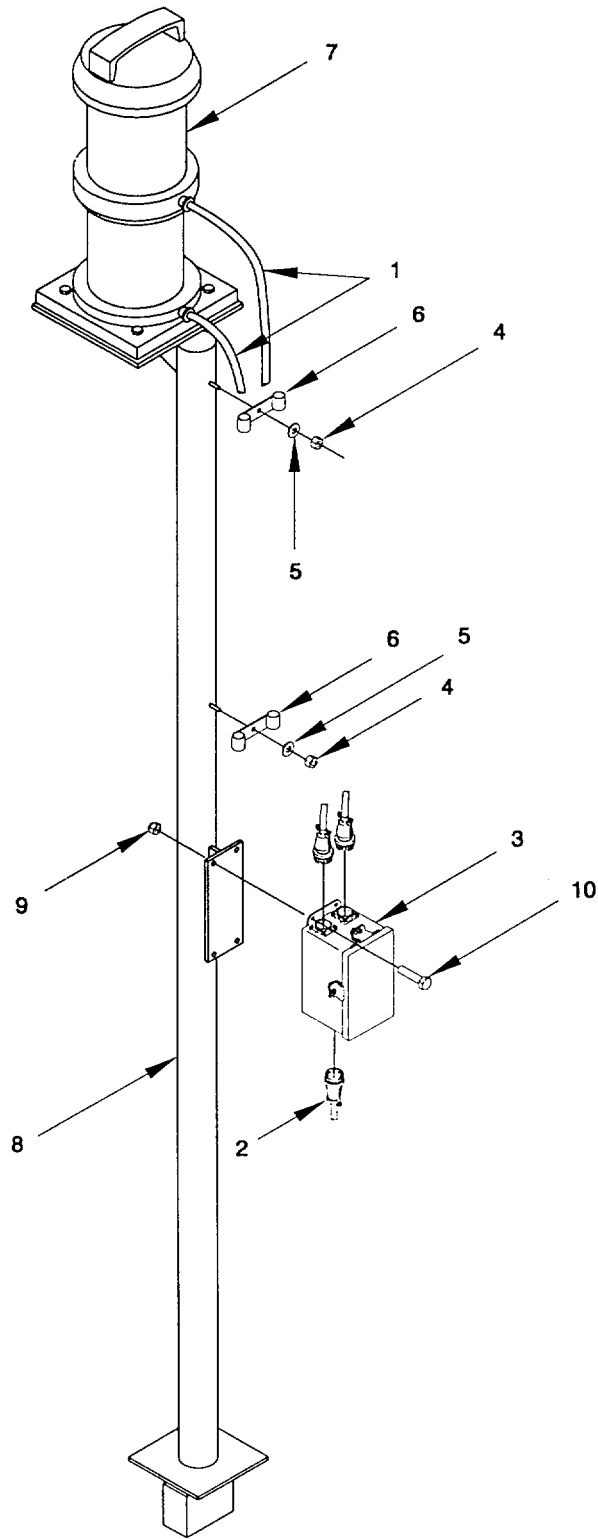


Figure 2-168. Cables and Enclosure Assembly, Remove/Install.

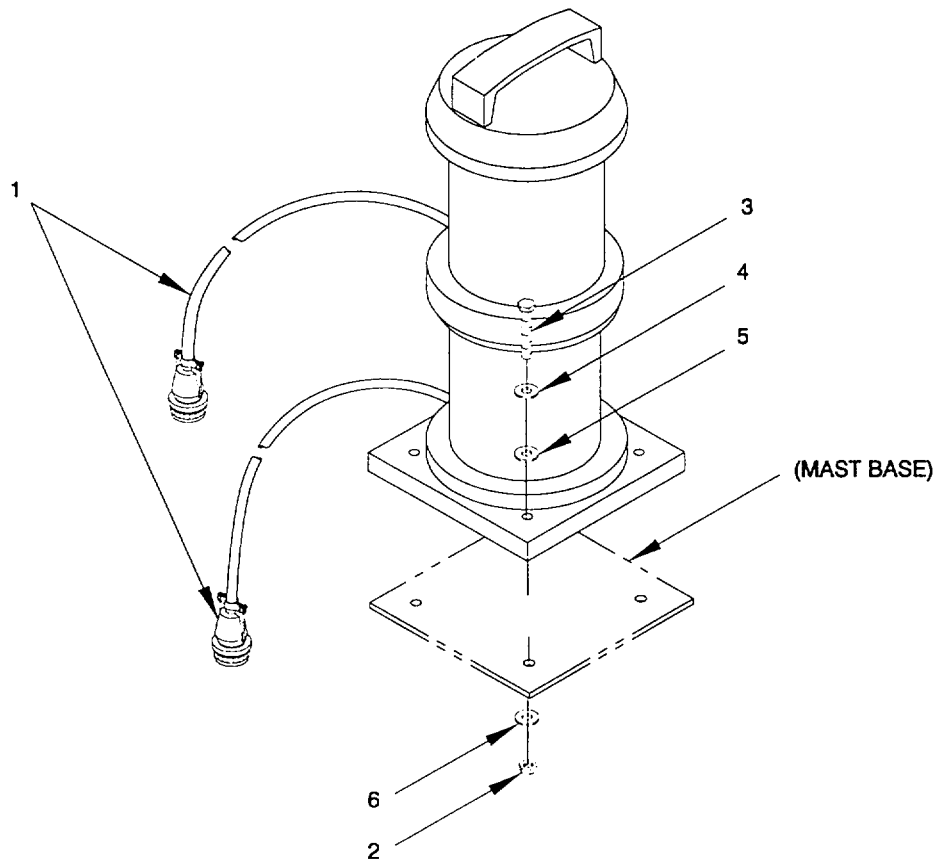


Figure 2-169. Stern Light Remove/Install.

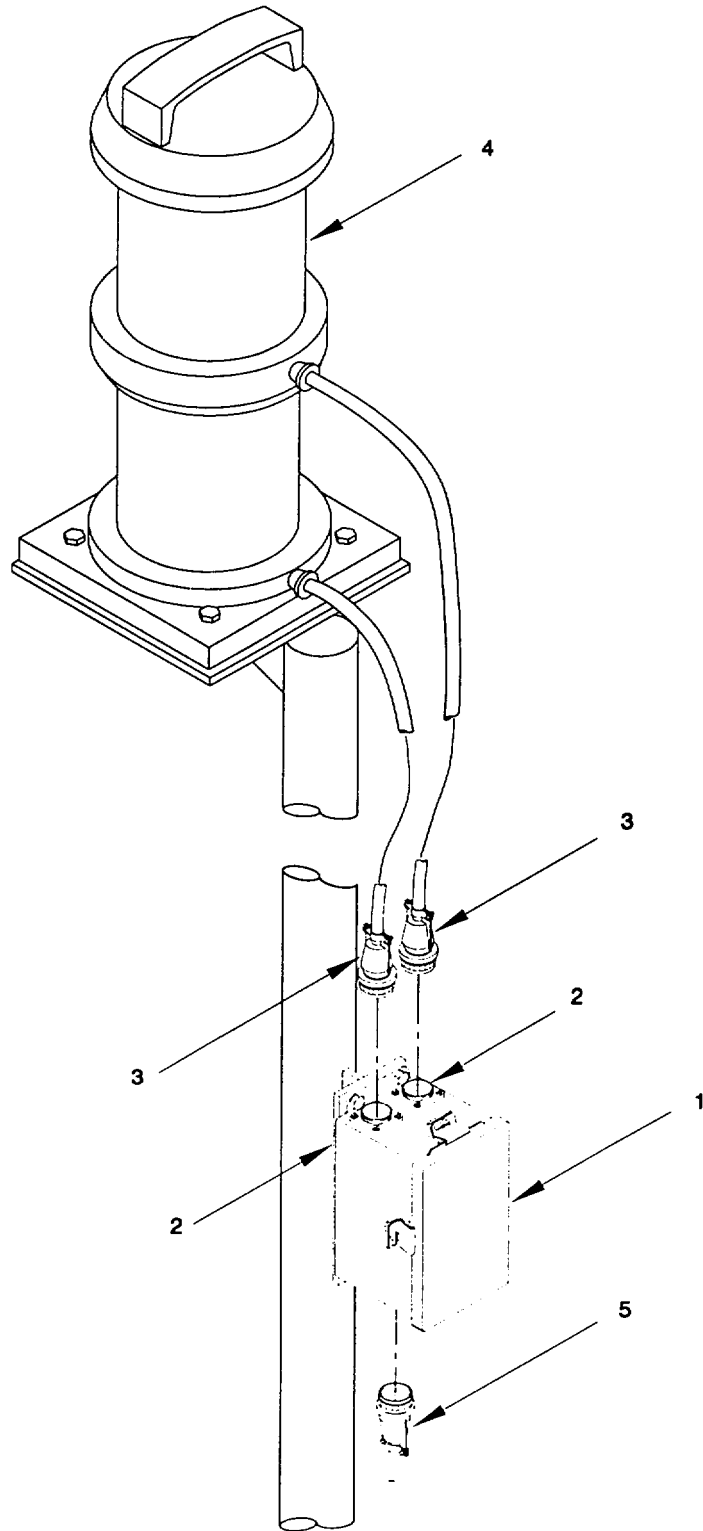


Figure 2-170. Cables and Enclosure Assembly, Inspect/Repair.

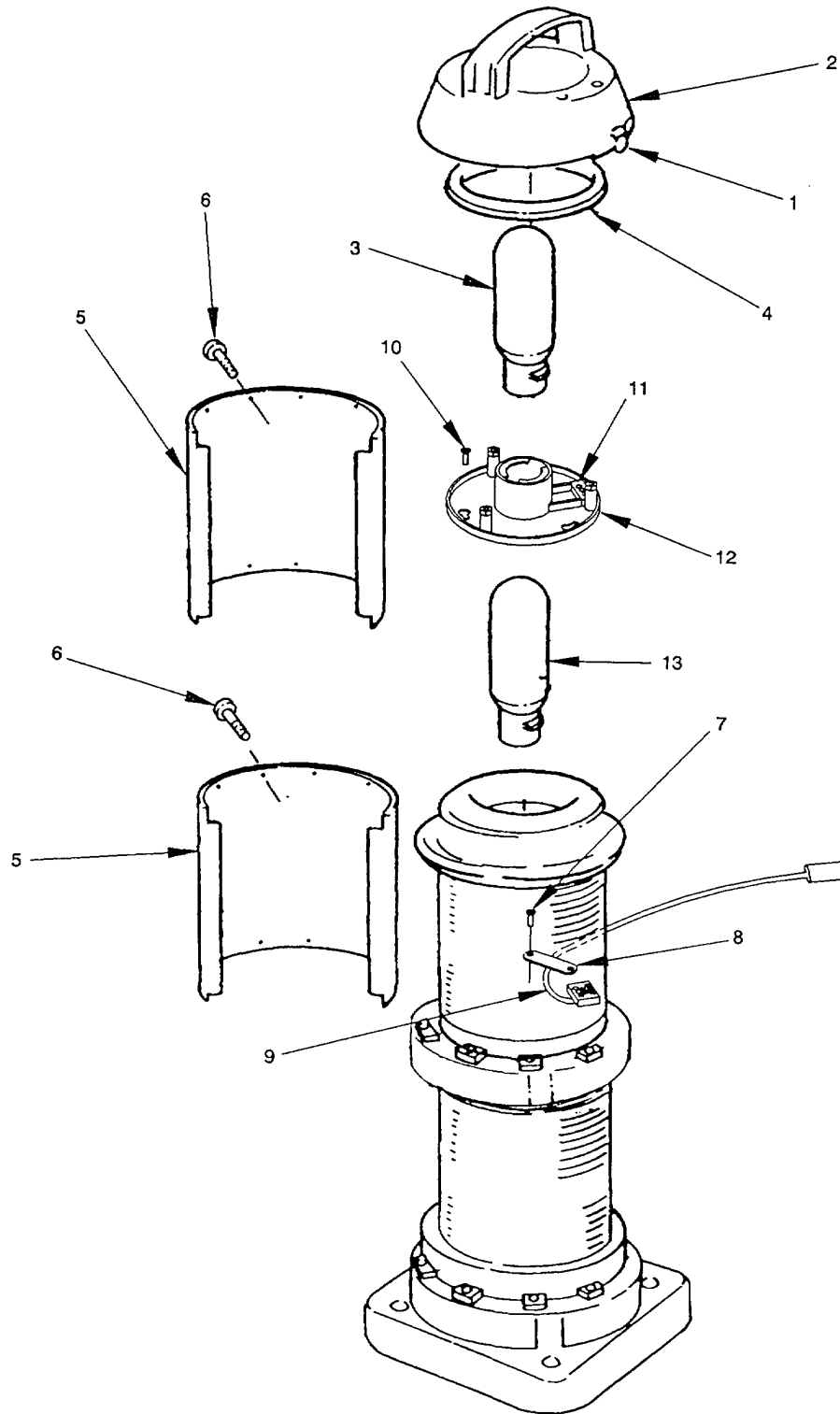


Figure 2-171. Stern Light, Repair.

2-169. Main Mast Navigation Assembly.

 This task covers: a. Remove b. Repair c. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Navigation Light, Single
 Navigation Light, Double
 Bulb, Single/Dual Lamp
 Neoprene Strip
 marked,
 Gaskets

Materials/Parts (Cont)

Cloth, Lint Free (Item 7, Appendix F)
 Compound, Antiseize (Item 9, Appendix F)
 Adhesive (Item 2, Appendix F)

Equipment Condition

All main connections and cables leading into the main
 navigation mast have been disconnected, match
 and tagged "OUT OF SERVICE"

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. *Remove.*

- (1) Navigation Mast Assembly. (figure 2-172)

WARNING

Before disassembling the main navigation mast, the P1 pigtail connector that connects the operator's cab to the navigation lights terminal box shall be disconnected and tagged "OUT OF SERVICE" to prevent inadvertent operation.

The mast assembly weighs approximately 400 lbs. Use certified hoisting equipment for 800 lbs or more to prevent injury to personnel or damage to equipment.

- (a) Disconnect the P1 pigtail connector (1) that connects the operator's cab to the navigation light terminal box (2) Tag connector end and control panel "OUT OF SERVICE".
- (b) The mast (3), as an assembly, shall be disconnected from the cab. Remove four nuts (4) and capscrews (5) to release the clamp (6) from the upper mast mount (7) from the operator's cab roof.
- (c) Remove the hex nut (8) and the 7.0 inch long bolt (9) securing the mast bottom to its holder in front of the operator's cab. Lift mast from deck and lower mast onto work stand.

2-169. Navigation Mast Assembly (Cont).

- (2) Navigation Lights. (figure 2-173) '

NOTE

This procedure is typical for the following navigation lights; Double Sidelight (Port and Starboard) (1), Double Masthead Light (2), Single Anchor Light (3), Single Vessel Aground Light (4), and Single Task Light (5).

- (a) Unscrew and disconnect the electric cable (5) for each light from its junction box.
 - (b) Remove the four hex nuts (6), capscrews (7), flat washers (8), plastic washers (9) and lockwashers (10)
 - (c) Perform repair procedures (see paragraph 2-177).
- (3) Junction Boxes. (figure 2-174)

NOTE

Typically, the junction box does not require inspection or maintenance. If, however, it has been damaged and the seal broken, it is recommended it be replaced. The following procedure is typical for all mast junction boxes (2).

- (a) Disconnect light pigtail(s) (1) from the junction box (2).
 - (b) Remove hex nuts (3) and pan head capscrews (4) to bring junction box (2) off mast base.
 - (c) If necessary, replace gasket (5).
- (4) Yardarms and Mast Structure.
- (a) Remove male unions (1, figure 2-175) to separate the blank covers (2), cover gaskets (3), and conduit bodies (4) from the round pipe (5) and the cord grips (6). Collect two hubs (7).
 - (b) Remove capscrews (8) and clamps (9).
 - (c) Remove six hex nuts (10), lockwashers (11), and 1-1/2" capscrews (12), to separate the upper mast (13) from the lower mast (14).
 - (d) Remove four hex nuts (10), lockwashers (11), and 4-1/2" capscrews (15) to separate the port yardarm (16) and the starboard yardarm (17) from the mast assembly.
 - (e) Remove four hex nuts (1, figure 2-176) and 4" capscrews (2) to remove the upper yardarms (3) from the upper mast (4)
 - (f) If necessary, remove nuts (5) and flat washers (6) to replace corroded eye bolts (7), chains (8), or pulleys (9) off the upper yardarms (3).
- (5) Navigation Light Terminal Box. (figure 2-177).
- (a) Open navigation light terminal box (1) and disconnect/unsolder wiring.

2-169. Navigation Mast Assembly (Cont).

- (b) Remove blank cover (2) with cover gasket (3), and conduit body (4) from the mast. Remove the short round pipe (5) and hub (6) from the top of the navigation terminal box (1).
- (c) Remove nuts (7), lockwashers (8), and capscrews (9) to bring navigation light terminal box (1) off mast, if necessary.
- (d) Remove connectors (10) and backshells (11) from terminal box (1).

b. Repair. (figure 2-178)

- (1) Inspect cables, cable connections, and conduits for deterioration, corrosion, splitting. Reference Appendix G, Replace as necessary.
- (2) Inspect connector receptacles (1) on junction boxes (2) for corrosion or dirty plugs. Clean off corrosion and clean out plugs.
- (3) Inspect pigtail connector plugs (3) from lights and cables for corrosion, connection separation, insulation cracking, bent pins and dirty plugs. Clean off corrosion and straighten pins.
- (4) On the bottom mast, replace the neoprene strips (4) on the two clamps (5) that secure and store the stub mast (6) assembly with the navigation mast.
- (5) If damaged, replace pipes by loosening hubs and removing clamps. If wires are not damaged, they can be routed through the new piping.

NOTE

This procedure is typical for the following navigation lights; Double Sidelight (Port and Starboard) (1), Double Masthead Light (2), Single Anchor Light (3), Single Vessel Aground Light (4), and Single Task Light (5).

- (6) Single Lamp Fixtures. (figure 2-179)
 - (a) Loosen safety knob screw (1) and turn cover (2) by its handle to the left and lift up the cover. The bulb (3) may then be changed from the top.
 - (b) If damaged or worn, replace cover gasket (4).
- (7) Dual Lamp Fixtures. (figure 2-179)
 - (a) Loosen safety knob screw (1) and turn cover (2) by its handle to the left and lift up the cover. The bulb (3) may then be changed from the top.
 - (b) If damaged or worn, replace cover gasket (4).
 - (c) To reach bottom lamp bulb (5), remove lens (6) and mounting plate (7).
- (8) Inspect navigation light terminal box (2, figure 2-180) for moisture, corrosion, evidence of overheating. Wipe out, dry, and resolder or reconnect electrical leads as necessary.

2-169. Navigation Mast Assembly (Cont).c. Install.

- (1) Navigation Lights Terminal Box. (figure 2-177)
 - (a) Install nuts (7), lockwashers (8), and capscrews (9) to secure navigation light terminal box (1) to mast.
 - (b) Install hub (6), blank cover (2) with cover gasket (3), and conduit body (4) to the top of the navigation terminal box (1)
 - (c) Open navigation light terminal box (1) and connect/solder wiring.
- (2) Yardarms and Mast Structure.
 - (a) Install replacement chains (8, figure 2-176), pulleys (9), and eye bolts (7) onto the upper yardarms (3)
 - (b) Apply antiseize compound to all fasteners. Install capscrews (12, figure 2-182), washers (11) and nuts (10) which hold port (16) and starboard (17) lower yardarms and main mast sections (13) and (14) together.
 - (c) Install clamps (9), capscrews (8), and round pipe (5).
 - (d) Install the two hubs (7), male unions (1), conduit bodies (4), new cover gaskets (3), and covers (2)
- (3) Junction Boxes. (figure 2-174)
 - (a) Place gasket (5) between junction box (2) (with cover removed) and mast base. Install four pan head capscrews (4) through junction box and mast base. Secure with four hex nuts (3).
 - (b) Connect internal wiring to junction box panel and tighten wire connector setscrews. Replace and secure cover plate onto junction box.
- (4) Navigation Lights. (figure 2-173)
 - (a) Install and secure light into mast by putting the plastic washers (9) between the mast and the light base. Insert each capscrew (7) through flat washer (8), light base, plastic washer (9), lockwasher (10) and mast.
 - (b) Tighten hex nuts (6) onto capscrews (7). Torque no more than 35 ft.-lbs.
 - (c) Connect cable (5) to appropriate junction box and screw down connector.

2-169. Navigation Mast Assembly (Cont).**NOTE**

Verify that the navigation lights are located properly on the mast and that the screens are in correct orientation.

Verify that the navigation lights operate correctly prior to installation.

Insure that the wiring and grounding connections are tight.

Insure that all bolted connections are tight and preloaded to the values shown.

(5) Mast Assembly. (figure 2-172)

WARNING

The mast assembly weighs approximately 400 lbs. Use certified hoisting equipment for 800 lbs or more to prevent injury to personnel or damage to equipment.

- (b) Lift mast from saw horses. Position into deck holder. Install bolt (9) through holder and mast bottom (3) and secure with hex nut (8). Position mast (3) against upper mast mount (7) and secure with clamp (6) four capscrews (5) and four nuts (4).
- (c) Connect the P1 pigtail connector (1) to the operator's cab and navigation lights switch box (2). Remove "OUT OF SERVICE" tags.

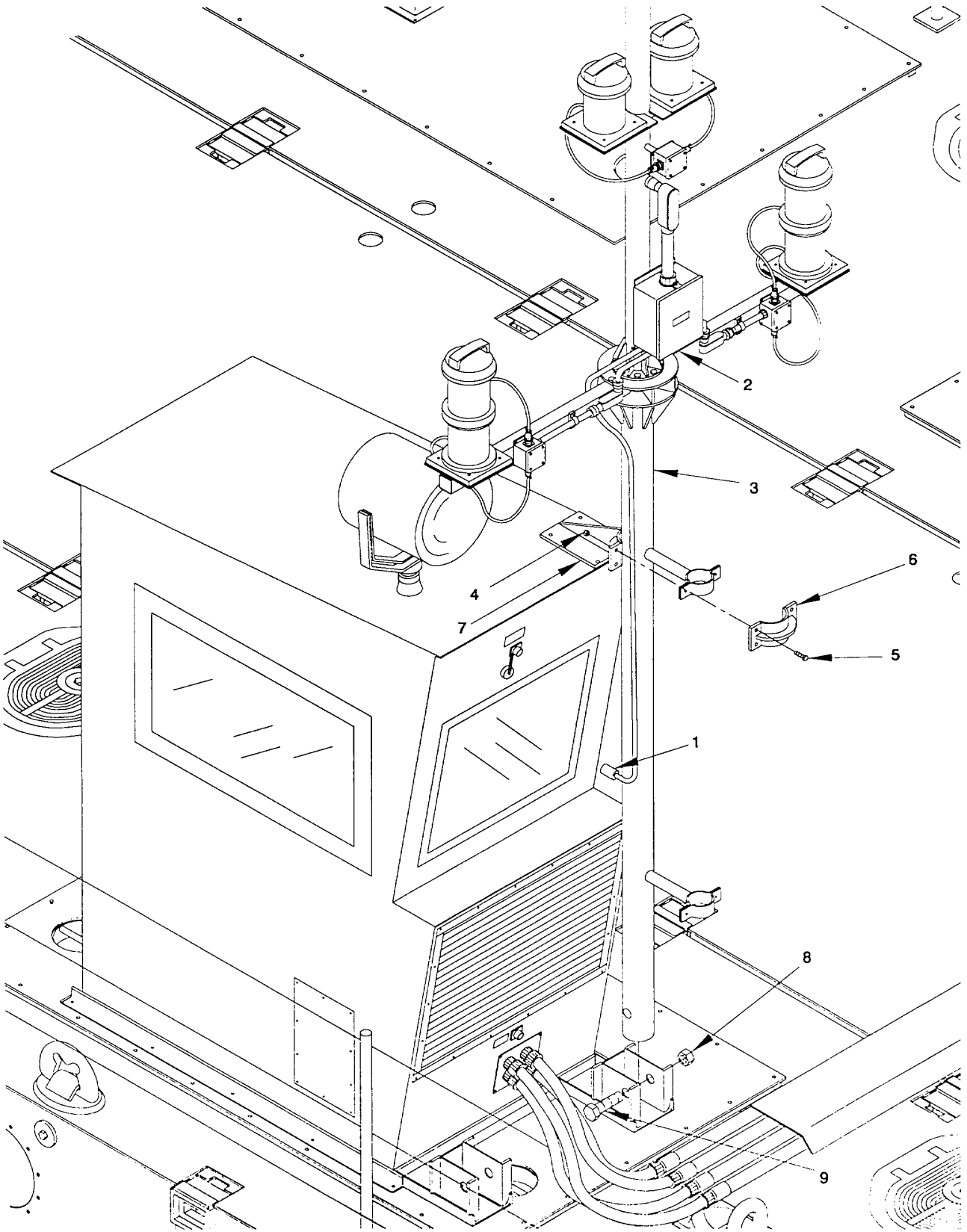


Figure 2-172. Navigation Mast, Remove/install.

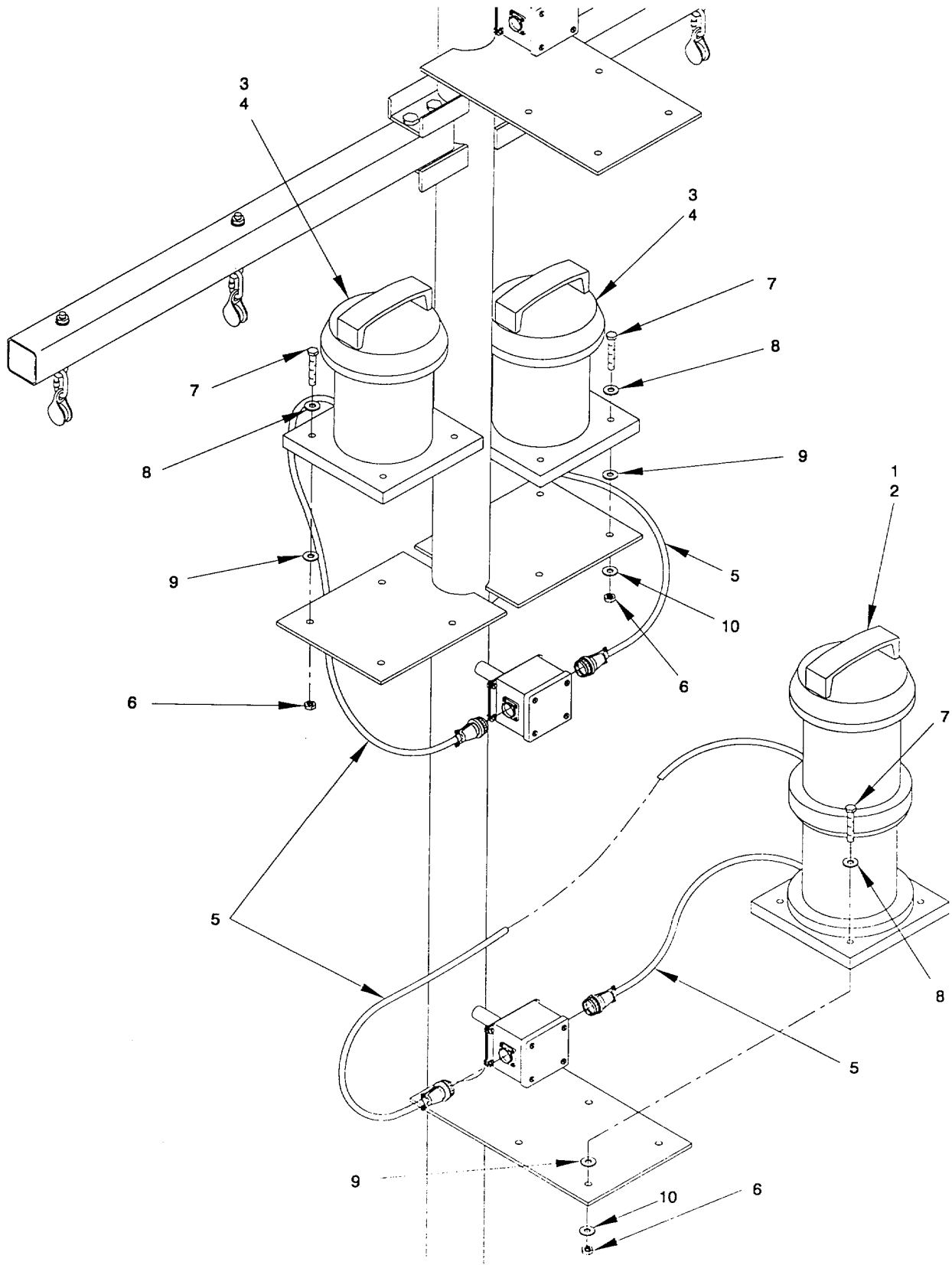


Figure 2-173. Navigation Lights, Remove/Install.

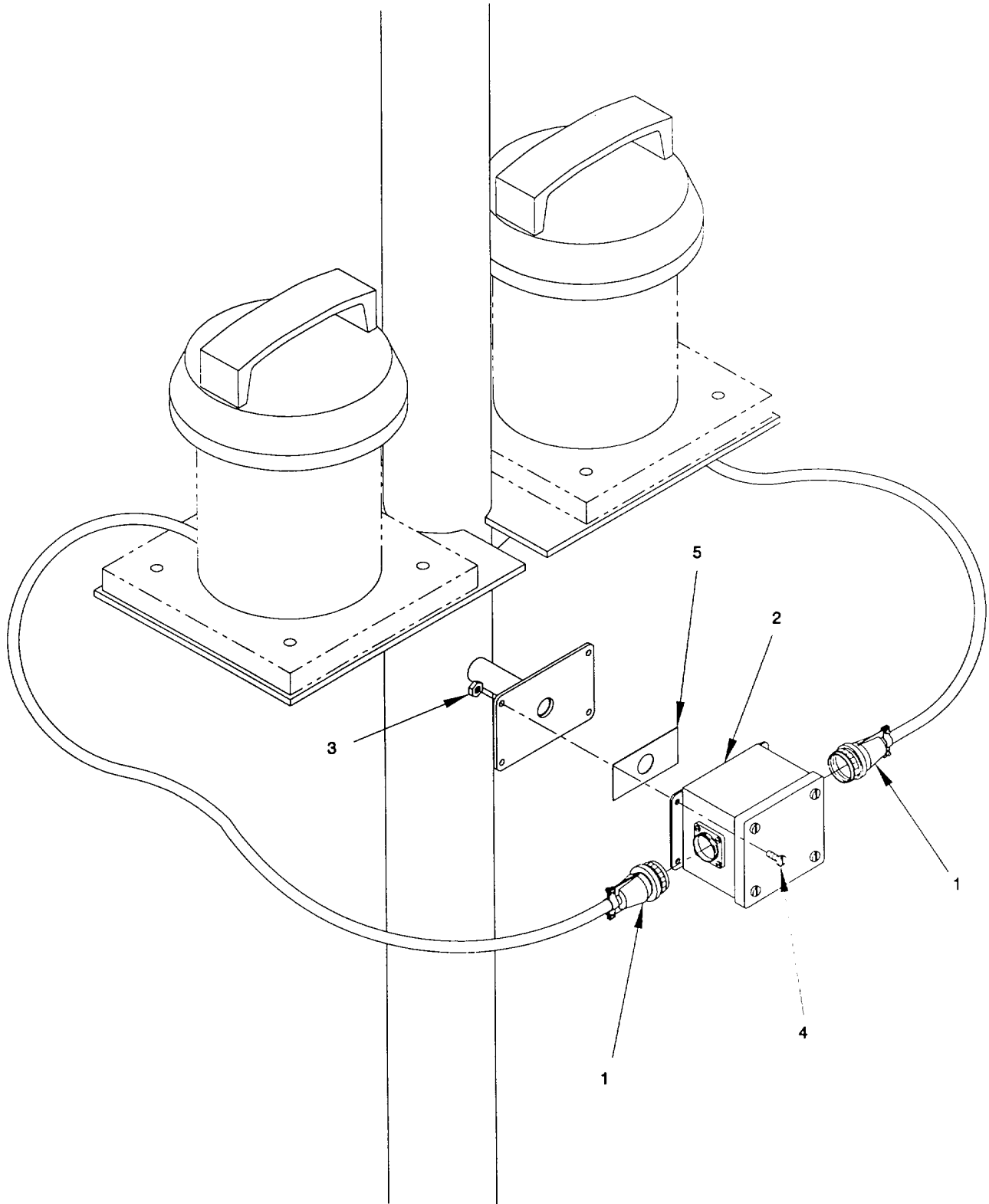


Figure 2-174. Junction Boxes Remove/Install.

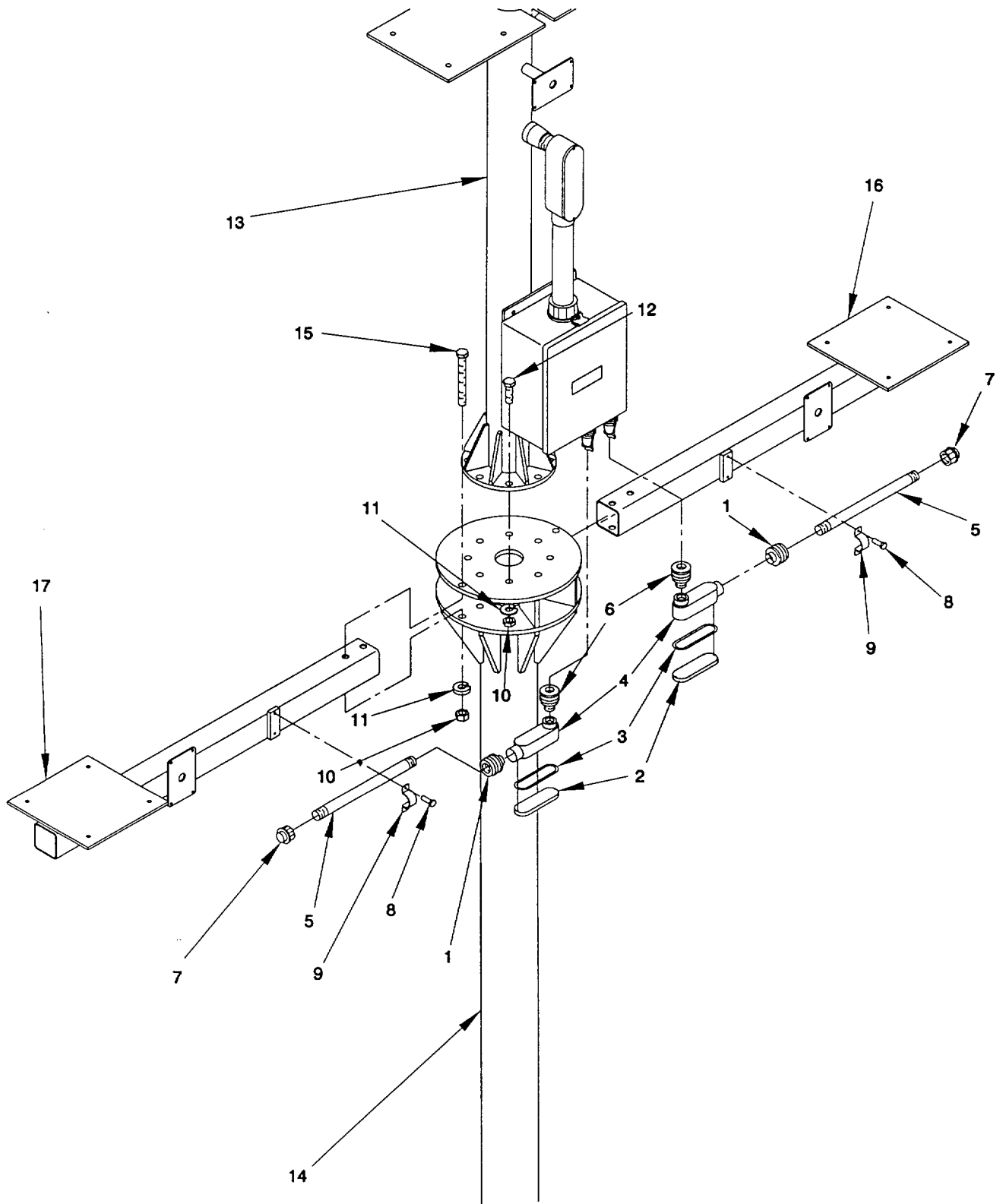


Figure 2-175. Lower Yardarm, Remove/Install.

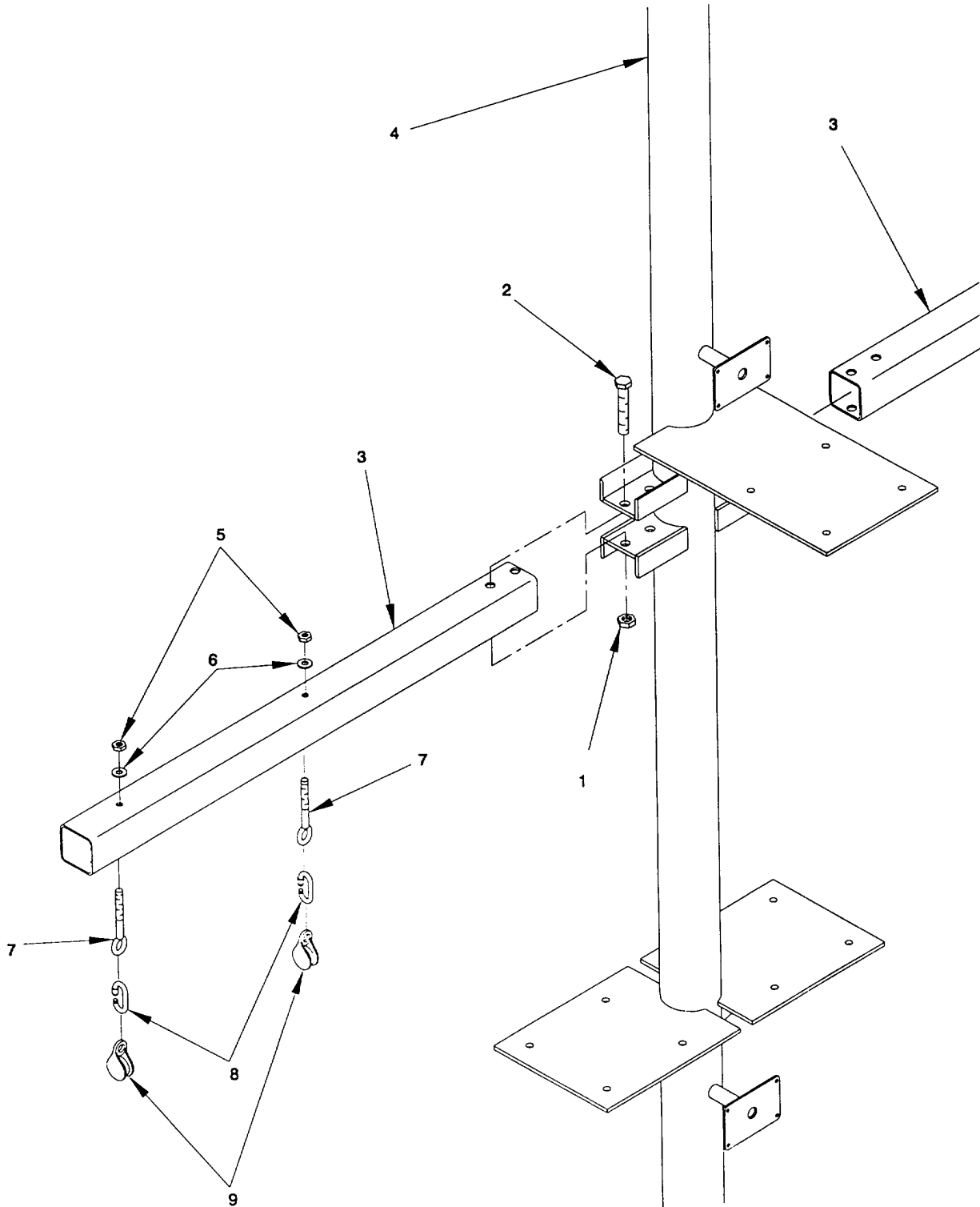


Figure 2-176. Upper Yardarm Remove/Install.

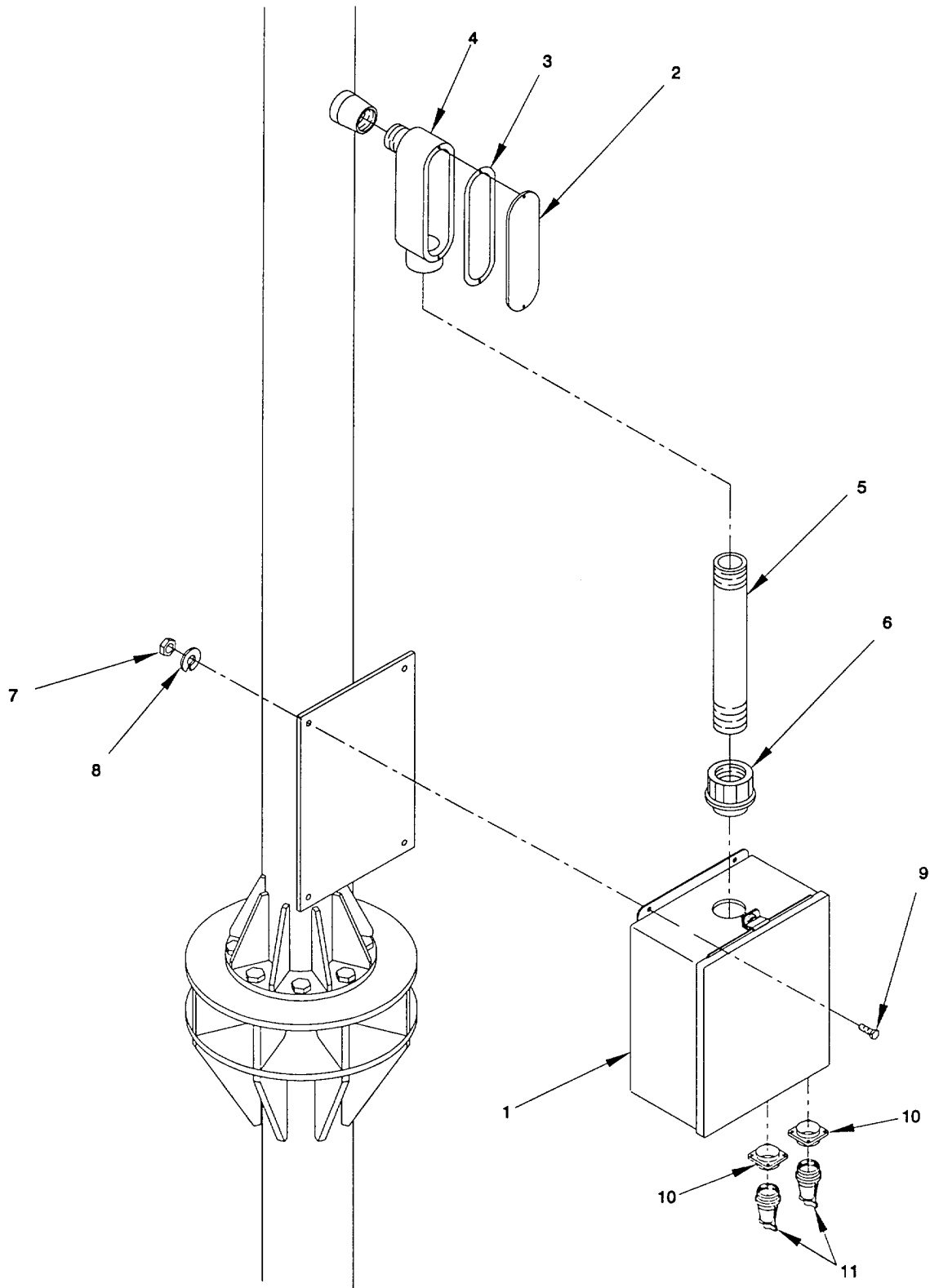


Figure 2-177. Navigation Lights Terminal Box, Remove/Install.

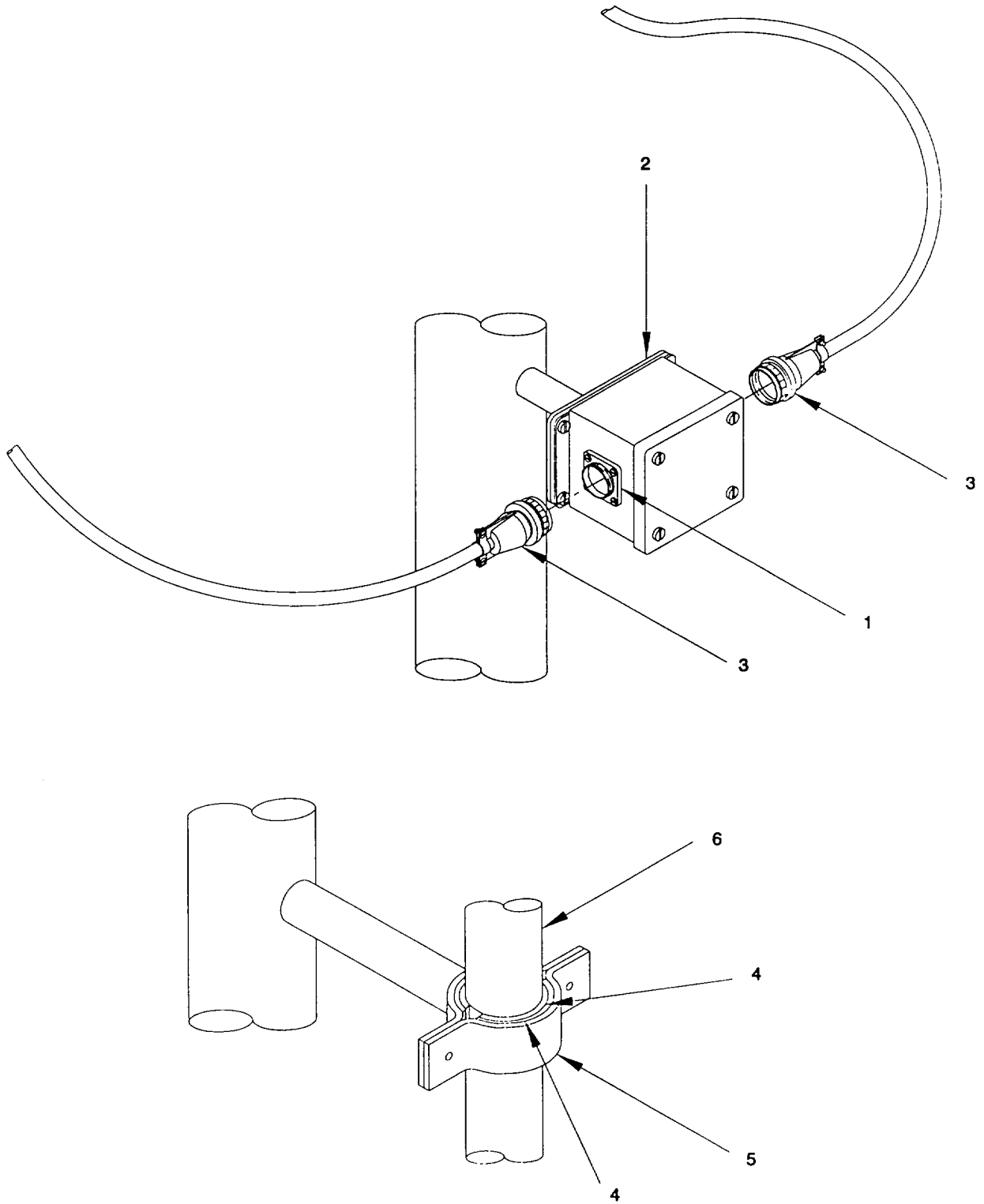


Figure 2-178. Navigation Mast Repair.

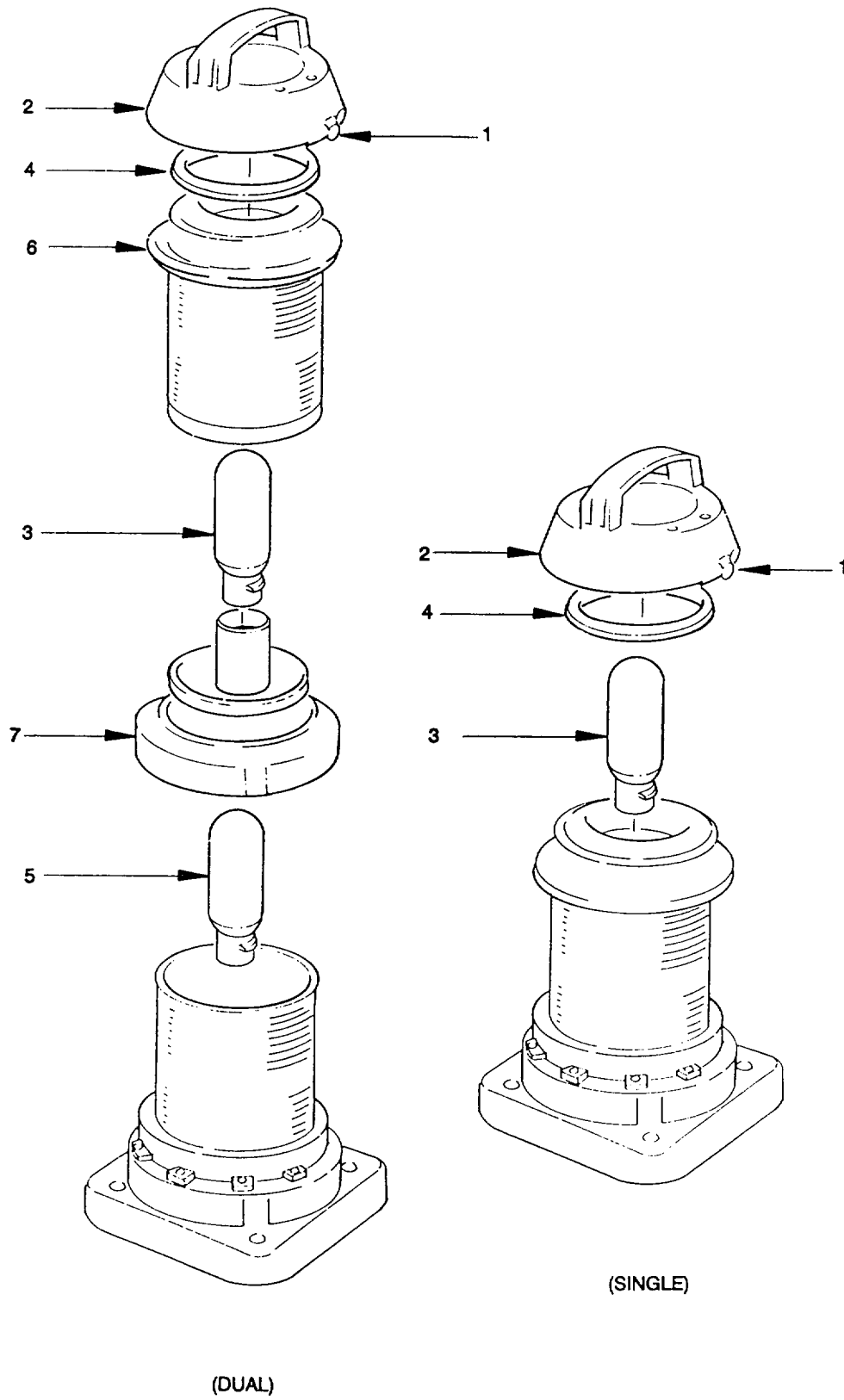


Figure 2-179. Navigation Lights, Repair.

2-170. Terminal Box, Main Mast Navigation Assembly.

This task covers: a. Remove b. Inspect c. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

Propulsion Module dry-docked.

Materials/Parts

Terminal Box

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-180)
- (1) Remove four screws (1) and four clamps (2) securing cover (3) to enclosure (8). Swing cover (3) open.
 - (2) Disconnect and tag electrical wiring to terminal box. Refer to Appendix G.
 - (3) Remove four hex head capscrews (4), four hex nuts (5), eight flat washers (6) and four lock washers (7) securing enclosure (8). Remove junction box.
- b. *Install.* (figure 2-180)
- (1) Apply antiseize compound to capscrews (4) and screws (1).
 - (2) Position new junction box and secure with four hex head capscrews (4), eight flat washers (6), four lock washers (7) and four hex nuts (5).
 - (3) Reconnect electrical wiring, as tagged, to junction box. Refer to Appendix G.
 - (4) Close cover (3) and secure with four clamps (2) and four screws (1).

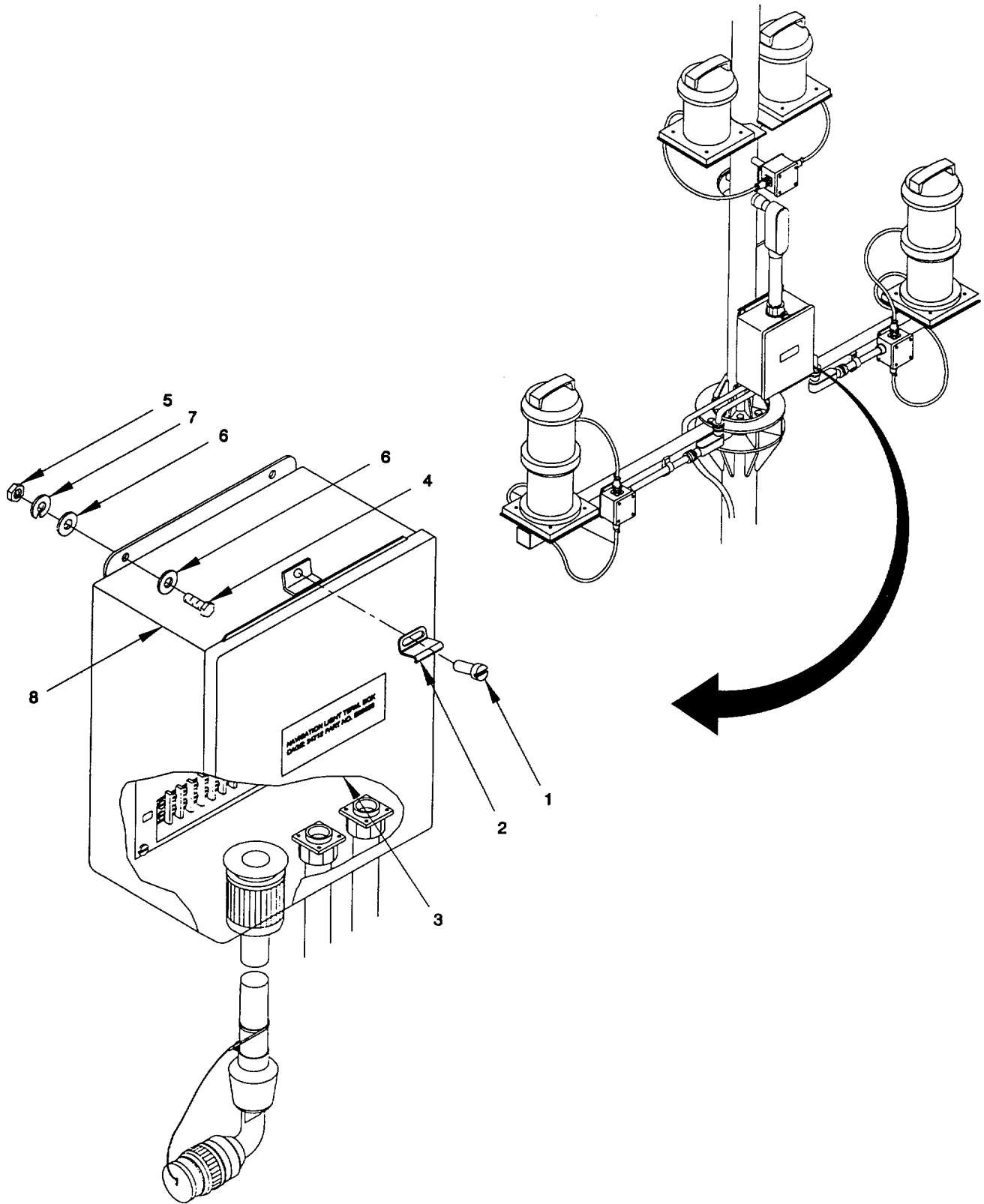


Figure 2-180. Terminal Box, Main Mast Navigation Assembly, Remove/Install.

2-171. Terminal Block, Terminal Box, Main Mast Navigation Assembly.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

Terminal Block
Compound, Antiseize (Item 9, Appendix F)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Remove.* (figure 2-181)
- (1) Loosen four screws (1) securing cover (2) to enclosure. Swing cover open.
 - (2) Disconnect and tag electrical wiring to terminal block. Refer to Appendix G.
 - (3) Remove two panhead screws (3), two lockwashers (4) and marker strip (5) from panel within enclosure. Remove terminal block (6).
- b. *Install.* (figure 2-181)
- (1) Position marker strip (5) and terminal block (6) on panel and secure with two lockwashers (4) and two panhead screws (3)
 - (2) Connect tagged electrical wiring to terminal block (6). Refer to Appendix G.
 - (3) Close cover (2), apply antiseize compound to seven screws (1), and secure.

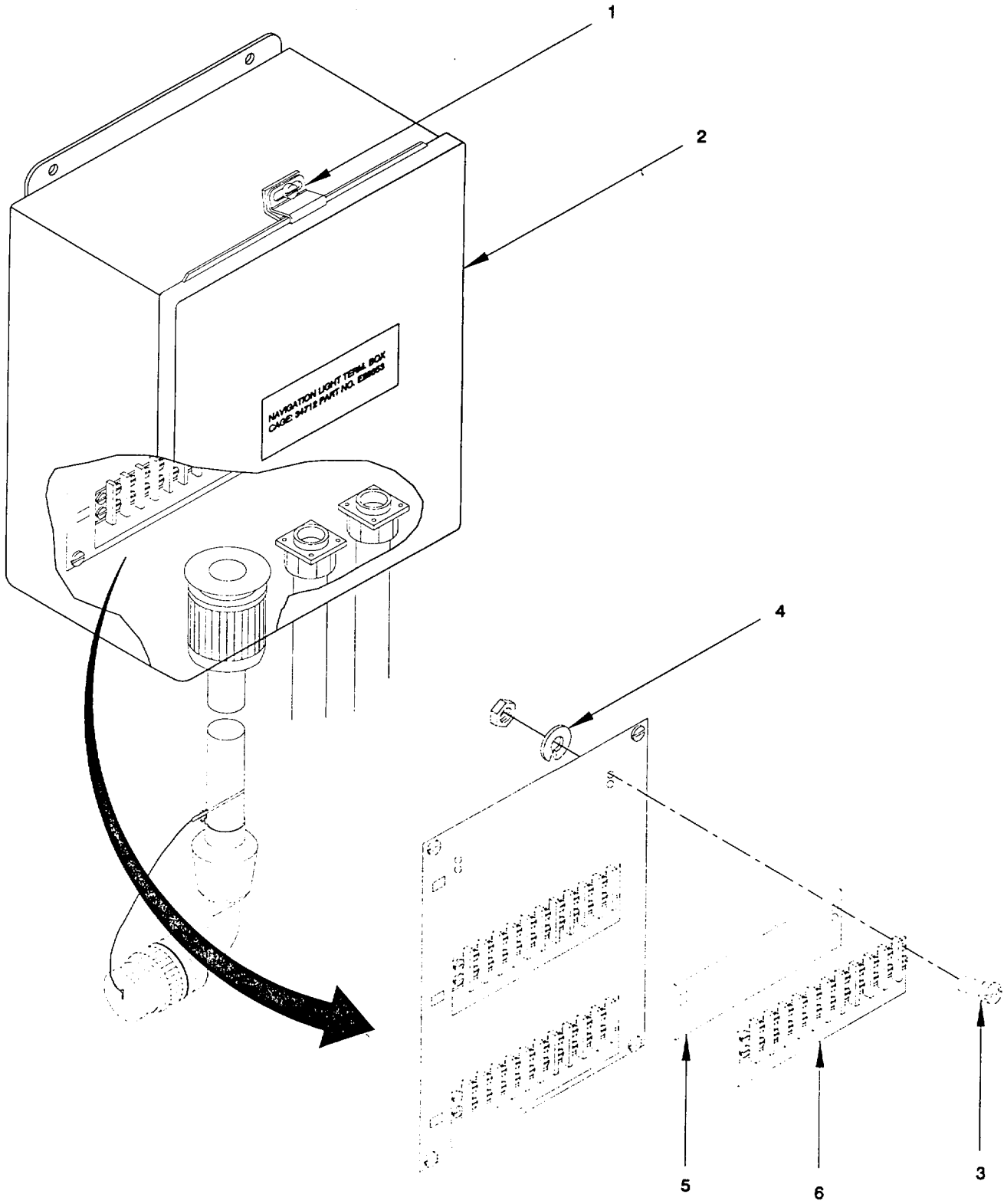


Figure 2-181. Terminal Block, Main Mast Navigation Assembly, Remove/Install.

2-172. Anchorboard.

 This task covers: a. Remove b. Repair c. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN
5180-00-629-9783)

Equipment Condition

In dry dock

Materials/Parts

Cloth, Lint Free (Item 7, Appendix F)
Anchorboard Assembly

WARNING

Secure anchor to anchorboard weldment, support anchorboard assembly and provide suitable lifting devices before attempting removal or installation of the support weldment. Ensure reversible tie wrap secures leg and release arm of hook release to prevent tripping of hook and releasing of anchor. The anchorboard assembly weighs 3318 lbs. Failure to comply may result in serious injury to personnel.

a. Remove. (figure 2-182)

- (1) Secure anchor to anchorboard weldment, support anchorboard assembly (4) and provide suitable lifting devices for removal of anchorboard assembly (4)
- (2) Remove three locking pins (1) with sash chains (2) and toggle pin (3) with sash chain (2) securing anchorboard assembly (9) and support weldment (10).
- (3) Remove anchor rope (4) from shackle (5) and anchor (11).
- (4) Remove trip hook rope (6), buoy rope (7) and buoy (8).
- (5) Using lifting devices, remove anchorboard assembly (9) and support weldment (10).

b. Repair. (figure 2-183)

- (1) Remove anchor (1) from anchorboard weldment (20).
- (2) Remove tie wrap (2) from leg and the release arm.
- (3) Remove hex head capscrew (3), self locking hex nut (4), and two flat washers (5) from the trip hook (6). Remove trip hook (6).
- (4) Remove twin link clevis (7) securing coil chain (10) to trip hook (6).
- (5) Remove shackle (8) and master link (9) securing coil chain (10) to release hook (13).
- (6) Remove hex head capscrew (11) and self locking hex nut (12) securing release hook (13) to anchorboard weldment (20). Remove release hook (13).
- (7) Remove two toggle pins (14) with sash chains (15) from RH and LH ramp extensions (18 and 19).

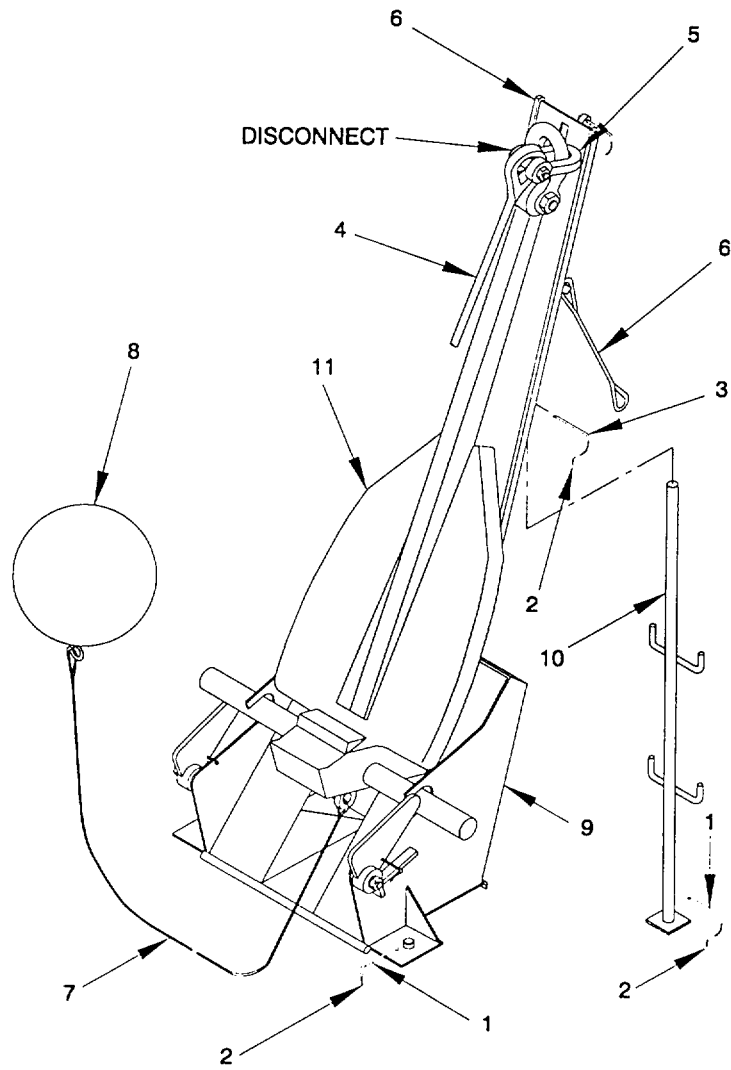


Figure 2-182. Anchorboard Assembly, Remove/Install.

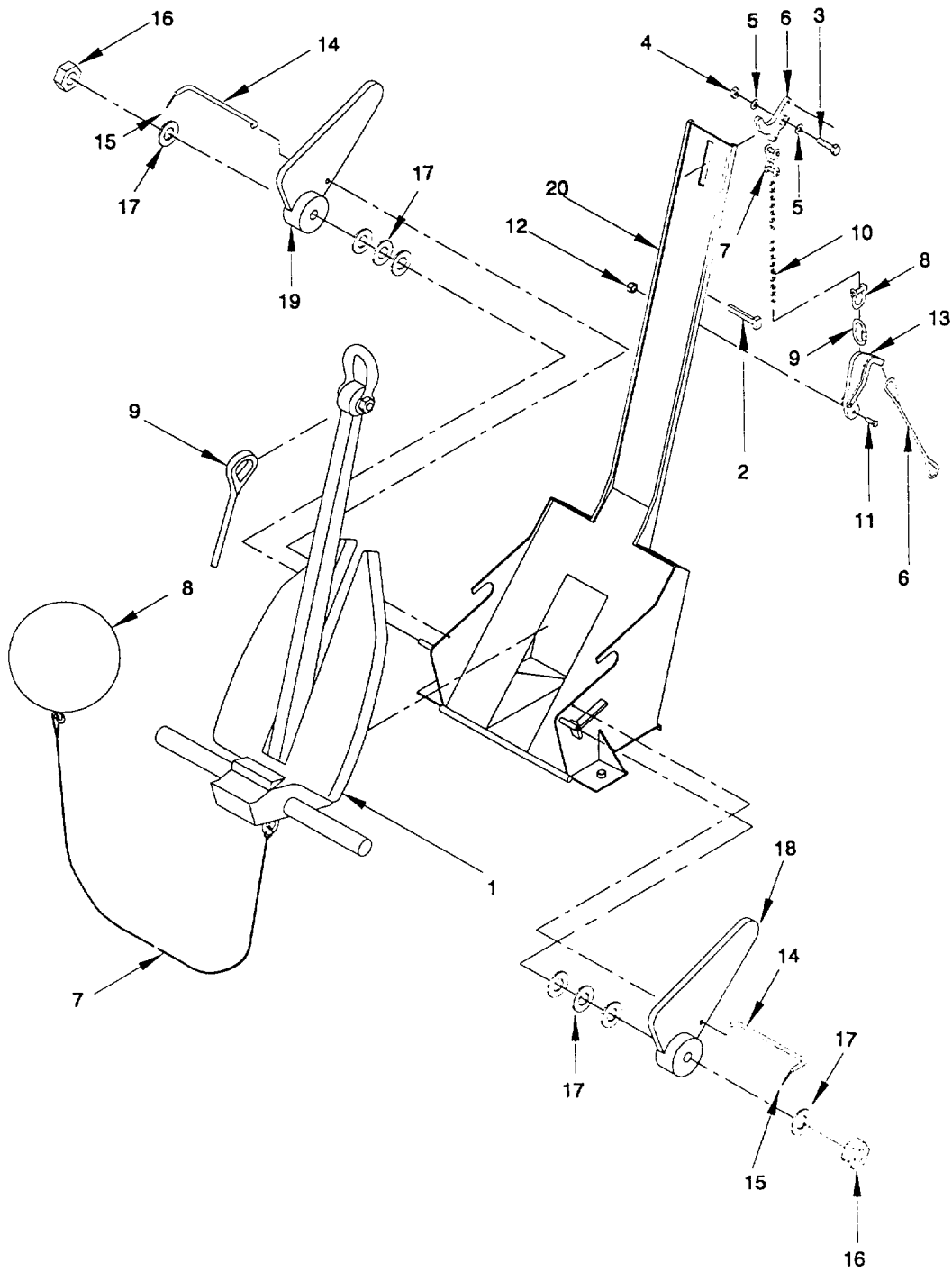


Figure 2-183. Anchorboard Assembly. Repair.

2-172. Anchorboard (Cont).

- (8) Remove two self locking hex nuts (16) and four flat washers (17) securing RH and LH ramp extensions (18 and 19) to anchorboard weldment (20). Remove RH and LH ramp extensions (18 and 19).
 - (9) Inspect trip hook (6) and release hook (13) for damage or cracks. Replace if any evidence of damage or cracks is found.
 - (10) Inspect toggle pins (14) for damage. Replace as necessary.
 - (11) Inspect anchor wire rope (9) for kinks, parted strands or other damage. Replace as necessary.
 - (12) Inspect buoy rope (7) and trip hook rope (6) for parted strands or damage. Replace as necessary.
 - (13) Position RH and LH ramp extensions (18 and 19) on anchorboard weldment (20). Secure with two hex nuts (16) and four flat washers (17).
 - (14) Install two toggle pins (14) with sash chains (15) in RH and LH ramp extensions (18 and 19).
 - (15) Position release hook (13) on anchorboard weldment (20) and secure with hex head capscrew (11) and self locking hex nut (12).
 - (16) Secure coil chain (10) to release hook (13) with shackle (8) and master link (9).
 - (17) Position trip hook (6) on anchorboard weldment (20) and secure with hex head capscrew (3), two flat washers (5) and self locking hex nut (4).
 - (18) Secure coil chain (10) to trip hook (6) with twin link clevis (7).
 - (19) Install tie wrap (2) around leg and the release arm.
- c. *Install.* (figure 2-182)
- (1) Position anchorboard assembly (9) and support weldment (10) and secure with three locking pins (1) with sash chains (2) and toggle pin (3) with sash chain (2).
 - (2) Position anchor (11) on anchorboard weldment (6), ensuring anchor (11) is secured by RH and LH ramp extensions and trip hook.
 - (3) Install buoy (8), buoy rope (7) and trip hook rope (6).
 - (4) Secure anchor rope (4) to anchor (11) with shackle (5).

2-173. Railing Installation.

This task covers: Repair

INITIAL SETUP

*Tools**Materials/Parts*General Mechanic's Tool Kit, Rail and Marine (NSN
5180-00-629-9783)Cable assemblies

Repair. (figure 2-184)

- (1) Loosen turnbuckles (1) to remove tension from cables (3, 4, 5, 6, 7, 8, 9).
- (2) Remove shackle (2) from handrail (14).
- (3) Remove cable assemblies (3, 4, 5, 6, 7, 8, 9).
- (4) Remove hex bolt (10) and nut (11), collect keeper plate (12) and remove handrails (13, 14, 15, 16, 17).
- (5) Replace handrails (13, 14, 15, 16, 17) and secure with keeper plate (12), hex bolt (10) and nut (11).
- (6) Install new cable assemblies (3, 4, 5, 6, 7, 8, 9), using shackles (2) on corner handrail.
- (7) Tighten turnbuckles (1) until cables are taught.

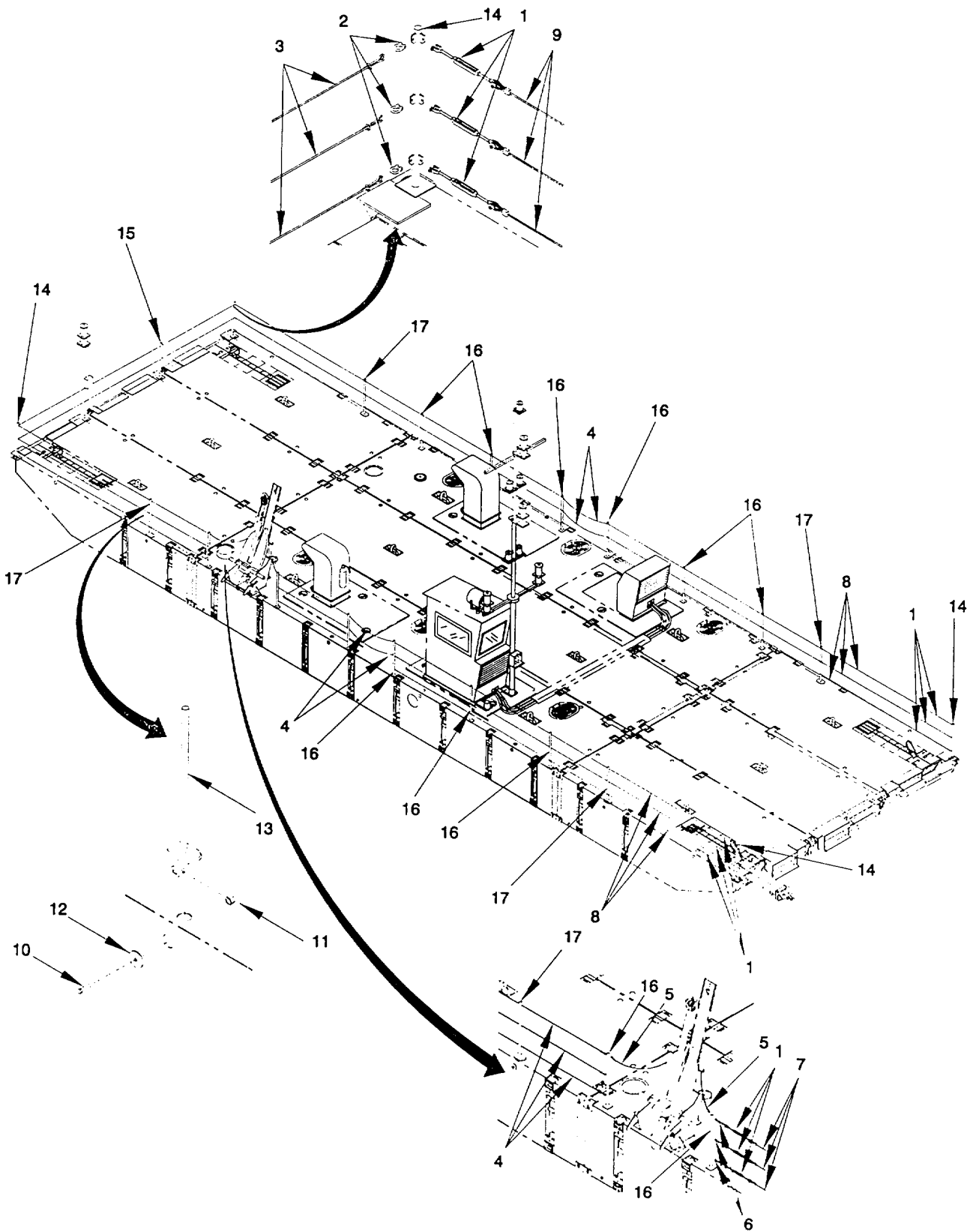


Figure 2-184. Railing Installation, Repair.

2-174. P25B Beach End Module Assembly.

This task covers: a. Service b. Test c. Repair

INITIAL SETUP

*Tools**Equipment Condition*

General Mechanics Tool Kit (NSN 5180-00-629-9783) Propulsion Module dry-docked.

Material/Parts

Grease, Lubriplate (Item 22, Appendix F)
 Paint, Mid Graphite Grey (Item 37, Appendix F)
 Compound, Sealing (Item 13, Appendix F)

WARNING

Grease is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

- a. Service. (figure 2-185)
- (1) Lubricate end rake hatches and hinges.
 - (2) Check and lubricate connector assemblies and flexor.
 - (3) Perform pressure test. Refer to paragraph 2-94.
 - (4) Wire brush and spot paint any exposed or rusting surfaces.
- b. Test. (figure 2-87)
- (1) Perform pneumatic pressure test in accordance with paragraph 2-94.
- c. Repair. (figure 2-185)

NOTE

For removal of the guillotine and flexor connector assemblies from module, see TM 1945-205-10.

- (1) Remove interlock connector (1) and connector pin spring (2) in two places from each connector.
- (2) Remove hex nut (3), hex bolt (4), locking plate (5) to free interconnect guillotine (6).
- (3) Remove pipe plug (7) from module (8).
- (4) Apply sealing compound to pipe plug. Replace pipe plug (7) into module (8).
- (5) For each of the six connectors, replace interconnect guillotine (6), position locking plate (5), and secure with hex bolt (4) and hex nut (3).
- (6) Grease each connector pin spring (2). Replace spring (2) and interlock connector (1) in two places on each connector subassembly.

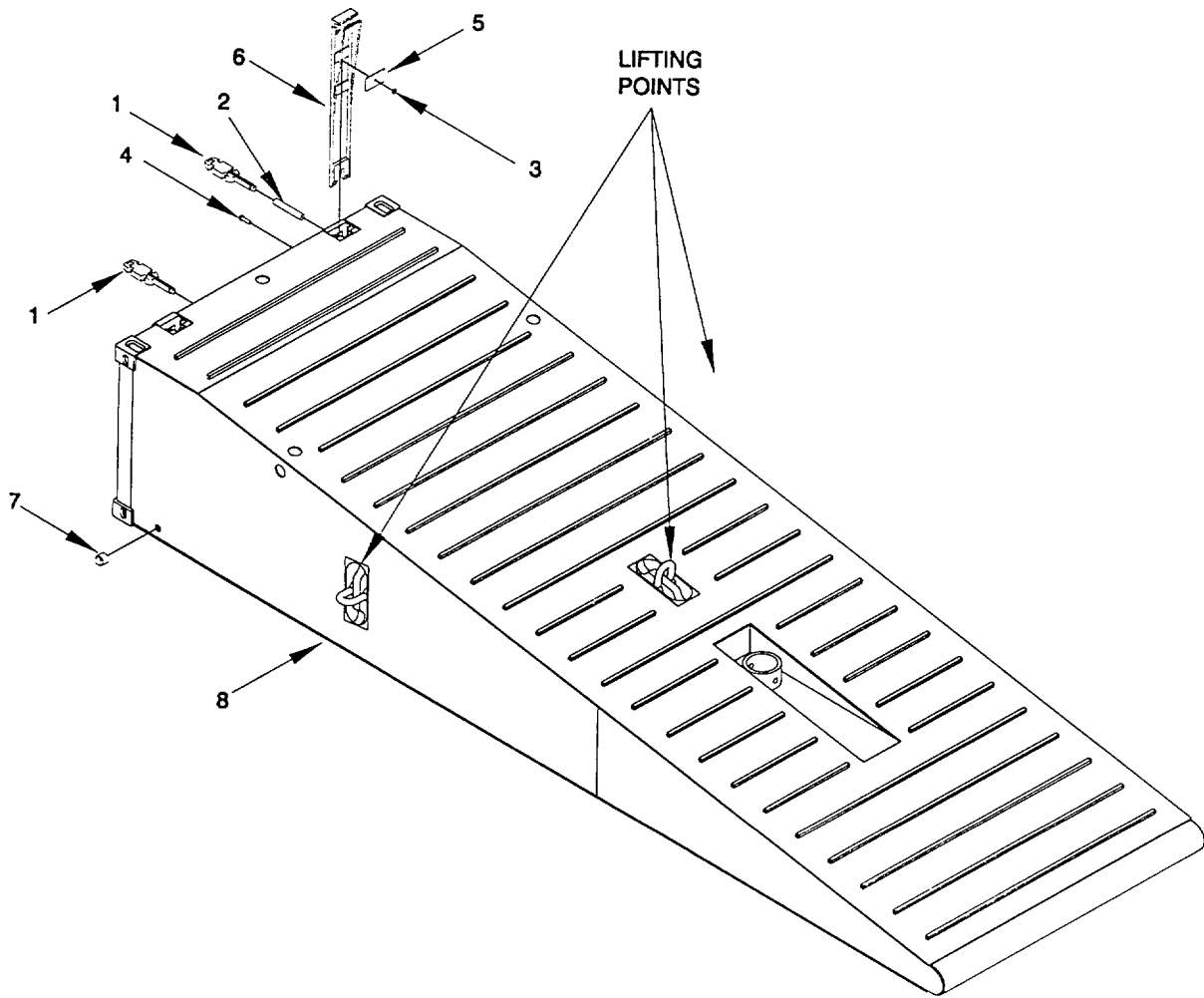


Figure 2-185. P25B Beach End Module Assembly, Service/Repair.

2-175. Rhino Horn.

This task covers: a. Remove b. Inspect c. Install

INITIAL SETUP

Tools

General Mechanics Tool Kit (NSN 5180-00-629-9783)

Equipment Condition

Normal operating condition.

Materials/Parts

Rhino Horn

WARNING

Rhino horn weighs approximately 88 lbs. Use appropriate lifting devices when removing or installing. Failure to comply can result in serious injury to personnel.

a. Remove. (figure 2-186)

Remove nut (1) and hex head capscrews (2) securing rhino horn (3) to standpipe. Remove rhino horn (3).

b. Inspect.

Check that welds on rhino horn weldment are free of cracks, corrosion, and rust. Replace as necessary.

c. Install. (figure 2-186)

Position rhino horn (3) in standpipe. Secure rhino horn (3) with nut (1) and hex head capscrew (2).

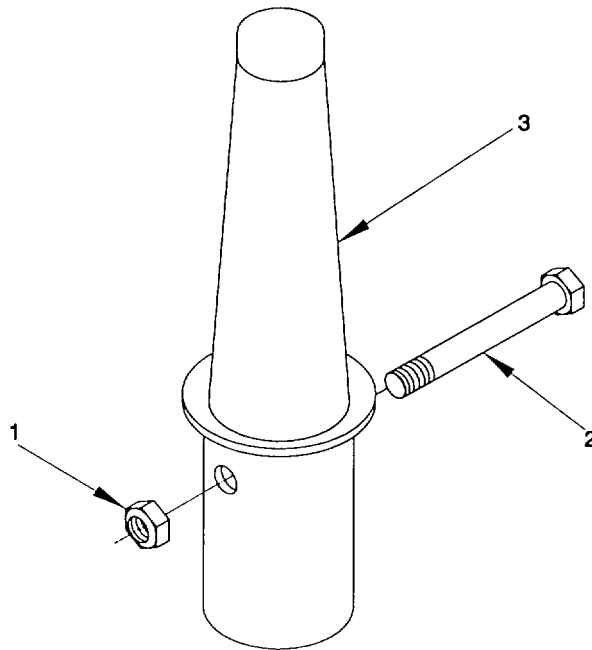


Figure 2-186. Rhino Horn, Remove/Install.

2-176. P3 Adaptor Assembly.

This task covers: a. Service b. Repair c. Adjust d. Test

INITIAL SETUP

*Tools**Equipment Condition*

General Mechanics Tool Kit (NSN 5180-00-629-9783) Dry-docked.

Material/Parts

Grease, Lubriplate (Item 22, Appendix F)
 Paint, Mid Graphite Grey (Item 37, Appendix F)
 Compressed air source
 Pneumatic Test Setup (Figure 2-87 or equivalent)
 Compound, Sealing (Item 13, Appendix F)

WARNING

Grease is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

a. Service. (figure 2-187)

- (1) Check and lubricate connector assemblies.
- (2) Push up on retainer on underside of connector pin to release pin from male connector assembly housing. Remove connector pin to expose deployment spring. Remove spring and inspect spring for cracks or cuts (replace as necessary). Lubricate spring using a light coat of lubriplate grease.
- (3) Wire brush and spot paint any exposed or rusting surfaces.

b. Repair. (figure 2-187)

- (1) Remove interlock connector (1) and connector pin spring (2) in two places from each connector.
- (2) Remove hex nut (3), hex bolt (4), locking plate (5) to free interconnect guillotine (6).
- (3) Remove pipe plug (7) from module (8) and allow any water and sediment to drain from module.
- (4) For each of the six connectors, replace interconnect guillotine (6), position locking plate (5), and secure with hex bolt (4) and hex nut (3).
- (5) Grease each connector pin spring (2). Replace spring (2) and interlock connector (1) in two places on each connector subassembly.

c. Adjust.**NOTE**

Friction Plates apply a force against the guillotine bars, holding them in the up position when raised with pry bars. Do not over tighten friction plate. This will make guillotine bar operation difficult.

2-176. P3 Adaptor Assembly (Cont.)

- (1) Locate the friction plate for a connector assembly.
- (2) Adjust tightness of the bolt locate at each connector location using two standard wrenches, as shown in figure 2-86. One standard wrench is used to hold the nut of the friction plate while the other wrench loosens or tightens the assembly.

d. Test.

- (1) Remove pipe plug (7) from its location at side of module (8).
- (2) Install pressure fitting and gauge (typical setup shown in figure 2-87) into module through pipe plug location.

NOTE

Do not operate air compressor without first observing all safety warnings and carefully reading the operating and maintenance manual. Failure to comply may result in serious injury or death to personnel.

An air pressure regulating valve and a low pressure gauge must be used when pressurizing modules. Use 3 psi pressure. Higher pressures may cause explosion. Failure to comply may result in serious injury to personnel.

When performing a pneumatic pressure test of MCF modules, the air compressor operator shall use proper eye protection. Failure to comply may result in serious injury to personnel.

NOTE

Modules may be pressurized and a liquid leak detector applied to weld seams. Leaks can be readily identified where liquid starts to bubble.

Leaky joints must be sealed or welded before use. Water leaking into MCF structure may cause corrosion and metal deterioration.

- (3) Apply pressure with compressor at 3 psi by attaching air hose with test setup (figure 2-87) through MCF module pipe plug location.
- (4) If 3 psig internal pressure cannot be maintained, apply liquid leak detector to all external seams and weld joints. Inspect all seams for evidence of leakage. Mark modules at all areas of observed leakage. Report any leakage to the next higher maintenance level. Seams must be welded watertight before proceeding with assembly for mission.
- (5) When test is completed satisfactorily, release the pressure from the module.
- (6) Reinstall the plug to the module test location.

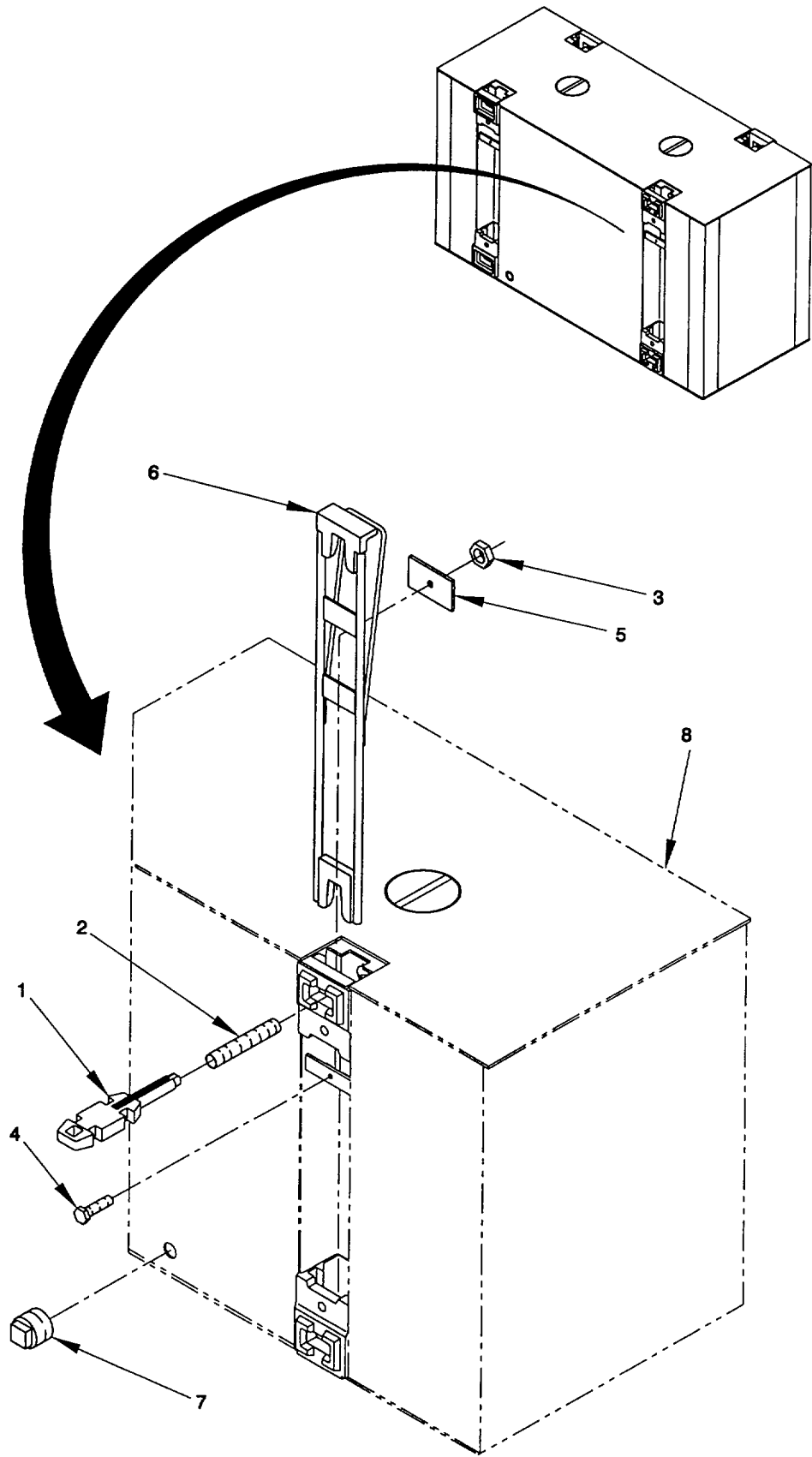


Figure 2-187. P3 Adaptor Assembly, Service/Repair.

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CHAPTER 3

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

OVERVIEW 3-1

Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND
 DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT 3-1

Section II DIRECT SUPPORT TROUBLESHOOTING PROCEDURES 3-1

Section III DIRECT SUPPORT MAINTENANCE PROCEDURES 3-7

OVERVIEW

This chapter contains information for maintenance of the Modular Causeway Ferry (MCF) by direct support level maintenance personnel.

Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

3-1 Common Tools and Equipment 3-1

3-2 Special Tools, TMDE, and Support Equipment 3-1

3-3 Repair Parts 3-1

3-1. Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

3-2. Special Tools, TMDE, and Support Equipment. Special tools are listed in Appendix B Maintenance Allocation Chart (MAC), of this manual.

3-3. Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List TM 55-1945-205-24P covering Unit, Direct Support, and General Support Maintenance for the Modular Causeway Ferry (MCF).

Section II. DIRECT SUPPORT TROUBLESHOOTING PROCEDURES

3-4 General 3-1

3-5 Direct Support Troubleshooting Procedures 3-1

3-4. General. This section contains troubleshooting and corrective action procedures authorized at the direct support maintenance level.

3-5. Direct Support Troubleshooting Procedures. Refer to symptom index to locate the troubleshooting procedure for the observed malfunction. Table 3-1 lists malfunctions that may occur during operation or maintenance of the MCF. Tests, checks, inspections, and corrective actions should be performed in the order listed. If a malfunction is beyond the scope of direct support maintenance is discovered, refer the malfunction to general support maintenance.

NOTE

This table is not intended to cover every possible symptom, but is rather a list of the more frequent problems and some of their causes.

SYMPTOM INDEX

Symptom	Page
1. Diesel engine malfunctions	3-3
2. Marine Gear malfunctions	3-3
3. Bilge pump status lights not functional	3-3
4. Electronic Governor, Engine Junction Box A4, is completely dead, actuator lever stays at minimum position when power is applied to governor.....	3-3
5. Engine is not operating, electronic governor actuator goes to full stroke when DC power is applied	3-4
6. Improper engine speed control from Operator's Cab.....	3-4
7. Clutch status light not operational	3-6
8. Fan operating status light does not illuminate.....	3-6
9. Fire alarm light 3A2DS3 (stbd) or 3A2DS1 (port) does not illuminate in ALARM mode	3-6
10. Flood alarm beeper does not operate	3-6
11. Fire alarm horn 3A4LS2 does not operate	3-6

Table 3-1. Direct Support Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Diesel engine malfunctions.	Step 1. Refer to TM 55-1945-205-24-2 (ENGINE).	
2. Marine Gear malfunctions.	Step 1. Refer to TM 55-1945-205-24-3 (MARINE TRANSMISSION).	
3. Bilge pump status lights not functional.	Inspect for open isolation diode.	

<u>PUMP RUN</u>	<u>DIODE</u>
#1 Port (3A2S9)	3A2D3
#2 Port (3A2S10)	3A2D4
#3 Port (3A2S11)	3A2D5
#4 Port (3A2S12)	3A2D6
#5 Port (3A2S13)	3A2D7
#6 Port (3A2S14)	3A2D8
#1 Stbd (3A2S15)	3A2D9
#2 Stbd (3A2S16)	3A2D10
#3 Stbd (3A2S17)	3A2D11
#4 Stbd (3A2S18)	3A2D12
#5 Stbd (3A2S19)	3A2D13
#6 Stbd (3A2S20)	3A2D14

4. Electronic Governor, Engine Junction Box A4, is completely dead, actuator lever stays at minimum position when power is applied to governor. (Refer to Appendix G for wiring diagrams and schematics).
 - Step 1. Check battery voltage at terminals 1 and 2 on controller. Terminal 1 is positive. Check battery connections and contacts for turning power ON to the controller.
 - Step 2. Check for proper linkage setup. Correct and free linkage.

NOTE

Testing multimeter should have an impedance of 5000 ohms or higher. Refer to wiring diagram and schematic in Appendix G, page G-6.

- Step 3. Magnetic pickup signal absent or too low. Measure AC voltage across terminals 10 and 11 of governor while cranking the engine. Voltage should be approximately 2 VAC.
- Step 4. Measure the resistance of the magnetic pickup coil. This should be approximately 150 ohms. If there is an open or shorted coil, replace the magnetic pickup.
- Step 5. Measure the resistance of each pin to the metal case of the magnetic pickup. No continuity should be evident. If there is continuity to case, replace the magnetic pickup.

Table 3-1. Direct Support Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. Electronic Governor, Engine Junction Box A4, is completely dead, actuator lever stays at minimum position when power is applied to governor (Cont).	Step 6. DC Supply Off. Place an insulated jumper between terminals 2 and 3 (TP1 & TP2). With DC ON, the actuator should go to full stroke. DC voltage at terminals 4 & 5 should be within 3 volts of the supply. If the actuator still does not move to full stroke, continue with steps below.	Step 7. Measure the actuator coil resistance. Coil resistance (24 VDC unit) should be 2.3 +0.4 ohms.
	If actuator coil is open or shorted to case, replace actuator.	If governor still does not operate, continue with steps below.
	Step 8. Using a low scale ohm meter, measure the resistance of each coil lead to the actuator case to indicate an open circuit.	If continuity is detected, replace the actuator.
	Step 9. With DC to the governor ON and the engine OFF, measure the DC voltage from terminal 6 (+) to terminal 2 (-). This should be approximately 8 VDC.	If 8 VDC is not present, replace the controller.
	Measure the voltage between terminal 7 (+) to terminal 2 (-). If 4 VDC not present, replace the controller.	
5. Engine is not operating, electronic governor actuator goes to full stroke when DC power is applied.	Step 1. Check magnetic pickup leads for proper shielded wire or open shield. Verify and correct wiring as necessary.	Step 2. Make sure there is no jumper between terminals 2 and 3. Verify and correct wiring as necessary.
	Step 3. Visually inspect for damaged or defective fail safe circuit in the controller. Correct by replacing controller.	Step 4. With DC power OFF, remove leads at actuator. Check continuity of each terminal to case. If continuity is detected, replace the controller.
	Step 5. Disconnect leads to remote speed potentiometer to terminals 6, 7 and 9 of the controller. Turn DC power ON to the governor if the actuator is now normal.	
6. Improper engine speed control from Operator's Cab.	Step 1. Inspect for engine governor malfunction.	Check local engine speed control. If improper, refer to diesel engine troubleshooting procedures.

Table 3-1. Direct Support Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

6. Improper engine speed control from Operator's Cab (Cont).

Step 1 (Cont).

With the DC to the governor ON and the engine OFF, measure the DC voltage at the engine governor controller (located in the Engine J-Box, Unit 1A4 Stbd, Unit 2A4 Port) from terminal 6 (+) to terminal 2(-). This should be approximately 8 VDC. Between terminal 7 (+) to terminal 2 (+), the voltage should be approximately 4 VDC. If voltages are not correct, refer to diesel engine troubleshooting procedures. If voltages are correct, proceed to the next step.

Step 2. Inspect for open circuit between the Engine J-Box and the Operator Cab Terminal Board Assembly.

NOTE

If governor controller terminal 7 is open, engine speed will go high. If terminal 8 is open, there will be no control by the Operator Cab throttle. If terminal 6 is open, speed will remain at the value set at the governor controller.

Check DC voltages as tabulated below at the Operator's Cab Terminal Board Assembly (Unit 3A4).

<u>THROTTLE</u>	<u>TERMINALS (UNIT 3A4)</u>	<u>WIRE NOS.</u>	<u>VOLTAGE</u>
3A2R2 (Port)	TB1-15/TB10-3	395/0	4 VDC
	TB1-16/TB10-3	396/0	8 VDC
	TB1-17/TB10-3	397/0	4-8 VDC*
3A2R3 (Stbd)	TB3-15/TB10-3	398/0	4 VDC
	TB3-16/TB10-3	399/0	8 VDC
	TB3-17/TB10-3	400/0	4-8 VDC*

* Voltage depends on throttle position.

If no voltage is measured, check interconnect wiring between the Power Module Engine Junction Box and the Operator Cab Terminal Board Assembly.

Step 3. Inspect for open circuit between the Operator Cab Terminal Board Assembly (Unit 3A4) and the engine throttle' potentiometers (3A2R2 port, 3A2R3 stbd).

Check DC voltages as tabulated below at the Operator Cab Lower Control Panel (Unit 3A2).

<u>TERMINALS (UNIT 3A2)</u>	<u>VOLTAGE</u>	<u>WIRE NOS.</u>
R2-1/DS2-2 (Port)	4 VDC	395/0
R2-3/DS2-2 (Port)	8 VDC	396/0
R2-2/DS2-2 (Port)	4-8 VDC*	397/0
R3-1/DS2-2 (Stbd)	4 VDC	398/0
R3-3/DS2-2 (Stbd)	8 VDC	399/0
R3-2/DS2-2 (Stbd)	4-8 VDC*	400/0

*Voltage depends on throttle position.

Table 3-1. Direct Support Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. Improper engine speed control from Operator's Cab (Cont).	Step 3 (Cont).	If no voltage is measured check wiring between the Operator Cab Terminal Board Assembly (Unit 3A4) and the throttle controls. Repair/replace as necessary.
	Step 4. Inspect for failed throttle potentiometer.	Check 5K ohm potentiometer A2R2 (port) or A2R3 (stbd) as applicable. Replace if necessary.
7. Clutch status light not operational.	Step 1. Inspect for failed diode 3A2D1 (port), 3A2D2 (stbd).	Check the appropriate diode and replace if necessary.
8. Fan operating status light does not illuminate.	Step 1. Inspect for failed diode 3A2D15 (port), 3A2D16 (stbd).	Check appropriate diode located on the Diode board Assembly E21143. Replace diode if necessary.
9. Fire alarm light 3A2DS3 (stbd) or 3A2DS1 (port) does not illuminate in ALARM mode.	Step 1. Inspect for failed diode 3A2D18.	Check diode and replace if necessary.
10. Flood alarm beeper does not operate.	Step 1. Inspect for failed diode 1A5D1 (stbd), 2A5D1 (port).	If 24 VDC was not present in the previous step, check for 24 VDC at TB1-2/TB3-2 (wire nos. 138/0) in the appropriate Bilge Pump Control Panel. If 24 VDC is present, replace diode. If 24 VDC is not present, check wiring to Bilge Float Switches 1S4, 1S5, 1S6 (stbd); 2S4, 2S5, 2S6 (port). Check float switch operation. Replace switch as necessary.
11. Fire alarm horn 3A4LS2 does not operate.	Step 1. Inspect for failed diode 1A5D2 (stbd), 1A5D2 (port).	If wiring checks OK, check diode A5D2 located in the appropriate Power Module Bilge Pump Control Panel Assembly. If failed, replace diode. Refer to Fire Suppression System troubleshooting procedures.

Section III. DIRECT SUPPORT MAINTENANCE PROCEDURES

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3-6. General. This section contains direct support maintenance instructions on the Modular Causeway Ferry (MCF) as authorized by the MAC (Appendix B) of this manual.

3-7. Duplex Strainer.

 This task covers: a. Repair b. Adjust

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

Dry-docked.

Duplex strainer removed (paragraph 2-11).

Materials/Parts

Body Cover Gasket, Item 2 (Appendix E)
 Packing (Item 16, Appendix E)
 Valve Cover Gasket (Item 15, Appendix E)

- a. Repair. (figure 3-1)

WARNING

The Duplex Strainer weighs 262 pounds. Use appropriate lifting device to support strainer during disassembly and installation procedures. Failure to comply may result in serious injury to personnel.

- (1) Remove pipe plugs (1) from the Duplex Strainer.
- (2) Remove yoke handle (2) and yoke stud (3) from the yoke (4). Collect yoke (4).
- (3) Remove body cover (5), body cover gasket (6) and basket (7) from the integral body (8).
- (4) Remove alien set screw (9) from valve handle (10) and remove handle (10).
- (5) Remove nuts (11) and locking flange (12). (Refer to paragraph 3-7b, steps 1 through 3 if difficult to remove).
- (6) Remove jam nut (13) from locking flange stud (14) and remove stud (14).
- (7) Remove capscrews (15), gland (16) and packing (17).
- (8) Remove capscrews (18), valve cover (19), and collect gasket (20).
- (9) Collect woodruff key (21) and valve plug assembly (22).
- (10) Install valve plug assembly (22) with woodruff key (21) into integral body (8).
- (11) Install new cover gasket (20), valve cover (19) and capscrews (18).

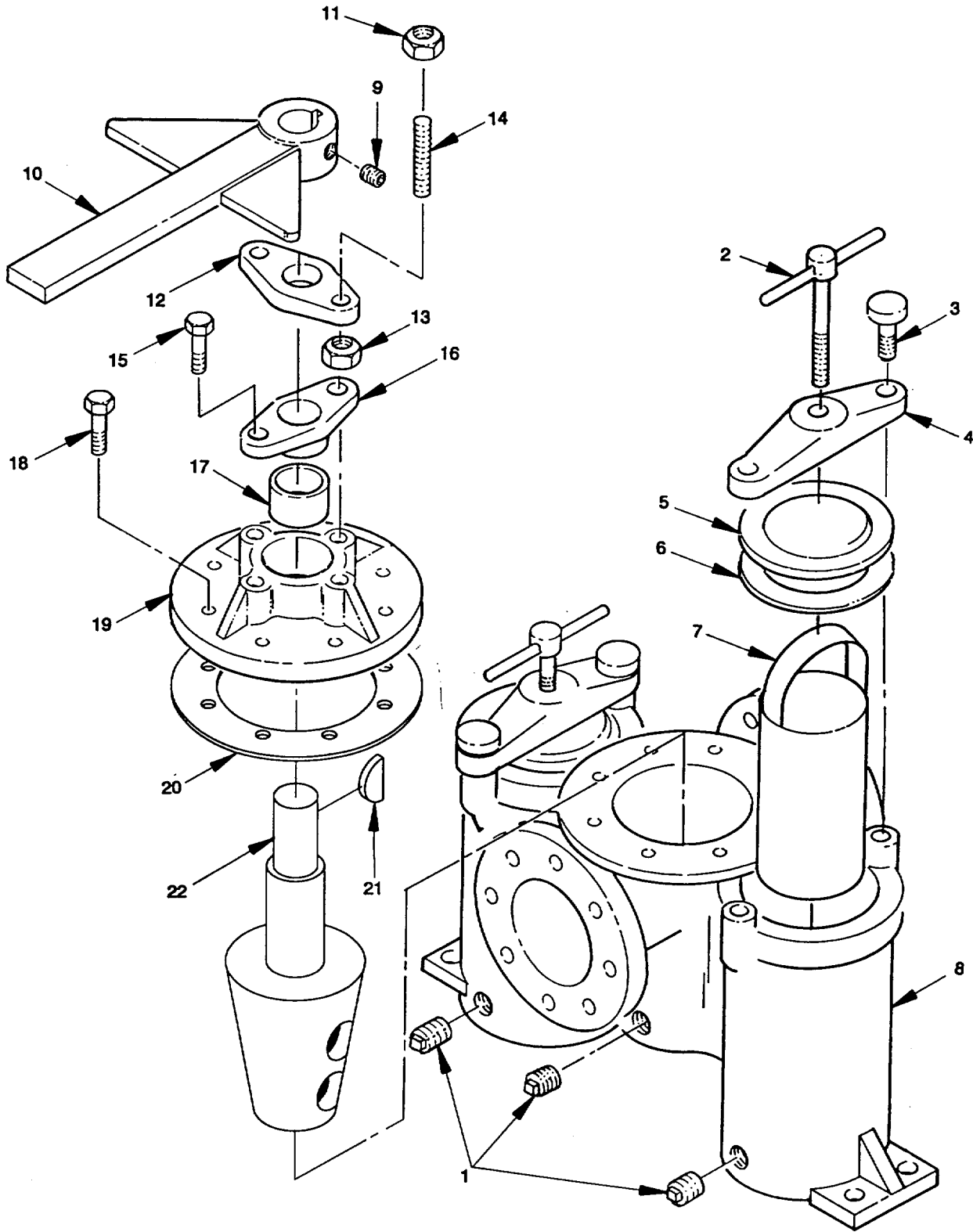


Figure 3-1. Duplex Strainer, Repair.

3-7. Duplex Strainer (Cont).

- (13) Install new packing (17), gland (16) and capscrews (15).
- (14) Install stud (14) and jam nut (13).
- (15) Install locking flange (12) and nuts (11). Adjust as necessary (paragraph 3-7b).
- (16) Install handle (10) and allen set screw (9).
- (17) Install basket (7) into integral body (8).
- (18) Install new body cover gasket (6) and body cover (5).
- (19) Install yoke (4), yoke stud (3) and yoke handle (2).
- (20) Install pipe plugs (12).

3-8. Drive Train.

This task covers: Align

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Machinery guards removed (paragraphs 2-24, 2-25).

Align.

- (1) Diesel engine crankshaft centerline to be parallel within +0.062" to hull longitudinal centerline. Refer to diesel engine removal/installation (paragraph 3-11).
- (2) Shim engine to elevation shown in figure 3-5. Engine shall be level and square to the hull within +0.062".
- (3) Transfer case input and output flanges must be in line with marine gear and pump-jet (paragraph 3-14). Shim transfer case to elevation shown in figure 3-5.
- (4) Alternator sheaves must be in line with the engine crank shaft sheaves within +0.5".

FOLLOW ON MAINTENANCE:

Install machinery guards (paragraph 2-24 and 2-25).

3-9. Drive Shafts, Drive Train.

 This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)
 Sling (240 lb. capacity)
 Torque Wrench (500 ft.-lbs. capacity)

Material/Parts

Drive Shaft, Pump-Jet to Transfer Case
 Drive Shaft, Transfer Case to Marine Gear
 Adhesive (Item 2, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE
 Machinery guards removed (paragraphs 2-24 and 2-25).

Exhaust plenum removed (paragraph 2-164).

Hatch cover removed.

- a. Remove. (figure 3-2)

WARNING

Drive Shaft from pump-jet to transfer case weighs 180 lbs. Drive shaft from transfer case to marine gear weighs 240 lbs. When lifting or handling the drive shaft, proper tools and procedures shall be used to prevent dropping or shifting the load and causing personal injury.

CAUTION

Drive Train components contain precision machined parts and assemblies. Precautions shall be taken to prevent damage to the components during maintenance and handling procedures.

For proper operation, balance of the drive shafts must be maintained. Onboard maintenance of the drive shafts must be limited to removal and replacement of the drive shafts. Rebuilding of the drive shafts (U-joint replacement, etc.) must be performed by the supplier of the drive shaft.

- (1) Support pump-jet-to-transfer-case drive shaft (8) with a sling attached to an appropriate lifting device.
- (2) Remove capscrews (1), hex nuts (2) and lockwashers (3) securing drive shaft (8) to pump-jet. Be sure shaft is held tightly by sling and lifting device.
- (3) Remove capscrews (4), hex nuts (5), and lockwashers (6) from drive shaft (8) and transfer case drive shaft flange (7).
- (4) Remove drive shaft (8) through hatch.
- (5) Support transfer-case-to-diesel engine drive shaft (16), using blocking material at both ends.
- (6) Remove capscrews (9), hex nuts (10) and lockwashers (11) securing drive shaft (16) to transfer case.
- (7) Remove capscrews (12), hex nuts (13), and lockwashers (14) from drive shaft flange (15).

3-9. Drive Shafts (Cont).

- (8) Remove drive shaft (16) through exhaust plenum deck opening. Support drive shaft using a sling attached to an appropriate lifting device above deck.
- b. *Install.* (figure 3-2)
- (1) Support new transfer-case-to-diesel-engine drive shaft (16) using an appropriate lifting device. Guide drive shaft through exhaust plenum deck opening and lower below deck.
- (2) Apply adhesive to drive shaft (16) flanges at each end.
- (3) Roll drive shaft (16) into position and support diesel engine end of drive shaft with an appropriate lifting device. Slowly raise diesel engine end of drive shaft to mate with diesel engine flange (15). Remove all traces of rust inhibitor, dirt and grease from the flange surfaces. Arrows on drive shaft (16) and drive shaft flange (15) must face each other.
- (4) Replace capscrews (12), lockwashers (14) and hex nuts (13) securing drive shaft (16) to diesel engine flange (15). Torque capscrews to 460 ft.-lbs.
- (5) Using appropriate hoisting device, slowly raise transfer case end of drive shaft (16) to mate with transfer case flange.
- (6) Replace capscrews (9), lockwashers (11) and hex nuts (10) securing drive shaft (16) to transfer case. Torque capscrews (9) to 55 ft.-lbs.
- (7) Support new pump-jet-to-transfer-case drive shaft (8) using a sling attached to a crane. Guide drive shaft through exhaust plenum deck opening and lower below deck onto appropriate blocking material.
- (8) Apply adhesive to drive shaft (8) flanges at each end.
- (9) Roll drive shaft (8) into position and support pump-jet end of drive shaft using an appropriate lifting device and sling. Slowly raise pump-jet end of drive shaft (8) to mate with pump-jet disk. Remove all traces of rust inhibitor, dirt and grease from the disk surfaces. Arrows on shaft (8) and disk must face each other.
- (10) Replace capscrews (4), lockwashers (6) and hex nuts (5), supporting drive shaft (8) to transfer case. Torque capscrews (5) to 55 ft.-lbs.
- (11) Slowly raise transfer case end of drive shaft (8) to mate with transfer case flange (7).
- (12) Replace capscrews (1), lockwashers (3) and hex nuts (2) securing drive shaft (8) to transfer case. Torque capscrews (2) to 330 ft.-lbs.

FOLLOW ON MAINTENANCE:

- Install machinery guards (paragraph 2-24 and 2-25).
- Install hatch cover
- Install exhaust plenum (paragraph 2-164).

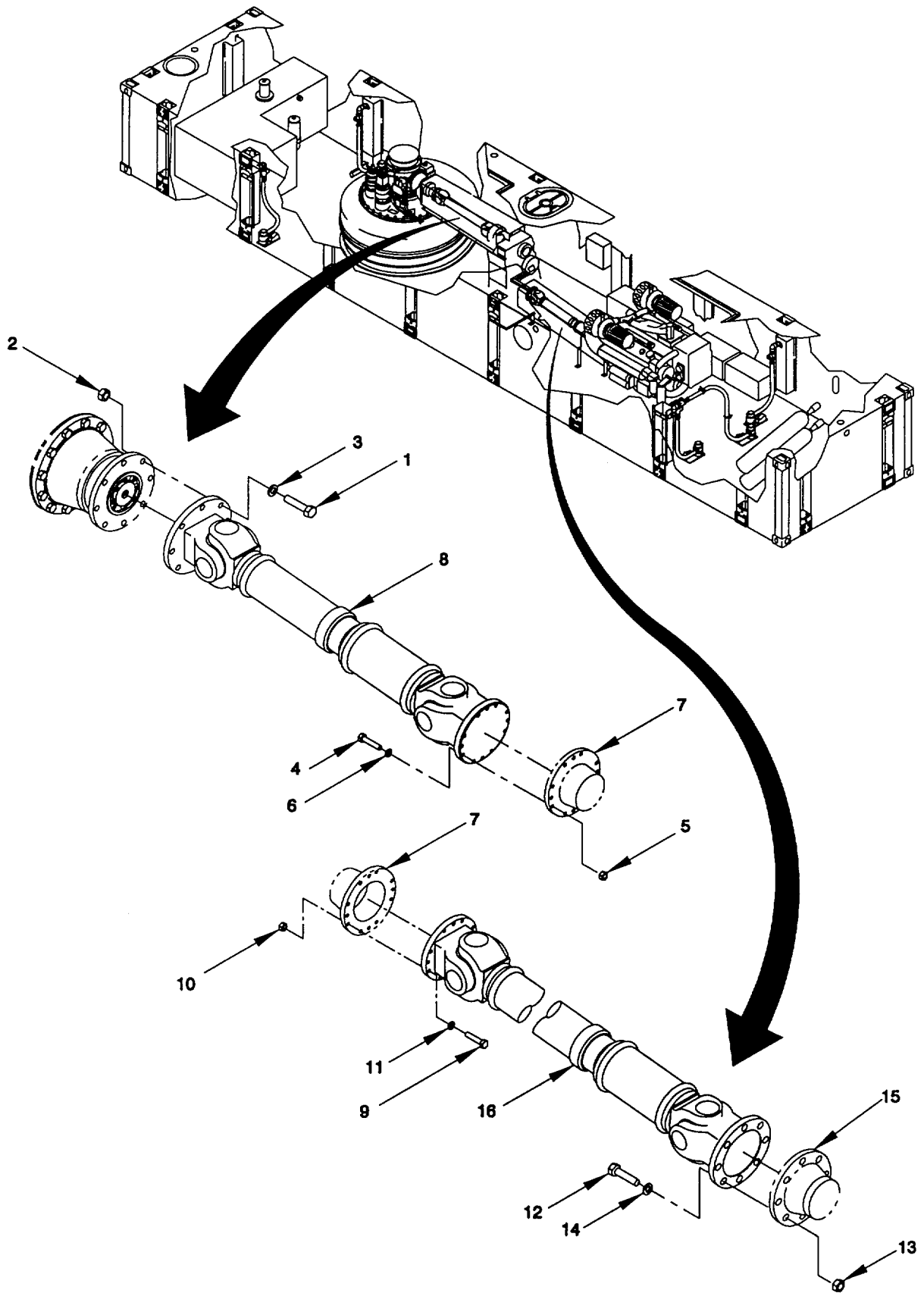


Figure 3-2. Drive Shafts, Remove/Install.

3-10. Oil Cooler, Transfer Case.

 This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Transfer case drained of oil (refer to paragraph 3-14).

Material/Parts

Oil Cooler

a. Remove. (figure 3-3)

- (1) Ensure oil is drained out of transfer case. Disconnect hose assembly (1) at oil cooler outlet. Cover hose end to prevent dirt and debris from entering hose.
- (2) Disconnect hose assembly (2) at oil cooler inlet. Cover hose end to prevent dirt and debris from entering hose.
- (3) Loosen clamps (3) and disconnect hose (4). Disassemble nipple (5), elbow (6), nipple (7), street elbow (8), ball valve (9), nipple (10), and reducer (11) from cooler.
- (4) Loosen clamps (12) and disconnect hose (13). Disassemble nipple (14) and reducer (15) from cooler (18).
- (5) Remove two hex head capscrews (16) and hex nuts (17) to free oil cooler (18) from foundation.

b. Install. (figure 3-3)

- (1) Position oil cooler (18) on foundation and secure with two hex head capscrews (16) and hex nuts (17).
- (2) Assemble reducer (15) and nipple (14) into cooler (18). Attach hose (13) and secure with clamps (12).
- (3) Assemble reducer (11), nipple (10), ball valve (9), street elbow (8), nipple (7), elbow (6) and nipple (5) into cooler (18). Attach hose (4) and secure with clamps (3).
- (4) Remove cover on hose assembly (2) end and connect hose assembly (2) from port "A" of transfer case to oil cooler inlet.
- (5) Remove cover on hose assembly (1) end and connect hose assembly (1) from port "B" of transfer case to oil cooler outlet.
- (6) Fill transfer case with oil (refer to paragraph 3-14). Check hose connections, oil cooler and transfer case for oil leakage.

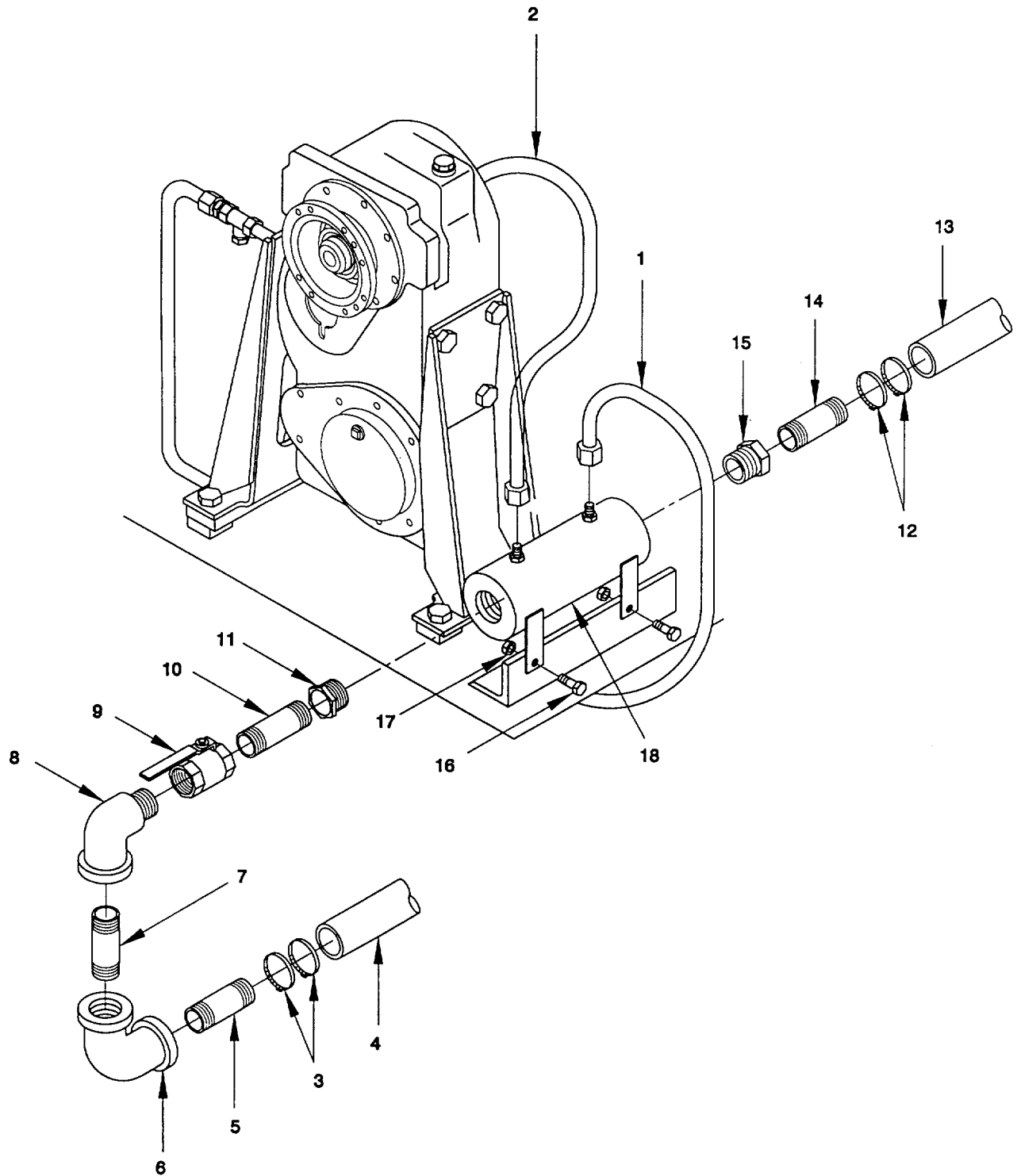


Figure 3-3. Oil Cooler, Drive Train, Remove/Install.

3-11. Diesel Engine.

This task covers:		
	a. Remove	b. Install
Cylinder Head	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 1.2
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 1.2
	Inspect	Reference TM 55-1945-205-24-2 (ENGINE), Section 1.2
Vibration Damper and Engine Lift Brackets	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 1.3.6
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 1.3.6
Crankshaft Pulley	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 1.3.7
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 1.3.7
Rocker Cover	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 1.2.4
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 1.2.4
Electronic Governor	Remove	Reference TM 55-1945-205-24-2 (ENGINE) & para. 3-12.
	Install	Reference TM 55-1945-205-24-2 (ENGINE) & para. 3-12.
	Adjust	Reference TM 55-1945-205-24-2 (ENGINE), Section 2.8.1
Injector Controls	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 2.9
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 2.9
Air Inlet Housing	Service	Reference TM 55-1945-205-24-2 (ENGINE), Section 3.3
	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 3.3
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 3.3
Blower and Drive	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 3.4.1
Turbocharger	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 3.5
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 3.5
Oil Cooler/Gear Lines	Remove	Reference TM 55-1945-205-24-2 (ENGINE) Section 4.4
	Install	Reference TM 55-1945-205-24-2 (ENGINE) Section 4.4
Ventilation System	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 4.8
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 4.8
Fresh Water Pump	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.1
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.1
Thermostat	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.2.1
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.2.1
Heat Exchanger	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.5
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.5
Raw Water Pump	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.6
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.6
Exhaust Manifold	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.2
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 5.2

3-11. Diesel Engine (Cont).

This task covers (cont):

Shutoff Alarms	Remove	Reference TM 55-1945-205-24-2 (ENGINE), Section 7.4.2
	Install	Reference TM 55-1945-205-24-2 (ENGINE), Section 7.4.2

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)
 Torque Wrench (NSN 5120-00-230-6380)
 Torque Wrench (NSN 5120-00-554-7292)
 Torque Wrench (NSN 5120-00-542-5577)
 Spreader Bar with Sling (3 Point Hookup)
 Hoisting Equipment
 Engine Tools as Listed in TM 55-1945-205-24-2

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE
 Engine deck hatch removed.
 Cab or intake plenum removed for engine removal.
 Alternator V-belts removed (paragraph 2-15).
 Hydraulic pump removed (paragraph 2-29).
 Fast lube system removed (paragraph 2-22).
 Drive shafts removed (paragraph 3-9).
 Power Module dry-docked.

Materials/Parts

Drain Containers
 Antifreeze (Item 5, Appendix F)
 Oil
 Distilled Water (Item 54, Appendix F)
 Cleaning Cloth (Item 8, Appendix F)
 Diesel Fuel
 Tools and Parts Listed in TM 55-1945-205-24-2, Appendix E

References

TM 55-1945-205-24-2

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertant operation. Failure to comply can result in serious injury to personnel.

Fuel lines contain residual fuel. When removing fuel lines, precautions shall be taken to collect the residual fuel in an appropriate container. Fuel is flammable, keep sparks and open flame away from area. Failure to comply can result in serious injury to personnel.

Hydraulic lines may contain residual hydraulic pressure. Ensure pressure is relieved before performing maintenance. Failure to comply can result in serious injury to personnel.

Hydraulic lines contain residual hydraulic fluid. When removing hydraulic lines, precautions shall be taken to collect the residual hydraulic fluid in an appropriate container. Hydraulic fluid is flammable, keep sparks and open flame away from area. Failure to comply can result in serious injury to personnel.

Diesel engine weighs approximately 4000 lbs. Use appropriate lifting devices when removing or installing. Failure to comply can result in serious injury to personnel.

3-11. Diesel Engine (Cont).a. Remove. (figure 3-4)

- (1) Tag and disconnect electrical wiring to diesel engine. Refer to Appendix G.
- (2) Shut off fuel supply and return ball valves in fuel system and disconnect fuel lines to engine.
- (3) Remove the cold pack starting supply line from the blower housing.
- (4) Remove exhaust connections to turbocharger and remove muffler to allow clearance for engine removal.
- (5) Drain both cooling systems, fresh water and raw water. Reference TM 55-1945-205-24-2 (ENGINE) Section 5 (COOLING SYSTEM CAPACITY) and (DRAIN COOLING SYSTEM).
- (6) Disconnect quick disconnect couplings at heater inlet and outlet.
- (7) Disconnect raw water piping connections to engine intake and exhaust.

CAUTION

Always lift diesel engine with 3 point hookup. DO NOT attempt to lift with any less than a 3 point hookup. Failure to comply can result in damage to equipment.

- (8) Support engine at three lifting points using three point lift beam and sling.
 - (9) Remove eight capscrews (1) freeing marine gear from marine gear base brackets (2). Remove eight capscrews (3) freeing engine from flywheel housing brackets (4). Remove two capscrews (5), two hex nuts (6), and collect shims (7) freeing front motor bracket (8) from engine (9).
 - (10) Remove the engine (9) with marine gear from the powered module hull using three point lift beam and sling.
- b. Install. (figure 3-4)
- (1) Using appropriate three point lift beam, sling and hoisting equipment, hoist engine and reassemble engine mounts to engine.

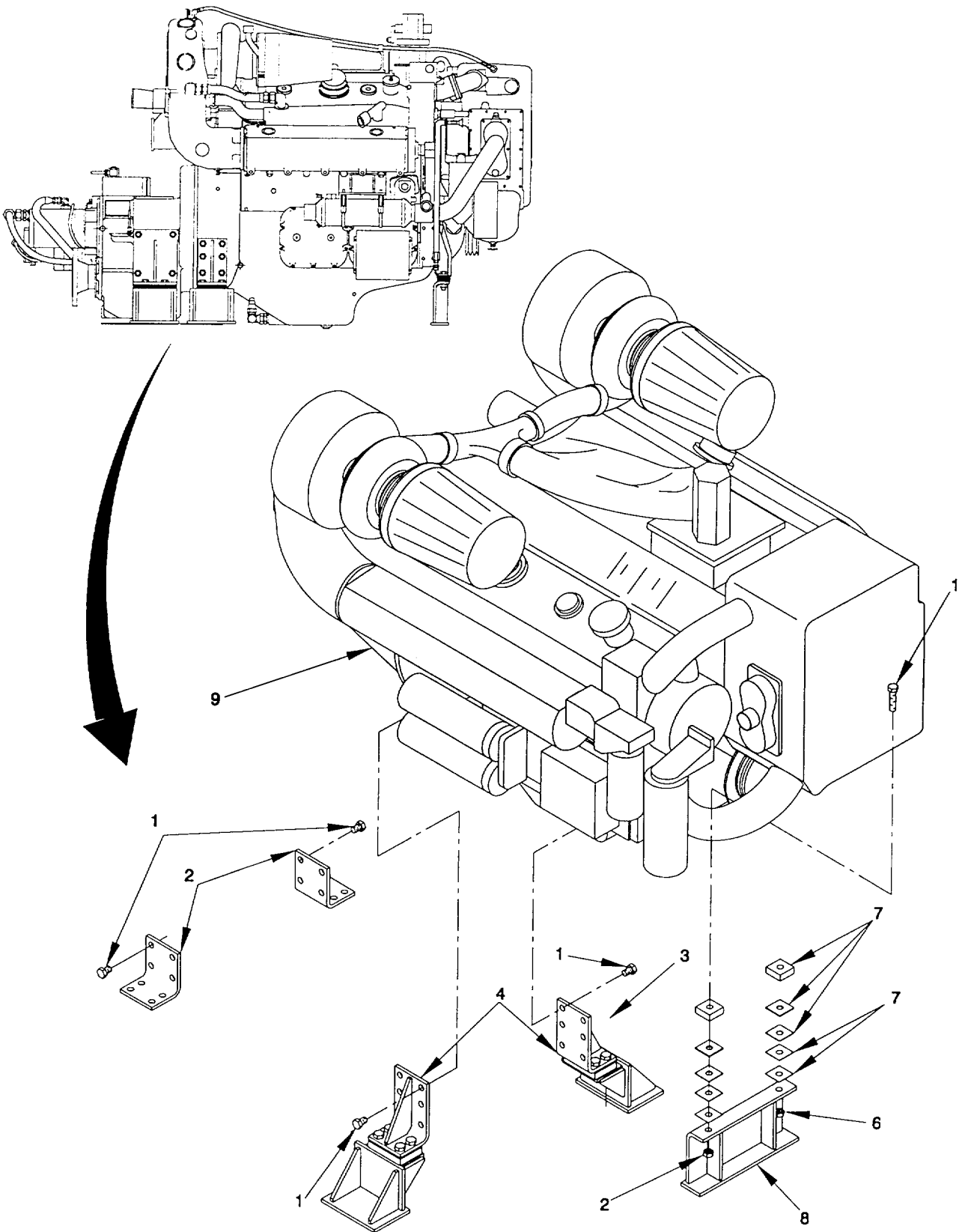


Figure 3-4. Diesel Engine, Remove/Install.

3-11. Diesel Engine (Cont).

- (2) Lower engine (9) into position aligning with engine module mountings. Alignment of engine is from centerline of crankshaft and must be parallel within .062 inches to hull longitudinal centerline. Engine shall be level and square to the hull within .062 inches. Refer to figure 3-5.
- (4) Secure the two flywheel housing brackets (4) to the marine gear housing with capscrews (1).
- (5) two marine gear brackets (2) to marine gear housing with capscrews (1).
- (3) Using shims (7), position engine (9) to elevation shown in figure 3-5. Secure engine (9) with capscrews (1) and hex nuts (6).
- (6) Reconnect fast lube system oil drain line
- (7) Reconnect quick disconnects heater hose couplings to engine inlet and outlet.
- (8) Reconnect raw water cooling system hoses.
- (9) Replace muffler and reconnect exhaust connections.
- (10) Reconnect the cold pack starting supply line at blower housing.
- (11) Reconnect fuel supply and return lines and open ball valves on fuel tank.
- (12) Reconnect electrical wiring, as tagged, to diesel engine. Refer to Appendix G.

FOLLOW ON MAINTENANCE:

Install drive shafts (paragraph 3-9).
Install fast lube system (paragraph 2-22).
Install hydraulic pump (paragraph 2-29).
Install alternator V-belts (paragraph 2-15).
Install deck hatch, cab and/or intake plenum.

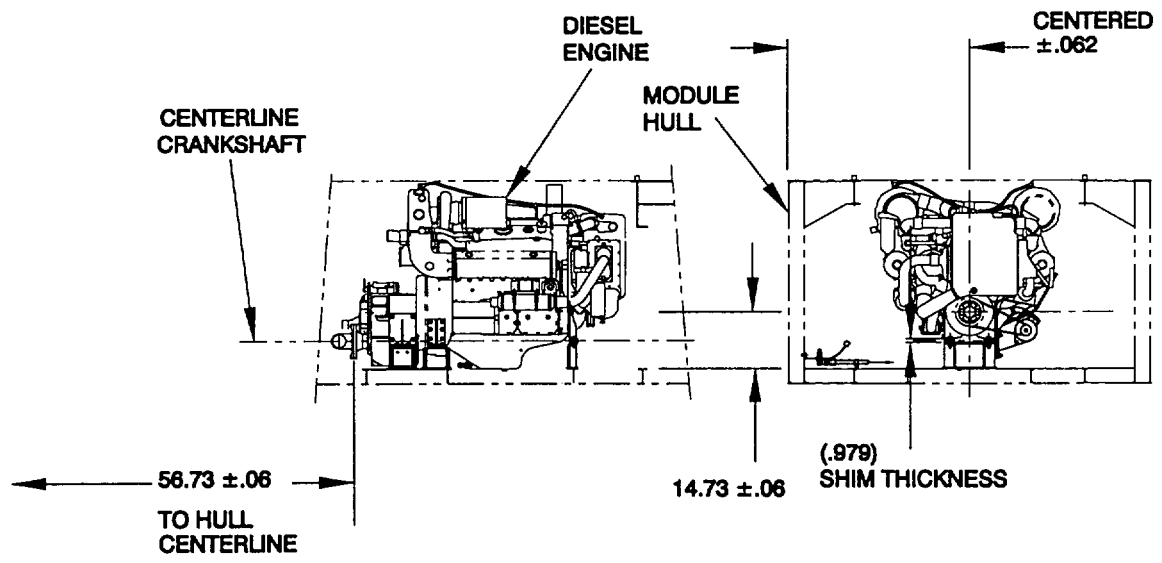


Figure 3-5. Engine Elevation.

3-12. Electronic Governor Controller, Engine Junction Box Assembly "A4".

This task covers: a. Adjust b. Remove c. Install

INITIAL SETUP:

<i>Tools</i>	<i>Equipment Condition</i>
General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)	All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE
<i>Materials/Parts</i>	<i>Reference</i>
None	Appendix G

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

- a. *Adjust.* (figure 3-6)
- (1) Disconnect and tag OUT OF SERVICE the electrical system.
 - (2) Remove six screws (1) and six clamps (2) securing cover (3) to enclosure (10). Swing cover (3) open.
 - (3) Disconnect and tag electrical wiring to governor controller (4). Refer to Appendix G.
 - (4) Set governor switches to the following positions:
 - (a) Switch S1 (5) in OFF position.
 - (b) Switch S2 (6) in ON position.
 - (5) Adjust positions of "GAIN", "DROOP", and "I" indicators (7, 8, and 9) on controller (4) to those shown in figure 3-6:
 - (a) "GAIN" (7) should be in the 40% to 50% position.
 - (b) "DROOP" (8) should be in the "full counterclockwise" position.
 - (c) "I" (9) should be in the 30% position.
 - (6) Connect electrical wiring to governor controller (4) as previously tagged.
 - (7) Close cover (3), position six clamps (2) and secure with six screws (1).
 - (8) Connect electrical system and remove OUT OF SERVICE tags.
 - (9) Start the engine. It should be operating at 800 RPM.

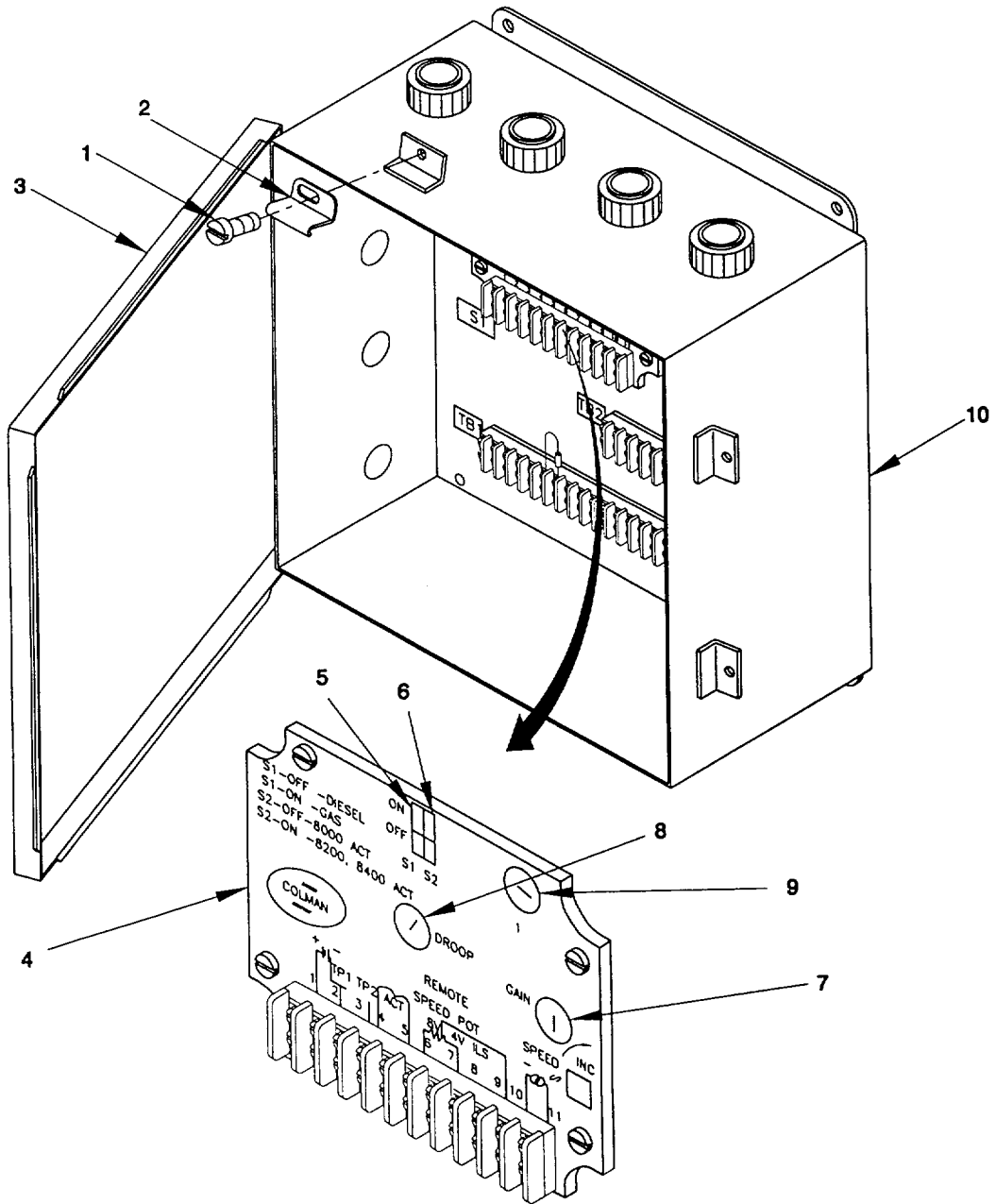


Figure 3-6. Governor Controller, Engine Junction Box "A4", Adjust.

3-12 Electronic Governor Controller, Engine Junction Box Assembly "A4" (Cont'd)

- b. Remove. (figure 3-6).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertant operation. Failure to comply can result in serious injury to personnel. Failure to comply can result in serious injury to personnel.

- (1) Disconnect and tag all electrical wiring to the speed switch and the governor controller. Tag each per wiring diagrams in Appendix G and tag OUT OF SERVICE. Ensure that the engine cannot start.
 - (2) Disconnect electrical leads to the signal generator and remove generator (1) from driveshaft (2).
 - (3) Open cover of housing for electronic speed switch by loosening screws (3) to free clamps.
 - (4) Disconnect leads to switch and unscrew switch (4) from elbow (5).
 - (5) Remove four screws (6) that secure electronic speed switch (7) to housing box (8).
 - (6) Remove bolt (9) and two washers (10), freeing rod assembly (11) from control lever (12).
 - (7) Remove bolt (13), nut (14) and two washers (15), freeing rod assembly (11) from lever assembly (16).
 - (8) Remove six bolts (17) from housing 0 and collect washers (18). Remove governor actuator (19), plate (20) and gasket (21). Remove four screws (22) and lockwashers (23) to separate plate (20) from actuator (19).
 - (9) Remove bolt (24) and lockwasher (25).
 - (10) Remove bolt (26) and lockwasher (27).
 - (11) Remove bolt (28) and lockwasher (29).
 - (12) Remove bolt (30) and washer (31).
 - (13) Remove bolt (32) and washer (33).
 - (14) Remove bolts (34), lockwashers (35) and washers (36) from six positions.
 - (15) Remove two bolts (37) and collect washers (38), cover (39), gasket (40) and hose (41).
 - (14) Remove key (42) from control lever shaft on engine, freeing control lever (12) from shaft. Collect ring (43), washer (44), washer (45), seal (46), and bushing (47). Remove bolt (48) and lockwasher (49) from control lever.
 - (15) Remove pin (50) and shaft assembly (51).
 - (16) Remove tube (52).
 - (17) Magnetic pickup assembly (53) may be removed as required.
- c. Install. (figure 3-6).
- (1) Install magnetic pickup assembly (53).
 - (2) Replace tube (52).

3-12 Electronic Governor Controller, Engine Junction Box Assembly "A4" (Cont'd)

- (3) Replace pin (50) and shaft assembly (51).
- (4) Replace lockwasher (49) and bolt (48) on control lever (12). Install bushing (47), seal (46), washer (45), washer (44) and ring (43) over control lever shaft. Secure with key (42).
- (5) Replace hose (41), gasket (40), cover (39), washers (38) and two bolts (37).
- (6) Install washers (36), lockwashers (35) and bolts (34) in six positions.
- (7) Install washer (33) and bolt (32).
- (8) Install washer (31) and bolt (30).
- (9) Install lockwasher (29) and bolt (28).
- (10) Install lockwasher (27) and bolt (26).
- (11) Install lockwasher (25) and bolt (24).
- (12) Position plate (20) over actuator (19) and secure with four lockwashers (21) and screws (22). Position gasket (21) and place governor actuator (19) and plate (20) over it. Secure on housing with six washers (18) and bolts (17).
- (13) Install rod assembly (11) on lever assembly (16) and secure with two washers (15), bolt (13) and nut (14).
- (14) Install rod assembly (11) on control lever (12) and secure with two washers (10) and bolt (9).
- (15) Position electronic speed switch (7) on housing box (8) and secure with four screws (6).
- (16) Screw switch (4) into elbow (5). Connect electrical leads.
- (17) Close door to housing for electronic speed switch (7) and secure by positioning clamps and tightening screws (3).
- (18) Install signal generator (1) on driveshaft (2). Connect electrical leads, as tagged, to generator.
- (19) Connect all electrical wiring, as tagged, to the speed switch and governor controller. Refer to Appendix G.

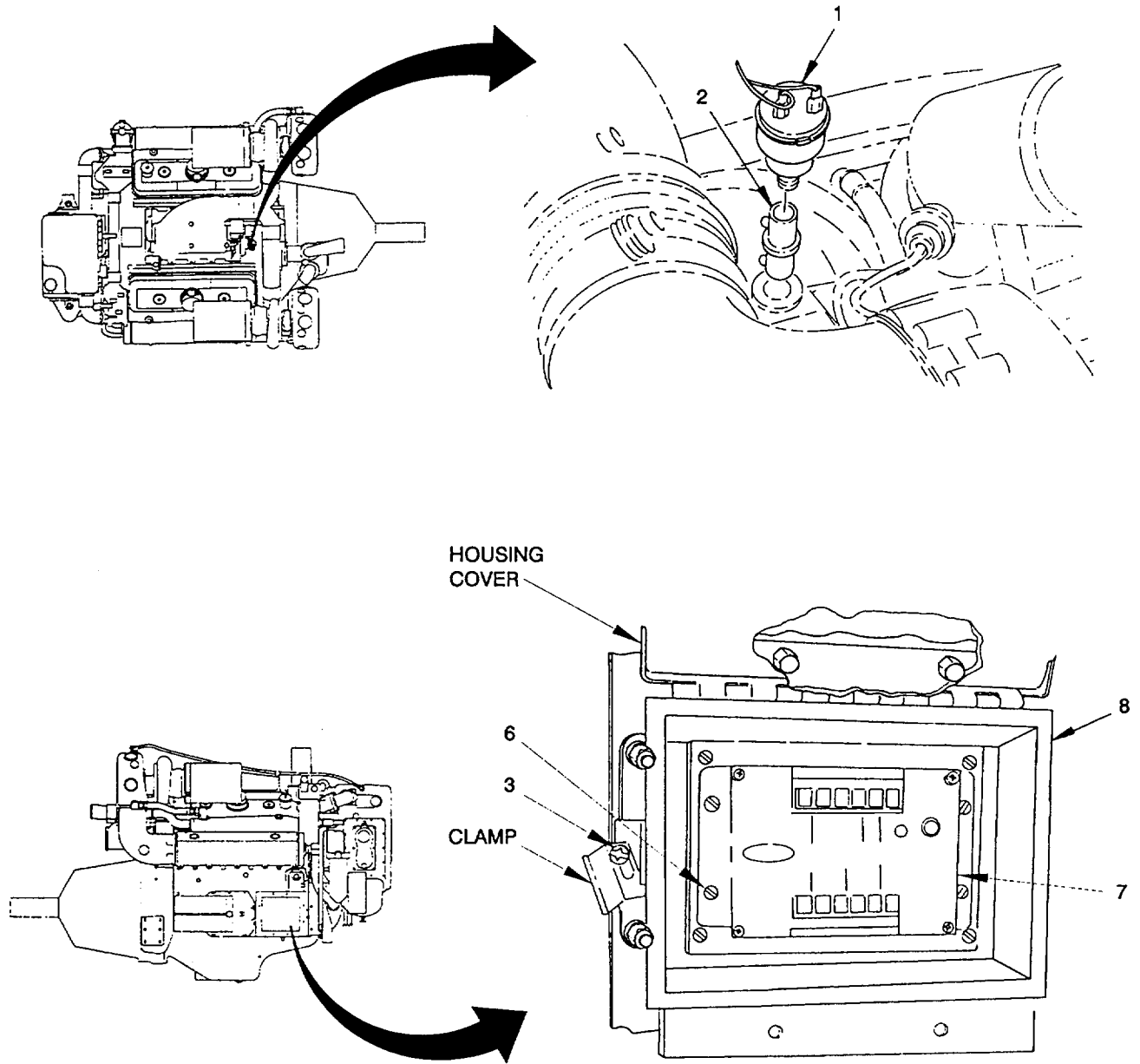


Figure 3-7. Electronic Governor Controller, Engine Junction Box Assembly "A4", Remove/Install (Sheet 1 of 3).

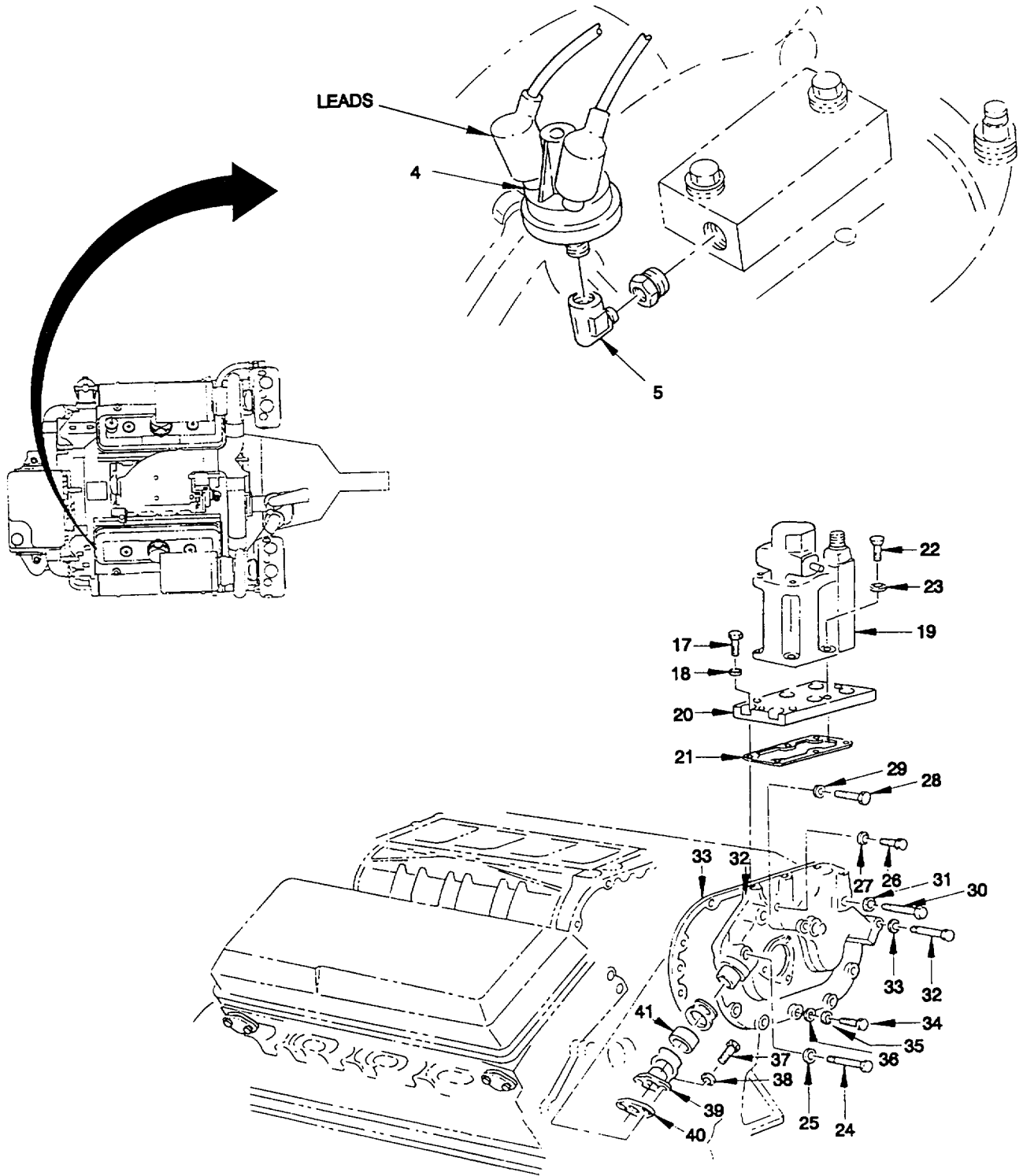


Figure 3-7. Electronic Governor Controller, Engine Junction Box Assembly "A4", Remove/Install (Sheet 2 of 3).

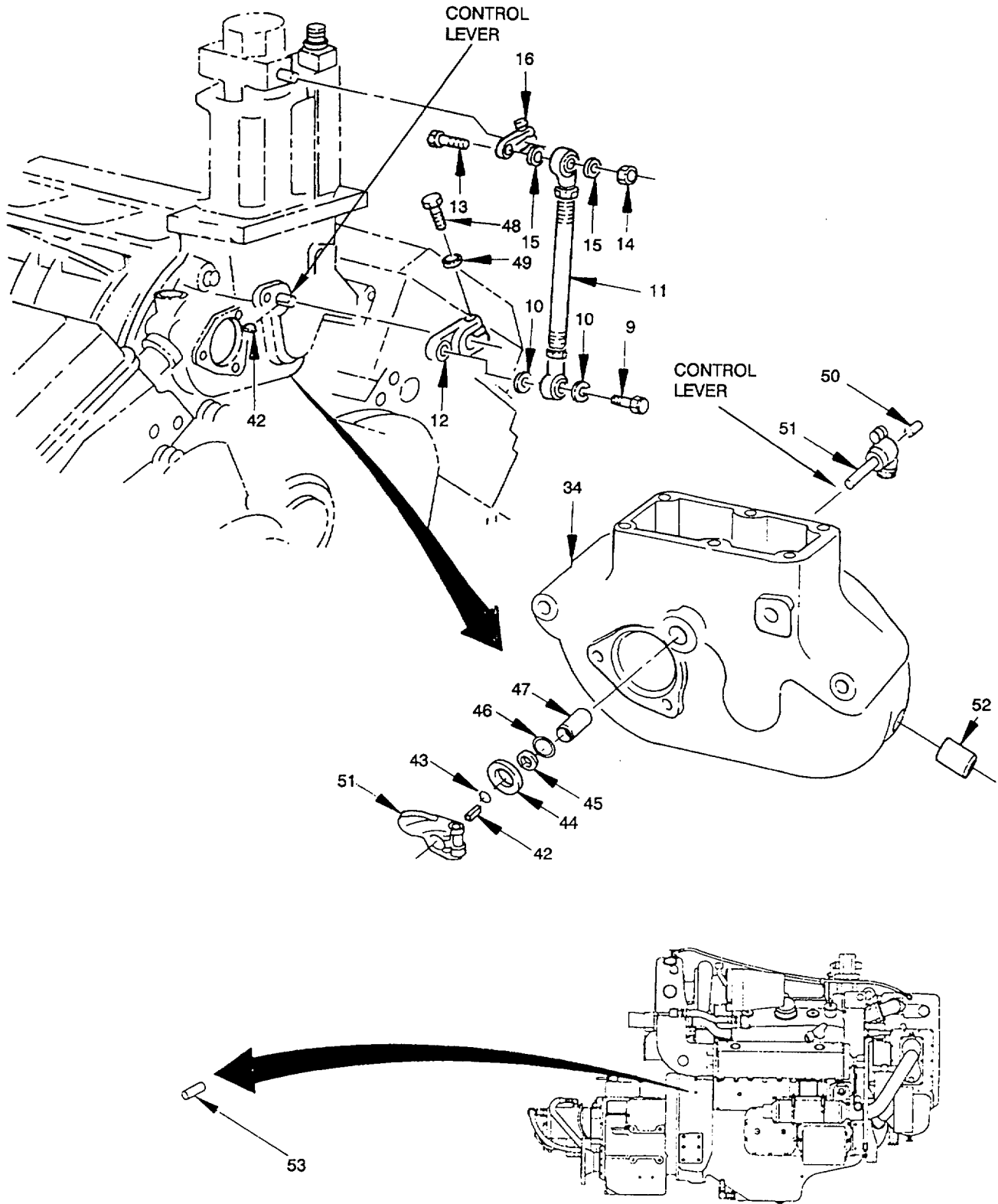


Figure 3-7. Electronic Governor Controller, Engine Junction Box Assembly "A4", Remove/Install (Sheet 3 of 3).

3-13. Marine Gear.**This task covers: a. Remove b. Install c. Align****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Torque Wrench (NSN 5120-00-230-6380)

Torque Wrench (NSN 5120-00-554-7292)

Torque Wrench (NSN 5120-00-542-5577)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Propulsion Module dry-docked.

Deck hatch removed.

Materials/Parts

As defined in TM 55-1945-205-24-2 (ENGINE) and TM 55-1945-205-24-3 (MARINE TRANSMISSION)

References

TM 55-1945-205-24-2 (ENGINE)

TM 55-1945-205-24-3 (MARINE TRANSMISSION)

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

When performing Marine Gear maintenance, the diesel engine should be shut off and tagged to prevent inadvertent operation. Failure to comply may result in personnel injury or death.

Marine Gear components and the hydraulic motor will reach temperatures up to 180° F during normal operation. Wait for system to cool prior to performing maintenance. Failure to comply may result in personnel injury or death.

a. Remove. (figure 3-8)

- (1) To access and remove the Marine Gear, loosen the two hose clamps (1) connecting the raw water line to the raw water pump. Loosen the two hose clamps (2) connecting the raw water line to the cross-over tee of the exhaust system. Pull hose lines out of way and tie off if necessary (Figure 3-8).
- (2) For removal of the Marine Gear, refer to TM 55-1945-205-24-2 (ENGINE) and TM 55-1945-205-24-3 (MARINE TRANSMISSION), Section H.

b. Install. (figure 3-8)

- (1) For installation of the Marine Gear, refer to TM 55-1945-205-24 (ENGINE) and TM 55-1945-205-24-3 (MARINE TRANSMISSION), Sections L, N1 and N2.
- (2) Connect raw water line (1) to raw water pump and tighten hose clamps. Connect raw water line (2) to exhaust cross-over tee and tighten clamps.

c. Align.

Refer to TM 55-1945-205-24-2 (ENGINE) and TM 55-1945-205-24-3 (MARINE TRANSMISSION), Section M, for alignment procedures of the Marine Gear with the engine.

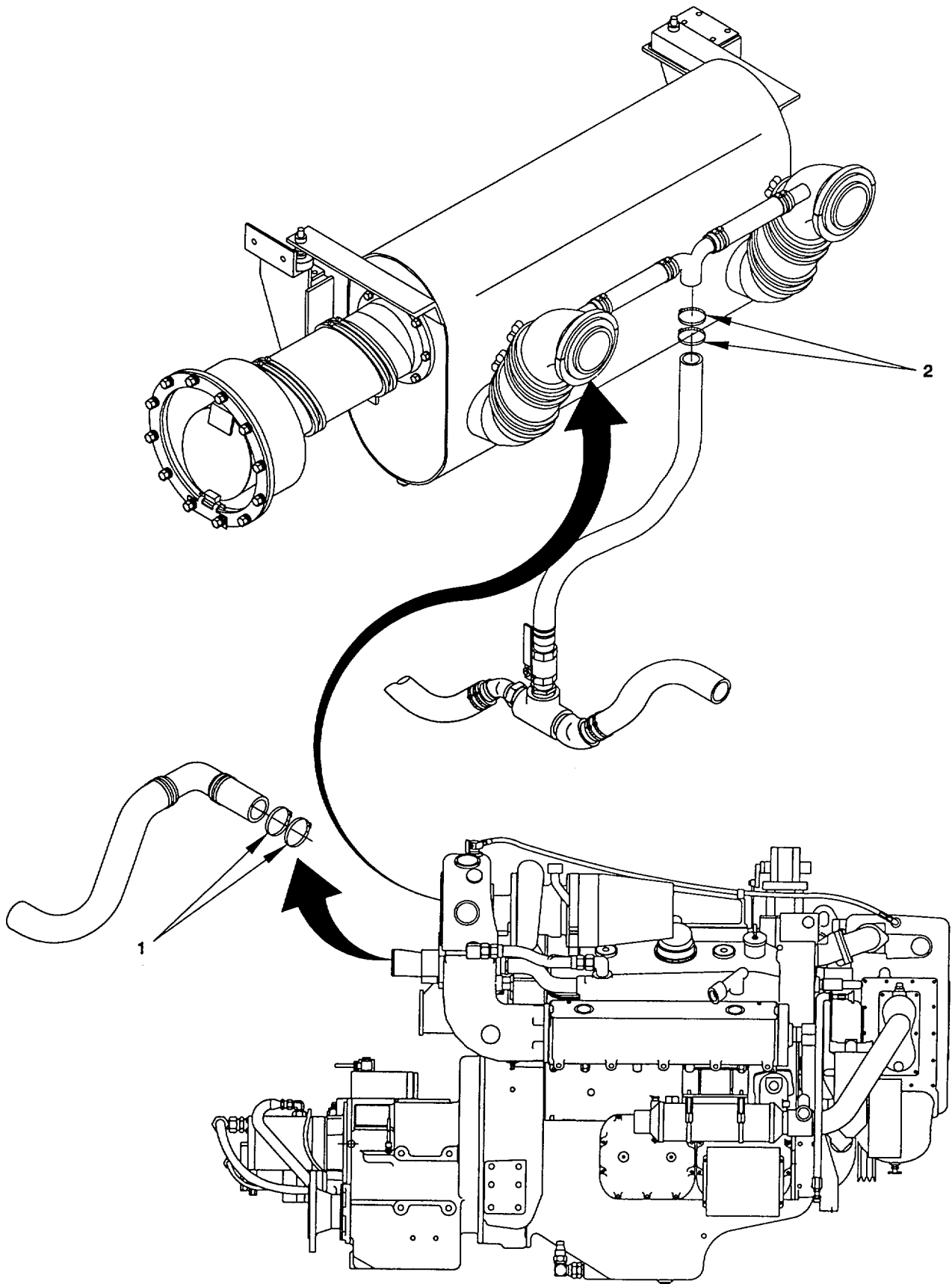


Figure 3-8. Marine Gear, Remove/Install.

3-12. Electronic Governor Controller, Engine Junction Box Assembly "A4".**This task covers: a. Adjust b. Remove c. Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)
Torque wrench (100 ft.-lbs. capacity)
Air line (80-120 psi)

Materials/Parts

Transfer Case
Cloth, soft, lint-free (Item 7, Appendix F)
Oil (Item 32 or 33, Appendix F)
Pan, Oil Catch

Equipment Condition

Drive shafts removed (paragraph 3-9).
Exhaust system removed (paragraph 2-27).
Cab or intake plenum removed.
Propulsion Module dry-docked.

References

TM 55-1945-205-24-4 (TRANSFER CASE)
LO 55-1945-205-12

WARNING

When performing transfer case maintenance, the diesel engine should be shut off and tagged to prevent inadvertent operation. Failure to comply may result in personnel injury or death.

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

Pump-jet marine gear components and the hydraulic motor will reach temperatures up to 1800 F during normal operation. Wait for system to cool prior to performing maintenance. Failure to comply may result in personnel injury or death.

Transfer case weighs approximately 450 lbs. dry. Use proper handling equipment when handling. Failure to comply may result in injury or death to personnel.

a. *Remove.* (figure 3-9)

- (1) Drain oil from the Transfer Case by putting suitable container under drain plug (2), open breather (1) slightly and remove drain plug (2). Collect waste oil in the container and dispose of properly per MSDS. Replace drain plug (2) and breather (1).
- (2) Remove upper plumbing by disconnecting hose assembly (3) at male connector (4). Remove male connector (4) as an assembly with 90° elbow (5), pipe nipple (6) and 90° elbow (7). Remove lower plumbing by disconnecting rubber hose (10) at male connector (8). Remove tee (9) as an assembly with male connector (8) and hose assembly (11).

3-14. Transfer Case (Cont).**WARNING**

Transfer case weighs approximately 450 lbs, dry. Use proper handling equipment when handling. Failure to comply may result in injury or death to personnel.

- (3) Support transfer case with proper handling equipment to prepare for removal.
- (4) Remove four hex head capscrews (12) and four hex head capscrews (14), freeing transfer case from supports (13 and 15).

CAUTION

When lifting transfer case away from deck and out of supports, be careful not to bend or damage supports. Failure to comply may result in damage to equipment.

- (5) With suitable lifting device, carefully lift and maneuver the transfer case sufficiently to collect spacers (16). Lift transfer case assembly out of the powered section via the Cab or Intake Plenum access hole.

b. Install. (figure 3-9)**CAUTION**

When lifting transfer case onto deck and within supports, be careful not to bend or damage supports. Failure to comply may result in damage to equipment.

- (1) With suitable lifting device, carefully lower and maneuver the transfer case into the powered section via the Cab or Intake Plenum access hole and between supports (13 and 15).
- (2) Position spacers (16) and secure transfer case support (15) to transfer case using four hex head capscrews (14). Torque to 95 ft.-lbs.
- (3) Secure transfer case support (13) to transfer case using four capscrews (12). Torque to 95 ft.-lbs.
- (4) Install hose assembly (11) with male connector (8) and tee (9). Connect lower plumbing rubber hose (10) with male connector (8). Connect upper plumbing hose assembly (3) at male connector (4) with 90° elbow (5), pipe nipple (6) and 90° elbow (7).
- (5) Open breather (2) slightly to allow air to enter case. Remove filler plug (17). Fill transfer case with oil to level just below filler plug (17). Transfer case oil capacity is approximately 11 pints. Replace filler plug (17) and tighten breather (2).

FOLLOW-ON MAINTENANCE: Install the following:

Drive Shafts (paragraph 3-10).
Exhaust system (paragraph 2-27)
Cab or intake plenum.

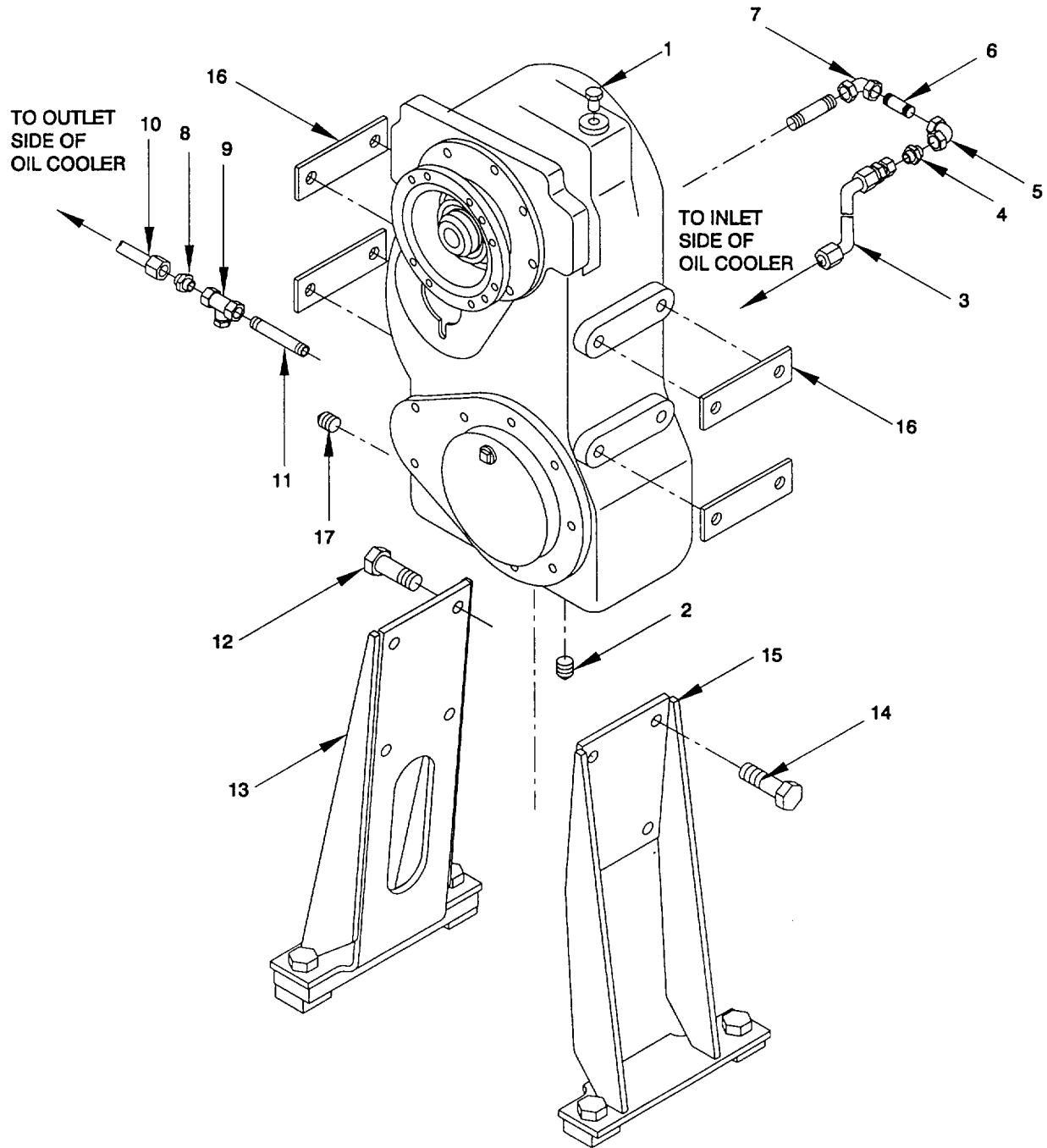


Figure 3-9. Transfer Case, Remove/Install.

3-15. Hydro-Motor, Pump-Jet.**This task covers: a. Remove b. Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

*Materials/Parts*Hydro Motor
Fluid, Hydraulic (Item 18, Appendix F)

All oil drained from lines.

All pressure relieved from hydraulic system (paragraph 2-28).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

When performing maintenance, the diesel engine should be shut off and tagged to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

a. *Remove.* (figure 3-10)

- (1) Disconnect hydraulic line maximum pressure hose (1) by unscrewing straight male stud fitting (2). Protect open hose end from contamination.
- (2) Disconnect hydraulic pipe (3) at equal tee (4) and adjustable tee fitting (5). Protect open pipe ends from contamination.
- (3) Remove adjustable tee fitting (5) from straight male stud fitting (6) to remove pipe (3). Protect open pipe ends from contamination.
- (4) Remove adjustable tee fitting (7) from straight male stud fitting (8) Protect open pipe ends from contamination.
- (5) Remove two hex screws (9) and collect lockwashers (10). Remove motor (11) for repair.

b. *Install.* (figure 3-10)

- (1) Position motor (11) on planetary gearing and secure with two hex screw (9) and lockwashers (10).
- (2) Install straight male fitting (8) and adjustable tee fitting (7) .
- (3) Install pipe (3) by connecting adjustable tee fitting (5) on straight male stud fitting (6).
- (4) Install hydraulic pipe (3) between equal tee (4) and adjustable tee fitting (5).
- (5) Connect hydraulic line maximum pressure hose (1) with straight male stud fitting (2).

FOLLOW-ON MAINTENANCE: Pump-Jet, Service (paragraph 2-21).

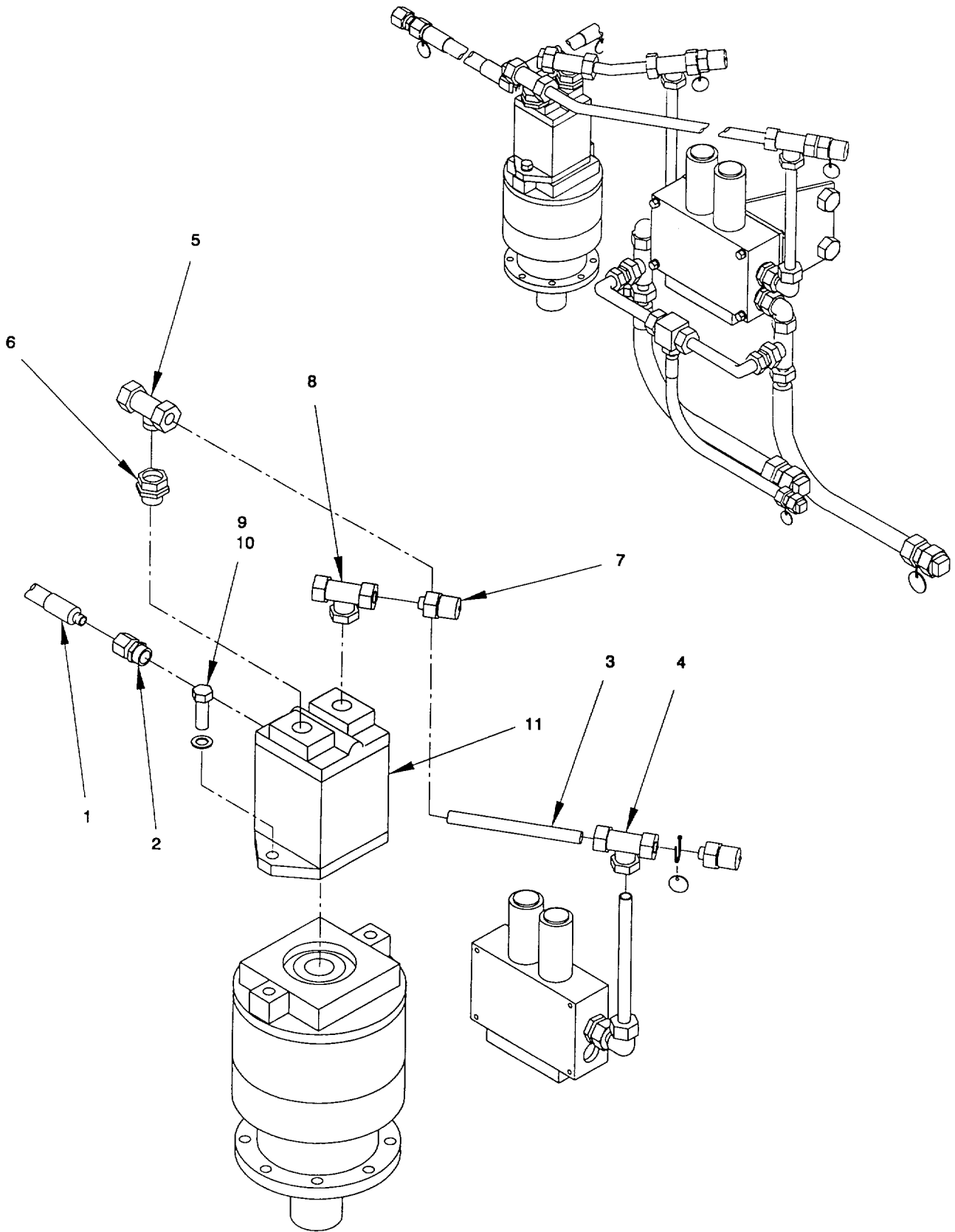


Figure 3-10. Hydro-Motor, Remove/Install.

3-16. Planetary Gearing, Emergency Steering, Pump-Jet**This task covers: a. Remove b. Install****INITIAL SETUP:***Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)
Lifting device

Materials/Parts

Seal (PN 1109439)
Bearing (PN 1012726)
Preformed packing (PN 1001400)
Brush (Item 6, Appendix F)
Cloth, Cleaning (Item 7, Appendix F)
Grease (Item 23, Appendix F)
Solvent (Item 46, Appendix F)

Equipment Condition

All power off to equipment.
All equipment and controls/indicators tagged OUT OF SERVICE.
Emergency Steering unit removed from Pump-Jet.
Connecting adapter and key removed from system.
Propulsion Module dry-docked.
Hatch removed.

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

Pump-jet marine gear components and the hydraulic motor will reach temperatures up to 180° F during normal operation. Wait for system to cool prior to performing maintenance. Failure to comply may result in personnel injury or death.

a. Remove. (figure 3-11)

- (1) Remove eight capscrews (1) and collect eight lockwashers (2). Lift planetary gearing (6) from pump-jet.
- (2) Loosen set screw (3), remove gear (4), collect Preformed packing (5). Discard Preformed packing in appropriate container. Retain gear (4) and set screw (3).
- (3) Remove two capscrews (7) and collect lockwashers (8) to free cover assembly (9). Collect key (10).
- (4) Remove shaft clip (11) and bore clip (12). Remove bearing (13), shaft (14), and seal (15) Discard bearing (13) and seal (15) in appropriate container.

b. Install. (figure 3-11)

- (1) Transport planetary gearing replacement (6) to a suitable work area.
- (2) Clean gear (4), cover (9), shaft (14) and mounting surfaces with solvent and brush.
- (3) Install replacement seal (15) and shaft (14) into cover (9). Install replacement bearing (13) onto shaft (14).

3-16. Planetary Gearing, Emergency Steering, Pump-Jet (Cont)

- (4) Install shaft clip (11) and bore clip (12).
- (5) Install cover assembly (9) along with key (10) into planetary drive (6). Align cover (9) mounting holes with holes in planetary drive (6). Secure with two lock washers (8) and capscrews (7).
- (6) Install gear (4) into shaft (14) and secure with setscrew (3).
- (7) Apply grease on Preformed packing groove in planetary drive (6) and install Preformed packing (5) into groove.

FOLLOW-ON MAINTENANCE: Pump-Jet, Service (paragraph 2-21).

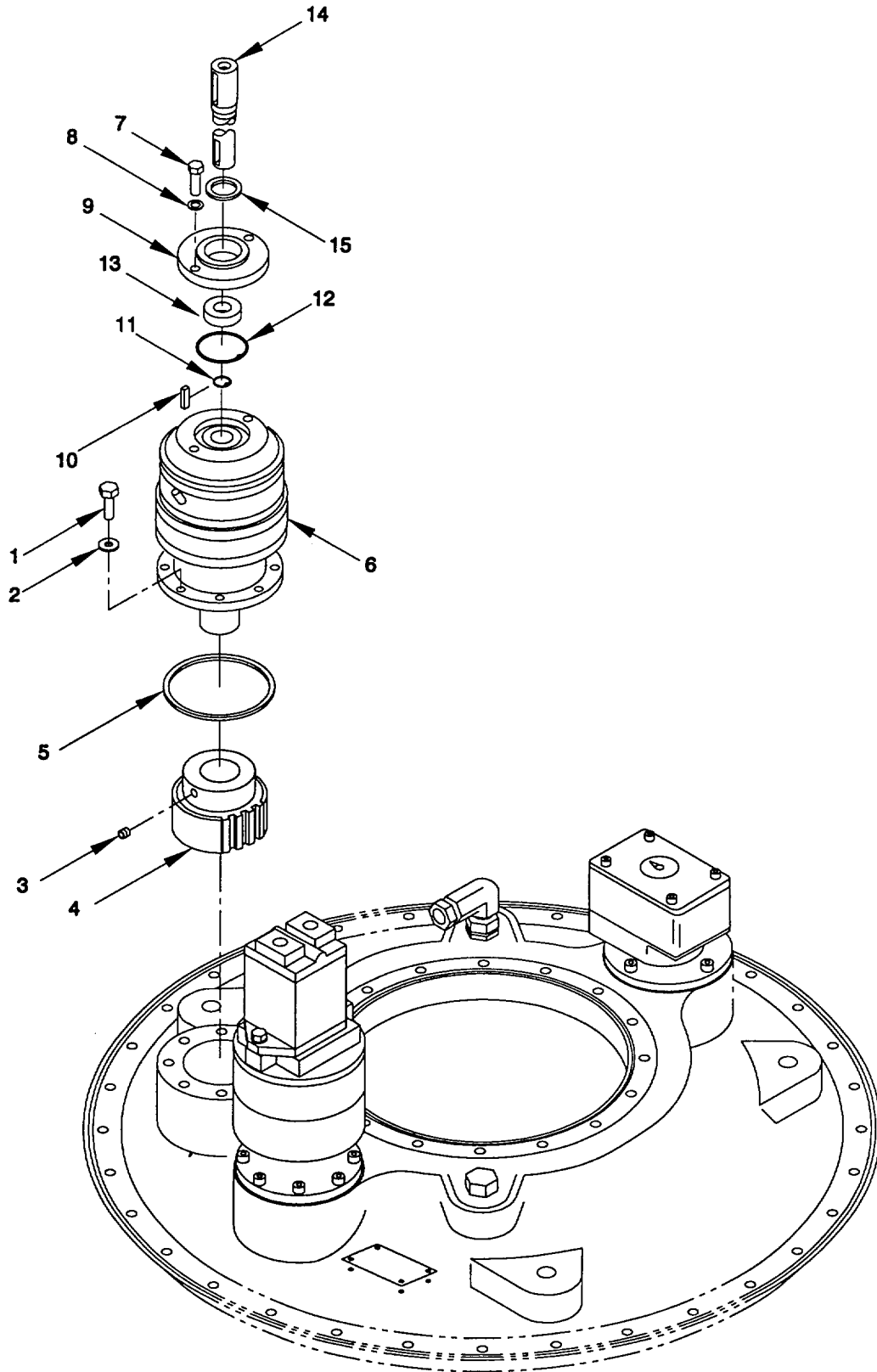


Figure 3-11. Planetary Gearing, Emergency Steering, Pump-Jet, Remove/Install.

3-17. Planetary Gearing, Emergency Steering, Pump-Jet

This task covers: a. Remove b. Service c. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Pump-Jet SPJ82T drain)
Upper Gearbox Bearing
Grease (Item 21, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Oil drained from Pump-Jet to level of sight glass in upper gear box housing (refer to paragraph 2-21 to

All pressure relieved from hydraulic system.

Pump-Jet removed from propulsion module (paragraph (4-11)).

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

When performing maintenance, the diesel engine should be shut off and tagged to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

a. Remove. (figure 3-12)

- (1) Disconnect and tag OUT OF SERVICE all electrical wiring to feed back unit.
- (2) Remove four hexagon cap screws (1) and collect spring washers (2) from base of gearing.
- (3) Lift feedback housing (3) and gearing assembly from pump-jet, being careful not to damage gears, and collect Preformed packing (4).
- (4) Remove four socket head cap screws from top plate of housing (3) to access components inside housing.
- (5) Remove three hexagon screws (5) and collect spring washers (6) from outside of console (11). Remove a fourth hexagon screw (5) from inside of console (11). Separate feedback housing (3) from gearing assembly.

b. Service. (Figure 3-12)

- (1) Remove feedback unit from housing (3) and disassemble (refer to paragraph a).
- (2) Turn gearing assembly upside down. Remove spring pin (7) from shaft (8) and collect spur wheel (9).
- (3) Remove bushing (10), console (11), and bushing (12).
- (4) Fill gearing chamber with grease.
- (5) Replace bushing (12), console (11), and bushing (10).

3-17. Feed Back Unit, Pump-Jet (Cont).

(6) Position spur wheel (9) on shaft (8) and secure with spring pin (7).

(7) Replace feedback unit per step (c).

c. Install. (figure 3-12)

(1) Install feedback unit (3) to gearing assembly and secure with four hexagon cap screws (5) and spring washers (6).

(2) Position Preformed packing (4) and feedback unit (3) and gearing assembly on pump-jet, being careful not to damage gears.

(3) Install spring washers (2) and four hexagon screws (1) in base of gearing assembly.

FOLLOW-ON MAINTENANCE: Pump-Jet, Service (paragraph 2-21).

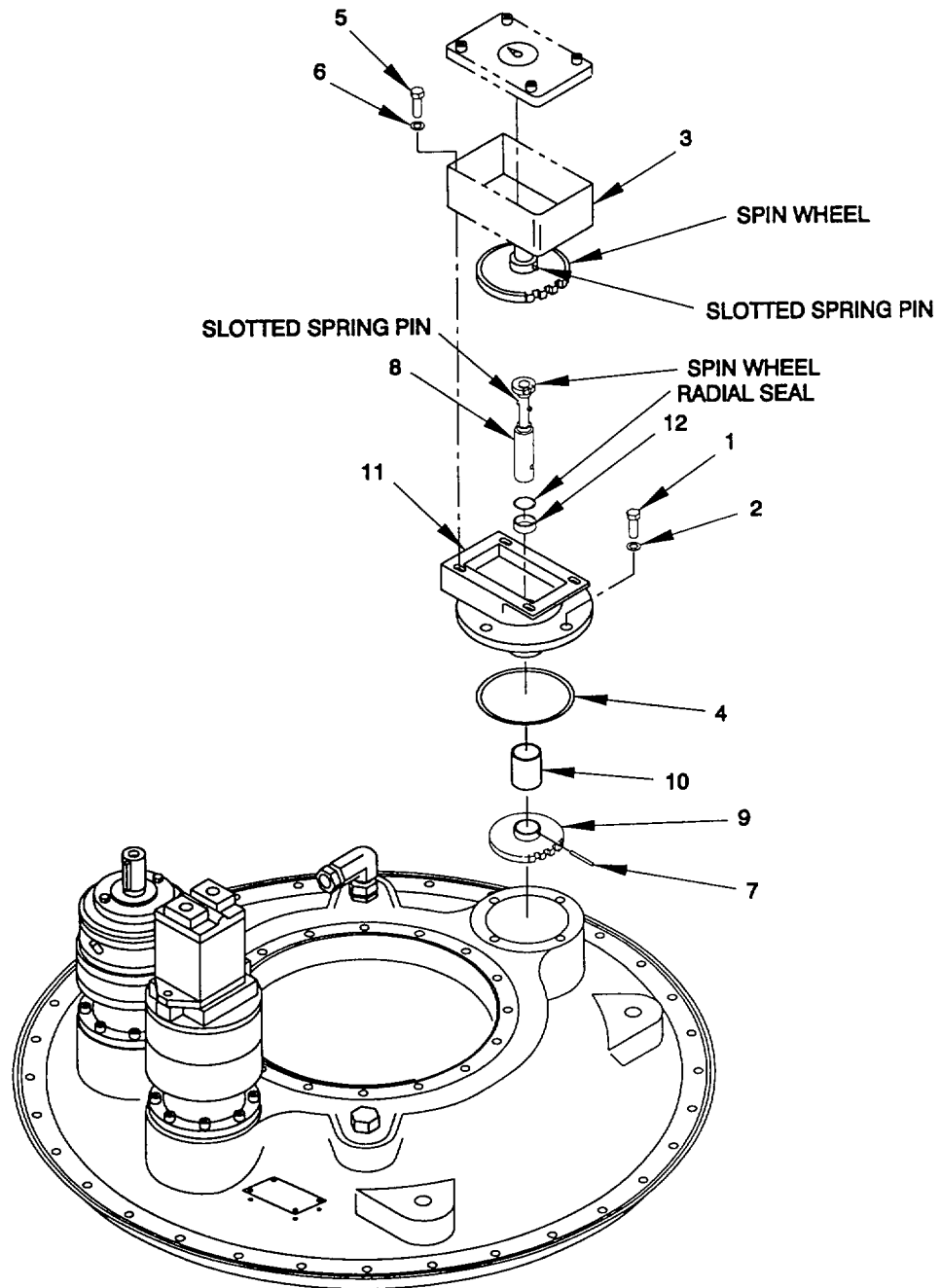


Figure 3-12. Feedback Unit, Remove, Service, Install.

3-18. Planetary Gearing, Steering, (Hydro) Motor Pump-Jet

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN
5180-00-629-9783)
Lifting device

Materials/Parts

Preformed packing (PN 1001400)
Brush (Item 6, Appendix F)
Cloth, Cleaning (Item 7, Appendix F)
Grease (Item 23, Appendix F)
Solvent (Item 46, Appendix F)

Equipment Condition

All power off to equipment.

All equipment and controls/indicators tagged OUT OF SERVICE.

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

Pump-jet marine gear components and the hydraulic motor will reach temperatures up to 1800 F during normal operation. Wait for system to cool prior to performing maintenance. Failure to comply may result in personnel injury or death.

a. *Remove.* (figure 3-13)

- (1) Disconnect all hydraulic lines and steering motor.
- (2) Remove eight capscrews (1) and collect eight lockwashers (2).

WARNING

Planetary gearing weighs approximately 80 lbs. Use appropriate lifting equipment when handling. Failure to comply may result in injury to personnel.

- (3) Remove planetary gearing using appropriate lifting equipment to a suitable work area.
- (4) Loosen set screw (4) and remove gear (5). Retain gear for reuse. Remove Preformed packing (6) and discard into appropriate container.

FOLLOW-ON MAINTENANCE: Pump-Jet, Service (paragraph 2-21).

3-18. Planetary Gearing, Steering Motor, Pump-Jet (Cont).

- b. *Install.* (figure 3-13)

WARNING

**Planetary gearing weighs 80 lbs. Use appropriate lifting equipment when handling.
Failure to comply may result in injury to personnel.**

- (1) Transport planetary gearing replacement (4) to a suitable work area.
- (2) Clean gear (2) and mounting surfaces with solvent and brush. Ensure mounting surfaces are free of dirt or rust preventatives.
- (3) Install gear (5) into planetary gearing shaft and secure with set screw (4).
- (4) Apply grease to Preformed packing groove and install replacement Preformed packing (6) into planetary gearing (3) mounting base.
- (5) Using appropriate lifting equipment, position planetary gearing (3) on pump-jet, ensuring that connections with hydraulic lines are aligned properly.
- (6) Install eight lockwashers (2) and socket head capscrews (1) to secure planetary gearing to pump-jet.
- (7) Reconnect hydraulic lines and steering motor.

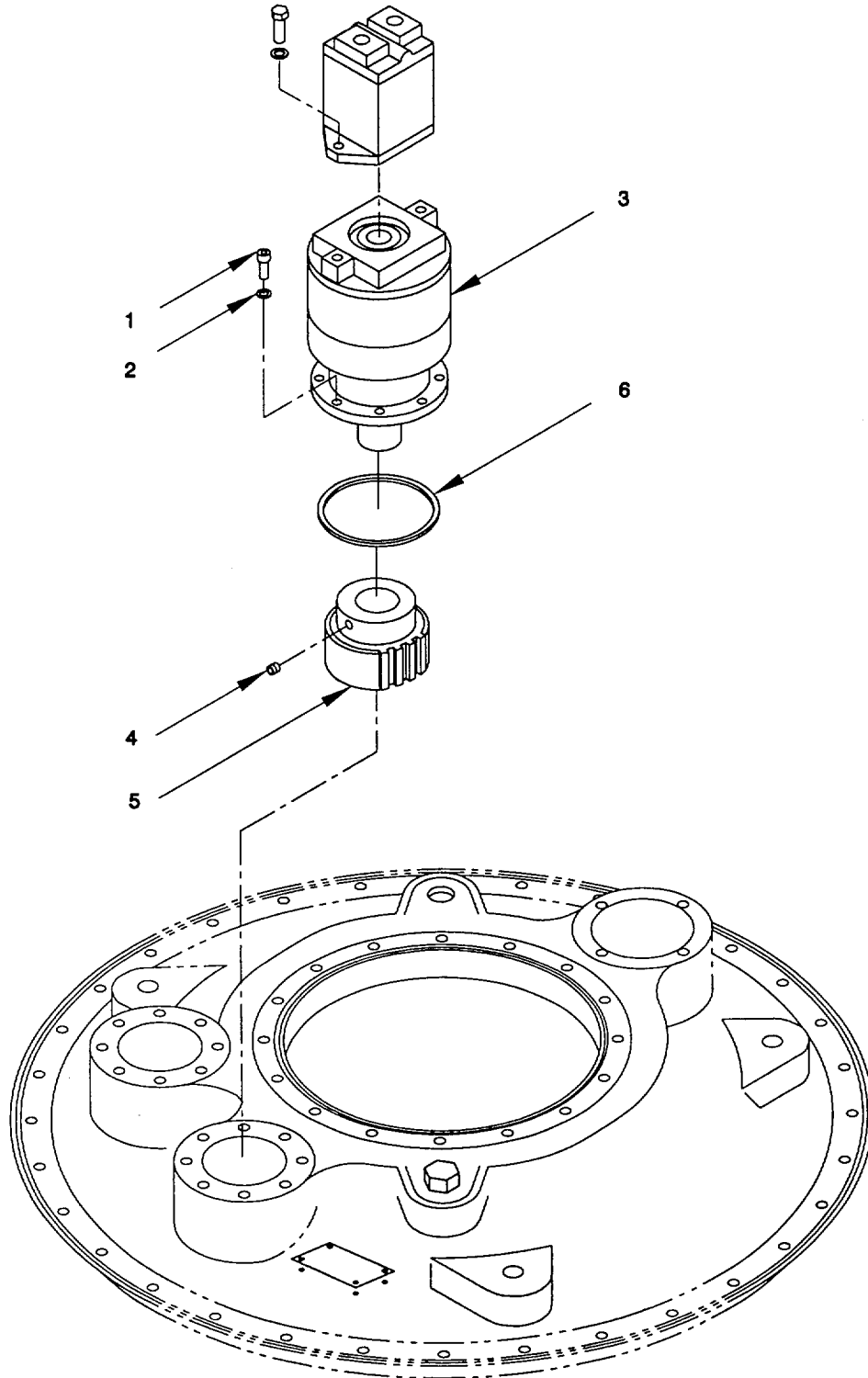


Figure 3-13. Planetary Gearing, Steering Motor, Pump-Jet, Remove/Install.

3-19. Diode Board Assembly, Lower Control Panel "A2"

This task covers: a. Remove b. Install

INITIAL SETUP:*Tools*General Mechanic's Tool Kit, Rail and Marine (NSN. All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE
5180-00-629-9783)*Equipment Condition**Materials/Parts*

Lower control panel removed (paragraph 2-122).

Diode Board Assembly
Compound, Antiseize (Item 9, Appendix F)
Wraps, Tie (Item 57, Appendix F)

WARNING**When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.**a. *Remove.* (figure 3-14)

- (1) Tag and disconnect electrical wiring to diode board assembly (3). Refer to Appendix G.
- (2) Remove eight pan head screws (1) securing diode board assembly (3) to lower control panel (4). Remove diode board assembly (3) and eight standoffs (2).
- (3) Send diode board to next higher level maintenance for repair.

b. *Install.* (figure 3-14)

- (1) Apply retaining compound to pan head screws (1).
- (2) Position eight standoffs (2) and new diode board assembly (3) on back side of lower control panel (4). Secure diode board assembly (3) with eight pan head screws (1).
- (3) Reconnect electrical wiring, as tagged, to diode board assembly (3). Refer to Appendix G. Use tie wraps and mounting bases to secure any loose wires.

FOLLOW ON MAINTENANCE: Install lower control panel (paragraph 2-122).

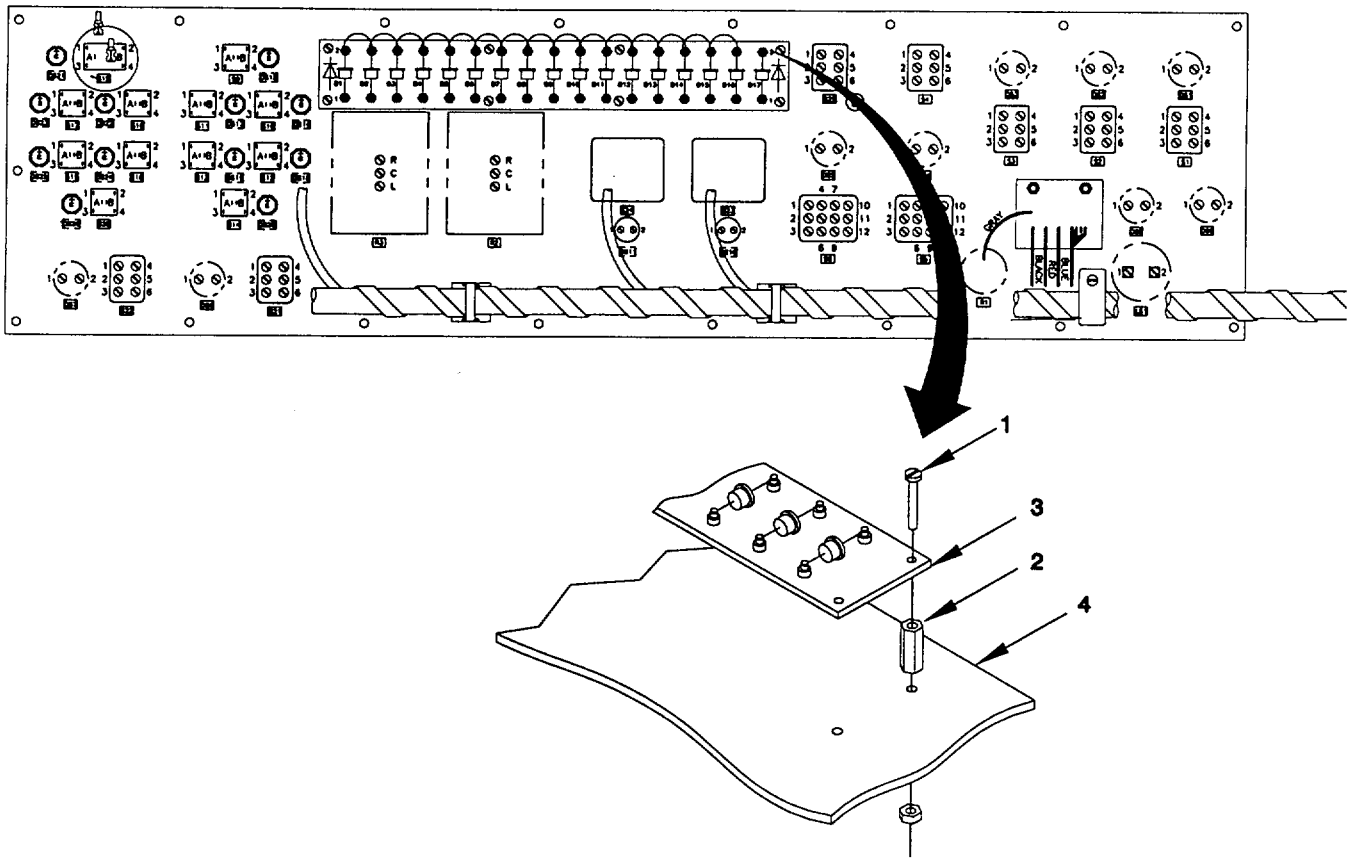


Figure 3-14. Diode Board Assembly, Lower Control Panel, Remove/Install.

3-20. Voltage Regulator, Pump-Jet Direction /Auxiliary Batty Junction Box "A9"

This task covers: a. Test

INITIAL SETUP:*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

Materials/Parts

(paragraph 2-122).

Voltage Regulator

Compound, Antiseize (Item 9, Appendix F)

Wraps, Tie (Item 57, Appendix F)

Lower control panel lifted out of console or removed

WARNING

When performing maintenance, the electrical system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury to personnel.

a. Test. (figure 3-15)

- (1) Disconnect negative cable from battery.
- (2) Remove factory alternator. Tape original battery output cable and do not use.
- (3) Install alternator.

CAUTION

Battery charging cables must be of sufficient capacity handle the high amperage. If cable is 0'-20' use #2 AWG fine-stranded cable. If cable is 20'-40' use #00 AWG fined-stranded cable. Failure to comply may result in serious damage to electronic components.

- (4) Install two heavy gauge battery charge cables from the alternator's output terminals to battery positive post. Make certain that the engine block is grounded. to the battery's negative post with the same size cable as the positive. Failure to follow these steps will result in poor alternator performance.
- (5) Mount regulator to a flat surface in as cool a location as possible.

CAUTION

Always ground the regulator before connecting any power source to it. Failure to do so may damage the regulator.

- (6) Ensure alternator connected. Connect black wire from regulator to ground terminal on back of alternator.
- (7) Connect ring eyelet on blue wire to top of alternator stud marked FLD (Field wire).
- (8) Connect ring eyelet on orange wire to third stud on back of brush assembly (refer to figure 3-14).
- (9) Connect red wire labeled (Battery Sense) to positive post on chassis battery.

3-20. Voltage Regulator, Pump-Jet Direction/Auxiliary Battery Junction Box "A9" (Cont).

- 10) Connect brown wire labeled (Key ignition) to factory alternator key ignition wire with or without lamp

Table 3-2. Regulator Test Points.

Location	Wire Color	Ignition OFF	Ignition ON Engine ON	Ignition ON Engine OFF
Ground	Black			
Term. S	Orange	0 volts		12-16 volts
Term. A	Red	12.6 volts		28 volts
Term. I	Brown	0 volts		28 volts
Term. F	Blue	0 volts		8-24 volts

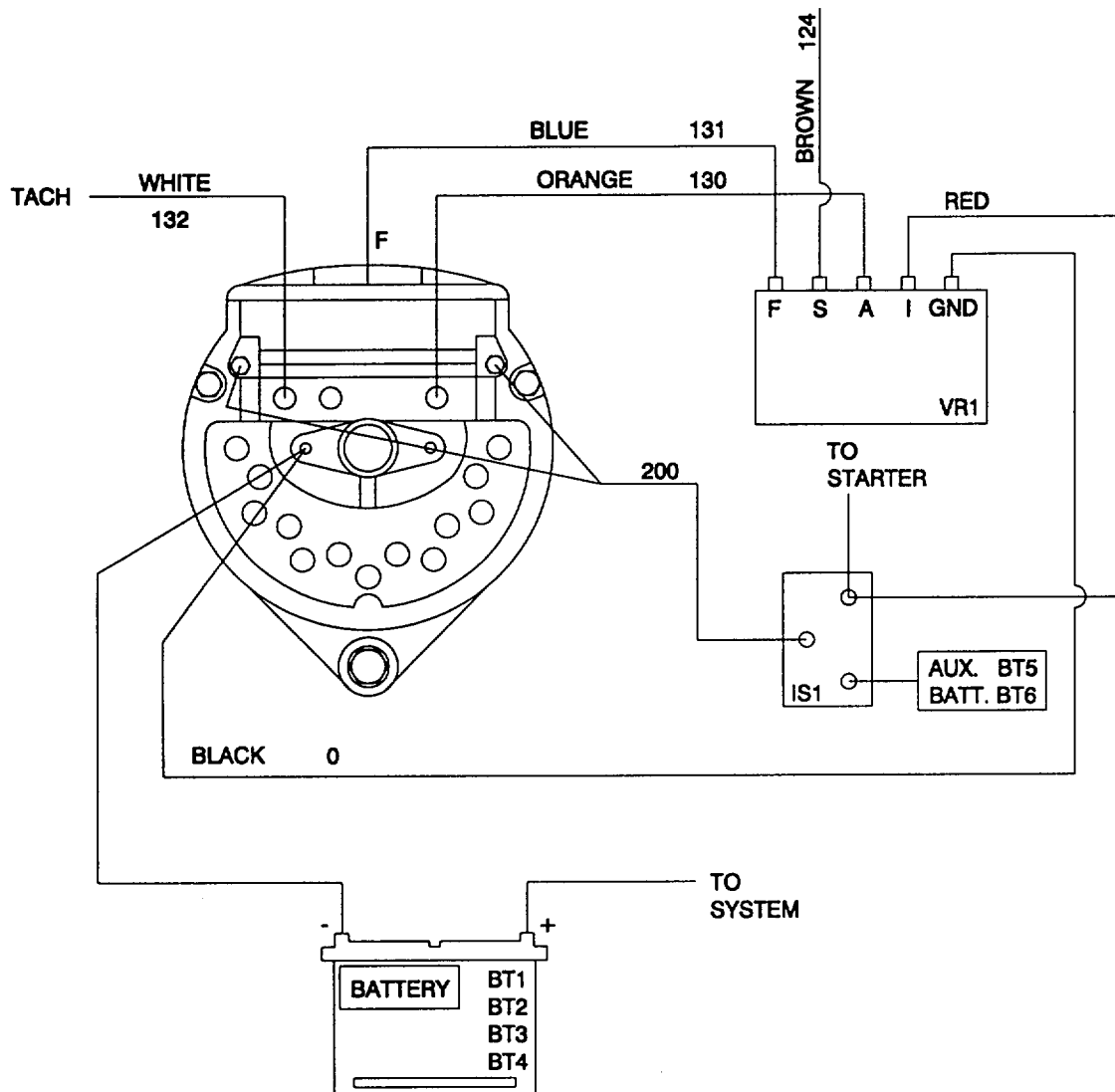


Figure 3-15. Voltage Regulator, Pump-Jet Directional/Auxiliary Junction Box "A9", Test.

CHAPTER 4

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

OVERVIEW 4-1
 Section I REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND
 DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT 4-1
 Section II GENERAL SUPPORT TROUBLESHOOTING PROCEDURES 4-1
 Section III GENERAL SUPPORT MAINTENANCE PROCEDURES 4-4

OVERVIEW

This chapter contains information for maintenance of the Modular Causeway Ferry (MCF) by general support level maintenance personnel.

Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

4-1 Common Tools and Equipment..... 4-1
 4-2 Special Tools, TMDE, and Support Equipment..... 4-1
 4-3 Repair Parts 4-1

4-1. Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

4-2. Special Tools, TMDE, and Support Equipment. Special tools are listed in Appendix B Maintenance Allocation Chart (MAC), of this manual.

4-3. Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List TM 55-1945-205-24P covering Unit, Direct Support, and General Support Maintenance for the Modular Causeway Ferry (MCF).

Section II. GENERAL SUPPORT TROUBLESHOOTING PROCEDURES

4-4 General..... 4 - 1
 4-5 General Support Troubleshooting Procedures..... 4 - 1

4-4. General. This section contains troubleshooting and corrective action procedures authorized at the general support maintenance level.

4-5. General Support Troubleshooting Procedures. Refer to symptom index to locate the troubleshooting procedure for the observed malfunction. Table 4-1 lists malfunctions that may occur during operation or maintenance of the MCF. Tests, checks, inspections, and corrective actions should be performed in the order listed.

NOTE

This table is not intended to cover every possible symptom, but is rather a list of the more frequent problems and some of their causes.

SYMPTOM INDEX

Symptom	Page
1. Diesel engine malfunctions	4-3
2. Marine Transmission malfunctions.....	4-3
3. Drive train does not turn freely and smoothly.....	4-3
4. Oil level increases in the sump of the transfer case.....	4-3
5. Oil level decreases in the sump of the transfer case	4-3

Table 4-1. Unit Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. Diesel engine malfunctions.	Step 1. Refer to TM 55-1945-205-24-2 (ENGINE).	
2. Marine Transmission malfunctions.	Step 1. Refer to TM 55-1945-205-24-3 (MARINE TRANSMISSION).	
3. Drive train does not turn freely and smoothly.	Step 1. Inspect for damage bearing to drive shaft and universal joints.	Replace drive shaft.
	Step 2. Inspect for damaged bearing or gearing in transfer case.	Replace as necessary.
4. Oil level increases in the sump of the transfer case.	Step 1. Inspect lube oil cooling tubes for leaking allowing water in cooling (raw water) to enter the gearcase.	Replace the lube oil cooler or cooler tubing bundle.
5. Oil level decreases in the sump of the transfer case.	Step 1. Inspect lube oil cooling tubes for leaking allowing lube oil to exit the gearcase into the cooling water.	Replace the lube oil cooler or cooler tubing bundle in transfer case.
	Step 2. Inspect transfer case lube lines for loose or damaged connections.	Tighten connections or replace fittings.
	Step 3. Inspect transfer case for leaking at shaft seals and gaskets.	Replace seals and/or gaskets as necessary.

Section III. GENERAL SUPPORT MAINTENANCE PROCEDURES

Paragraph		Page
4-6	General	4-4
4-7	Diesel Engine	4-5
4-8	Marine Transmission	4-7
4-9	Electric Control Valve, Marine Transmission	4-8
4-10	Transfer Case	4-10
4-11	Pump-Jet	4-11
4-12	Diode Replacement, Typical	4-23
4-13	Module Electrical Interconnect Assembly.....	4-25
4-14	Spreader Assembly Bridle Sling.....	4-27
4-15	Way-Valve Assembly, Hydraulic System	4-30

4-6. General. This section contains direct support maintenance instructions on the Modular Causeway Ferry (MCF) as authorized by the MAC (Appendix B) of this manual.

4-7. Diesel Engine.

This task covers:

Cylinder Block	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 1.1 and 1.1.1
Cylinder Head Assembly	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 1.2, 1.2.1, 1.2.2 and 1.2.4
Crankshaft Assembly	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 1.3, 1.3.2, 1.3.3, 1.3.4, 1.3.5, 1.3.5.1, 1.3.6 and 1.3.7
Flywheel Assembly	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 1.4 and 1.4.1
Flywheel Housing	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 1.5
Connecting Rod and Piston	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 1.6, 1.6.1, 1.6.2 and 1.6.3
Camshaft & Gear Train and Balance Weight Cover	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 1.7, 1.7.1, 1.7.2, 1.7.3, 1.7.4, 1.7.5, 1.7.6, 1.7.7 and 1.7.8
Fuel Manifold & Connections	Repair Remove Install	Reference TM 55-1945-205-24-2 (ENGINE) Section 2, 2.1.1 and 2.1.4 Reference TM 55-1945-205-24-2 (ENGINE) Section 2, 2.1.1 and 2.1.4 Reference TM 55-1945-205-24-2 (ENGINE) Section 2, 2.1.1 and 2.1.4
Fuel Injector Assembly	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 2, 2.1.1 and 2.1.4
Fuel Pump	Repair Remove Install	Reference TM 55-1945-205-24-2 (ENGINE) Section 2.2 Reference TM 55-1945-205-24-2 (ENGINE) Section 2.2 Reference TM 55-1945-205-24-2 (ENGINE) Section 2.2
Fuel Injector Controls	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 2.9
Turbocharger	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 3.5
Turbocharger Aftercooler	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 3.5.3
Oil Pump Assembly	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 4.1
Oil Pressure Regulator and Relief Valves	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 4.1.1
Oil Pan	Remove Install	Reference TM 55-1945-205-24-2 (ENGINE) Section 4.7 Reference TM 55-1945-205-24-2 (ENGINE) Section 4.7
Water Connection	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 5.3
Raw Water Pump	Repair	Reference TM 55-1945-205-24-2 (ENGINE) Section 5.6

4-7. Diesel Engine (Cont).

INITIAL SETUP

Tools

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)
 Torque Wrench (NSN 5120-00-554-7292)
 Torque Wrench (NSN 5120-00-230-6380)
 Torque Wrench (NSN 5120-00-542-5577)
 Additional Engine Tools as Listed in TM 55-1945-205-24-2 (ENGINE)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

 Engine remove (paragraph 3-11)

References

TM 55-1945-205-24-2 (ENGINE)

Materials/Parts

Listed in TM 55-1945-205-24-2 (ENGINE), Appendix E

Refer to TM 55-1945-205-24-2 (ENGINE) for General Support maintenance of the diesel engine.

FOLLOW ON MAINTENANCE: Install diesel engine (paragraph 3-11).

4-8. Marine Transmission.

This task covers: Repair

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Equipment Condition

Marine Transmission removed (paragraph 3-13).

Materials/Parts

As defined in TM 55-1945-205-24-3 (MARINE TRANSMISSION)

References

TM 55-1945-205-24-3 (MARINE TRANSMISSION)

Repair.

For repair procedures of the marine transmission, refer to TM 55-1945-205-24-3 (MARINE TRANSMISSION).

4-9. Electric Control Valve, Marine Transmission.

This task covers: a. Remove b. Install

INITIAL SETUP

Tools

General Mechanic's Tool Kit (NSN 5180-00-629-9783)
controls/indicators tagged OUT OF SERVICE.

Equipment Condition

All power off to equipment. All equipment and

Materials/Parts

Gasket
Brush (Item 6, Appendix F)
Cloth, Cleaning (Item 7, Appendix F)
Solvent (Item 46, Appendix F)
Drain container

References

TM 55-1945-205-24-3 (MARINE TRANSMISSION)

a. Remove. (figure 4-1)

- (1) Disconnect electrical plug-in connections (1) and (2) from control valve.
- (2) Disconnect hydraulic line (3) from control valve, draining any hydraulic fluid into an approved container.
- (3) Remove four protective caps (4) from mounting cap screws and remove four mounting cap screws (5).
- (4) Remove control valve (6) and collect gasket (7) from marine transmission housing (8).

b. Install. (figure 4-1)**WARNING**

Cleaning solvent is flammable and toxic. Use solvent in a well ventilated area. Wear appropriate personal protective covering and avoid prolonged breathing of fumes or solvent contact with skin. Failure to comply may result in injury or death to personnel.

- (1) Remove old gasket material from transmission housing (8). With solvent and brush, wipe mating surface of new control valve to assure a clean surface.
- (2) Install new gasket (7) and control valve (6).
- (3) Insert four mounting capscrews (5) and secure (reference TM 55-1945-205-24-3, Sections N-1 and N-2) for proper torque values. Insert four protective caps (4).
- (4) Connect hydraulic line (3) to control valve (6).
- (5) Connect electrical plug-in connections (1) and (2) to solenoids on control valve.

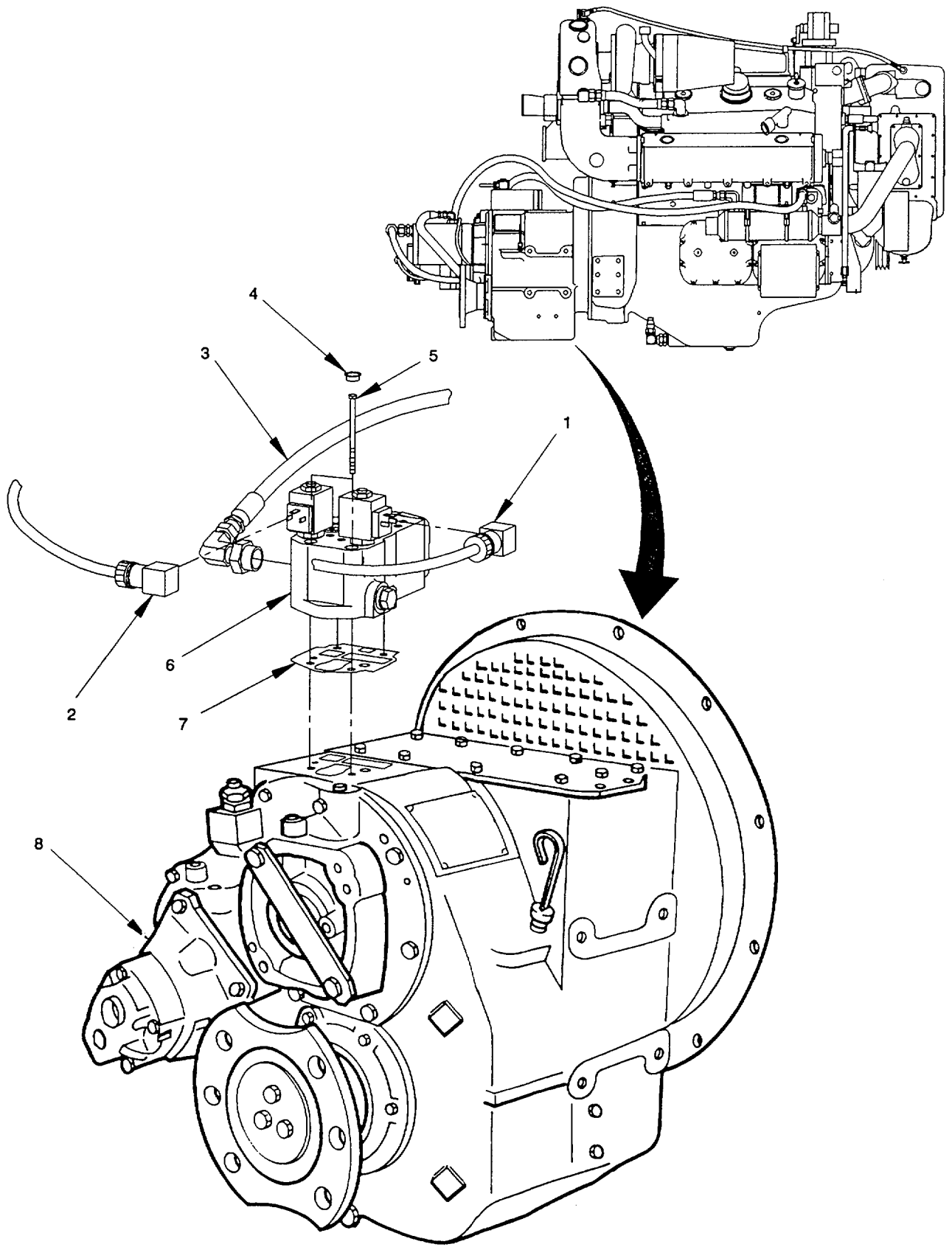


Figure 4-1. Electric Control Valve, Marine Transmission.

4-10. Transfer Case.

 This task covers: a. Remove b. Install

Lubrication Pump Install	Remove Reference	Reference TM 55-1945-205-24-4 (TRANSFER CASE), pages 18, 19, 20 TM 55-1945-205-24-4 (TRANSFER CASE), pages 33, 51
Upper Shaft without shift unit	Remove Install	Reference TM 55-1945-205-24-4 (TRANSFER CASE), pages 18, 19, 27, 28 Reference TM 55-1945-205-24-4 (TRANSFER CASE), pages 33, 38-40
Lower Shaft Install	Remove Reference	Reference TM 55-1945-205-24-4 (TRANSFER CASE), pages 18, 31, 32 TM 55-1945-205-24-4 (TRANSFER CASE), pages 33, 34, 35
Intermediate Shaft Install	Remove Reference	Reference TM 55-1945-205-24-4 (TRANSFER CASE), pages 18, 30 TM 55-1945-205-24-4 (TRANSFER CASE), pages 33, 36, 37

INITIAL SETUP

*Tools**Equipment Condition*

General Mechanics Tool Kit (NSN 5180-00-629-9783) Transfer Case removed (paragraph 3-14).

Material/Parts

As defined in TM 55-1945-205-24-4 .(TRANSFER CASE)

WARNING

When performing transfer case maintenance, the diesel engine should be shut off and tagged to prevent inadvertent operation. Failure to comply may result in personnel injury or death.

When performing transfer case maintenance, the electrical system should be disconnected and tagged to prevent inadvertent operation. Failure to comply may result in personnel injury or death.

Pump-jet marine transmission components and the hydraulic motor will reach temperatures up to 180° F during normal operation. Wait for system to cool prior to performing maintenance. Failure to comply may result in personnel injury or death.

Transfer case weighs approximately 450 lbs, dry. Use proper handling equipment when handling. Failure to comply may result in personnel injury or death.

a. Remove.

For remove procedures of transfer case components, refer to TM 55-1945-205-24-4 (TRANSFER CASE).

b. Install.

For installation procedures of transfer case components, refer to TM 55-1945-205-24-4 (TRANSFER CASE).

FOLLOW ON MAINTENANCE: Install Transfer Case (paragraph 3-14).

4-11. Pump-Jet.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit, Rail and Marine (NSN 5180-00-629-9783)

Materials/Parts

Pump-Jet SPJ82T
 Preformed packings
 Compound, Antiseize (Item 9, Appendix F)
 Puller/Mounting Plate 1102213 {Special Tool}
 Loctite (Item 41, Appendix F)
 Sealer, Loctite 598 (Item 12, Appendix F)

Equipment Condition

All power off to all equipment. All equipment and control/indicators tagged OUT OF SERVICE

All oil drained from Pump-Jet (paragraph 2-21)

All pressure relieved from hydraulic system.

WARNING

When performing maintenance, the electrical system system should be disconnected and tagged OUT OF SERVICE to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

When performing maintenance, the diesel engine should be shut off and tagged to prevent inadvertent operation. Failure to comply can result in serious injury or death to personnel.

Pump-jet gearbox components and the hydraulic steering motor will reach high temperatures during normal operation. Wait for system to cool before performing maintenance. Failure to comply may result in injury or death to personnel.

The pump-jet weighs approximately 6, 000 lbs. Use proper lifting and handling equipment, attached to three lifting eyes on the steering gear housing, when removing or installing the assembly or its components. Failure to comply may result in serious injury or death to personnel.

a. *Remove.* (figure 4-2)

1. Remove bolts (1) connecting the input drive shaft (2) to the input flange (3). Move drive shaft (2) to an area not interfering with unit removal.
2. Disconnect hydraulic tubing (4, 5, 6) from steering motor. Disconnect hydraulic lines leading "to" or "from" steering motor (L3 at location "h", L4 at location "j", and L5 at location "w"). Disconnect hydraulic lines at tee fittings (7, 8, 9) leading to or from steering motor. Protect open tube ends from contamination.

NOTE

Tag and disconnect all electrical connections to the pump-jet feed back unit (10) before further disassembly.

3. Tag and disconnect all electrical connections in feed back unit (10).
4. Disconnect canon plug (11) and remove monitoring device (12) from gear housing (13).

4-11. Pump-Jet (Cont).

WARNING

The pump-jet weighs approximately 6, 000 lbs. Use proper lifting and handling equipment when removing or installing the assembly or its components. Failure to comply may result in serious injury or death to personnel.

5. Attach appropriate lifting equipment to lifting eyes (figure 4-2). Using lifting equipment to hold pump-jet assembly, remove thirty-two nuts (14), (16mm), from studs (15) and lower unit from well. Collect Preformed packing (16).
6. Position unit to allow access to the underside. Remove the ten hexagon socket head capscrews (17) (12mm), and remove water inlet (18) assembly.
7. Remove four hexagon socket head capscrews (19) (10mm), freeing cap (20). Remove cap (20) and collect Preformed packing (21). This will expose the output shaft end and locking element (22).
8. To remove locking element (22), loosen all screws on element. Remove four screws from locking element and relocate in the holes provided. Tighten the four screws evenly to avoid putting unnecessary strain on the parts. Collect Preformed packing (23) and Preformed packing (24).
9. Slide rotary wheel (25) from output shaft. This will expose the output shaft seal assembly (27).

CAUTION

Radial lip seals ride on sealing bushings. Caution shall be taken when removing sealing bush (27, 28) to prevent damage to the ceramic or plasma coated seal riding surface. Wrap riding surfaces with duct tape. Failure to comply may result in damage to equipment.

NOTE

Ceramic sealing surfaces can be identified by the polished black seal riding surfaces. Plasma coated sealing surfaces are polished metallic.

10. Remove eight hexagon head capscrews (26) (8mm). Remove the output shaft sealing bush (27) by using jacking holes provided. Remove sealing bush (28) and collect Preformed packing (29). Remove Preformed packings (30, 31).

NOTE

At this point in the disassembly, the output shaft seals may be replaced. If no other work is to be performed, no further disassembly is required. Go to paragraph b, step (8) and follow steps (8) through (13) of the same paragraph to replace seals and reassemble. Otherwise, if further disassembly is required, follow steps (11) through (25) below.

NOTE

If bearings in gearhead need to be replaced, perform steps (16) through (17) before step (11) below.

11. Support remaining pump-jet assembly to allow access to the twenty-four hexagon capscrews (30) and remove the capscrews (32), (16mm). This frees the diffuser (33). Remove diffuser (33) from the steering gear housing (50) and upper gearbox (13) assembly, and collect Preformed packings (34, 35, 36).

4-11. Pump-Jet (Cont).**NOTE**

Steps (12) through (15) describe replacing the radial seals (43) if no further disassembly is required. Otherwise, go to step (16).

12. Carefully position steering gear housing (50) assembly on adequate supports (approx. 3000 lbs.) with the gearhead down. This will allow access to the area of the radial seals.
13. Remove eight hexagon socket head capscrews (37), (10mm), and remove bell shaped flange (38).

CAUTION

Caution shall be taken to protect the ceramic seal riding surface on the liner (40). Failure to comply may result in damage to equipment.

14. Remove eighteen hexagon socket head capscrews (39) (16mm), and remove liner (40).
15. Remove twenty-four hexagon capscrews (41) (8mm), freeing clamping ring (42). Remove the two exposed radial seals (43).

NOTE

At this point in the disassembly, if the radial seals (43) need to be replaced and no further work is to be performed, no further disassembly is required. If this is the case, perform paragraph b, steps (27) through (35) to replace radial seals (43), then reassemble.

16. To replace bearings in the gearhead, before removing diffuser, remove twelve hexagon capscrews (44) (16mm), and power input housing (45), from main gearhead using jackholes provided. Be careful to not lose spacer ring (46).
17. Remove nineteen hex nuts (47) (16mm) from studs (49) and lift gearbox (13) and output shaft assembly from steering gear housing (50) and well cover (51). Collect spacer (52) and Preformed packings (53). Transport to a suitable area for rebuilding.

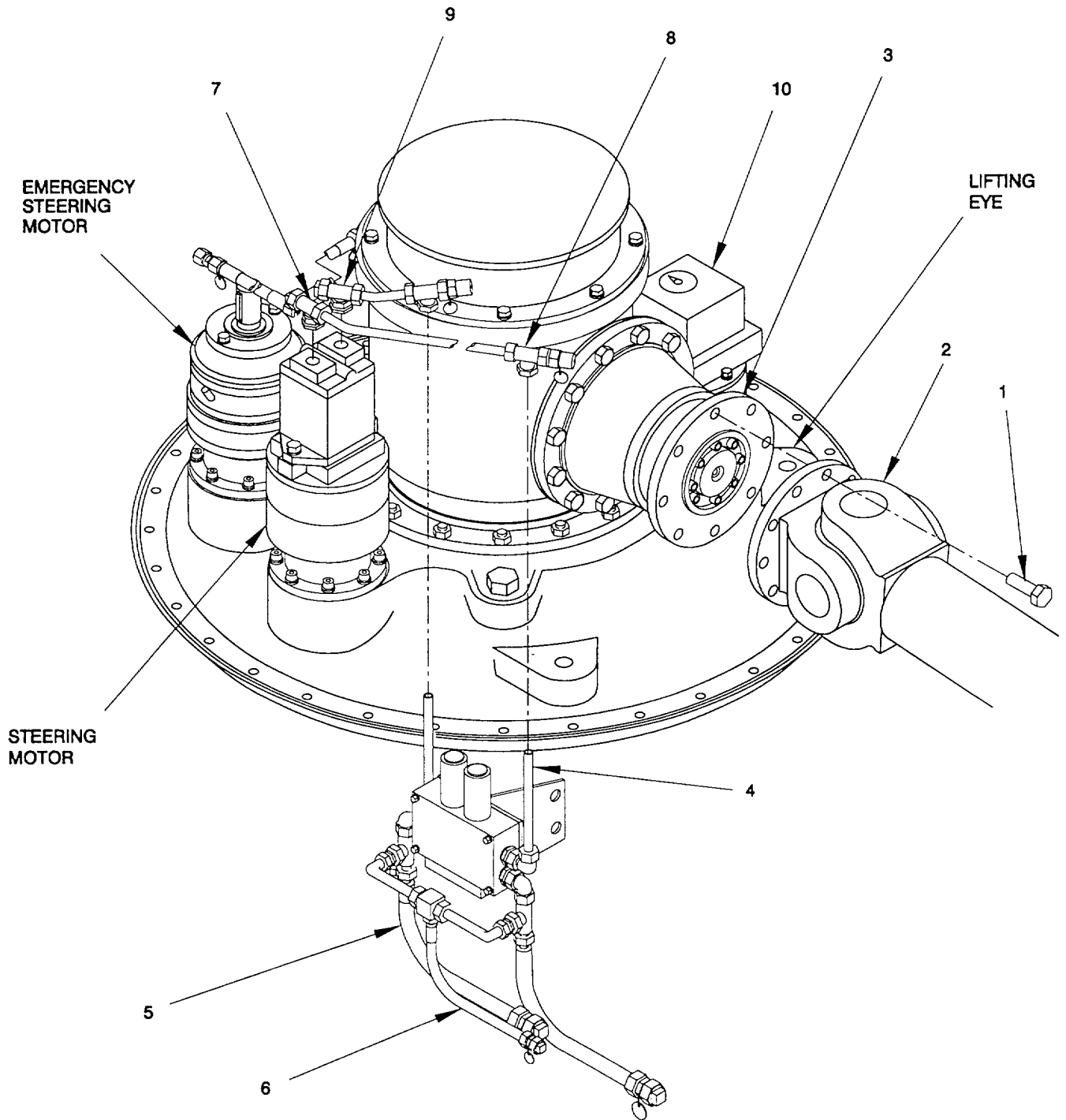


Figure 4-2. Pump-Jet, Remove, Install (Sheet 1 of 3).

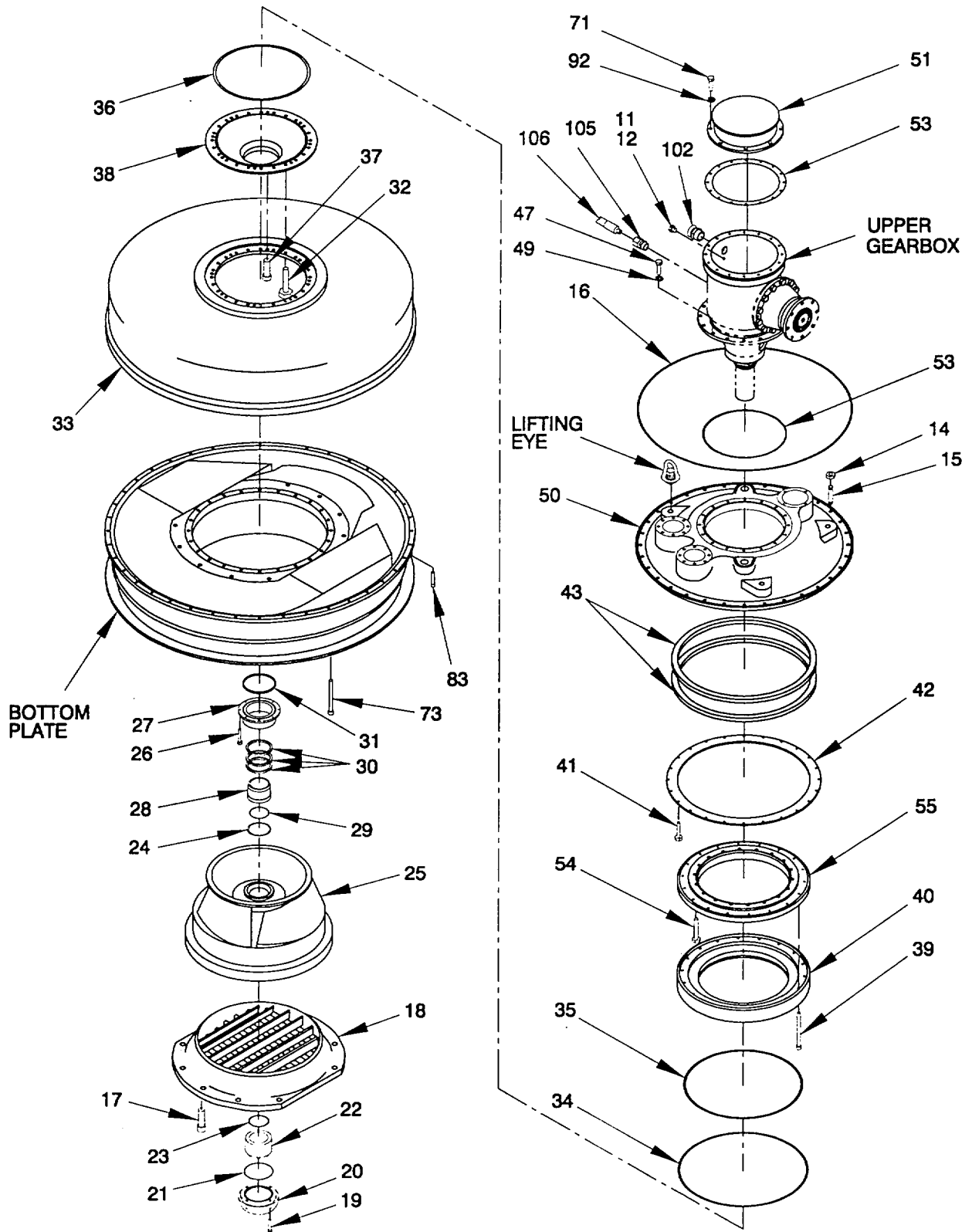


Figure 4-2. Pump-Jet, Remove, Install (Sheet 2 of 3).

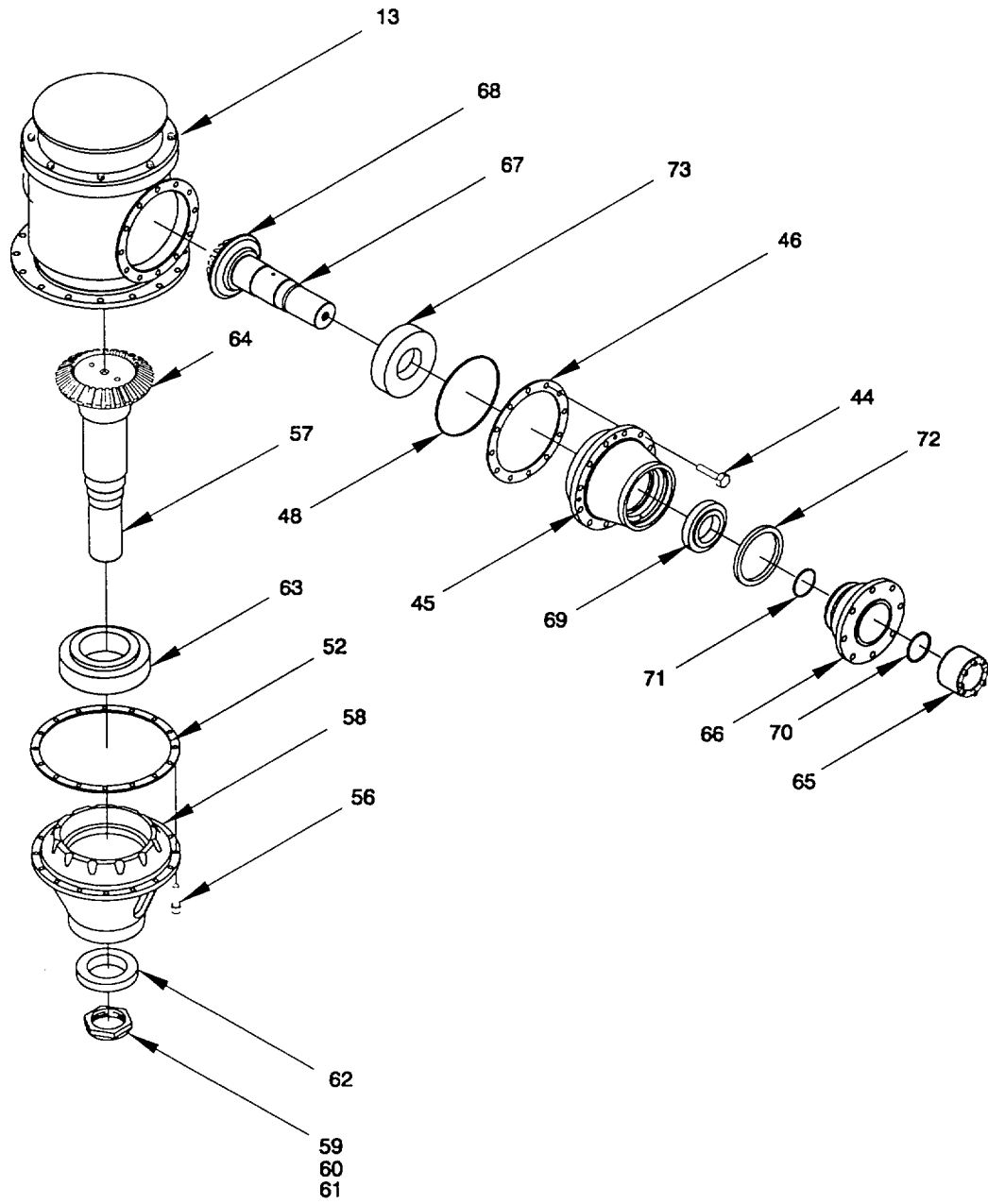


Figure 4-2. Pump-Jet, Remove, Install (Sheet 3 of 3).

4-11. Pump-Jet (Cont).

NOTE

If four point contact bearing (55) needs replacing, but no work is required in the gearbox, follow steps 12 thru 15, then remove eighteen hexagon bolts (54) ((16mm). This will allow for the removal of the four point contact bearing (55).

NOTE

At this point in the disassembly, if the four point bearing (55) needs replacing and no further work is to be performed, no further disassembly is required. If this is the case, go to steps (23) thru (26) and follow steps outlined to replace bearing and reassemble.

NOTE

To replace the upper gearbox bearings, follow steps (18) thru (25) below and refer to figure 4-2.

18. Support gearbox on its top with output shaft pointing up.
 19. Remove sixteen hexagon socket head capscrews (56)(12mm). Lift output shaft (57) and ball end (58) from gearcase. Care should be taken not to lose spacer (52).
 20. Support output shaft assembly and remove three hexagon socket head set screws (59) from slotted nut (61). Smartly rap nut shoulder adjacent to set screw holes with drift and hammer to loosen locking pins (60) in nut. Remove nut (61) from shaft.
 21. Using a press, push output shaft (57) out of conical roller bearing (62), in direction of bevel gears.
 22. Remove outer bearing races from top and bottom of ball end (58). Strip top bearing (63) from output shaft (57). Clean up shaft and all bearing mounting surfaces. Care must be taken to support output bevel gear (64) when it releases from conical roller bearing (62).
 23. Position and support input shaft. To remove locking element (65), loosen all locking element screws. Remove four locking element screws and relocate them in the holes provided. Tighten them evenly to avoid putting unnecessary strain on the parts. Slide input flange (66) from input shaft (67). Care must be taken not to damage ceramic seal face on input flange.
 24. Using a press, push input shaft (67) out of housing, in direction of gear. Care must be taken to catch input bevel gear (68) when it releases from bearing (69). Remove Preformed packings (70 and 71). Remove radial seal (72) as required after inspection.
 25. Remove outer bearing races from housing, strip bearing (73) from shaft. Clean up shaft and bearing mounting surfaces.
- b. Install. (figure 4-2)

NOTE

The following steps (1-7) describe replacement of the input pinion assembly.

1. Tap outer race of conical roller bearing (73) into housing using a composite hammer or brass drift.

4-11. Pump-Jet (Cont).

2. Heat inner bearing (73) to approximately 250° F and install on shaft. Wide face of inner race seats against backside of input bevel gear (68).
3. Tap outer race of conical roller bearing (69) into housing using a composite hammer or brass drift.
4. Insert input shaft (67) into housing, stand upright and support. With input shaft (67) in a vertical position, heat inner bearing (69) to approximately 2500 F and drop onto shaft (67).
5. Install radial seal (72) in housing, with lip facing in.
6. Install new Preformed packing (71) inside bore of input flange (66).
7. Lubricate radial seal (72), with white lithium base grease (Lubriplate), by filling back side of lip. Shaft (67) must be preloaded in a position which allows rotation of shaft. Install coupling and pull onto shaft. Face of coupling must contact the inner race of the outer bearing on the input pinion. Lightly oil end of shaft (67) and push input flange (66) on. Install O seal (70) and push down shaft to bore bottom. Pull coupling on until all slack is taken from bearings. Using a dial indicator, pull coupling an additional 0.03mm. Lightly oil locking element (65) and insert into bore. Utilizing puller plate, preload bearings 0.03mm and tighten diagonally opposite screws of locking element (65) in stages to a final torque of 43 ft/lbs.

NOTE

The following steps (8-13) describe replacement of the output shaft assembly.

8. Tap outer race of conical roller bearing (63) into ball end housing (58) using composite hammer or brass drift.
9. Heat inner bearing (63) to approximately 250° F and install on shaft Wide face of inner race seats against backside of output bevel gear (64).
10. Tap outer race of conical roller bearing (62) into ball end housing (58) using composite hammer or brass drift.
11. Stand and support output bevel gear (64) in a vertical position, gear face down. Lower ball end housing (58) over shaft (67), heat inner bearing (62) to approximately 250° F and slide onto shaft (57).
12. Lightly oil threads and install slotted nut (61). Bearings preload should be 0.02 - 0.04mm. If not, slotted nut (61) must be removed and machined to achieve this preload. If preload is insufficient, a small amount of material must be lopped off the top of the ridge on the slotted nut. (Refer to figure 4-3). If preload is too great, a small amount of material must be machined off the shoulder flat. Once the proper preload is achieved, torque the slotted nut to 1480 ft-lbs.
13. Install three hexagon socket head set screws (59), with Loctite, into slotted nut (61) and torque to 25 ft/lbs.

NOTE

The following steps (14-18) describe replacement of the Upper Gear Housing.

14. Clean up spacer ring (52). Lower output shaft (57) and ball end housing (58) assembly into gear housing (13) with well cover (51), being certain that spacer ring (52) is in place. Install hexagon socket head capscrews (56) (12mm) with Loctite and torque to 86 ft/lbs.

4-11. Pump-Jet (Cont).

15. Clean up spacer ring (46) and install on input shaft housing (45). Support gear housing (13) and insert input shaft housing (45) allowing gear teeth to mesh.
16. Install four hexagon head capscrews (44) and tighten.

NOTE

Normally, if the backlash is too great, a small amount of material must be removed from the input housing spacer to allow the input gear to advance inward, reducing the backlash. Removing small amounts of material from spacer rings causes a large change in backlash. As each amount is removed, recheck backlash until the proper backlash is achieved. Proper fit of bevel gear when unloaded is shown in figure 4-4. Not less than 50% of tooth length should be supporting the load when fully loaded.

The greater the load, the greater the displacements and deviations and the stronger the flank engagement will be displaced towards the small diameter of the beveled gears.

17. Use Prussian Blue to check tooth contact. Using a dial indicator off of a gear flank, check that gear backlash, or the clearance that is designed into the meshing flanks of the rotating gear assembly, is 0.18 mm to 0.23mm. Check that tooth contact is very close to being centered on the flanks. If tooth contact or backlash is not correct, adjustments must be made to spacer rings (46) or (52).

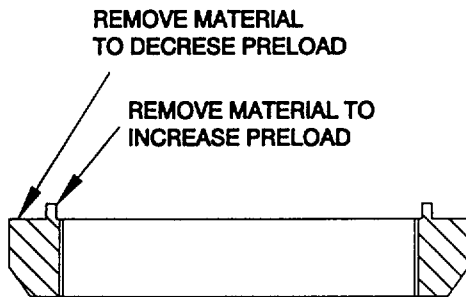


Figure 4-3. Slotted Nut Preload Adjustment.

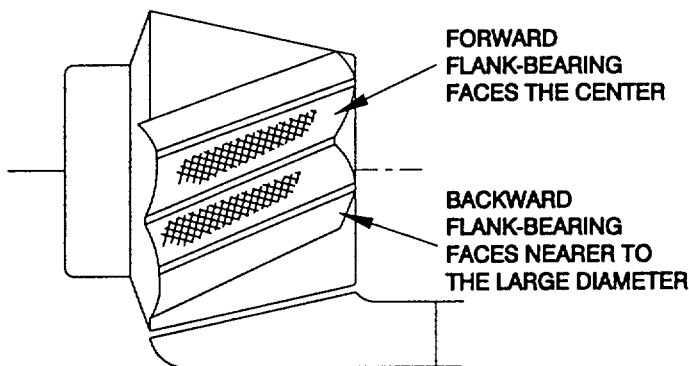


Figure 4-4. Proper Fit of Bevel Gear When Unloaded.

4-11. Pump-Jet (Cont).

18. Remove input housing (45), install Preformed packing (48), and coat with Loctite 598 sealer. Install input housing (45) into gear housing (13). Install twelve hexagon head capscrews (44) (16mm) with Loctite and torque to 200 ft/lbs.

NOTE

The following steps (19-22) describe the installation of the upper gear housing into the steering housing and reassembly of the pump jet.

19. With steering gear housing (50) supported, attach upper gear housing (13) to appropriate lifting device and position over steering housing.
20. Install Preformed packing (53) into accepting groove. Coat with Loctite 598 sealer.
21. Lower upper gear housing (13) over studs (49), checking match marks for correct alignment.
22. Install sixteen nuts (47) (16mm) with Loctite and torque to 200 ft/lbs.

NOTE

The following steps (23-26) describe installation of the four point bearing assembly.

23. Support steering housing (50) and upper gear housing (13) in such a way that output shaft is vertical and upper gear housing (13) is down.
24. Clean all mounting surfaces on steering housing (50) and four point bearing (55) assembly.
25. Lower four point bearing (55) assembly into steering housing (50) and check to be certain that bearing is over pilot step.
26. Install eighteen hexagon head bolts (54) (16mm) with Loctite and torque to 200 ft/lbs.

NOTE

The following steps (27-35) describe Installation of the steering seal assembly.

27. Clean surfaces of seal pocket in steering housing (50).

NOTE

The first radial seal prevents oil from leaking out of the steering housing. The second prevents water from entering the unit.

28. Install first radial seal (43) into housing, with lip facing the oil chamber.
29. Install second radial seal (43) into housing, with lip facing the water and clamping ring.
30. Install clamping ring (42) checking match marks for alignment. Install twenty-four hexagon head capscrews (41), (8mm) with Loctite and torque to 17 ft/lbs.

4-11. Pump-Jet (Cont).

31. Lubricate radial seals (43) with white lithium base grease, (Lubriplate), by filling backside of lips.
32. Lower liner (40) into seal recess, checking that seal lips are not being rolled.
33. Install eighteen hexagon socket head capscrews (39) with Loctite and torque to 200 ft/lbs.
34. Install Preformed packing (36) on bell-shaped flange (38) and coat with Loctite 598 sealer.
35. Install bell-shaped flange (38) on seal liner (40). Install eight hexagon socket head capscrews (37) with Loctite and torque to 35 ft/lbs.

NOTE

The following steps (36-38) describe installation of the diffuser.

36. Clean up all mounting surfaces on diffuser (33), liner (40) and bell-shaped flange (38).
37. Install Preformed packings (34) and (35) and coat with Loctite 598 sealer.
38. Lower diffuser (33) onto mounting surface. Install twenty-four hexagon head capscrews (32), (16mm) with Loctite and torque to 150 ft/lbs.

NOTE

The following steps (39-48) describe installation of the output shaft seal assembly.

39. Remove old power output radial seals (30), and clean up housing and seal pocket.
40. Install new power output radial seals (30) in housing.

NOTE

The first two power output radial seals prevent sea water from entering the Pump-Jet. The last or third seal prevents oil from leaking from the Pump-Jet.

41. The first two radial seals (30) are installed with their lips facing the water space.
42. The last radial seal (30) is installed with its lip facing in towards the oil space.
43. Lubricate radial seals (30) with white lithium base grease (Lubriplate) by filling backsides of lips.
44. Install Preformed packing (31) and coat with Loctite 598.
45. Mount sealing bush (27) on bell-shaped flange (38). Install eight hexagon head capscrews (26) (8mm) with Loctite and torque to 17 ft/lbs.
46. Clean up sealing bush (28). If any chipping or nicks is noted on the ceramic or plasma coated surfaces, the bush (28) must be replaced. Install Preformed packing (29) on inside groove in sealing bush (28).
47. Lightly oil inside of sealing bush (28) and push onto lower shaft until it bottoms on internal step.
48. Install Preformed packing (24) in outer groove of sealing bush (28).

4-11. Pump-Jet (Cont).**NOTE**

The following steps (49-55) describe installation of the rotary wheel and water inlet.

49. Clean up shaft and internal bore of rotary wheel (25).
50. Lightly oil shaft and lower rotary wheel (25) onto shaft until it bottoms on sealing bush (28). Install Preformed packing (23) over shaft and push to bottom bore.
51. Install and tighten diagonally opposite screws of locking element (22) in stages to a final torque of 45 ft/lbs.
52. Fill cavity with white lithium base grease (Lubriplate).
53. Clean up mounting surfaces of cap (20) and rotary wheel (25). Install Preformed packing (21) in groove and coat with Loctite 598 sealer.
54. Install four hexagon socket head capscrews (19), (10mm) with Loctite and torque to 17 ft/lbs.
55. Lower water inlet (18) into recess. Install ten hexagon socket head capscrews (17), (12mm) with Loctite and torque to 60 ft/lbs.

NOTE

The following steps (56-59) describe installation of the pump jet into the well.

56. Clean up both mounting flange surfaces, including Preformed packing groove in steering housing (13).
57. Lay a bead of Loctite 598 sealer into Preformed packing groove and install Preformed packing (16) into sealer.
58. Lift unit and position in well, aligning match marks.
59. Install thirty-two hexagon nuts (14) (16mm) with Loctite, on studs (15) and torque to 144 ft/lbs.
60. Install monitoring device (12) in gear housing (13). Connect canon plug (11).
61. Make electrical connections to feedback unit (10) as tagged.
62. Connect hydraulic lines at tee fittings (7, 8, 9) and those leading to and from steering motor (L3 at location "h", L4 at location "j" and L5 at location "w." Connect hydraulic tubing (4, 5, 6) to steering motor.
63. Fill unit with recommended oil (paragraph 2-21).
64. Install input drive shaft (2) to input flange (3) using bolts (1).
65. Connect all electrical and hydraulic fittings.

4-12. Diode Replacement, Typical.

This task covers: a. Remove b. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Equipment Condition

Module interconnect assembly removed.

Materials/Parts

Panel or terminal board removed.

Diodes

One of the following:

- Bilge Pump Control Assembly "A5"
 - Single Bilge Pump Control Assembly "A7"
 - Lower Control Panel "A2"
 - Terminal Strip "A4"
 - Pump-Jet Junction Box A2JB2
 - Mast Enclosure Assembly
-

- a. *Remove.* (figure 4-5).

NOTE

Diodes are mounted to terminal boards in three different ways on the Modular Causeway Ferry. Typical procedures are described below for each type of mounting.

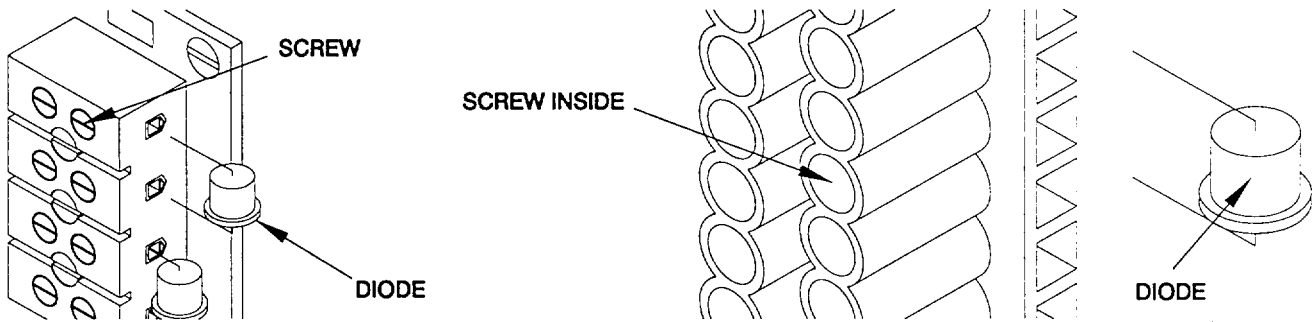
- (1) Screw down mount (applies to Bilge Pump Control Assembly "A5", Single Bilge Pump Control Assembly "A7", Lower Control Panel "A2 and Mast Enclosure "A7").
 - a. Loosen screws holding leads of diode to be replace.
 - b. Remove diodes from side of terminal board.
- (2) Lug mount (applies to Terminal Strip "A4")
 - a. Loosen screws on top of terminal strips.
 - b. Slide diode leads out from under screws on top of board.
- (3) Soldered mount (applies to Pump-Jet Junction Box "A2JB2").
 - a. Attach heat sink, as needed, for proper dissipation of heat to protect components.
 - b. Use soldering iron or gun to loosen diode leads.
 - c. Remove diodes.

- b. *Install.* (figure 4-5).

- (1) Soldered mount (applies to Pump-Jet Junction Box "A2JB2").
 - a. Position diodes on terminal board.
 - b. Attach heat sink, as needed, for proper dissipation of heat to protect components.

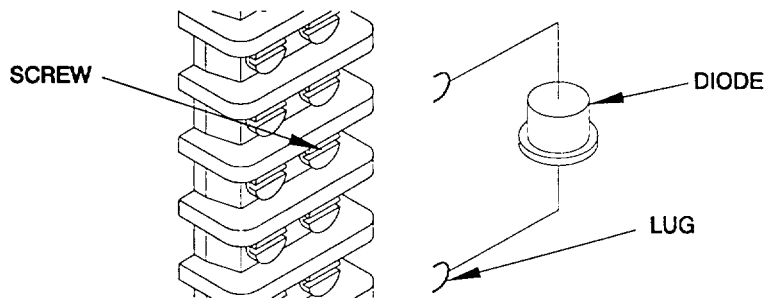
4-12. Diode Replacement, Typical (Cont).

- c. Solder leads with iron or gun.
- (2) Lug mount (applies to Terminal Strip "A4")
 - a. Slide diode leads into position under screws on top of board. Refer to Appendix G for proper placement.
 - b. Tighten screws to secure diodes in position.
- (3) Screw down mount (applies to Bilge Pump Control Assembly "A5", Single Bilge Pump Control Assembly "A7", Lower Control Panel "A2" and Mast Enclosure "A7").
 - a. Insert and hold diodes into proper, side ports of the terminal board.
 - b. Tighten screws to secure diodes in position.



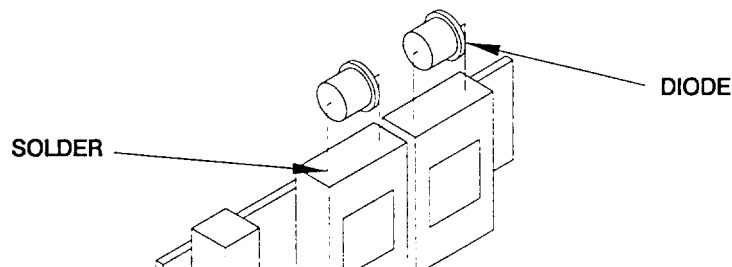
SCREW DOWN MOUNT

USED ON: BILGE PUMP CONTROL ASSEMBLY 'A5', SINGLE BILGE PUMP CONTROL ASSEMBLY "A7", LOWER CONTROL PANEL 'A2', AND MAST ENCLOSURE.



LUG MOUNT

USED ON: TERMINAL STRIP "A4" ASSEMBLY.



SOLDER MOUNT

USED ON: PUMP JET JUNCTION BOX A2JB2

Figure 4-5. Diodes, Typical Remove/Install.

4-13. Module Electrical Interconnect Assembly.

This task covers: a. Remove b. Inspect c. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)
Crimping Tool, E12368-1
Insertion Tool, E12368-2
Extraction Tool, E12368-3

Equipment Condition

Module interconnect assembly removed.

Materials/Parts

Connectors
Pins

- a. *Remove.* (figure 4-6).

NOTE

Wiring to receptacle pins is either soldered or crimped. Disassembly of the electrical interconnect assembly should be performed only in the event of electrical problems (open circuits, short circuits) with the wiring harness or physical damage to the receptacles.

Cab end of cable is painted with red fluorescent paint.

- (1) Disconnect and tag OUT OF SERVICE all power to the module electrical interconnect assembly.
- (2) Unscrew the connectors (1), (2), (3), (4) from the Operator's Cab Assembly.
- (3) Unscrew the connectors (5), (6), (7) and (8) from the power module vent connector end of the cable, opposite the Operator's Cab; access through the intake plenum assembly. Remove the conduit entry plate (9) from the Operator's Cab bulkhead and the conduit entry plate (10) from the intake plenum.
- (4) Disconnect cables (11) containing contact pins (13) from contact sockets (12).
- (5) Remove conduit to panel fitting (14) and conduit to pipe (15) fitting.

- b. *Inspect.* (figure 4-6)

- (1) Inspect for broken or bent pins (13). Replace as needed. Use special tools to replace pins.
- (2) Inspect for broken contact sockets (12) or corrosion on sockets.

- c. *Install.* (figure 4-6)

- (1) Replace conduit to pipe fitting (15) and conduit to panel fitting (14).
- (2) Replace missing pins (13) and reconnect all cables containing contact pins (11) into sockets (12).
- (3) Replace the conduit entry plate (9) in the Operator's Cab and the conduit entry plate (10) from the

4-13. Module Electrical Interconnect Assembly - (Cont).

intake plenum at the "power module vent connector end."

- (4) Re-connect cable connectors (1), (2), (3), (4) and cable connectors (5), (6), (7) and (8).

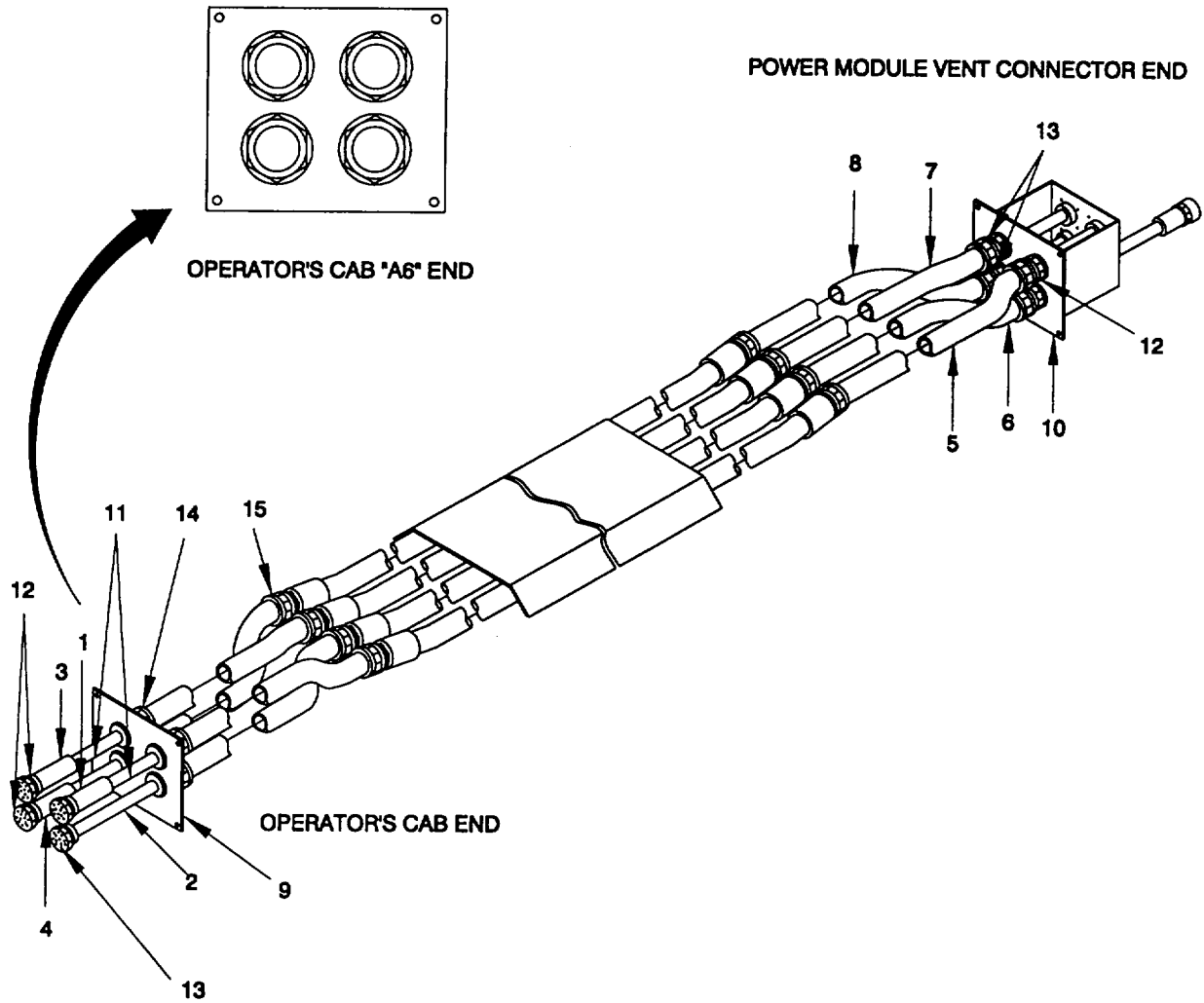


Figure 4-6. Module Interconnect Assembly, Remove/Install.

4-14. Spreader Assembly Bridle Sling.

This task covers: a. Remove b. Inspect c. Service d. Test e. Install

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)
Wrench, Adjustable, 12"

Equipment Condition

Bridle sling lowered to ground to permit disassembly, inspection and reassembly.

Materials/Parts

Sling, Bridle (Item 77, Appendix C)
Shackles, (Items 72 - 76, Appendix C)
Appropriate lifting device for 6, 000 lbs. load.
Rust preventative compound (Item 11, Appendix F) or
wire rope grease (Item 25, Appendix F)

- a. Remove. (figure 4-6)

WARNING

Spreader assembly weighs 5, 970 lbs. Shackles weigh 52 to 178 lbs. Bridle sling weighs 746 lbs. Use appropriate lifting devices when performing maintenance. Failure to comply can result in serious injury or death to personnel.

All personnel shall be kept clear of loads about to be lifted and of suspended loads.

- (1) Remove hex head capscrews (1) and hex nut (2) securing 55 ton shackle (3). Remove 55 ton shackle (3) and bridle sling (7).
- (2) Remove two hex head capscrews (4) and two hex nuts (5) securing two 35 ton shackles (6) to bridle sling (7). Remove 35 ton shackles (6).

- b. Inspect. (figure 4-6)

Refer to TB 43-0142 for inspection criteria for lifting devices.

WARNING

Slings must be replaced if any one of the following conditions exist: severe localized abrasion or scraping; damage such as kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure; end attachments that are cracked, deformed, or worn to the extent that the strength of the sling is substantially affected. Failure to comply may result in serious injury or death to personnel.

- (1) Daily, and before each use, inspect inside of shackles for wear, signs of fatigue, cracks, distortion, corrosion, damage or defects. Immediately replace entire shackle if any such condition is noted.
- (2) Daily, and before each use, inspect swaged ends of wire ropes for signs of stress, loosening of joints, corrosion, damage, defects, or other weakening conditions. Replace entire rope if any such condition is noted.

4-14. Spreader Assembly Bridle Sling (Cont).

- (3) Daily, and before each use, inspect wire rope for signs of stress, corrosion, damage, defects, broken strands or other weakening conditions. Replace entire rope if any such condition is noted.
- (4) Check that length of slings are matched $\pm 2.25"$.

c. Service.

Apply rust preventative compound or wire rope grease to sling components to maintain corrosion resistance.

d. Test.

Each time bridle sling components are replaced, the sling must be re-certified. Load ratings must be certified as follows:

- (1) Vertical design load total = 50 tons
- (2) Tension design load per sling = 35 tons
- (3) Proof load per sling = 81 tons
- (4) Minimum UTS per sling = 122 tons

e. Install. (figure 4-6)**NOTE**

Shackles must be certified for the following loads: proof load 2.2 X rated capacity, ultimate strength 1.5 X proof load.

- (1) Install two 35 ton shackles (6) on new bridle sling (7). Secure with two hex head capscrews (4) and two hex nuts (5).
- (2) Install 55 ton shackle (3) on bridle sling (7) and secure to spreader assembly with hex head capscrew (1) and hex nut (2).

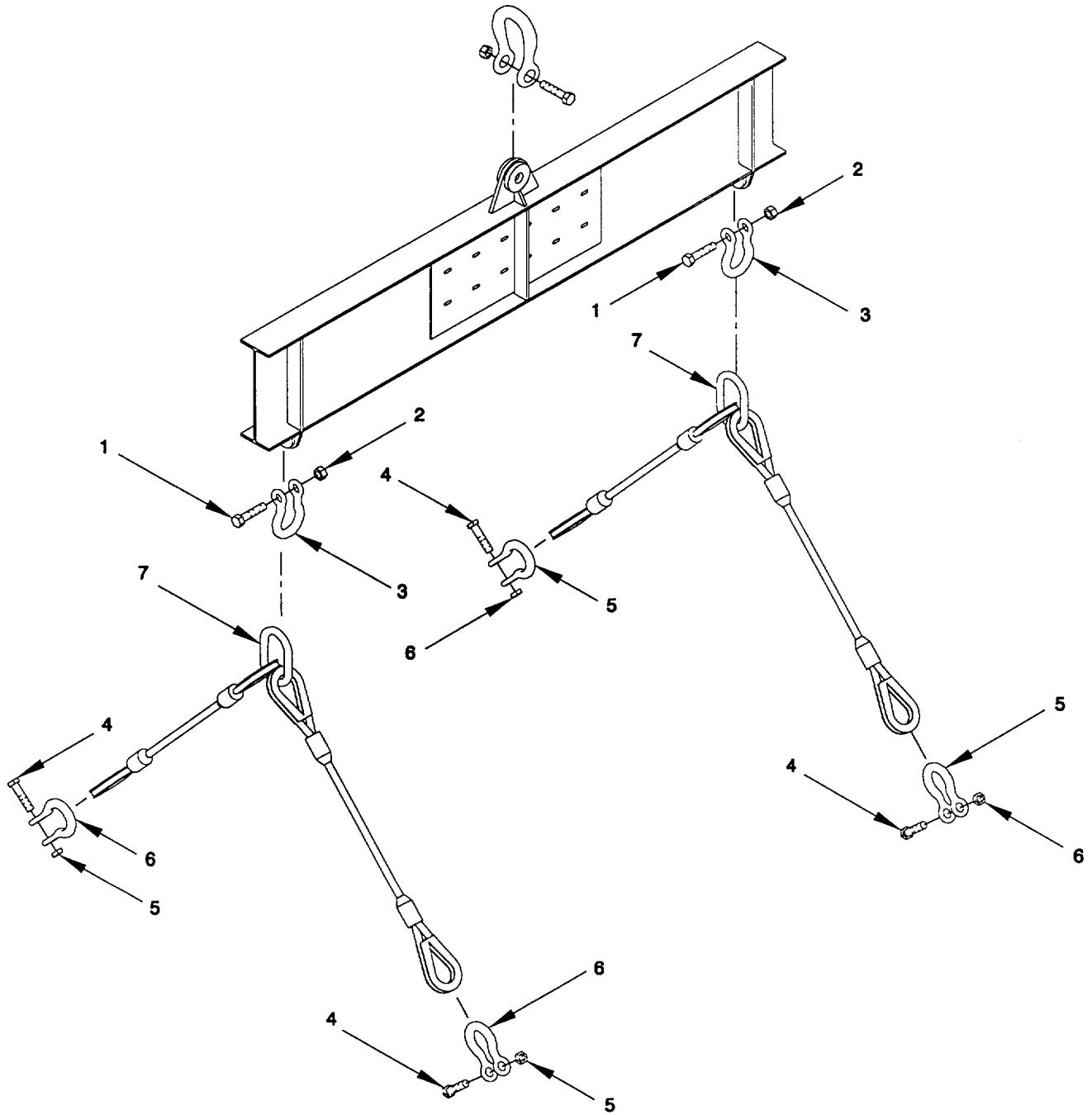


Figure 4-7. Spreader Assembly Bridle Sling, Remove/Install.

4-15. Way-Valve Assembly, Hydraulic System.

This task covers: a. Repair

INITIAL SETUP*Tools*

General Mechanic's Tool Kit (NSN 5180-00-629-9783)

Materials/Parts

Preformed packings (Items 80, 81, 82, 83, 84, 87, 88, 90, Appendix E)

Seals (Items 85, 86, 89, Appendix E)

Valve, Electric Control

Equipment Condition

Way-Valve unit removed from hydraulic system (refer to paragraph 2-30).

- a. Repair. (figure 4-8)

WARNING

Hydraulic fluid is toxic. Avoid contact with skin and eyes. Wear approved gloves and safety goggles. Avoid breathing vapors. Use only in adequate ventilation. Do not take internally. Material can be fatal if swallowed. If taken internally, seek medical help immediately.

CAUTION

During hydraulic component removal or replacement, precautions shall be taken to prevent foreign matter from entering the hydraulic system. Covers and caps should be metal or plastic; materials subject to lint, splinters, flaking, crumbling, etc. should not be used.

- (1) Remove four circlips (1), two pins (2) and collecting link (3).
- (2) Remove four bolts (4) to free block (6) with control rod. Collect preformed packing (5).
- (3) Pull block (6) out of housing (14) and collect dust ring (7), cover (8), ring (9), seal (10), ring (11), bushing (12), preformed packing (13) and housing (14).
- (4) Remove four bolts (15) from block valve (18). and collect five preformed packings (16) and one preformed packing (17).
- (5) Remove push-pull rod assembly from block valve (18). Collect preformed packing (19), bushing (20), preformed packing (21) and bushing (22).
- (6) Remove bushing (23), support (24), spring (25), and spring (26).
- (7) Remove pin (27) and collect disc (28), preformed packing (29), preformed packing (30), preformed packing (31), piston (32), support (33), bushing (34) and clamp (35) from control rod (36).
- (8) As necessary, remove electric control valve (37).
- (9) Inspect all components for burrs, foreign matter, dirt, rust, corrosion, scale and/or loose or broken parts. Remove as possible. Repair is limited to replacement of parts as necessary or identified for mandatory replacement in the following steps.

4-15. Way-Valve Assembly, Hydraulic System (Cont).

- (10) Replace electric control valve (37).
- (11) Holding control rod (36), replace clamp (35), bushing (34), support (33), piston (32), new preformed packings (29-31), and disc (28). Secure with pin (27).
- (12) Replace springs (25 and 26) and install support (24) and bushing (23).
- (13) Insert bushing (22), new preformed packing (21), bushing (20) and preformed packing (19) into block valve (18).
- (14) Position block valve (18), new preformed packing (17), and secure with four new preformed packings (16) and bolts (15).
- (15) Position new preformed packing (5) and housing (14) on block valve (18). Position new preformed packing (13), bushing (12), ring (11), new seal (10), and ring (9) on housing.
- (16) Install cover (8) and dust ring (7).
- (17) Position block (6) over end of push-pull rod (36) and secure with four bolts (4).
- (18) Position connecting link (3) on rod and insert pins (2). Secure with circlips (1).

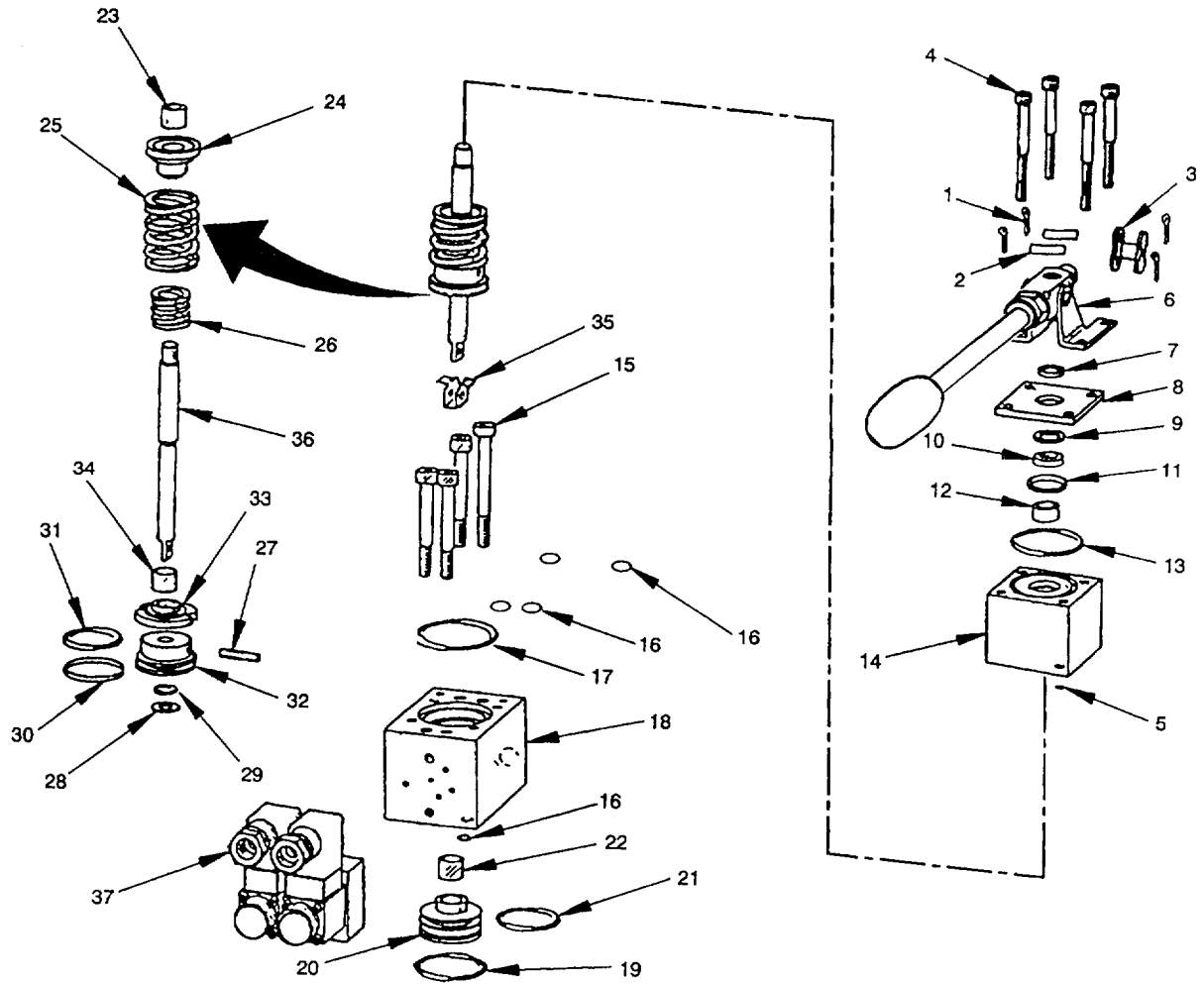


Figure 4-8. Way-Valve, Hydraulic System, Repair.

APPENDIX A

REFERENCES

A-1. Scope.

This appendix lists all Forms, Field Manuals, and Technical Manuals referenced in this manual, and other relevant manuals.

A-2. Forms.

Recommended Changes to Publications and Blank Forms	DA Form 2028
Recommended Changes to Equipment Technical Publications	DA Form 2028-2
Equipment Inspection and Maintenance Worksheet	DA Form 2404
Product Quality Deficiency Report	SF-368

A-3. Field Manuals.

First Aid for Soldiers.....	FM 21-11
Watercraft Operator	FM 55-501
Watercraft Engineer	FM 55-509

A-4. Technical Manuals.

Destruction of Military Material to Prevent Enemy Use.....	TM 750-244-6
Installation Instructions for Installation Kit Electronic Equipment MK-2347NRC (NSN 5895-01-328-1990) (EIC: N/A) To Permit Installation of Radio Sets ANNRC-89/91/92 Series into U.S. Army Watercraft	TB 11-5820-890-20-23
Lubrication Order, MCF	LO 55-1945-205-12
Operator Controls, PMCS, and Operation Under Usual/Unusual Conditions, Modular Causeway Ferry (MCF)	TM 55-1945-205-10
Operator, Unit, Direct Support and General Support Maintenance Manual, Modular Causeway Section (MCS)	TM 55-1945-207-14&P
Painting of Vessels	TB 43-0144
Repair Parts and Special Tools List for the MCF.....	TM 55-1945-205-24P
Unit, Direct Support and General Support Maintenance Manual Modular Causeway Ferry (MCF).....	TM 55-1945-205-24-1
Unit, Direct Support and General Support Maintenance Manual, Diesel Engine (MCF)	TM 55-1945-205-24-2
Unit, Direct Support and General Support Maintenance Manual, Marine Transmission (MCF)	TM 55-1945-205-24-3
Unit, Direct Support and General Support Maintenance Manual, Transfer Case (MCF)	TM 55-1945-205-24-4

A-5. Miscellaneous.

Material Deterioration Prevention and Control	DARCOM Reg 702-24
Army Corrosion Prevention and Control Program	AR 750-59
Watercraft Information and Reporting System (WIRS) Data Collection for Configuration Control	TB 55-1900-205-24

APPENDIX B

MAINTENANCE ALLOCATION CHART (MAC)

Section I. INTRODUCTION

B-1. The Army Maintenance System Mac.

a. This introduction (Section I) provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or components will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown in the MAC in column (4) as:

Unit - includes two subcolumns: C (operator/crew) and O (unit) maintenance.

Direct Support - includes an F subcolumn.

General Support - includes an H subcolumn.

Depot- includes a D subcolumn.

c. Section III lists the tools and test equipment (both special tools and common tools sets) required for each maintenance function referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function as referenced from Section II.

B-2. Maintenance Functions.

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (i.e., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontamination, when required), to replace filters, to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. 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.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. Replace is

authorized by the MAC and is shown as the 3rd position code of the SMR code.

i. Repair. The application of maintenance services¹ including fault location/troubleshooting², removal/installation, and disassembly/assembly³ procedures, and maintenance actions⁴ to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and item, or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those service/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 material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment and components.

B-3. Explanation of Columns in the Mac, Section II.

a. Column 1 Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2 Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3 Maintenance Function. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph A-2.)

d. Column 4 Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the

¹Service - Inspect, test, service, adjust, align, calibrate, and/or replace.

²Fault 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).

³Disassembly/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., identification as maintenance significant).

⁴Actions - Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

- C Operator or Crew
- O Unit Maintenance
- F Direct Support Maintenance (DS)
- H General Support Maintenance (GS)
- D Depot Maintenance

e. Column 5 Tools and Equipment. Column 5 specifies, by number code, those common tool sets (not individual tools) and special tools; Test, Measurement, and Diagnostic Equipment (TMDE); and support equipment required to perform the designated function, which shall be keyed to the tools listed in Section III.

f. Column 6 Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in Section IV.

B-4. Explanation of Columns in Tool and Test Equipment Requirements, Section III.

a. Column 1 Reference Code. The tool and test equipment reference code correlates with a number code used in the MAC, Section II, Column 5.

b. Column 2 Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3 Nomenclature. Name or identification of the tool or test equipment.

d. Column 4 National Stock Number. The National stock number (NSN) of the tool or test equipment.

e. Column 5 Tool Number. The manufacturer's part number.

B-5. Explanation of Columns in Remarks, Section IV.

a. Column 1 Reference Code. The letter code recorded in Column 6, Section II.

b. Column 2 Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

**Section II. MAINTENANCE ALLOCATION CHART
FOR
MODULAR CAUSEWAY FERRY (MCF)**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS-	DEPOT		
			C	O	F	H	D		
0	Modular Causeway Ferry (MCF)	INSPECT	2.0	6.0	2.0	4.0		1-11	C
		SERVICE	2.0	6.0	2.0			1-12	F
01	Powered Section Assembly	INSPECT	2.0					1-11	C
		SERVICE	2.0	2.0				1-12	F
		TEST	0.5						
0101	P40P Propulsion Module Assembly	INSPECT	4.0					1-11	C, G
		SERVICE	8.0					1-13	A, C, E, F
		REPAIR	2.0			4.0		1-13	C, G
		TEST	0.5						
010101	Engine Cooling System Install.	INSPECT	0.5						C, G
		REPLACE	0.5	1.5					
		REPAIR	0.5	1.5					
		TEST	0.5						
01010101	Duplex Strainer	SERVICE		1.5				11	C
		REPAIR			1.0			12	
		REPLACE		1.0				12	B
		ADJUST		0.5					
010102	Drive Train Installation	INSPECT	1.0	1.5					C, G
		SERVICE	0.5	0.5					C, G
		REPLACE			1.0				C, G
		REPAIR				2.0			C, G
		ALIGN			2.0				
01010201	Diesel Engine	INSPECT	1.5	1.0				11	C
		SERVICE		2.0	2.0			1-12	C
		REPLACE			8.0				
		REPAIR		10.0	24.0	12.0	63.5	12	
		TEST	1.0		1.0	1.0			H
		ADJUST	2.0	2.0				11	H
0101020101	Cylinder Block Group	REPLACE				4.0		12	I, K
		REPAIR				4.0		12	I, K
010102010101	Block Assembly	REPLACE				4.0		12	I, K
		REPAIR				6.2		12	I, K
010102010102	Plate Assembly	REPLACE				2.0		12	I, K
		REPAIR				4.0		12	I, K
010102010103	Plate Assembly	REPLACE				2.0		12	I, K
		REPAIR				4.0		12	I, K
0101020102	Air Box Drains Group	REPLACE		1.0				12	K
		REPAIR		1.4				12	K
0101020103	Cylinder Head Group	INSPECT			0.6			12	B, K
		REPLACE			8.0				
		REPAIR				2.1		12	K
010102010301	Cylinder Head Assembly	REPLACE			4.0			12	I, K
		REPAIR				10.0		12	I, K

**Section II. MAINTENANCE ALLOCATION CHART
FOR
MODULAR CAUSEWAY FERRY (MCF)**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS-	DEPOT		
			C	O	F	H	D		
0101020104	Engine Lifter Brackets Group	REPLACE			0.5			12	K
		REPAIR			0.5			12	K
0101020105	Crankshaft and Stabilizers Group	REPLACE				1.5		12	I, K
		REPAIR				5.6		12	I, K
010102010501	Crank Assembly	REPLACE				1.0		12	I, K
		REPAIR				10.0		12	I, K
0101020106	Vibration Damper Group	REPLACE			1.0			12	K
		REPAIR			2.6			12	K
010102010601	Hub Assembly	REPLACE			0.5			12	I, K
		REPAIR			1.0			12	I, K
0101020107	Crankshaft Pulley Group	REPLACE			1.0			12	K
		REPAIR			1.0			12	K
0101020108	Flywheel Housing Group	REPLACE				0.5		12	K
		REPAIR				2.0		12	K
0101020109	Flywheel Group	REPLACE				1.0		12	K
		REPAIR				4.0		12	K
010102010901	Flywheel Assembly	REPLACE				4.0		12	I, K
		REPAIR				4.0		12	I, K
0101020110	Connecting Rod and Piston Group	REPLACE				4.0		12	K
		REPAIR				4.0		12	K
010102011001	Rod Assembly	REPLACE				2.0		12	I, K
		REPAIR				2.0		12	I, K
0101020111	Camshaft and Gear Train Group	REPLACE				7.0		12	K
		REPAIR				8.0		12	K
010102011101	Hub Assembly	REPLACE				2.0		12	I, K
		REPAIR				2.0		12	I, K
0101020112	Balance Weight Cover Group	REPLACE				1.0		12	K
		REPAIR				1.0		12	K
010102011201	Cover Assembly	REPLACE				0.5		12	I, K
		REPAIR				0.5		12	I, K
0101020113	Valve and Injector Operator Group	REPLACE				1.4		12	K
		REPAIR				1.6		12	K
010102011301	Shaft Assembly	REPLACE				0.5		12	I, K
		REPAIR				0.5		12	I, K
010102011302	Left Arm Assembly	REPLACE				0.5		12	I, K
		REPAIR				0.5		12	I, K
010102011303	Right Arm Assembly	REPLACE				0.5		12	I, K
		REPAIR				0.5		12	I, K
010102011304	Clevis Arm Assembly	REPLACE				0.5		12	I, K
		REPAIR				0.5		12	I, K

**Section II. MAINTENANCE ALLOCATION CHART
FOR
MODULAR CAUSEWAY FERRY (MCF)**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS-	DEPOT		
			C	O	F	H	D		
0101020114	Rocker Cover Group	REPLACE			0.5			12	K
		REPAIR			0.5			12	K
0101020115	Fuel injector/Change Controls Group	REPLACE					1.6	12	K
		REPAIR					2.2	12	K
0101020117	Fuel Pump Group	REPLACE					0.5	12	K
		REPAIR					1.7	12	K
010102011701	Pump Assembly	REPLACE					1.0	12	I, K
		REPAIR					1.0	12	I, K
0101020118	Fuel Filter Mounting Group	REPLACE		0.4					
		REPAIR		0.4				12	K
0101020119	Fuel Manifold and Connections Group	REPLACE					0.4	12	K
		REPAIR					0.8	12	K
010102011901	Pipe Assembly	REPLACE					0.5	12	I, K
		REPAIR					0.5	12	I, K
010102011902	Pipe Assembly	REPLACE					0.5		
		REPAIR					0.5	12	I, K
0101020120	Fuel Lines Filter and Cooler Group	REPLACE		1.0				12	K
		REPAIR		1.8				12	K
010102012001	FuelN/Water Separator	SERVICE		0.5					
		REPLACE		1.0				12	I, K
		REPAIR		1.0				12	I, K
0101020121	Electric Governor Group	REPLACE			1.0			12	K
		REPAIR			1.5			12	K
		ADJUST			0.5			12	K
010102012101	Housing Assembly	REPLACE			0.3			12	I, K
		REPAIR			0.3			12	I, K
0101020122	Injector Controls Group	REPLACE			1.5			12	K
		REPAIR			3.0			12	K
010102012201	Lever Assembly	REPLACE			0.5			12	I, K
		REPAIR			0.5			12	I, K
010102012202	Modulator Assembly	REPLACE			0.5			12	I, K
		REPAIR			0.5			12	I, K
0101020123	Air Inlet Housing Group	SERVICE			1.5			12	K
		REPLACE			1.5			12	K
		REPAIR			1.5			12	K
010102012301	Housing Assembly	REPLACE			1.5			12	I, K
		REPAIR			1.5			12	I, K
0101020124	Blower and Drive Group	REPLACE			2.0			12	K
		REPAIR			2.0			12	K
010102012401	Blower Assembly	REPLACE			2.0				
		REPAIR			2.0			12	I, K

**Section II. MAINTENANCE ALLOCATION CHART
FOR
MODULAR CAUSEWAY FERRY (MCF)**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS-	DEPOT		
			C	O	F	H	D		
010102012402	Rotor Assembly	REPLACE			2.0			12	I, K
		REPAIR			2.0			12	I, K
010102012403	Rotor Assembly	REPLACE			2.0			12	I, K
		REPAIR			2.0			12	I, K
010102012404	Plate Assembly	REPLACE			2.0			12	I, K
		REPAIR			2.0			12	I, K
01012012405	Plate Assembly	REPLACE			2.0			12	I, K
		REPAIR			2.0			12	I, K
010102012406	Connector Assembly	REPLACE			3.0			12	I, K
		REPAIR			3.0			12	I, K
0101020125	Blower Drive Shaft Group	REPLACE			1.5			12	K
		REPAIR			1.5			12	K
0101020126	Turbocharger Group	REPLACE			1.0			12	K
		REPAIR					0.5	12	K
010102012601	Aftercooler Assembly	REPLACE					2.0		
		REPAIR					2.0	12	I, K
0101020127	Oil Pump Group	REPLACE					1.5		
		REPAIR					3.0	12	K
010102012701	Pump Assembly	REPLACE					1.0		
		REPAIR					1.0	12	I, K
0101020128	Oil Distribution System Group	REPLACE					2.0		
		REPAIR					3.7	12	K
0101020129	Oil Pressure Regulator Group	REPLACE					1.5		
		REPAIR					2.1	12	K
010102012901	Regulator Assembly	REPLACE					1.0		
		REPAIR					1.0	12	I, K
010102012902	Valve Assembly	REPLACE					1.0		
		REPAIR					1.0	12	I, K
0101020130	Oil Filter Group	REPLACE		0.5					
		REPAIR		0.5				12	K
0101020131	Oil Cooler and Marine Gear Lines Group	REPLACE			2.5				
		REPAIR			1.5			12	K
0101020132	Oil Filter Group	REPLACE		1.0					
		REPAIR		1.5				12	K
0101020133	Dipstick Group	REPLACE		0.5					
		REPAIR		0.5				12	K
0101020134	Oil Pan Group	REPLACE			0.5				
		REPAIR			2.0			12	K
0101020135	Ventilation System Group	REPLACE			1.5				
		REPAIR			2.0			12	K

**Section II. MAINTENANCE ALLOCATION CHART
FOR
MODULAR CAUSEWAY FERRY (MCF)**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS-	DEPOT		
			C	O	F	H	D		
010102013501	Collector Assembly	REPLACE			1.0				
		REPAIR			2.5			12	I, K
010102013502	Collector Assembly	REPLACE			1.0				
		REPAIR			2.5			12	I, K
0101020136	Fresh Water Pump Group	REPLACE			1.5			11	B
		REPAIR			3.0			12	K
010102013601	Pump	REPLACE			1.0				
		REPAIR			1.0			12	I, K
0101020137	Manifold Water Outlet Group	SERVICE		1.1				12	K
		REPLACE		1.5					
		REPAIR		2.0				12	K
0101020138	Thermostat Group	REPLACE			1.0				
		REPAIR			2.0			11	K
0101020139	Water Bypass Tube Group	REPLACE		0.5					
		REPAIR		1.0				12	K
0101020140	Water Connection Group	REPLACE				2.5			
		REPAIR				2.5		12	B
0101020141	Heat Exchanger Group	INSPECT		2.0				12	K
		SERVICE		2.5				12	K
		REPLACE			2.5				
		REPAIR			3.5			12	B
010102014101	Electrode Assembly	REPLACE			0.5				
		REPAIR			2.1			12	I, K
0101020142	Raw Water Pump Group	SERVICE		0.5				11	
		REPAIR				3.0		12	B, K
		REPLACE			1.5				
010102014201	Pump Assembly	REPLACE			1.0				
		REPAIR			1.0			12	I, K
0101020143	Water Filter Group	SERVICE	0.75					12	K
		REPLACE	0.4						
		REPAIR	0.4					12	K
0101020144	Exhaust Manifold Connections Group	REPLACE		1.0					
		REPAIR		4.0				12	K
0101020145	Exhaust Muffler Connections Group	REPLACE	0.5					12	B
		REPAIR	0.5						
0101020146	Starting Motor Group	REPLACE	0.5						
		REPAIR	1.9					12	
0101020147	Tachometer Drive Group	REPLACE	2.0						
		REPAIR	2.0					12	B
0101020148	Alarm System Group	REPLACE		1.0					
		REPAIR		3.5				12	K

**Section II. MAINTENANCE ALLOCATION CHART
FOR
MODULAR CAUSEWAY FERRY (MCF)**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS	
			UNIT		DS	GS-	DEPOT			
			C	O	F	H	D			
0101020149	Overspeed Governor Group	ADJUST			1.0			12	K	
		REPLACE			2.0					
		REPAIR			2.0			12	K	
0101020150	Instruments Sending Units Group	REPLACE			0.5					
		REPAIR			1.1			12	K	
0101020151	Pushbutton Group	REPLACE			0.5					
0101020152	Heater Connections Group	REPAIR			1.0			12	B, K	
		REPLACE		1.0						
0101020153	Alternator and Bracket Group	REPLACE						12	K	
		REPAIR		2.0						
		TEST		0.5				12	K	
0101020154	Wire Harness Group	REPLACE						12	B	
		REPAIR		2.0						
		ADJUST		0.5				12	K	
0101020154	Wire Harness Group	REPLACE					2.0			
		REPAIR					1.0		12	K
0101020155	Cold Pac Starting Aid Group	INSPECT		0.1					12	
		SERVICE		0.5					12	
		REPLACE		1.5						
		REPAIR		0.5					12	B
010102015501	Cold Pac Assembly	REPLACE		1.5					12	
		REPAIR		0.5					12	
0101020156	Fuel Priming Pump Group	REPLACE		1.0					12	B, K
		REPAIR		1.0						
0101020157	Marine Gear	INSPECT	0.5	0.5						
		SERVICE		1.0						
		ADJUST			1.0				12	B, I, K
		REPLACE			6.0					
		REPAIR				6.0				
010102015701	Electric Control Valve	ALIGN			2.0					
		REPAIR					3.0			
		REPLACE					3.0			
01010202	Transfer Case	INSPECT	0.5	0.5					11	
		SERVICE		1.0					11	C, F, K
01010203	Pump-Jet	REPLACE			2.0					
		REPAIR				4.0			12	
		INSPECT	0.5	0.5					11	
0101020301	Upper Gear Box	SERVICE	1.0	1.5					11	C, F
		REPAIR		0.5			10.0		12	
		REPLACE					6.0			
0101020302	Hydro-Motor	REPLACE					3.0			
		REPAIR					3.0			
0101020303	Planetary Gearing	REPLACE			2.0					
		REPAIR					3.0			

**Section II. MAINTENANCE ALLOCATION CHART
FOR
MODULAR CAUSEWAY FERRY (MCF)**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS-	DEPOT		
			C	O	F	H	D		
0101020304	Feed Back Unit	REPLACE			0.5				
		REPAIR				1.0			
0101020305	Planetary Gearing	SERVICE			0.5	0.5			
		REPLACE			2.0				
		REPAIR				3.0			
01010204	Fast Lube Oil Change System	REPLACE		0.5					
		REPAIR		0.5					
01010205	Tank Assembly	REPLACE		0.5					
		REPAIR		0.5					
010103	Machinery Guard Installation	REPLACE		0.5			12	B B	
		REPAIR		0.5					
010104	Engine Exhaust System Installation	REPLACE		4.0					
		REPAIR		2.0					
		SERVICE	0.25				11		
01010401	Muffler Assembly	REPAIR		0.5					
		REPLACE		0.5					
01010402	Thru Hull Assembly	REPAIR		0.5					
		REPLACE		0.5					
01010403	Retainer Assembly	REPAIR		0.5					
		REPLACE		0.5					
010105	Hydraulic System Installation	INSPECT	1.0	3.0			11	C	
		SERVICE		6.0			11	C, D, G	
		REPLACE		4.0					
		REPAIR		1.0			12		
		ADJUST		1.0			12	B	
01010501	Hydro-Pump Installation	REPLACE		1.0					
		REPAIR		1.0					
		ADJUST		1.0					
0101050101	Pump	REPLACE		1.0					
		REPAIR				4.0			
01010502	Valve Unit	REPLACE		1.0					
		REPAIR		1.0					
0101050201	Valve	REPLACE		1.0					
		REPAIR				2.5			
01010503	Hydro-Handpump Installation	REPLACE		1.0					
		REPAIR		1.0					
		SERVICE		0.2					
0101050301	Handpump	INSPECT	0.2						
		REPLACE		1.0					
		REPAIR		1.0					
01010504	Ball Valve	REPLACE		0.5					
		REPAIR		0.5					
01010505	Hydraulic Reservoir Assembly	REPLACE		2.0					
		REPAIR		2.0					
			B-10						

**Section II. MAINTENANCE ALLOCATION CHART
FOR
MODULAR CAUSEWAY FERRY (MCF)**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS-	DEPOT		
			C	O	F	H	D		
0101050501	Return Filter Assembly	REPAIR		0.5					
		REPLACE		0.5					
0101050502	Inspection Cover	REPAIR		0.5					
		REPLACE		0.5					
010106	Bilge System Installation	INSPECT	1.0				11	C, G	
		REPLACE		2.0					
		REPAIR		3.0			11	B	
		TEST	0.1				12		
010107	Fire Suppression System	INSPECT	0.25						
		SERVICE				1.0			
		REPLACE		1.0					
		REPAIR		1.0					
		TEST		0.5					
010108	Fuel System	INSTALL		1.0					
		INSPECT	0.5						
		SERVICE	0.5	1.0			12		
		REPLACE		1.0					
		REPAIR		2.5			11	C, G	
010109	Propulsion Module Electrical Assembly	INSPECT	0.5						
		REPAIR		2.0			12	B	
		REPLACE		2.0					
		TEST	0.5						
01010901	Bilge Pump Control Assembly A5	INSPECT		0.25					
		REPLACE			2.0				
		REPAIR		1.5				B	
01010902	Single Bilge Pump Control Assembly A7	INSPECT		0.25					
		REPLACE			2.0				
		REPAIR		1.5				B	
01010903	Engine Junction Box Assembly A4	INSPECT		0.25					
		REPLACE			2.0				
		REPAIR		1.5				B	
01010904	Propulsion Module Junction Box A3	INSPECT		0.25					
		REPLACE			2.0			B	
		REPAIR			1.5				
01010905	Circuit Breaker Panel Assembly A6	INSPECT		0.25					
		REPAIR			1.5			B	
		REPLACE			2.0				
01010906	Battery Installation	INSPECT	0.5					C, G	
		SERVICE	1.5	0.5			11	F	
		REPLACE		0.5					
		REPAIR		1.5			11	B	
01010907	Vent Fan Relay Enclosure Assembly	INSPECT		0.25					
		REPLACE			2.0				
		REPAIR			1.5			B	
01010908	Pump-Jet Junction Box Assembly A2	INSPECT		0.25					
		REPLACE			2.0				
		REPAIR			1.5				
			B-11						

**Section II. MAINTENANCE ALLOCATION CHART
FOR
MODULAR CAUSEWAY FERRY (MCF)**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS-	DEPOT		
			C	O	F	H	D		
01010909	Pump-Jet Dir/Aux Battery Junction Box A9	INSPECT		0.25					
		REPLACE		2.0					
		REPAIR		1.5					
010110	Emergency Steering System	INSPECT	0.5						C, G
		SERVICE	0.5						
		REPLACE		0.5					
		REPAIR		2.5				12	B
0102	P40 Pontoon Assembly	INSPECT	0.5						
		REPLACE		0.5					
		REPAIR		0.5			*	1-11, 13	A, B
		TEST		0.5					
		ADJUST		1.0					
0103	P20LR Pontoon Assembly	INSPECT	0.5						
		REPLACE		0.5					
		REPAIR		0.5			*	1-11, 13	A, B
		TEST		0.5					
		ADJUST		0.5					
010301	Hatch Assembly	REPAIR	0.5						
		REPLACE	0.5						
0104	P20CR Pontoon Assembly	INSPECT	0.5						
		REPLACE		0.5					
		REPAIR		0.5			*	1-11, 13	A, B
		TEST		0.5					
		ADJUST		0.5					
0105	P20RR Pontoon Assembly	INSPECT	0.5						
		REPLACE		0.5					
		REPAIR		0.5			*	1-11, 13	A, B
		TEST		0.5					
		ADJUST		0.5					
010501	Hatch Assembly	REPAIR		0.5					
		REPLACE		0.5					
0106	Operator's Cab	INSPECT	1.5						
		SERVICE	1.5						
		REPLACE		1.0					
		REPAIR		2.5					B
010601	Middle Control Panel A1	INSPECT	0.5	0.75					C, G
		REPLACE		0.5					
		REPAIR		2.0				11	B
01060101	Indicating Device	REPLACE		0.5					
		REPAIR		0.5					
010602	Lower Control Panel A2	INSPECT	0.5	0.75					C, G
		REPLACE		0.5					
		REPAIR		2.0				11	B
010603	Operator's Cab Circuit Breaker Panel A3	INSPECT		0.25					C, G
		REPLACE		2.0					
		REPAIR		1.5					B

**Section II. MAINTENANCE ALLOCATION CHART
FOR
MODULAR CAUSEWAY FERRY (MCF)**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS-	DEPOT		
			C	O	F	H	D		
010604	Terminal Strip Assembly A4	INSPECT		0.5					C, G
		REPLACE		2.0					
		REPAIR		1.5					B
010605	Stbd Receptacle Assembly A5	INSPECT		0.5					C, G
		REPLACE		2.0					
		REPAIR		1.5					B
010606	Port Receptacle Assembly A6	INSPECT		0.5					C, G
		REPLACE		2.0					
		REPAIR		1.5					B
010607	Spotlight	SERVICE		0.2				12	
		REPLACE		1.0					
		REPAIR		2.0				12	B
		ADJUST		0.2				12	
010608	Junction Box Assembly	INSPECT		0.5					C, G
		REPAIR		2.0					B
		REPLACE		1.5					
010609	Mast Enclosure Assembly	INSPECT		0.5					
		REPLACE		2.0					
		REPAIR		1.5					
0107	Intake Plenum Assembly	INSPECT	0.2						
		REPAIR		0.5				11-13	A
		REPLACE		0.5					
0108	Fender Assembly	REPLACE		0.25					
		REPAIR		0.5					B
0109	Mooring Cleat Assembly	REPLACE		0.25					
		REPAIR		0.5					B
0110	Mooring D-Ring	REPLACE		0.25					
		REPAIR		0.5					
0111	Exhaust Plenum Assembly	INSPECT	0.2						
		REPLACE		0.5				11-13	B
		REPAIR		1.0					
		SERVICE		0.25					
0112	Stub Mast Navigation Assembly	INSPECT	0.2						C, G
		REPLACE		0.2				2-13	
		REPAIR		0.5					F
011201	Stern Light	REPLACE		0.5					
		REPAIR		1.5					
0113	Main Mast Navigation Assembly	INSPECT	0.2						
		REPLACE		1.0				13	B
		REPAIR		1.0					
011301	Navigation Lights Terminal Box	INSPECT		0.5					
		REPAIR		2.0					
		REPLACE		1.5					
011302	Navigation Light, Starboard	REPLACE		1.0					
		REPAIR		1.5					

**Section II. MAINTENANCE ALLOCATION CHART
FOR
MODULAR CAUSEWAY FERRY (MCF)**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS-	DEPOT		
			C	O	F	H	D		
011303	Navigation Light, Port	REPLACE		1.0					
		REPAIR		1.5					
011304	Navigation Light, Vessel	REPLACE		1.0					
	Aground	REPAIR		1.5					
011305	Navigation Light, Masthead	REPLACE		1.0					
		REPAIR		1.5					
011306	Navigation Light, Anchor	REPLACE		1.0					
		REPAIR		1.5					
011307	Single Task Light	REPLACE		1.0					
		REPAIR		1.5					
0114	Module Electrical	INSPECT		0.5				C, G	
	Interconnect Assembly	REPLACE		0.5				B	
		REPAIR				1.5		B	
0115	Anchorboard Assembly	INSPECT	0.5					C, G	
		SERVICE	0.5				1-10	F	
		REPAIR		2.0					
		REPLACE		1.0					
0116	Railing Installation	INSPECT	0.5						
		REPLACE		1.0					
		REPAIR		0.5					
0117	Spreader Assembly	INSPECT		0.5			0.5	C, G	
		REPLACE					1.5	F	
		REPAIR				1.5			
		TEST				1.0			
		SERVICE	0.5						
02	MCF Intermediate Section	INSPECT	1.0					1-11	
	Assembly							C, G	
03	MCF Beach End Section	INSPECT	1.0					1-11	
0301	P25B Beach/Sea End	INSPECT	0.5					13	
	Module	REPAIR		0.5				A, B, E	
		REPLACE		0.5					
		TEST		0.5					
		ADJUST		0.25					
030101	Rhino Horn Assembly	REPLACE		0.25				13	
		REPAIR		0.5					
		INSPECT		0.5					
04	P3 Module Assembly	INSPECT	0.5						
		REPLACE		0.5					
		REPAIR		0.5					
		TEST		0.5					
		SERVICE		0.25					
		ADJUST		0.25					
			B-14						

**Section III. TOOLS AND TEST EQUIPMENT
FOR
MODULAR CAUSEWAY FERRY (MCF)**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER
1	C	Bar, Pry, Pinch, 60"	5120-00-224-1384	GGGB-101
2	C	Hammer, Hand, 10 LB	5120-00-251-4489	
3	C	Hammer, Hand, Scaling	5120-00-224-4111	
4	C	Corrosion Remover	1440-01-028-3063	A-29
5	C	Brush, Wire, Scratch	7920-00-291-5815	
6	C	Grease, General Purpose	9150-00-985-7316	MIL-G-23549
7	C	Wrench Set, Combination	5120-00-148-7917	GGG-W-636
8	C	Wrench, Adjustable, 12"	5120-00-264-3796	ANSI-B107-8
9	C	Socket, Thin Wall	5120-00-277-1465	53918
10	O	Tool Kit, Automotive	5180-00-177-7033	
11	O	Wrench, Strap	5120-00-776-1840	
12	O	Wrench, Monkey	5120-00-277-3020	
13	O	Tester, Battery Electrolyte Solution	6630-00-171-5126	GG-T-258
14	O	Tool Kit, Marine & Rail	5180-00-629-9783	
15	O	Flashlight, Regular, Two Cell	6230-00-163-1856	W-F-421
16	O	Fuse Puller and Tester	5120-00-319-3295	34-005
17	O	Multimeter	6625-00-004-9536	
18	O	Tester, Battery	6630-00-171-5126	
19	O	Wrench, Torque, 0-150 FT.LBS	5120-00-247-2540	
20	F	Tool Kit, Welder	5180-00-754-0661	
21	H	Wrench, Spanner		543-1-15X24-9
22	H	Wrench, Torque, 100-500 Ft.LBS	5120-00-542-5577	
23	H	Dial Indicator	5120-00-402-9619	J7872

**Section IV. REMARKS FOR
MODULAR CAUSEWAY FERRY (MCF)**

REMARKS CODE	REMARKS
A	Repair beyond the capabilities of GS units will be performed on a case by case basis subject to funding and approval by the National Maintenance Point (NMP).
B	Repair of this item is by replacement.
C	Accomplish monthly or prior to use and before stowage.
D	Accomplish monthly or after exposure to severe weather (sea state 3) and operator mishandling.
E	Accomplish whenever craft is removed from water.
F	Service includes cleaning, painting, and surface preservation.
G	After every time MCF has accomplished a field/training operation.
H	After return from higher level maintenance.
I	Time does not include engine, Transfer Case, or Pump-Jet removal from MCF.
J	Accomplish in accordance with prescribed military technical manual procedures.
K	Accomplish in accordance with commercial manufacturer maintenance and repair procedures.

APPENDIX C

COMPONENTS OF END ITEM/
BASIC ISSUE ITEMS LIST (COEI/BII)

Section I. INTRODUCTION

C-1. Scope.

This appendix lists components of the end item and basic issue items for the Modular Causeway Ferry (MCF) to help you inventory the items for safe and efficient operation of the equipment.

C-2. General.

The Components of End Item (COEI) and Basic Issue Items (BII) Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for information purposes only, and is not authority to requisition replacements. These items are part of the Modular Causeway Ferry (MCF). 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 the COEI are removed and separately packaged for transportation or shipment when necessary. Illustrations are furnished to help you find and identify the items.

b. Section III. Basic Issue Items. These essential items are required to place the Modular Causeway Ferry (MCF) in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the MCF during operation and when it is transferred between property accounts. This list is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

C-3. Explanation of Columns.

a. Column (1). Illustration Number (Illus Number). This column gives you the number of the item illustrated.

b. Column (2). National Stock Number. This column identifies national stock number of the item to be used for requisitioning purposes.

c. Column (3). Description, CAGEC and Part Number. This column identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the Commercial and Government Entity Code (CAGEC) (in parentheses) and the part number.

d. Column (4). Usable On Code. If item needed differs for different models of this equipment, the model is shown in this column.

e. Column (5). Unit of Issue (UM). This column indicates how the item is issued for the National Stock Number shown in column two.

f. Column (6). Quantity Required (Qty Req). This column indicates the quantity required.

Section II. COMPONENT OF END ITEM (COEI)					
(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGE AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY REQD
1		ADAPTER, RADIO POWER (0GXD3), 2412	FKY	EA	1
2		ADAPTER, P3 (34712), E28063	FKY	EA	3
3		ANCHORBOARD ASSY (34712), E20053	FKY	EA	1
4		ANTENNA (23657), 5240	FKY	EA	1
5		ANTENNA (96906), GFE-3	FKY	EA	1
6		CAB, OPERATOR (34712), E02873	FKY	EA	1
7		CHARGER, RADIO BATTERY (OHTU4), HTN9630	FKY	EA	1
8		COMPASS (50967), HB-85	FKY	EA	1
9		CLEAT, MOORING (34712), E07723	FKY	EA	16
10		CONNECTOR, FLEXOR (34712), E02783	FKY	EA	6
11		D-RING, MOORING (34712), E07803	FKY	EA	40
12		FENDER ASSY (34712), E03103	FKY	EA	16
13		HORN, RHINO (34712), E07733	FKY	EA	3
14		INTERCONNECT, MODULE ELECTRICAL (34712), E03003	FKY	EA	1
15		KIT, HYDRAULIC TEST (34712), E28943	FKY	EA	1
16		MANUAL, LUBRICATION ORDER LO55-1945-205-12	FKY	EA	1
17		MANUAL, OPERATOR TM55-1945-205-10	FKY	EA	1

Section II. COMPONENT OF END ITEM (COEI)					
(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGE AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY REQD
18		MANUAL, REPAIR PARTS & SPECIAL TOOLS LIST TM55-1945-205-24P	FKY	EA	1
19		MANUAL, UNIT DS & GS MAINT TM55-1945-205-24-1, MCF	FKY	EA	1
20		MANUAL, UNIT DS & GS MAINT TM55-1945-205-24-2, DIESEL ENGINE	FKY	EA	1
21		MANUAL, UNIT DS & GS MAINT TM55-1945-205-24-3, MARINE GEAR	FKY	EA	1
22		MANUAL, UNIT DS & GS MAINT TM55-1945-205-24-4, TRANS CASE	FKY	EA	1
23		MAST ASSEMBLY, MAIN (34712), E03123	FKY	EA	1
24		MAST ASSEMBLY, STUB (34712), E18343	FKY	EA	1
25		MODULE, P25B BEACH END (34712), E02853	FKY	EA	3
26		MODULE, PROPULSION, P40P (34712), E28043	FKY	EA	2
27		PLENUM, EXHAUST (34712), E18263	FKY	EA	2
28		PLENUM, INTAKE (34712), E12183	FKY	EA	1
29		PONTOON, P20CR (34712), E02823	FKY	EA	7
30		PONTOON, P20LR (34712), E02833	FKY	EA	7
31		PONTOON, P20RR (34712), E02813	FKY	EA	7
32		PONTOON, P40 (34712), E02803	FKY	EA	10

Section II. COMPONENT OF END ITEM (COEI)					
(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGE AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY REQD
33		RADIO (96906), GFE-1	FKY	EA	1
34		RAILING INSTALLATION (34712), E03136	FKY	EA	1
35		RECEIVER/TRANSMITTER (OHTU4), H5111	FKY	EA	1
36		RECEIVER/TRANSMITTER (OWF67), DSC 500	FKY	EA	1
37		REMOTE AND MICROPHONE (96906), GFE-2	FKY	EA	1
38		SPREADER ASSEMBLY (34712), E19883	FKY	EA	1

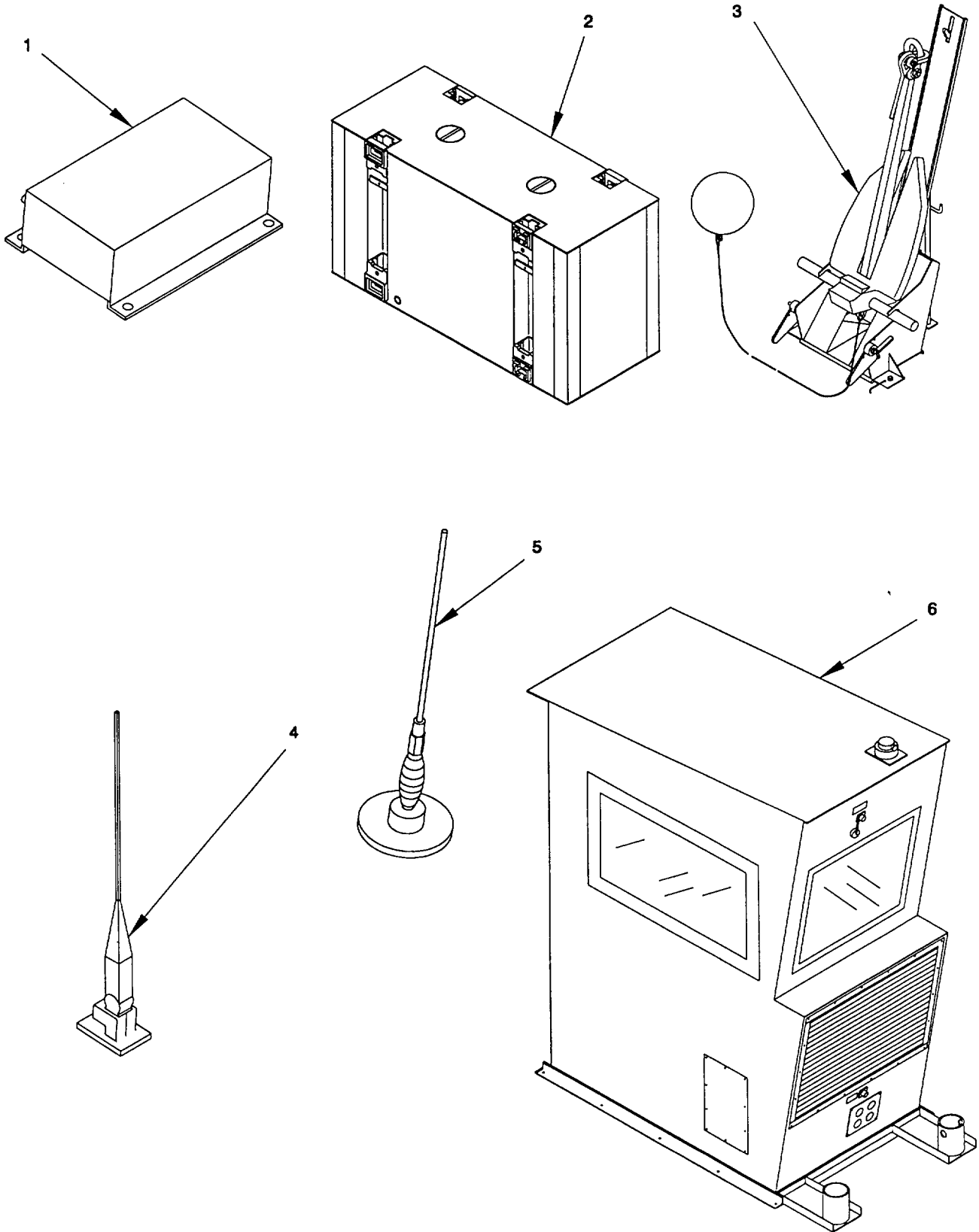


Figure C-1. Components of the End Item (COEI) (Sheet 1 of 5)

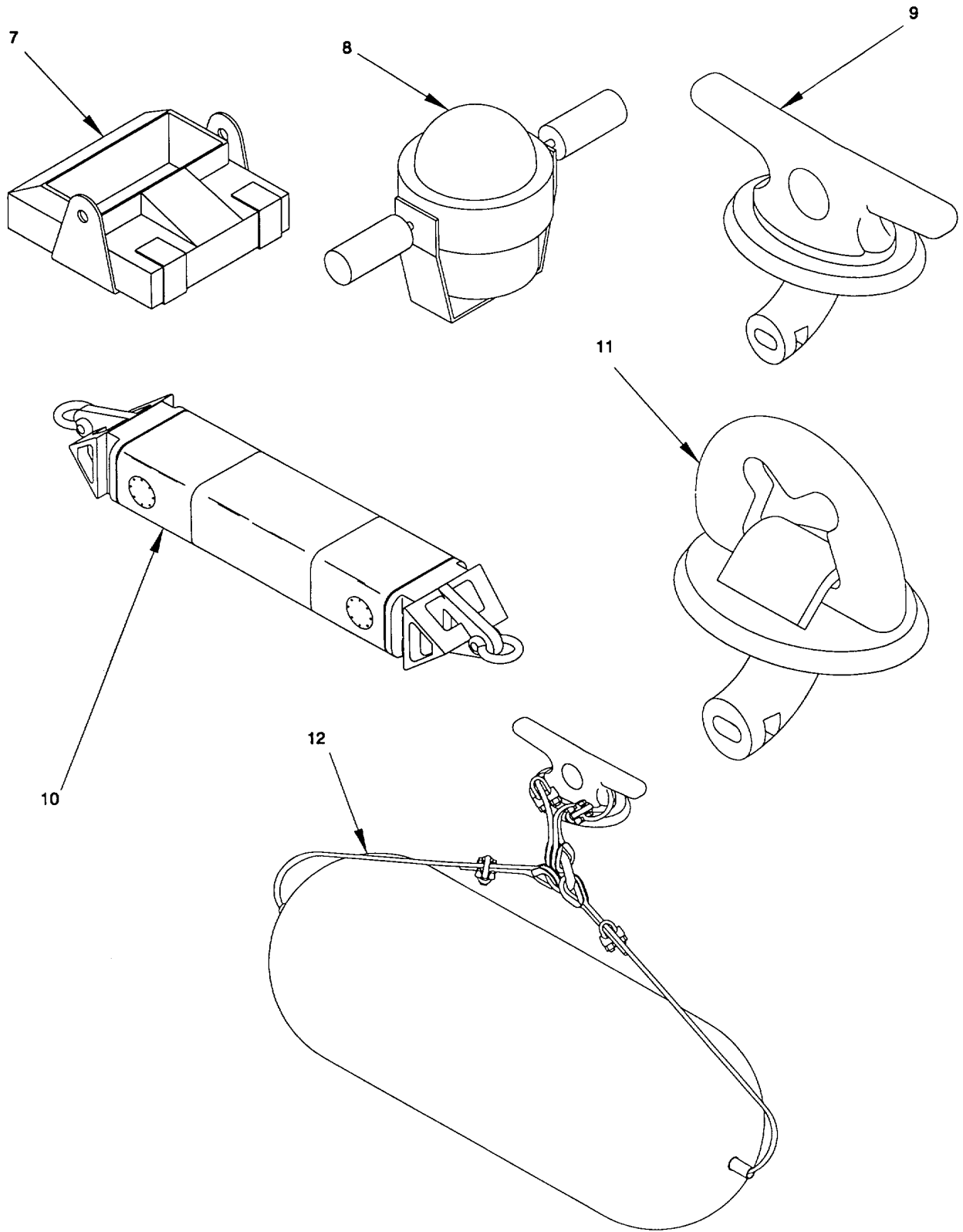


Figure C-1. Components of the End Item (COEI) (Sheet 2 of 5)

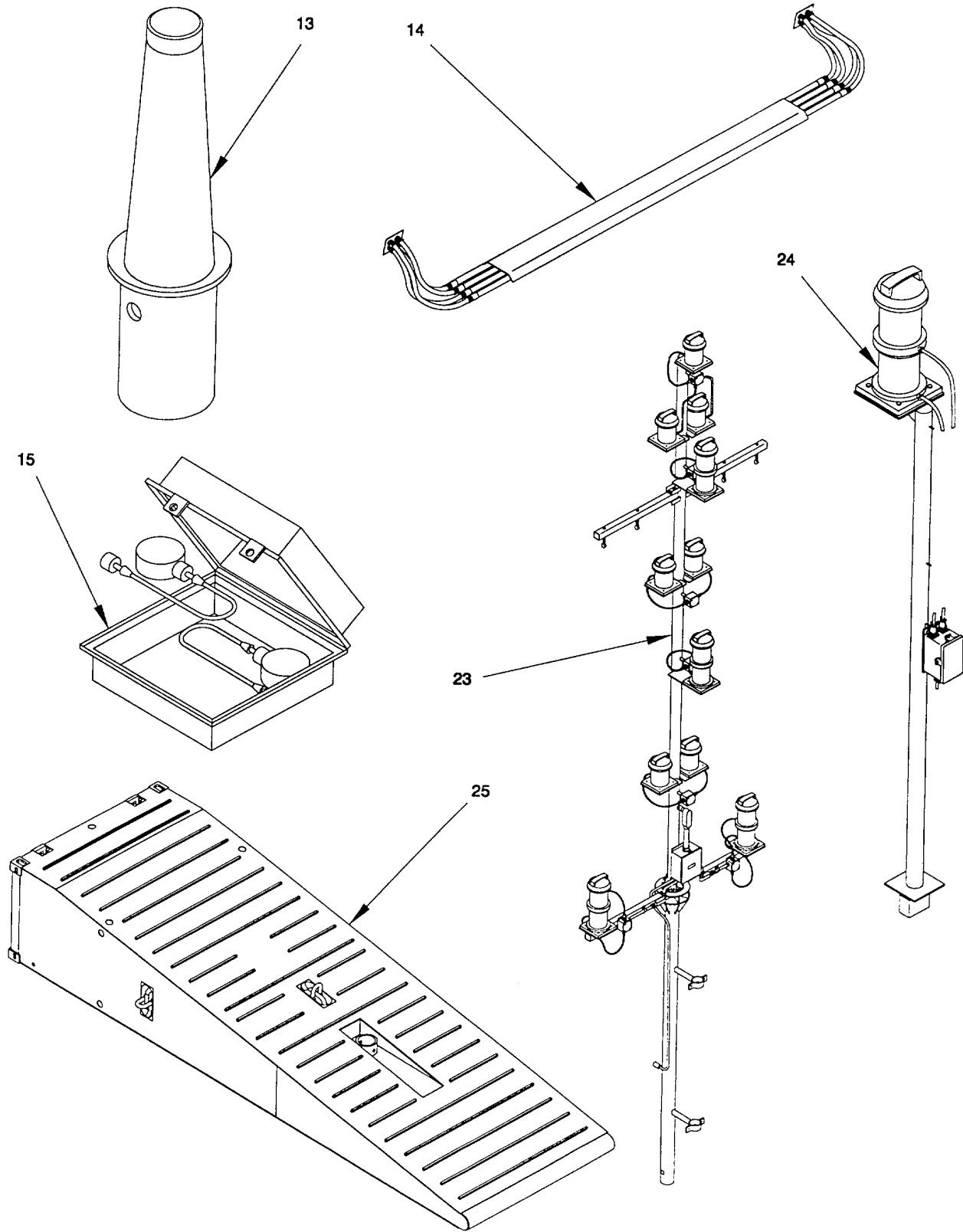


Figure C-1. Components of the End Item (COEI) (Sheet 3 of 5)

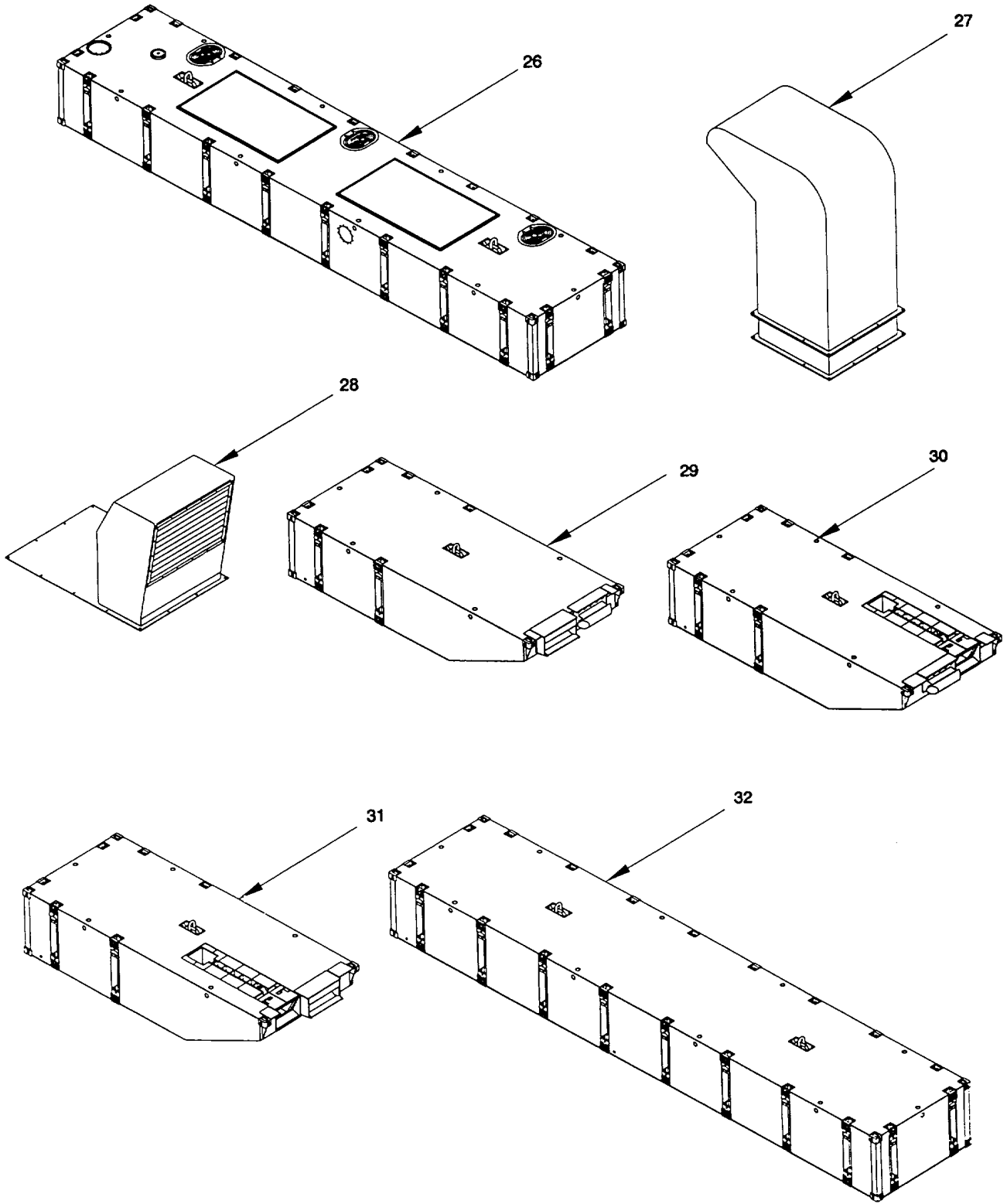


Figure C-1. Components of the End Item (COE) (Sheet 4 of 5)

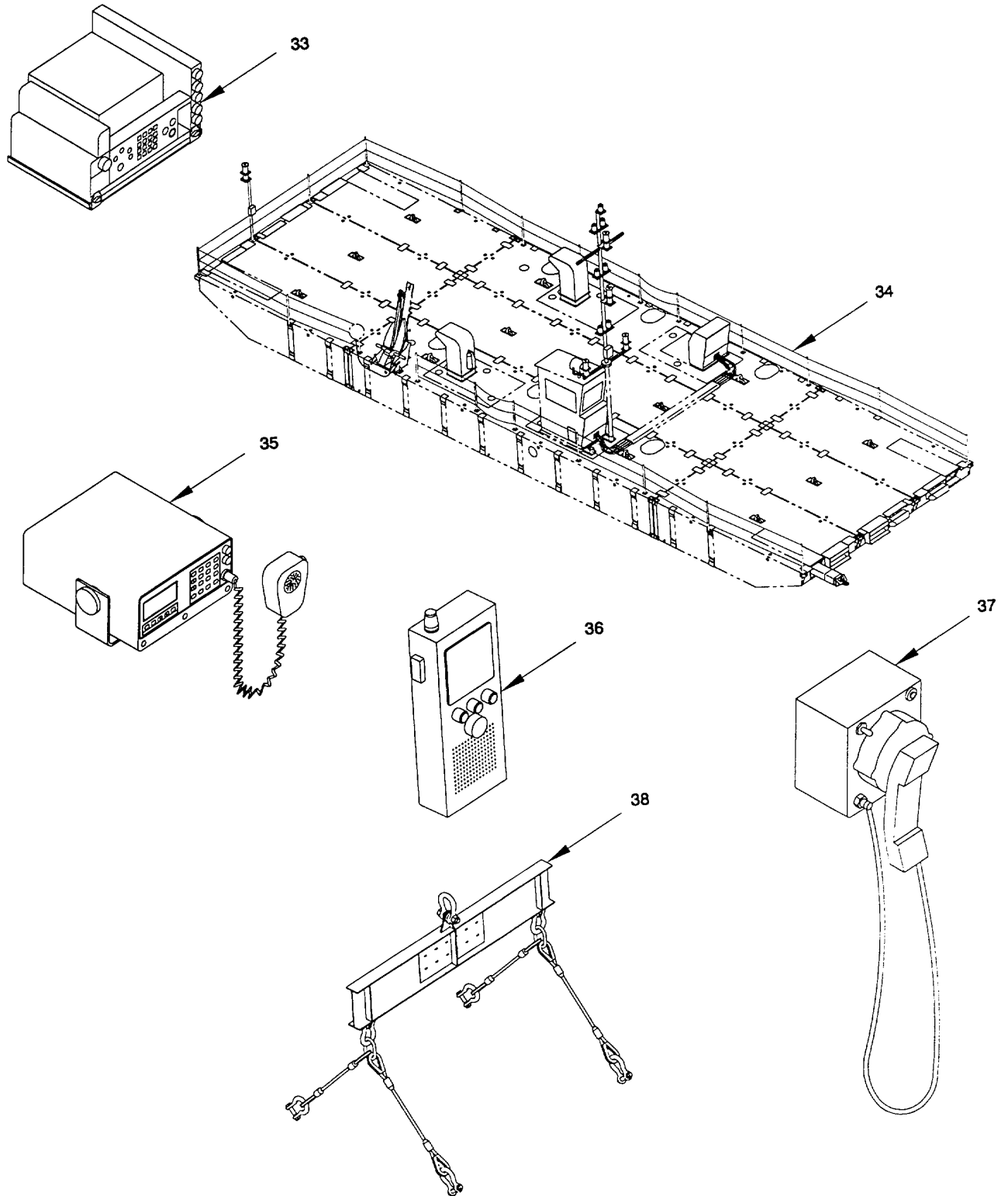


Figure C-1. Components of the End Item (COEI) (Sheet 5 of 5)

Section II. COMPONENT OF END ITEM (COEI)					
(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGE AND PART NUMBER	(4) USABL E ON CODE	(5) UM	(6) QTY REQD
1	8415-00-082-6108	Apron, Battery Service	FKY	EA	2
2	4210-00-142-4949	Ax, Fire (81348) GGG-A-926	FKY	EA	1
3	5120-00-242-0762	Bar, Wrecking, 36 In. Long (81348) GGG-B-101	FKY	EA	2
4	6135-00-643-1310	Battery, Nonrechargeable, 6V (Battle Lantern) (83740) EV90	FKY	EA	6
5	6135-00-930-0030	Battery, Flashlight, Size "D", Alkaline (80058) BA3030	FKY	BX	1
6	Local Purchase Item- Water-Jel AWK Fire Blanket, H&H Associates Inc., P.O. Box 4496, Alexandria, VA 22303, Phone 1- 800-326-5708	Blanket, Fire, 72" X 60"	FKY	EA	1
7	5340-00-275-4583	Clips, Halyard	FKY	BOX	2
8	Local Purchase Item- Coverall, Antiexposure, Sterns Lifesaving Systems Corp., 720 4th St. SW, Ruskin, FL 33570-1829, Phone 813-645-2768	Model 1FS-580, Orange (1 per crew member)	FKY	EA	6
9	5120-00-224-1390	Crowbar, Wedge Point, 60 In. Long	FKY	EA	2
10	Local Purchase Item- Water-Jel AWK Kit, H&H Associates, Inc. P. O. Box 4469, Alexandria, VA 22303 Phone 1-800-326-5708	Dressing, Burn, Kit (contains 2/8" X 18", 1/4" X 16", 4/4" X 4", 1/12" X 16" [Face Mask] dressings, and 1 package of Burn-Jel topical dressing	FKY	EA	1
11	4210-00-203-0217	Extinguisher, Fire, Portable, 15 lbs. CO2 capacity (33525) 466182	FKY	EA	3
12	4220-00-542-2048	Faceshield, Safety (1 per crew member)	FKY	EA	6
13		Fast Lube Oil Change System (FLOCS), Pump and Hoses	FKY	EA	1

Section II. COMPONENT OF END ITEM (COEI)					
(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGE AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY REQD
14	5120-00-223-8921	Fid, 12 inch Wood	FKY	EA	2
15	8345-00-935-0445	Flag, Signal, "A" Intn'l Code, Size 6 (81349) MIL-F-2692	FKY	EA	1
16	8345-00-926-6803	Flag, Signal, "B" Intn'l Code, Size 6 (81349) MIL-F-2692	FKY	EA	1
17	8345-00-935-0451	Flag, Signal, "O" Intn'l Code, Size 6 (81349) MIL-F-2692	FKY	EA	1
18	8345-00-926-6814	Flag, Signal, "U" Intn'l Code, Size 6 (81349) MIL-F-2692	FKY	EA	1
19	8345-00-935-0455	Flag, Signal, "V" Intn'l Code, Size 6 (81349) MIL-F-2692	FKY	EA	1
20	8345-00-935-0456	Flag, Signal, "W" Intn'l Code, Size 6 (81349) MIL-F-2692	FKY	EA	1
21	8345-00-935-0457	Flag, Signal, "Y" Intn'l Code, Size 6 (81349) MIL-F-2692	FKY	EA	1
22	6230-00-264-8261	Flashlight, Watertight (81349) MIL-F-3747	FKY	EA	2
23	8415-00-266-8677	Gloves, Chemical Battery Service	FKY	PR	2
24	8415-01-267-9661	Gloves, Anti-Flash (1 pair per crew member) (81349) MIL-G-2874	FKY	PR	6
25	8415-00-634-4658	Gloves, Leather Palm (1 pair per crew member) (58536) A-A-50021	FKY	PR	6
26	8415-00-266-8691	Gloves, Electric (1 pair per crew member) (81348) ZZ-G-401	FKY	PR	6
27	4240-00-052-3776	Goggle, Clear Lens, Chipping (1 per crew member)	FKY	EA	6
28	4240-00-190-6432	Goggle, Industrial, No Vents (Chemical Splash)(1 per engineer) (58536) A-A-110	FKY	EA	2

Section II. COMPONENT OF END ITEM (COEI)					
(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGE AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY REQD
29	8465-01-004-2893	Goggle, Safety, Wind, Dust, Sand, Spray (1 per crew member) (81349) MIL-G-43914	FKY	EA	6
30	5120-00-243-2957	Hammer, Sledge, 10 lb	FKY	EA	2
31	8415-00-279-2205	Hard hat, Blue (58346) A-A-2269 Type 2 Class A Style A	FKY	EA	2
32	8415-00-823-7575	Hard hat, Brown (58346) A-A-2269 Type 2 Class A Style A	FKY	EA	4
33	4240-00-022-2522	Harness, Safety, Torso (80204) ANSI Z359.1	FKY	EA	6
34	2040-00-268-9250	Hook, Boat, 10 ft Handle (21530) H389	FKY	EA	2
35	Local Purchase Item GEN367C	Kit, Lockout/Tagout, Pig	FKY	EA	1
36	4730-00-542-3359	Kit, Pipe Repair, Emergency (81349) MIL-4-17882B	FKY	EA	1
37	6230-00-783-6519	Lantern, Battle, SYM 100.2, with red filter, Body Assembly (62025A),M16377/53-001	FKY	EA	1
38	6230-00-783-6519	Lantern, Battle, SYM 100.2, no filter, Body Assembly (62025A),M16377/53	FKY	EA	2
39	6230-00-776-5920	Lantern, Battle, SYM100.2, Handle and Switch	FKY	EA	3
40	4240-00-022-2518	Lanyard, Safety Harness (80204) ANSI Z359.1	FKY	EA	6
41	6260-01-086-8077	Light, Distress, Personnel Marker (83239) 2172-A-1	FKY	EA	24
42	4020-00-240-2161	Line, Halyard, Nylon, 1/4 inch x 300 ft	FKY	EA	1
43	4020-01-344-0552	Line, Heaving, Safety, 100 ft (OGU87) NIS-G-0213	FKY	EA	2
44	4020-00-530-0698	Line, Retrieving, Ring Bouy (81349) MIL-R-24049	FKY	RL	1

Section II. COMPONENT OF END ITEM (COEI)					
(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGE AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY REQD
45	5120-00-255-1476	Maul, Ship's, 5 lb. (Damage Control Plugs) (58536) A-A-1285	FKY	EA	1
46		Pneumatic Test Set-Up	FKY	EA	1
47	5510-00-260-8949	Plug, Soft Wood, 10" X 7" X 12" Long (80064) S8800-461043	FKY	EA	5
48	5510-00-260-8973	Plug, Soft Wood, 8" X 4" X 10" Long (80064) S88000-461043	FKY	EA	5
49	5510-00-260-8969	Plug, Soft Wood, 7" X 3" X 10" Long (80064) 803-461043	FKY	EA	5
50	5510-00-260-8953	Plug, Soft Wood, 1" X 0" X 3" Long (80064) 803-461043	FKY	EA	5
51	5510-00-260-8958	Plug, Soft Wood, 2" X 0" X 4" Long (80064) S8800-461043	FKY	EA	5
52	5510-00-260-8962	Plug, Soft Wood, 3" X 0" X 8" Long (80064) 803-461043	FKY	EA	5
53	4220-00-200-0538	Preserver, Life, Inherently Buoyant, Vest Type w/Collar (1 per crew member) (81349) MIL-L-18045	FKY	EA	8
54	4220-00-276-8926	Preserver, Life, Vest (1 per crew member) (81349) MIL-L-7653	FKY	EA	8
55	4240-00-022-2946	Protector, Aural, Sound (1 per crew member) (71483) E31C	FKY	EA	6
56		Pump, AOAP Sampling	FKY	EA	1
57	8345-01-101-1101	Shape, Day Maritime, Diamond, Black, 2 ft. dia., 4 ft. Long (81349) MIL-S-29134	FKY	EA	1
58	8345-00-174-0453	Shape, Day Maritime, Ball, Black, 2 ft. dia., 4 ft. Long (81349) MIL-S-29108	FKY	EA	2

Section II. COMPONENT OF END ITEM (COEI)					
(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGE AND PART NUMBER	(4) USABLE ON CODE	(5) UM	(6) QTY REQD
59	2090-00-058-3737	Shoring, Steel, Adjustable, Short, 3 ft. to 5 ft. (81349) MIL-S-23965	FKY	EA	4
60	1370-01-030-8330	Signal, Distress, Orange Smoke, Red Illumination (10001) DL3139734	FKY	EA	12
61	9390-01-078-8660	Tape, Retroreflective, 3" X 50 yds, Adhesive Backed (94960) 3150-3X50YD	FKY	RL	1
62	5180-00-629-9783	Tool Kit, Marine and Rail	FKY	EA	1
63	5510-00-268-3479	Wedge, Plug, Tapered, Hardwood, 2" X 2" X 8" Long (80064) S8800-461043	FKY	EA	5
64	5510-00-268-3475	Wedge, Shoring, Tapered, Hardwood, 1 1/2" X 2" X 12" Long (80064) S8800-461043	FKY	EA	5
65	8465-00-254-8803	Whistle, Plastic Ball w/Lanyard (58536) A-A-55106	FKY	EA	24

APPENDIX D

TORQUE TABLE

D-1. Introduction.

Table D-1 contains a standard torque table to be utilized for torquing all SAE fasteners, except metric fasteners, when specific torque values are not provided. Proper torque settings for all metric fasteners are shown in Table D-2.

<i>Table D-1. Standard SAE Torque Table.</i>				
CAPSCREW/BOLT DIAMETER (INCHES)	S.A.E. 2 ASTM A-307 (FT/LBS)	S.A.E. 5 ASTM A-449 (FT/LBS)	S.A.E. 7 (FT/LBS)	S.A.E. 8 (FT/LBS)
3/8	13-15	20-23	26-30	30-35
7/16	21-24	30-35	38-45	47-55
1/2	31-35	47-55	59-70	68-80
5/8	66-75	95-110	120-140	148-170
3/4	115-130	175-200	205-240	245-280
7/8	110-125	285-320	345-400	400-460
1	160-190	430-480	520-600	590-680
1-1/8	220-270	525-600	710-840	825-960
1-1/4	315-380	735-840	950-1100	1160-1360
1-3/8	410-490	955-1100	1310-1560	1530-1780
1-1/2	550-650	1285-1460	1830-2080	2060-2360
1-3/4	960-1160	2300-2600	3250-3750	3300-3900
2	1400-1680	3300-3750	4675-5425	4870-5670

NOTES:

1. Tightening torque ranges for UNC capscrews and bolts.
2. Values are maximum and minimum torque in foot-pounds.
3. Torque values are for plated steel capscrews or when lubrication is used for assembly of capscrews. (If possible, all bolts which are to be torqued should be plated or lubricated.)
4. If Lubrication or plating cannot be used, increase above torque values by 15 percent.
5. Grade 5 and grade 8 bolts need hardened plate washers.
6. If self-locking fasteners are used, add to the tightening torque the torque required to overcome the self-locking drag of the fastener.

Use the proper torque settings in Table D-2 for metric fasteners when specific torque values are not provided.

Table D-2. Metric Torque Table in Newton-Meters (ft/lbs in parentheses).

CAPSCREW/BOLT SIZE	Strength			Strength		
	8.8	10.9	12.9	A4-70	A4-80	C3-80
M 4	2,8 (2.06)	4,1 (3.06)	4,8 (3.54)	2,2 (1.62)	2,9 (2.14)	3,1 (2.28)
M 5	5,5 (4.05)	8,1 (5.97)	9,5 (7.00)	4,3 (3.17)	5,7 (4.20)	6,1 (4.50)
M 6	9,5 (7.00)	14 (10.32)	16,5 (12.16)	7,3 (5.38)	9,8 (7.22)	10,4 (7.66)
M 7	15,5 (11.42)	23 (16.95)	27 (19.90)	12 (8.84)	16 (11.79)	17 (12.53)
M 8	23 (16.95)	34 (25.06)	40 (29.48)	17 (12.53)	23 (16.95)	25 (18.43)
M 10	46 (33.90)	68 (50.12)	79 (58.22)	35 (25.80)	48 (35.38)	51 (37.59)
M 12	79 (58.22)	117 (86.23)	135 (99.50)	60 (44.22)	82 (60.43)	87 (64.12)
M 14	125 (92.13)	185 (136.35)	215 (158.46)	98 (72.23)	130 (95.81)	140 (103.18)
M 16	195 (143.72)	280 (206.36)	330 (243.21)	150 (110.55)	200 (147.40)	215 (158.46)
M 18	280 (206.36)	390 (287.43)	460 (339.02)	210 (154.77)	280 (206.36)	300 (221.10)
M 20	390 (287.43)	560 (412.72)	650 (479.05)	300 (221.10)	405 (298.49)	430 (316.91)
M 22	530 (390.61)	750 (552.75)	880 (648.56)	225 (165.83)	• 545 (401.67)	580 (427.46)
M 24	670 (493.79)	960 (707.52)	1120 (825.44)	290 (213.73)	• 695 (512.22)	740 (545.38)
M 27	1000 (737.00)	1400 (1031.80)	1650 (1216.05)	430 (316.91)	• 1030 (759.11)	1100 (810.70)
M 30	1350 (994.95)	1900 (1400.30)	2250 (1658.25)	585 (431.15)	• 1400 (1031.80)	1500 (1105.50)
M 33	1850 (1363.45)	2600 (1916.20)	3000 (2211.00)	- (1381.88)	• 1875 (1474.00)	2000 (1474.00)
M 36	2350 (1731.95)	3300 (2432.10)	3900 (2874.30)	-	• 2450 (1805.65)	2600 (1916.20)
M 39	3000 (2211.00)	4300 (3169.10)	5100 (3758.70)	-	• 3190 (2351.03)	3400 (2505.80)

• Denotes diameters exceeding M 20. These require a special agreement on the mechanical strength properties between client and manufacturer.

APPENDIX E

MANDATORY REPLACEMENT PARTS LIST (MRPL)

Section I. INTRODUCTION

E-1. Scope.

This appendix lists mandatory replacement parts you will need to maintain the Modular Causeway Ferry (MCF). Additional mandatory replacement parts for the diesel engine are contained in TM 55-1945-205-24-2 (ENGINE).

E-2. Explanation of Columns.

a. Column 1 - item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e. , "Cleaning solvent P-D-680 (Appendix C, item 2)").

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item. The symbol designations are as follows:

- C - Operator or crew
- O - Unit Level maintenance
- F - Direct Support
- H - General Support

c. Column 3 - National Stock Number. This column indicates the National Stock Number assigned to the item; use it to request or requisition the item.

d. Column 4 - Description, CAGE and Ref Number. This column Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity (CAGE) code in parentheses followed by the part number.

e. Column 5 - Unit of Measure (U/M). This column indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. MANDATORY REPLACEMENT PARTS LIST						
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGE AND REF NUMBER			(5) U/M
1	F		GASKET	72-48F-7	34294	EA
2	F		BASKET, MONEL	72-48F-9	34294	EA
3	F		PACKING	72-48F-22	34294	EA
4	F		GASKET	72-48F-24	34294	EA
5	O		GASKET, FLANGE	E09151	34712	EA
6	H		GASKET, BODY VALVE	P-9495-A	61208	EA
7	H		BEARING	1004161	0XS19	EA
8	H		BEARING	1004148	0XS19	EA
9	H		BEARING	1101423	0XS19	EA
10	H		BEARING	1004110	0XS19	EA
11	H		SEAL, RADIAL	1001198	0XS19	EA
12	H		PREFORMED PACKING	1001511	0XS19	EA
13	H		PREFORMED PACKING	1001367	0XS19	EA
14	H		PREFORMED PACKING	1001369	0XS19	EA
15	H		BUSH, SEALING	1099413	0XS19	EA
16	H		BUSH, SEALING	1099428	0XS19	EA
17	H		BEARING	1101421	0XS19	EA
			SPRING	1106039-02.06	0XS19	EA
19			BEARING	1106039-03.02	0XS19	EA
20	H		PREFORMED PACKING	1106039-04.02	0XS19	EA
21	H		RING, SEAL	1106039-07	0XS19	EA

Section II. MANDATORY REPLACEMENT PARTS LIST						
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGE AND REF NUMBER			(5) U/M
22	H		PREFORMED PACKING	1106039-13	0XS19	EA
23	H		RING, GASKET	710300705	A4432	EA
24	H		BEARING	712758079	A4432	EA
25	H		BEARING	712758032	A4432	EA
26	H		PREFORMED PACKING	715303245	A4432	EA
27	H		BEARING	712753055	A4432	EA
28	H		PREFORMED PACKING	715303275	A4432	EA
29	H		SEAL, RADIAL	1101422	0XS19	EA
30	H		SEAL, RADIAL	1001175	0XS19	EA
32	H		PREFORMED PACKING	1024856	0XS19	EA
33	H		PREFORMED PACKING	1013922	0XS19	EA
34	H		PREFORMED PACKING	1001473	0XS19	EA
35	H		PREFORMED PACKING	1020506	0XS19	EA
36	H		PREFORMED PACKING	1001408	0XS19	EA
37	H		PREFORMED PACKING	1001400	0XS19	EA
38	H		PREFORMED PACKING	1001387	0XS19	EA
39	H		PREFORMED PACKING	1001377	0XS19	EA

Section II. MANDATORY REPLACEMENT PARTS LIST						
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGE AND REF NUMBER			(5) U/M
40	H		PREFORMED PACKING	1001491	0XS19	EA
41	H		RING, GASKET	710300705	A4432	EA
42	H		BEARING	712758079	A4432	EA
43	H		BEARING	712758032	A4432	EA
44	H		PREFORMED PACKING	715303245	A4432	EA
45	H		PREFORMED PACKING	715307157	A4432	EA
46	H		PREFORMED PACKING	715307251	A4432	EA
47	H		BEARING	712753054	A4432	EA
48	H		PREFORMED PACKING	715303242	A4432	EA
49	H		BEARING, BALL	1012726	0XS19	EA
50	H		SEAL, RADIAL	1109439	0XS19	EA
51	H		HOSE	1008084	0XS19	EA
52	F		SHIM SET	E11961	34712	EA
53	F		SHIM SET	E11971	34712	EA
54	F		SHIM SET	E26091	34712	EA
55	O		HOSE ASSEMBLY	E24553	34712	EA
56	F		HOSE ASSEMBLY	2010101-8-8-8 -36	87373	EA
57	O		GASKET	E27141	34712	EA
58	O		VENT, AIR	1108051	0XS19	EA
59	F		HOSE ASSEMBLY	2010606-8-8-8 -24	87373	EA

Section II. MANDATORY REPLACEMENT PARTS LIST						
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGE AND REF NUMBER			(5) U/M
60	F		HOSE ASSEMBLY	2013939-8-8-8 -72	87373	EA
61	O		GASKET	E13591	34712	EA
62	O		GASKET	E26698-7	34712	EA
63	O		GASKET	E26698-17	34712	EA
64	O		HOSE	E26698-27	34712	EA
65	O		HOSE, HUMP	E26698-29	34712	EA
66	O		HOSE	E26698-31	34712	EA
67	H		BEARING	70109-001	D1572	EA
68	H		BEARING	70109-002	D1572	EA
69	H		SEAL, SHAFT	BH00794325	D1572	EA
70	H		PREFORMED PACKING	68111-041	D1572	EA
71	H		PREFORMED PACKING	68111-040	D1572	EA
72	H		V-RING	BH00791407	D1572	EA
73	H		PREFORMED PACKING	68105-908	D1572	EA
74	H		PREFORMED PACKING	68101-013	D1572	EA
75	O		RING	BH00114774	D1572	EA
76	H		PREFORMED PACKING	68104-011	D1572	EA
77	H		PREFORMED PACKING	68105-904	D1572	EA
78	O		HOSE	1008084	0XS19	EA
79	O		HOSE	1008088	0XS19	EA

Section II. MANDATORY REPLACEMENT PARTS LIST						
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGE AND REF NUMBER			(5) U/M
80	H		PREFORMED PACKING	1088210-2	0XS19	EA
81	H		PREFORMED PACKING	1088210-4	0XS19	EA
82	H		PREFORMED PACKING	1088210-5	0XS19	EA
83	H		PREFORMED PACKING	1088210-7.2	0XS19	EA
84	H		PREFORMED PACKING	1088210-8	0XS19	EA
85	H		SEAL	1088210-9	0XS19	EA
86	H		SEAL	1088210-16	0XS19	EA
87	H		PREFORMED PACKING	1088210-20	0XS19	EA
88	H		PREFORMED PACKING	1088210-25	0XS19	EA
89	H		SEAL	1088210-26	0XS19	EA
90	H		PREFORMED PACKING	1088210-40	0XS19	EA
91	O		HOSE	1007322	0XS19	EA
92	O		HOSE	1008085	0XS19	EA
93	O		HOSE	1008088	0XS19	EA
94	O		PREFORMED PACKING	1043573-36	0XS19	EA
95	O		PREFORMED PACKING	1043573-37	0XS19	EA
96	O		PREFORMED PACKING	1043573-38	0XS19	EA
97	O		GASKET	1043573-40	0XS19	EA

Section II. MANDATORY REPLACEMENT PARTS LIST						
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGE AND REF NUMBER			(5) U/M
98	O		PREFORMED PACKING	1043573-42	0XS19	EA
99	O		SEAL	1043573-45	0XS19	EA
100	O		FILTER, AIR	1009814	0XS19	EA
101	O		RING, SEALING	1002204	0XS19	EA
102	O		PREFORMED PACKING	150239	0XS19	EA
103	O		PREFORMED PACKING	150251	0XS19	EA
104	O		PREFORMED PACKING	150232	0XS19	EA
105	O		PREFORMED PACKING	200103	0XS19	EA
106	O		ELEMENT	G10	1572X	EA
107	O		FILLER, BREATHER	NAB-1010-4	34712	EA
108	O		GASKET	HC-EC-S	23619	EA
109	O		ELEMENT, FILTER	N10	1572X	EA
110	O		GASKET	E28301	34712	EA
111	O		HOSE, FLEXIBLE	252184	7S794	EA
112	O		GASKET, FILLER NECK	E12491	34712	EA
113	O		GASKET	E12111	34712	EA
114	O		GASKET	E12091	34712	EA
115	O		GASKET	E13728	34712	EA
116	O		GASKET	E26978-1	34712	EA
117	O		GASKET	E26978-2	34712	EA

Section II. MANDATORY REPLACEMENT PARTS LIST						
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGE AND REF NUMBER			(5) U/M
119	O		GASKET	E26978-2	34712	EA
120	O		BEARING	51017	81493	EA
121	O		BUSHING	75168	81493	EA
122	O		BEARING	51014	81493	EA
123	O		BUSHING	75167	81493	EA
118	O		GASKET	E26978-1	34712	EA
124	O		BEARING	51015	81493	EA
125	O		PREFORMED PACKING	50043	81493	EA
126	O		BEARING	51013	81493	EA
127	O		FITTING, LUBE	75174	81493	EA
128	O		GASKET	25071-1	81493	EA
129	O		SPRING	71017	81493	EA
130	O		STRIP, WEAR	26710	81493	EA
131	O		BEARING	51018	81493	EA
132	O		PAD, BRAKE	51011	81493	EA
133	O		GASKET	10-40450-16	77820	EA
134	O		GASKET	E26978-3	34712	EA
135	O		GASKET	10-40450-16	77820	EA
136	O		WASHER, PLASTIC	2332-N385-30	1FJ15	EA
137	O		GASKET	10-40450-16	77820	EA
138	O		GASKET, LID	95800146	61204	EA
139	O		GASKET, LID	95800146	61204	EA
140	O		GASKET, LID	95800146	61204	EA

Section II. MANDATORY REPLACEMENT PARTS LIST						
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGE AND REF NUMBER			(5) U/M
141	O		GASKET, LID	95800146	61204	EA
142	O		GASKET, LID	95800146	61204	EA
143	O		WASHER, PLASTIC	2332-N385-30	1FJ15	EA
144	O		GASKET, LID	95800146	61204	EA
145	O		PULLY, ROPE	3083T21	39428	EA
146	O		GASKET, COVER	GASK1941	15235	EA
147	O		GASKET, COVER	GASK1945	15235	EA
148	O		GASKET	10-40450-16	77820	EA

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APPENDIX F

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

F-1. Scope.

Section II lists Expendable/Durable Supplies and Materials (EDSM) you will need to operate and maintain the Modular Causeway Ferry (MCF). These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

F-2. Explanation of Columns.

a. Column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Cleaning solvent P-D-680 (Appendix C, item 2)").

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item. The symbol designations are as follows:

- C - Operator or crew
- O - Unit Level maintenance
- F - Direct Support
- H - General Support

c. Column 3 - National Stock Number. This column indicates the National stock number assigned to the item. Use it to request or requisition the item.

d. Column 4 - Description CAGE and Ref Number. This column indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity (CAGE) code in parentheses followed by the part number.

e. Column 5 - Unit of Measure (U/M). This column indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. MANDATORY REPLACEMENT PARTS LIST				
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION,	(5) U/M
1	O	8030-01-126-9460	Adhesive (05972) #222, MIL-S-46163A, Type II, Grade M	EA
2	O	8040-01-250-3969	Adhesive (05972) #242, MIL-S-46163A, Type II, Grade N	EA
3	O	8040-00-092-2816	Adhesive, Epoxy (12405) EPS-608	EA
4	O	8040-01-194-0391	Adhesive, Silicone (71984) RTV-732	EA
5	O	6850-00-181-7929 6850-00-181-7933	Antifreeze, Ethylene Glycol, (81349) ASTM-D4985 1 gallon container 5 gallon container	GL GL
6	O	7920-01-088-5188	Brush, Soft Bristle (53800) 30G14493	EA
7	O	7920-00-044-9281	Cloth, Cleaning (81349) MIL-C-85043	LB
8	O	7920-00-292-9204	Cloth, Cleaning, extra heavy (80244) A-A-162, Type 1, Class 2	MX
9	C	8030-00-209-8005	Compound, Antiseize (81348) TT-S-1732 (M22361)	OZ
10	C, O	6850-00-926-2275	Compound, Cleaning, windshield washer, 1 pint (81348) O-C-1901	PT
11	C		Compound, Rust Preventative (81349), MIL-C-16173, Grade 2	
12	O		Compound, Sealing (05972) 598	EA
13	O	8030-01-009-2590	Compound, Sealing (08854) 42029	CN
14	C		Compound, Silicone (81349), MIL-C-21567 or commercial equivalent	EA
15	O	5970-00-241-5406	Compound, Thermal Joint (05820) 120-8	OZ
16	O	7930-00-282-9699	Detergent, General Purpose, 1 gallon (80244) MIL-D-16791 Type I	GL

Section II. MANDATORY REPLACEMENT PARTS LIST				
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION,	(5) U/M
17	O	6810-00-236-0702 6810-00-904-9372	Electrolyte, Acid, Sulfuric (81348) O-S-801 Class III 1 gallon 5 gallons	GL GL
18	O	9150-00-993-6621	Fluid, Hydraulic, Mobil DTE 25 (19135) 60263-1	GL
19	C	9150-00-145-0268	Grease, Aircraft (81349) MIL-G-81322	CN
20	O	9150-00-985-7246	Grease, Aircraft and Instrument (81349) MIL-G-23827	LB
21	F		Grease, lithium (73219) GR-132	TU
22	C, O	9150-00-929-7946	Grease, Lubriplate TU (73219) 1200-2	
23	O		Grease, Mobilux Grade No 2 or equivalent E. P. Grease, NLGI grade 2 19135) 64127-4	TU
24	F	9150-01-080-9652	Grease, Silicone (81349) MIL-L-15719	EA
25	O	9150-00-530-6814	Grease, Wire Rope, 81349) MIL-G-18458	CN
26	C	6850-00-003-5295	Lubricant, Compound, Cleaning (81349) MIL-C-83360	CN
27	C		Oil, Light Lubricating, General Purpose (81348) W-L-820	PT
28	C, O	9150-01-035-5393	Oil, Lubricating, Gear	CN
29	O		Oil, Mobilgear 626 (19135) 61085-7	QT
30	O		Oil, Mobilgear 629 (19135) 61086-5	QT
31	O	9150-00-261-7899	Oil, Penetrating (81348) W-P-216	EA
32	O		Oil, SAE Grade 30, Mobil Delvac 1230 (if operating below 0° F.) (19135) 44067-7	PT

Section II. MANDATORY REPLACEMENT PARTS LIST				
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION,	(5) U/M
33	O	9150-01-219-3276	Oil, SAE Grade 50, Mobil Delvac 1250 (if operating above 0° F.) 19135) 44097-4	PT
34	O		Oil, SAE 40, API Class CD-II, Sulfated Ash less than 1.0%, Mobil Delvac 1340, MIL-L-2104D (19135) 44073-5	QT
35	C		Paint, Amercoat 385 PA Oxide Red Primer (09869) 373-930	GL
36	C		Paint, Amercoat 385 #27 Haze Grey (09869) 353-070	GL
37	C		Paint, Amercoat 385 AS Mid Graphite Grey (09869) 372-130	GL
38	C		Paint, Amercoat 385 Black (09869) 994-086	GL
39	C		Paint, Enamel, Yellow (17833) TTE-490	GL
40	C		Paint, Primer, Red Oxide (17833) TTP-664, #13538	GL
41	C, O	8030-00-204-9149	Sealant, Pipe Thread, 50 ML Tube, (05972) #592	EA
42	O		Sealant, RTV Silicone, Tube (4M493) #6BC	EA
43	O	8030-00-339-0310	Sealant, Thread, 50 ml bottle (05972) 56931	EA
44	O		Sleeve, Solder (63590) LSSS-300	EA
45	O	6505-00-055-9422	Soda, Baking (Sodium Bicarbonate (60060) NDC00074-4103-03	OZ
46		6850-00-664-5685 6850-00-264-9038 6850-00-274-5421 6850-00-285-8011	Solvent, dry cleaning P-D-680 Type II (58536) A-A-71 1 quart container 1 gallon can 5 gallon drum 55 gallon drum	QT GL GL GL
47	O	8030-00-889-3535	Tape, Teflon, 1/2 In (81348) MIL-T-27730	RL

Section II. MANDATORY REPLACEMENT PARTS LIST				
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION,	(5) U/M
48	C		Thinner, Paint, Amercoat #65 or equivalent 09869 100-120	GL
49	O		5970-01-124-7344 Tubing, Heat Shrink (06090) MIL-LT-1/4	FT
50	O	5970-01-124-8565	Tubing, Heat Shrink (06090) MIL-LT-3/8	FT
51	O		Tubing, Heat Shrink (06090) MIL-LT-1/2	FT
52	O	5970-01-101-7407	Tubing, Heat Shrink (75037) EPS-200 1-1/2	FT
53	O		Tubing, Heat Shrink (75037) EPS-200 2	FT
54	C	6810-00-297-9540	Water, Distilled, 5 gallons (96906) MS36300-5	GL
55	O	9330-01-250-2958	Wrap, Spiral (06383) T50N	EA
56	O	9330-01-311-3859	Wrap, Spiral (06383) T25N	EA
57	O	E24628-3	Wrap, Tie, Nylon, .140 X 11.10 (546501) TY526MX	Bdl
58	H	8010-01-349-8055 8010-01-380-3306	Zinc, Inorganic, No. 531 0N4K0 (IC531) 4 Gallon Package 1 Gallon Package	GL

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APPENDIX G

CABLE AND WIRING DIAGRAMS

Section I. INTRODUCTION

G-1 SCOPE.

This appendix provides the illustrated cable and wiring diagrams necessary for maintenance, troubleshooting, and repair of the Modular Causway Ferry (MCF). Diagrams provide the identification of each wire to be connected , by color code or wire number as applicable. The diagrams show the location of each pertinent terminal and/or position.

The same diagram may be referenced at different times as it applies to instructions within the appropriate maintenance chapter (Unit Level, Direct Support, or General Support).

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LEGEND:					
A1	ENGINE & COMPONENTS. NOTE 1.	B1	VENT FAN MOTOR (B1)	S2	CO2 PRESSURE SWITCH
A1B1	ENGINE STARTER	BT	BATTERY	S8	FIRE THERMAL DETECTOR LOCATED AFT
A2	THRUSTER & COMPONENTS	G1	ALTERNATOR	S9	FIRE THERMAL DETECTOR LOCATED MIDDLE
A2B1	THRUSTER STEERING POSITION SYNCHRO	JB1	JUNCTION BOX FOR #1 BILGE PUMP (B2)	VR1	REGULATOR FOR ALTERNATOR
A2JB2	THRUSTER JUNCTION BOX E26929	JB2	JUNCTION BOX FOR #3 BILGE PUMP (B4)	LEGEND NOTES: 1. ENGINE COMPONENTS INCLUDE ACTUATOR FOR SPEED GOVERNOR, ELECTRONIC OVERSPEED SWITCH, PRESSURE SWITCHES, TEMP & PRESS SENDING UNITS ETC. SEE POWER MODULE SCHEMATIC. THESE ARE WIRED TO ENGINE IN HARNESS K-MB1	
A2JB1	HYDRAULIC CONTROL NOTE 2.	JB3	NATO RECEPTACLE	2. HYD CONTROL BOX CONNECTS TO STEERING SOLENOIDS.	
A2S2	THRUSTER GEAR BOX OIL LEVEL SW	JB5	JUNCTION BOX FOR #5 BILGE PUMP (B6)	3. THIS LEGEND LISTS ONLY THOSE COMPONENTS CONNECTED IN PROPULSION MODULE & DOES NOT ADDRESS COMPONENTS WIRED ON SUBASSEMBLIES.	
A3	PROPULSION MODULE JUNCTION BOX, E28803	JB6	JUNCTION BOX FOR #6 BILGE PUMP (B7)		
A4	ENGINE JUNCTION BOX & E STOP SW, E08913	JB8	JUNCTION BOX FOR #4 BILGE PUMP (B5)		
A5	BILGE PUMP CONTROL PANEL, E08893	L1	COLD START SOLENOID		
A6	CIRCUIT BREAKER PANEL, E06783	L2/L3	CLUTCH ENGAGE FORWARD/ENGAGE BACKFLUSH SOLENOIDS		
A7	SINGLE BILGE PUMP CONTROL PANEL, E08903				
A8	VENT FAN RELAY ENCLOSURE, E23703, FOR MOTOR B1				
A9	THRUSTER DIR/ AUX. BATT. JUNCTION BOX ASSY. ENCLOSURE E28253.				

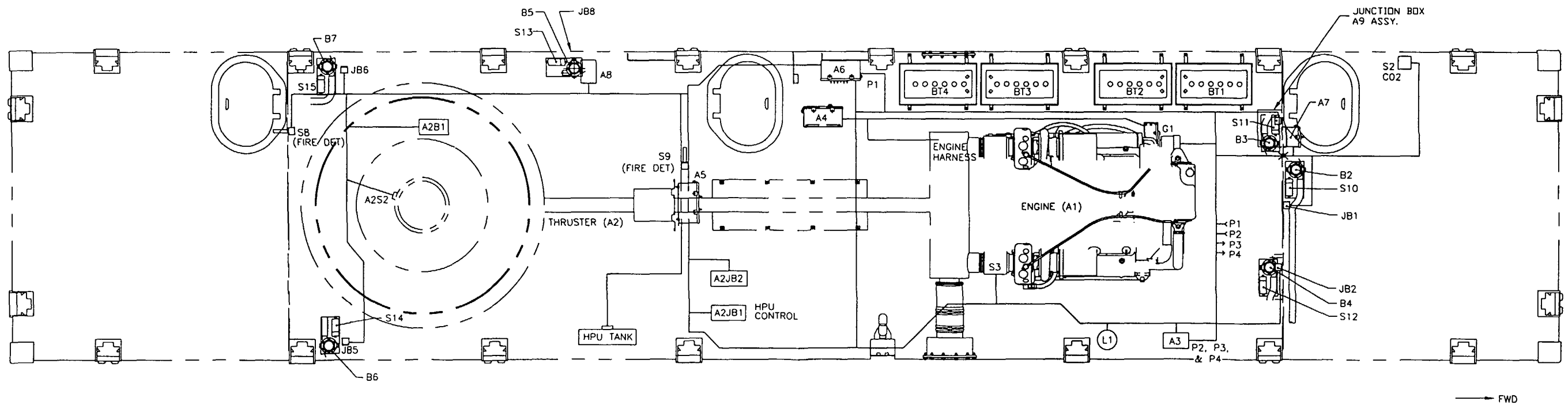


Figure G-1. Propulsion Module Electrical Assembly (Schottel).
(Sheet 1 of 3)

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CABLE LEGEND

CABLE ID.	DESCRIPTION
P24	24VDC DISTRIBUTION
KEH	CLUTCH CONTROL
KMB	ENGINE CONTROL
KL	STEERING CONTROL
CFR	FIRE CO2 RELEASE SWITCH
CBP	BILGE PUMP AND INDICATION CONTROL
CF	FIRE/FLOOD DETECTORS
CFD	BILGE PUMPS/SWITCHES
HPU	HYD. POWER UNIT
VF	VENT FAN
SWE	CABLE/HARNESS "SUPPLIED WITH EQUIP"
P1	24V PLUG/CABLE ASSEMBLY
P2	PLUG/CABLE ASSEMBLY
P3	PLUG/SHIELDED CABLE ASSEMBLY
P4	PLUG/CABLE ASSEMBLY
P5	PLUG/CABLE ASSEMBLY

- NOTE: DO NOT LOCATE STUFFING TUBES PER THIS DRAWING.-
NOTE: DESIGNATION IN PARENTHESES IS CABLE TYPE PER FOLLOWING.

DESIGNATION	TYPE	DESCRIPTION	O.D.	ITEM
D3	LSDHOF-3	2/C 16 AWG	.425	25
D4	LSDHOF-4	2/C 14 AWG	.460	26
D9	LSDNW-9	2/C 10 AWG	.545	111
D30	LSDHOF-30	2/C 5 AWG	.960	75
D50	LSDNW-50	2/C 3 AWG	.910	28
T3	LSTHOF-3	3/C 16 AWG	.450	29
T4	LSTHOF-4	3/C 14 AWG	.480	30
T9	LSTNW-9	3/C 10 AWG	.625	112
F4	LSFNW-4	4/C 14 AWG	.513	128
F9	LSFNW-9	4/C 10 AWG	.630	27
4SJ20	LS4SJ-20	4/C 20 AWG	.320	69
2SJ18	LS2SJ-18	2/C 18 AWG	.310	33
I/O	I/O CABLE	1/C I/O AWG	.910	53,55

DESIGNATION	TYPE	DESCRIPTION	O.D.	ITEM
-	-	-	-	-
M19	LSMHOF-19	19/C 16 AWG	.705	74
M14	LSMHOF-14	14/C 16 AWG	.635	34
M37	LSMHOF-37	37/C 16 AWG	.925	120
3SJ18	LS3SJ18	3/C SHLD 18 AWG	.325	35
3SU-7	LS3SU-7	7 SHLD TRIADS	.910	121
SWE	VARIOUS	SUPPLIED WITH EQUIP.	-	VARIOUS
S06	2S0-6	2/C 6 AWG	.825	119
BATT	5JBX-1011-02P	1/C 1/O BK	.491	52
BATT	5JBX-1011-03P	1/C 1/O RED	.491	53

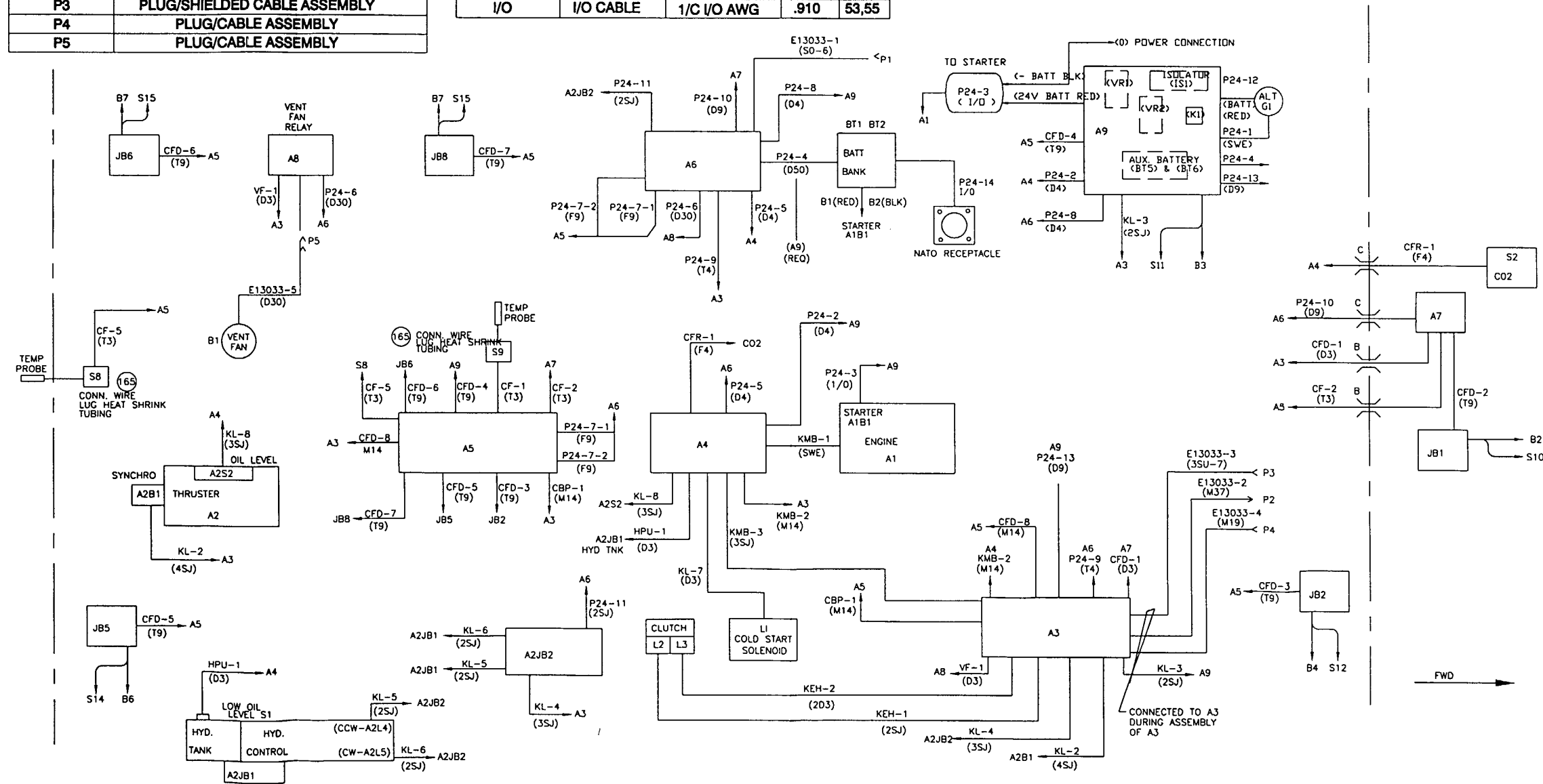


Figure G-1. Propulsion Module Electrical Assembly (Schottel).
(Sheet 2 of 3)

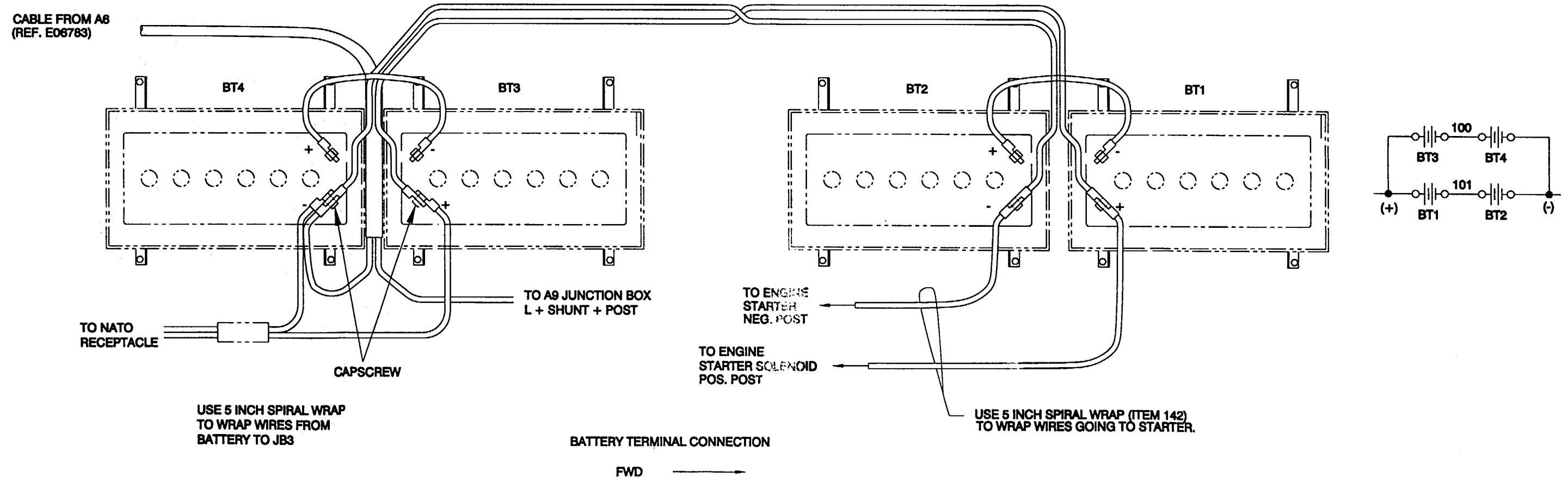


Figure G-1. Propulsion Module Electrical Assembly (Schottel).
(Sheet 3 of 3)

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PROPULSION MODULE
UNIT 1 IF LOCATED STBD
UNIT 2 IF LOCATED PORT

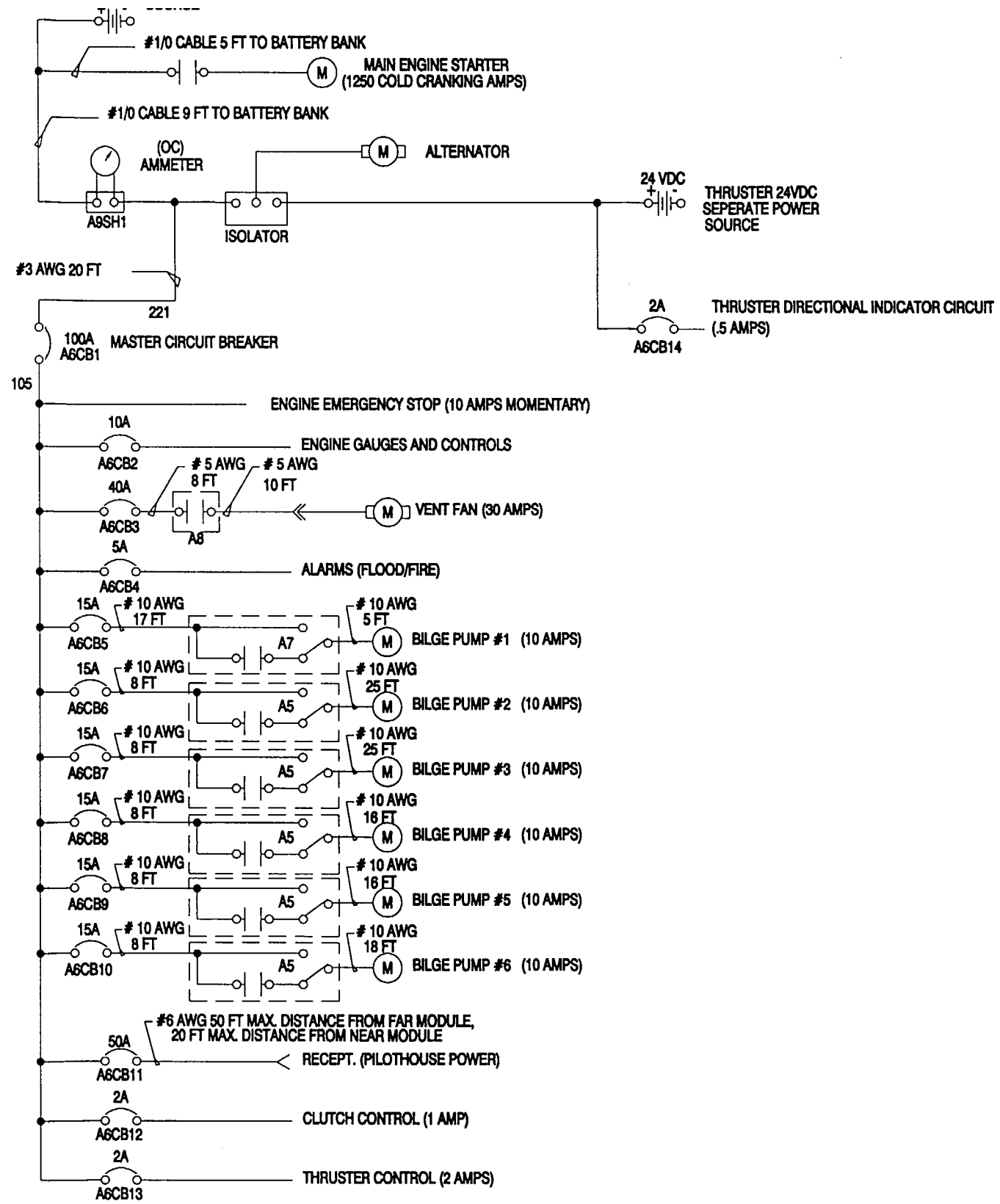


Figure G-2. Propulsion Module One Line Diagram.

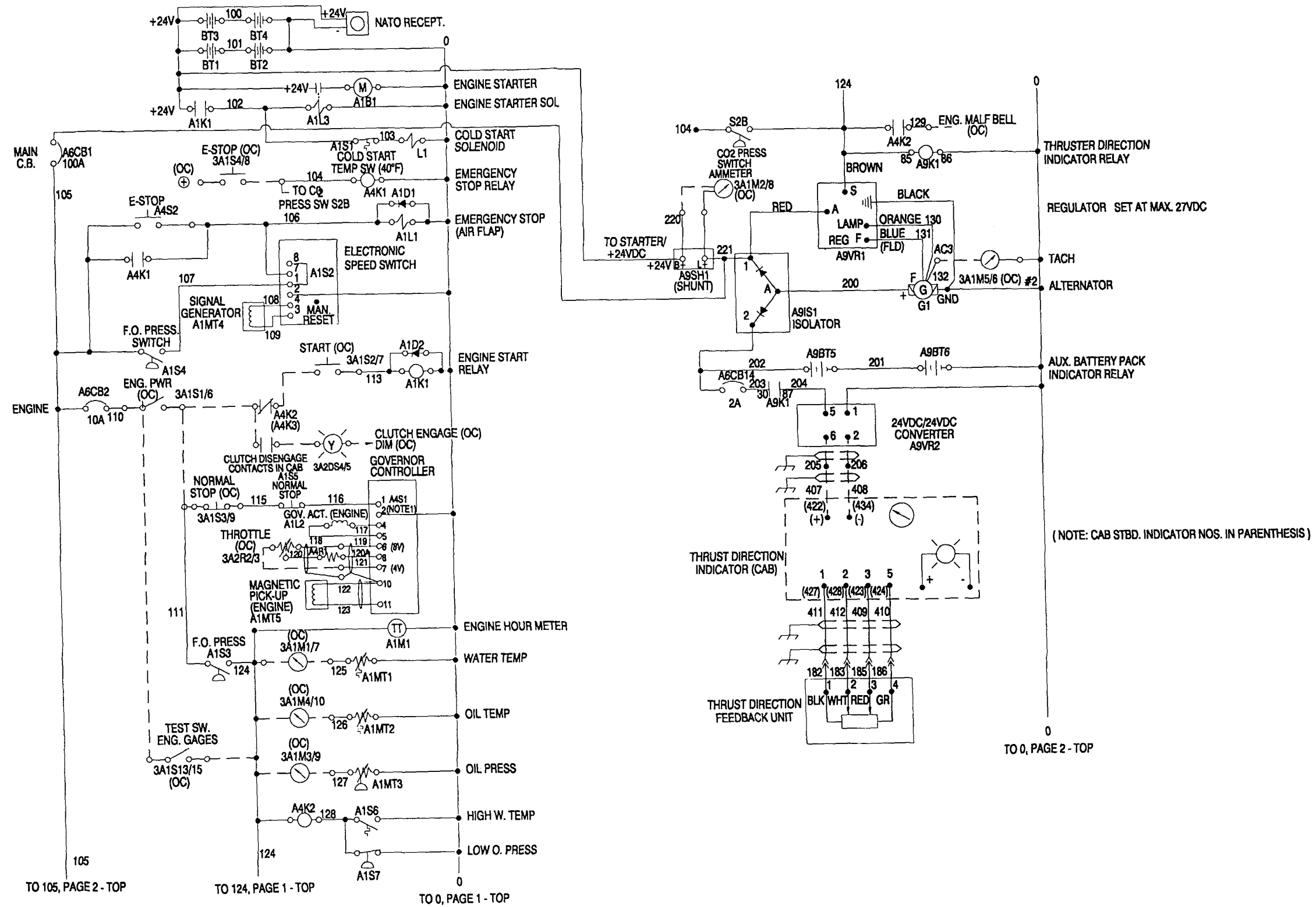


Figure G-3. Propulsion Module Schematic.
 (Sheet 1 of 4)

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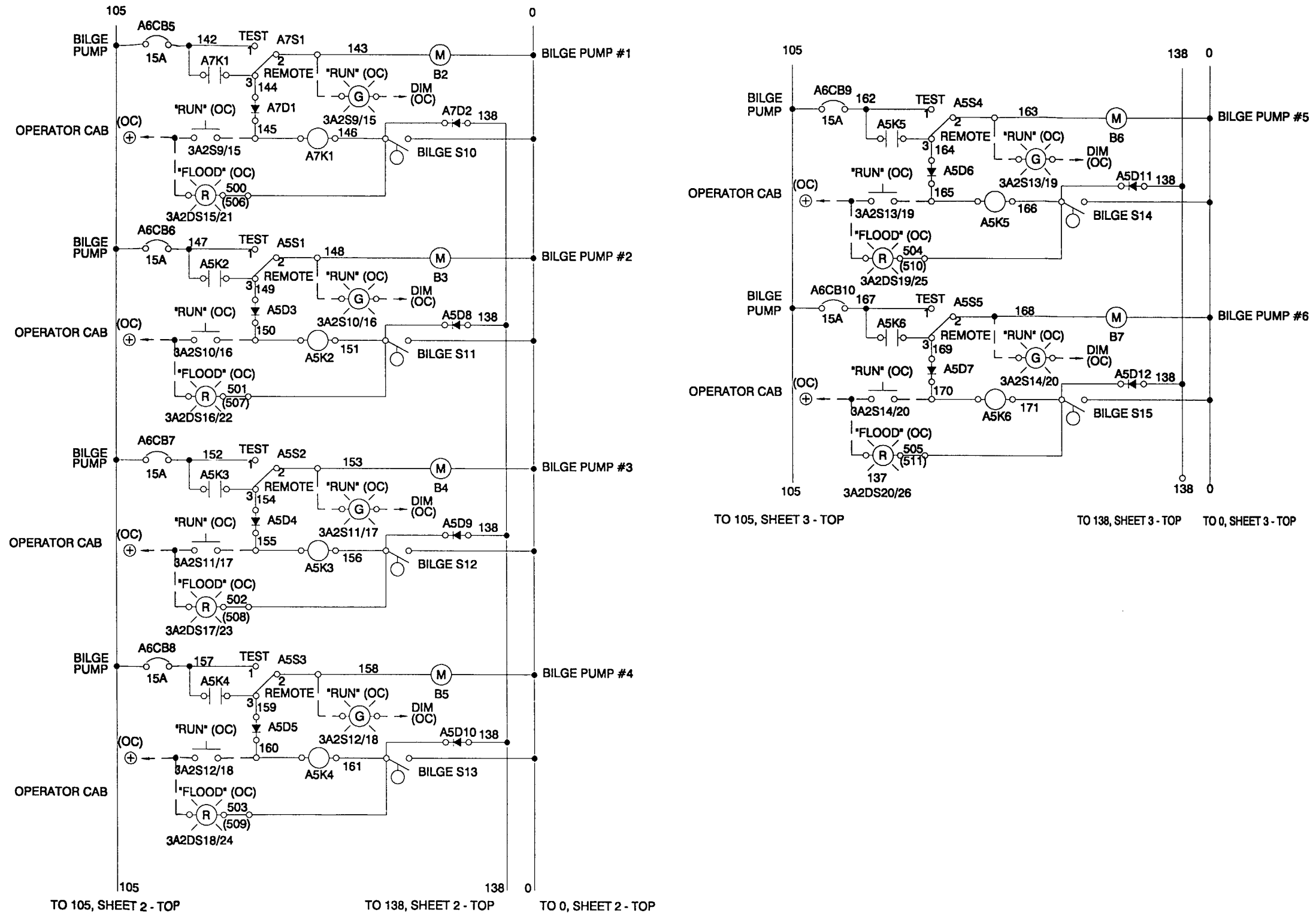


Figure G-3. Propulsion Module Schematic.
(Sheet 2 of 4)

G-13/(G-14 blank)

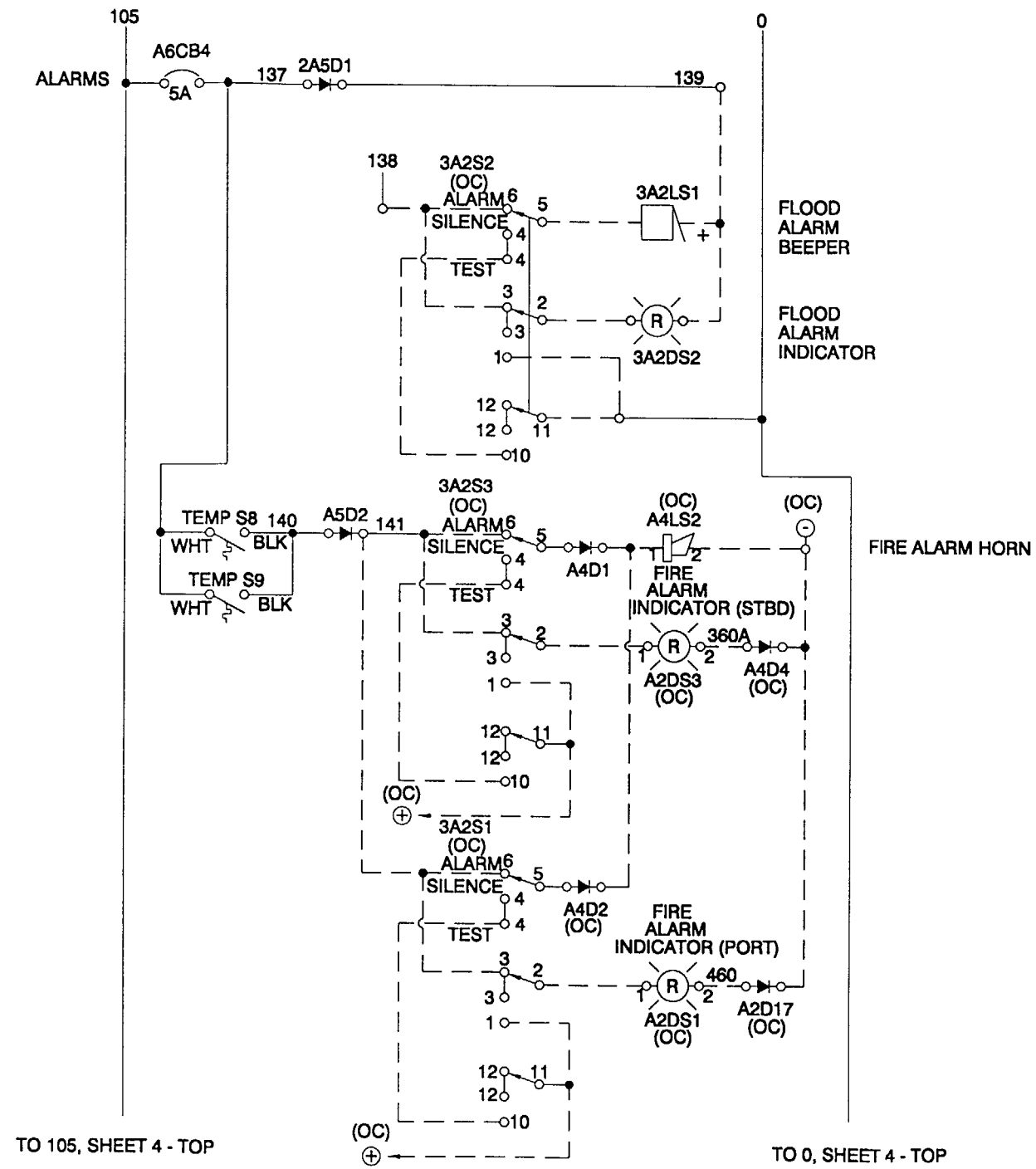
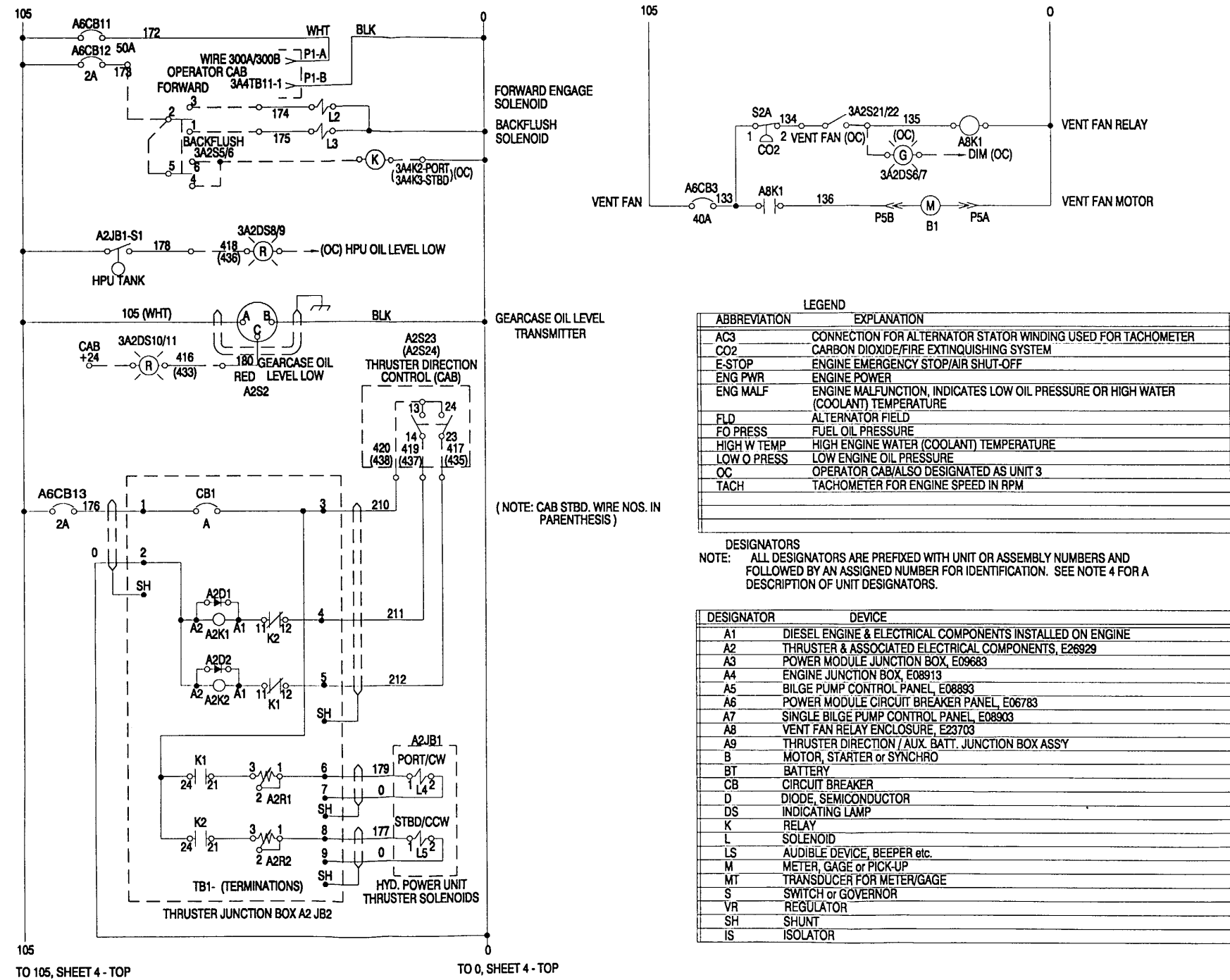
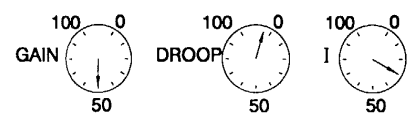


Figure G-3. Propulsion Module Schematic.
(sheet 3 of 4)

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- NOTES:**
- CONDUCTORS GOING TO OPERATOR CAB ARE SHOWN AS DASHED. DEVICES IN OPERATOR CAB HAVE DESIGNATIONS THAT START WITH "3". LAST DIGIT OF OPERATOR CAB DEVICES IF SEPARATED FOR PORT/STBD ARE SHOWN WITH A SLASH BETWEEN THE PORT AND STBD DEVICE NUMBERS.
 - THIS SCHEMATIC DOES NOT SHOW ALL TERMINAL OR CONNECTOR PIN NUMBERS.
 - SYSTEM DESIGNATORS (ALL DESIGNATORS NOT USED ON THIS SCHEMATIC)
 - UNIT 1 : STBD PROPULSION MODULE. THIS IS MODULE E02843 (P40P) INSTALLED IN STBD LOCATION.
 - UNIT 2 : PORT PROPULSION MODULE. THIS IS MODULE E02843 (P40P) INSTALLED IN PORT LOCATION.
 - UNIT 3 : OPERATOR CAB
 - UNIT 4 : MAIN MAST
 - UNIT 5 : STUB MAST
 - GOVERNOR A4S1 SETTINGS AS FOLLOWS:
 - SWITCH S1=OFF
 - SWITCH S2=ON
 - GAIN = 40% OR 50% POSITION
 - DROOP = FULL CCW
 - I = 30% POSITION
 - IDLE SPEED 800 RPM MINIMUM



- EXAMPLES:**
- A1M1, THIS IS METER NUMBER 1 (ENGINE HOUR METER) INSTALLED ON DIESEL ENGINE (A1)
 - S3, THIS IS SWITCH NUMBER 3 (NEUTRAL LIMIT SWITCH) IN POWER MODULE. THIS SWITCH IS THE ONLY ELECTRICAL COMPONENT INSTALLED ON THE POWER TAKE OFF CLUTCH ENGAGEMENT CYLINDER.
 - 3A2DS13/19, THIS IS INDICATING LAMP (DS) NUMBER 13 FOR PORT AND NUMBER 19 FOR STBD LOCATED IN ASSEMBLY A2 IN THE OPERATOR CAB (UNIT 3). SEE OPERATOR CAB SCHEMATIC E26546 AND ASSEMBLY E02873 FOR DESCRIPTION OF THE A2 ASSEMBLY WHICH IS THE LOWER CONTROL PANEL ASSEMBLY "A2" DRAWING E06773.

Figure G-3. Propulsion Module Schematic. (Sheet 4 of 4)

G-17/(G-18 blank)

PROPULSION MODULE WIRING LIST**NOTES:**

1. All material on this drawing is ordered from LAKE SHORE INC. drawing number E26573 (POWER MODULE ELECTRICAL ASSEMBLY).
2. Cable lengths are approximate, verify before cutting cables. Record lengths for future updates in drawing.
3. Reference drawings:

A.	E26573	(POWER MODULE ELECTRICAL ASSEMBLY)
B.	E26554	(POWER MODULE SCHEMATIC)
C.	E26524	(POWER MODULE ONE LINE)
D.	E06783	(POWER MODULE CB PANEL "A6")
E.	E08893	(BILGE PUMP CONTROL PANEL "A5")
F.	E08903	(SINGLE BILGE PUMP CONTROL PANEL "A7")
G.	E08913	(ENGINE JB BOX "A4")
H.	E09683	(POWER MODULE JB BOX "A3")
I.	E26664	(CABLE ENTRY DIAGRAM)
J.	E26929	(SCHOTTEL 1109363 THRUSTER ELE. SYSTEM A2JB2)
K.	E26754	(SCHOTTEL 1109139 HYD. SYSTEM SCHEMATIC A2JB1)
L.	E28253	(THRUSTER/AUX. BATT. BOX A9)

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*Figure G-4. Wiring List, Power Module
(Sheet 1 of 60).*

SHEET	SUBJECT	TYPE	SHEET	SUBJECT	TYPE
1	TITLE PAGE		25	CF-1	T3
2	INDEX PAGE		26	CF-2	---
3	P24-1	SWE	27	---	---
4	P24-2	D4	28	---	---
5	P24-3	1/0	29	CF-5	T3
6	P24-4	D50	30	---	---
7	P24-5	D4	31	CBP-1	M14
8	P24-6	D30	32	---	---
9	P24-7-1, P24-7-2	F9	33	CFD-1	D3
10	P24-8	D4	34	CFD-2	T9
11	P24-9	T4	35	CFD-3	T9
12	P24-10	D9	36	CFD-4	T9
13	P24-11	2SJ18	37	CFD-5	T9
14	P24-12	BATT RED	38	CFD-6	T9
15	P24-13	D9	39	CFD-7	T9
16	P24-14	I/O	40	CFD-8	M14
17	B1, B2	BATT	41	---	---
18	B3, B4, B5, B6	BATT	42	---	---
19	---	---	43	CFR-1	F4
20	KMB-1	(SWE) ENGINE	44	---	---
21	KMB-2	M14	45	KEH-1	2SJ18
22	KMB-3	3SJ18	46	KEH-2	2SJ18
23	---	---	47	---	---
24	---	---	48	---	---

Figure G-4. Wiring List, Power Module
(Sheet 2 of 60).

SHEET	SUBJECT	TYPE	SHEET	SUBJECT	TYPE
49	KL-2	4SJ20			
50	KL-3	2SJ18			
51	KL-4	3SJ18			
52	KL-5	2SJ18			
53	KL-6	2SJ18			
54	KL-7	D3			
55	KL-8	3SJ18			
56	---	---			
57	HPU-1	D3			
58	---	---			
59	VF-1	D3			
60	---	---			

Figure G-4. Propulsion Module Wiring List
(Sheet 2A of 60).

CABLE LIST						
CABLE NUMBER: P24-1						
CABLE TYPE: SWE						
O.D.:						
CABLE LENGTH: 4'						
CABLE ENTRY FROM: G1			FROM: ALTERNATOR			
CABLE ENTRY TO: VR1/A9			TO: VOLTAGE REGULATOR/A9 JUNCTION BOX			
BULKHEAD FITTINGS: NONE			NOTES: CABLE IS FURNISHED WITH VOLTAGE REGULATOR - BROWN LEAD IS BROKEN OUT AND ROUTED TO ENG. JUNC. BOX (A4) IN CABLE P24-2. RED WIRE AND OTHER LEADS FURNISHED ARE CONNECTED TO ALTERNATOR.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
	124	BRN	SEE SHT.3	A4 (TB1-13)	COMPRESSION	TB1-4
	+24	RED	E20908-1	G1-OUT(+)	COMPRESSION	TB1-5
	131	BLU	FURNISHED	G1-F	COMPRESSION	TB1-1
	130	ORG	FURNISHED	G1-AC	COMPRESSION	TB1-2
	0	BLK	FURNISHED	G1-GND	COMPRESSION	TB1-3
	132	WHITE	20909-1	G1-AC	COMPRESSION	TB1-6
				NOTE: G1 TERMINALS NOT MARKED		

Figure G-4. Propulsion Module Wiring List
(Sheet 3 of 60).

CABLE LIST						
CABLE NUMBER: P24-2						
CABLE TYPE: LSDHOF-4						
O.D.: .460						
CABLE LENGTH: 12'						
CABLE ENTRY FROM: VR1/G1			FROM: VOLTAGE REGULATOR/ALTERNATOR (A9)			
CABLE ENTRY TO: A4			TO: ENGINE JUNCTION BOX			
BULKHEAD FITTINGS: #2 NYLON TUBE AT A4, 2E PACKING			NOTES: BROWN CONDUCTOR SUPPLIED AS PART OF VOLTAGE REGULATOR/ALTERNATOR WIRING HARNESS IS CONNECTED TO BLACK CONDUCTOR.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	124	BLACK	E13258	TB1-4(BROWN)	E11028-21	TB1-13
2	132	WHITE	E11028-10	TB1-6 (WHT)	E11028-21	TB2-10

Figure G-4. Propulsion Module Wiring List
(Sheet 4 of 60).

CABLE LIST						
CABLE NUMBER: P24-3						
CABLE TYPE: 1/0						
O.D.: .910						
CABLE LENGTH: SEE BELOW						
CABLE ENTRY FROM: A9				FROM: THRUSTER DIR/AUX BATT./VOLTAGE REG./ISOLATOR		
CABLE ENTRY TO: A1B1				TO: ENG. STARTER, A1B1		
BULKHEAD FITTINGS:				NOTES: MAIN WIRES FOR ALTERNATOR CHARGING CURRENT TO +24 VDC SYSTEM		
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	E11028-23	ALT GND	E20908-2	STARTER NEG. POST
2	+24	RED	E11028-23	IS1-1	E20908-2	STARTER POS. POST
NOTE: RED = 96" BLK - 60"						

Figure G-4. Propulsion Module Wiring List (Sheet 5 of 60).

CABLE LIST						
CABLE NUMBER: P24-4						
CABLE TYPE: LSDNW-50						
O.D.: .910						
CABLE LENGTH: 14'						
CABLE ENTRY FROM: BT&A9			FROM: BATTERY BANK AND A9 JUNCTION BOX			
CABLE ENTRY TO: A6			TO: POWER MODULE CIRCUIT BREAKER BOX			
BULKHEAD FITTINGS: #5 NYLON TUBE AT A6, 5D PACKING			NOTES: CONDUCTORS ARE CLAMPED IN TERMINAL BLOCKS AT A6			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	E20838-2	BT2 NEG	WIRE	TB4-(*)
2	+24	WHITE	E20838-2	A95H1-L+	WIRE	TB1-1

(*) TB4 TERMINAL BLOCK CONNECTIONS TO
(0)
CONNECT TO AN OPEN TERMINAL POINT.

Figure G-4. Propulsion Module Wiring List
(Sheet 6 of 60).

CABLE LIST						
CABLE NUMBER: P24-5						
CABLE TYPE: LSDHOF-4						
O.D.: .460						
CABLE LENGTH: 5'						
CABLE ENTRY FROM: A6			FROM: POWER MODULE CIRCUIT BREAKER PANEL			
CABLE ENTRY TO: A4			TO: ENG JUNCTION BOX			
BULKHEAD FITTINGS: 2 NYLON STUFFING TUBE 2E PACKING ASSEMBLY-BOTH ENDS			NOTES: LOAD SIDE OF MAIN CB FOR +24 VDC FEED TO ENG JUNCTION BOX.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	WIRE	TB4	E11028-1	TB1-20
2	105	WHITE	WIRE	TB2-1	E11028-1	TB1-17

Figure G-4. Propulsion Module Wiring List
(Sheet 7 of 60).

CABLE LIST						
CABLE NUMBER: P24-6						
CABLE TYPE: LSDHOF-30						
O.D.: .960						
CABLE LENGTH: 8'						
CABLE ENTRY FROM: A8			FROM: VENT FAN RELAY, A8			
CABLE ENTRY TO: A6			TO: CIRCUIT BREAKER PANEL, A6			
BULKHEAD FITTINGS: 5 NYLON TUBE 5E PACKING ASSEMBLY BOTH ENDS			NOTES: FEED FOR VENT FAN MOTOR CIRCUIT			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	WIRE	TB1	WIRE	TB4
2	133	WHITE	WIRE	K1-1	WIRE	TB2-02
			USE TB1 LARGE LUG IN A8 FOR "0" WIRE FOR THIS CABLE. SEE CABLE VF-1.			

Figure G-4. Propulsion Module Wiring List (Sheet 8 of 60).

CABLE LIST						
CABLE NUMBER: P24-7-1 & 7-2						
CABLE TYPE: LSFNW-9						
O.D.: .630						
CABLE LENGTH: 12'						
CABLE ENTRY FROM: A5			FROM: BILGE PUMP CONTROL PANEL			
CABLE ENTRY TO: A6			TO: PM CIRCUIT BREAKER PANEL			
BULKHEAD FITTINGS: 4 NYLON TUBE 4E INSERT BOTH ENDS			NOTES: TWO CABLES RUN TO SAME LOCATIONS. POWER FEED TO ENGINE COMPARTMENT BILGE PUMP CIRCUIT AND FLOOD ALARM.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
(7-1) 1	0	BLACK	WIRE	TB3-1	WIRE	TB4
(7-1) 2	0	WHITE	WIRE	TB3-1	WIRE	TB4
(7-1) 3	137	RED	WIRE	TB1-8	WIRE	TB3-3
(7-1) 4	147	GREEN	WIRE	TB2-3	WIRE	TB3-5
(7-2) 1	152	BLACK	WIRE	TB2-8	WIRE	TB3-6
(7-2) 2	157	WHITE	WIRE	TB4-3	WIRE	TB3-7
(7-2) 3	162	RED	WIRE	TB4-8	WIRE	TB3-8
(7-2) 4	167	GREEN	WIRE	TB3-8	WIRE	TB3-9

Figure G-4. Propulsion Module Wiring List
(Sheet 9 of 60).

CABLE LIST						
CABLE NUMBER: P24-8						
CABLE TYPE: LSDHOF-4						
O.D.: .460						
CABLE LENGTH: 20'						
CABLE ENTRY FROM: A9			FROM: THRUSTER DIR/AUX BATT. JUNCTION BOX ASSEMBLY			
CABLE ENTRY TO: A6			TO: PM CIRCUIT BREAKER PANEL			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	202	BLACK	WIRE	TB2-3	WIRE	TB2-4
2	203	WHITE	WIRE	TB2-4	WIRE	TB2-5

Figure G-4. Propulsion Module Wiring List (Sheet 10 of 60).

CABLE LIST						
CABLE NUMBER: P24-9						
CABLE TYPE: LSTHOF-4						
O.D.: .480						
CABLE LENGTH: 20'						
CABLE ENTRY FROM: A6			FROM: PM CIRCUIT BREAKER PANEL			
CABLE ENTRY TO: A3			TO: PM JUNCTION BOX			
BULKHEAD FITTINGS: #4 NYLON TUBE #4B PACKING ASSEMBLY BOTH ENDS			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
0	0	BLACK	WIRE	TB4	E11028-21	TB2-13
1	110	WHITE	WIRE	TB3-1	E11028-21	TB1-3
2	173	RED	WIRE	TB3-10	E11028-21	TB1-10

Figure G-4. Propulsion Module Wiring List (Sheet 11 of 60).

CABLE LIST						
CABLE NUMBER: P24-10						
CABLE TYPE: LSDNW-9						
O.D.: .545						
CABLE LENGTH: 17'						
CABLE ENTRY FROM: A6				FROM: PM CIRCUIT BREAKER PANEL		
CABLE ENTRY TO: A7				TO: FWD BILGE PUMP CONTROL		
BULKHEAD FITTINGS: #4 NYLON TUBE #4B PACKING BOTH ENDS				NOTES: CONDUCTOR 1 IS CLAMPED IN TERMINAL BLOCK 4 AT CIRCUIT BREAKER PANEL		
				TERMINATION DATA		
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	WIRE	TB4	WIRE	TB1-6
2	142	WHITE	WIRE	TB3-4	WIRE	TB1-3

Figure G-4. Propulsion Module Wiring List (Sheet 12 of 60).

CABLE LIST						
CABLE NUMBER: P24-11						
CABLE TYPE: LS2SJ-18						
O.D.: .310						
CABLE LENGTH:						
CABLE ENTRY FROM: A2JB2			FROM: THRUSTER CONTROL JUNCTION BOX			
CABLE ENTRY TO: A6			TO: PM CIRCUIT BREAKER PANEL			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLK	COMPRESSION	TB1-2	COMPRESSION	TB4-(*)
2	176	WHT	COMPRESSION	TB1-1	COMPRESSION	TB3-11
3	SH	SHLD	COMPRESSION	TB1-SH		NONE
			(*)TB4 TERMINAL BLOCK ALL CONNECTIONS (0) CONNECT TO AN OPEN TERMINAL POINT.			

Figure G-4. Propulsion Module Wiring List (Sheet 13 of 60).

CABLE LIST						
CABLE NUMBER: P24-12						
CABLE TYPE: 1/0 RED						
O.D.:						
CABLE LENGTH: 8 FT.						
CABLE ENTRY FROM: ALT/G1				FROM: ALTERNATOR		
CABLE ENTRY TO: A9				TO: THRUSTER DIR/AUX BATT, JUNCTION BOX A9		
BULKHEAD FITTINGS: A9 BOX NO. 2 STUFFING TUBE NO. 2E PACKING				NOTES: CABLE PART NO. <u>E20828-2</u> 1A CABLE IS A JUMPER FROM (+) LH SIDE TO (+) RH SIDE G1.		
				TERMINATION DATA		
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	200	RED	E20908-3	G1 (+)	E20908-3	1S1-A
1A	200	RED	E20908-3	G1 (+)	E20908-3	G1(+)

Figure G-4. Propulsion Module Wiring List (Sheet 14 of 60).

CABLE LIST						
CABLE NUMBER: P24-13						
CABLE TYPE: LSDNW-9						
O.D.: 0.545						
CABLE LENGTH: 15'						
CABLE ENTRY FROM: A9			FROM: THRUSTER JUNCTION BOX DIR/BATTERY A9			
CABLE ENTRY TO: A3			TO: POWER MODULE JUNCTION BOX A3			
BULKHEAD FITTINGS: #4 TUBE #4B PACKING			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	220	BLACK	E11028-19	SH1-B+	E11028-19	TB4-10
2	221	WHT	E11028-19	SH1-L+	E11028-19	TB4-11

Figure G-4. Propulsion Module Wiring List (Sheet 15 of 60).

CABLE LIST						
CABLE NUMBER: P24-14						
CABLE TYPE: I/O						
O.D.:						
CABLE LENGTH: 10' EACH						
CABLE ENTRY FROM: BT			FROM: MAIN BATTERY BOX			
CABLE ENTRY TO: JB3			TO: NATO RECEPTICAL JUNCTION BOX			
BULKHEAD FITTINGS:			NOTES: FOR COLD WEATHER STARTING			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	E20838-1	-BT4	COMPRESSION	+
2	+24V	RED	E20838-1	+BT3	COMPRESSION	-

Figure G-4. Propulsion Module Wiring List (Sheet 16 of 60).

CABLE LIST						
CABLE NUMBER: B1, B2						
CABLE TYPE: 5JBX-1011-02P & 03P						
O.D.: .491						
CABLE LENGTH: SEE BELOW						
CABLE ENTRY FROM: BT			FROM: BATTERY BT 1/BT 2			
CABLE ENTRY TO: A1B1			TO: STARTER/SOLENOID A1 B1			
BULKHEAD FITTINGS:			NOTES: MAIN WIRES FOR ENGINE STARTER			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
B1	+24	RED 5'	E20838-1	BT1-POS.	E20838-1	SOLENOID POS. POST
B2	0	BLK 4'	E20838-1	BT2-NEG.	E20838-1	STARTER NEG. POST
			NOTE: BLK = 4' RED = 5'			

Figure G-4. Propulsion Module Wiring List
(Sheet 17 of 60).

CABLE LIST						
CABLE NUMBER: B3 THRU B6						
CABLE TYPE: 1/0						
O.D.: .491						
CABLE LENGTH: AS NEEDED						
CABLE ENTRY FROM: SEE NOTES			FROM: SEE NOTES			
CABLE ENTRY TO: SEE NOTES			TO: SEE NOTES			
BULKHEAD FITTINGS:			NOTES: INTERNAL CABLING ON BATTERY BANK SEE BELOW. REFERENCE E26573 SHT. 8. LABEL ENDS OF CABLES WITH TERMINATION POINT.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
B3	SEE NOTE	RED	E20838-1	BT1-POS	E20838-1	BT3-POS
B4	SEE NOTE	BLK	E20838-1	PT1-NEG	E20838-1	BT2-POS
B5	SEE NOTE	BLK	E20838-1	PT3-NEG	E20838-1	BT4-POS.
B6	SEE NOTE	BLK	E20838-1	BT2-NEG	E20838-1	BT4-NEG
			B3	7FT	LONG	
			B4	2FT	LONG	
			B5	2FT	LONG	
			B6	7FT	LONG	

Figure G-4. Propulsion Module Wiring List
(Sheet 18 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List (Sheet 19 of 60).

CABLE LIST						
CABLE NUMBER: KMB-1						
CABLE TYPE: SWE						
O.D.:						
CABLE LENGTH: 20'						
CABLE ENTRY FROM: A1			FROM: MAIN ENGINE			
CABLE ENTRY TO: A4			TO: ENGINE JUNCTION BOX			
BULKHEAD FITTINGS: TWO SCREW CONNECTOR AT A4			NOTES: KMB-1 IS WIRING HARNESS FURNISHED ON ENGINE SHIELD ON W/NO. 122 & 123 CONNECT TO SHIELD ON KMB-3 W/NO. 119, 120, & 121 AND TO TB1-8			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
0	0	BLACK		SWE	E11028-17	A4TB1-20
103	103	PURPLE		SWE	E11028-17	A4TB1-10
105	105	WHITE		SWE	E11028-17	A4TB1-17
106	106	WHITE		SWE	E11028-17	A4TB1-18
111	111	RED		SWE	E11028-17	A4TB2-1
113	113	ORANGE		SWE	E11028-17	A4TB2-2
115	115	BROWN		SWE	E11028-17	A4TB2-6
116	116	BROWN		SWE	E11028-17	A4TB1-1
117	117	RED		SWE	E11028-17	A4TB1-2
118	118	BLACK		SWE	E11028-17	A4TB1-3
122	122	WHITE	TIE SHIELD TO TB1-8 FOR W/N 122 & 123	SWE	E11028-17	A4TB1-8
123	123	BLACK		SWE	E11028-17	A4TB1-9
124	124	GREEN		SWE	E11028-17	A4TB1-12
125	125	RED		SWE	E11028-17	A4TB2-7
126	126	GRAY		SWE	E11028-17	A4TB2-8
127	127	BLUE		SWE	E11028-17	A4TB2-9
128	128	YELLOW		SWE	E11028-17	A4TB1-14

Figure G-4. Propulsion Module Wiring List
(Sheet 20 of 60).

CABLE LIST						
CABLE NUMBER: KMB-2						
CABLE TYPE: LSMHOF-14						
O.D.: .635						
CABLE LENGTH: 20'						
CABLE ENTRY FROM: A4			FROM: ENGINE JUNCTION BOX, A4			
CABLE ENTRY TO: A3			TO: POWER MODULE JUNCTION BOX, A3			
BULKHEAD FITTINGS: #4 NYLON TUBE 4E INSERT BOTH ENDS			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	104	BLACK	E11028-1	TB1-16	E11028-1	TB1-8
2	111	WHITE	E11028-1	TB2-1	E11028-1	TB1-4
3	113	RED	E11028-1	TB2-2	E11028-1	TB1-2
4	115	GREEN	E11028-1	TB2-06	E11028-1	TB1-6
5	124	ORANGE	E11028-1	TB1-13	E11028-1	TB1-7
6	125	BLUE	E11028-1	TB2-7	E11028-1	TB3-14
7	126	WH/BK	E11028-1	TB2-8	E11028-1	TB3-15
8	127	RD/BK	E11028-1	TB2-9	E11028-1	TB3-16
9	129	GN/BK	E11028-1	TB1-15	E11028-1	TB1-9
10	132	OR/BK	E11028-1	TB2-10	E11028-1	TB3-17
11	133	BLU/BK	E11028-1	TB2-3	E11028-1	TB2-20
12	134	BK/WHT	E11028-1	TB2-4	E11028-1	TB1-14
13	180	RED/WH T	E11028-1	TB2-5	E11028-1	TB2-11
14	178	GN/WHT	E11028-1	TB1-11	E11028-1	TB2-15

Figure G-4. Propulsion Module Wiring List
(Sheet 21 of 60).

CABLE LIST						
CABLE NUMBER: KMB-3						
CABLE TYPE: LS3SJ-18						
O.D.: .325						
CABLE LENGTH: 20'						
CABLE ENTRY FROM: A4			FROM: ENGINE JUCTION BOX			
CABLE ENTRY TO: A3			TO: POWER MODULE JUNCTION BOX			
BULKHEAD FITTINGS: 2 NYLON TUBE 2B PACKING BOTH ENDS			NOTES: THROTTLE CONTROL			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	119	BLACK	E11028-9	TB1-4	E11028-9	TB3-2
2	121	WHITE	E11028-9	TB1-7	E11028-9	TB3-3
3	120	RED	E11028-9	TB1-6	E11028-9	TB3-4
4	122	SHIELD	E11028-9	TB1-8	E11028-9	TB3-1

Figure G-4. Propulsion Module Wiring List
(Sheet 22 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List
(Sheet 23 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List
(Sheet 24 of 60).

CABLE LIST						
CABLE NUMBER: CF-2						
CABLE TYPE: LSTHOF3						
O.D.:.450						
CABLE LENGTH: 25'						
CABLE ENTRY FROM: A7			FROM: FORWARD COMPARTMENT BILGE PUMP CONTROL			
CABLE ENTRY TO: A5			TO: BILGE PUMP CONTROL PANEL			
BULKHEAD FITTINGS: NO. 2 STUFFING TUBE NO. 2E PACKING BOTH ENDS			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	138	BLACK	WIRE	TB1-7	WIRE	TB1-2
2	SPARE	WHITE				
3	146	RED	WIRE	TB1-4	WIRE	TB1-7

Figure G-4. Propulsion Module Wiring List
(Sheet 26 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List
(Sheet 27 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List (Sheet 28 of 60).

CABLE LIST						
CABLE NUMBER: CF-5						
CABLE TYPE: LSTHOF-3						
O.D.: .450						
CABLE LENGTH: 25'						
CABLE ENTRY FROM: A5			FROM: BILGE PUMP CONTROL PANEL			
CABLE ENTRY TO: S8			TO: AFT COMPARTMENT FIRE DETECTOR S8			
BULKHEAD FITTINGS: #2 NYLON TUBE, 2E PACKING AT A5. TWO SCREW CONNECTOR AT JB7			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	140	BLACK	WIRE	TB1-5	E23808-1	S8-2
2	137	WHITE	WIRE	TB1-9	E23808-1	S8-1
3	SPARE	RED			---	---

Figure G-4. Propulsion Module Wiring List (Sheet 29 of 60).

CABLE LIST						
CABLE NUMBER: CBP-1						
CABLE TYPE: LSMHOF-14						
O.D.: .635						
CABLE LENGTH: 20'						
CABLE ENTRY FROM: A5			FROM: BILGE PUMP CONTROL PANEL A5			
CABLE ENTRY TO: A3			TO: POWER MODULE JUNCTION BOX A3			
BULKHEAD FITTINGS: #4 NYLON STUFFING TUBE 4E PACKING BOTH ENDS			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	SPARE	BLACK				
2	SPARE	WHITE				
3	139	RED	WIRE	TB1-10	E11028-1	TB1-16
4	141	GREEN	WIRE	TB1-6	E11028-1	TB1-17
5	148	ORANGE	WIRE	TB2-5	E11028-1	TB1-20
6	150	BLUE	WIRE	TB2-1	E11028-1	TB2-1
7	153	WH/BLK	WIRE	TB2-10	E11028-1	TB2-2
8	155	RD/BLK	WIRE	TB2-6	E11028-1	TB2-3
9	158	GN/BLK	WIRE	TB4-5	E11028-1	TB2-4
10	160	OR/BLK	WIRE	TB4-1	E11028-1	TB2-5
11	163	BU/BLK	WIRE	TB4-10	E11028-1	TB2-6
12	165	BK/WH	WIRE	TB4-6	E11028-1	TB2-7
13	168	RD/WH	WIRE	TB3-10	E11028-1	TB2-8
14	170	GN/WH	WIRE	TB3-6	E11028-1	TB2-9

Figure G-4. Propulsion Module Wiring List
(Sheet 31 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List (Sheet 32 of 60).

CABLE LIST						
CABLE NUMBER: CFD-1						
CABLE TYPE: LSDHOF-3						
O.D.: .425						
CABLE LENGTH: 12'						
CABLE ENTRY FROM: A3			FROM: P.M. JUNCTION BOX			
CABLE ENTRY TO: A7			TO: FORWARD COMPARTMENT BILGE PUMP CONTROL			
BULKHEAD FITTINGS: #2 NYLON TUBE, 2E PACKING AT BOTH ENDS.			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	143	BLACK	E11028-1	TB1-18	WIRE	TB1-5
2	145	WHITE	E11028-1	TB1-19	WIRE	TB1-1

Figure G-4. Propulsion Module Wiring List (Sheet 33 of 60).

CABLE LIST						
CABLE NUMBER: CFD-2						
CABLE TYPE: LSTNW-9						
O.D.: .625						
CABLE LENGTH: 5'						
CABLE ENTRY FROM: A7			FROM: FORWARD COMPARTMENT BILGE PUMP CONTROL			
CABLE ENTRY TO: JB1			TO: FWD. COMPARTMENT JUNCTION BOX, BILGE PUMP, SWITCH			
BULKHEAD FITTINGS: #4 NYLON TUBE 4E PACKING AT A7. USE TWO SCREW CONNECTOR (ITEM 57) AT JB1.			NOTES: IN JB1, CFD-2 CONNECTS TO WIRES FROM BILGE PUMP B2, & FLOAT SWITCH S10. OBSERVE POLARITY OF B2, S10 IS NON-POLARIZED.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	WIRE	TB1-6	E23808-2	B2-1 (BLACK) S10-2
2	143	WHITE	WIRE	TB1-5	E23808-2	B2-2 (BROWN)
3	146	RED	WIRE	TB1-4	E23808-2	S10-1

Figure G-4. Propulsion Module Wiring List (Sheet 34 of 60).

CABLE LIST						
CABLE NUMBER: CFD-3						
CABLE TYPE: LSTNW-9						
O.D.: .625						
CABLE LENGTH: 32'						
CABLE ENTRY FROM: A5			FROM: BILGE PUMP CONTROL PANEL, A5			
CABLE ENTRY TO: JB2			TO: FWD. STBD. ENG. RM. JUNCTION BOX 2, B4, S12			
BULKHEAD FITTINGS: #4 NYLON TUBE, 4E PACKING AT A5 TWO SCREW CONNECTOR AT JB2.			NOTES: IN JB2, CFD-3 CONNECTS TO WIRES FROM BILGE PUMP B4, & BILGE SW. S12. OBSERVE POLARITY OF B4, S12 IS NON-POLARIZED.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	WIRE	TB3-4	E23808-2	B4-1 (BLACK) S12-2
2	153	WHITE	WIRE	TB2-10	E23808-2	B4-2 (BROWN)
3	156	RED	WIRE	TB2-9	E23808-2	S12-1

Figure G-4. Propulsion Module Wiring List (Sheet 35 of 60).

CABLE LIST						
CABLE NUMBER: CFD-4						
CABLE TYPE: LSTNW-9						
O.D.:.625						
CABLE LENGTH: 25'						
CABLE ENTRY FROM: A5			FROM: BILGE PUMP CONTROL PANEL			
CABLE ENTRY TO: A9			TO: FWD PORT ENG. RM. THRUSTER JUNCTION BOX, A9			
BULKHEAD FITTINGS: #4 NYLON TUBE, 4E PACKING BOTH ENDS. #1 NYLON TUBE, 1B PACKING ON PUMP/FLOAT SWITCH.			NOTES: A9 JUNCTION BOX IS USED AS A PASS THROUGH FOR B3-S11 PUMP/FLOAT SWITCH.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	WIRE	TB3-2	E23808-2	TB2-18
2	148	WHITE	WIRE	TB2-5	E23808-2	TB2-19
3	151	RED	WIRE	TB2-4	E23808-2	TB2-20
			NOTE:FROM A9 TO PUMP/PUMP FLOAT SWITCH. THE FOLLOWING CONNECTIONS SHALL BE USED.			
1	0		WIRE	TB2-18	E23808-2	B3-1 (BLK) S11-2
2	148		WIRE	TB2-19	E23808-2	B3-2 (BROWN)
3	151		WIRE	TB2-20	E23808-2	S11-1

Figure G-4. Propulsion Module Wiring List (Sheet 36 of 60).

CABLE LIST						
CABLE NUMBER: CFD-5						
CABLE TYPE: LSTNW-9						
O.D.: .625						
CABLE LENGTH: 25'						
CABLE ENTRY FROM: A5			FROM: BILGE PUMP CONTROL PANEL			
CABLE ENTRY TO: JB5			TO: AFT. STBD. ENG. RM. JUNCTION BOX, B6, S14			
BULKHEAD FITTINGS: #4 NYLON TUBE, 4E PACKING AT A5, TWO SCREW CONNECTOR AT JB5.			NOTES: IN JB5 CFD-5 CONNECTS TO WIRES FROM BILGE PUMP B6 AND BILGE SWITCH S14, OBSERVE POLARITY OF B6, S14 IS NON-POLARIZED.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	WIRE	TB3-2	E23808-2	B6-1 (BLACK) S14-2
2	163	WHITE	WIRE	TB4-10	E23808-2	B6-2 (BROWN)
3	166	RED	WIRE	TB4-9	E23808-2	S14-1

Figure G-4. Propulsion Module Wiring List (Sheet 37 of 60).

CABLE LIST						
CABLE NUMBER: CFD-6						
CABLE TYPE: LSTNW-9						
O.D.: .625						
CABLE LENGTH: 18'						
CABLE ENTRY FROM: A5			FROM: BILGE PUMP CONTROL PANEL, A5			
CABLE ENTRY TO: JB6			TO: AFT. COMPARTMENT, JUNCTION BOX, JB8			
BULKHEAD FITTINGS: #4 NYLON TUBE 4E PACKING AT A5, TWO SCREW CONNECTOR AT JB6.			NOTES: IN JB6 CFD-6 CONNECTS TO WIRE FROM BILGE PUMP B7 & BILGE SWITCH S15. OBSERVE POLARITY OF B7, S15 IS NON-POLARIZED.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	WIRE	TB3-5	E23808-2	B7-1 (BLACK) S15-2
2	168	WHITE	WIRE	TB3-10	E23808-2	B7-2 (BROWN)
3	171	RED	WIRE	TB3-9	E23808-2	S15-1

Figure G-4. Propulsion Module Wiring List (Sheet 38 of 60).

CABLE LIST						
CABLE NUMBER: CFD-7						
CABLE TYPE: LSTNW-9						
O.D.: .625						
CABLE LENGTH: 19'						
CABLE ENTRY FROM: A5			FROM: BILGE PUMP CONTROL PANEL			
CABLE ENTRY TO: JB8			TO: AFT. PORT ENGINE RM. JUNCTION BOX, B5, S13			
BULKHEAD FITTINGS: #4 NYLON TUBE 4E PACKING AT A5, TWO SCREEN CONNECTOR AT JB8.			NOTES: IN JB8, CFD-7 CONNECTS TO WIRES FROM BILGE PUMP B5, & BILGE SWITCH S13, OBSERVE POLARITY OF B5, S13 IS NON-POLARIZED.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	WIRE	TB3-3	E23808-2	B5-1 (BLACK) S13-2
2	158	WHITE	WIRE	TB4-5	E23808-2	B5-2 (BROWN)
3	161	RED	WIRE	TB4-4	E23808-2	S13-1

Figure G-4. Propulsion Module Wiring List (Sheet 39 of 60).

CABLE LIST						
CABLE NUMBER: CFD-8						
CABLE TYPE: LSMHOF-14						
O.D.: .635						
CABLE LENGTH: 25'						
CABLE ENTRY FROM: A5			FROM: BILGE PUMP CONTROL PANEL			
CABLE ENTRY TO: A3			TO: PM JUNCTION BOX			
BULKHEAD FITTINGS: #4 STUFFING TUBE #4E PACKING BOTH ENDS			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	146	BLK	WIRE	TB1-7	E11028-21	TB4-1
2	151	WHT	WIRE	TB2-4	E11028-21	TB4-2
3	156	RED	WIRE	TB2-9	E11028-21	TB4-3
4	161	GREEN	WIRE	TB4-4	E11028-21	TB4-4
5	166	ORANGE	WIRE	TB4-9	E11028-21	TB4-5
6	171	BLUE	WIRE	TB3-9	E11028-21	TB4-6
7	138	WH/BLK	WIRE	TB1-2	E11028-21	TB4-7
8	138	RED/BLK	WIRE	TB5-1	E11028-21	TB4-8
9	138	GRN/BLK	WIRE	TB6-1	E11028-21	TB4-9
10	SPARE	ORG/BLK	---	---	---	---
11	SPARE	BLU/BLK	---	---	---	---
12	SPARE	BLK/WH T	---	---	---	---
13	SPARE	RED/WH T	---	---	---	---
14	SPARE	GRN/WH	---	---	---	---

Figure G-4. Propulsion Module Wiring List
(Sheet 40 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List
(Sheet 41 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List (Sheet 42 of 60).

CABLE LIST						
CABLE NUMBER: CFR-1						
CABLE TYPE: LSFNW-4						
O.D.: .513						
CABLE LENGTH: 30'						
CABLE ENTRY FROM: A4			FROM: ENGINE JB			
CABLE ENTRY TO: S2			TO: CO ₂ RELEASE SWITCH, FWD. COMPARTMENT			
BULKHEAD FITTINGS: #4			NOTES: THIS CABLE IS CONNECTED TO ONE POLE OF THE CO ₂ RELEASE SWITCH.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	133	BLACK	RING TONGUE	TB2-3	RING TONGUE	S2A COM
2	134	WHITE	RING TONGUE	TB2-4	RING TONGUE	S2A N/C
3	104	RED	RING TONGUE	TB1-16	RING TONGUE	S2B-COM
4	124	GREEN	RING TONGUE	TB1-12	RING TONGUE	S2B-N/O
			USE RING TONGUE TERMINALS			

Figure G-4. Propulsion Module Wiring List (Sheet 43 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List (Sheet 44 of 60).

CABLE LIST						
CABLE NUMBER: KEH-1						
CABLE TYPE: LS2SJ-18						
O.D.: .310						
CABLE LENGTH: 14'						
CABLE ENTRY FROM: A3			FROM: POWER MODULE JUNCTION BOX			
CABLE ENTRY TO: L2			TO: CLUTCH SOLENOID (L2)			
BULKHEAD FITTINGS: 2A PACKING, #2 NYLON TUBE @A3 1C PACKING, #1 NYLON TUBE @ SOL. CONNECTION			NOTES: COORDINATE WITH HYDRAULIC SYSTEM MECHANICS TO IDENTIFY ENGAGE CONNECTIONS.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	E11028-1	TB1-13	PLUG	L2-2 (0)
2	174	WHITE	E11028-1	TB1-11	PLUG	L2-1 (+)

Figure G-4. Propulsion Module Wiring List (Sheet 45 of 60).

CABLE LIST						
CABLE NUMBER: KEH-2						
CABLE TYPE: LS2SJ-18						
O.D.: .31						
CABLE LENGTH: 14'						
CABLE ENTRY FROM: A3			FROM: POWER MODULE JUNCTION BOX			
CABLE ENTRY TO: L3			TO: CLUTCH SOLENOID L3			
BULKHEAD FITTINGS: POWER MODULE NO. 2 PACKING NO. 2A PACKING CLUTCH = PLUG CONNECTIONS. NO. 1 STUFFING TUBE NO. 1C PACKING			NOTES: COORDINATE WITH HYDRAULIC SYSTEM MECHANICS TO IDENTIFY DISENGAGE CONNECTION.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLK	E11028-1	TB1-13	PLUG	L3-2 (0)
2	175	WHT	E11028-1	TB1-12	PLUG	L3-1 (+)
3	SHLD		WIRE LUG	SHIELD CONNECTIONS		

Figure G-4. Propulsion Module Wiring List (Sheet 46 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List (Sheet 47 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List (Sheet 48 of 60).

CABLE LIST						
CABLE NUMBER: KL-2						
CABLE TYPE: LS4SJ-20						
O.D.: .360						
CABLE LENGTH: 16'						
CABLE ENTRY FROM: A3			FROM: POWER MODULE J BOX			
CABLE ENTRY TO: A2JB1			TO: ON THRUSTER - SYNCHRO, A2JB1			
BULKHEAD FITTINGS: #4 NYLON TUBE, 4B PACKING AT A2, TBD AT A2JB1.			NOTES: EQUIPMENT FURNISHED AS PART OF THRUSTER. CONSULT MANUFACTURER'S DATA TO CONFIRM CONNECTIONS..			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	182	BLACK	E11028-1	TB3-10	COMPRESSION	1
2	183	WHITE	E11028-1	TB3-11	COMPRESSION	2
3	185	RED	E11028-1	TB3-6	COMPRESSION	3
4	186	GREEN	E11028-1	TB3-7	COMPRESSION	4
5	SHIELD	SHIELD	E11028-1	TB3-13		

Figure G-4. Propulsion Module Wiring List (Sheet 49 of 60).

CABLE LIST						
CABLE NUMBER: KL-3						
CABLE TYPE: LS2SJ-18						
O.D.: .310						
CABLE LENGTH: 15'						
CABLE ENTRY FROM: A9			FROM: THRUSTER DIR/AUX. BATT./VOLTAGE REG.			
CABLE ENTRY TO: A3			TO: POWER MODULE JUCTION BOX			
BULKHEAD FITTINGS: STUFFING TUBE #2 PACKING #2A BOTH ENDS			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	205	BLACK	E11028-21	TB2-6	E11028-21	TB2-18
2	206	WHITE	E11028-21	TB2-7	E11028-21	TB2-19
3	SHIELD	---				

Figure G-4. Propulsion Module Wiring List (Sheet 50 of 60).

CABLE LIST						
CABLE NUMBER: KL-4						
CABLE TYPE: LS3SJ-18						
O.D.: .325						
CABLE LENGTH: 25'						
CABLE ENTRY FROM: A2JB2			FROM: THRUSTER/JUNCTION BOX (A2JB2)			
CABLE ENTRY TO: A3			TO: POWER MODULE JUNCTION BOX A3			
BULKHEAD FITTINGS: NO. 2 SUFFING TUBE, NO. 2A PACKING, BOTH ENDS.			NOTES: INTERFACE CABLING TO CAB FOR THRUSTER CONTROL			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	210	BLK	COMPRESSION	TB1-3	E11028-21	TB3-12
2	211	WHT	COMPRESSION	TB1-4	E11028-21	TB3-19
3	212	RED	COMPRESSION	TB1-5	E11028-21	TB3-18
4	SHLD	SHLD	COMPRESSION	SHLD	E11028-21	TB3-13

Figure G-4. Propulsion Module Wiring List (Sheet 51 of 60).

CABLE LIST						
CABLE NUMBER: KL-5						
CABLE TYPE: LS2SJ-18						
O.D.: .310						
CABLE LENGTH: 8'						
CABLE ENTRY FROM: A2JB1			FROM: HYD. CONTROL/SOL. A			
CABLE ENTRY TO: A2JB2			TO: THRUSTER CONTROL			
BULKHEAD FITTINGS: HYD. CONTROL PLUG SOL. A THRUSTER CONTROL NO. 2 SUTFFING TUBE NO. 2A PACKING			NOTES: CCW THRUSTER ROTATION			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLK	PLUG	L5-2	COMPRESSION	TB1-9
2	177	WHT	PLUG	L5-1	COMPRESSION	TB1-8
3	SHLD	SHLD	---	---	COMPRESSION	TB1-9/SH

Figure G-4. Propulsion Module Wiring List (Sheet 52 of 60).

CABLE LIST						
CABLE NUMBER: KL-6						
CABLE TYPE: LS2SJ-18						
O.D.: .310						
CABLE LENGTH: 8'						
CABLE ENTRY FROM: A2JB1			FROM: HYD. CONTROL/SOL. B			
CABLE ENTRY TO: A2JB2			TO: THRUSTER CONTROL			
BULKHEAD FITTINGS: HYD. CONTROL SOL. B			NOTES: CW THRUSTER ROTATION			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLK	PLUG	L4-2	COMPRESSION	TB1-7
2	179	WHT	PLUG	L4-1	COMPRESSION	TB1-6
3	SHLD	SHLD	---	---	COMPRESSION	TB1-7/SH

Figure G-4. Propulsion Module Wiring List (Sheet 53 of 60).

CABLE LIST						
CABLE NUMBER: KL-7						
CABLE TYPE: LSDHOF-3						
O.D.: .425						
CABLE LENGTH: 21'						
CABLE ENTRY FROM: A4			FROM: ENGINE JUNCTION BOX, A4			
CABLE ENTRY TO: L1			TO: COLD START SOLENOID, L1			
BULKHEAD FITTINGS: #2 NYLON TUBE, 2E PACKING AT A4			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	103	BLACK	E11028-1	TB1-10	E11028-1	BLUE SOL. POS
2	0	WHITE	E11028-1	TB1-19	E11028-1	BLACK SOL. NEG

Figure G-4. Propulsion Module Wiring List (Sheet 54 of 60).

CABLE LIST						
CABLE NUMBER: KL-8						
CABLE TYPE: LS35J-18						
O.D.: .370						
CABLE LENGTH: 25'						
CABLE ENTRY FROM: A4			FROM: ENGINE BOX A4			
CABLE ENTRY TO: A2S2			TO: THRUSTER GEAR CASE OIL LEVEL			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	180	RED	RING TONGUE	TB2-5	PLUG	C
2	0	BLACK	RING TONGUE	TB1-19	PLUG	B
3	105	WHITE	RING TONGUE	TB1-17	PLUG	A

Figure G-4. Propulsion Module Wiring List (Sheet 55 of 60).

CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List (Sheet 56 of 60).

CABLE LIST						
CABLE NUMBER: HPU-1						
CABLE TYPE: LSDHOF-3						
O.D.: .425						
CABLE LENGTH: 25'						
CABLE ENTRY FROM: A2JB1			FROM: HYD. TANK A2JB1-S1			
CABLE ENTRY TO: A4			TO: ENGINE BOX A4			
BULKHEAD FITTINGS: #2 STUFFING TUBE #2E PACKING @A4 #1 PACKING #1C PACKING @ HPU CONN.			NOTES:			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	178	BLACK	SPLICE	RED WIRE	E11028-1	TB1-11
2	105	WHITE	SPLICE	RED WIRE	E11028-1	TB1-17

Figure G-4. Propulsion Module Wiring List (Sheet 57 of 60).

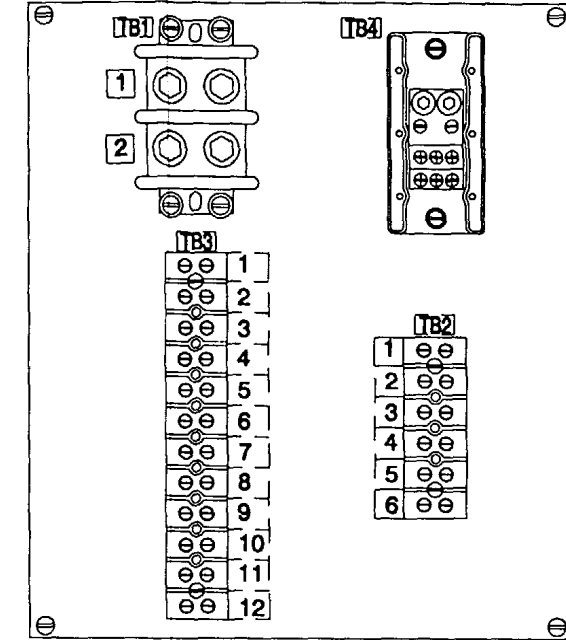
CABLE LIST						
CABLE NUMBER:						
CABLE TYPE:						
O.D.:						
CABLE LENGTH:						
CABLE ENTRY FROM:			FROM:			
CABLE ENTRY TO:			TO:			
BULKHEAD FITTINGS:			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT

Figure G-4. Propulsion Module Wiring List (Sheet 60 of 60).
G-79/(G-80 blank)

NOTES:

- 1 TERMINAL NUMBERS AND COMPONENT DESIGNATORS AS INDICATED BY C SHALL BE PERMANENTLY STAMPED IN INK, LOCATED APPROXIMATELY AS SHOWN.
- 2 THE POWER MODULE CIRCUIT BREAKER PANEL IS UNIT A6. UNIT PREFIX IS "1" ON THE STBD POWER MODULE AND "2" ON THE PORT POWER MODULE.
- 3 TB4, IS COMMON NEGATIVE (0) CONNECTION POINT.
- 4 TB1, IS POSITIVE (24) CONNECTION POINT.
- 5 USE LOCTITE ON ALL MOUNTING SCREWS.
- 6 USE TIE WRAPS AND CABLE TIE MOUNTS TO SECURE WIRE BUNDLES.
- 7 UPPER TERMINAL ON ITEMS 3 THROUGH 8 IS TERMINAL 2.

FROM	TERM	ITEM #	WIRE #	SIZE	TO	TERM	ITEM #	NOTES
TB1	1	-	+24	6	CB1	1	66	-
TB1	2	-	105	8	CB3	1	49	-
TB1	2	-	105	8	CB11	1	49	-
TB1	2	-	105	8	TB2	1	-	-
CB1	2	66	105	6	TB1	2	-	-
CB3	1	49	105	8	CB2	1	49	JUMPER
CB2	1	49	105	8	CB4	1	49	JUMPER
CB4	1	49	105	8	CB5	1	49	JUMPER
CB5	1	49	105	8	CB6	1	49	JUMPER
CB6	1	49	105	8	CB7	1	49	JUMPER
CB11	1	49	105	8	CB13	1	49	JUMPER
CB13	1	49	105	8	CB12	1	49	JUMPER
CB12	1	49	105	8	CB10	1	49	JUMPER
CB10	1	49	105	8	CB9	1	49	JUMPER
CB9	1	49	105	8	CB8	1	49	JUMPER
CB2	2	44	110	14	TB3	1	-	-
CB3	2	49	133	8	TB2	2	-	-
CB4	2	44	137	14	TB3	3	-	-
CB5	2	44	142	14	TB3	4	-	-
CB6	2	44	147	14	TB3	5	-	-
CB7	2	44	152	14	TB3	6	-	-
CB8	2	44	157	14	TB3	7	-	-
CB9	2	44	162	14	TB3	8	-	-
CB10	2	44	167	14	TB3	9	-	-
CB11	2	49	172	8	TB2	3	-	-
CB12	2	44	173	14	TB3	10	-	-
CB13	2	44	176	14	TB3	11	-	-
CB14	1	44	202	14	TB2	4	-	-
CB14	2	44	203	14	TB2	5	-	-



EXTERNAL CONNECTIONS

WIRE #	FROM	TERM	EQUIPMENT	NOTES
0	TB4	ALL	NEGATIVE	ALL GROUNDS TIE HERE
+24	TB1	1	+24 IN	
105	TB2	1	EMER SHUT DOWN	
110	TB3	1	ENGINE POWER	
133	TB2	2	VENT FAN	
137	TB3	3	ALARMS	
142	TB3	4	BILGE PUMP 1	
147	TB3	5	BILGE PUMP 2	
152	TB3	6	BILGE PUMP 3	
157	TB3	7	BILGE PUMP 4	
162	TB3	8	BILGE PUMP 5	
167	TB3	9	BILGE PUMP 6	
172	TB2	3	OPERATOR CAB	
173	TB3	10	CLUTCH CONTROL	
176	TB3	11	THRUSTER	
202	TB2	4	THRSTR INDICATOR	
203	TB2	5	THRSTR INDICATOR	

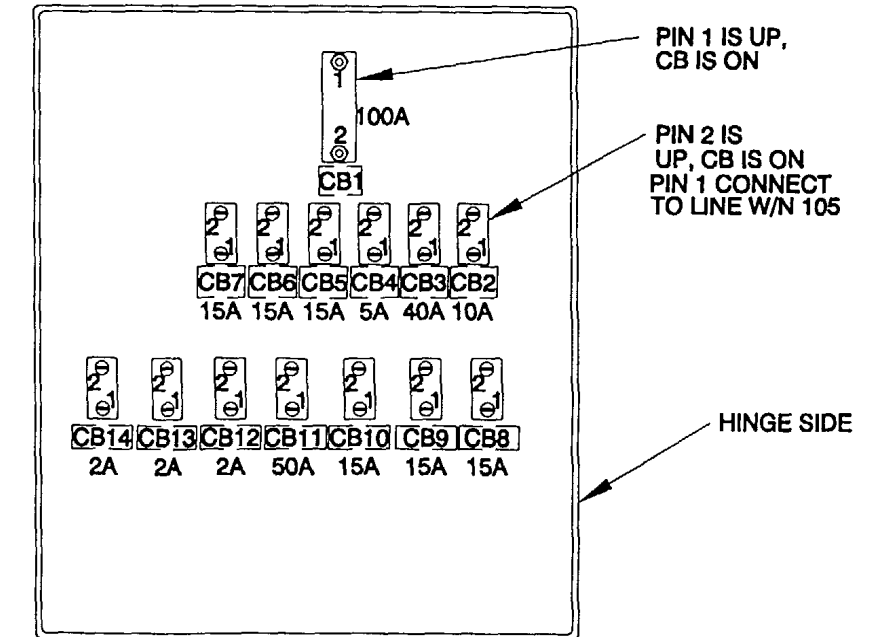
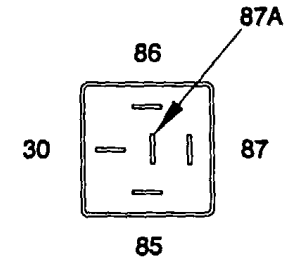


Figure G-5. Wiring List, Circuit Breaker Panel "A6", and Rear View.

INTERNAL WIRING LIST

FROM	TERM	ITEM #	WIRE #	SIZE	TO	TERM	ITEM #	NOTES
TB6	3	-	138	16	TB6	1	-	JUMPER
TB6	1	-	138	16	TB5	1	-	JUMPER
TB5	1	-	138	16	TB5	3	-	JUMPER
TB5	3	-	138	16	TB1	2	-	JUMPER
TB1	2	-	138	16	TB1	3	-	JUMPER
TB1	3	-	138	-	D12	A	29	D12-A
TB1	4	-	171	-	D12	K	29	D12-K
TB1	5	-	140	-	D2	A	29	D2-A
TB1	6	-	141	-	D2	K	29	D2-K
TB1	9	-	137	-	D1	A	29	D1-A
TB1	10	-	139	-	D1	K	29	D1-K
K2	30	8	147	16	TB2	3	-	
K2	87	8	149	16	TB2	2	29	D3-A
K2	86	8	150	16	TB2	1	29	D3-K
K2	85	8	151	16	TB2	4	-	
S1	1	32	147	16	TB2	3	-	
S1	2	32	148	16	TB2	5	-	
S1	3	32	149	16	TB2	2	-	
K3	30	8	152	16	TB2	8	-	
K3	87	8	154	16	TB2	7	29	D4-A
K3	86	8	155	16	TB2	6	29	D4-K
K3	85	8	156	16	TB2	9	-	
S2	1	32	152	16	TB2	8	-	
S2	2	32	153	16	TB2	10	-	
S2	3	32	154	16	TB2	7	-	
K4	30	8	157	16	TB4	3	-	
K4	87	8	159	16	TB4	2	29	D5-A
K4	86	8	160	16	TB4	1	29	D5-K
K4	85	8	161	16	TB4	4	-	
S3	1	32	157	16	TB4	3	-	
S3	2	32	158	16	TB4	5	-	
S3	3	32	159	16	TB4	2	-	
K5	30	8	162	16	TB4	8	-	
K5	87	8	164	16	TB4	7	29	D6-A
K5	86	8	165	16	TB4	6	29	D6-K
K5	85	8	166	16	TB4	9	-	
S4	1	32	162	16	TB4	8	-	
S4	2	32	163	16	TB4	10	-	
S4	3	32	164	16	TB4	7	-	
TB1	8	-	137	16	TB1	9	-	JUMPER
TB3	1	-	0	16	TB3	2	-	JUMPER
TB3	2	-	0	16	TB3	3	-	JUMPER
TB3	3	-	0	16	TB3	4	-	JUMPER
TB3	4	-	0	16	TB3	5	-	JUMPER
K6	30	8	167	16	TB3	8	-	
K6	87	8	169	16	TB3	7	29	D7-A
K6	86	8	170	16	TB3	6	29	D7-K
K6	85	8	171	16	TB3	9	-	
S5	1	32	167	16	TB3	8	-	
S5	2	32	168	16	TB3	10	-	
S5	3	32	169	16	TB3	7	-	
TB5	1	-	138	-	D8	A	29	D8-A
TB5	2	-	151	-	D8	K	29	D8-K
TB5	3	-	138	-	D9	A	29	D9-A
TB5	4	-	156	-	D9	K	29	D9-K
TB6	1	-	138	-	D10	A	29	D10-A
TB6	2	-	161	-	D10	K	29	D10-K
TB6	3	-	138	-	D11	A	29	D11-A
TB6	4	-	166	-	D11	K	29	D11-K
TB2	4	-	151	16	TB5	2	-	JUMPER
TB2	9	-	156	16	TB5	4	-	JUMPER
TB4	4	-	161	16	TB6	2	-	JUMPER
TB4	9	-	166	16	TB6	4	-	JUMPER
TB3	9	-	171	16	TB1	4	-	JUMPER

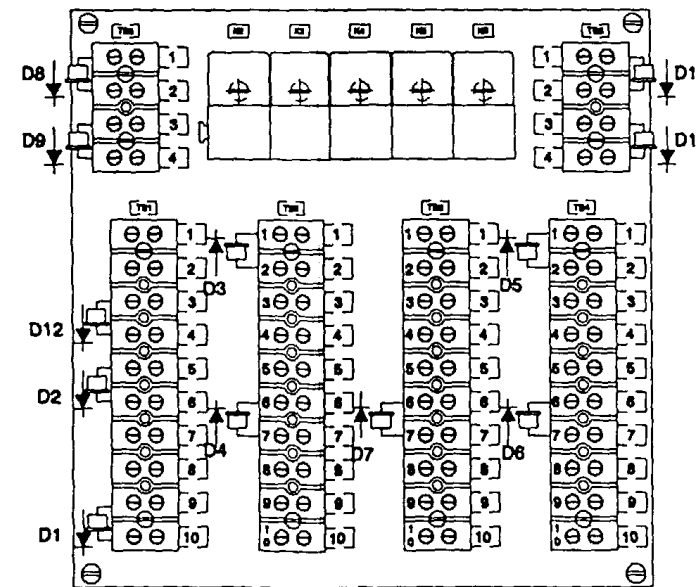
Figure G-6. Wiring List, Bilge Pump Control Assembly "A5", and Rear View. (Sheet 1 of 2)



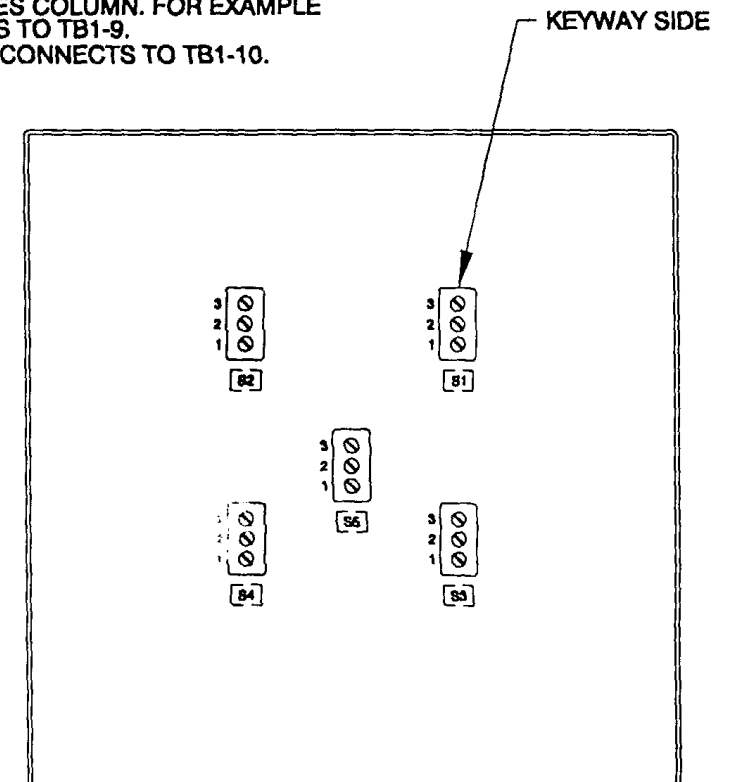
TERMINAL IDENTIFICATION FOR K2 THRU K6

NOTES:

- 1 POLARITY OF DIODES, TERMINAL BLOCK DESIGNATIONS, TERMINAL NUMBERS, AND COMPONENT DESIGNATORS AS INDICATED BY [] SHALL BE PERMANENTLY STAMPED IN INK, LOCATED APPROXIMATELY AS SHOWN.
- 2 THE BILGE PUMP CONTROL PANEL ASSY IS UNIT A5.
- 3 MARK ENDS OF INTERNAL WIRES WITH WIRE NUMBER USING HEAT SHRINK TUBING. COVER TERMINAL LUG BARREL WITH HEAT SHRINK TUBING.
- 4 RELAY DESIGNATION K1 IS NOT USED IN THIS ASSEMBLY.
- 5 USE TIE WRAPS AND CABLE TIE MOUNTS TO SECURE WIRE BUNDLES.
- 6 CONNECT DIODES AS LISTED IN NOTES COLUMN. FOR EXAMPLE D1-A IS THE DIODE WHICH CONNECTS TO TB1-9. D1-K IS THE DIODE CATHODE WHICH CONNECTS TO TB1-10.

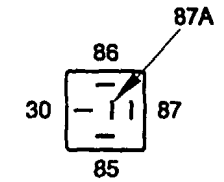


TERMINAL LAYOUT

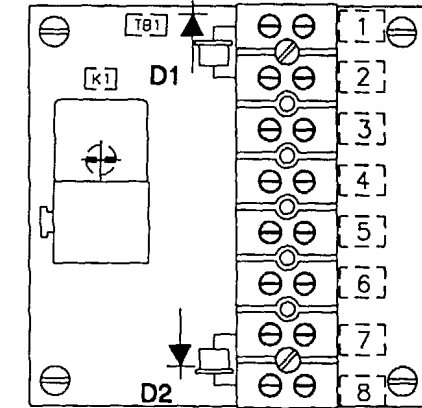


BACK SIDE OF FRONT COVER PANEL

Figure G-6. Wiring List, Bilge Pump Control Assembly "A5", and Rear View. (Sheet 2 of 2)



TERMINAL IDENTIFICATION FOR K1



TERMINAL LAYOUT

NOTES:

- 1 POLARITY OF DIODES, TERMINAL NUMBERS AND COMPONENT DESIGNATORS AS INDICATED BY SHALL BE PERMANENTLY STAMPED IN INK, LOCATED APPROXIMATELY AS SHOWN.
- 2 THE SINGLE BILGE PUMP CONTROL ASSY IS UNIT A7 LOCATED IN THE FORWARD COMPARTMENT. UNIT PREFIX IS "1" FOR THE STBD POWER MODULE, "2" FOR THE PORT POWER MODULE. BILGE PUMP ASSY FOR STBD POWERED MODULE IS "1A7" AND FOR PORT POWERED MODULE "2A7".
- 3 LABEL ALL INTERNAL WIRE ENDS WITH WIRE NUMBERS USING HEAT SHRINK TUBING, ITEM 24. COVER TERMINAL LUG BARREL WITH HEAT SHRINK TUBING.

INTERNAL WIRING LIST

FROM	TERM #	ITEM #	WIRE #	SIZE	TO	TERM	ITEM #	NOTES
K1	30	6	142	16	TB1	3	-	
K1	87	6	144	16	TB1	2	-	
K1	86	6	145	16	TB1	1	-	
K1	85	6	146	16	TB1	8	-	
K1	85	6	146	16	TB1	4	-	
S1	1	22	142	16	TB1	3	-	
S1	2	22	143	16	TB1	5	-	
S1	3	22	144	16	TB1	2	-	
D1	A	-	144	16	TB1	2	-	DIODE ANODE
D1	K	-	145	16	TB1	1	-	DIODE CATHODE
-	-	-	0	-	TB1	6	-	(EXTERNAL WIRES)
D2	A	-	138	-	TB1	7	-	DIODE ANODE
D2	K	-	146	16	TB1	8	-	DIODE CATHODE

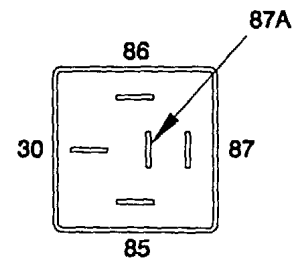
Figure G-7. Wiring List, Single Bilge Pump Control "A7".

INTERNAL WIRING LIST

FROM	TERM	ITEM #	WIRE #	SIZE	TO	TERM	ITEM #	NOTES
S1	1	17	116	16	TB1	1	17	
S1	2	17	0	16	TB1	20	17	
S1	4	17	117	16	TB1	2	17	
S1	5	17	118	16	TB1	3	17	
S1	6	17	119	-	TB1	4	17	
S1	8	17	120A	-	TB1	5	17	
R1	-	17	120A	-	TB1	5	17	ITEM 22
R1	-	17	120	-	TB1	6	17	ITEM 22
S1	7	17	121	-	TB1	7	17	
S1	10	17	122	-	TB1	8	17	
S1	11	17	123	-	TB1	9	17	
K1	30	6	105	14	TB1	17	17	
K1	87	6	106	14	TB1	18	17	
K1	86	6	104	16	TB1	16	17	
K1	85	6	0	16	TB1	19	17	
K2	86	6	124	16	TB1	13	17	
K2	30	6	124	16	TB1	13	17	
K2	85	6	128	16	TB1	14	17	
K2	87	6	129	16	TB1	15	17	
TB1	19	18	0	16	TB1	20	18	JUMPER
TB1	12	18	124	-	TB1	13	18	JUMPER
S2	1	-	105	16	TB1	17	17	
S2	2	-	106	16	TB1	18	17	

EXTERNAL WIRES (REFERENCE ONLY)

WIRE #	TO	TERM#
0	TB1	20
0	TB1	19
103	TB1	10
104	TB1	16
105	TB1	17
106	TB1	18
111	TB2	1
113	TB2	2
115	TB2	06
116	TB1	01
117	TB1	02
118	TB1	03
119	TB1	04
120	TB1	06
121	TB1	07
122	TB1	08
123	TB1	09
124	TB1	12
124	TB1	13
125	TB2	07
126	TB2	08
127	TB2	09
128	TB1	14
129	TB1	15
132	TB2	10
133	TB2	3
134	TB2	4
178	TB1	11
180	TB2	5
SHIELDS	TB1	8



TERMINAL IDENTIFICATION FOR K1 & K2

Figure G-8. Wiring List, Engine Junction Box Assembly "A4".

INTERNAL WIRING LIST

TO	TERM	ITEM #	CABLE COND #	WIRE #	CONN	PIN	NOTES
TB1	01	10	1	112	P2	01	
TB1	02	10	2	113	P2	02	
TB1	03	10	3	110	P2	03	
TB1	04	10	4	111	P2	04	
TB1	05	10	5	114	P2	05	
TB1	06	10	6	115	P2	06	
TB1	07	10	7	124	P2	07	
TB1	08	10	8	104	P2	08	
TB1	09	10	9	129	P2	09	
TB1	10	10	10	173	P2	10	
TB1	11	10	11	174	P2	11	
TB1	12	10	12	175	P2	12	
TB1	13	-	13	-	-	-	
TB1	14	10	14	134	P2	14	
TB1	15	10	15	135	P2	15	
TB1	16	10	16	139	P2	16	
TB1	17	10	17	141	P2	17	
TB1	18	10	18	143	P2	18	
TB1	19	10	19	145	P2	19	
TB1	20	10	20	148	P2	20	
TB2	01	10	21	150	P2	21	
TB2	02	10	22	153	P2	22	
TB2	03	10	23	155	P2	23	
TB2	04	10	24	158	P2	24	
TB2	05	10	25	160	P2	25	
TB2	06	10	26	163	P2	26	
TB2	07	10	27	165	P2	27	
TB2	08	10	28	168	P2	28	
TB2	09	10	29	170	P2	29	
TB2	10	10	30	181	P2	30	
TB2	11	10	31	180	P2	31	
TB2	12	10	32	-	P2	32	SPARE
TB1	13	10	33	0	P2	33	
TB2	14	10	34	190	P2	34	
TB2	15	10	35	178	P2	35	
TB2	16	10	36	187	P2	36	
TB2	17	10	37	-	P2	37	SPARE
TB2	18	10	6-BK	205	P3	21	
TB2	19	10	6-WH	206	P3	22	
TB2	20	-	-	133	-	-	
TB3	01	10	1-SHD	-	P3	01	SHIELD
TB3	02	10	1-BK	119	P3	02	
TB3	03	10	1-WH	121	P3	03	
TB3	04	10	1-RD	120	P3	04	
TB3	06	10	2-BK	185	P3	05	
TB3	07	10	2-WH	186	P3	06	
TB3	05	10	2-SHD	0	P3	07	SHIELD
TB3	08	10	2-RD	-	P3	08	SPARE
TB3	10	10	3-BK	182	P3	09	
TB3	14	10	4-BK	125	P3	10	
TB3	15	10	4-WH	126	P3	11	
TB3	16	10	4-RD	127	P3	12	
TB3	09	10	3-SHD	0	P3	13	SHIELD
TB3	11	10	3-WH	183	P3	14	
TB3	12	10	6-RD	210	P3	27	
TB3	13	10	4-SHD	0	P3	16	SHIELD
TB3	17	10	5-BK	132	P3	17	
TB3	18	10	5-WH	212	P3	18	-
TB3	19	10	5-RD	211	P3	19	-
TB3	20	10	6-SHD	0	P3	20	SHIELD

INTERNAL WIRING LIST

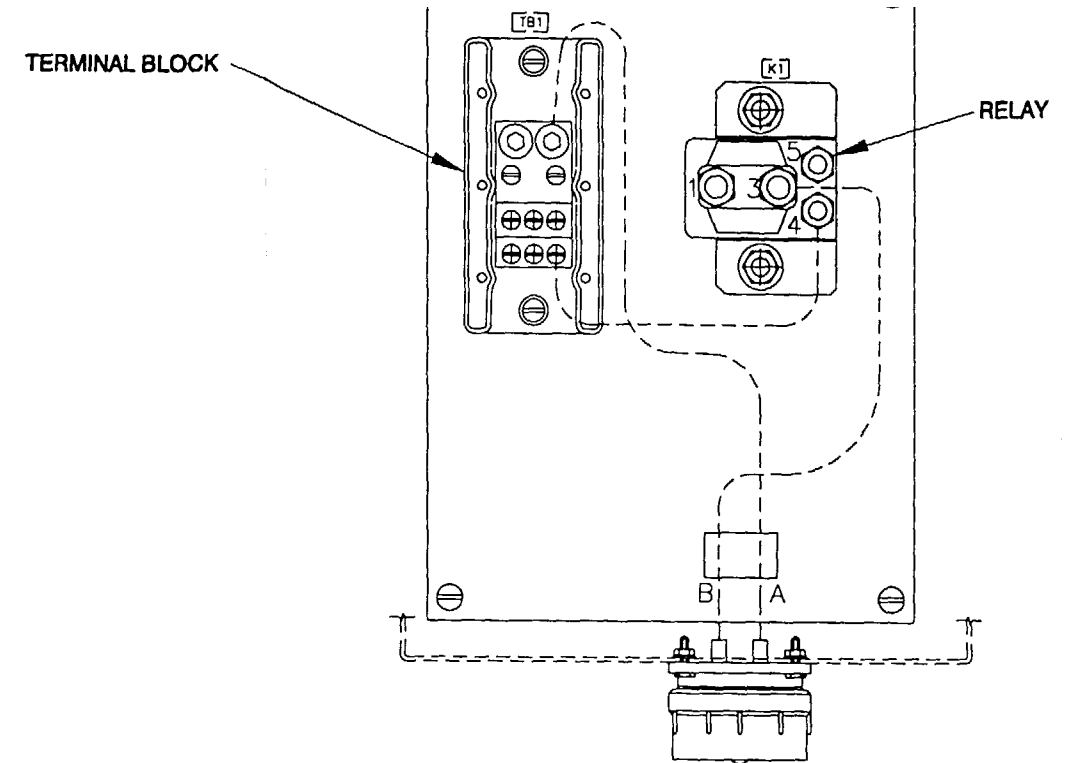
TO	TERM	ITEM #	CABLE COND #	WIRE #	CONN	PIN	NOTES
TB4	01	10	1	146	P4	01	
TB4	02	10	2	151	P4	02	
TB4	03	10	3	156	P4	03	
TB4	04	10	4	161	P4	04	
TB4	05	10	5	166	P4	05	
TB4	06	10	6	171	P4	06	
TB4	07	10	7	138	P4	07	
TB4	08	10	8	SPARE	P4	08	
TB4	09	10	9	SPARE	P4	09	
TB4	10	10	10	220	P4	10	
TB4	11	10	11	221	P4	11	
TB4	12	10	12	SPARE	P4	12	
TB4	13	10	13	SPARE	P4	13	
TB4	14	10	14	SPARE	P4	14	

NOTE:

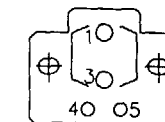
1. TB2-20 IS USED AS A TIE POINT FOR WIRE #133 WHEN MAKING INTERCONNECTIONS IN PROPULSION MODULE (E26573).

Figure G-9. Wiring List, Power Module Junction Box "A3".

G-91/(G92 blank)



WIRE INTERNAL CONNECTIONS								
FROM	TERM.	ITEM#	WIRE#	SIZE	TO	TERM.	ITEM#	NOTES
P5	A	21	0	5AWG		LARGE SCREW	8	NO.4
P5	B	21	136	5AWG	K1	3	4	NO.4
K1	4	4	0	14AWG	TB1	SMALL SCREW	8	NO.4



TERMINAL IDENTIFICATION FOR K1

NOTES:

- 1 TERMINAL NUMBERS AND COMPONENT DESIGNATORS AS INDICATED BY [] SHALL BE PERMANENTLY STAMPED IN INK, LOCATED APPROXIMATELY AS SHOWN.
- 2 TB1 IS USED FOR ALL COMMON "0" WIRES.
- 3 AFFIX LABEL PLATES, ITEM 6 WITH ITEM 7.
- 4 LABEL ALL INTERNAL WIRE ENDS WITH INTERNAL WIRE NUMBER USING HEAT SHRINK TUBING. COVER TERMINAL LUG BARREL WITH HEAT SHRINK TUBING.
- 5 APPLY THREAD LOCKING COMPOUND TO ALL MOUNTING SCREWS.
- 6 HOLES FOR STUFFING TUBES (STUFFING TUBES CALLED OUT AND INSTALLED ON POWER MODULE ASSY.)
- 7 CHECK VENT FAN ROTATION FOR PROPER RELAY CONNECTIONS. INTERCHANGE K1-1 WITH K1-3 AS REQ'D AT INSTALLATION.

Figure G-10. Wiring List, Vent Fan Relay Assembly "A8".

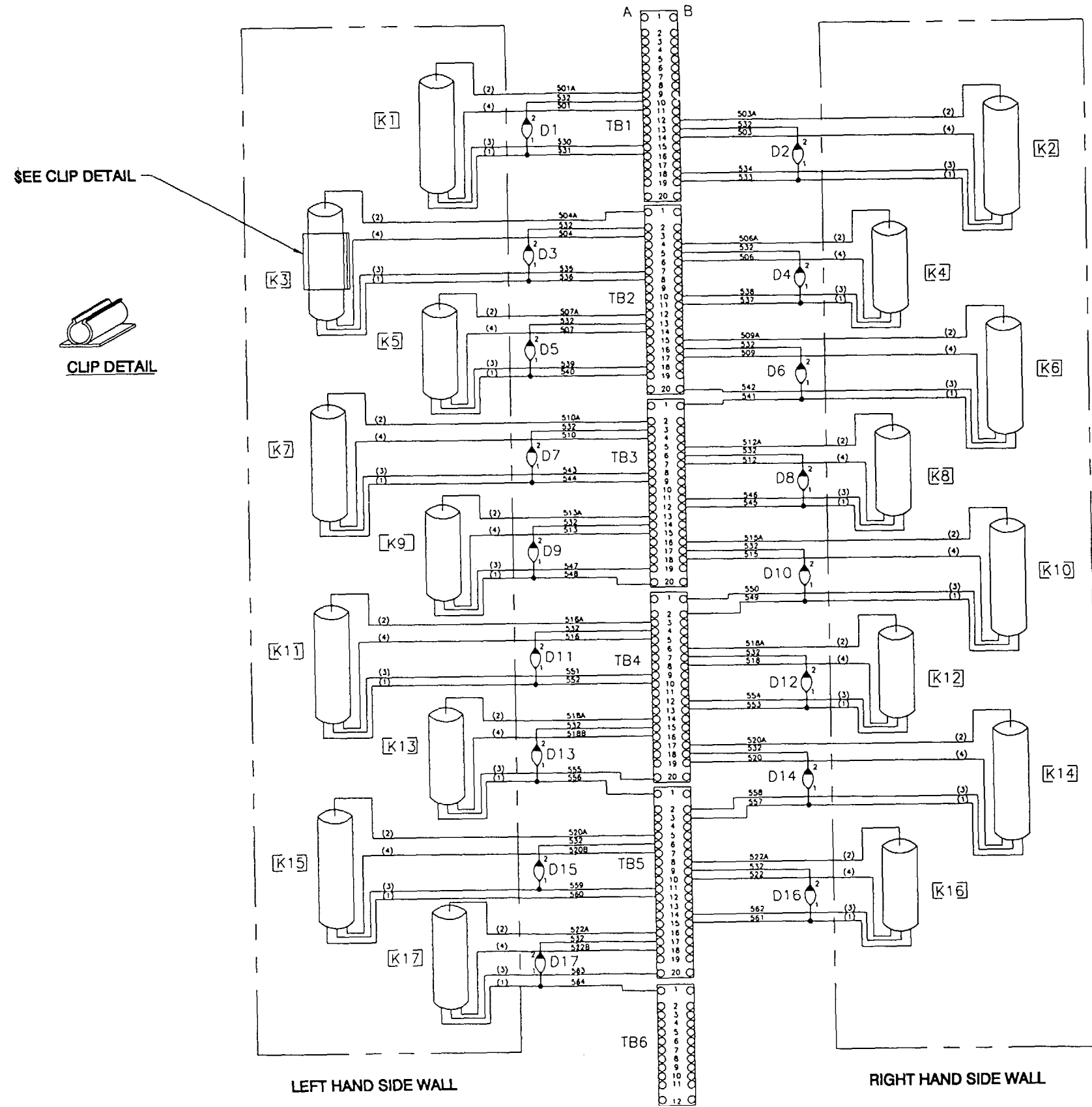


Figure G-11. Wiring List, Mast Enclosure. (Sheet 2 of 2)

G-97/(G-98 blank)

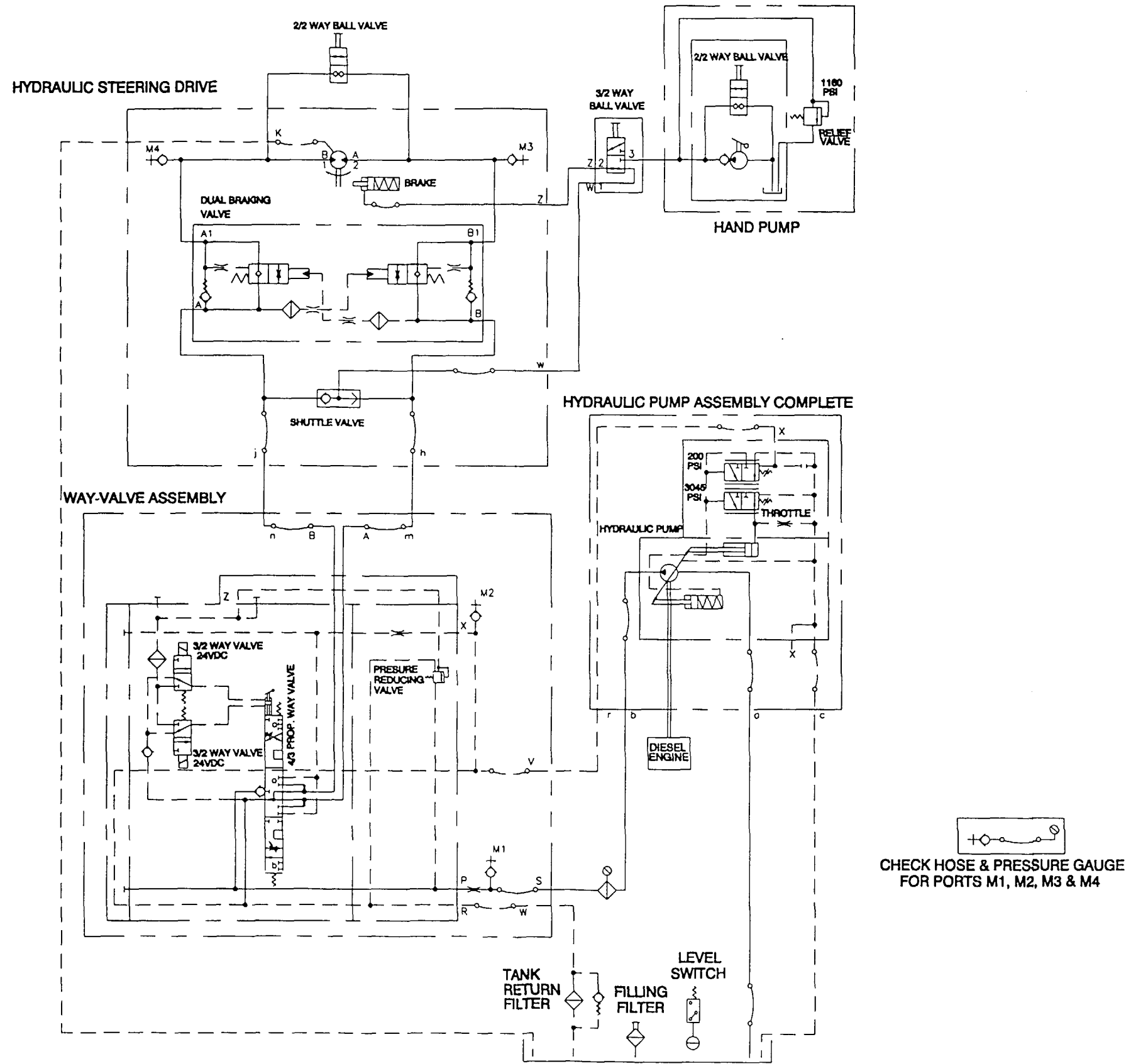
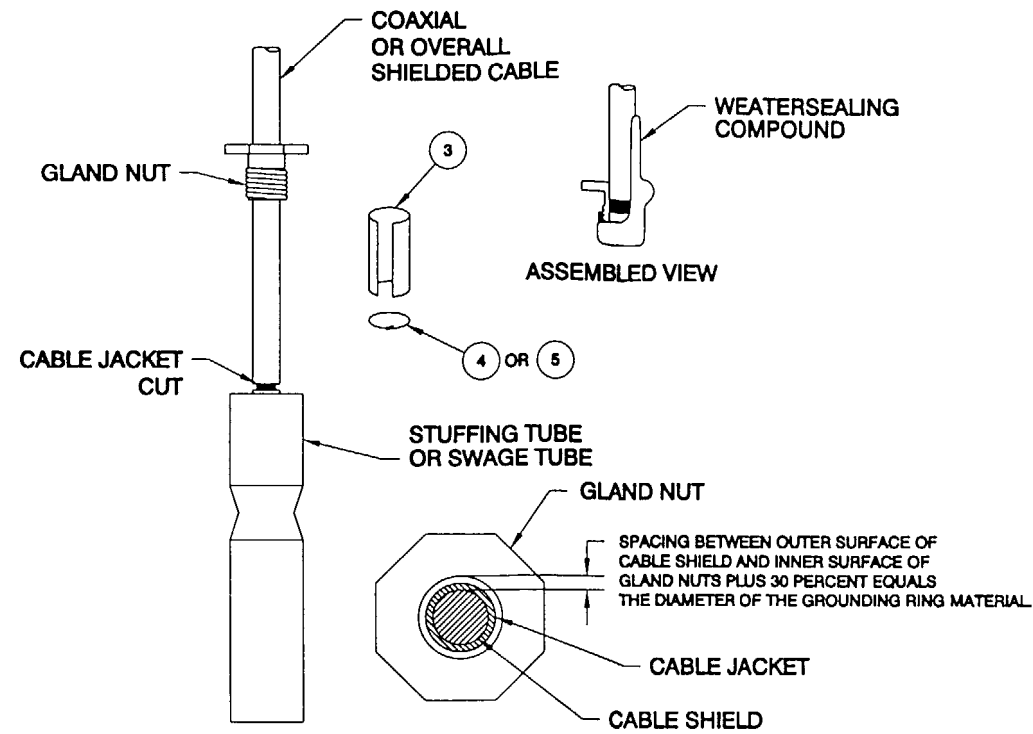


Figure G-12. Hydraulic System Schematic.

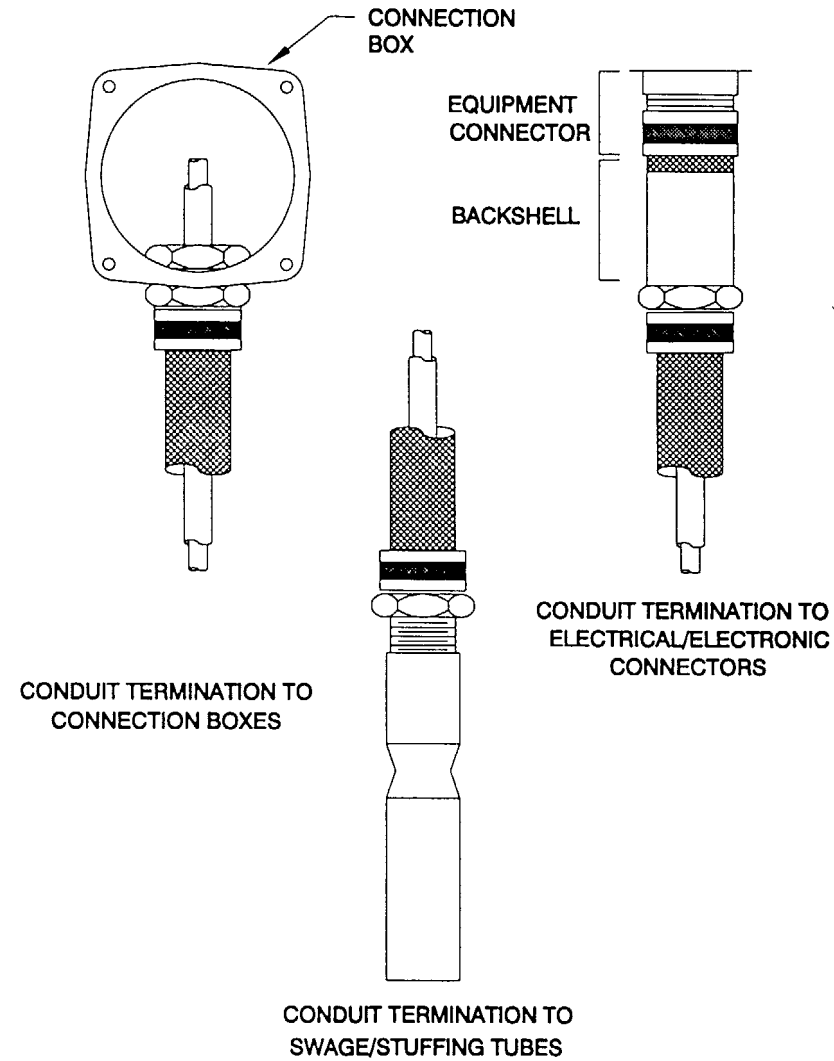
G-99/(G-100 blank)



SIZING OF GROUNDING RING

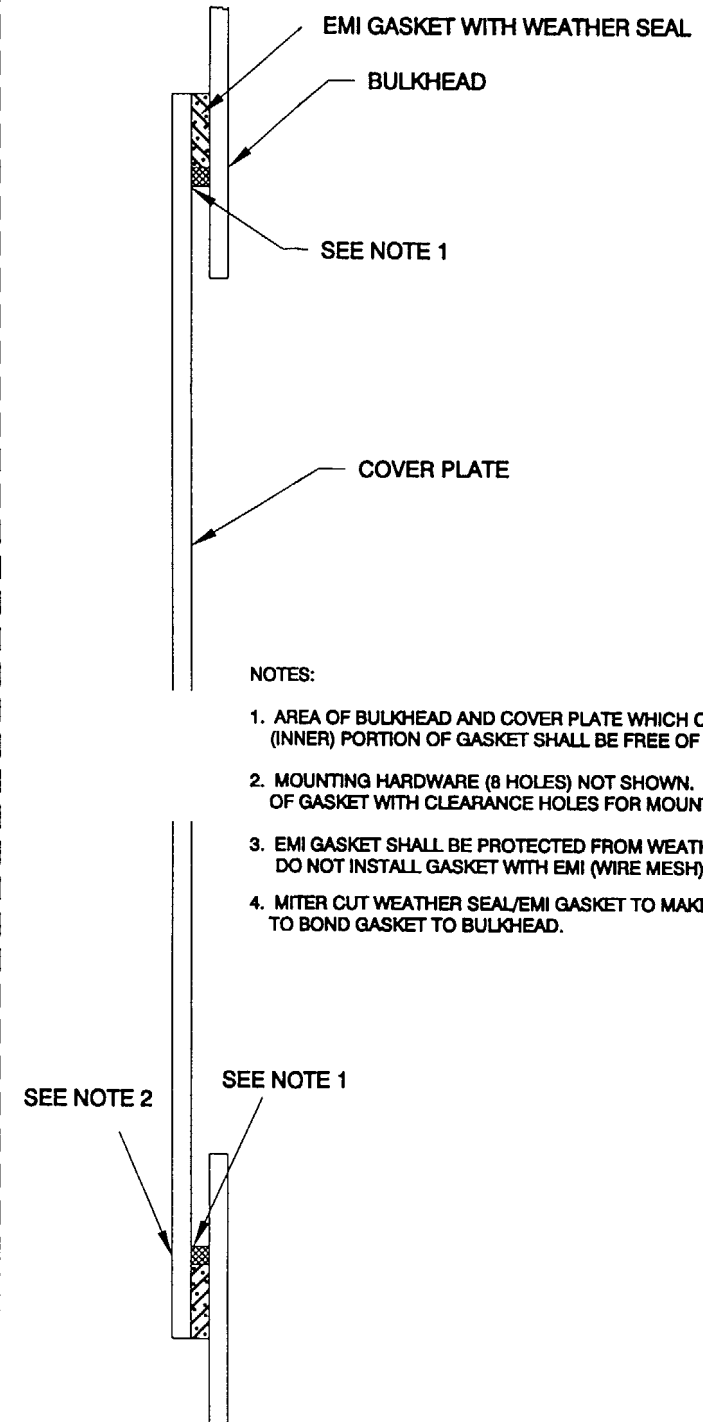
- NOTES:
1. THIS METHOD OF CABLE SHIELD GROUNDING APPLIES TO CABLE INSTALLATIONS, WHERE GROUNDING IS REQUIRED AND CABLE REPLACEMENT IS NOT OTHERWISE AUTHORIZED.
 2. THE METHOD SHOWN HERE FOR CABLE SHIELD GROUNDING MAY ALSO BE USED FOR METAL PIPES AND TUBING ROUTED THROUGH STUFFING TUBES, AND FOR RIGID CONDUIT TERMINATING AT STUFFING OR SWAGE TUBES.
 3. THE GROUNDING RING SHALL BE ROUND CROSS-SECTION NEOPRENE-SPONGE FLEXIBLE-WIRE-MESH STRIP, ITEM 4 OR ITEM 5.
 4. UNSCREW PACKING GLAND NUT FROM THE STUFFING TUBE AND MOVE IT SEVERAL INCHES UP THE CABLE AND TAPE IT IN PLACE. ENSURE INSIDE OF GLAND NUT IS CLEAN. CLEANING WITH FINE SANDPAPER MAY BE REQUIRED. WITH A POCKET KNIFE OR SIMILAR TOOL, MAKE TWO CIRCULAR CUTS TUBE AND ANOTHER APPROXIMATELY 1/4 INCH HIGHER. REMOVE THE CUT SECTION OF THE CABLE JACKET.
 5. SELECT PROPER DIAMETER GROUNDING RING MATERIAL IAW CRITERIA ABOVE. CUT LENGTH OF GROUNDING RING TO FIT THE AREA WHERE JACKET WAS REMOVED. COAT THE GROUNDING RING, EXPOSED CABLE SHIELD AND THREADS OF THE GLAND NUT WITH MIL-T-22361 (HIGH ZINC CONTENT) ANTISEIZE COMPOUND.
 6. PLACE GROUNDING RING AROUND CABLE IN CONTACT WITH EXPOSED SHIELD. PLACE COMPRESSION SLEEVE (SHIM STOCK) AROUND CABLE JACKET AND GROUNDING RING. HOLDING COMPRESSION RING TIGHTLY AROUND CABLE AND GROUNDING RING, SLIDE GLAND NUT DOWN OVER COMPRESSION SLEEVE AND THREAD INTO STUFFING TUBE. AFTER THREADS HAVE ENGAGED, REMOVE THE COMPRESSION SLEEVE. WEATHERPROOF AS REQUIRED FOR CORROSION PROTECTION.
 7. THE COMPRESSION SLEEVE IS USED ONLY TO COMPRESS THE GROUNDING RING WHILE INSTALLING THE GLAND NUT. IT CAN BE CUT FROM 0.005" SHIM STOCK.

DETAIL A-7

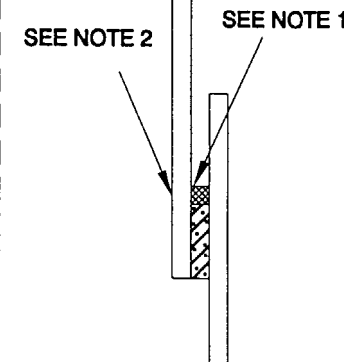


- NOTES:
1. THESE METHODS OF CABLE SHIELDING APPLY TO NEW CABLE INSTALLATIONS AND TO EXISTING CABLE INSTALLATIONS WHERE THE CABLES CAN BE REMOVED FROM THE TERMINATING EQUIPMENT AND HANGERS, AND ROUTED THROUGH THE CONDUIT. INSTALL CONDUIT AND FITTINGS IAW THIS FIGURE.
 2. SELECT CONDUIT SIZE TO ACCOMMODATE CABLE OVERALL DIAMETER.
 3. THE MINIMUM BEND RADIUS SHALL NOT BE EXCEEDED.
 4. ELBOW FITTINGS, 45 OR 90 DEGREE, SHALL BE USED, WHERE NEEDED, TO REDUCE STRAIN ON CONNECTORS AND CONDUIT. SELECT CONDUIT FITTINGS TO MATCH CONDUIT SIZE AND TERMINATING EQUIPMENT.
 5. CONDUIT FITTINGS SHALL BE BRASS OR STEEL. REPLACE NON-METALLIC STUFFING TUBES AND UNSHIELDED CABLES WHERE REQUIRED. APPLICATION OF ANTISEIZE COMPOUND AND WEATHERPROOFING SHALL BE IAW LSI STANDARD PRACTICE.

DETAIL A-5

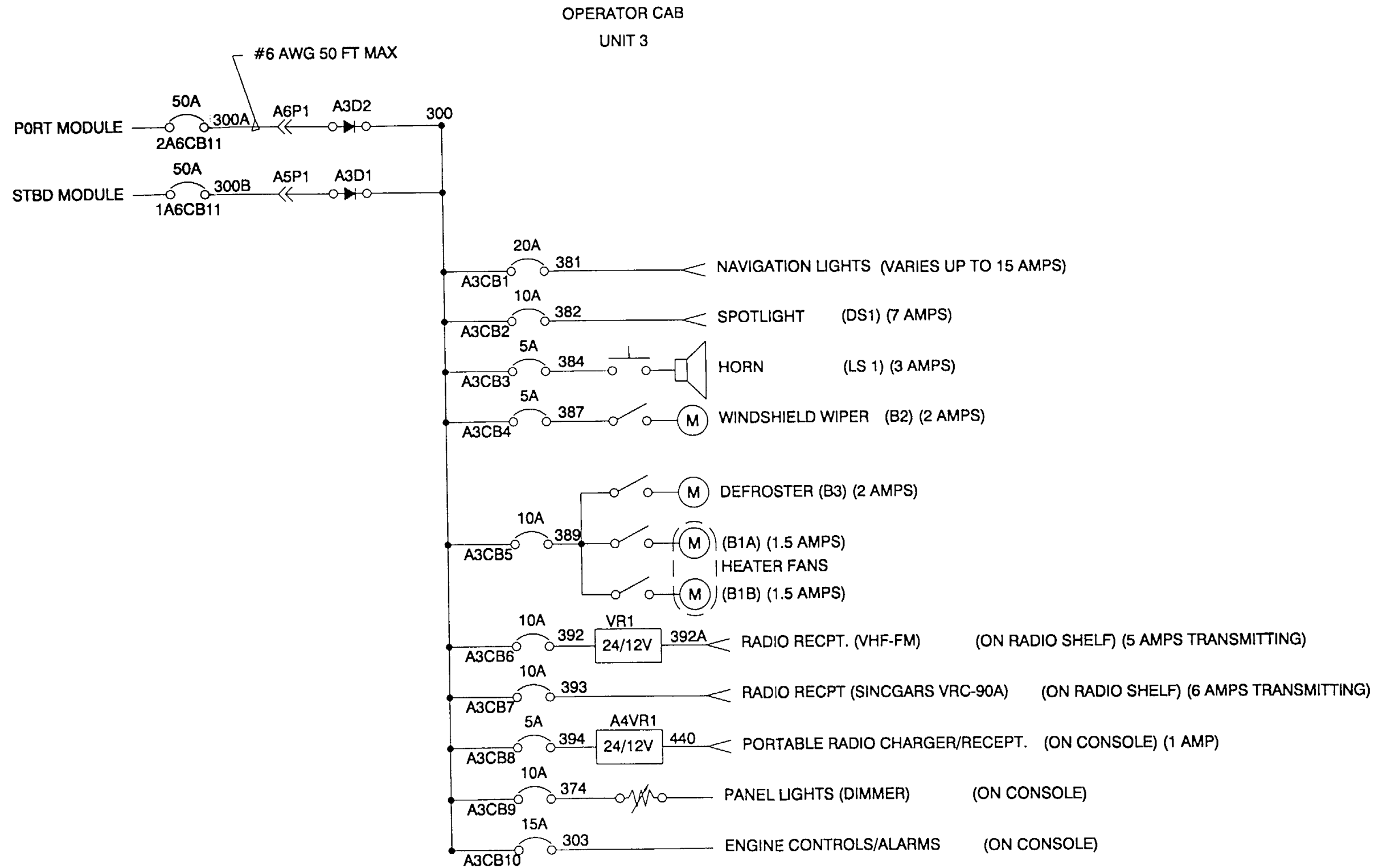


- NOTES:
1. AREA OF BULKHEAD AND COVER PLATE WHICH COMES IN CONTACT WITH EMI (INNER) PORTION OF GASKET SHALL BE FREE OF PAINT.
 2. MOUNTING HARDWARE (8 HOLES) NOT SHOWN. PUNCH NON-CONDUCTIVE PART OF GASKET WITH CLEARANCE HOLES FOR MOUNTING HARDWARE.
 3. EMI GASKET SHALL BE PROTECTED FROM WEATHER FROM WEATHER SEAL GASKET. DO NOT INSTALL GASKET WITH EMI (WIRE MESH) SIDE EXPOSED TO THE WEATHER.
 4. MITER CUT WEATHER SEAL/EMI GASKET TO MAKE CORNERS. USE ADHESIVE, TO BOND GASKET TO BULKHEAD.



DETAIL B-2

Figure G-13. Grounding/Bonding Details.



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

Figure G-14. Operator's Cab One Line Diagram.

OPERATOR CAB WIRING LIST

NOTES:

1. All material on this drawing is ordered from ILS drawing number E02873 (OPERATORS CAB ASSEMBLY).
2. Cable lengths are approximate, verify before cutting cables. Record lengths for future updates in drawing.
3. Coaxial connectors and plugs are called out on LSI Dwg. E02873.
4. Reference Drawing:
 - A. E26554 (SCHOTTEL) (OPERATOR'S CAB "UNIT 3" SCHEMATIC)
 - B. E02873 (OPERATORS CAB ASSEMBLY)
 - C. E08683 (TERMINAL STRIP " A4 " ASSEMBLY)

Figure G-16. Wiring List, Operator's Cab (Sheet 1 of 17).

LEGEND

CABLE LIST	TYPE
P24-1	LSMHOF-14
P24-2	16-2SO (SHIELD)
P24-3	SWE FURNISHED
P24-5	SWE FURNISHED
P24-6	SWE FURNISHED
P12-1	SWE FURNISHED
P12-2	FURNISHED
R-RA1	RG-58/U FURNISHED
R-RA1/1	RG-58/U FURNISHED
R-RA2	RG-58/U FURNISHED
P24-7	LSDHOF-3
P24-8	LSDHOF-4
P24-9	LSTHOF-3
NH-1	14-2SO (SHIELD)
P24-4	16-2SO (SHIELD)

Unit 3 = OPER CAB
 ASSEMBLY A1 = MIDDLE CONTROL PANEL (ITEM 2 ON E02873)
 ASSEMBLY A2 = LOWER CONTROL PANEL (ITEM 3 ON E02873)
 ASSEMBLY A3 = OPER CAB CIRCUIT BREAKER PANEL (ITEM 4 ON E02873)
 ASSEMBLY A4 = TERMINAL BOARD ASSEMBLY (ITEM 8 ON E02873)
 JB1 = JUNCTION BOX #1 ON RADIO SHELF (ITEM 133 ON E02873)
 ASSEMBLY A5 = STBD RECEPTACLE ASSEMBLY (ITEM 9 ON E02873)
 ASSEMBLY A6 = PORT RECEPTACLE ASSEMBLY (ITEM 10 ON E02873)

Figure G-16. Wiring List, Operator's Cab (Sheet 2 of 17).

CABLE LIST						
CABLE NUMBER:P24-1						
CABLE TYPE: LSMHOF-14,ITEM 91						
O.D.: 635						
CABLE LENGTH: 10 FEET						
CABLE ENTRY FROM: A4/A3			FROM: CONTROL CONSOLE - A4/A3			
CABLE ENTRY TO: JB1 (Item 133)			TO: RADIO SHELF JUNCTION BOX - JB1			
BULKHEAD FITTINGS: T & B			NOTES: 1. CABLE CONNECTS TO BRANCH CABLES IN JB1/TB1			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	WIRE	A4TB05-20	ITEM 93	TB1-1
2	386	WHITE	ITEM 92	A4TB05-3	ITEM 93	TB1-2
3	0	RED	WIRE	A4TB11-2	ITEM 93	TB1-3
4	388	GREEN	ITEM 92	A4TB05-6	ITEM 93	TB1-4
5	0	ORG	WIRE	A4TB11-2	ITEM 93	TB1-5
6	383	BLUE	ITEM 92	A4TB05-5	ITEM 93	TB1-6
7	0	WH/BK	WIRE	A4TB11-2	ITEM 93	TB1-7
8	392	RD/BK	ITEM 92	A3CB6-2	ITEM 93	TB1-8
9	0	GN/BK	WIRE	A4TB11-2	ITEM 93	TB1-9
10	393	OR/BK	ITEM 92	A3CB7-2	ITEM 93	TB1-10
11	0	BU/BK	WIRE	A4TB11-2	ITEM 93	TB1-11
12	442	BK/WH	ITEM 92	A4TB05-15	ITEM 93	TB1-12
13	SPARE	RD/WH				
14	SPARE	GN/WH				

Figure G-16. Wiring List, Operator's Cab (Sheet 3 of 17).

CABLE LIST						
CABLE NUMBER: P24-2						
CABLE TYPE: 16-2S0 (SHIELD), ITEM 94						
O.D.: .360 INCH						
CABLE LENGTH: 3 FEET						
CABLE ENTRY FROM: JB1 (ITEM 133)			FROM: RADIO SHELF - JB1			
CABLE ENTRY TO: B3 (ITEM 50)			TO: DEFROSTER FAN MOTOR - B3			
BULKHEAD FITTINGS: SIZE B STUFFING TUBE @ SHELF T & B LIQUIDTIGHT AT JB1			NOTES: 1. CABLE SHIELD GROUNDED AT STUFFING TUBE IN SHELF, REFER TO LSI DWG. E13441, DETAIL A-7. 2. CONNECTIONS TO MOTOR SHALL BE MADE IN DEFROSTER CASE. DISCONNECT MOTOR LEAD FROM CASE AND TERMINATE TO LEAD (0) OF THIS CABLE.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	442	BLACK	ITEM 93	TB1-12	ITEM 93	B3-1
2	0	WHITE	ITEM 93	TB1-11	ITEM 93	B3-2

Figure G-16. Wiring List, Operator's Cab (Sheet 4 of 17).

CABLE LIST						
CABLE NUMBER: P24-3						
CABLE TYPE: SWE						
O.D.: .445 INCH						
CABLE LENGTH: 6 FEET						
CABLE ENTRY FROM: JB1			FROM: RADIO SHELF - JB1			
CABLE ENTRY TO: DS1			TO: SPOTLIGHT, TOP OF OPERATOR'S CAB			
BULKHEAD FITTINGS: METAL STUFFING TUBES S/W LIGHT FIXTURE. T & B LIQUIDTIGHT AT JB-1			NOTES:			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	ITEM 93	TB1-5	ITEM 92	DS-1/2
2	383	WHITE	ITEM 93	TB1-6	ITEM 92	DS-1/1
3	Ⓢ SHIELD	SHIEL				

Figure G-16. Wiring List, Operator's Cab (Sheet 5 of 17).

CABLE LIST						
CABLE NUMBER: P24-5						
CABLE TYPE: SWE						
O.D.: N/A						
CABLE LENGTH: 8"						
CABLE ENTRY FROM: VR1			FROM: DC/DC CONVERTER, RADIO SHELF			
CABLE ENTRY TO: JB1, J2			TO: RADIO SHELF JUNCTION BOX, RADIO RECEPT. - JB1			
BULKHEAD FITTINGS: T & B LIQUIDTIGHT AT JB1			NOTES: DC/DC CONVERTER FURNISHED WITH VHF-FM RADIO AND MOUNTED ON TOP OF JB1.			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	(0)	BLACK	WIRE	COMMON	ITEM 93	TB1-7
2	392	ORG	WIRE	+24VDC INPUT	ITEM 93	TB1-8
3	392A	RED	WIRE	+12VDC OUTPUT	ITEM 93	NOTE BELOW
			RED WIRE FROM CONVERTER (W/N 392A) IS CONNECTED TO RED WIRE GOING TO ROSS DSC500 RADIO PLUG WITH A WIRE COMPRESSION NUT IN JB1. RELOCATE CONVERTER FUSE TO INSIDE OF JB1. USE BUTT SPLICE TO ADD LENGTH OF WIRE AS NECESSARY. LOOP WIRE 392A TWICE THROUGH FERRITE CORE (ITEM 160) INSIDE JB1. SECURE WITH TIE WRAPS (ITEM 156).			

Figure G-16. Wiring List, Operator's Cab (Sheet 6 of 17).

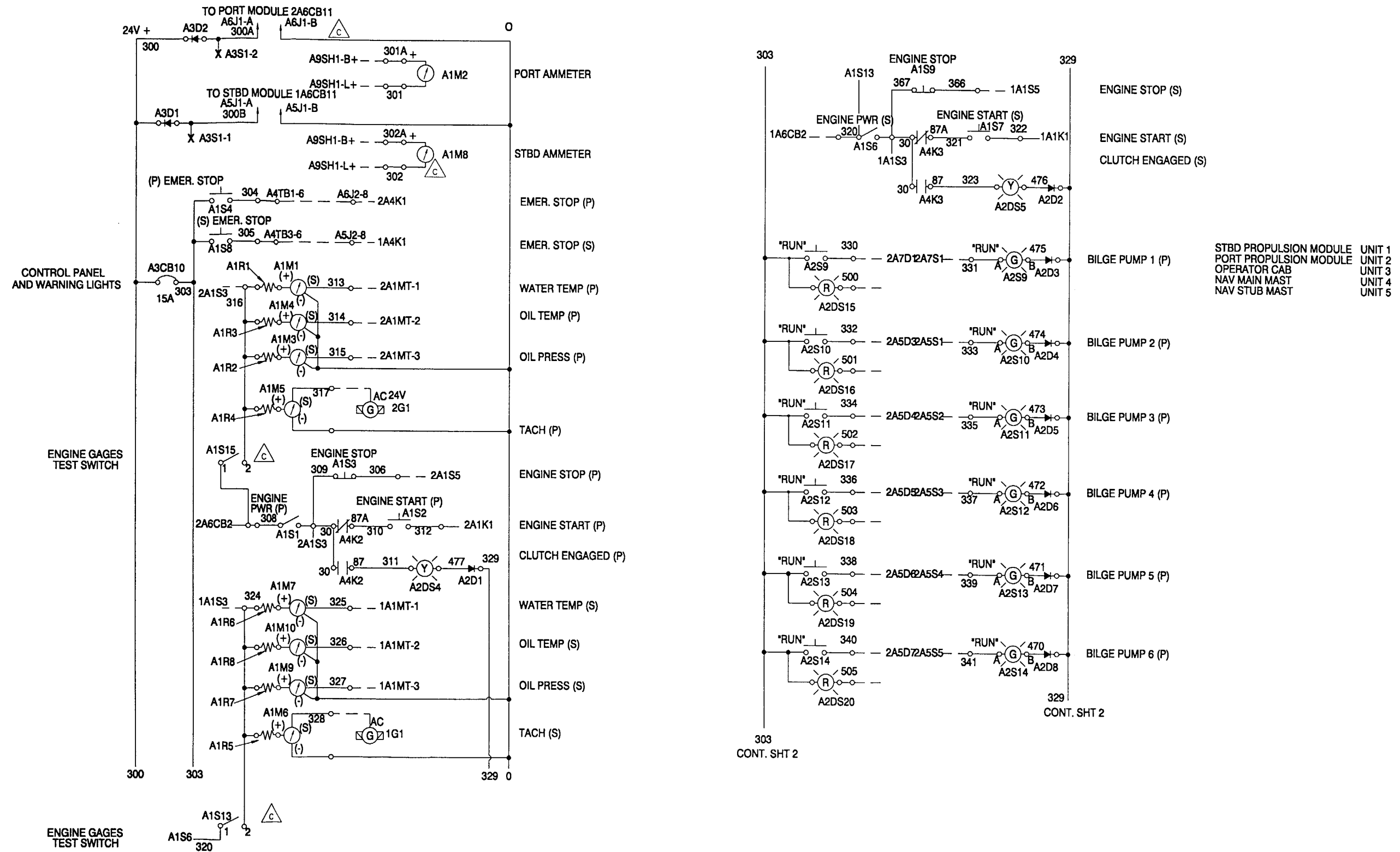


Figure G-15. Operator's Cab Schematic. (Sheet 1 of 5).

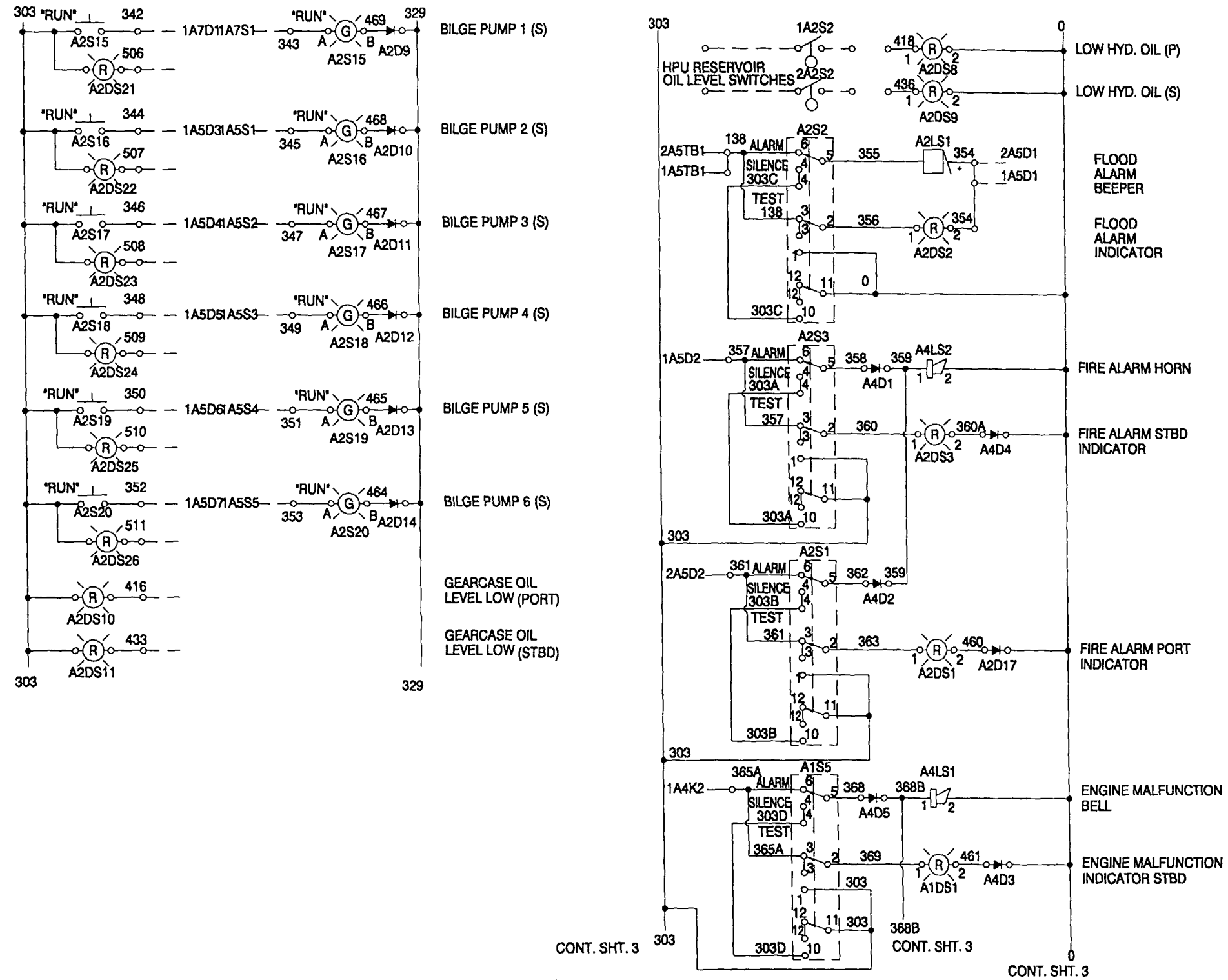


Figure G-15. Operator's Cab Schematic (Sheet 2 of 5).

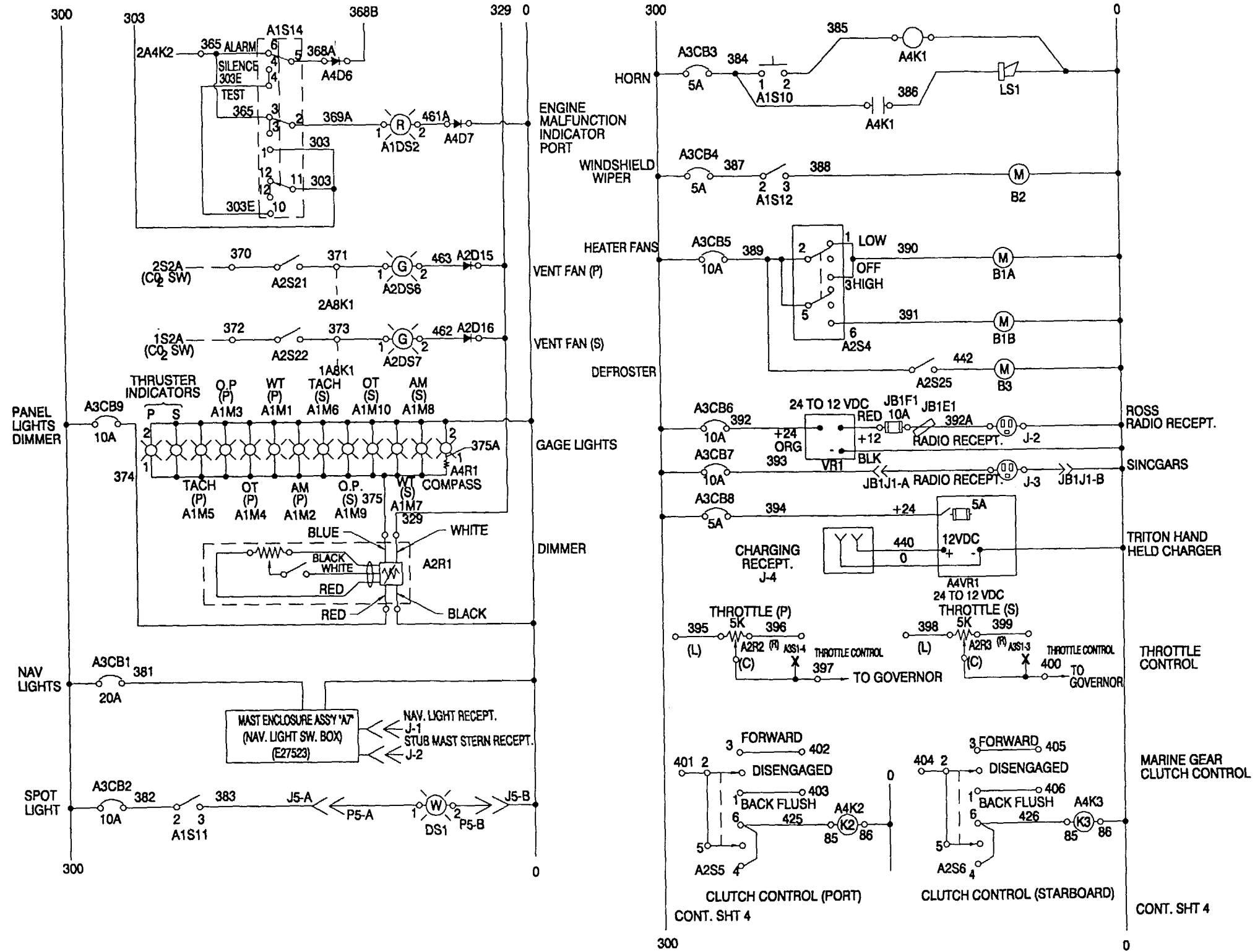


Figure G-15. Operator's Cab Schematic. (Sheet 3 of 5).

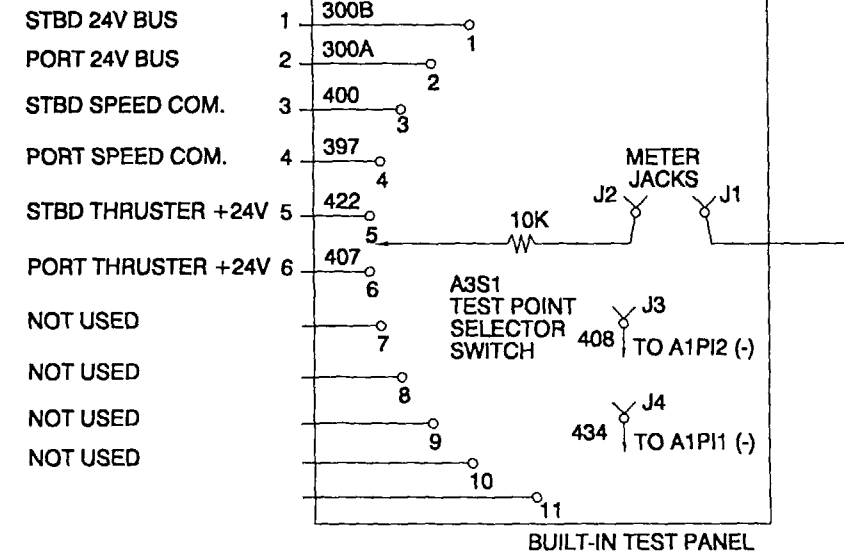
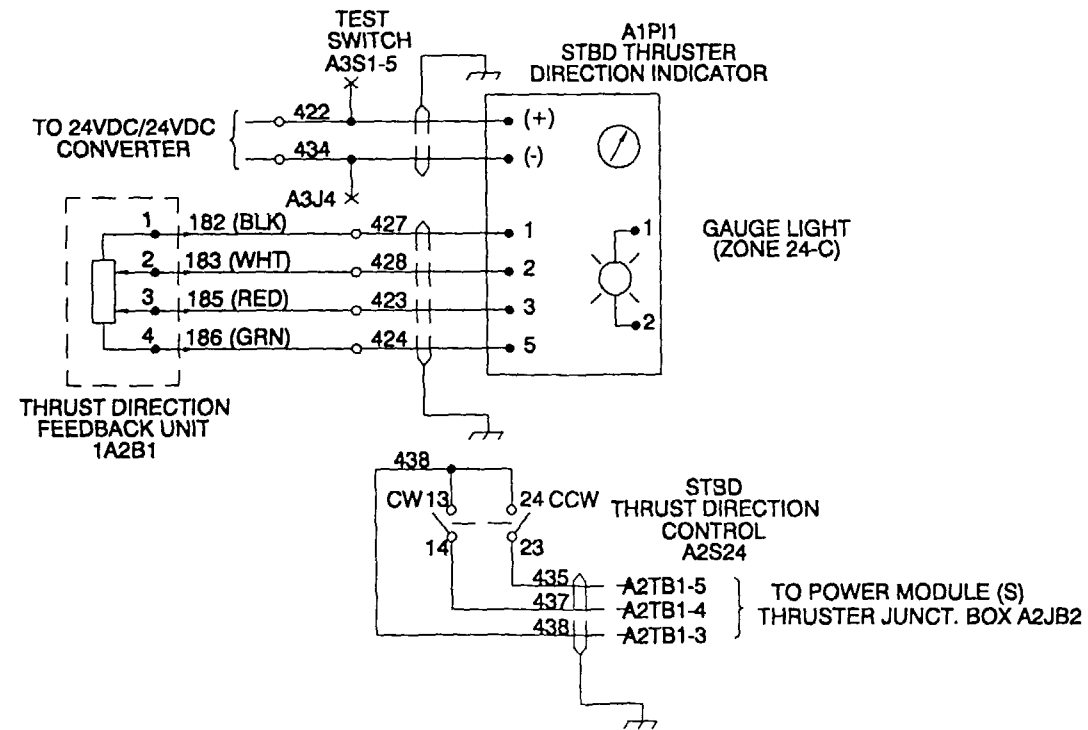
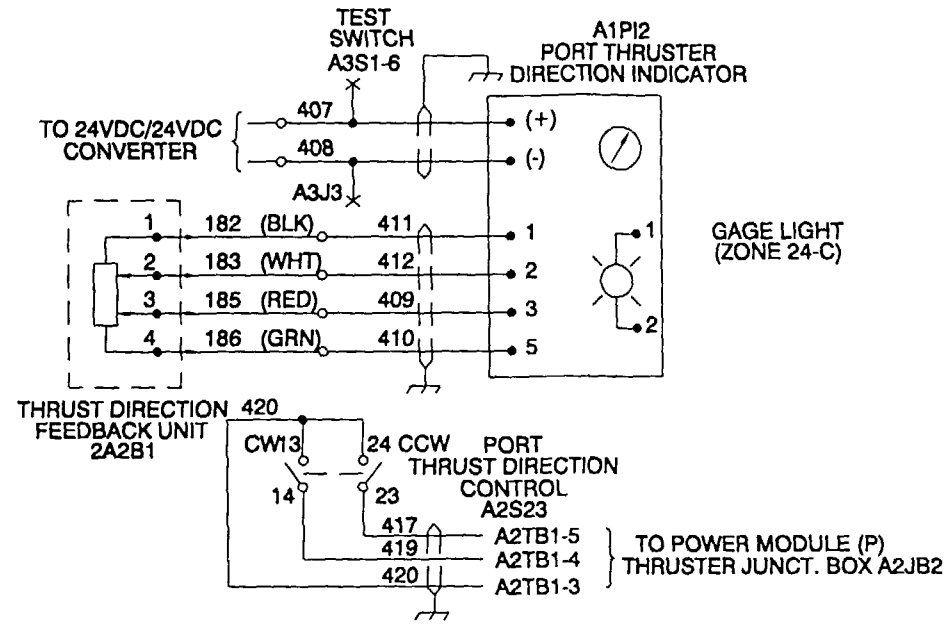


Figure G-15. Operator's Cab Schematic. (Sheet 4 of 5).

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DESIGNATORS

NOTE: ALL DESIGNATORS ARE PREFIXED WITH UNIT OR ASSEMBLY NUMBERS AND FOLLOWED BY AN ASSIGNED NUMBER FOR IDENTIFICATION.

DESIGNATOR	DEVICE
A1	MIDDLE CONTROL PANEL ASSEMBLY, E06763
A2	LOWER CONTROL PANEL ASSEMBLY, E06773
A3	OPERATOR CAB CIRCUIT BREAKER PANEL, E06793
A4	TERMINAL STRIP ASSEMBLY, E08683
A5	STBD RECEPTACLE ASSEMBLY, E08873
A6	PORT RECEPTACLE ASSEMBLY, E08883
A7	MAST ENCLOSURE ASSEMBLY, E27523
B	MOTOR, STARTER or SYNCHRO
BT	BATTERY
CB	CIRCUIT BREAKER
D	DIODE, SEMICONDUCTOR
DS	INDICATING LAMP
E	EMI/RFI SUPPRESSOR
G	ALTERNATOR
JB	JUNCTION BOX
K	RELAY
LS	AUDIBLE DEVICE, BEEPER etc.
M	METER, GAGE or PICK-UP
MT	TRANSDUCER FOR METER/GAGE
PI	PANEL INDICATOR
R	RESISTOR OR POTENTIOMETER
S	SWITCH INCLUDING ILLUMINATED PUSHBUTTON SWITCHES
VR	VOLTAGE CONVERTER, 24VDC TO 12 VDC

EXAMPLES: 1) A1M1, THIS IS METER NUMBER 1 (PORT ENGINE WATER TEMP METER) INSTALLED ON MIDDLE CONTROL PANEL ASSEMBLY 'A1'
 2) A1S6, THIS IS SWITCH NUMBER 6 (STBD ENGINE POWER SWITCH) INSTALLED ON MIDDLE CONTROL PANEL ASSEMBLY 'A1'
 3) A2S13, THIS IS SWITCH NUMBER 13 (ILLUMINATED PUSHBUTTON SWITCH FOR PORT BILGE PUMP NUMBER 5 INSTALLED ON LOWER CONTROL PANEL ASSEMBLY 'A2'

NOTES:

1. CONDUCTORS SHOWN AS DASHED CONTINUE TO PROPULSION MODULES THROUGH CONNECTORS. DEVICES IN PROPULSION MODULES ARE DESIGNATED BY NUMERICAL PREFIX, TYPE DESIGNATION, AND PART NUMBER. PORT (2) OR STBD (1) MODULE DESIGNATIONS PREFIX PART DESIGNATOR.
2. THIS SCHEMATIC DOES NOT SHOW ALL TERMINALS OR CONNECTOR PIN NUMBERS.
3. TERMINAL MARKINGS ON GAGES OR OTHER DEVICES MAY DIFFER DUE TO ALTERNATE SOURCES.
4. *RUN* LIGHTS A2S9 THROUGH A2S20 (SHEET 1) ARE PART OF ILLUMINATED PUSHBUTTON SWITCHES A2S9 THROUGH A2S20. FOR SCHEMATIC PURPOSES THESE LIGHTS HAVE *S* DESIGNATIONS INSTEAD OF *DS* DESIGNATION FOR OTHER LIGHTS IN THE SYSTEM.

LEGEND

ABBREVIATION	EXPLANATION
AC	CONNECTION FOR ALTERNATOR STATOR WINDING USED FOR TACHOMETER
E-STOP	ENGINE EMERGENCY STOP/AIR SHUT-OFF
ENG PWR	ENGINE POWER
ENG MALF	ENGINE MALFUNCTION, INDICATES LOW OIL PRESSURE OR HIGH COOLANT TEMPERATURE
DISENGAGED	CLUTCH IN NEUTRAL POSITION
(P)	PORT
RECEPT	RECEPTACLE, CONNECTOR
(S)	STBD
SINCGARS	GOVERNMENT FURNISHED RADIO, SINGLE CHANNEL GROUND & AIRBORNE RADIO SYSTEM
SW	SWITCH
TACH	TACHOMETER FOR ENGINE SPEED IN RPM
TEMP	TEMPERATURE
TRITON	*BRAND NAME* FOR MOTOROLA HANDHELD RADIO
AM	AMMETER

Figure G-15. Operator's Cab Schematic. (Sheet 5 of 5).

CABLE LIST						
CABLE NUMBER: P24-6						
CABLE TYPE: SWE						
O.D.: N/A						
CABLE LENGTH: 3 FEET						
CABLE ENTRY FROM: JB1			FROM: RADIO SHELF - JB1			
CABLE ENTRY TO: J1			TO: SINCGARS, AN/VRC-94A, MOUNTING BASE			
BULKHEAD FITTINGS: T & B LIQUIDTIGHT AT JB1			NOTES: 1. CONNECT FURNISHED CABLE TO J1 ON JB1 AND TO SINCGARS RADIO.			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	(0)	N/A		J1-B	PLUG (J-3)	SINCGARS
2	393	N/A		J1-A	PLUG (J-3)	SINCGARS
		Ⓢ	RED WIRE FROM CONVERTER (W/N 392A) IS CONNECTED TO RED WIRE GIONG TO ROSS DSC500 RADIO PLUG WITH A WIRE COMPRESSION NUT IN JB1. RELOCATE CONVERTER FUSE NO. JB1 F1 TO INSIDE OF JB1. USE BUTT SPLICE TO ADD LENGTH OF WIRE AS NECESSARY. LOOP WIRE 392A TWICE THROUGH FERRITE CORE (ITEM 160) INSIDE JB1. SECURE WITH THE TIE WRAPS (ITEM 156).			

Figure G-16. Wiring List, Operator's Cab (Sheet 7 of 17).

CABLE LIST						
CABLE NUMBER: P12-1						
CABLE TYPE: SWE						
O.D.: N/A						
CABLE LENGTH: 5 FEET						
CABLE ENTRY FROM: A4VR1			FROM: CONTROL CONSOLE TERMINAL BOARD ASSEMBLY, DC/DC CONVERTER A4.			
CABLE ENTRY TO: J-4			TO: CONSOLE TOP, TRITON HANDI-TALKI CHARGING RECPT J4.			
BULKHEAD FITTINGS: GROMMET @ CONSOLE TOP (COMPASS CABLE, P24-7, ALSO PASSES THROUGH THIS GROMMET)			NOTES: 1. CABLE ASSEMBLY WITH TWO PLUGS FURNISHED AS PART OF VEHICULAR ADAPTER. POSITIVE WIRE CONNECTED TO CENTER PIN OF AUTOMOTIVE ACCESSORY PLUG. 2. REMOVE ACCESSORY PLUG FOR MCF INSTALLATION.			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
(-)	0		ITEM 92	A4 TB11-2	PLUG	J-4 OUTER PIN
(+)	440		ITEM 92	A4 TB10-10	PLUG	J-4 CENTER PIN

Figure G-16. Wiring List, Operator's Cab (Sheet 8 of 17).

CABLE LIST						
CABLE NUMBER: P12-2						
CABLE TYPE: FURNISHED						
O.D.: N/A						
CABLE LENGTH: 3 FEET						
CABLE ENTRY FROM: JB1			FROM: RADIO SHELF, JUNCTION BOX - JB1			
CABLE ENTRY TO: VHF-FM			TO: RADIO SHELF, VHF-FM TRANSCEIVER			
BULKHEAD FITTINGS: T & B LIQUIDTIGHT AT JB1			NOTES: 1. CABLE AND CONNECTOR FURNISHED WITH RADIO. 2. REFER TO OWNER/OPERATOR MANUAL FOR DETAILED INSTALLATION INSTRUCTIONS. 3. W/N 392A RED CONNECTS WITH WIRE COMPRESSION NUT TO RED WIRE FROM DC-DC CONVERTER, P24-5.			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
(-)	(0)	BLACK	ITEM 93	TB1-7	WIRE	(-) OUT (J2-COM) ©
(+)	392A	RED	ITEM 93	SEE NOTE 3	WIRE	(+) OUT (J2+) ©

Figure G-16. Wiring List, Operator's Cab (Sheet 9 of 17).

CABLE LIST						
CABLE NUMBER: R-RA1						
CABLE TYPE: RG-58/U						
O.D.: .195 INCH						
CABLE LENGTH: 6 FEET						
CABLE ENTRY FROM: VHF-FM				FROM: RADIO SHELF, VHF-FM TRANSCEIVER - ANTENNA CABLE		
CABLE ENTRY TO: JB2				TO: OP CAB INTERIOR, AFT STBD UPPER CORNER - JB2		
BULKHEAD FITTINGS: TERMINAL TUBE ON JB-2				NOTES: 1. CABLE FURNISHED WITH ANTENNA. 2. GROUND CABLE SHIELD AT TERMINAL TUBE ENTRANCE TO JB-2 IAW LSI DWG E13441 3. COAXIAL CONNECTORS TO BE INSTALLED BY EXPERIENCED TECHNICIAN.		
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
	R-RA1	BLACK	PL-259 COAXIAL PLUG	VHF-FM TRANSCEIVER (ANT)	PL-259 COAXIAL PLUG	J-1 (INSIDE JB-2)

Figure G-16. Wiring List, Operator's Cab (Sheet 10 of 17).

CABLE LIST						
CABLE NUMBER: R-RA1/1						
CABLE TYPE: RG-58/U						
O.D.: .195 INCH						
CABLE LENGTH: 18 INCHES						
CABLE ENTRY FROM: JB-2 J-1			FROM: OP CAB EXTERIOR UPPER AFT STBD CORNER, J-1 OF JB-2			
CABLE ENTRY TO: RA-1			TO: OP CAB ROOF AFT STBD CORNER, VHF-FM ANTENNA			
BULKHEAD FITTINGS:			NOTES: 1. CABLE IS FURNISHED WITH AND CONNECTED TO ANTENNA. 2. CUT EXCESS LENGTH FROM CABLE AND USE FOR R-RA1. 3. COAXIAL CONNECTORS TO BE INSTALLED BY EXPERIENCED TECHNICIANS.			
			TERMINATION DATA			
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
	R-RA1/1	BLACK	PL-259 COAXIAL PLUG	JB-2 J-1	COAXIAL CABLE	ANTENNA

Figure G-16. Wiring List, Operator's Cab (Sheet 11 of 17).

CABLE LIST						
CABLE NUMBER: R-RA2						
CABLE TYPE: RG-58/U						
O.D.: .195 INCH						
CABLE LENGTH: 6 FEET						
CABLE ENTRY FROM: J-1			FROM: RADIO SHELF, SINCGARS TRANSCEIVER, RT			
CABLE ENTRY TO: J-1			TO: AFTER LEFT CORNER OF CAB ROOF, AS-3900/VRC ANTENNA			
BULKHEAD FITTINGS: SIZE C STUFFING TUBE ON AFT OP.CAB BULKHEAD.			NOTES: 1. CABLE AND CONNECTORS FURNISHED (GFE) WITH RADIO INSTALLATION KIT. 2. CONNECTOR INSTALLATION AND REMOVAL SHALL BE DONE BY EXPERIENCED TECHNICIAN. 3. INSTALL RIGHT ANGLE CONNECTOR AT TOP RIGHT SIDE OF TRANSCEIVER FRONT PANEL TO MATE WITH J-1 ON RADIO. 4. GROUND CABLE SHIELD AT BULKHEAD PENETRATION.			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
	R-RA2	BLACK	BNC (RT ANG)	RT J-1	BNC STRAIGHT	AS-3900 J-1

Figure G-16. Wiring List, Operator's Cab (Sheet 12 of 17).

CABLE LIST						
CABLE NUMBER: P24-7						
CABLE TYPE: LSDHOF-3 ITEM 97						
O.D.: .425						
CABLE LENGTH: 4 FEET						
CABLE ENTRY FROM: COMPASS			FROM: CONSOLE TOP, CENTER, MAGNETIC COMPASS			
CABLE ENTRY TO: A4TB5			TO: CONTROL CONSOLE INTERIOR, TERMINAL BOARD ASSEMBLY			
BULKHEAD FITTINGS: GROMMET @ CONSOLE TOP (JOINS CABLE P12-1)			NOTES: 1. CABLE FURNISHED WITH COMPASS IS 18 INCHES LONG. USE BUTT CONNECTORS TO CONNECT TO VESSEL CABLING INSIDE CONSOLE.			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	(0)	BLACK	WIRE	COMPASS CABLE	ITEM 92	A4TB5-20
2	375A	WHITE	WIRE	COMPASS CABLE	ITEM 92	A4TB5-17
			INSTALL SUPPLIED RESISTOR BETW A4TB5-19 & A4TB5-17.			

Figure G-16. Wiring List, Operator's Cab (Sheet 13 of 17).

CABLE LIST						
CABLE NUMBER: P24-8						
CABLE TYPE: LSDHOF-4 ITEM 99						
O.D.: .460 INCH						
CABLE LENGTH: 8 FEET						
CABLE ENTRY FROM: A3/A4			FROM: CONTROL CONSOLE INTERIOR, CB PANEL & TERM. BD. ASSY.			
CABLE ENTRY TO: J-1			TO: OP CAB EXTERIOR FORWARD, NAVIGATION MAST LIGHT RECEPTACLE			
BULKHEAD FITTINGS: STUFFING TUBE @ PLENUM BULKHEAD.			NOTES: W/N 381 FROM A3 CB1-2 TO A4TB9-10			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	(0)	BLACK	WIRE	A4TB11-2	SOLDER	J1-B
2	381	WHITE	ITEM 100	A4TB9-10	SOLDER	J1-A

Figure G-16. Wiring List, Operator's Cab (Sheet 14 of 17).

CABLE LIST						
CABLE NUMBER: P24-9						
CABLE TYPE: LSTHOF-3 ITEM 98						
O.D.: .450 INCH						
CABLE LENGTH: 5 FEET						
CABLE ENTRY FROM: A4TB05			FROM: CONTROL CONSOLE, TERMINAL BOARD ASSY.			
CABLE ENTRY TO: B1A/B1B			TO: CONTROL CONSOLE INTERIOR, HEATER FAN MOTORS			
BULKHEAD FITTINGS:			NOTES: 1. TERMINATE CABLE DIRECTLY TO MOTOR LEADS. DISCONNECT MOTOR LEADS TO (INTERNAL) CASE OF HEATER. CONNECT THESE LEADS TO (0) OF CABLE P24-9.			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	(0)	BLACK	ITEM 92	A4TB11-2	ITEM 93	B1A/B COMMON
2	390	WHITE	ITEM 92	A4TB05-07	ITEM 93	B1A POSITIVE
3	391	RED	ITEM 92	A4TB05-08	ITEM 93	B1B POSITIVE

Figure G-16. Wiring List, Operator's Cab (Sheet 15 of 17).

CABLE LIST						
CABLE NUMBER: NH-1						
CABLE TYPE: 14-2SO (SHIELD) ITEM 35						
O.D.: .445 INCH						
CABLE LENGTH: 6 FEET						
CABLE ENTRY FROM: JB-1			FROM: RADIO SHELF - JB1			
CABLE ENTRY TO: LS1			TO: NAV. HORN, TOP OF OPERATOR'S CAB			
BULKHEAD FITTINGS: METAL STUFFING TUBES S/W HORN FIXTURE T & B LIQUIDTIGHT AT JB-1			NOTES: 1. GROUND CABLE SHIELD AT FIXTURE AND CAB TOP STUFFING TUBES IAW LSI DWG. E13441 DETAIL A-7			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	(0)	BLACK	ITEM 93	TB1-1	ITEM 92	LS1 TB1-1
2	386	WHITE	ITEM 93	TB1-2	ITEM 92	LS1 TB1-2

Figure G-16. Wiring List, Operator's Cab (Sheet 16 of 17).

CABLE LIST						
CABLE NUMBER: P24-4						
CABLE TYPE: 16-2SO (SHIELD) ITEM 94						
O.D.: .360 INCH						
CABLE LENGTH: 3 FEET						
CABLE ENTRY FROM: JB1			FROM: RADIO SHELF - JB-1			
CABLE ENTRY TO: B2			TO: WINDSHIELD WIPER MOTOR			
BULKHEAD FITTINGS: T & B LIQUIDTIGHT AT JB1			NOTES: 1. GROUND SHIELD TO CABINET AT CONNECTOR.			
TERMINATION DATA						
WIRE NO.	WIRE LABEL	COLOR	FROM TERM METHOD	FROM TERM POINT	TO TERM METHOD	TO TERM POINT
1	0	BLACK	ITEM 93	TB1-3	ITEM 92	B2-2
2	388	WHITE	ITEM 93	TB1-4	ITEM 92	B2-1

Figure G-16. Wiring List, Operator's Cab (Sheet 17 of 17).

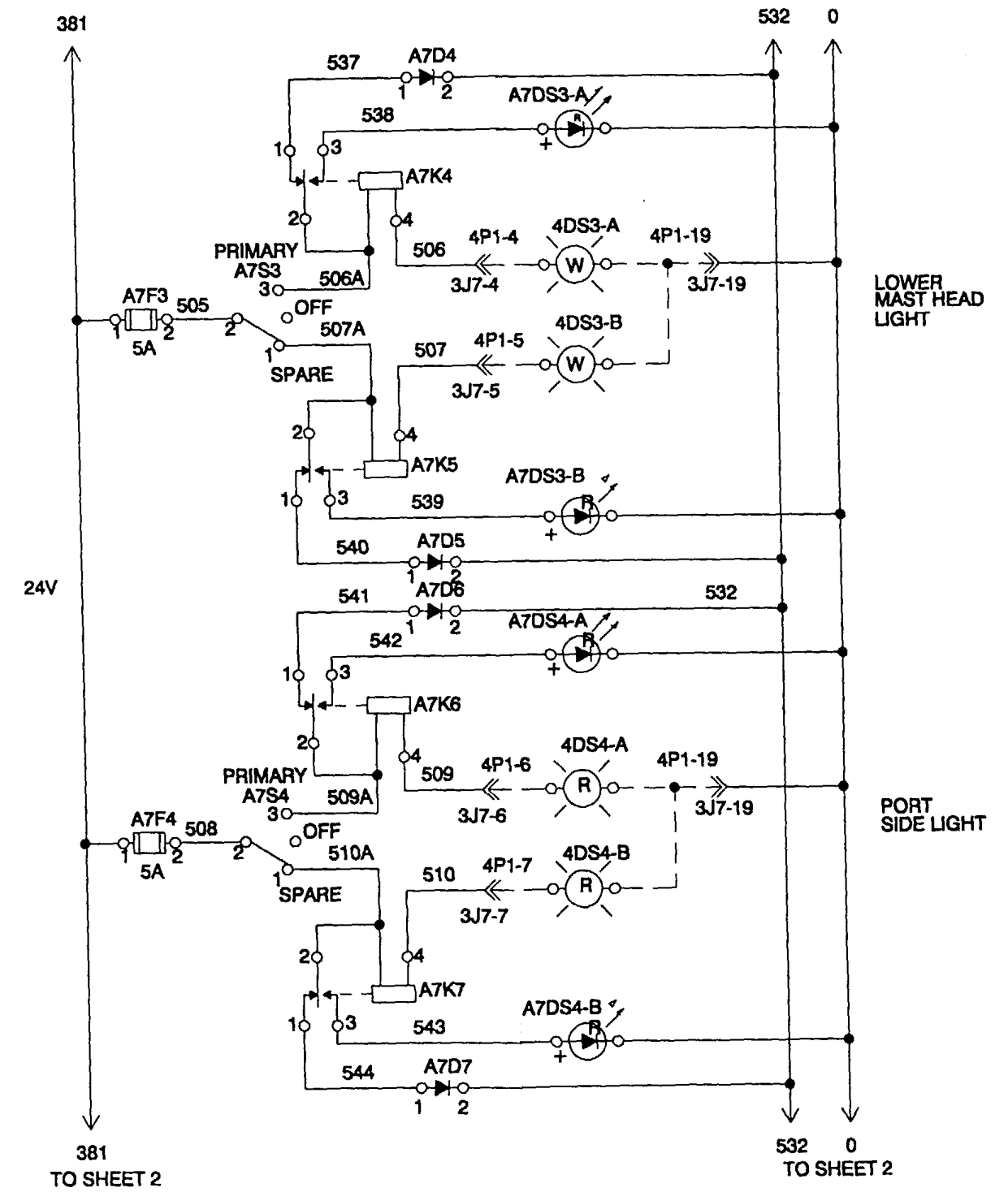
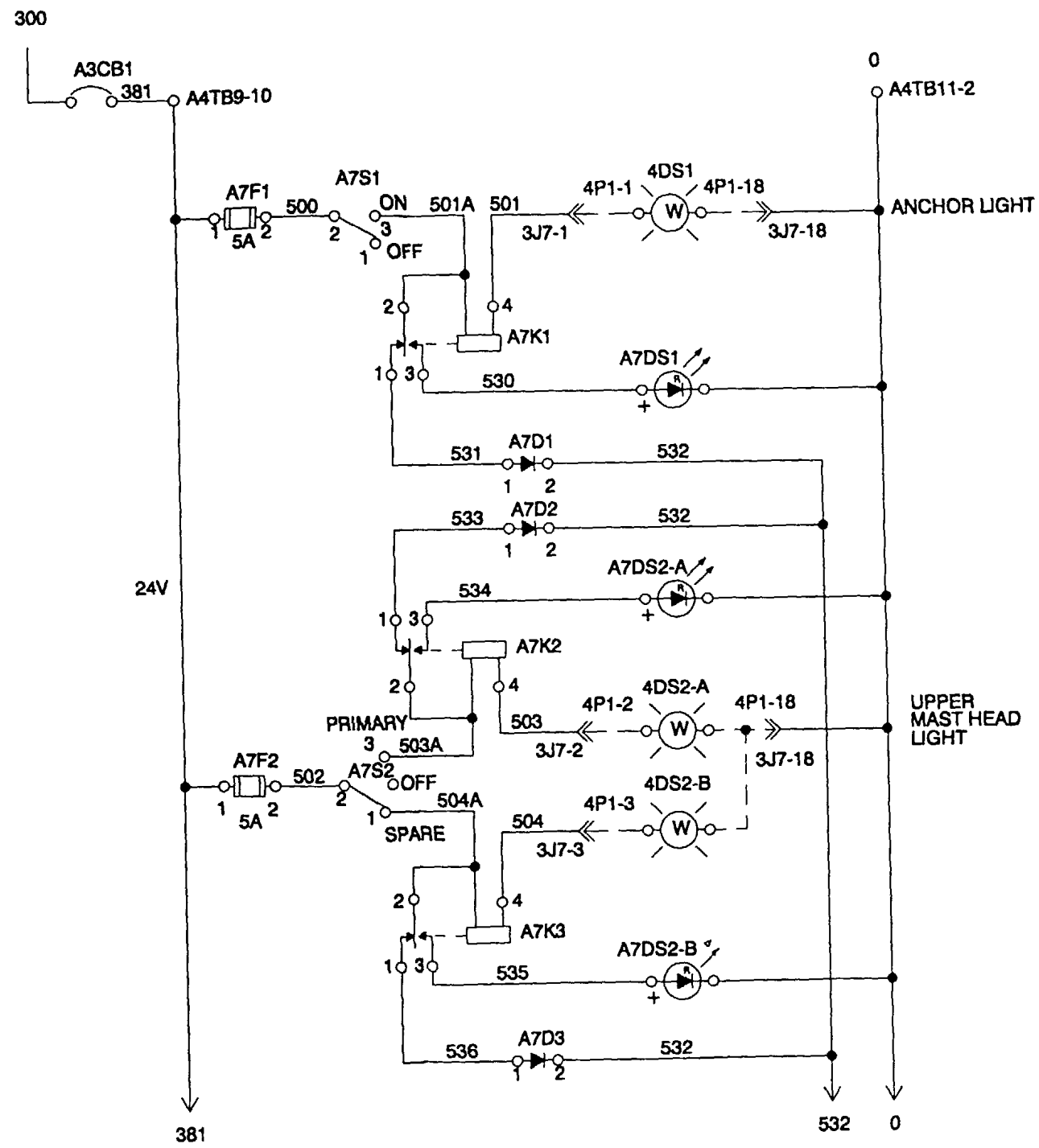


Figure G-17. Navigation Lights Schematic. (Sheet 1 of 3).

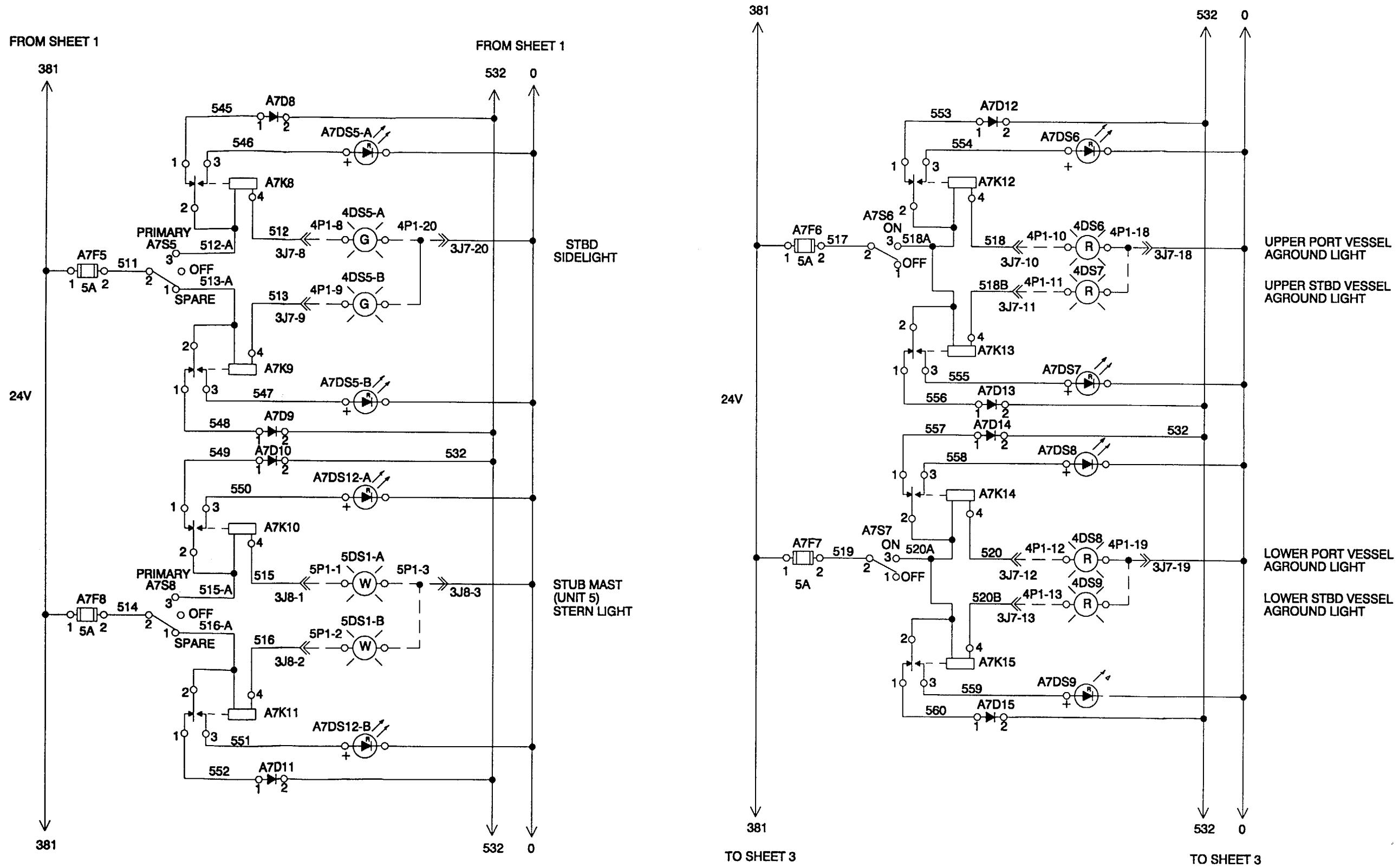


Figure G-17. Navigation Light, Schematic. (Sheet 2 of 3).

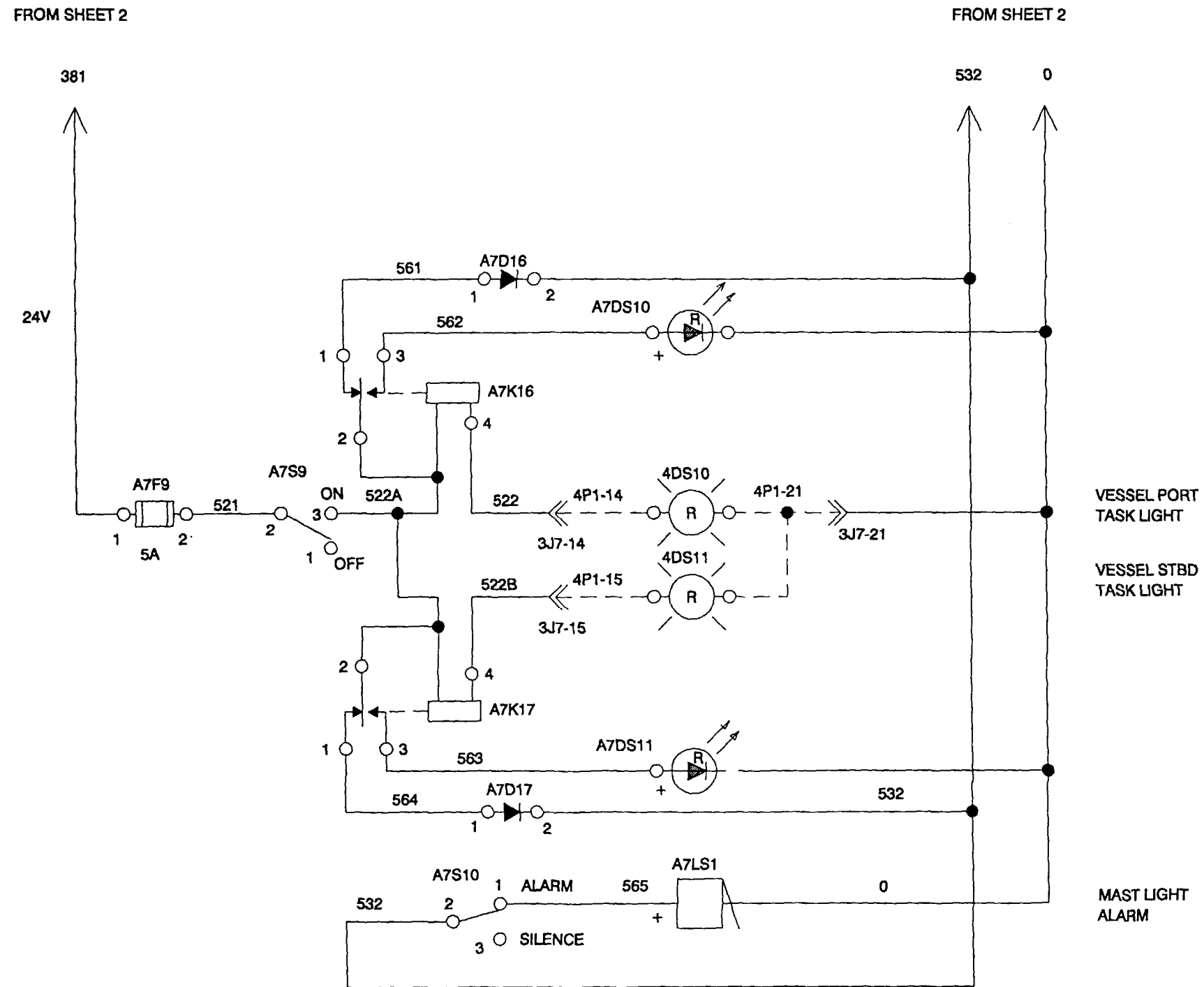
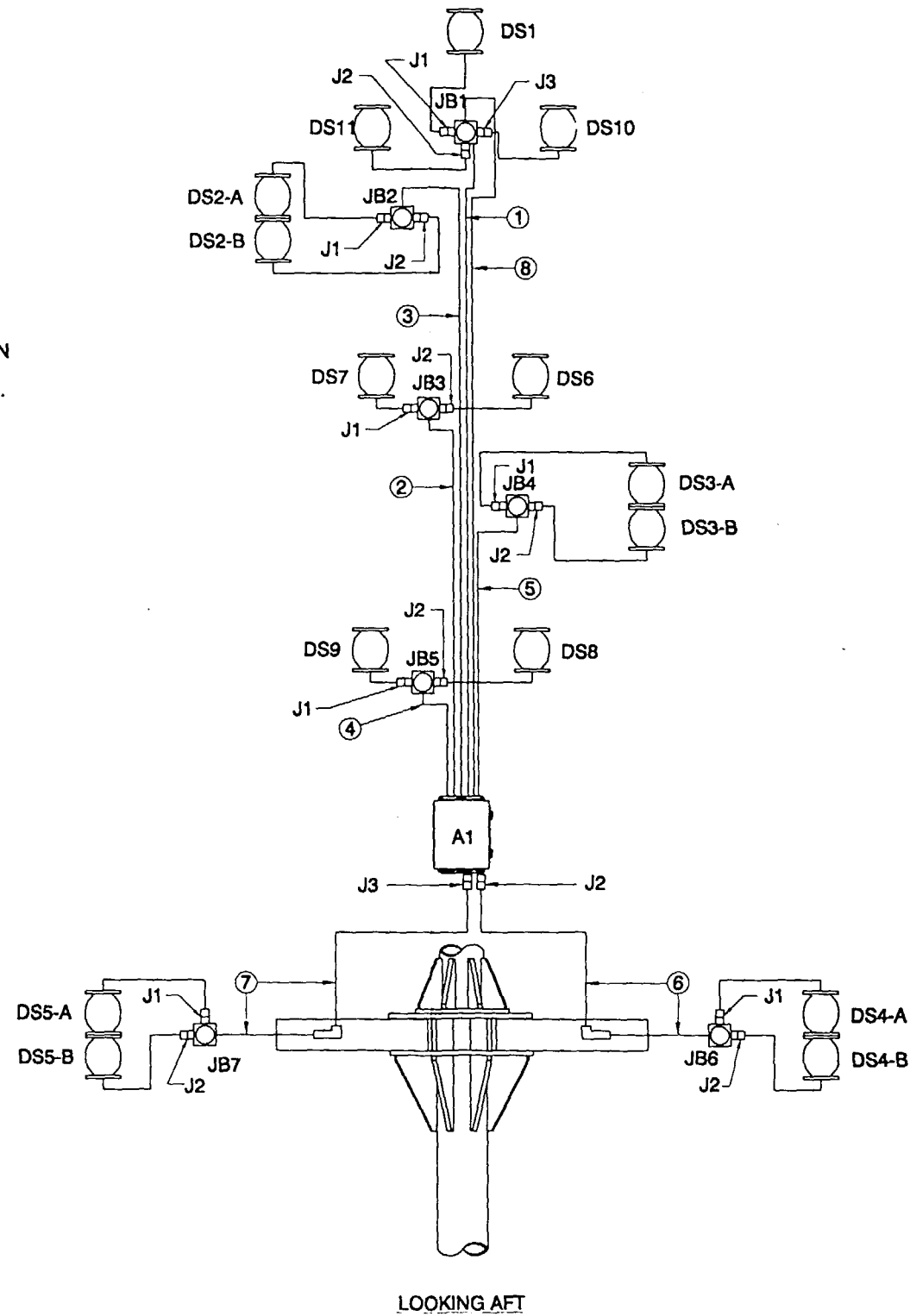


Figure G-17. Navigation Lights, Schematic (Sheet 3 of 3)

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NOTES:

- 1) NAVIGATION MAST IS UNIT 4 FOR COMPONENT DESIGNATION PURPOSES. NAVIGATION LIGHT TERMINATION BOX IS ASSEMBLY A1.
- 2) STUB MAST, (FOR STERNLIGHT), IS UNIT 5, AND IS NOT SHOWN ON THIS DRAWING.
- 3) LIGHT FIXTURES ARE PROVIDED WITH A SHIELDED CABLE, 14AWG, 2 CONDUCTOR, CONNECTORS ARE A 2 PIN PLUG WITH GROUNDED BACKSHELLS WHICH CONNECT TO RECEPTACLES ON JUNCTION BOXES. COMPRESSION CONNECTORS PER-TABLE I THIS DRAWING, ARE USED TO MAKE CONNECTIONS IN JUNCTION BOXES.
- 4) DESIGN SUPPORTS REMOVAL OF YARDARMS WITH RED AND GREEN SIDELIGHTS AND SEPARATION OF MAST AT THE BOLTED FLANGE. ALL LIGHT FIXTURE WIRING IS ROUTED WITHIN THE 3 INCH UPPER MAST WELDMENT, WITH SUFFICIENT LENGTH TO REACH NAVIGATION LIGHT TERMINATION BOX. THE YARDARM SIDELIGHTS ARE ROUTED WITHIN A SEPARATE 1/2 INCH CONDUIT AND SHIELDED CABLE TO THE NAVIGATION LIGHT TERMINATION BOX.



LEGEND

ANCHOR WHITE, ALL AROUND SINGLE	DS1
UPPER PORT VESSEL TASK RED, ALL AROUND SINGLE	DS10
UPPER STBD VESSEL TASK RED, ALL AROUND SINGLE	DS11
UPPER MASTHEAD WHITE, SCREENED DOUBLE	DS2-A DS2-B
UPPER PORT VESSEL AGROUND RED, ALL AROUND SINGLE	DS6
UPPER STBD VESSEL AGROUND RED, ALL AROUND SINGLE	DS7
LOWER MASTHEAD WHITE, SCREENED DOUBLE	DS3-A DS3-B
LOWER PORT VESSEL AGROUND RED, ALL AROUND SINGLE	DS8
LOWER STBD VESSEL AGROUND RED, ALL AROUND SINGLE	DS9
PORT SIDELIGHT RED, SCREENED DOUBLE	DS4-A DS4-B
STBD SIDELIGHT GREEN, SCREENED DOUBLE	DS5-A DS5-B
NAVIGATION LIGHT TERM BOX	A1

Figure G-18. Wiring Table and Cable Diagram, Mast Navigation Light. (Sheet 1 of 2)
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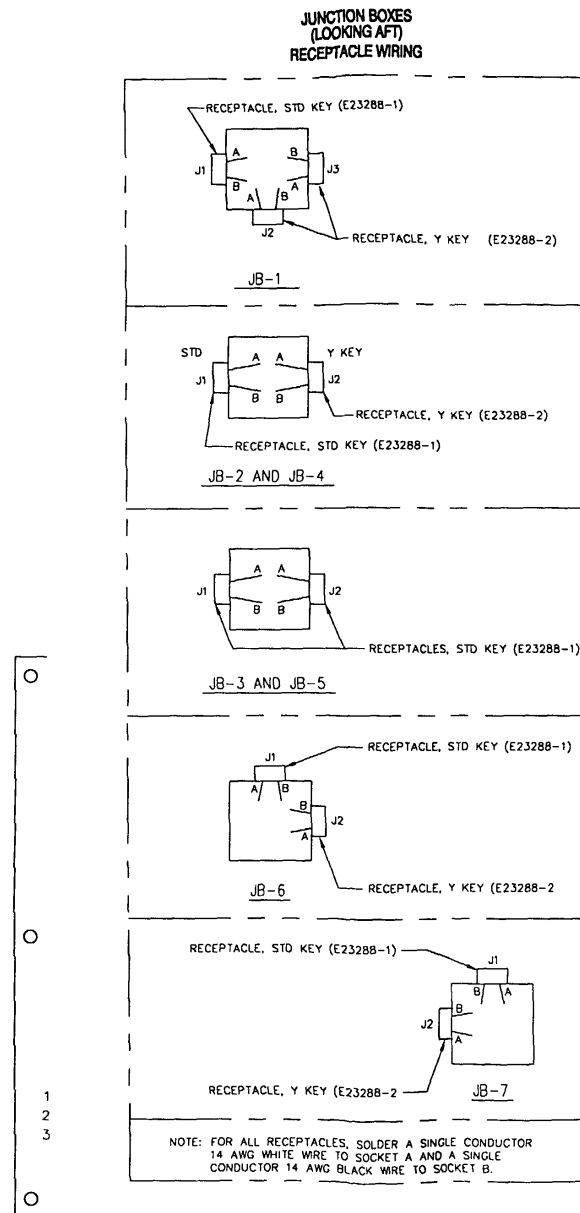


TABLE I

CABLE NUMBER	CABLE TYPE	CONDUCTOR NUMBER	CONDUCTOR COLOR	FROM	FROM METHOD	TO	TO METHOD	NOTES
1	14/2	501	WHT	A1TB1-1	A	JB1/J1-A	B	
	14/2	0	BLK	A1TB3-1	A	JB1/J1-B	B	
2	14/3	518	WHT	A1TB1-10	A	JB3/J2-A	B	
	14/3	518B	GRN	A1TB2-1	A	JB3/J1-A	B	
	14/3	0	BLK	A1TB3-2	A	JB3/J1&J2-B	C	
3	14/3	503	WHT	A1TB1-2	A	JB2/J1-A	B	
	14/3	504	GRN	A1TB1-3	A	JB2/J2-A	B	
	14/3	0	BLK	A1TB3-3	A	JB2/J1&J2-B	C	
4	14/3	520	WHT	A1TB2-2	A	JB5/J2-A	B	
	14/3	520B	GRN	A1TB2-3	A	JB5/J1-A	B	
	14/3	0	BLK	A1TB3-4	A	JB5/J1&J2-B	C	
	14/3	506	WHT	A1TB1-4	A	JB4/J1-A	B	
5	14/3	507	GRN	A1TB1-5	A	JB4/J2-A	B	
	14/3	0	BLK	A1TB3-5	A	JB4/J1&J2-B	C	
	14/3	509	WHT	J2-A	D	JB6/J1-A	B	
6	14/3	510	GRN	J2-C	D	JB6/J2-A	B	
	14/3	0	BLK	J2-B	D	JB6/J1&J2-B	C	
	16/3	512	WHT	J3-A	D	JB7/J1-A	B	
7	16/3	513	RED	J3-C	D	JB7/J2-A	B	
	16/3	0	BLK	J3-B	D	JB7/J1&J2-B	C	
	16/3	522	WHT	A1TB2-4	A	JB1/J3-A	B	
8	16/3	522B	RED	A1TB2-5	A	JB1/J2-A	B	
	16/3	0	BLK	A1TB3-6	A	JB1/J2&J3-B	C	

NOTES:

- 2.1) ALL INTERNAL CABLES ARE SJOW-A TYPE.
- 2.2) TERMINATION METHODS: TERMINATE WIRES AS SHOWN IN TABLE I. ASSEMBLY A1, ALL LAMPS AND JB'S WITH RECEPTACLES SHALL BE INSTALLED PRIOR TO USING TABLE I.
 - A - TERMINAL LUG, RING TONGUE, #6 FLANGED FORK FOR 14AWG WIRE IN A1 ASSEMBLY.
 - B - SETSCREW WIRE CONNECTOR FOR 2-14AWG WIRES IN JUNCTION BOXES.
 - C - SETSCREW WIRE CONNECTOR FOR 3-14AWG WIRES IN JUNCTION BOXES.
 - D - SHOULDER CONNECTION

- 2.2) CONDUCTOR LABELS: ALL WIRES ARE TO BE LABELED ON BOTH ENDS WITH CONDUCTOR NUMBER ON HEAT SHRINK TUBING IDENTIFIED ON ASSEMBLY DRAWING E03123.

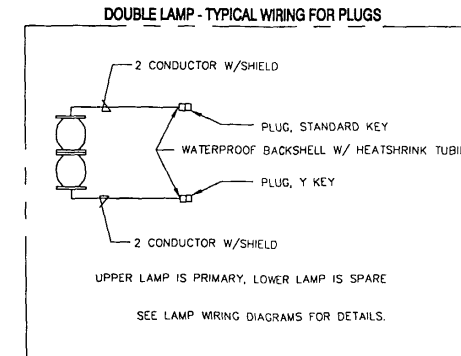
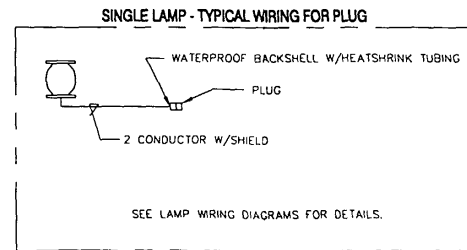
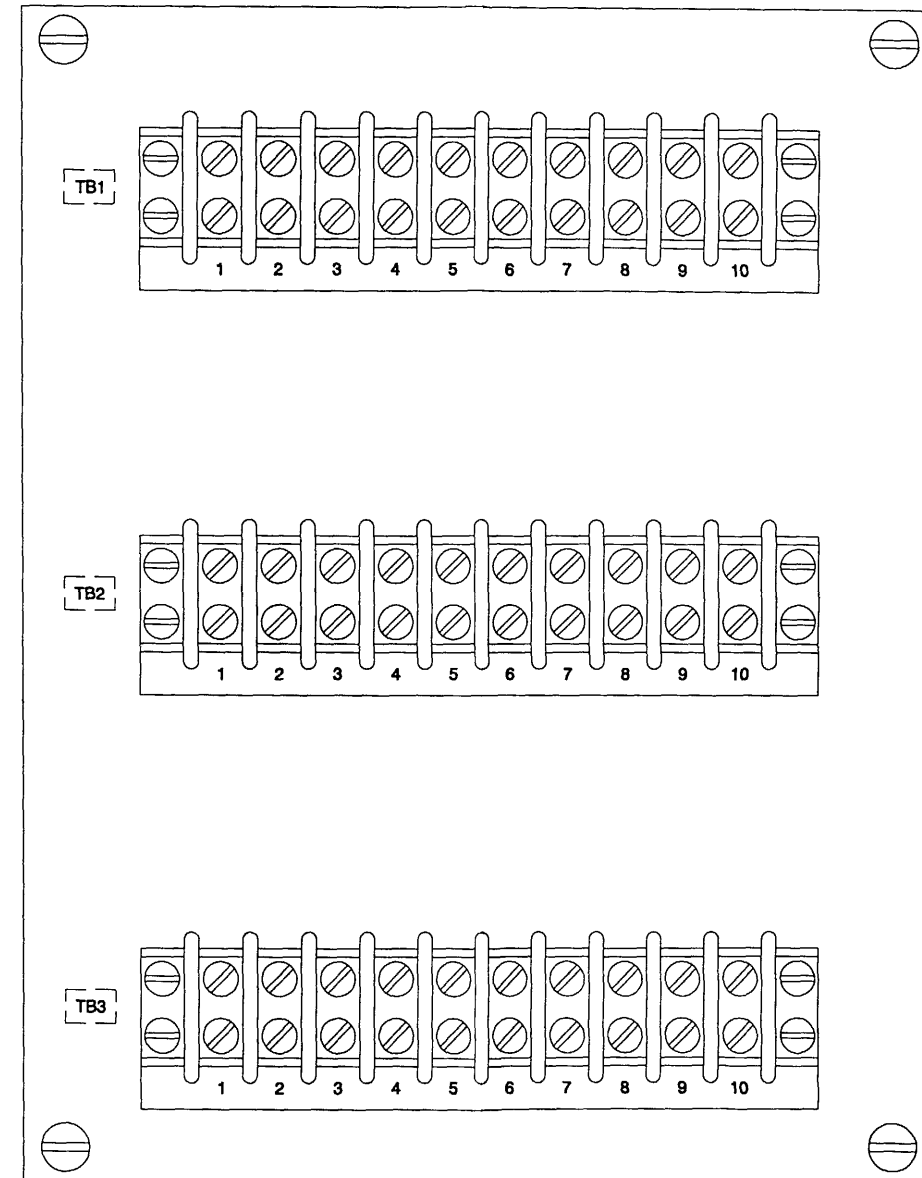


Figure G-18. Wiring Table and Cable Diagram, Mast Navigation Light. (Sheet 2 of 2)

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FROM	TERM	ITEM #	COLOR COLOR	WIRE #	SIZE	TO	TERM	NOTES
P1	1	5	BLK	501	18	TB1	1	-
P1	2	5	WHT	503	18	TB1	2	-
P1	3	5	RED	504	18	TB1	3	-
P1	4	5	GRN	506	18	TB1	4	-
P1	5	5	OR	507	18	TB1	5	-
P1	6	5	BLU	509	18	TB1	6	-
P1	7	5	WHT/BLK	510	18	TB1	7	-
P1	8	5	RED/BLK	512	18	TB1	8	-
P1	9	5	GRN/BLK	513	18	TB1	9	-
P1	10	5	OR/BLK	518	18	TB1	10	-
P1	11	5	BLU/BLK	518B	18	TB2	1	-
P1	12	5	BLK/WHT	520	18	TB2	2	-
P1	13	5	RED/WHT	520B	18	TB2	3	-
P1	14	5	GRN/WHT	522	18	TB2	4	-
P1	15	5	BLU/WHT	522B	18	TB2	5	-
P1	16	5	BLK/RED	-	-	-	-	SPARE
P1	17	5	WHT/RED	-	-	-	-	SPARE
P1	18	5	OR/RED	0	18	TB3	1	-
P1	19	5	BLU/RED	0	18	TB3	3	-
P1	20	5	RED/GRN	0	18	TB3	5	-
P1	21	5	OR/GRN	0	18	TB3	7	-
P1	22	5	BLK/WHT/RED	-	-	-	-	SPARE
P1	23	5	WHT/BLK/RED	-	-	-	-	SPARE
P1	24	5	RED/BLK/WHT	-	-	-	-	SPARE
TB3	1	29	-	-	-	TB3	2	JUMPER
TB3	2	29	-	-	-	TB3	3	JUMPER
TB3	3	29	-	-	-	TB3	4	JUMPER
TB3	4	29	-	-	-	TB3	5	JUMPER
TB3	5	29	-	-	-	TB3	6	JUMPER
TB3	6	29	-	-	-	TB3	7	JUMPER
TB3	7	29	-	-	-	TB3	8	JUMPER
TB3	8	29	-	-	-	TB3	9	JUMPER
TB3	9	29	-	-	-	TB3	10	JUMPER
J2	A	3	WHT	509	16	TB1	6	-
J2	B	3	WHT	0	16	TB3	8	-
J2	C	3	WHT	510	16	TB1	8	-
J3	A	3	WHT	512	16	TB1	8	-
J3	B	3	WHT	0	16	TB3	7	-
J3	C	3	WHT	513	16	TB1	9	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-



BOARD VIEW

Figure G-19. Navigation Lights Terminal Box Wiring List and Rear View.

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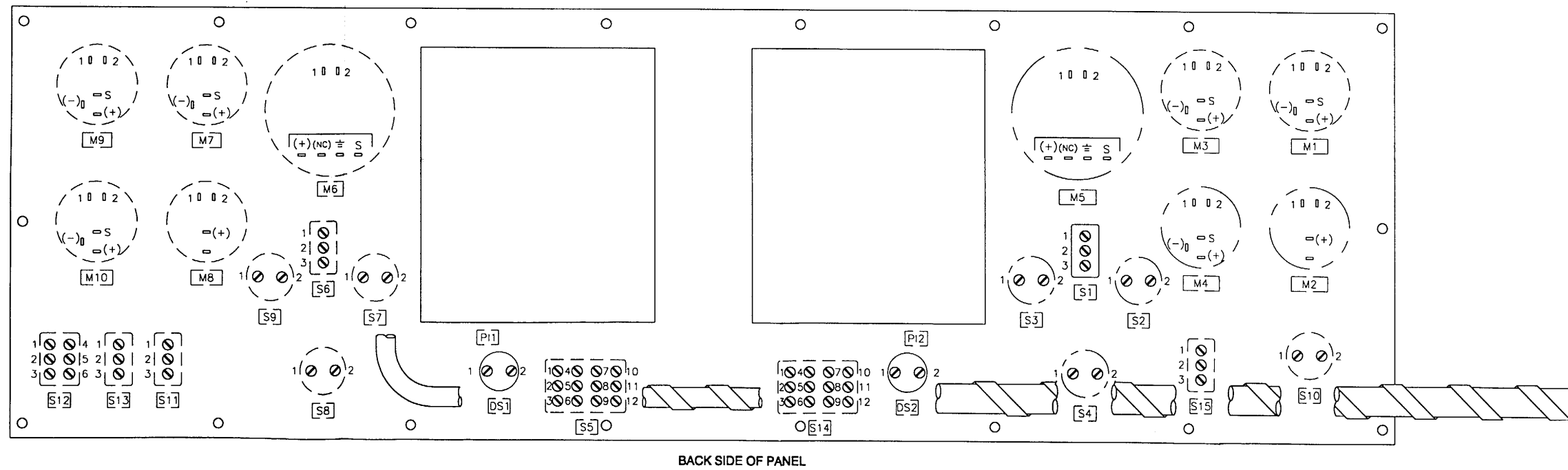
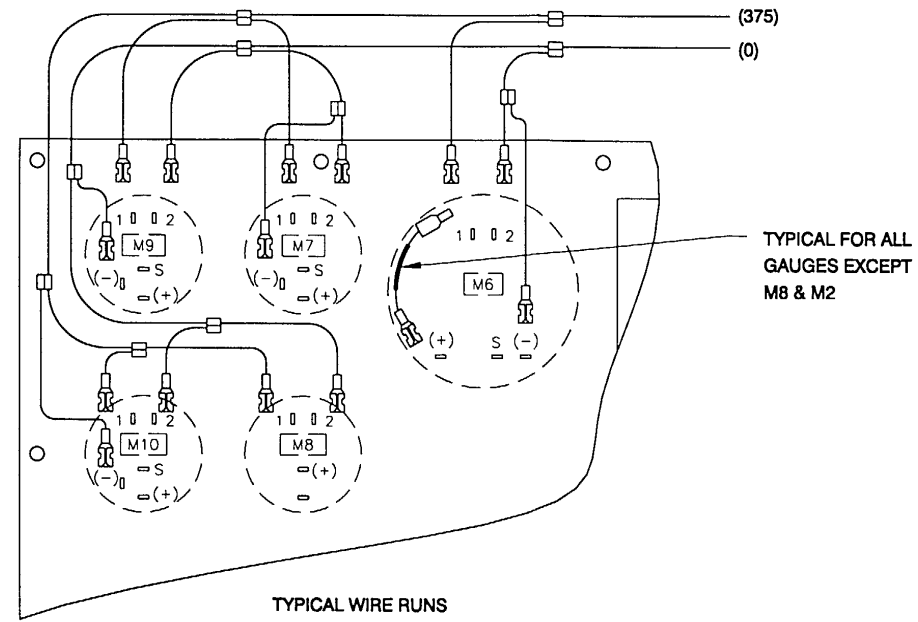


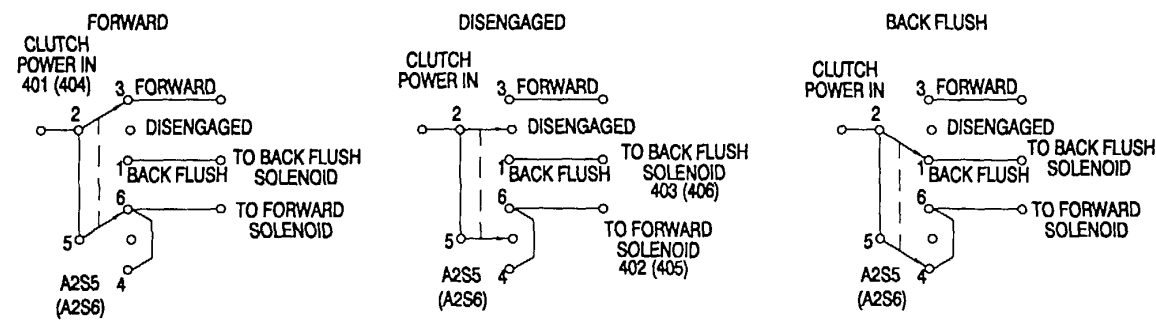
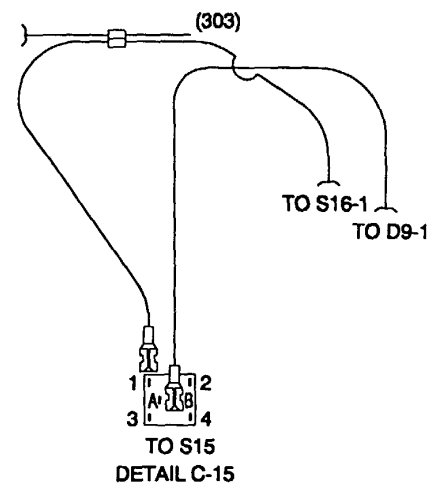
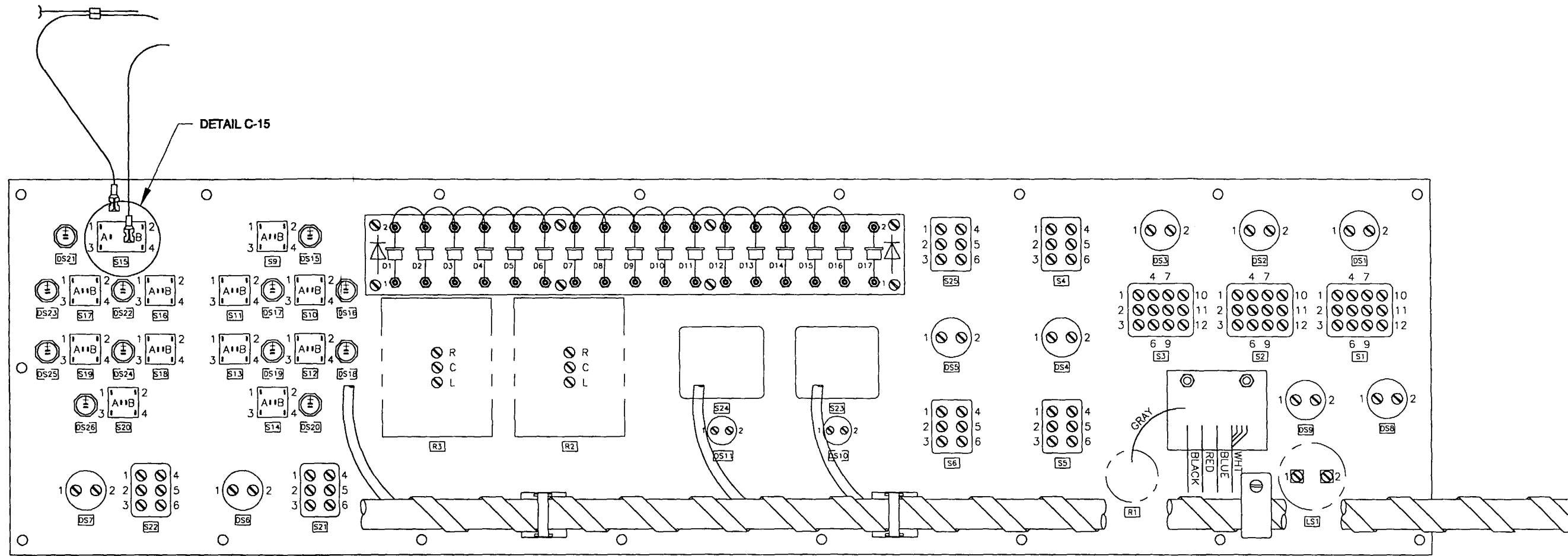
Figure G-20. Wiring Diagram and Lists, Middle Control Panel. (Sheet 1 of 2)

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FROM	TERM	ITEM #	WIRE #	SIZE	TO	TERM	ITEM #	NOTES
TAP	0	-	0	16	A4TB10	4	-	NOTE 1
M1	(-)	35	0	16	(0)	TAP	34	NOTE 6
M1	2	35	0	16	(0)	TAP	34	NOTE 6
M10	(-)	35	0	16	(0)	TAP	34	NOTE 6
M10	2	35	0	16	(0)	TAP	34	NOTE 6
-	-	-	-	-	-	-	-	-
M2	2	35	0	16	(0)	TAP	34	NOTE 6
M3	(-)	35	0	16	(0)	TAP	34	NOTE 6
M3	2	35	0	16	(0)	TAP	34	NOTE 6
M4	(-)	35	0	16	(0)	TAP	34	NOTE 6
M4	2	35	0	16	(0)	TAP	34	NOTE 6
M5	(-)	35	0	16	(0)	TAP	34	NOTE 6
M5	2	35	0	16	(0)	TAP	34	NOTE 6
M6	2	35	0	16	(0)	TAP	34	NOTE 6
M6	(-)	35	0	16	(0)	TAP	34	NOTE 6
M7	2	35	0	16	(0)	TAP	34	NOTE 6
M7	(-)	35	0	16	(0)	TAP	34	NOTE 6
-	-	-	-	-	-	-	-	-
M8	2	35	0	16	(0)	TAP	34	NOTE 6
M9	(-)	35	0	16	(0)	TAP	34	NOTE 6
M9	2	35	0	16	(0)	TAP	34	NOTE 6
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
M2	/	65	301	10	A4TB5	16	66	NOTE 1
M2	+	65	301A	10	A4TB5	18	66	NOTE 1
M8	/	65	302	10	A4TB9	7	66	NOTE 1
M8	+	65	302A	10	A4TB9	9	66	NOTE 1
S8	1	-	303	16	(303)	TAP	34	NOTE 6
S8	1	-	303	14	A4TB5	14	-	NOTE 1
S5	11	-	303	16	(303)	TAP	34	NOTE 6
S5	1	-	303	16	(303)	TAP	34	NOTE 6
S4	1	-	303	16	(303)	TAP	34	NOTE 6
S14	11	-	303	16	(303)	TAP	34	NOTE 6
S14	1	-	303	16	S4	1	34	NOTE 6
S14	10	-	303E	16	S14	4	34	NOTE 6
S5	10	-	303D	16	S5	4	34	NOTE 6
S4	2	-	304	14	A4TB1	6	34	NOTE 6
S8	2	-	305	16	A4TB3	6	-	NOTE 1
S3	2	-	306	16	A4TB1	7	-	NOTE 1
S1	2	55	308	16	A4TB1	10	-	NOTE 1
S15	1	55	308	16	S1	2	55	-
S1	3	55	309	16	A4TB1	11	-	NOTE 1
S3	1	-	309	16	S1	3	55	-
S2	1	-	310	16	A4TB1	8	-	NOTE 1
S2	2	-	312	16	A4TB1	9	-	NOTE 1
M1	S	35	313	16	A4TB1	2	-	NOTE 1
M4	S	35	314	16	A4TB1	3	-	NOTE 1
M3	S	35	315	16	A4TB1	1	-	NOTE 1
S15	2	55	316	16	(316)	TAP	34	NOTE 6
M1	R1/+	35	316	16	(316)	TAP	34	NOTE 5,6
M3	R2/+	35	316	16	(316)	TAP	34	NOTE 5,6
M4	R3/+	35	316	16	(316)	TAP	34	NOTE 5,6
M5	R4/+	35	316	16	S15	2	-	NOTE 1,5,6
S15	2	55	316	16	A4TB1	5	55	NOTE 1
M5	S	35	317	16	A4TB1	4	-	NOTE 1
S6	2	-	320	16	A4TB3	10	-	NOTE 1
S13	1	55	320	16	S6	2	55	-
S7	1	-	321	16	A4TB3	8	-	NOTE 1
S7	2	-	322	16	A4TB3	9	-	NOTE 1
S13	2	55	324	16	(324)	TAP	34	NOTE 6
M10	R8/+	35	324	16	(324)	TAP	34	NOTE 5,6
M6	R5/+	35	324	16	(324)	TAP	34	NOTE 5,6
M7	R6/+	35	324	16	(324)	TAP	34	NOTE 5,6
M9	R7/+	35	324	16	(324)	TAP	34	NOTE 5,6
S13	2	55	324	16	A4TB3	5	55	NOTE 1
M7	S	35	325	16	A4TB3	2	-	NOTE 1

FROM	TERM	ITEM #	WIRE #	SIZE	TO	TERM	ITEM #	NOTES
M10	S	35	326	16	A4TB3	3	-	NOTE 1
M9	S	35	327	16	A4TB3	1	-	NOTE 1
M6	S	35	328	16	A4TB3	4	-	NOTE 1
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
S5	6	55	365A	16	S5	3	55	-
S5	3	55	365A	16	A4TB3	12	-	NOTE 1
S14	3	-	365	16	S14	6	34	NOTE 6
S14	6	-	365	16	A4TB1	12	-	NOTE 1
S9	2	-	366	16	A4TB3	7	-	NOTE 1
S6	3	-	367	16	A4TB3	11	-	NOTE 1
S9	1	-	367	16	S6	3	55	-
-	-	-	-	-	-	-	-	-
S5	5	-	368	16	A4TB10	10	-	NOTE 1
S14	5	-	368A	16	A4TB10	9	-	NOTE 1
DS1	1	55	369	16	S5	2	55	NOTE 4
DS2	1	-	369A	16	S14	2	34	NOTE 6
TAP	375	-	375	16	A4TB5	19	-	NOTE 1
M1	1	35	375	16	(375)	TAP	34	NOTE 6
M10	1	35	375	16	(375)	TAP	34	NOTE 6
M2	1	35	375	16	(375)	TAP	34	NOTE 6
M3	1	35	375	16	(375)	TAP	34	NOTE 6
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
M4	1	35	375	16	(375)	TAP	34	NOTE 6
M5	1	35	375	16	(375)	TAP	34	NOTE 6
M6	1	35	375	16	(375)	TAP	34	NOTE 6
M7	1	35	375	16	(375)	TAP	34	NOTE 6
M8	1	35	375	16	(375)	TAP	34	NOTE 6
M9	1	35	375	16	(375)	TAP	34	NOTE 6
S11	2	-	382	14	A3CB2	2	-	NOTE 1
S11	3	-	383	14	A4TB5	5	-	NOTE 1
S10	1	-	384	16	A4TB5	2	-	NOTE 1
S10	2	-	385	16	A4TB5	4	-	NOTE 1
S12	2	55	387	16	A3CB4	2	-	NOTE 1
S12	3	55	388	16	A4TB5	6	-	NOTE 1
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
PI2	TB-3	42	409	16	A4TB6	1	-	-
PI2	TB-5	42	410	16	A4TB6	2	-	-
PI2	TB-1	42	411	16	A4TB6	4	-	-
PI2	TB-2	42	412	16	A4TB6	5	-	-
-	-	-	SHLD	-	A4TB6	3	-	-
PI2	(+)	42	407	16	A4TB7	3	-	-
PI2	(-)	42	408	16	A4TB7	6	-	-
-	-	-	SHLD	-	A4TB7	5	-	-
PI2	LT-1	42	375	16	(375)	TAP	34	NOTE 6
PI2	LT-2	42	0	16	(0)	TAP	34	NOTE 6
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
PI1	TB-3	42	423	16	A4TB8	1	-	-
PI1	TB-5	42	424	16	A4TB8	2	-	-
PI1	TB-1	42	427	16	A4TB8	4	-	-
PI1	TB-2	42	428	16	A4TB8	5	-	-
-	-	-	SHLD	-	A4TB10	3	-	-
PI1	(+)	42	422	16	A4TB9	3	-	-
PI1	(-)	42	434	16	A4TB9	6	-	-
-	-	-	SHLD	-	A4TB9	5	-	-
PI1	LT-1	42	375	16	(375)	TAP	34	NOTE 6
PI1	LT-2	42	0	16	(0)	TAP	34	NOTE 6
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
DS1	2	36	461	16	A4TB10	6	-	NOTE 1
DS2	2	-	461A	16	A4TB10	7	-	NOTE 1

Figure G-20. Wiring Diagram and Lists, Middle Control Panel. (Sheet 2 of 2)
G-147/ (G - 148 blank)



SS(PORT) / S6(STBD) MARINE GEAR CLUTCH CONTROL WIRING DIAGRAM

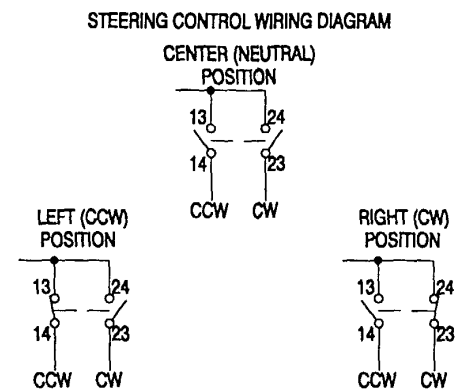
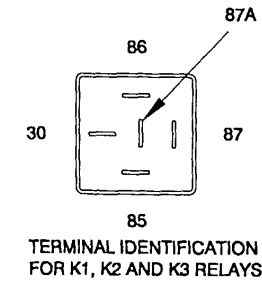


Figure G-21. Wiring Diagram and List, Lower Control Panel. (Sheet 1 of 2)

G-149/(G-150 blank)

CONNECTION	TERM	WIRE #	FROM	TERM	NOTES
TB01	1	315	A1M3	S	
TB01	1	315	A6J3	12	
TB01	2	313	A1M1	S	
TB01	2	313	A6J3	10	
TB01	3	314	A1M4	S	
TB01	3	314	A6J3	11	
TB01	4	317	A1M5	S	
TB01	4	317	A6J3	17	
TB01	5	316	A1S15	2	
TB01	5	316	A6J2	7	
TB01	6	304	A1S4	2	
TB01	6	304	A6J2	8	
TB01	7	306	A1S3	2	
TB01	7	306	A6J2	6	
TB01	8	310	A1S2	1	
TB01	8	310	K2	87A	
TB01	9	312	A1S2	2	
TB01	9	312	A6J2	2	
TB01	10	308	A1S1	2	
TB01	10	308	A6J2	3	
TB01	11	309	A1S1	3	
TB01	11	309	A6J2	4	
TB01	11	309	K2	30	
TB01	12	365	A6J2	9	
TB01	12	365	A1S14	6	
TB01	13	370	A2S21	2	
TB01	13	370	A6J2	14	
TB01	14	371	A2S21	3	
TB01	14	371	A6J2	15	
TB01	15	395	A2R2	L	
TB01	15	395	A6J3	2	
TB01	16	396	A2R2	R	
TB01	16	396	A6J3	3	
TB01	17	397	A2R2	C	
TB01	17	397	A3TB2	5	
TB01	17	397	A6J3	4	
TB01	18	0	A2R2		SHIELD
TB01	18	0	TB11		
TB01	19	500	A2DS15	(-)	
TB01	19	500	A6J4	1	
TB01	20	501	A2DS16	(-)	
TB01	20	501	A6J4	2	
TB02	1	330	A2S9	2	
TB02	1	330	A6J2	19	
TB02	2	331	A2S9	A	
TB02	2	331	A6J2	18	
TB02	3	332	A2S10	2	
TB02	3	332	A6J2	21	
TB02	4	333	A2S10	A	
TB02	4	333	A6J2	20	
TB02	5	334	A2S11	2	
TB02	5	334	A6J2	23	
TB02	6	335	A2S11	A	
TB02	6	335	A6J2	22	
TB02	7	336	A2S12	2	
TB02	7	336	A6J2	25	
TB02	8	337	A2S12	A	
TB02	8	337	A6J2	24	
TB02	9	338	A2S13	2	
TB02	9	338	A6J2	27	
TB02	10	339	A2S13	A	
TB02	10	339	A6J2	26	
TB02	11	340	A2S14	2	
TB02	11	340	A6J2	29	
TB02	12	341	A2S14	A	
TB02	12	341	A6J2	28	
TB02	13	403	A2S5	1	
TB02	13	403	A6J2	12	
TB02	14	401	A2S5	2	
TB02	14	401	A6J2	10	
TB02	15	402	A2S5	3	

CONNECTION	TERM	WIRE #	FROM	TERM	NOTES
TB02	15	402	A6J2	11	
TB02	16	311	A2DS4	1	
TB02	16	311	K2	87	
TB02	17	361	A2S1	3	
TB02	17	361	A6J2	17	
TB02	18	354	A6J2	16	
TB02	18	354	TB04	18	14 GA. WIRE
TB02	19	425	A2S5	6	
TB02	19	425	K2	85	
TB02	20	426	A2S6	85	
TB02	1	426	A1M9	6	
TB03	1	327	A5J3	12	
TB03	2	325	A1M7	S	
TB03	2	325	A5J3	10	
TB03	3	326	A1M10	S	
TB03	3	326	A5J3	11	
TB03	4	328	A1M6	S	
TB03	4	328	A5J3	17	
TB03	5	324	A1S13	2	
TB03	5	324	A5J2	7	
TB03	6	305	A1S8	2	
TB03	6	305	A5J2	8	
TB03	7	366	A1S9	2	
TB03	7	366	A5J2	6	
TB03	8	321	A1S7	1	
TB03	8	321	K3	87A	
TB03	9	322	A1S7	2	
TB03	9	322	A5J2	2	
TB03	10	320	A1S6	2	
TB03	10	320	A5J2	3	
TB03	11	367	A1S6	3	
TB03	11	367	A5J2	4	
TB03	11	367	K3	30	
TB03	12	365A	A1S5	3	
TB03	12	365A	A5J2	9	
TB03	13	372	A2S22	2	
TB03	13	372	A5J2	14	
TB03	14	373	A2S22	3	
TB03	14	373	A5J2	15	
TB03	15	398	A2R3	L	
TB03	15	398	A5J3	2	
TB03	16	399	A2R3	R	
TB03	16	399	A5J3	3	
TB03	17	400	A2R3	C	
TB03	17	400	A3TB2	4	
TB03	17	400	A5J3	4	
TB03	18	0	A2R3		SHIELD
TB03	18	0	TB11		
TB03	19	502	A2DS17	(-)	
TB03	19	502	A6J4	3	
TB03	20	503	A2DS18	(-)	
TB03	20	503	A6J4	4	
TB04	1	342	A2S15	2	
TB04	1	342	A5J2	19	
TB04	2	343	A2S15	A	
TB04	2	343	A5J2	18	
TB04	3	344	A2S16	2	
TB04	3	344	A5J2	21	
TB04	4	345	A2S16	A	
TB04	4	345	A5J2	20	



- NOTES:
- EXTERNAL WIRES PROVIDED AS PART OF OTHER ASSEMBLY HARNESSSES, OR OPERATOR CAB WIRING. USE TERMINAL LUGS, ITEM 22, FOR CONNECTION TO TB01 THROUGH TB10. WIRES TO TB11 ONLY REQUIRE STRIPPING. LABEL ALL WIRE ENDS WITH WIRE NUMBER USING HEAT SHRINK TUBING, ITEM 27.
 - WIRING COMING FROM A5 AND A6 RECEPTACLE ASSEMBLIES TO TERMINATE ON RIGHT HAND SIDE OF TERMINAL STRIPS. WIRING FROM OTHER DEVICES TO TERMINATE ON LEFT HAND OF TERMINAL STRIPS.
 - ALL INTERNAL WIRES ARE 16 GA. EXCEPT AS NOTED.
 - TB11 IS MAIN NEGATIVE SIDE TIE POINT FOR 24 VOLT DISTRIBUTION IN THE OPERATOR'S CAB.
 - ALL POINT TO POINT WIRING ON THIS 'A4' ASSEMBLY, IS TO BE COMPLETED PRIOR TO TERMINATING WIRES FROM OFF PANEL, EXTERNAL, DEVICES.

Figure G-22. Wiring List, Terminal Strip "A4" Assembly. (Sheet 1 of 3)

G-153/ (G-154 blank)

CONNECTION	TERM	WIRE #	FROM	TERM	NOTES
TB04	5	348	A2S17	2	
TB04	5	348	A5J2	23	
TB04	6	347	A2S17	A	
TB04	6	347	A5J2	22	
TB04	7	348	A2S18	2	
TB04	7	348	A5J2	25	
TB04	8	349	A2S18	A	
TB04	8	349	A5J2	24	
TB04	9	350	A2S19	2	
TB04	9	350	A5J2	27	
TB04	10	351	A2S19	A	
TB04	10	351	A5J2	26	
TB04	11	352	A2S20	2	
TB04	11	352	A5J2	29	
TB04	12	353	A2S20	A	
TB04	12	353	A5J2	28	
TB04	13	406	A2S6	1	
TB04	13	406	A5J2	12	
TB04	14	404	A2S6	2	
TB04	14	404	A5J2	10	
TB04	15	405	A2S6	3	
TB04	15	405	A5J2	11	
TB04	16	323	A2DS5	1	
TB04	16	323	K3	87	
TB04	17	357	A2S3	3	
TB04	17	357	A5J2	17	
TB04	18	354	A2LS1	(+)	
TB04	18	354	A5J2	16	
TB04	18	354	TB02	18	
TB04	19	504	A2DS19	(-)	
TB04	19	504	A6J4	5	
TB04	20	505	A2DS20	(-)	
TB04	20	505	A6J4	6	
TB05	1	394	A3CB8	2	
TB05	1	394	VR1	+IN	+24V J4 CHARGER
TB05	2	384	A3CB3	2	
TB05	2	384	A1S10	1	
TB05	2	384	K1	87	14 GA. WIRE
TB05	3	386	JB1TB1	2	NAV HORN
TB05	3	386	K1	30	14 GA. WIRE
TB05	4	385	A1S10	2	
TB05	4	385	K1	86	
TB05	5	383	A1S11	3	
TB05	5	383	JB1TB1	6	SPOTLIGHT
TB05	6	388	A1S12	3	
TB05	6	388	JB1TB1	4	WINDSHIELD WIPER
TB05	7	390	A2S4	3	
TB05	7	390	B1A	1	HEATER
TB05	8	391	A2S4	6	
TB05	8	391	B1B	1	HEATER
TB05	9	358	A2S3	5	
TB05	9	358	D1	A	CONNECT DIODE LEAD TO TERM
TB05	10	138	A2S2	6	
TB05	10	138	A5J4	7	
TB05	10	138	A6J4	7	
TB05	11	362	A2S1	5	
TB05	11	362	D2	A	CONNECT DIODE LEAD TO TERM
TB05	12	359	D1	K	CONNECT DIODE LEAD TO TERM
TB05	12	359	D2	K	CONNECT DIODE LEAD TO TERM
TB05	12	359	LS2	1	
TB05	13	303	A2S1	11	
TB05	13	303	A3CB10	2	
TB05	13	303	TB05	14	JUMPER
TB05	14	303	A1S8	1	
TB05	14	303	TB05	13	
TB05	15	442	A2S25	3	
TB05	15	442	JB1TB1	12	DEFROSTER
TB05	16	301	A1M2	/	
TB05	16	301	A6J4	11	
TB05	17	375A	COMPASS	1	
TB05	17	375A	ITEM 34	LEAD	COMPASS RESISTOR
TB05	18	301A	A6J4	10	
TB05	18	301A	A1M2	+	
TB05	19	375	A1M10	1	SEE RESISTOR ITEM 34

CONNECTION	TERM	WIRE #	FROM	TERM	NOTES
TB05	19	375	A2R1	BLUE	
TB05	19	375	ITEM 34	LEAD	COMPASS RESISTOR
TB05	20	0	JB1TB1	1	NAV HORN
TB05	20	0	A1M10	2	
TB05	20	0	TB11	-	
TB05	20	0	K1	85	
TB06	1	409	A1P12	TB03	-
TB06	1	409	A6J3	5	
TB06	2	410	A1P12	TB05	-
TB06	2	410	A6J3	6	
TB06	3	0	A1P12	-	SHIELD
TB06	3	0	A6J3	7	
TB06	3	0	A6J3	13	
TB06	3	0	A6J3	1	
TB06	3	0	TB11	-	
TB06	4	411	A1P12	TB01	-
TB06	4	411	A6J3	9	
TB06	5	412	A1P12	TB02	-
TB06	5	412	A6J3	14	
TB06	6	506	A2DS21	(-)	-
TB06	6	506	A5J4	1	
TB06	7	420	A2S23	13	-
TB06	7	420	A6J3	27	-
TB06	8	0	A6J3	20	SHIELD
TB06	8	0	TB07	5	-
TB06	8	0	TB06	9	JUMPER
TB06	9	0	TB06	10	JUMPER
TB06	9	0	A5J3	16	SHIELD
TB06	10	0	A5J3	20	SHIELD
TB06	10	0	TB11	-	
TB07	1	417	A2S23	23	
TB07	1	417	A6J3	18	
TB07	2	419	A2S23	14	
TB07	2	419	A6J3	19	
TB07	3	407	A1P12	TB (+)	-
TB07	3	407	A3TB2	7	
TB07	3	407	A6J3	21	
TB07	4	418	A2DS8	1	
TB07	4	418	A6J2	35	
TB07	5	0	A1P12	SHLD	
TB07	5	0	TB06	8	
TB07	5	0	A6J3	28	SHIELD
TB07	6	408	A1P12	TB (-)	-
TB07	6	408	A6J3	22	
TB07	6	408	A3TB2	11	
TB07	7	507	A2DS22	(-)	-
TB07	7	507	A5J4	2	
TB07	8	416	A2DS10	2	
TB07	8	416	A6J2	31	
TB07	9	508	A2DS23	(-)	-
TB07	9	508	A5J4	3	
TB07	10	509	A2DS24	(-)	-
TB07	10	509	A5J4	4	
TB08	1	423	A1P11	TB03	-
TB08	1	423	A5J3	5	
TB08	2	424	A1P11	TB05	-
TB08	2	424	A5J3	6	
TB08	3	0	A5J3	1	-
TB08	3	0	A5J3	7	-
TB08	3	0	A5J3	13	-
TB08	3	0	TB11	-	-
TB08	4	427	A1P11	TB-1	-
TB08	4	427	A5J3	9	
TB08	5	428	A1P11	TB-2	-
TB08	5	428	A5J3	14	
TB08	6	510	A2DS25	(-)	-
TB08	6	510	A5J4	5	

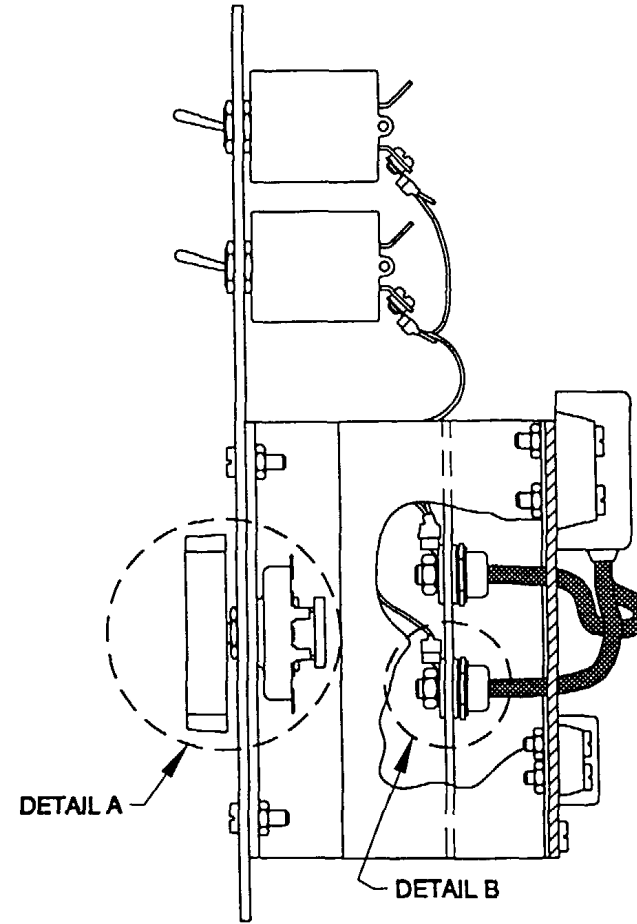
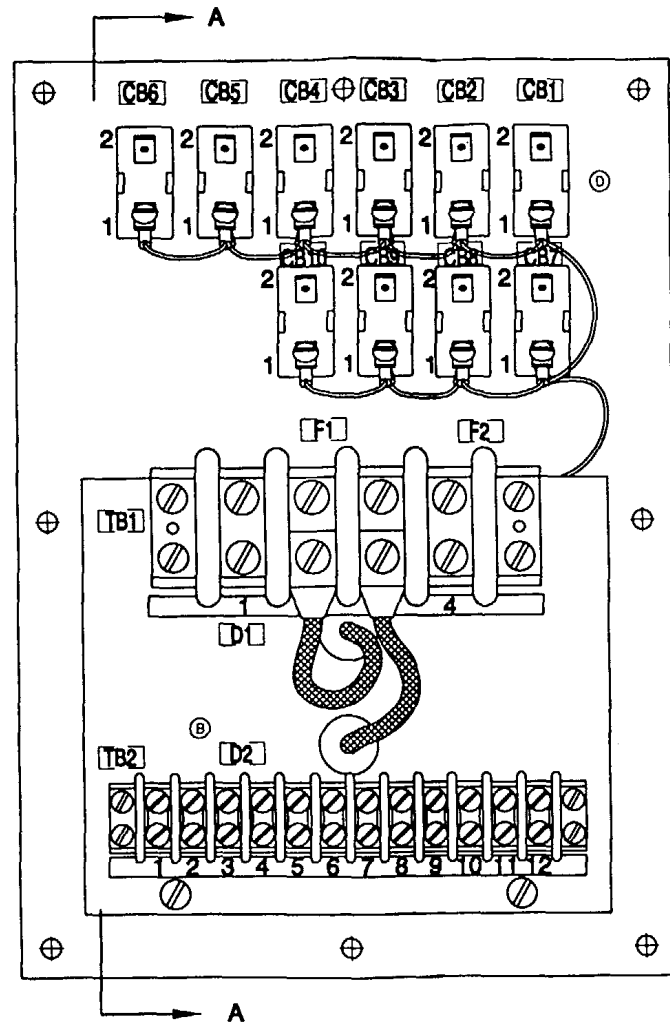
G-22. Wiring List, Terminal Strip "A4" Assembly.

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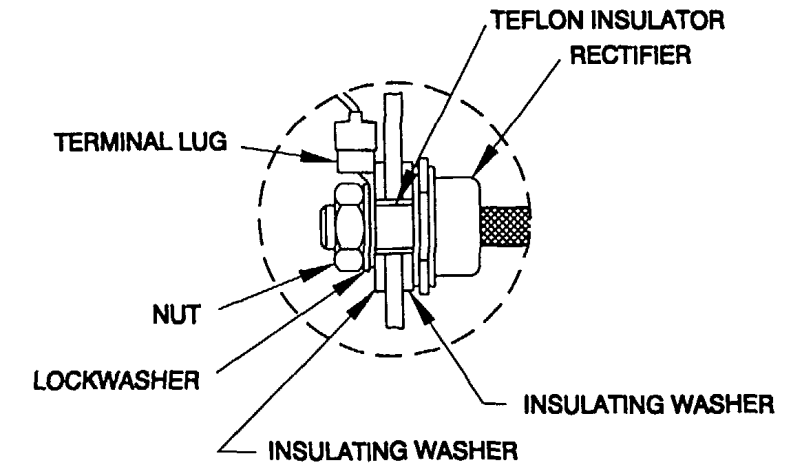
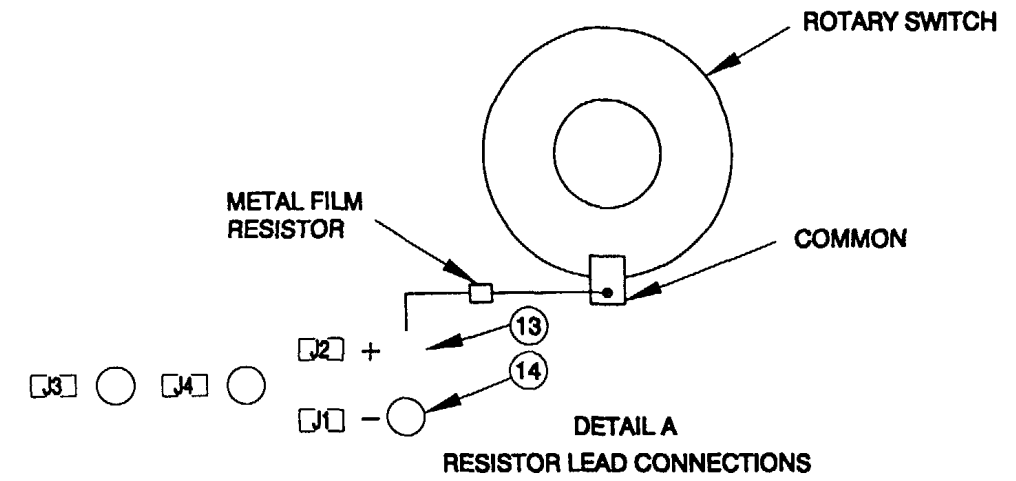
CONNECTION	TERM	WIRE #	FROM	TERM	NOTES
TB08	7	511	A2DS26	(-)	
TB08	7	511	A5J4	6	
TB08	8	438	A2S24	13	
TB08	8	438	A5J3	27	
TB08	9	440	VR1	+12 OUT	VOLTAGE REGULATOR
TB08	9	440	J4	+12 OUT	CHARGER
TB08	10	0	A4K2	86	
TB08	10	0	A4K3	86	
TB08	10	0	TB11	-	
TB09	1	435	A2S24	23	-
TB09	1	435	A5J3	18	
TB09	2	437	A2S24	14	-
TB09	2	437	A5J3	19	
TB09	3	422	A1P11	TB (+)	-
TB09	3	422	A3TB2	6	
TB09	3	422	A5J3	21	
TB09	4	436	A2DS9	1	
TB09	4	436	A5J2	35	
TB09	5	0	A5J3	28	SHIELD
TB09	5	0	A1P11	SHLD	
TB09	5	0	TB11	-	
TB09	6	434	A1P11	TB (-)	-
TB09	6	434	A5J3	22	
TB09	6	434	A3TB2	12	
TB09	7	302	A5J4	11	-
TB09	7	302	A1M8	/	-
TB09	8	433	A2DS11	2	
TB09	8	433	A5J2	31	
TB09	9	302A	A5J4	10	-
TB09	9	302A	A1M8	+	-
TB09	10	381	A7TB6	A12	NAV LIGHT SWITCH BOX
TB09	10	381	A3CB1	2	
TB10	1	360A	A2DS3	2	-
TB10	1	360A	D4	A	-
TB10	2	0	TB10	3	JUMPER
TB10	2	0	D4	K	-
TB10	3	0	A2DI7	2	
TB10	3	0	TB10	4	JUMPER
TB10	3	0	A1PI2	-	SHIELD
TB10	3	0	LS2	2	
TB10	4	0	A1M10	(-)	
TB10	4	0	TB10	5	JUMPER
TB10	4	0	LS1	2	
TB10	5	0	D3	K	
TB10	5	0	TB11	-	
TB10	5	0	D3	K	CONNECT DIODE LEAD TO TERM
TB10	5	0	D7	K	-
TB10	6	461	A1DS1	2	
TB10	6	461	D3	A	CONNECT DIODE LEAD TO TERM
TB10	7	461A	A1DS2	2	-
TB10	7	461A	D7	A	-
TB10	8	368B	LS1	1	-
TB10	8	368B	D5	K	-
TB10	8	368B	D6	K	-
TB10	9	368A	A1S14	5	-
TB10	9	368A	D6	A	-
TB10	10	368	D5	A	-
TB10	10	368	A1S5	5	-

CONNECTION	TERM	WIRE #	FROM	TERM	NOTES
TB11	-	0	A5J1	B	
TB11	-	0	A6J1	B	
TB11	-	0	B1A/B	2	HEATER
TB11	-	0	B2	2	WINDSHIELD WIPER
TB11	-	0	B3	2	DEFROSTER
TB11	-	0	DS1	2	SPOTLIGHT
TB11	-	0	JB1TB1	3	-
TB11	-	0	JB1TB1	5	-
TB11	-	0	JB1TB1	11	SINCGARS
TB11	-	0	A7TB6	A11	NAV. LT. SW. BOX 14 GA. WIRE
TB11	-	0	A3TB2	1	COMMON FOR TEST SW.
TB11	-	0	JB1TB1	9	-
TB11	-	0	JB1TB1	7	VHF-FM
TB11	-	0	A5J2	33	-
TB11	-	0	A5J3	16	-
TB11	-	0	A5J3	20	-
TB11	-	0	A6J3	16	-
TB11	-	0	A6J3	20	-
TB11	-	0	VR1	(-)	-
TB11	-	0	TB01	18	-
TB11	-	0	TB03	18	-
TB11	-	0	TB05	20	-
TB11	-	0	TB06	3	-
TB11	-	0	TB06	10	-
TB11	-	0	TB08	3	-
TB11	-	0	TB08	10	-
TB11	-	0	TB09	5	-
TB11	-	0	TB10	5	14 GA. WIRE

G-22. Wiring List, Terminal Strip "A4" Assembly. (Sheet 3 of 3)



SECTION A-A



DETAIL B

NOTES:

1. COVER RECTIFIER PIGTAIL WITH HEAT SHRINK TUBING FROM DIODE TO UPPER HALF OF LUG.
 2. USE THERMAL JOINT COMPOUND ON BOTH SIDES OF INSULATING WASHER. (SEE DETAIL B)
 3. USE LOCTITE ON ALL MOUNTING HARDWARE.
 4. PHANTOM LINE REPRESENTS 'CUT-OUT' WHEN PANEL IS INSTALLED IN OPERATOR'S CAB.
 5. USE TIE WRAP TO SECURE WIRE BUNDLES.
- NOTES CONTINUED ON SHEET 3

Figure G-23. Operator's Cab Circuit Breaker Panel "A3". (Sheet 1 of 2)

INTERNAL CONNECTIONS

FROM	TERM	ITEM #	WIRE #	SIZE	TO	TERM	ITEM #	NOTES
J1(-)	1	SOLDER	0	16	TB2	1	63	
-	-	-	-	-	-	-	-	
TB1	3	-	300A	-	D2	A	-	DIODE LEAD
-	-	-	-	-	-	-	-	
TB1	2	-	300B	-	D1	A	-	DIODE LEAD
D1	K	50	300	10	D2	K	50	ISOLATE FROM HEAT SINK
D2	K	50	300	10	CB7	1	51	
CB7	1	51	300	10	CB8	1	51	
CB7	1	51	300	10	CB1	1	51	
CB1	1	51	300	10	CB2	1	51	
CB2	1	51	300	10	CB3	1	51	
CB3	1	51	300	10	CB4	1	51	
CB4	1	51	300	10	CB5	1	51	
CB5	1	51	300	10	CB6	1	51	
CB8	1	51	300	10	CB9	1	51	
CB9	1	51	300	10	CB10	1	51	
-	-	-	-	-	-	-	-	
-	-	SOLDER	-	-	-	-	63	
S1	COMMON	SOLDER	+	LEAD	R1 (2)	1	SOLDER	SWITCH TO R1
R1	2	SOLDER	+	LEAD	J2(+)	1	SOLDER	R1 TO JACK (+)
S1	POS 1	SOLDER	300B	16	TB1	2	56	
S1	POS 2	SOLDER	300A	16	TB1	3	56	
S1	POS 3	SOLDER	400	16	TB2	4	17	
S1	POS 4	SOLDER	397	16	TB2	5	17	
S1	POS 5	SOLDER	422	16	TB2	6	17	
S1	POS 6	SOLDER	407	16	TB2	7	17	
S1	POS 7	SOLDER	N/A (13)	16	TB2	8	17	
S1	POS 8	SOLDER	N/A	16	TB2	9	17	
S1	POS 9	SOLDER	N/A	16	TB2	10	17	
J3	1	SOLDER	408	16	TB2	11	17	
J4	1	SOLDER	434	16	TB2	12	17	

NOTES: (CONTINUED FROM SHEET 2)

- (12) RESISTOR (R1) IS ITEM 15.
- (13) N/A IS NOT ASSIGNED.
- (14) REFERENCE ONLY, WIRE INSTALLED WITH E06773 (A2 PANEL).
- (15) REFERENCE ONLY, WIRE INSTALLED WITH E06763 (A1 PANEL).
- (16) USE 5 FOOT PIGTAILS FOR CONNECTIONS TO TERMINAL STRIP ASSEMBLY (A4 PANEL).

EXTERNAL CONNECTIONS

FROM	TERM	ITEM #	WIRE #	SIZE	TO	TERM	ITEM #	NOTES
TB2	1	17	0	16	A4TB11	-	NOT REQD	COMMON FOR TEST SW
TB1	3	80	300A	8	A6J1	A	CRIMP PINS	PORT +24VDC POWER
TB1	2	80	300B	8	A5J1	A	CRIMP PINS	STBD +24VDC POWER
CB10	2	81	303	14	A4TB5	13	17	CONTROL PANEL ALARMS
CB9	2	REF	374	14	A2R1	RED	REF	PANEL LIGHTS-NOTE (14)
CB1	2	81	381	14	A4TB9	10	17	NAVIGATION LIGHTS
CB2	2	REF	382	14	A1S11	2	REF	SPOTLIGHT-NOTE (15)
CB3	2	81	384	14	A4TB5	2	17	NAVIGATION HORN
CB4	2	REF	387	16	A1S12	2	REF	WSHLD WIPER-NOTE (15)
CB5	2	REF	389	16	A2S4	2	REF	HTR/DEFROSTER-NOTE (14)
CB6	2	81	392	16	3JB1TB1	8	17	VHF-FM RADIO
CB7	2	81	393	16	3JB1TB1	10	17	SINCCARS
CB8	2	81	394	16	A4TB5	1	17	RADIO CHARGER
TB2	5	17	397	16	A4TB1	17	17	THROTTLE CONTROL (P)
TB2	4	17	400	16	A4TB3	17	17	THROTTLE CONTROL (S)
TB2	7	17	407	16	A4TB7	3	17	THRUST INDICATOR (P)
TB2	11	17	408	16	A4TB7	6	17	THRUST INDICATOR (P)
TB2	6	17	422	16	A4TB9	3	17	THRUST INDICATOR (S)

PASS THROUGH TERMINATIONS

WIRE SIZE	FROM	WIRE#	TERM	TO	WIRE#	TERM
14	A4TB2-10	132	ITEM-18	TB1-6	132	COMPRESSION
14	TB1-6	132	COMPRESSION	G1-AC	132	E11028-24
10	B3-1	0	ITEM-33	TB2-18	0	E23808-2
10	S11-2	0	ITEM-33	TB2-18	0	E23808-2
10	B3-2	148	ITEM-33	TB2-19	148	E23808-2
10	S11-1	151	ITEM-33	TB2-20	151	E23808-2

ELECTRICAL INTERNAL WIRE CONNECTIONS

WIRE SIZE	FROM	WIRE#	TERM	TO	WIRE#	TERM
FURNISHED	VR1 BLUE	131	PLUG	TB1-1	131	COMPRESSION
FURNISHED	VR1 ORANGE	130	PLUG	TB1-2	130	COMPRESSION
FURNISHED	VR1 BLACK	0	PLUG	TB1-3	0	COMPRESSION
FURNISHED	VR1 BROWN	124	PLUG	TB1-4	124	COMPRESSION
FURNISHED	VR1 RED	221	PLUG	TB1-5	221	COMPRESSION
FURNISHED	TB1-5	221	COMPRESSION	IS1-1	221	ITEM-27
16	TB1-4	124	COMPRESSION	K1-85	124	ITEM-10
14	TB2-1	0	ITEM-18	K1-86	0	ITEM-10
14	TB2-1	0	ITEM-18	TB2-2	0	ITEM-18
14	TB2-2	0	ITEM-18	TB1-3	0	COMPRESSION
1/0	IS1-1	221	ITEM-26	SH1-L+	221	ITEM-26
1/0	SH1-B+	+24V	ITEM-26	FIELD CONNECTIONS		

WIRE SIZE	FROM	WIRE#	TERM	TO	WIRE#	TERM
1/0	IS1-A	200	ITEM-26	FIELD CONNECTION		
14	IS1-2	202	ITEM-18	TB2-3	202	ITEM-18
14	TB2-3	202	ITEM-20	BT5 +	202	ITEM-18
14	BT5 -	201	ITEM-21	BT6 +	201	ITEM-20
14	K1-30	203	ITEM-10	TB2-4	203	ITEM-18
16	K1-87	204	ITEM-10	VR2-5	204	COMPRESSION
14	VR2-1	0	COMPRESSION	TB2-1	0	ITEM-18
16	VR2-6	205	COMPRESSION	TB2-6	205	ITEM-18
16	VR2-2	206	COMPRESSION	TB2-7	206	ITEM-18
14	BT6 -	0	ITEM-21	TB2-2	0	ITEM-18
10	SH1-B+	220	ITEM-34	TB2-16	220	ITEM-33
10	SH1-L+	221	ITEM-34	TB2-17	221	ITEM-33

Figure G-24. Thruster Direction/Auxiliary Battery Junction Box "A9".

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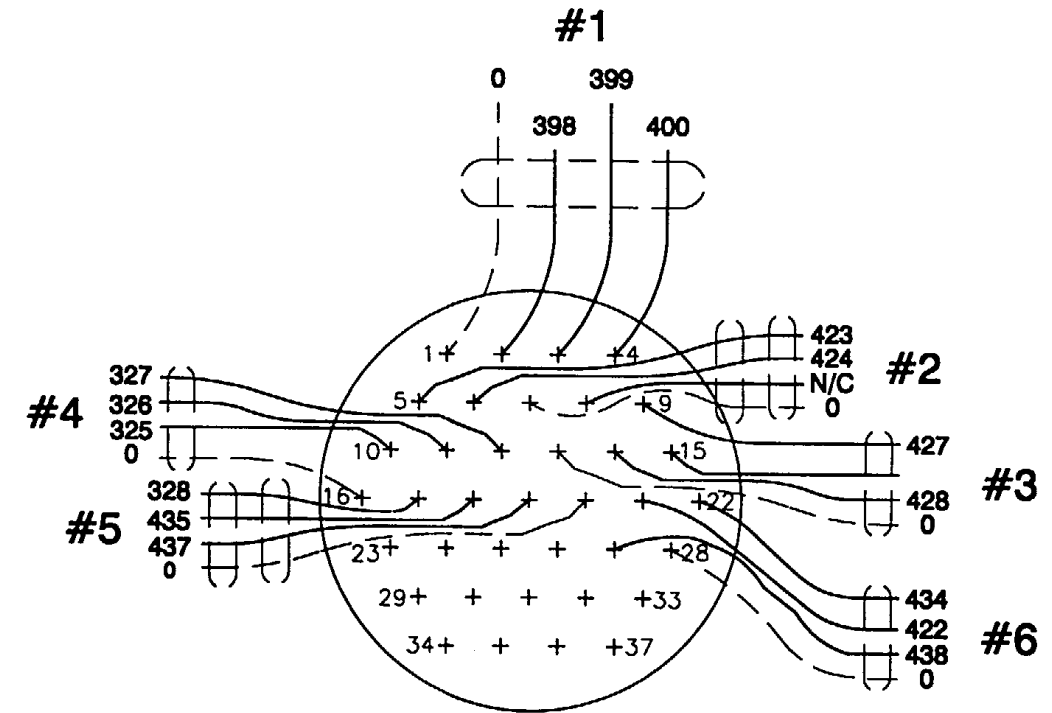
CONNECTOR	PIN	TYPE	CABLE WIRE #	SIZE	OPER CAB WIRE #	TO	TERM	LUG	NOTES
J1	A	S		8	300B	A3TB1	2		+24 VDC
J1	B	S		8	0	A4TB11	1		24 VDC RET
J2	01	C		16	-	-	-	-	SPARE
J2	02	C		16	322	A4TB3	9	B19	NOTE 2
J2	03	C		16	320	A4TB3	10	B19	
J2	04	C		16	367	A4TB3	11	B19	
J2	05	C		16	-	-	-	-	SPARE
J2	06	C		16	366	A4TB3	7	B19	
J2	07	C		16	324	A4TB3	5	B19	
J2	08	C		16	305	A4TB3	6	B19	
J2	09	C		16	365A	A4TB3	12	B19	
J2	10	C		16	404	A4TB4	14	B19	
J2	11	C		16	405	A4TB4	15	B19	
J2	12	C		16	406	A4TB4	13	B19	
J2	13	C	N/C	16	-	-	-	-	SPARE
J2	14	C		16	372	A4TB3	13	B19	
J2	15	C		16	373	A4TB3	14	B19	
J2	16	C		16	354	A4TB4	18	B19	
J2	17	C		16	357	A4TB4	17	B19	
J2	18	C		16	343	A4TB4	2	B19	
J2	19	C		16	342	A4TB4	1	B19	
J2	20	C		16	345	A4TB4	4	B19	
J2	21	C		16	344	A4TB4	3	B19	
J2	22	C		16	347	A4TB4	6	B19	
J2	23	C		16	346	A4TB4	5	B19	
J2	24	C		16	349	A4TB4	8	B19	
J2	25	C		16	348	A4TB4	7	B19	
J2	26	C		16	351	A4TB4	10	B19	
J2	27	C		16	350	A4TB4	9	B19	
J2	28	C		16	353	A4TB4	12	B19	
J2	29	C		16	352	A4TB4	11	B19	
J2	30	C	N/C	-	-	-	-	-	
J2	31	C		16	433	A4TB9	8	B19	
J2	32	C	N/C	-	-	-	-	-	SPARE
J2	33	C		-	0	A4TB11	2	B19	
J2	34	C	N/C	-	-	-	-	-	
J2	35	C		16	436	A4TB9	4	B19	
J2	36	C	N/C	-	-	-	-	-	
J2	37	C	N/C	-	-	-	-	-	
J3	01	C	1-SHD	16	0	A4TB8	3	B19	SHIELD
J3	02	C	1-BK	16	398	A4TB3	15	B19	
J3	03	C	1-WH	16	399	A4TB3	16	B19	
J3	04	C	1-RD	16	400	A4TB3	17	B19	
J3	05	C	2-BK	16	423	A4TB8	1	B19	
J3	06	C	2-WH	16	424	A4TB8	2	B19	
J3	07	C	2-SHD	16	0	A4TB8	3	B19	SHIELD
J3	08	C	2-RD	16		N/C			SPARE
J3	09	C	3-BK	16	427	A4TB8	4	B19	
J3	10	C	4-BK	16	325	A4TB3	2	B19	
J3	11	C	4-WH	16	326	A4TB3	3	B19	
J3	12	C	4-RD	16	327	A4TB3	1	B19	
J3	13	C	3-SHD	16	0	A4TB8	3	B19	SHIELD
J3	14	C	3-WH	16	428	A4TB8	5	B19	
J3	15	C	3-RD	-	-	N/C	-	-	

WIRING LIST NOTES:

- 1 "S" IN "TYPE" COLUMN INDICATES SOLDERED CONNECTION. "C" IN "TYPE" COLUMN INDICATES CRIMPED CONNECTION. J1 IS TWO PIN CONNECTOR FOR POWER. J2 IS 37 SOCKET PLASTIC SHELL CONNECTOR, FOR CONTROLS. J3 CONNECTOR IS 37 PIN PLASTIC SHELL, FOR SIGNALS AND OTHER SHIELDED LEADS. J4 IS 16 PIN PLASTIC SHELL CONNECTOR FOR FLOODING ALARM LIGHTS.
- 2 "COND#" COLUMN INDICATES CONDUCTOR OF CABLE ATTACHED TO CONTACT. ON THIS ASSEMBLY, COLUMN ONLY APPLIES TO J3.
- 3 J1 SHALL BE WIRED USING SINGLE CONDUCTOR #8 AWG WIRE. J2 & J4 SHALL BE WIRED USING SINGLE CONDUCTOR #16 AWG WIRE .

Figure G-25. Starboard Receptacle "A5" Assembly. (Sheet 1 of 2).

CONNECTOR	PIN	TYPE	CABLE	SIZE	OPER CAB WIRE #	TO	TERM	LUG	NOTES
J3	16	C	4-SHD	16	0	A4TB11	-	B19	SHIELD
J3	17	C	5-BK	16	328	A4TB3	4	B19	
J3	18	C	5-WH	16	435	A4TB9	1	B19	
J3	19	C	5-RD	16	437	A4TB9	2	B19	
J3	20	C	5-SHD	16	0	A4TB11	-		SHIELD
J3	21	C	6-BK	16	422	A4TB9	3	B19	SPARE
J3	22	C	6-WH	16	434	A4TB9	6	B19	SPARE
J3	23	C	7-BK	16		N/C			SPARE
J3	24	C	7-WH	16		N/C			SPARE
J3	25	C	7-RD	16		N/C			SPARE
J3	26	C	7-SHD	16	0				SPARE
J3	27	C	6-RD	16	438	A4TB8	8	B19	
J3	28	C	6-SHD	16	0	A4TB9	5		SHIELD
J3	29	C	N/C						
J3	30	C	N/C						
J3	31	C	N/C						
J3	32	C	N/C						
J3	33	C	N/C						
J3	34	C	N/C						
J3	35	C	N/C						
J3	36	C	N/C						
J3	37	C	N/C						
J4	1	C	-	16	506	A4TB6	6	B19	
J4	2	C	-	16	507	A4TB7	7	B19	-
J4	3	C	-	16	508	A4TB7	9	B19	
J4	4	C	-	16	509	A4TB7	10	B19	
J4	5	C	-	16	510	A4TB8	6	B19	
J4	6	C	-	16	511	A4TB8	7	B19	
J4	7	C	-	16	138	A4TB5	10	B19	
J4	8	C	-	-	-	-	-	-	SPARE
J4	9	C	-	-	-	-	-	-	SPARE
J4	10	C	-	16	302A	A4TB9	9	B19	-
J4	11	C	-	16	302	A4TB9	7	B19	-
J4	12	C	-	-	-	-	-	-	SPARE
J4	13	C	-	-	-	-	-	-	SPARE
J4	14	C	-	-	-	-	-	-	SPARE
J4	15	C	-	-	-	-	-	-	SPARE
J4	16	C	-	-	-	-	-	-	SPARE



J-3 CONNECTION DETAILS
 PIN-MATING FACE OF CONNECTOR
 SOCKET-WIRING SIDE OF CONNECTOR

Figure G-25. Starboard Receptacle "A5" Assembly. (Sheet 2 of 2).

CONNECTOR	PIN	TYPE	CABLE WIRE #	SIZE	OPER CAB WIRE #	TO	TERM	LUG	NOTES
J1	A	S		8	300A	A3TB1	3	-	+24 VDC
J1	B	S		8	0	A4TB11	1	-	24 VDC RET
J2	01	C		16	-	-	-	-	SPARE
J2	02	C		16	312	A4TB1	9	B19	NOTE 2
J2	03	C		16	308	A4TB1	10	B19	
J2	04	C		16	309	A4TB1	11	B19	
J2	05	C		16	-	-	-	-	SPARE
J2	06	C		16	306	A4TB1	7	B19	
J2	07	C		16	316	A4TB1	5	B19	
J2	08	C		16	304	A4TB1	6	B19	
J2	09	C		16	365	A4TB1	12	B19	
J2	10	C		16	401	A4TB2	14	B19	
J2	11	C		16	402	A4TB2	15	B19	
J2	12	C		16	403	A4TB2	13	B19	
J2	13	C	N/C	16	-	-	-	-	
J2	14	C		16	370	A4TB1	13	B19	
J2	15	C		16	371	A4TB1	14	B19	
J2	16	C		16	354	A4TB4	18	B19	
J2	17	C		16	361	A4TB2	17	B19	
J2	18	C		16	331	A4TB2	2	B19	
J2	19	C		16	330	A4TB2	1	B19	
J2	20	C		16	333	A4TB2	4	B19	
J2	21	C		16	332	A4TB2	3	B19	
J2	22	C		16	335	A4TB2	6	B19	
J2	23	C		16	334	A4TB2	5	B19	
J2	24	C		16	337	A4TB2	8	B19	
J2	25	C		16	336	A4TB2	7	B19	
J2	26	C		16	339	A4TB2	10	B19	
J2	27	C		16	338	A4TB2	9	B19	
J2	28	C		16	341	A4TB2	12	B19	
J2	29	C		16	340	A4TB2	11	B19	
J2	30	C	N/C	-	-	-	-	-	
J2	31	C		16	416	A4TB7	8	B19	
J2	32	-	N/C	-	-	-	-	-	SPARE
J2	33	C		16	0	A4TB11	2	B19	
J2	34	C	N/C	-	-	-	-	-	
J2	35	C		16	418	A4TB7	4	B19	
J2	36	C	N/C	-	-	-	-	-	
J2	37	C	N/C	-	-	-	-	-	
J3	1	C	1-SHD	16	0	A4TB6	3	B19	SHIELD
J3	2	C	1-BK	16	395	A4TB1	15	B19	
J3	3	C	1-WH	16	396	A4TB1	16	B19	
J3	4	C	1-RD	16	397	A4TB1	17	B19	
J3	5	C	2-BK	16	409	A4TB6	1	B19	
J3	6	C	2-WH	16	410	A4TB6	2	B19	
J3	7	C	2-SHD	16	0	A4TB6	3	B19	SHIELD
J3	8	C	2-RD	16		N/C			SPARE
J3	9	C	3-BK	16	411	A4TB6	4	B19	
J3	10	C	4-BK	16	313	A4TB1	2	B19	
J3	11	C	4-WH	16	314	A4TB1	3	B19	
J3	12	C	4-RD	16	315	A4TB1	1	B19	
J3	13	C	3-SHD	16	0	A4TB6	3	B19	SHIELD
J3	14	C	3-WH	16	412	A4TB6	5	B19	
J3	15	C	3-RD	-	-	-	-	-	SPARE

WIRING LIST NOTES:

1 "S" IN "TYPE" COLUMN INDICATES SOLDERED CONNECTION. "C" IN "TYPE" COLUMN INDICATES CRIMPED CONNECTION. J1 IS TWO PIN CONNECTOR FOR POWER. J2 IS 37 SOCKET PLASTIC SHELL CONNECTOR, FOR CONTROLS. J3 CONNECTOR IS 37 PIN PLASTIC SHELL, FOR SIGNALS AND OTHER SHIELDED LEADS. J4 IS 16 PIN PLASTIC SHELL CONNECTOR FOR FLOODING ALARM LIGHTS.

2 *COND#* COLUMN INDICATES CONDUCTOR OF CABLE ATTACHED TO CONTACT. ON THIS ASSEMBLY, COLUMN ONLY APPLIES TO J3.

3 J1 SHALL BE WIRED USING SINGLE CONDUCTOR #8 AWG WIRE (ITEM 16). J2 & J4 SHALL BE WIRED USING SINGLE CONDUCTOR #16 AWG WIRE.

Figure G-26. Port Receptacle "A6" Assembly. (Sheet 1 of 2).

CONNECTOR	PIN	TYPE	CABLE	SIZE	OPER CAB WIRE #	TO	TERM	LUG	NOTES
J3	16	C	4-SHD	16	0	A4TB11	-		SHIELD
J3	17	C	5-BK	16	317	A4TB1	4	B19	
J3	18	C	5-WH	16	417	A4TB7	1	B19	
J3	19	C	5-RD	16	419	A4TB7	2	B19	
J3	20	C	5-SHD	16	0	A4TB11	-		SHIELD
J3	21	C	6-BK	16	407	A4TB7	3	B19	SPARE
J3	22	C	6-WH	16	408	A4TB7	6	B19	SPARE
J3	23	C	7-BK	16		N/C			SPARE
J3	24	C	7-WH	16		N/C			SPARE
J3	25	C	7-RD	16		N/C			SPARE
J3	26	C	7-SHD	16	0				SPARE
J3	27	C	6-RD	16	420	A4TB6	7	B19	
J3	28	C	6-SHD	16	0	A4TB7	5		SHIELD
J3	29	C	N/C						
J3	30	C	N/C						
J3	31	C	N/C						
J3	32	C	N/C						
J3	33	C	N/C						
J3	34	C	N/C						
J3	35	C	N/C						
J3	36	C	N/C						
J3	37	C	N/C						
J4	1	C	-	16	500	A4TB1	19	B19	
J4	2	C	-	16	501	A4TB1	20	B19	-
J4	3	C	-	16	502	A4TB3	19	B19	
J4	4	C	-	16	503	A4TB3	20	B19	
J4	5	C	-	16	504	A4TB4	19	B19	
J4	6	C	-	16	505	A4TB4	20	B19	
J4	7	C	-	16	138	A4TB5	10	B19	
J4	8	C	-	-	-	-	-	-	SPARE
J4	9	C	-	-	-	-	-	-	SPARE
J4	10	C	-	16	301A	A4TB5	18	B19	-
J4	11	C	-	16	301	A4TB5	16	B19	-
J4	12	C	-	-	-	-	-	-	SPARE
J4	13	C	-	-	-	-	-	-	SPARE
J4	14	C	-	-	-	-	-	-	SPARE
J4	15	C	-	-	-	-	-	-	SPARE
J4	16	C	-	-	-	-	-	-	SPARE

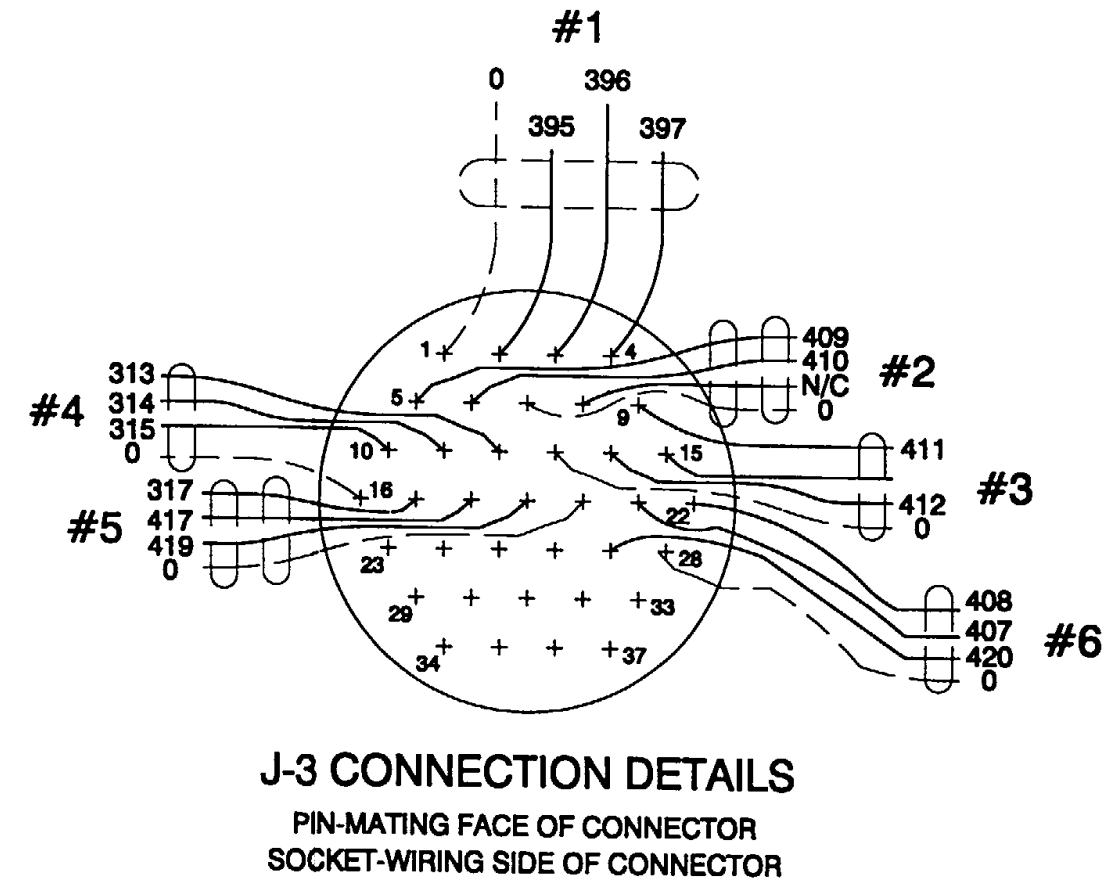


Figure G-26. Port Receptacle "A6" Assembly. (Sheet 2 of 2).

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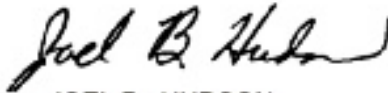
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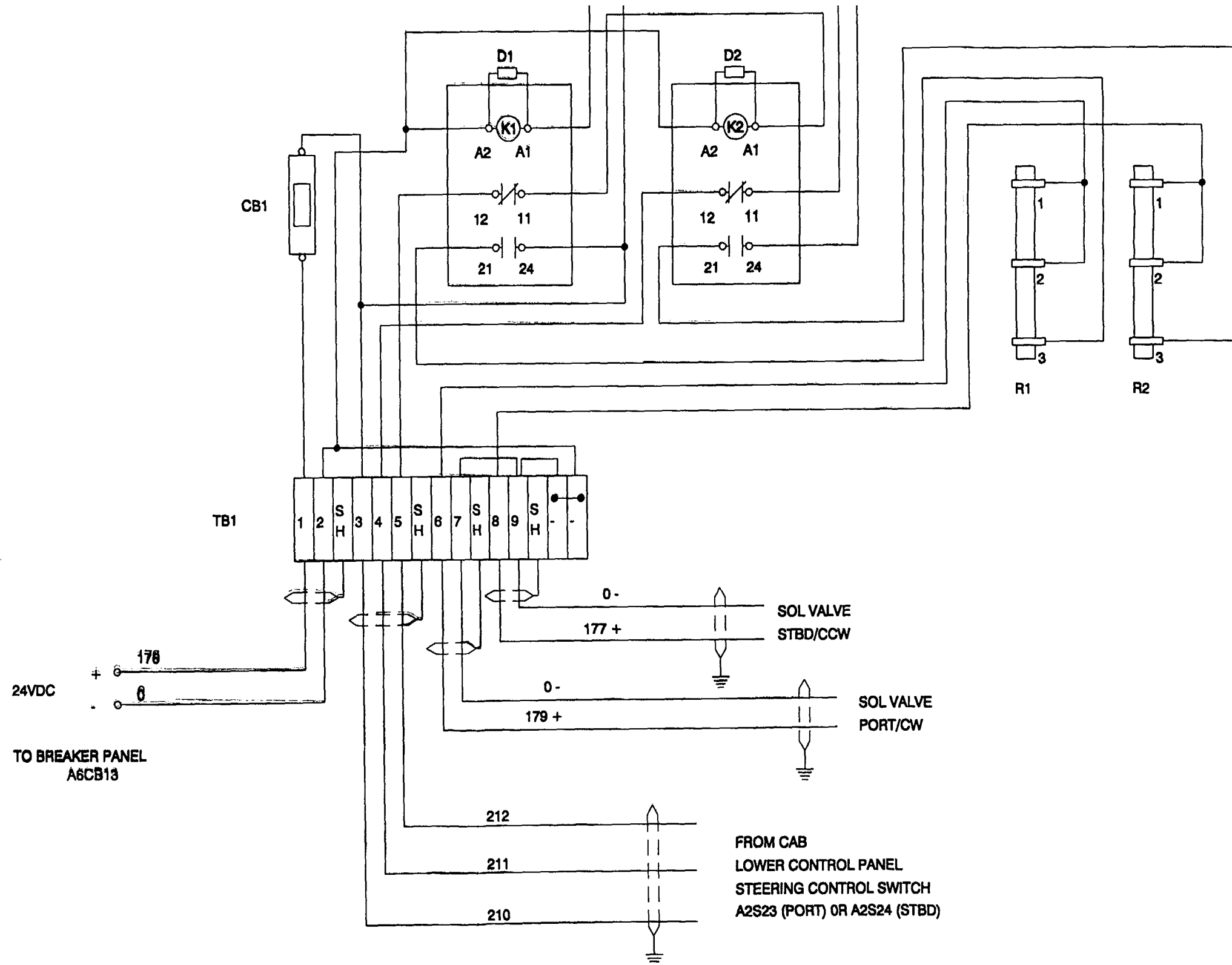


Figure G-28. Pumpjet/Thruster Junction Box "A2JB2:.

G-175/(G-176 blank)

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3, 280.8 feet

WEIGHTS

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigram = .035 ounce
 1 dekagram = 10 grams = .35 ounce
 1 hectogram = 10 dekagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 Pounds
 1 quintal = 100 kilograms = 220.46 Pounds
 1 metric Ton = 10 quintals = 1.1 Short Tons

LIQUID MEASURE

1 centiliter = 10 milliliters = .34 fl. ounce
 1 deciliter = 10 centiliters = 3.38 fl. ounces
 1 liter = 10 deciliters = 33.81 fl. ounces
 1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons

SQUARE MEASURE

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
 1 sq. meter (centare) = 100 sq. Decimeters = 10.76 sq. feet
 1 sq. dekameter (are) = 100 sq. meters = 1, 076.4 sq. feet
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.471 acres
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

CUBIC MEASURE

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
 1 cu. meter = 1000 cu. Decimeters = 35.31 cu feet

Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To Change</i>	<i>To</i>	<i>Multiply By</i>
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
Yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic Yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short Tons	metric Tons	.907	kilograms	pounds	2.205
pound feet	newton-meters	1.365	metric Tons	short Tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

F°	Fahrenheit temperature	5-9 (after subtracting 32)	Celsius temperature	°C
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