TECHNICAL MANUAL

OPERATOR, UNIT,
DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
FOR

WATER PURIFICATION BARGES
(NSN 4610-01-234-2165)

Preventive Maintenance Checks and Services
(PMCS) for all Onboard Systems

This technical manual is an authentication of the manufacturer's commercial literature and does not conform with the format and the content requirements normally associated with Army technical manuals. This technical manual does, however, contain all essential information required to operate and maintain the equipment.

Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY
7 JUNE 1991

WARNINGS AND SAFETY NOTICES

WARNING

DANGEROUS VOLTAGES AND HAZARDOUS MATERIALS

ARE USED IN THIS EQUIPMENT.

DO NOT TAKE CHANCES!

GENERAL WARNINGS

- Always redtag electrical equipment, controls, circuits, and switches before beginning repairs.
- Do not service or adjust high voltage electrical equipment when alone.
- Do not overload circuits.
- Always use authorized insulated tools and test equipment when working on electrical equipment.
- Remove all jewelry before working on or around electrical equipment with exposed current-carrying areas.
- Do not wear clothing with exposed metal fasteners when working on electrical equipment.
- Always use approved breathing apparatus when working with chemicals.
- Avoid chemical contact with eyes, skin, and clothing.
- Always wear safety glasses, gloves, and rubber aprons when handling chemicals.
- Wear protective clothing and safety glasses as required when working on barge equipment.
- Always wear approved ear protection or ear plugs in noise hazard areas.

SPECIFIC WARNINGS

- Do not connect any new circuit to an existing circuit.
- Do not energize circuits if water condensation is present.
- If any sparks are seen, stop operation immediately. Determine cause and take corrective action.
- Never touch radio antennas of fixed-base radio transmitters. When transmitting, antennas contain high voltage.
- Always use approved breathing apparatus when handling material in multimedia filters and chlorination unit descaling acid crystals. Do not breathe dust from these materials.
- Avoid breathing vapors from coagulant aid chemicals. Use in a well-ventilated area. In case of chemical contact with skin, wash with water. For eyes, immediately flush at eyewash station and obtain medical help as soon as possible.
- Always wear work gloves and shirts with full-length, buttoned sleeves when handling fuel oil and gasoline.

- Do not smoke or have open flames within 10 feet when handling fuel oil or gas. Only minimum number of personnel necessary to conduct fueling operation are permitted in area.

- Before starting any repairs on compressed air system, always release pressure from air receiver and compressor and open and redtag circuit breakers.

- On air compressor, do not adjust automatic regulator switch (pressure switch) and pilot valve settings.

- To avoid flying particles lodging in eyes, do not use compresssed air to "dust-off" clothing or workspace.

- Stay clear of anchor cables when operating anchor winches.

- Always wear safety glasses or face shield when using power tools.

- Always wear life vests when on weatherdeck and throughout the barge during storm conditions.

- Wear life vests at all times aboard workboat.

- Only qualified persons will operate and maintain arc and fuel gas welders.

- When welding, always make sure those working with or near the welder wear proper clothinc heavy, hole-free gloves, heavy shirt, cuffless trousers, high shoes, and cap. Keep clothing dry and free of oil and other flammable substances.

- Use dry, heavy canvas drop cloth to cover work area and adjacent deck when arc welding.

- Before welding on bulkheads, deckplates, and similar surfaces, always check carefully to make sure that the other side of the surface to be welded does not hide fuel or compressed gas tanks, flammable or other hazardous materials, electrical equipment, or wiring.

- When welding, keep your head out of the fumes and make sure area is well ventilated.

- Before welding on surfaces that have been cleaned with cleaning solutions containing chlorinated hydrocarbons, always wash with water, dry, and ventilate area thoroughly.

- Use shield with proper filter lens when welding. Do not allow others near welding operations to assist or observe without proper eye protection. This must include side shields during slag chipping operations.

- Warn personnel in area during welding operations not to look at arc or expose themselves to hot spatter or metal.

- In an extreme emergency, when welding is required in void 2 port, shut down chlorination system. Close all valves and cover parts of chlorination system not being welded with a heavy canvas drop cloth. Turn on vent 8 and, if available, provide additional forced air ventilation.

- Before welding on fuel oil or sludge tank, make sure tank is gas-free by:

  - cleaning tank thoroughly,

  - seeing that tank is thoroughly dry, and

  - force ventilating the tank.

- Connect arc welding work cable as close to welding area as possible. Work cables connected to barge framework or other locations far from welding site increase the possibility of the welding current passing through lifting chains, crane cables, or other possible circuit paths. This can create fire hazards or weaken lifting chains and crane cables until they break or fall.

- Always weld with all doors, portholes, and hatches propped open and necessary ventilation systems operating.

- Take frequent breaks away from the area where you are welding.

- Do not take oxygen and acetylene tanks into confined areas when welding.

- Always use a friction lighter to start oxyacetylene torch.

- Always maintain all welding equipment in proper working condition. If you have any doubts about the safety of any welding equipment, do not use the welder.

ELECTRICAL SHOCK SAFETY STEPS

Five safety steps to follow if someone is the victim of electrical shock:

a. Do not try to pull or grab individual.

b. Turn off electrical power when possible.

c. If you can not turn off electrical power, pull, push, or lift person to safety using a wooden pole, rope, or some other insulating material.

d. Get medical help as soon as possible.

e. After injured person is free of contact with source of electrical shock, move person a short distance away, and, if needed, start CPR immediately.

CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 15 OCTOBER 1992

OPERATOR, UNIT,
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FOR

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(NSN 1930-01-234-2165)
Preventive Maintenance Checks and Services (PMCS) for all Onboard Systems

Approved for public release; distribution is unlimited

TM 55-1930-209-14&P-19, 7 June 1991, is changed as follows:

1. Title is changed as shown above.

2. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
1 and 2	1 and 2
1-1 and 1-2	1-1 and 1-2
2-1 and 2-2	2-1 and 2-2
2-13 through 2-16	2-13 through 2-16
3-1 through 3-4	3-1 through 3-4
3-7 through 3-10	3-7 through 3-10
3-15 and 3-16	3-15 and 3-16
3-19 and 3-20	3-19 and 3-20
3-25 through 3-34	3-25 through 3-34
3-37 and 3-38	3-37 and 3-38
4-1 and 4-2	4-1 and 4-2
5-1 and 5-2	5-1 and 5-2
5-5 and 5-6	5-5 and 5-6
6-1 and 6-2	6-1 and 6-2
6-7 through 6-10	6-7 through 6-10
7-1 and 7-2	7-1 and 7-2
7-17 and 7-18	7-17 and 7-18
7-25 through 7-30	7-25 through 7-30
8-1 and 8-2	8-1 and 8-2
9-1 and 9-2	9-1 and 9-2
9-45 and 9-46	9-45 and 9-46
10-1 through 10-4	10-1 through 10-4

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GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

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Administrative Assistant to the
Secretary of the Army
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DISTRIBUTION:
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INTRODUCTION TO

TM 55-1930-209-14&P-19

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Troop Support Command, ATTN: AMSTR-MMTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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1. SCOPE

   TM 55-1930-209-14&P covers the Reverse Osmosis Water Purification Barges, Models 300-WPB-1, 300-WPB-2 and 300WPB-3, NSN 1930-01-234-2165. This manual consists of twenty-one volumes.

2. REVERSE OSMOSIS WATER PURIFICATION BARGES

   The Reverse Osmosis Water Purification Barges provide up to 300,000 gallons of drinking water per 24 hour period. The drinking water, converted from seawater or brackish water, is for use by a Rapid Deployment Force in a forward area. When needed, the drinking water can be pumped to a shore facility orto another vessel. This manual provides operation and maintenance procedures for all the component systems on the barges.

3. VOLUME 1 -NORMAL OPERATIONS

   This volume provides information and procedures on normal Reverse Osmosis Water Purification Barge operations, including barge movement and deployment, communications and electrical power systems, drinking water production, shutdown, and required operational maintenance. Emergency shutdown procedures are also provided.

4. VOLUME 2 -SEAWATER SYSTEM

   This volume describes operation and maintenance of the seawater system which supplies seawater to the Reverse Osmosis Water Purification Units (ROWPUs) for processing to the air conditioning unit for cooling to the ballast tank for barge trimming to the chlorination unit for priming and cooling, and to the diesel generators for cooling.

5. VOLUME 3 -REVERSE OSMOSIS WATER PURIFICATION UNIT (ROWPU) SYSTEM

   Volume 3 provides operation and maintenance procedures for the ROWPU System which processes seawater or brackish water to produce drinking water. Normally, this system processes seawater supplied by the seawater system (TM 55-1930-209-14&P-2) to create product water. Chlorine is then added to this product water by the chlorination system (TM 55-1930-209-14&P-4). The resultant drinking water is discharged into four storage tanks that are part of the drinking water system (TM 55-1930-209-14&P-5).

6. VOLUME 4 -CHLORINATION SYSTEM

   Operation and maintenance procedures for the chlorination system onboard the Water Purification Barges are contained in this volume. This system produces chlorine in a sodium hypochlorite solution, upon demand, to water processed by the ROWPU system just before the water enters the four drinking water storage tanks.

7. VOLUME 5 -DRINKING WATER SYSTEM

   The drinking water system provides storage for water produced by the ROWPUs and includes pumps and valves to move this water from onboard storage tanks to the shore discharge system, to another vessel, or overboard. The drinking water system also provides a pressurized water supply for drinking and washing onboard the barges.

8. VOLUME 6 -SHORE DISCHARGE SYSTEM

   This volume provides operation and maintenance procedures for the shore discharge system which transfers drinking water from barge storage tanks to holding/storage facilities ashore.

9. VOLUME 7 -COMPRESSED AIR SYSTEM

   Volume 7 describes the operation and maintenance of the compressed air system which provides compressed air to five air stations in the ROWPU space, one in the workshop, and one on stem weatherdeck. This system also provides compressed air to two air stations for blowdown of seachests in void 2 starboard and void 4 port. Compressed air is used on the barges to operate air-powered impact tools, to propel air through the shore discharge hose, to blowdown seachest, and for general cleaning blowdown.

10. VOLUME 8 -FUEL OIL SYSTEM

    This volume provides operation and maintenance procedures for the fuel oil system which functions as a centralized receiving storage and distribution system for diesel fuel used for barge operations. This onboard fuel system provides fuel for two 155 kW diesel ship service generators, a 20 kW ship auxiliary generator, two ROWPU high-pressure pump diesel engines, and a fueling station for the barge workboat.

11. VOLUME 9 -ELECTRICAL POWER SYSTEMS

    Operation and maintenance procedures for the two electrical power systems installed aboard the Water Purification Barges are contained in Volume 9. The normal electrical power system generates, controls and distributes all electrical power for operating the water purification system and its auxiliary systems. The emergency electrical system supplies 24 Vdc from a battery bank to 24 Vdc equipment and converts to 24 Vdc through an inverter to 120 Vac to power emergency lighting and equipment.

12. VOLUME 10 -LIGHTING SYSTEM

    Volume 10 contains operation and maintenance procedures for the onboard lighting systems for the Water Purification Barges. This system supplies interior and exterior lighting. Normal and emergency interior lighting is provided in the deckhouse ROWPU space, dayroom, workshop, and voids. Exterior lighting consists of searchlights and floodlights for use at night or during reduced visibility. Lights on the weatherdecks and standard navigation and status lights are for use during operation and towing.

13. VOLUME 11 -EQUIPMENT MONITORING SYSTEM

    This volume provides operation and maintenance procedures for the equipment monitoring system which monitors the operation of several equipment components onboard the Water Purification Barges. This system monitors operating conditions such as amount of drinking water in storage tanks and temperature of diesel engine cooling water. Sensors detect unacceptable operating conditions, the main processor flashes at double intensity and remote alarms (horns, strobe lights and buzzer alert crewmembers that corrective action is necessary.

14. VOLUME 12--COMMUNICATIONS SYSTEM

Operation and maintenance procedures for the communications system are provided in Volume 12. This system consists of three separate communications methods, radio communications, foghorn and intercom telephones.

15. VOLUME 13 HANDLING EQUIPMENT

This volume contains operation and maintenance procedures for handling equipment used for lifting, transporting and repositioning equipment and materials onboard the barges. The system includes a bridge crane, bow crane and a void 4 trolley hoist.

16. VOLUME 14 ANCHOR, MOORING, AND TOWING EQUIPMENT

Volume 14 describes the operation and maintenance procedures for the anchor mooring, and towing equipment on the Water Purification Barges. This equipment provides a method to hold (anchor) the barges in a fixed position offshore, at dockside, or next to another vessel and a method to move the barges from one location to another.

17. VOLUME 15 - MISCELLANEOUS EQUIPMENT (DAYROOM, WORKSHOP, ACCESSES, AND SANITATION SYSTEMS)

Volume 15 addresses operation and maintenance procedures for miscellaneous equipment installed on the Water Purification Barges. This equipment includes the dayroom on the forward starboard side of deckhouse, the workshop on the forward portside of deckhouse, accesses such as deckhouse doors and portholes and various accesses to and from the voids, and two separate sanitation systems (toilets and bilge). Additional equipment addressed in this volume includes: guard rails, rubber fendering, removable floor mats, eyewash stations, component labels, caution, warning and danger signs, and storage areas.

18. VOLUME 16 VENTILATION, HEATING, AND AIR CONDITIONING SYSTEMS

This volume contains operation and maintenance procedures for the deckhouse and voids ventilation systems and the heating and air conditioning (HAC) system installed on the Water Purificaiton Barges. The ventilation system provides fresh air circulation in the deckhouse and voids with 17 hatches and 10 ventilation fans. The HAC controls the temperature in the dayroom and deckhouse.

19. VOLUME 17 WORKBOAT, LIFESAVING, AND FIREFIGHTING EQUIPMENT

Volume 17 includes procedures for the operation and maintenance of:

a. Workboat provides water transportation for crew members and visitors, small cargo items, transportation of the messenger line for the shore discharge hose and similar work-related tasks associated with operating the Water Purification Barges.

b. Lifesaving Equipment installed on the barges and consisting of 2 liferafts, 15 Type II and 24 Type V lifevests and 4 lifesaving rings.

c. Firefighting Equipment installed on the barges and consisting of Halon 1301 system, 2 CO2 hose reel units, a smoke detector system, 17 portable C02 fire extinguishers, 5 dry chemical fire extinguishers, 5 self-contained breathing apparatuses, and a portable, engine driven firefighting pump. The workboat also has a 10-pound, portable, dry chemical fire extinguisher.

20. VOLUME 18 SUPPORTING APPENDICES FOR VOLUMES 1-17

Volume 18 contains the Maintenance Allocation Chart, Components of End Item List, Tools and Test Equipment List, Expendable/Durable Supplies and Materials List and the Repair Parts and Special Tools List.

All of the information contained in this volume is common to volumes 1-17 and does not appear in each individual volume.

Appendix A in volumes 1-17 provides information unique to each volume. Appendix B in volumes 1-17 provides manufacturers manuals and instructions unique to the system described in each volume. Appendixes C-G are located in Volume 18.

21. VOLUME 19 PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

    Volume 19 contains PMCS pertinent to all onboard systems for the Reverse Osmosis Water Purification Barges.

22. VOLUME 20-SUPPLEMENTAL DATA

    Volume 20 contains the Basic Issue Items List, and Additional Authorization List for all onboard systems for the Reverse Osmosis Water Purification Barges.

23. VOLUME 21 This volume contains operation and maintenance procedures for the 20-ton double drum diesel engine winch used on the Water Purification Barges.

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

TABLE OF CONTENTS (Continued)
VOLUME 1

LIST OF APPENDICES

NOTE

The following appendixes, common to all volumes, are in TM 55-1930-209-14&P-18

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT LIST (TTEL)
EXPENDABLE SUPPLIES AND MATERIALS LIST (ESML)
COMPONENTS OF END ITEM LIST (COEIL)
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

TABLE OF CONTENTS (Continued)
VOLUME 1
LSIT OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)
VOLUME 1
LIST OF ILLUSTRATIONS

Figure **Page**

TABLE OF CONTENTS (Continued)
VOLUME 1
LIST OF ILLUSTRATIONS

Figure **Page**

TABLE OF CONTENTS (Continued)
VOLUME 1
LIST OF ILLUSTRATIONS

Figure **Page**

LIST OF TABLES

Table **Page**

TABLE OF CONTENTS (Continued)
VOLUME 1

Table **Page**

TABLE OF CONTENTS
VOLUME 2

TABLE OF CONTENTS (Continued)
VOLUME 2

TABLE OF CONTENTS (Continued)
VOLUME 2

TABLE OF CONTENTS (Continued)
VOLUME 2

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

TABLE OF CONTENTS (Continued)
VOLUME 2

Figure **Page**

LIST OF TABLES

Table **Page**

TABLE OF CONTENTS (Continued)
VOLUME 3-1

Page

TABLE OF CONTENTS (Continued)
VOLUME 3-1

Page

TABLE OF CONTENTS (Continued)
VOLUME 3-1

Page

TABLE OF CONTENTS (Continued)
VOLUME 3-1
LIST OF ILLUSTRATIONS

Figure **Page**

TABLE OF CONTENTS (Continued)
VOLUME 3-1

Page

TABLE OF CONTENTS (Continued)
VOLUME 3-1

LIST OF APPENDICES

NOTE

The following appendices, common to all TMs in this series, are in TM 55-1930-209-14 & P-18.

MANUFACTURERS' SERVICE MANUALS/INSTRUCTIONS - See TM 55-1930-209-14&P-3-2
MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT LIST (TTEL)
EXPENDABLE SUPPLIES AND MATERIALS LIST (ESML)
COMPONENTS OF END ITEM LIST (COEIL)
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)
VOLUME 3-1
LIST OF TABLES

TABLE OF CONTENTS
VOLUME 3-2

LIST OF APPENDICES

TABLE OF CONTENTS (Continued)
VOLUME 4

Page

TABLE OF CONTENTS (Continued)
VOLUME 4

Page

TABLE OF CONTENTS (Continued)
VOLUME 4

Page

TABLE OF CONTENTS (Continued)
VOLUME 4

LIST OF APPENDICES

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)
VOLUME 4
LIST OF ILLUSTRATIONS

LIST OF TABLES

TABLE OF CONTENTS (Continued)
VOLUME 5

Page

TABLE OF CONTENTS (Continued)
VOLUME 5

Page

TABLE OF CONTENTS (Continued)
VOLUME 5

TABLE OF CONTENTS (Continued)
VOLUME 5

LIST OF APPENDICES

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST
LIST OF FIGURES

TABLE OF CONTENTS (Continued)
VOLUME 5

LIST OF TABLES

TABLE OF CONTENTS
VOLUME 6

Page

TABLE OF CONTENTS (Continued)
VOLUME 6

Page

TABLE OF CONTENTS (Continued)
VOLUME 6

TABLE OF CONTENTS (Continued)
VOLUME 6

TABLE OF CONTENTS (Continued)
VOLUME 6

LIST OF APPENDICES

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)

TOOLS AND TEST EQUIPMENT (TTEL)

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)

ADDITIONAL AUTHORIZED ITEM LIST (AAL)

BASIC ISSUE ITEMS LIST

TABLE OF CONTENTS (Continued)
VOLUME 6

LIST OF ILLUSTRATIONS

LIST OF TABLES

TABLE OF CONTENTS (Continued)
VOLUME 7

TABLE OF CONTENTS (Continued)
VOLUME 7

TABLE OF CONTENTS (Continued)
VOLUME 7

TABLE OF CONTENTS (Continued)
VOLUME 7

LIST OF APPENDICES

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

TABLE OF CONTENTS (Continued)
VOLUME 6

LIST OF ILLUSTRATIONS

LIST OF TABLES

TABLE OF CONTENTS (Continued)

VOLUME 8

TABLE OF CONTENTS (Continued)
VOLUME 8

TABLE OF CONTENTS (Continued)
VOLUME 8

LIST OF APPENDICES

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

TABLE OF CONTENTS (Continued)
VOLUME 8

LIST OF ILLUSTRATIONS

LIST OF TABLES

TABLE OF CONTENTS (Continued)
VOLUME 9-1

TABLE OF CONTENTS (Continued)
VOLUME 9-1

TABLE OF CONTENTS (Continued)
VOLUME 9-1

TABLE OF CONTENTS (Continued)
VOLUME 9-1

TABLE OF CONTENTS (Continued)
VOLUME 9-1

TABLE OF CONTENTS (Continued)
VOLUME 9

TABLE OF CONTENTS (Continued)
VOLUME 9-1

TABLE OF CONTENTS (Continued)
VOLUME 9-1

LIST OF APPENDICES

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT LIST (ITTEL)
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED LIST (AAL)
EXPENDABLE SUPPLIES AND MATERIAL LIST (ESML)

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)
VOLUME 9-1
LIST OF ILLUSTRATIONS (Continued)

LIST OF TABLES

TABLE OF CONTENTS
VOLUME 9-2
LIST OF APPENDICES

VOLUME 9-3

LIST OF APPENDICES

TABLE OF CONTENTS (Continued)
VOLUME 10

TABLE OF CONTENTS (Continued)
VOLUME 10

TABLE OF CONTENTS (Continued)
VOLUME 10

TABLE OF CONTENTS (Continued)
VOLUME 10

LIST OF APPENDICES

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)
VOLUME 10
LIST OF ILLUSTRATIONS (Continued)

LIST OF TABLES

TABLE OF CONTENTS (Continued)
VOLUME 11

TABLE OF CONTENTS (Continued)
VOLUME 11

TABLE OF CONTENTS (Continued)
VOLUME 11

LIST OF APPENDICES

TABLE OF CONTENTS (Continued)
VOLUME 11

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

LIST OF ILLUSTRATIONS

LIST OF TABLES

TABLE OF CONTENTS (Continued)
VOLUME 12

TABLE OF CONTENTS (Continued)
VOLUME 12

TABLE OF CONTENTS (Continued)
VOLUME 12

TABLE OF CONTENTS (Continued)
VOLUME 12

TABLE OF CONTENTS (Continued)
VOLUME 12

TABLE OF CONTENTS (Continued)
VOLUME 12

LIST OF APPENDICES

TABLE OF CONTENTS (Continued)
VOLUME 12

NOTE:
The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.
MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE
The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.
COMPONENTS OF END ITEM LIST (COEIL) ·
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)
VOLUME 12

Figure **Page**

LIST OF TABLES

Table **Page**

TABLE OF CONTENTS (Continued)
VOLUME 13

TABLE OF CONTENTS (Continued)
VOLUME 13

Page

TABLE OF CONTENTS (Continued)
VOLUME 13

TABLE OF CONTENTS (Continued)
VOLUME 13

TABLE OF CONTENTS (Continued)
VOLUME 13

TABLE OF CONTENTS (Continued)
VOLUME 13

LIST OF APPENDICES

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)
VOLUME 12

LIST OF ILLUSTRATIONS

LIST OF TABLES

TABLE OF CONTENTS (Continued)
VOLUME 14

TABLE OF CONTENTS (Continued)
VOLUME 14

TABLE OF CONTENTS (Continued)
VOLUME 14

LIST OF APPENDICES

TABLE OF CONTENTS (Continued)
VOLUME 14

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

LIST OF ILLUSTRATIONS

LIST OF TABLES

TABLE OF CONTENTS (Continued)
VOLUME 15

TABLE OF CONTENTS (Continued)
VOLUME 15

TABLE OF CONTENTS (Continued)
VOLUME 15

TABLE OF CONTENTS (Continued)
VOLUME 15

TABLE OF CONTENTS (Continued)
VOLUME 14

TABLE OF CONTENTS (Continued)
VOLUME 15

TABLE OF CONTENTS (Continued)
VOLUME 15

TABLE OF CONTENTS (Continued)
VOLUME 15

TABLE OF CONTENTS (Continued)
VOLUME 15

Page

LIST OF APPENDICES

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

TABLE OF CONTENTS (Continued)
VOLUME 15

LIST OF ILLUSTRATIONS

LIST OF TABLES

TABLE OF CONTENTS
VOLUME 16

Page

TABLE OF CONTENTS (Continued)
VOLUME 16

TABLE OF CONTENTS (Continued)
VOLUME 16

TABLE OF CONTENTS (Continued)
VOLUME 16

Page

TABLE OF CONTENTS (Continued)
VOLUME 16

TABLE OF CONTENTS (Continued)
VOLUME 16

Page

LIST OF APPENDICES

TABLE OF CONTENTS (Continued)
VOLUME 16
NOTE

The following appendices, common to all TM.s in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST (COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)
VOLUME 16

LIST OF TABLES

TABLE OF CONTENTS
VOLUME 17

TABLE OF CONTENTS (Continued)

VOLUME 17

TABLE OF CONTENTS (Continued)

VOLUME 17

TABLE OF CONTENTS (Continued)

VOLUME 17

TABLE OF CONTENTS (Continued)

VOLUME 17

TABLE OF CONTENTS (Continued)
VOLUME 17

TABLE OF CONTENTS (Continued)

VOLUME 17

LIST OF APPENDICES

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-18.

MAINTENANCE ALLOCATION CHART (MAC)
TOOLS AND TEST EQUIPMENT LIST (TTEL)
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

NOTE

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.

COMPONENTS OF END ITEM LIST(COEIL)
ADDITIONAL AUTHORIZED ITEM LIST (AAL)
BASIC ISSUE ITEMS LIST

TABLE OF CONTENTS (Continued)

VOLUME 17
LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)
VOLUME 17

LIST OF TABLES

TABLE OF CONTENTS
VOLUME 18

LIST OF APPENDICES

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS
VOLUME 19

TABLE OF CONTENTS (Continued)
VOLUME 19.

TABLE OF CONTENTS (Continued)
VOLUME 19

TABLE OF CONTENTS (Continued)
VOLUME 19

TABLE OF CONTENTS (Continued)
VOLUME 19

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Continued)
VOLUME 19
LIST OF ILLUSTRATIONS (Continued)

LIST OF TABLES

TABLE OF CONTENTS (Continued)
VOLUME 19

LIST OF TABLES (Continued)

TABLE OF CONTENTS (Continued)
VOLUME 19
LIST OF TABLES (Continued)

TABLE OF CONTENTS
VOLUME 20

LIST OF APPENDICES

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS
VOLUME 21

TABLE OF CONTENTS (Continued)
VOLUME 21

TABLE OF CONTENTS (Continued)
VOLUME 21

TABLE OF CONTENTS (Continued)
VOLUME 21

TABLE OF CONTENTS (Continued)
VOLUME 21

TABLE OF CONTENTS (Continued)
VOLUME 21

TABLE OF CONTENTS (Continued)
VOLUME 21

TABLE OF CONTENTS (Continued)
VOLUME 21

TABLE OF CONTENTS (Continued)
VOLUME 21

LIST OF APPENDICES

TABLE OF CONTENTS (Continued)
VOLUME 21
LIST OF ILLUSTRATIONS

Figure **Page**

TABLE OF CONTENTS (Continued)
VOLUME 21

LIST OF ILLUSTRATIONS (Continued)

TABLE OF CONTENTS (Continued)
VOLUME 21

LIST OF ILLUSTRATIONS (Continued)

TABLE OF CONTENTS (Continued)
VOLUME 21
LIST OF ILLUSTRATIONS (Continued)

LIST OF TABLES

TABLE OF CONTENTS (Continued)

VOLUME 21

LIST OF TABLES (Continued)

CHAPTER 1 INTRODUCTION TO MANUAL

Section I. General information

1-1 Purpose. This technical manual (TM) describes the Preventive Maintenance Checks and Services (PMCS) for the Water Purification Barge. Information pertains to all barges. Operation and maintenance information on systems installed onboard is in TM 55-1930-209-14&P-1 thru P-17 and P-21. TM 55-1930-209-14&P-18 contains appendices common to all TM's. Location of major barge components is shown in Figure 1-1.

1-2 Scope. Chapters 2-18 describe the PMCS. Each chapter contains PMCS procedures for one of the Reverse Osmosis Water Purification Unit (ROWPU) barge operating and support systems.

1-3 Maintenance forms and records. For an explanation and examples of the required maintenance forms and records, see DA PAM-738-750, the Army Maintenance Management System (TAMMS).

1-4 Destruction of Army materiel to prevent enemy use. This shall be as directed in TM 750-244-3.

1-5 PMCS definitions. System definitions used in this TM are as follows: A-ampere, ac-alternating current, amp hr-ampere-hour, C-centigrade, cm-centimeter, dc-direct current, F-fahrenheit, g-grams, gal-gallons, gph-gallons per hour, gpm-gallons per minute, HG-hydra gyrum (level of mercury such as used in a pressure gauge), HP-high pressure, Hz-Hertz, in-inch, kg-kilogram, kVA-kilovolt-ampere, kW-kilowatt, L-liter, lb/ft-pound per foot, mA-milliamperes, mm-millimeter, N-Newton, NC-National Coarse, N•m-Newton meter, NPT-National Pipe Thread, oz-ounce, pH-hydrogen power (acidity/alkalinity), ph-phase, POL-petroleum, oil, lubricants, ppm-parts per million, psi-pounds per square inch, psig-pounds per square inch gauge, pt-pint, qt-quart, rmp-revolutions per minute, V-volts, Vac-Volts alternating current, Vdc-Volts direct current.

1-6 Maintenance concept

a. Operator, Organizational, Direct Support and General Support maintenance functions are performed by barge crewmembers whenever possible. Before, during, and after PMCS is the first step in this process. Periodic PMCS are the next steps. Maintenance beyond the capability of crewmembers is provided by a shore-based area support maintenance unit.

b. PMCS consists of servicing, lubricating, cleaning, adjusting, and correcting deficiencies or malfunctions. No special tools are required. When performing PMCS, be sure to observe approved shop practices, Warnings, and Safety Notices. Report all repair/replacement requirements to the shift leader or bargemaster.

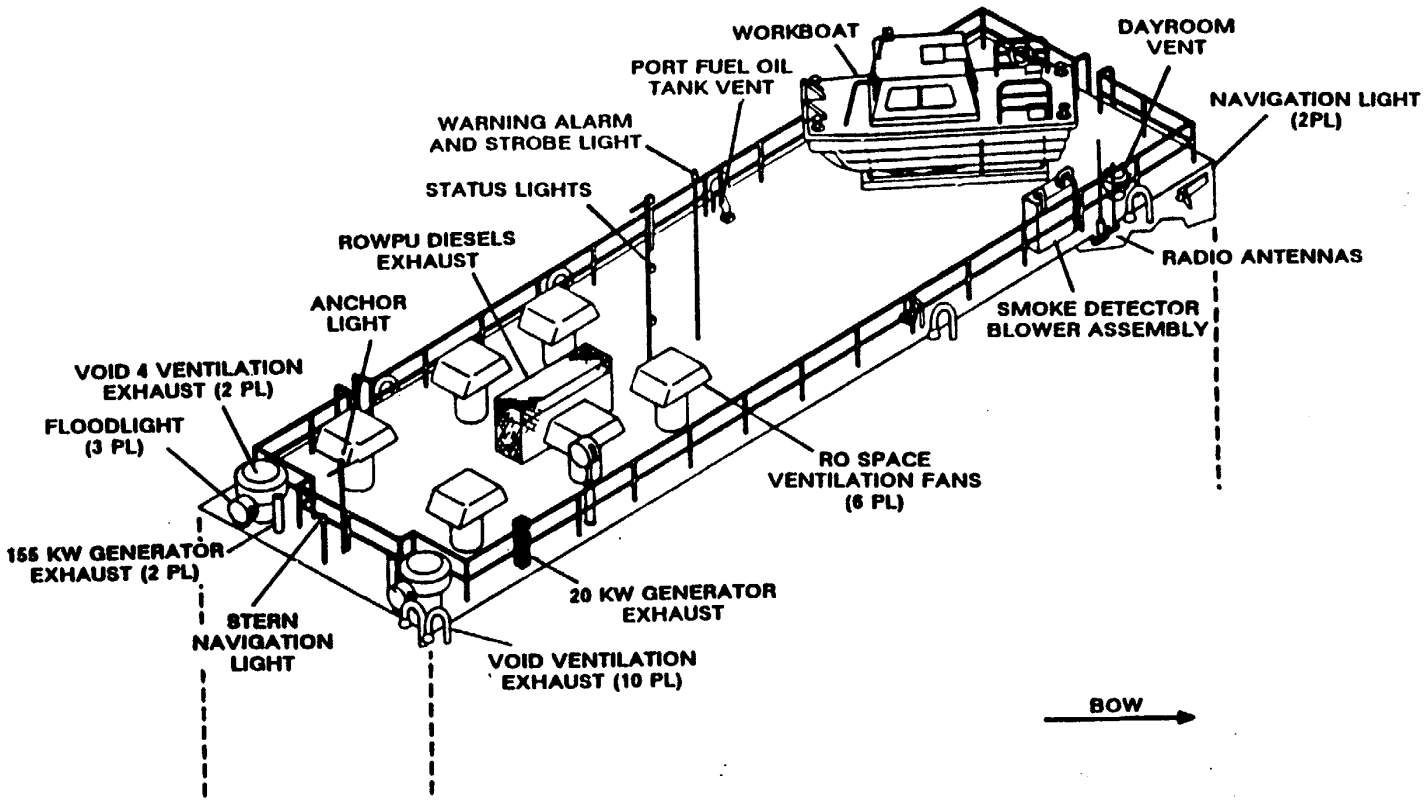


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment-Deckhouse Roof (Sheet 1 of 3)

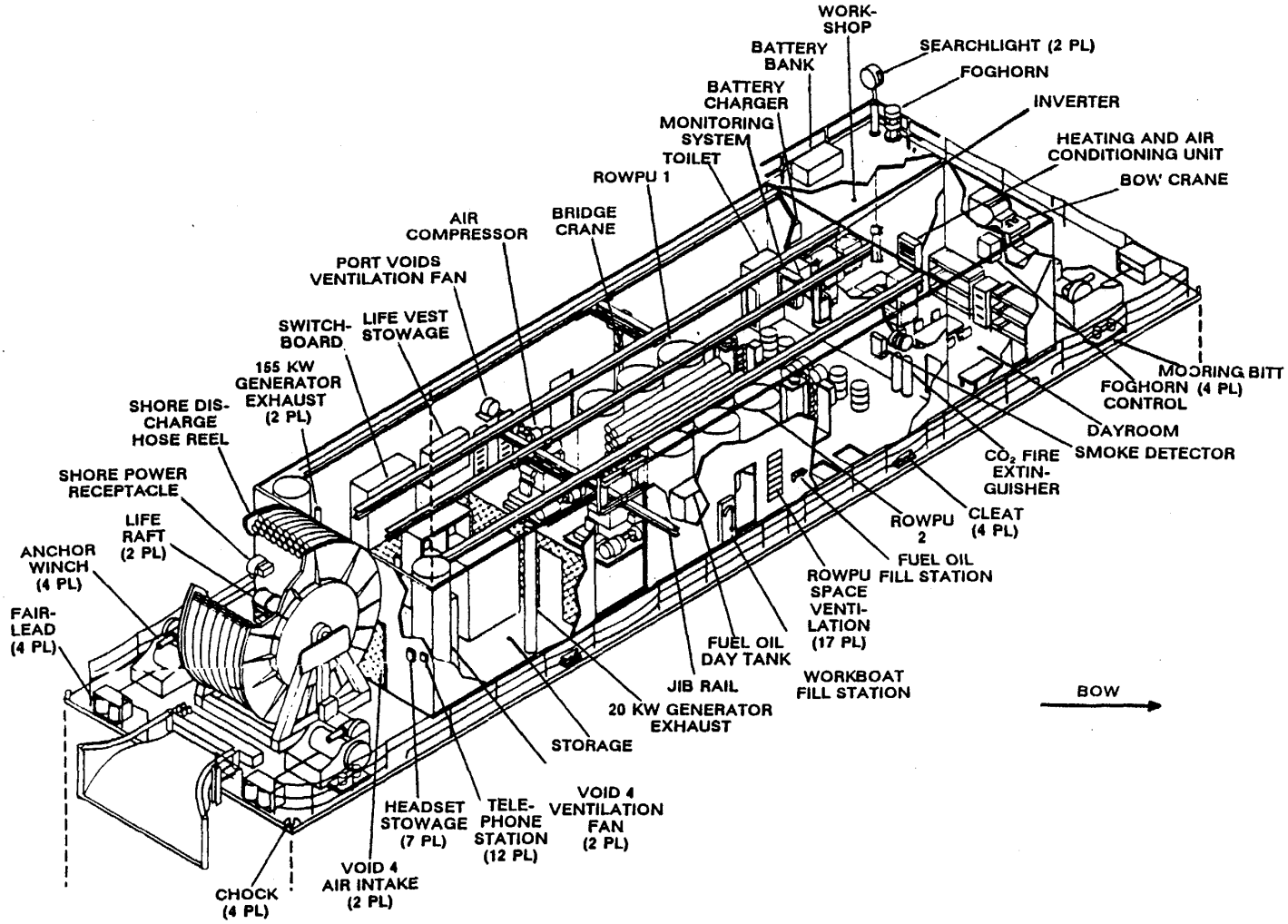


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment-Deckhouse Roof (Sheet 2 of 3)

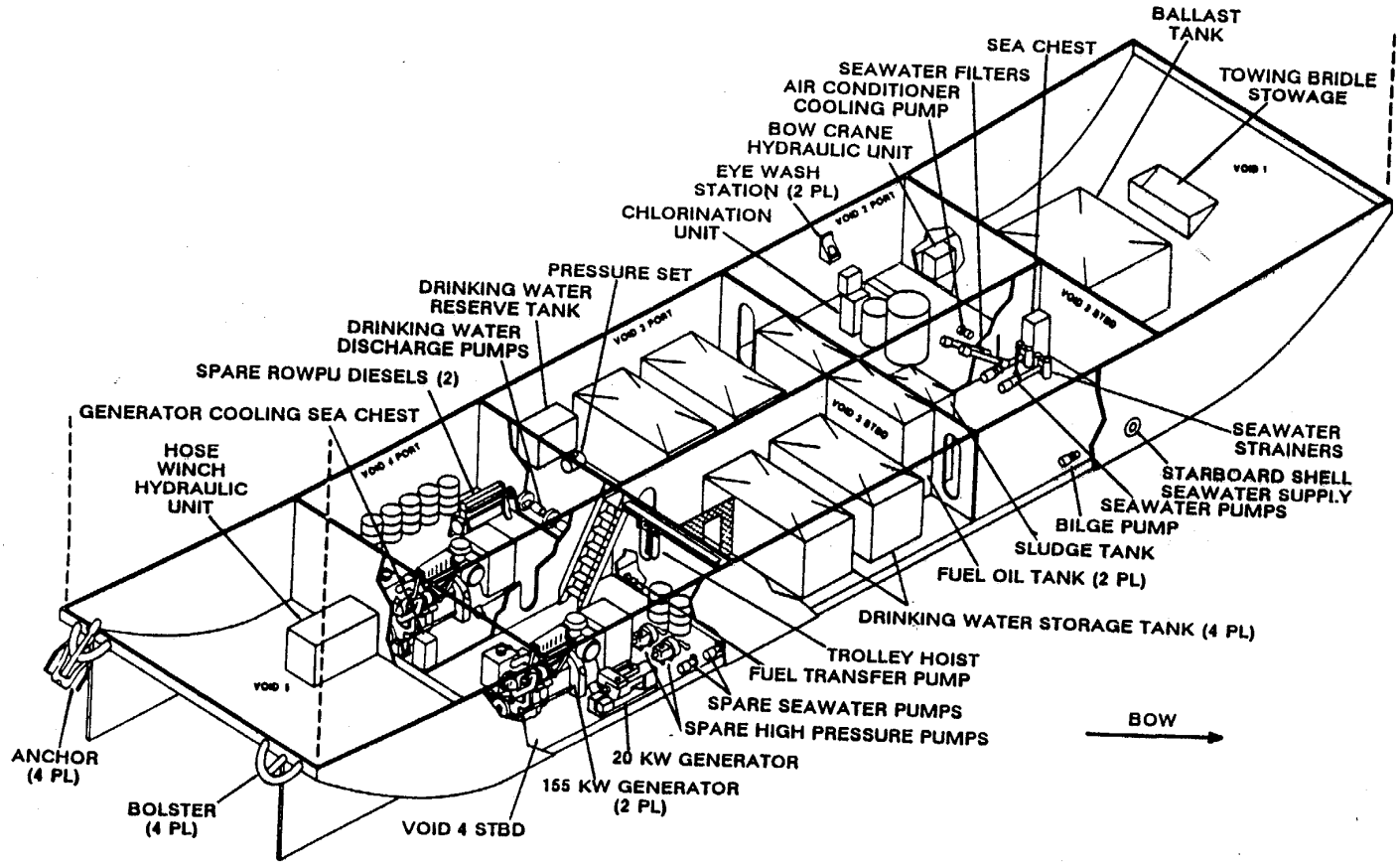


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment-Voids (Sheet 3 of 3)

Section II. Preventive Maintenance Checks and Services (PMCS)

1-7 Introduction to PMCS.

a. General.

(1) Systematic (B) before, (D) during, (A) after, and scheduled periodic PMCS are essential to ensure that the Reverse Osmosis Water Purification Barge is in operational readiness at all times. The purpose of the PMCS program is to discover and correct deficiencies and malfunctions before they cause serious damage or failure of the barges and their support systems. An effective PMCS program requires that operators report all unusual conditions noticed before, during and after operation as well as while performing periodic PMCS. All deficiencies and malfunctions discovered during maintenance inspections must be recorded, together with the corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

(2) A schedule for preventive maintenance inspections and service should be established and adhered to. When operating under unusual conditions, such as extreme heat or cold, it may be necessary to perform PMCS more frequently.

(3) Chapters 2-18 contain PMCS tables specific to each Reverse Osmosis Water Purification Barge support system. The PMCS items have been arranged and numbered in a logical sequence to provide for greater efficiency and the least amount of downtime required for maintenance.

b. PMCS columnar entries.

(1) Item Number Column. Checks and services are numbered in chronological order regardless of interval. This column is used as a source of item numbers for the "Item Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

(2) Interval Column. The interval columns tell you when to do a certain check or service: before, during, or after operation. Sometimes a dot may be placed in more than one interval column which would mean you should do the check or service at each of those intervals.

(3) Item to Be Inspected Column. This column lists the common name of the item to be inspected such as "Air Filters".

(4) Procedures Column. This column tells you how to do the required checks and services. Carefully follow these instructions.

(5) Equipment is Not Ready/Available if Column. This column tells you when and why your equipment cannot be used.

NOTE

The terms "Ready/Available" and "Mission Capable" refer to the same status: equipment is on hand and is able to perform its combat missions. (See DA PAM 738-750).

(6) Increased Inspections. Perform weekly as well as Before Operations PMCS if:

(a) You are the assigned operator and have not operated the item since the last weekly PMCS.

(b) You are operating the item for the first time.

(7) Leakage Definitions. In checking for fluid leaks, the following leakage definitions apply to all ROWPU barges and barge equipment, product water, and seawater leakage by class type.

(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 enough to cause drops to drip from the item being checked/inspected.

(c) Class III-Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

CAUTION

Equipment operation is allowable with minor leakages (Class I or II). However, .the fluid level or operating pressure of the item being checked/inspected must be considered. When in doubt, notify the shift leader or bargemaster.

When operating with Class I or Class II leaks, continue to check fluid levels as required by PMCS and operating instructions.

(8) The following fuel and hazardous material leakage procedures apply for any fuel, chemical, or bilge system.

WARNING

Class I, II or III leaks or seepage occurring in a fuel, chemical, or bilge container, tank, line, piping, or valve can cause fire or health hazards.

(a) If any leaks or seepage from a fuel, chemical, or bilge container, tank, or fluid line is detected, it must be immediately reported to the shift leader or bargemaster for corrective action.

(b) To prevent combustible or toxic fumes from collecting or contaminated material from spilling, exercise extreme caution after detecting leaks or seepage of flammable or hazardous material.

c. Continuous operation. When equipment must be kept in continuous operation for extended periods of time, check and service only those items that can be checked and serviced without disturbing operations. Perform complete checks and services when the equipment can be shut down.

d. Maintenance log. Always record the time and date of PMCS, any deficiencies noted, and corrective action taken in the PMCS log book.

CHAPTER 2 SEAWATER SYSTEM PMCS

Section I. General system information

2-1 Introduction. Chapter 2 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Barge Seawater System. Operating and maintenance procedures are described in detail in TM 55-1930-209-14&P-2. TM 55-1930-209-14&P-2, Appendix C also contains complete Preventive Maintenance I Checks and Services for the Seawater System.

2-2 Major components. The seawater system consists of the Reverse Osmosis Water Purification Unit (ROWPU) and ballast seawater supply, the air conditioner cooling and chlorination unit seawater supply, and the diesel engine generator cooling and seawater supply. System components include; seachests, seawater strainers, pressure gauges and regulators, seawater filters, pumps, water supply, ballast and chemical tanks, piping, valves, and associated electrical circuitry and control panels. Tables 2-1 through 2-3 list the major components of the seawater system, their basic function and location on the barge.

Table 2-1. Major Components of ROWPU and Ballast Seawater Supply

Component	Function	Location
Seachest	Supplies seawater for ROWPU processing, chlorination unit cooling, and heating and air conditioning unit cooling	Void 2 starboard
Seawater strainers 1 and 2	Remove foreign matter from seawater before water enters seawater pumps	Void 2 starboard
Seawater pumps 1 and 2	Draw seawater from seachest or shell penetration for processing in ROWPU's	Void 2 starboard
Seawater filters 1 and 2 from seawater before water enters ROWPU media filters	Filter additional foreign matter	Void 2 starboard
Ballast tank	Stores seawater for trimming barge	Void 1
Ballast tank liquid level indicator	Indicates seawater level in ballast tank	Void 2 starboard on forward bulkhead
Seawater pump OFF/ ON/START switches	For operation of seawater pumps	ROWPU space on ROWPU 1 and 2 control stations

Table 2-1. Major Components of ROWPU and Ballast Seawater Supply (Continued)

Component	Function	Location
Seawater pump local control switches	Provide local operation of seawater pumps	Void 2 starboard on centerline bulkhead near pumps
Strainer 1 inlet pressure gauge	Indicates pressure in strainer 1 input line	Void 2 starboard
Strainer 1 outlet pressure gauge	Indicates pressure in strainer 1 output line	Void 2 starboard
Strainer 2 inlet pressure gauge	Indicates pressure in strainer 2 input line	Void 2 starboard
Strainer 2 outlet pressure gauge	Indicates pressure in strainer 2 output line	Void 2 starboard

Table 2-2. Major Components of Air Conditioner Cooling Seawater and Chlorination Unit Seawater Supply

Component	Function	Location
Seawater strainer 3	Removes foreign matter from seawater before water enters air conditioning cooling pump	Void 2 port
Cooling pump	Draws seawater from seachest for cooling air conditioner and/or chlorination system	Void 2 port
Cooling pump motor controller	Allows manual operation of cooling pump	Void 2 port centerline bulkhead
Seawater pressure regulator	Controls pressure in chlorination unit	Void 2 port in sea-water line
Seawater pressure gauge	Indicates seawater pressure to chlorination unit	Void 2 port in sea-water line
Seawater filter 3	Filters seawater to chlorination unit	Void 2 port in sea-water line
Strainer 3 inlet pressure gauge	Indicates pressure in strainer 3 input line	Void 2 port
Strainer 3 outlet pressure gauge	Indicates pressure in strainer 3 output line	Void 2 port

Table 2-3. Major Components of Diesel Engine Generator Cooling Seawater

Component	Function	Location
Seachest	Supplies seawater for generator unit cooling	Void 4 port
Generator cooling strainer generator cooling pump	Removes foreign matter from seawater before water enters	Void 4 port
Cooling strainer inlet pressure gauge (Barges 2 and 3 only)	Indicates pressure in strainer input line	Void 4 port
Cooling strainer outlet pressure gauge (Barges 2 and 3 only)	Indicates pressure in strainer output line	Void 4 port
Inlet temperature gauge	Indicates temperature of cooling water entering each generator set	1 in void 4 port and 2 in void 4 starboard (one on each generator set)
Outlet temperature gauge	Indicates temperature of cooling water leaving each generator set	1 in void 4 port and 2 in void 4 starboard (one on each generator set except for the auxiliary generator on Barge 1)

2-3 Seawater System Description. The seawater system supplies seawater to the ROWPUs for processing, to the air conditioning unit for cooling, to the ballast tank (Figures 2-1 and 2-2) for barge trimming, to the chlorination unit for priming and cooling (Figure 2-3 and 2-4), and to the diesel generators (Figures 2-5 and 2-6) for cooling. There are three sources for supplying seawater; a forward seachest in void 2 starboard, a shell penetration in void 2 starboard and an aft seachest in void 4 port. The seachest in void 2 starboard supplies sufficient seawater to ROWPUs for processing when the barge is anchored in 15 feet or more of water. When anchored in from 10 to 15 feet of water, the starboard shell intake supplies sufficient seawater to ROWPUs for processing. When the barge is anchored or is pierside, seachest in void 2 starboard can be used to supply seawater for the air conditioner and the chlorination unit. Also, when the barge is anchored or pierside, the seachest in void 4 port can be used to supply seawater for cooling diesel generators.

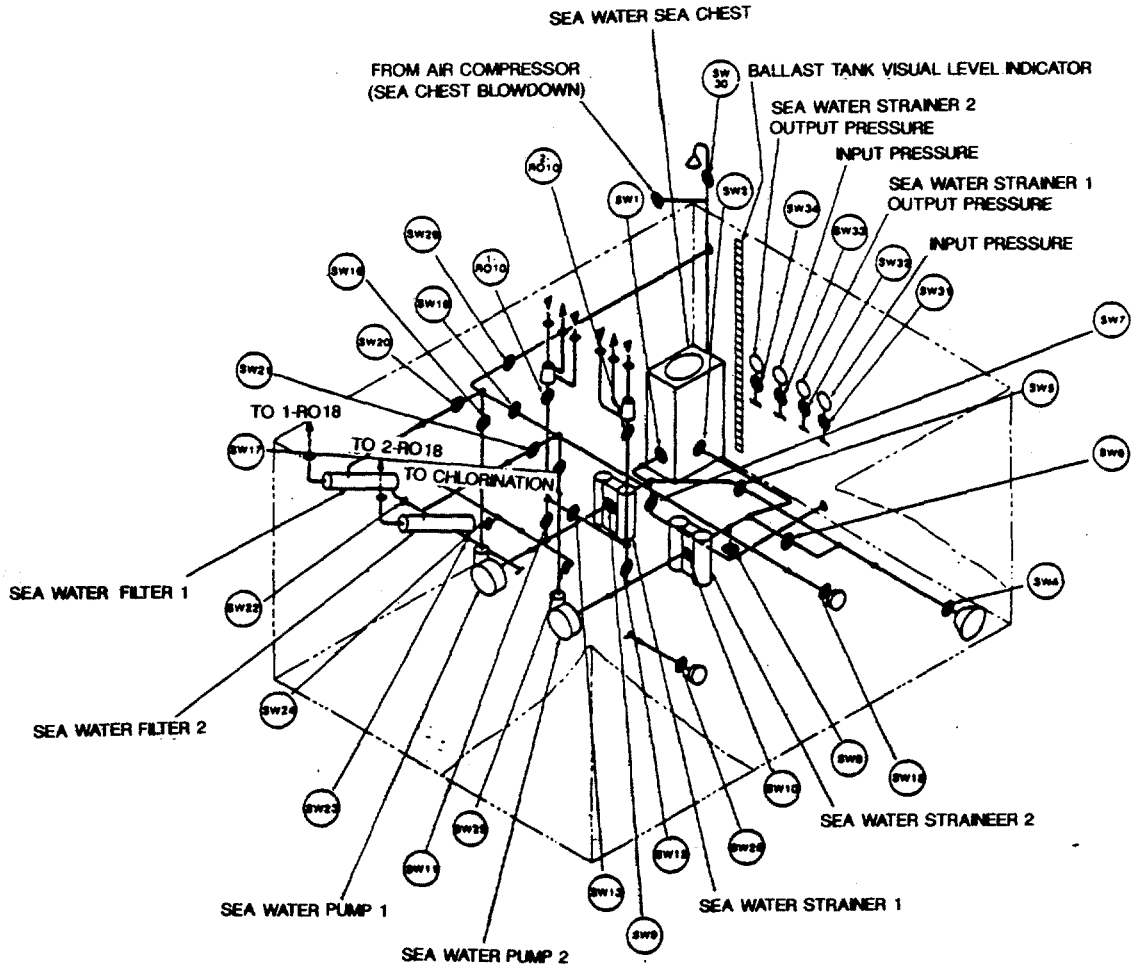


Figure 2-1. ROWPU and Ballast Seawater Supply

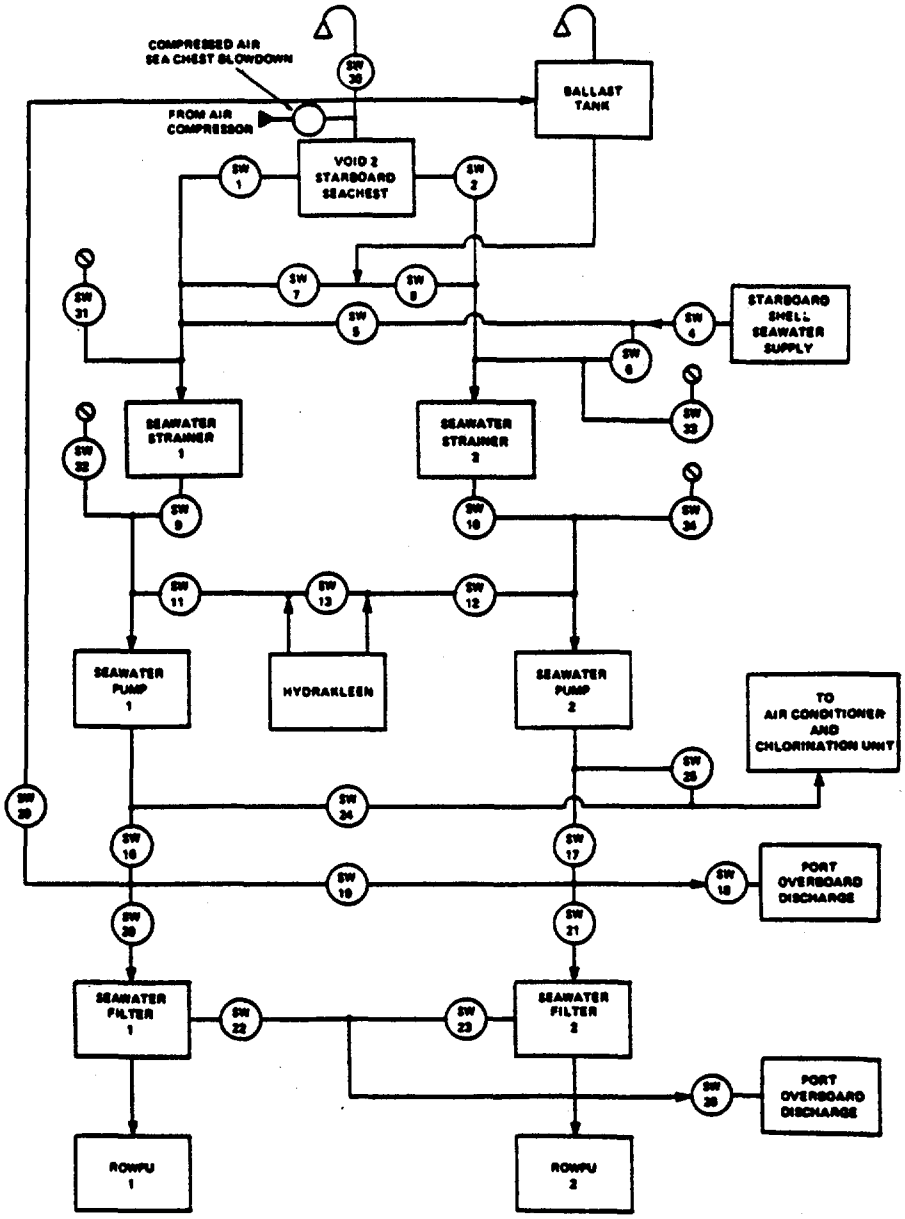


Figure 2-2. ROWPU and Ballast Seawater Supply Block Diagram

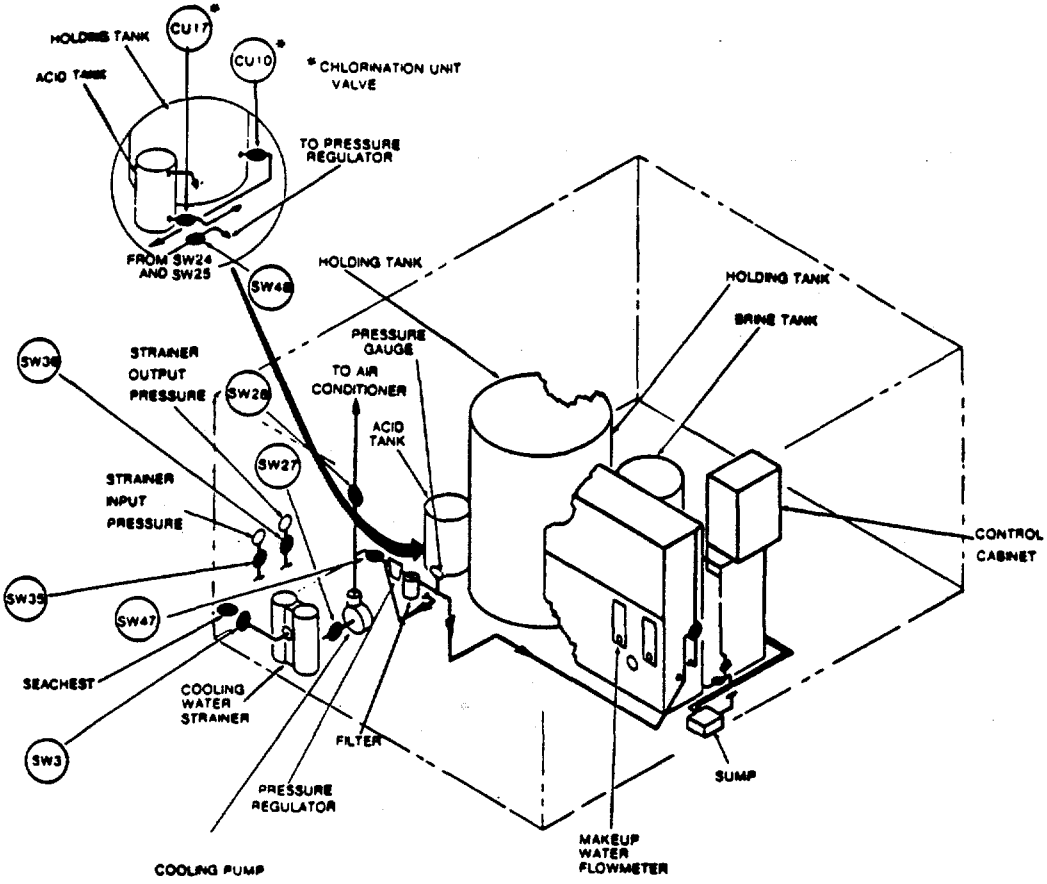


Figure 2-3. Air Conditioner Seawater Cooling and Chlorination Unit Supply

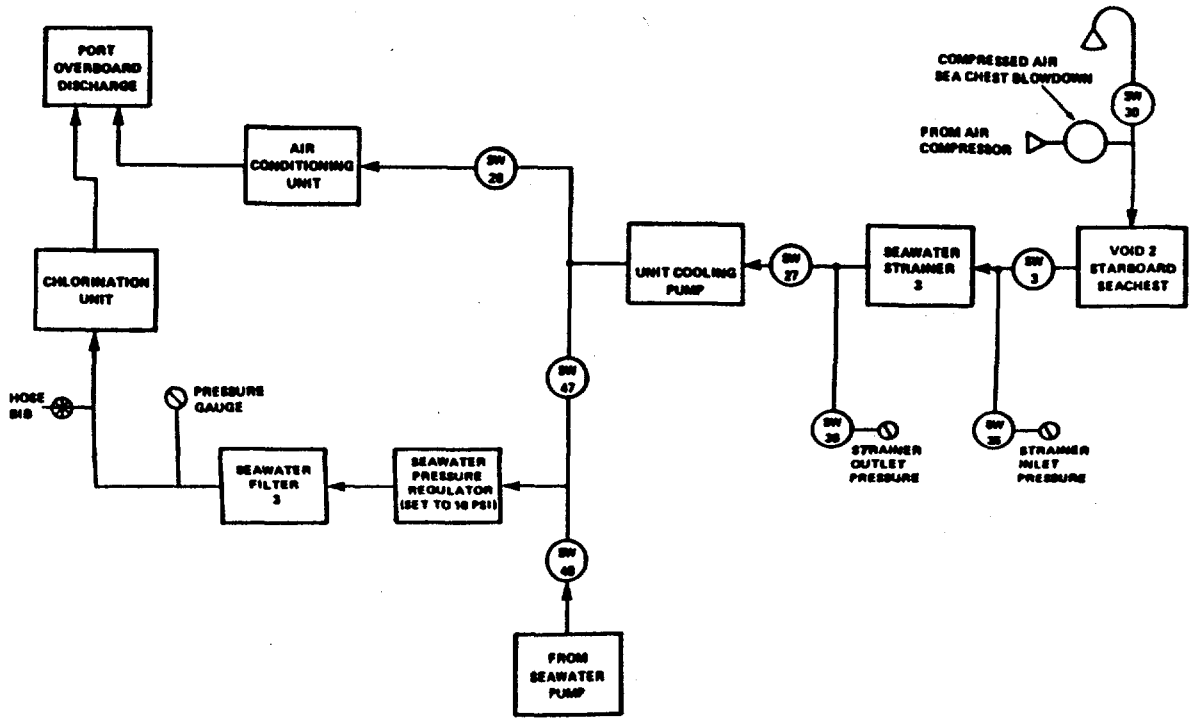


Figure 2-4. Air Conditioner and Chlorination Seawater Cooling Block Diagram

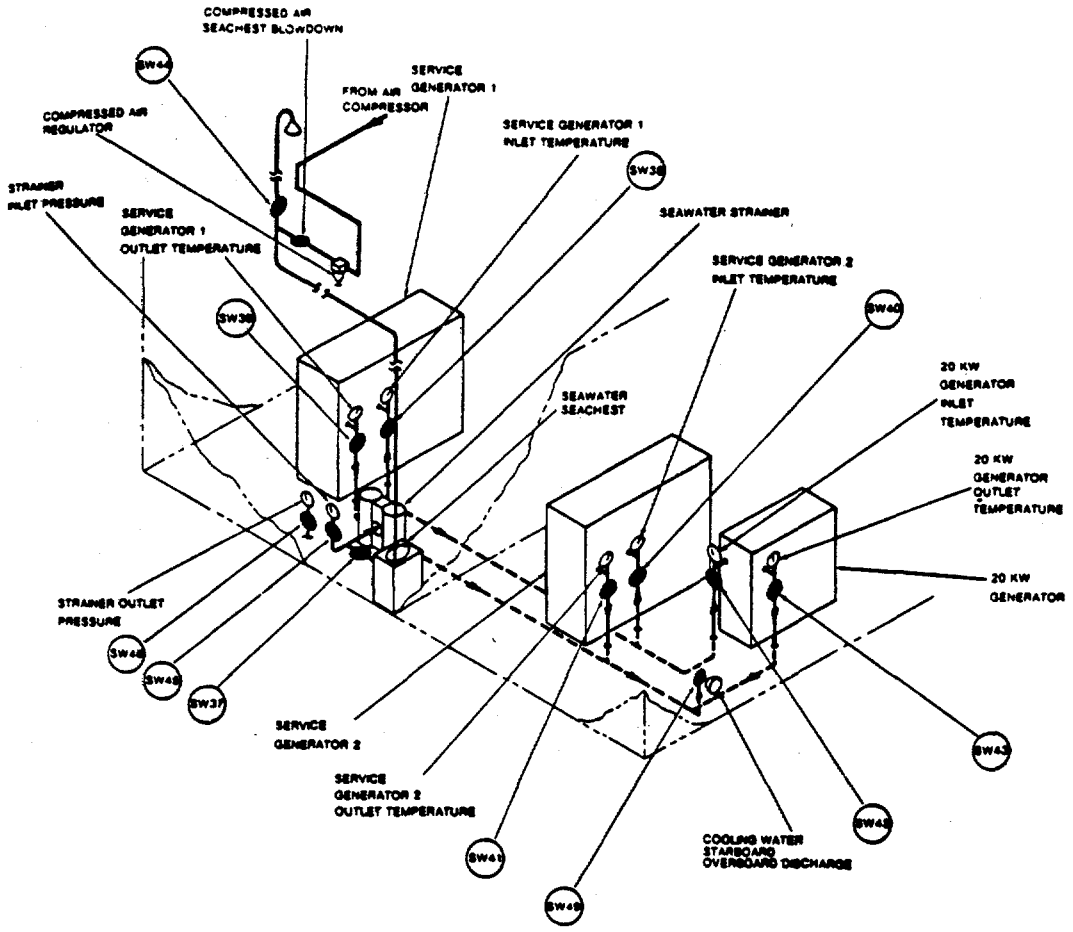


Figure 2-5. Diesel Engine Generator Seawater Cooling

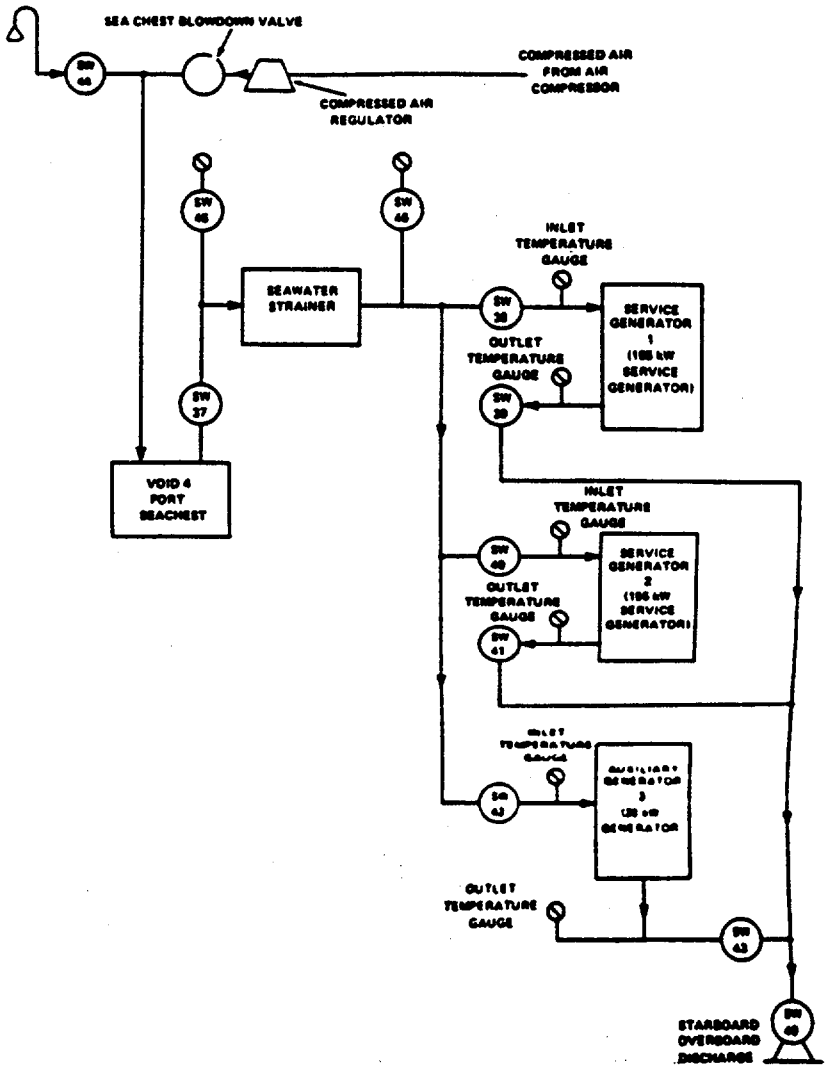


Figure 2-6. Diesel Generator Seawater Cooling Block Diagram

Section II

Table 2-4. Preventive Maintenance Checks and Services for Seawater System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										SEAWATER SYSTEM	**WARNINGS** **Be sure electrical power is OFF before performing-any maintenance or repair on this system. OPEN circuit breakers. Redtag circuit breakers or motor controller with "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe safety precautions listed at the beginning of this manual and in manufacturers' manuals/instructions.** **High voltages and hazardous materials are used in the operation of this equipment.** **The power supply to the equipment must be shut off before performing PMCS.** **NOTE** **Open (OFF) switchboard circuit breakers:** a. ROWPU 1 and 2 control station-switchboard circuit breakers P6 and P7 are open (OFF). b. Cooling pump controller-power panel 1 circuit breaker 1 P5 is open (OFF).	
1	•		•	•	•					All Components	a. Wipe components clean, especially gauges and control panels (void 2 starboard)	
	•		•	•							b. Check for leaks, paying special attention to all joints, valves, fittings and piping. Report leaks to shift leader or bargemaster for corrective action.	Class III leaks.
	•		•	•							c. Check for damage, especially to pressure gauges, filters and control panels.	Pressure gauge inoperable.

Table 2-4. Preventive Maintenance Checks and Services for Seawater System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	•		•	•							d. Check for loose or missing securements and fasteners. Tighten and replace as necessary.	Securements and/or fasteners loose or missing.
2	•			•						Wiring	a. Check wiring for loose connections and frayed cables. Secure as necessary. Repair or replace damaged cables using insulated tools.	Cables frayed.
		•									b. Visually check wiring for loose connections. If sparks are visible, immediately stop operation and report to shift leader or bargemaster.	Connections loose.
3	•	•		•						Seawater Strainer	a. Ensure that seawater strainer baskets (void 2 port and starboard) are clean and properly installed.	
				•							b. Change flow, remove and clean, or replace as follows: 1) To change flow: • Loosen diverter plug locking flange by turning locking T-bolt handle/ handlewheel counterclockwise. • Turn handle toward clean basket until it stops. **CAUTION** **Never operate strainer with diverter plug unseated. Sediment may collect under plug and prevent a tight seal causing damage to equipment.** • Tighten locking flange by turning locking T-bolt handle/handlewheel clockwise to seat diverter plug. Do not overtighten. 2) To remove and clean seawater basket: • Loosen yoke screw until yoke swings free.	

Table 2-4. Preventive Maintenance Checks and Services for Seawater System (Continued)

B -	**Before**	**D -**	**Daily**	**Q - Quarterly**
D -	**During**	**W -**	**Weekly**	**S - Semiannually**
A -	**After**	**M -**	**Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											• Pull basket handle straight up to remove basket. **CAUTIONS** **Do NOT leave basket well open for more than 10 minutes. Diverter plug does not completely cut off water and water will seep into open well.** **Do NOT use any petroleum based products to clean basket. Be careful not to damage basket. Do not use wire brush.** • Clean basket on weatherdeck with soft brush and flush with drinking water. **WARNINGS** **DO NOT use compressed air to clean clothing or work space. High pressure (HP) air turns small particles into dangerous projectiles that may injure people.** **When using compressed air to clean equipment, ALWAYS use protective shield to protect eyes and face from flying particles. Wear gloves and avoid skin damage by closing buttons and collars and rolling down shirt sleeves on work clothing.** • Use compressed air to discharge difficult particles. • Flush with drinking water. • Wipe interior of basket with clean cloth before reinstalling. 3) To replace strainer basket: • Lower cleaned or new basket into well. • Swing yoke over basket well until end fits over stud.	

Table 2-4. Preventive Maintenance Checks and Services for Seawater System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											Be sure O-rings on cover rest in machined grooves before tightening yoke screw securely. overtighten.	O-ring damaged or missing. Do not
					*						c. Lubricate seawater pump motors and fittings, if necessary, with grease as specified in manufacturer's manual.	
		*									d. Be alert for unusual equipment noises, smells or overheating that might indicate pending equipment or system maifunction.	
4	*	*		*						Seawater Pumps	a. When using seawater pumps 1 and 2 (void 2 starboard):	Class III leaks.
											1) Check seawater system components for normal operation and for leaks.	
											2) Inspect mounting bolts.	
											3) Regularly monitor seawater strainer input and output pressure gauges for:	
											* A pressure difference of 2-4 Hg between the pressure gauges is normal.	
											* If the pressure difference reaches 8 Hg, turn handle on strainer to route seawater flow through clean strainer basket.	
											* Remove and clean dirty strainer basket.	
			*								b. Check gauges and tubing for cracks or leakage.	Class Ill leaks.
5	*	*		*						Seawater Filters	a. Drain seawater filters as follows:	
											NOTE **Drain only filter(s) in active use. If only one ROWPU system is in use with just one seawater pump, then drain only filter(s) in use.** Clean Water Operations Drain filter 15 seconds every 8 hours.	

Table 2-4. Preventive Maintenance Checks and Services for Seawater System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
6		*	*							Cooling Pump	Dirty Water Operations Drain filter 15 seconds per each hour of operation. 1) Drain seawater filters by: Seawater Filter No. — Open seawater Valve No. 1 — 22 and 26 2 — 23 and 26 1 and 2 — 22, 23 and 26 2) After draining, dose valves SW22 and/or 23, and SW26. 3) Record time/date of purging in operations log. a. While supplying seawater to air conditioning unit and/or chlorinating system using cooling pump (void 2 port) perform the following: 1) Check for normal operation and leaks. 2) Check cooling water strainer input and output pressure gauges for normal operation. * Pressure differences between the two reading gauges is normal. * If pressure difference between the two gauges reaches 2 HG, turn handle on the cooling water strainer to route the seawater flow through dean strainer basket. * Remove and clean dirty strainer basket. * Record date/time of strainer basket change in operation log. 3) When regulator outlet pressure gauge drops 10 psi, replace in-line filters. 4) Inspect mounting bolts.	Class III leaks. Gauges inoperable.

Table 2-4. Preventive Maintenance Checks and Services for Seawater System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											* If chlorination unit valve CU11 is in OPEN position, turn to CLOSE position. * Close seawater valves SW47 and SW48. * Use in-line bib to drain excess water from line, then close hose bib. * Unscrew filter body and drain. Clean or replace filter element. * Replace filter body in housing. * Return CU11 and SW47 and SW48 to OPEN.	
		*		*							b. When supplying seawater for generator. cooling; 1) Check for normal operation and leaks. 2) Regularly monitor generator cooling strainer input and output pressure gauges (void 4 port on barges 2 and 3 only). * Pressure difference of 2-4 psi between the two groups is normal. * If pressure differences between input and output gauges reaches 8 psi, turn handle on generator cooling system to route seawater through clean strainer. * Remove and clean dirty strainer basket.	Class III leaks.
		*		*							c. Remove rust and corrosion. paint in accordance with TB 43-0144 as necessary. Do not paint thread or labels.	Touch up or
				*							d. Lubricate air conditioning cooling pump motor and fittings, if necessary, with grease in each oil hole as specified in the manufacturer's manual.	

Table 2-4. Preventive Maintenance Checks and Services for Seawater System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
									*	Liquid Level Indicator	e. Flush liquid level indicator with drinking water as follows: 1) Empty seawater ballast tank 2) Disconnect 2 pipe unions connecting indicator to tank. Remove indicator. 3) Flush indicator by allowing drinking water to flow into top pipe connector and out of bottom pipe connector. 4) Connect indicator to tank by tightening pipe unions. 5) Check for leaks and for indication on equipment monitoring system. Check visual flag indicator when ballast tank is refilled.	
				*							f. If seawater source is high in debris perform BLOWDOWN as follows: **CAUTION** **During seachest blowdown, be sure regulator 2 pressure gauge reads 40 psi. Reset if necessary by turning adjusting screw.** 1) Prestart * Make sure air compressor is operating. if not, start up in accordance with air compressor system operation. * Check that compressed air pressure regulator 2 is set to 40 psi as shown on regulator gauge. * Make sure seachest is not in use.	

Table 2-4. Preventive Maintenance Checks and Services for Seawater System (Continued)

B -	**Before**	**D -**	**Daily**	**Q -**	**Quarterly**
D -	**During**	**W -**	**Weekly**	**S -**	**Semiannually**
A -	**After**	**M -**	**Monthly**	**A -**	**Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											2) Operation * Close seawater (SW) valves SW11, SW2 and SW3. * Turn valve SW30 to position C, SEACHEST. * When regulator gauge reading stabilizes at 3-5 psi, turn valve SW30 to position A - VENT. **NOTE** **If seachest obstruction is not cleared, repeat BLOWDOWN procedures.** **WARNING** **Do not open seachest unless valve SW30 is in position A - VENT.**	

CHAPTER 3 REVERSE OSMOSIS WATER PURIFICATION UNIT (ROWPU) PMCS

Section I. General ROWPU information

3-1 Introduction. Chapter 3 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Unit used on the Reverse Osmosis Water Purification Barges. Operating and maintenance procedures for this unit are described in TM 55-1930-209-14&P-3. TM 55-1930-209-14&P-3, Appendix C also contains complete Preventive Maintenance Checks and Services for the ROWPU System.

3-2 Major components. The ROWPU System consists of two identical units, ROWPU 1 and ROWPU 2. Each unit includes a pretreatment skid assembly consisting of a control station, two chemical metering pumps, four water pressure gauges and a cartridge filter. It also includes a steel framework to support these components as well as the necessary electrical cabling switches, indicators, plus interconnecting piping and valves. Seawater pumps, components of the seawater system, provide pressure for the ROWPU system. Major components, their functions and their location on the barge are identified in Table 3-1. Table 3-2 contains a list of ROWPU system valves.

Table 3-1. ROWPU System Components

Component	Quantity	Function	Location
Pretreatment skid assembly	1 per ROWPU	Controls flow of sea-water and chemicals to media filters and cartridge filter assembly, indicates status of pre-treatment filters.	Forward of media filters
Seawater pump flow rate indicator F1	1 per ROWPU	Monitors flow rate of incoming seawater	On pretreatment skid
Pressure gauge P1	1 per ROWPU	Indicates pressure of media filter inlet water (seawater pump discharge)	On pretreatment skid top panel
Pressure gauge P2	1 per ROWPU	Indicates pressure of media filter outlet water and cartridge filter assembly inlet water	On pretreatment skid top panel
Pressure gauge P3	1 per ROWPU	Indicates water pressure at cartridge filter assembly outlet	On pretreatment skid top panel
Pressure gauge P4	1 per ROWPU	Indicates HP pump discharge pressure	On HP pump outlet
Pressure gauge P5	1 per ROWPU	Indicates brine discharge pressure	On pretreatment skid top panel

Table 3-1. ROWPU System Components (Continued)

Component	Quantity	Function	Location
Temperature gauge T1	1 per ROWPU	Monitors incoming sea-water temperature	Aft of pretreatment skid between RO18 and F1
Product water flowmeter F2	1 per ROWPU	Measures flow of product water to storage tanks	Aft of RO block assembly
Sight glass flow indicator	1 per ROWPU	Indicates presence of water flow from RO block	Brine discharge line
Media filter	3 per ROWPU	Filters water from seawater pump before entering cartridge filter assembly	Between pretreat-ment skid cartridge filter assembly and HP pump skid
Cartridge filter assembly	1 per ROWPU	Filters water from media filters before it enters HP pump	Mounted on pre-treatment skid
HP pump assembly	1 per ROWPU	Boosts pressure of chemically treated seawater to high level required for RO block processing	Aft of media filters and RO block assembly
RO block assembly	1 per ROWPU	Processes chemically treated seawater from HP pump	Inboard of media filters
Hydrakleen-20 (55 gallon cleaning agent drum)	1 per ROWPU	Cleans RO membrane elements	Inboard of Hydrapol 50 drum
Chemical metering pumps	2 per ROWPU	Adds measured amounts of chemicals (coagulant aid and inhibitor) to feedwater	On top of pretreat-ment skid
Hydrapol-50 (55 gallon coagulant drum)	1 per ROWPU	Added to seawater as a coagulant aid before entering media filters	Forward of pre-treatment skid
Hydrapol-100 (55 gallon inhibitor drum)	1 per ROWPU	Added to seawater as a scale inhibitor before entering cartridge filter assembly	Outboard of Hydrapol 50 drum

Table 3-2. ROWPU System Valves

Type	Valve	Location	Label Identification and Valve Function
3-in. 3-way ball valve	RO1	ROWPU space - on pretreatment skid	MEDIA FILTER 1 FLOW; allows seawater to flow to media filter 1 when making product water and when back-flushing media filter 1
3-in. 3-way ball valve	RO2	ROWPU space - on pretreatment skid	MEDIA FILTER 2 FLOW; allows seawater to flow to media filter 2 when making product water and when backflushing media filter 2
3-in. 3-way ball valve	RO3	ROWPU space - on pretreatment skid	MEDIA FILTER 3 FLOW; allows seawater to flow to media filter 3 when making product water and when backflushing media filter 3
3-in. 3-way ball valve	RO4	ROWPU space - on pretreatment skid	MEDIA FILTERS FLOW; allows seawater from media filters to flow to cartridge filter assembly and HP pump when making product water
2-in. globe diaphragm valve	R05	ROWPU space - on pretreatment skid	MEDIA FILTER BACKWASH; allows waste water to flow through RO6 and valve RO12 directly overboard during media filter backflushing
3-in. 2-way ball valve	RO6	ROWPU space - on pretreatment skid	MEDIA FILTER BACKWASH FLOW; allows adjusting media filter backflushing water flow to obtain optimum flow
2-in 2-way throttling valve	RO7	ROWPU space - in brine discharge line	BRINE THROTTLE VALVE; adjusts brine flow rate so that product water is 1/3 of seawater flow. Product water flow is controlled by adjusting valve RO7 and HP pump diesel engine speed
3/4-in. 2-way ball valve	RO8	ROWPU space - bottom of cartridge filter assembly	CARTRIDGE FILTER DRAIN for taking filtered seawater samples and draining cartridge filter assembly

Table 3-2. ROWPU System Valves (Continued)

Type	Valve	Location	Label Identification and Valve Function
3/4-in. 2-way ball valve	RO9	ROWPU space - on end of each pressure tube	PRODUCT WATER SAMPLING; for sampling product water in RO block pressure tube
4-in. gate valve	RO10	Void 2 starboard - above seawater pump	MEMBRANE CLEANING SOLUTION RECIRCULATION; allows membrane cleaning solution to recirculate through seawater pumps
3-in. gate valve	RO11	ROWPU space - in HP pump suction line	CARTRIDGE FILTER TO HIGH PRESSURE PUMP; allows filtered seawater from cartridge filter assembly to flow to HP pump
			Label Identification
3-in. gate valve	R012	ROWPU space - in-board of pretreatment skid	BRINE TO OVERBOARD DISCHARGE; allows brine to flow overboard from RO block when making product water
3/4 in. 2-way ball valve	RO13	ROWPU space - near membrane cleaning solution drum	MEMBRANE CLEANING SOLUTION RETURN; allows flow of membrane cleaning solution back to drum
3/4-in. 2-way ball valve	RO14	ROWPU space - near membrane cleaning solution drum	MEMBRANE CLEANING SOLUTION INPUT; allows membrane cleaning solution to flow from drum
3-in. gate valve	RO15	ROWPU space - between RO block and HP pump	PRODUCT WATER TO STORAGE TANKS; allows product water from RO block to flow to drinking water storage tank
3-in. gate valve	RO16	ROWPU space - between RO block and HP pump	HIGH PRESSURE PUMP BYPASS; allows flow of membrane cleaning solution to RO block bypassing HP pumps
1/4-in. 2-way ball valve	RO17	ROWPU space - in brine discharge piping near valve RO7	BRINE SAMPLING; for taking samples of brine output from RO block
3-in. gate valve	RO18	ROWPU space - in pretreatment skid seawater input piping	SEAWATER TO ROWPU; allows flow of seawater to ROWPU pretreatment skid

Table 3-2. ROWPU System Valves (Continued)

Type	Valves	Location	Label identification and Valve Function
3-in. gate valve	RO19 (Barges 2 and 3 only)	ROWPU space - in board of pretreatment skid	MEMBRANE CLEANING SOLUTION RECIRCULATION; during RO block membrane cleaning, allows cleaning solution to recirculate through seawater pump
3-in. gate valve	R020 (Barges 2 and 3 only)	ROWPU space - between RO block and HP pump	PRODUCT WATER TO OVERBOARD; allows flow of product water from RO block to overboard
4-in. gate valve	RO21 (Barges 2 and 3 only)	Void 3 port shell	PRODUCT WATER OVERBOARD DISCHARGE; allows product water from RO block and RO 20 to flow overboard

3-3 ROWPU System Description. The ROWPU system processes seawater or brackish water supplied by the seawater system to create drinking water. Chlorine is added to the processed water by the chlorination system. The resulting drinking water is then discharged into four drinking water storage tanks.

Section II

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System

B - Before **D - During** **A - After** **D - Daily** **W - Weekly** **M - Monthly** **Q - Quarterly** **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
										ROWPU SYSTEM		
1	*		*	*						Small Components	a. Wipe components clean, especially pressure gauges, flowmeters, indicators and control panels.	Gauges inoperable.
	*	*		*							b. Check for leaks, paying special attention to joints, valves, fittings and piping. Report uncorrectable leaks to shift leader or bargemaster.	Pressure drops below normal level.

Table 3.3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	*	*	*								c. Check for physical damage and broken welds. Notify shift leader or bargemaster of damage that will affect normal operation.	Damaged or broken welds.
	*	*		*							d. Check control station indicator lights for cracked or broken lenses and burned out bulbs. Replace lenses as follows 1) Open (OFF) switchboard circuit breaker P6 or P7 as appropriate. Red-tag circuit breaker with the following: "**WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE**." 2) Unscrew lense to expose light bulb. 3) Unscrew burned out bulb and install replacement bulb. 4) Reinstall lens. 5) Close (ON) switchboard circuit breaker P6 or P7 and remove red warning tag.	
	*	*									e. Check valves RO1 through RO7 for ease of operation. If any valve is inoperable, notify shift leader or bargemaster for repairs.	Valve inoperable.
	*	*									f. Check gauges for cracked or broken lenses. If damaged, notify shift leader or bargemaster for repairs.	Gauges cracked or broken.
	*	*	*								g. Check for loose or missing securements and fasteners. Tighten or replace as necessary.	Securements and/or fasteners missing or loose.
	*	*									h. Check flowmeter Fl and temperature gauge for cracks, leaks and operation.	
2	*	*								Chemical Metering Pumps and Tubing	a. Check chemical metering hoses for proper connection to pumps and drums. Check tubing and connections for leaks and cracks.	Meters inoperable.

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	*		*								b. Check fuse on metering pump. Replace if necessary.	Fuse blown.
	*		*								c. Make sure coagulant and inhibitor drums each contain at least 2 to 3 gal of liquid. If level is low, disconnect metering pump hoses and replace drums as follows: **WARNING** **Avoid exposure to coagulant and inhibitor. Wear safety goggles or face shield and rubber gloves when working around chemicals. If chemical Is swallowed, do not Induce vomiting. Drink water and seek medical attention. If chemical gets In eyes, flush with water and seek medical attention. If chemical contacts skin, wash with soapy water.** **NOTE** Pump section hose enters drum through the larger of two plastic lungs which are screwed into the drum. 1) Remove suction hose, with suction foot valve and weight attached, from empty drum. **NOTE** Drum breather (vent) hose enters drum through smaller plastic lung and hangs over side. 2) Remove breather hose. 3) Remove empty drums and replace with full drum. **CAUTION** **Carefully read labels on drums to insure that proper drum is being connected.**	Drums empty.

Table 3.3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											4) Use drum lifter and bridge crane with 2-ton hoist to obtain new drum. Position and secure drum in rack 5) Install section hose in drum through hole in large lung. Foot valve should be just above the drum bottom. 6) Connect other end of suction hose to chemical metering pump. 7) Insert breather hose into smaller lung in drum. Make sure hose does not siphon chemical onto the deck.	
								*			d. Check for chemical seepage around head disk. If seepage occurs replace pump diaphragm as follows: 1) Place pump stroke length knob at 100 percent. 2) Remove four screws and flatwashers holding dosing head to pump. Remove dosing head. 3) Place pump stroke length knob at 0 percent. Remove pump diaphragm by turning counterclockwise. The head disc will also fall free. 4) Install replacement diaphragm by holding head disc in position (drain slot on inside) and turning diaphragm clockwise onto plunger shaft end. Grasp perimeter of diaphragm and hand tighten. 5) Place pump stroke length knob at 100 percent. Rotate head disc until marker hole is up and drain slot is down. Align four screw holes with motor housing holes. 6) Install dosing head with arrow oriented up. Secure dosing head with four screws and flatwashers. Tighten screws evenly.	Class III leaks.

Table 3.3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After** **D - Daily** **W - Weekly** **M - Monthly** **Q - Quarterly** **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						*					e. Check tubing for cracks and leaks. If necessary, replace as follows: **WARNING** **Avoid exposure to coagulant and inhibitor. Wear safety goggles or faceshield and rubber gloves when working around chemicals. If chemical is swallowed, do not induce vomiting. Drink water and seek medical attention. If chemical gets In eyes, flush with water and seek medical attention. If chemical contacts skin, wash with soap and water.** 1) Cut new tubing the same length as bad tubing being replaced. 2) Install new tubing. 3) Slip carbon seal cartridge thru an O-ring positioned in a groove in the end bell manifold. Some oil on the O-ring will facilitate assembly. 4) Check pump lubricant level and add oil as necessary.	Class II leaks. *

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	*										f. Prime chemical metering pump after replacing coagulant or inhibitor. * Set stroke and speed controls to 100. * Set control station ONIOFF switch to ON. * Connect hose to purge air purge valve to collect any air or liquid. * While pump is priming open air purge valve. * Close air purge valve when fluid is free of air. * When pump is primed, turn control station ON/OFF switch to OFF. * Set chemical metering pump control: STROKE LENGTH / STROKE FREQUENCY Coagulant (P2) 50 35 Inhibitor (P4) 100 46	
	*										g. Make sure membrane cleaning agent (Hydrakleen) drums are full. If not, replace drums in accordance with item 4 below.	
3	*									Chemical Agent Drum	a. Check chemical agent drum.Replace if necessary as follows: **WARNING** **Wear safety goggles or face shield and rubber gloves while replacing chemical agent drums. Immediately wash off agent that contacts skin. If agent touches eyes, Immediately flush eyes at eye wash station. Wash spills with water. Dry mop to prevent slipping.** 1) Close valve RO13 on hose connected to large threaded drum bunghole. 2) Disconnect hose containing valve RO13.	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											3) Close valve RO14 on hose connected to small threaded drum bunghole. 4) Disconnect hose containing valve RO14. 5) Tip drum from vertical position and remove using drum lifter and bridge crane with 2-ton hoist. **NOTE** **Membrane cleaning agent drum is normally painted black.** 6) Use drum lifter and bridge crane with 2-ton hoist to position drum to stand so large bunghole is on bottom and small bunghole is on top when drum is tipped into place. 7) Connect hose containing valve RO14 to small threaded drum bunghole. 8) Connect hose containing valve RO13 to large threaded drum bunghole.	
4	*	*	*			*				Media Filters	a. Check each media filter unit for damage and leaks. Check vent valve for proper operation. Replace vent valve as required. Unscrew existing air vent on top of media tank and install new vent (P/N 51896-1).	
		*									b. Backwash and flush media filters when pressure difference between seawater pump discharge pressure gauge P1 and media filter output gauge P2 exceeds 35 psi, when MEDIA FILTER LIGHT OK light goes out, or when water sample taken from cartridge filter assembly drain valve RO8 is dirty.	Pressure in P1 and P2 exceeds 35 psi.

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
		*									c. If HP pump diesel engine is operating: 1) Position valve RO15 from product water flow to overboard flow. **CAUTION** **Do not abruptly stop engine except in an emergency. When shutting down engine, always reduce throttle and operate engine for 5 minutes at low idle to allow hot areas to cool and turbocharger to slow down while maintaining oil pressure on turbine shaft**. 2) Gradually reduce HP pump diesel engine throttle setting to IDLE. Leave engine idling and check oil and temperature gauges. 3) Open throttling RO7. 4) Stop coagulant pump and inhibitor pump at control station by setting ON/OFF switches to OFF. 5) After HP pump diesel engine has idled for 5.minutes, stop engine by pushing in shutdown lever. 6) Stop seawater pump by turning OFF/ON/START switch on control station to OFF. d. Backwash media filter 1: 1) Position RO valves as indicated below: O = Open X = Closed 1/20 = 1/2 open A = Position A B = Position B C = Position C RO Valve No. — Valve Position 1 — B 2 — A 3 — A 4 — C 5 — X 6 — 1/20 7 — X 12 — O 18 — O 19 — X	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											2) Start seawater pump by turning pump OFF/ON/START switch on control station to START and then to ON. 3) Adjust valve RO6 to obtain slow backwash flow rate of 162 gpm at seawater flow indicator F1 and a temperature reading of 80°F at seawater temperature gauge T1. Exact flow rate depends on actual temperature reading. Cooler water requires less flow. TEMPERATURE (Backwash) FLOW RATE Temperature T1 (F) / Slow backwash F1 flow rate (qpm) / Fast backwash F1 flow rate (qpm) 55 / 115 / 180 60 / 125 / 200 65 / 135 / 220 70 / 144 / 240 75 / 153 / 255 80 / 162 / 270 85 / 170 / 285 90 / 177 / 300 95 / 184 / 315 100 / 191 / 325 105 / 198 / 334 110 / 204 / 342 115 / 210 / 350 120 / 216 / 355 125 / 222 / 360 4) Observe condition of water at brine flow indicator.After 5 minutes or when water is clear, open valve RO6 to obtain fast backwash flow rate corresponding to water temperature at T1.	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											5) After 2 minutes of fast backwash, partially close valve RO6 to obtain slow backwash flow rate at Fl. 6) After 2 minutes of slow backwash, stop seawater pump by turning pump ON/OFF/START switch on control station to OFF. e. Backwash media filter 2: 1) Position RO valves as indicated below: O = Open X = Closed 1/20 = 1/2 open A = Position A B = Position B C = Position C RO Valve No. — Valve Position 1 — A 2 — B 3 — A 4 — C 5 — X 6 — 1/20 7 — X 12 — O 18 — O 19 — X 2) Follow procedures shown above. f. Backwash media filter 3: 1) Position RO valves as indicated below: O = Open X =Closed 1/20 = 1/2open RO Valve No. — Valve Position 1 — A 2 — A 3 — B 4 — C 5 — X 6 — 1/20 7 — X 12 — O 18 — O 19 — X	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											2) Follow procedures above. g. Flush each media filter simultaneously: 1) Position RO valves as indicated below: O = Open X = Closed 1/20 = 1/2 open A = Position A B = Position B C = Position C RO Valve No. — Valve Position 1 — A 2 — A 3 — A 4 — C 5 — O 6 — O 7 — X 12 — O 18 — O 19 — X 2) Start seawater pump by turning pump ON/OFF/START switch on control station to START and then to ON. 3) After 10 minutes of flushing, stop seawater pump by turning pump ON/OFF/START switch to OFF.	
5	*	*								RO Block Pressure Tube Membrane	**NOTE** Clean RO block tube membranes when the pressure difference between HP pump discharge pressure gauge P4 and brine discharge pressure gauge P5 exceeds 25 psi. Procedures are for normal cleaning operations using seawater pump 1 for cleaning ROWPU 1 RO Block and seawater pump 2 for cleaning ROWPU 2 RO Block.	Pressure between P4 and P5 exceeds 25 psi.

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	*	*	*			*					a. Check RO block for cracks and leaks. When replacement of pressure tube seals is necessary, notify shift leader or bargemaster.	Class III leaks.
						*					b. Spray end cap on RO block with silicone spray to protect against rust.	
	*		*		*						c. Check system wiring for damage and loose connections. Tighten or replace as required.	Damaged wire.
		*									d. If the HP pump diesel engine is operating:	
											1) Position valve RO15 from product water flow to overboard flow.	
											2) Gradually reduce HP pump diesel engine throttle setting to IDLE. Leave engine idling.	
											3) Open throttle valve R07.	
											4) Stop coagulant pump and inhibitor pump at control station by setting ON/ OFF switches to OFF.	
			*								e. Clean RO block membrane:	
											WARNING **Wear safety goggles or face shield and rubber gloves while replacing chemical agent drums. Immediately wash off agent that contacts skin. If agent touches eyes, immediately flush eyes at eye wash station. Wash spills with water. Dry mop to prevent slipping.**	
											1) Install full drum of membrane cleaning agent (Hydraldeen-20).	
											2) Close valve RO13 on hose connected to large threaded drum bunghole.	
											3) Disconnect hose containing valve RO13.	
											4) Close valve RO14 on hose connected to small threaded drum bunghole.	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											6) Tip drum from vertical position and remove using drum lifter and bridge crane with 2-ton hoist. 7) Use drum lifter and bridge crane with 2-ton hoist to position drum to stand so large bunghole in on bottom and small bunghole is on top when drum is tipped into place. 8) Connect hose containing valve R014 to small threaded drum bunghole. 9) Connect hose containing valve RO 13 to large threaded drum bunghole. 10) To clean ROWPU 1, use seawater pump 1. Position seawater (SW) valves: O = Open X =Closed SW Valve No. Valve Position 1 0 5 X 7 X 9 0 11 0 13 X 16 O 19 X 20 O 22 X 24 X 29 X	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											11) To clean ROWPU 2, use seawater pump 2. Position seawater (SW) valves: O = Open X = Closed SW Valve No. — Valve Position 2 — O 6 — X 8 — X 10 — 0 12 — O 13 — X 17 — O 18 — X 19 — X 21 — O 23 — X 25 — X 12) Position RO valves: O = Open X = Closed A = Position A C = Position C RO Valve No. — Valve Position 1 — C 2 — C 3 — C 4 — C 5 — X 6 — X 7 — X 8 — X 9 — X 10 — O 11 — X 12 — X 13 — X 14 — X 15 — Overboard 16 — O 17 — X 18 — O 19 — O 20 — O	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After** **D - Daily** **W - Weekly** **M - Monthly** **Q - Quarterly** **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	*										13) Open vent on top of RO block to allow air to escape. 14) Start seawater pump 1 for ROWPU 1 or pump 2 for ROWPU 2 by setting OFF/ON/START switch on control station to ON. 15) Close seawater valve SW9 for ROWPU 1 or SW10 for ROWPU 2 for ROWPU to allow water/Hydrakleen solution to recirculate. 16) Open valves RO13 and RO14 to allow Hydrakleen to drain out and return to drum. 17) After water circulates for 15 minutes, stop seawater pump. 18) Close valves RO13 and RO14. 19) Disconnect used drum of Hydrakleen-20 and attach a new drum as described in b.1 through b.9. 20) Open valves RO13 and RO14. 21) Start seawater pump. 22) Read seawater temperature at temperature gauge T1 to determine how long seawater pump should operate. Use the following table. Seawater Pump Operating Time Temperature at T1 (F) — Operating Time 60 or less — 2 hrs. 40 min. 65 — 2 hrs. 20 min. 70 — 2 hrs. 75 — 1 hr. 40 min. 80 — 1 hr. 30 min. 85 — 1 hr. 30min. 90 or more — 1 hr. 10 min.	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	*										23) After allotted time, stop seawater pump. 24) Close valves RO13 and R014. 25) Open valve R012 and close valve R019. 26) Open seawater valve SW9 for ROWPU 1 or SW10 for ROWPU 2. 27) Start seawater pump to flush RO Block. 28) Flush for 20 minutes and take a water sample at valve RO17. Use a water test kit to check pH. If pH not acceptable, flush RO block membrane for 30 minutes more and test again. Continue flushing until pH is acceptable (pH 7). 29) Stop seawater pump.	pH is 3.5 or below or element still dirty.
6	*		*							Cartridge Filter Assembly	a. Charge cartridge filter assembly when pressure difference between media filter output pressure gauge P2 and cartridge filter assembly output pressure gauge P3 exceeds 12 psi or when CARTRIDGE FILTER OK light goes out. **NOTE** **A minimum of 3 personnel and a bridge crane with a 2-ton hoist Is required to' change cartridge filter assembly (filter elements).**	CARTRIDGE FILTER OK light goes out or P3 gauge exceeds 12 psi.

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	*										b. If the HP pump diesel engine is operating: 1) Position valve RO15 from product water flow to overboard flow. 2) Gradually reduce HP pump diesel engine throttle setting to IDLE. Leave engine idling. 3) Open throttling valve R07. 4) Stop coagulant pump and inhibitor pump at control station by setting ON/ OFF switch to OFF. 5) After HP pump diesel engine has idled for 5 minutes, stop engine by pushing in on shutdown lever. 6) Stop seawater pump by turning pump OFF/ON/START switch on control panel to OFF. c. To remove cartridge case assembly (filter elements): 1) Turn valve R04 to position C (OFF) to prevent seawater flow to cartridge filter assembly. 2) Drain cartridge filter assembly by opening valve R08. 3) Disconnect camlock coupling on cartridge filter assembly output line. 4) Remove four hex nuts on top end assembly. **WARNING** **Do not manhandle heavy components. Use a bridge crane to lift heavy components.**	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	*										5) Use bridge crane and 2-ton hoist to remove top end assembly from filter housing and place it out of the immediate work area. 6) Attach a lifting rig to U-bolts of cartridge cage assembly. 7) Use bridge crane and 2-ton hoist to lift cartridge cage assembly while slowly rotating it to overcome O-ring resistance. As assembly clears housing, attach lines to the assembly to control movement. Lift assembly vertically and slowly to prevent damage. Move assembly away from filter housing, lower to deck and remove hoist.	
	*		*								d. To install cartridge cage assembly: 1) Check that O-rings on cartridge cage assembly are in their grooves and lightly lubricated with silicone-based lubricant. Install new O-rings if damaged. 2) Attach lifting rig to cartridge cage assembly U-bolts. Use bridge crane with 2-ton hoist to lift assembly and guide it over filter housing. **CAUTION** **Be careful not to damage 0-ring when installing cartridge assembly.** 3) Carefully lower assembly into the filter housing. Rotate assembly slightly, if necessary, to get O-rings into filter housing without damage. 4) Attach lifting rig to top end of assembly and lower onto filter housing. Insert tie rods into tie rod holes and align camlock connections.	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	*		*								5) Install hex nuts on tie rods and torque evenly to 10 lb/ft. 6) Connect camlock coupling. 7) Close valve RO8. 8) Return R04 to service position.	
7										Cartridge Filter Element	Check cartridge filter element for cracks, leaks, and other damage. If necessary repair or replace as follows: **NOTE** **To replace cartridge filter on filter element you will need:** **12 new filter elements (P/N 52088)** **1 set of socket wrenches and a torque wrench** **12 upper seals (spare) (Hydraunatics #52088)** **12 lower seals (spare) (Hydrautics #52084)** **3 0-rings (spare)** **(Parker 2-452C557-70)** **1 Stiff bristle brush and clean, lint-free cloths.** **Clean workplace.** a. Invert cartridge cage assembly and stand on three U-Bolts. b. Remove three 5/16 hex nuts, six washers , and three springs. Lift and lower spider from tie rods. **CAUTION** **Do not remove upper and lower seals. If seals come loose, be sure to install upper seals on upper spider and lower seals on lower spider. Failure to install seals correctly may result in water leakage.**	Cracks or leaks in cartridge filter element.
	*	*										
	*	*										

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	*	*									c. Remove used filter elements. Keep upper seals separate from lower seals. **NOTE** **Examine used filter elements. If they contain large amounts of sand the frequency of replacement has increased, check media filters for internal damage.**	
	*	*									d. Discard used filter elements.	
	*	*									e. Clean internal parts and inside of filter housing with a stiff bristle brush and clean water and dry with clean, lint-free cloths.	
	*	*									f. Inspect upper and lower spiders. Check seals for damage and replace if nicked. Place new or reused upper seals in sockets on upper spider. Place lower seals on guide pins on lower spider.	Spiders are bent.
	*	*									g. Place three new filter elements in three center sockets on upper spider. Make sure upper seals remain properly seated.	
	*	*									h. Place lower spider on assembly so that tie rod holes on spider align with tie rods and center guide pins just engage filter core tubes.	
	*		*								i. Make sure seals remain in sockets and place nine outer filter elements in outer sockets on upper spider. Make sure upper and lower seals are properly seated for each filter.	
	*	*									j. Install six washers, three springs, and three hex nuts on spider tie rod ends. Hand tighten until nuts contact top washers. Tighten hex nuts evenly another seven turns each to compress but not to completely flatten spring.	Springs are missing.

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
8										DIESEL ENGINE HIGH PRESSURE PUMP		
8A	•		•	•						All Components	a. Wipe off oil, grease and other foreign matter. Check for cracks, leaks, and loose or missing hardware.	Class III leaks.
	•			•							b. Check gauges for cracked or broken lenses. If damaged, notify shift leader or bargemaster for repairs.	
8B	•	•		•						Crankcase	a. Check engine crankcase oil level. Add oil (OE/HDO-MIL-L-2104/MIL-L46002), if necessary. Fill until level is between FULL and ADD marks on dipstick.	Oil level to low.*
											b. Change HP pump diesel engine oil quarterly or every 250 meter hours, or as AOAP indicates. 1) Drain engine crankcase oil as follows: (a) Barge 1 - Open crankcase drain valve BD12 to drain ROWPU 1 engine and BD13 to drain ROWPU 2 engine. (b) Barges 2 and 3 - Connect one end of a utility hose to the quick-disconnect at crankcase drain. Connect other end to the quick-disconnect at crankcase drain oil disposal. Open valves BD12 and BD19 when draining ROWPU 2 engine. (c) Start bilge pump and run until crankcase is empty. Turn bilge pump off and close valve BD12 or BD13 and BD19. Disconnect utility hose, flush it clean, and return it to stowage or allow gravity to drain hose.	Oil level to low.*

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											2) Remove and replace filter as follows: (a) Wipe dirt from oil filter. (b) Remove and discard filter. (c) Clean the filter base and remove all old gasket material. (d) Lightly coat filter gasket with engine oil. (e) Install new filter. Hand tighten an additional 3/4 turn after gasket contacts the base. 3) Fill crankcase with 9 gal of oil. 4) Start and run engine to operating temperature. Check for leaks.	
	•	•									c. Check pump lubricant level in sight glass. If necessary, unscrew HP pump oil breather and add oil (OE/HDO-MIL-L-2104) until level is between MAX and MIN marks on oil level gauge. **NOTE** The caterpillar model 3406T1 engine has been modified to accept Installation of the Oildex filtered and controlled crankcase ventilation system. d. Empty and clean glass collecting bowl located at bottom of filtering system as follows: 2) Remove bowl by pulling down metal tab of cage holding the bowl. 3) Unsnap wire cage on each side of bowl bottom. 4) Remove bowl; wipe with dean cloth. Do not use abrasives.	Oil level to low.

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
				•							5) Replace bowl in reverse order. e. Change engine crankcase filter system vapor filter element as follows: 1) Snap off two metal clips on top of filter body. 2) Lift off top and remove element. Discard and replace with new element. 3) Reinstall in reverse order.	
8C	•			•						Power Takeoff	a. Check power takeoff oil lever. If necessary, add oil (OE/HDO-MIL-L-2104) until level is between LOW and FULL marks on dipstick.	Oil level to low.
			•								b. Grease belt tensioner bearings as follows: 1) Clean grease from belt tensioner bearings. Grease fittings. 2) Use hand pump grease gun to pump grease (MIL-G-10924) into bearings until grease appears. 3) Wipe off excess grease.	
8D						•				Oil Breather	a. Check oil breather for dirt. Clean as follows: 1) Remove wingnut lockwasher, and flatwasher from oil breather and remove oil breather top. 2) Remove element from oil breather. 3) Wipe all dirt from oil breather top and body. **WARNING** Solvent may cause toxic fumes. Work only In a well-ventilated area. Avoid skin and eye contact. Do not breathe vapors. Solvent Is flammable Do not bring open flame or sparks near solvent	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											4) Clean oil breather element with dry-cleaning solvent, type 2 (A-A-711). Dry thoroughly. 5) Install oil breather element on body. 6) Install oil breather top, flatwasher, lockwasher, and wingnut.	
8E				•						RO Block Throttling Valve R07	a. Grease RO block throttling valve R07 as follows: 1) Clean grease from RO block throttling valve R07 using a clean, lint-free cloth. 2) Use hand pump grease gun to pump grease (MIL-G-10924) into bearings until grease appears. 3) Wipe off excess grease.	
8F	•			•						Alternator	a. Check alternator belt for looseness, frays or cracks. Replace as necessary. If loose, adjust as follows: 1) Remove three nuts, bolts, lockwashers, and flatwashers. Remove alternator guard. 2) Place straight edges from vibration damper pulley to alternator pulley to adjust. b. Check alternator for loose mounting hardware and wire connections. Tighten or replace as necessary. c. Check for damaged alternator. Alternator • If necessary, replace as follows: inoperable. **WARNING** **To prevent electric shock, ensure battery is disconnected before performing this procedure.**	Alternator belt is loose, frayed or cracked.

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						•					1) Removal (a) Disconnect battery. (b) Remove alternator cover. (c) Remove jam nut and loosen alternator adjusting nut. (d) Loosen mounting nut. (e) Remove bolt and flatwasher from mounting adjustment block (f) Push alternator toward engine. Remove fan belt from vibration damper and alternator pulleys. (g) Tag and disconnect two wires from alternator. (h) Remove two nuts, four flatwashers, two lockwashers, and two mounting bolts. (i) Remove alternator. 2) Installation (a) Install alternator. Install two mounting bolts, four fiatwashers, two lockwashers, and two nuts. Hand tighten. (b) Install bolt and flatwasher on mounting adjustment block (c) Install adjusting arm and jam nut Do not tighten. (d) Install fan belt on vibration damper and alternator pulleys. (e) Connect two wires to alternator and remove tags. (f) Adjust fan belt as instructed above.	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
							•				(g) Connect battery. (h) Test alternator as follows using a multimeter: (1) Remove battery cover. (2) Set multimeter on 50 V scale (use 100 V scale if meter does not have 50 V scale). (3) Connect positive (+) lead to alternator cable that comnnects to positive battery terminal. (4) Connect negative (-) lead to alternator cable that connects to negative battery terminal. (5) Start engine (TM 55-1930-209-14 & P-3). (6) Multimeter reading should be 24 to 28 V. If not, replace alternator as described in removal procedure above.	
8G	•			•						Cooling System	**WARNING** **At operating temperatures, engine coolant Is hot under pressure. It also contains alkaline materials harmful to eyes and skin. To avoid personal Injury check coolant level only when engine is stopped and radiator cap is cool enough to be touched with a bare hand. Should engine coolant come in contact with eyes or skin, Immediately flush affected area with clean water and seek medical attention, if necessary.** a. Check coolant level when engine is cool. Inspect filler cap gasket Replace if damaged. Add coolant if necessary. Install filler cap.	Engine coolant level is low.

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						•		•			b. Check HP pump engine cooling system for leaks and signs of corrosion. Check coolant level and add coolant as required. Pressure test engine cooling system.	Class III leaks.
8H	•			•						Fuel Tank	a. Check fuel oil level in day tank Add fuel oil if necessary.	Oil level is low. I
											b. Drain water from fuel filter. as necessary at a minimum of 1000 hrs. as follows: **CAUTION** **To ensure a proper seal, ensure all old gasket material is removed.** 1) Clean gasket sealing surface of filter base. 2) Put light coat of oil (MIL-L-2104) on filter seal. 3) Install filter. Finger tighten until gasket contacts base, then tighten 1/2 to 3/4 turn more. 4) Bleed fuel system as follows: (a) Ensure fuel line valve is open and engine shut off control is OFF. (b) Unlock fuel priming pump. (c) Operate priming pump until resistance is felt. (d) Lock fuel priming pump.	Replace filter

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
81					•					Pump V Belts	(e) Empty and dean glass collecting bowl on bottom d engine crankcase filter system s fold-lows: • Pull down on metal tab of cage surrounding bowl. • Unsnap wire cage on each side of bottom of bowl. • Remove bowl and wipe with dean cloth. Do not use abra-sives. • Replace fuel filter in reverse order. **WARNING** **To prevent electric shock, ensure battery Is disconnected before performing this procedure.** **NOTE** **Refer to TM 55-1930-209-14&P-2, para 6.2.10 for complete Instructions and Illustrations on belt tensioning**. a. Check tension on pump V-belts. If they appear to be slack adjust tension. 1) Adjust HP pump Vet as follows: • Remove 32 mounting bolts and lockwashers. Remove front V-belt housing (two pieces). • Place a straight edge on V-belt in a straight line with bearing bases. • Place tension meter pointer on the line on the center of the front belt **NOTE** **Do not contact O-ring on tester stern.**	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						•					2) Press down on tester stem until register flange just contacts the next belt. 3) Release pressure and note pressure scale reading under O-ring. 4) Repeat steps (1) thru (2) for each belt. 5) Both readings should be 13-17 lb (9.5-11.25 kg) and outside belts should be within 1 lb (0.45 kg) of each other. 6) h belts are not adjusted correctly, proceed as follows: • Loosen four bolts. • Loosen two adjusting screw locknuts. • Turn adjusting screws equally to adjust belt tensioner assembly. • Check adjustments. • Tighten adjusting screw locknuts. • Tighten four bolts. 7) Check adjustment after 2 hours of operation. Adjust as necessary. Check again after 2 more hours of operation. Install front Vbelt housing (two pieces). Install 32 mounting bolts and lockwashers.	
			•								b. Check for frayed or cracked HP pump V-belts. If necessary, replace as follows: **NOTE** When one V-belt requires changing, replace all 12 belts as a set. 1) Housing removal (a) Remove 32 mounting bolts and lockwashers. (b) Remove front V-belt housing (two pieces).	V-belts cracked or frayed.

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B -	**Before**	**D -**	**Daily**	**Q -**	**Quarterly**
D -	**During**	**W -**	**Weekly**	**S -**	**Semiannually**
A -	**After**	**M -**	**Monthly**	**A -**	**Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
				•							2) V-belt removal (a) Loosen two locknuts and two adjusting screws. (b) Remove four bolts, flatwashers, two brackets, and belt tensioner assembly. **CAUTION** **Do not use any tool to force belts on or off belt sheaves.** (c) Remove V-belts from pulleys. Inspect sheaves for wear or damage. Wipe off oil or grease. Remove rust and burrs. 2) V-belt installation (a) Check sheave alignment by placing straight edge across face of driver and driver sheaves. Make sure there is less than 0.025 in gap between straight edge and face of sheaves. **NOTE** Always use a new set of matched V-bets when replacing. Belts must be properly installed to ensure maximum belt life and reduce wear on bearings.	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
			•								(b) Install V-belts on pulleys by hand without forcing belts. Install belt tensioner assembly, two brackets, and four flatwashers and bolts. (c) Tighten two adjusting screws. Tighten two locknuts. (d) Pump grease into grease fittings. (e) Adjust V-belts. 3) Housing installation (a) Install front V-belt housing (two pieces). Install 32 mounting screws and lockwashers. (b) Check battery fluid level. Add fluid if necessary. Make sure all electrical connections are clean and tight and batteries are clean and secure. (c) Check diesel engine and HP pump for leaks, general cleanliness, and placement and tightness of guards. (d) During engine startup, measure oil level while engine is running at low idle. Oil level must be between the ADD and FULL marks on the dipstick. (e) Add oil (OE/HDO-MIL-L-2104) if necessary.	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
8J	•					•				Air Cleaner	**CAUTION** **Service air cleaner with engine stopped**. m. Check HP pump drive engine air cleaner. If red service indicator piston is locked in, raised position, service air cleaner. Inspect element after each cleaning. If exhaust smoke and/or loss of power continues after service, install new element as follows: 1) Open six latches and remove air cleaner cover and element. 2) Cover air inlet opening to prevent foreign objects from entering engine. 3) Wipe filter housing and cover clean. 4) Before reinstalling filter, tap it gently on a hard surface to remove dirt and debris. 5) Remove covering from air inlet opening. **CAUTION** **Arrows on the side of the element indicate direction of air flow. Ensure element is installed correctly.** 6) Install either new or cleaned filter element. 7) Install air cleaner cover and secure latches. 8) Reset red service indicator by pushing in the reset button.	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
8K								•		Turbo Charger	a. Check turbocharger mounting hardware for tightness. Tighten as required. b. Check for cracks and leaks. If damaged notify shift leader or bargemaster so repairs can be made.	Loose or missing I hardware.
8L								•		Throttle and Emergency Shutoff Cord	a. Check HP pump diesel engine throttle and emergency shutoff cord for proper operation. Repair as required. b. Check for loose mounting hardware. Tighten as required. Notify shift leader or bargemaster if replacement is required.	Emergency shutoff cord inoperable.
8M								•		Exhaust System	a. Check for leaks and cracks. Notify barge-master or shift leader so repairs can be made. b. Check for loose or missing hardware. Tighten or replace as necessary.	Leaks or cracks exist. Loose or missing I hardware.
									•		a. Remove and replace HP pump with spare HP pump stored in void 4 star-board. b. Turn in used HP pump to depot for disas-sembly, cleaning, inspection, and/or repair. c. Place a spare HP pump back in void 4 starboard.	
8N										Pedestal Bearing	**CAUTION** The mechanical seal Is a precision product. Treat it with care. Do not scratch face of carbon ring or let It drop. Take particular care not to scratch the lapped face that comes In contact with the carbon ring. Seals should never be Immersed In solvent as this could damage the internal packing.	

Table 3-3. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
								•			a. Check HP pump pedestal bearing oil. Change pedestal bearing oil every 6 months or 4000 hours of operation, whichever comes first. This interval must be reduced to 4 months or 2500 hours for pumping at temperatures above 200°F. 1) Place container under drain plug to catch used oil (Figure 3-10). 2) Remove drain plug underneath pedestal and allow oil to drain. 3) Replace plug. 4) Remove oil breather and add 6 qt of oil (OE/HDO-MIL-L-2104). Replace oil breather. 5) Clean up any spills.	Oil level is low.
	•					•		•			b. Replace pump mechanical seals if necessary. The mechanical seal in the pump requires no maintenance or adjustment. When seal has become worn or damaged and leaks excessively, ft must be replaced. Maximum allowable leakage for the mechanical seal is 1 gal per hour. c. Refer to LO 10-4610-229-12 for complete lubrication instructions for 150,000 GPD ROWPU.	Seal leaks exceed 1 gal per hour.

CHAPTER 4 CHLORINATION SYSTEM PMCS

Section I. General system information

4-1 Introduction. Chapter 4 contains Preventive Maintenance Checks and services for the Reverse Osmosis Water Purification Barge Chlorination System. Operating and maintenance procedures for the chlorination system are described in detail in TM 55-1930-209-14&P-4. TM 55-1930-209-14&P-4, Appendix C also contains I complete Preventive Maintenance Checks and Services for the Chlorination System.

4-2 Major components. The chlorination system consists of a priming brine tank and holding tank, chlorine generation and recirculation unit, metering pump control unit, acid tank various pumps, flowmeters, pressure gauges, and valves. In addition, there are associated indicator lights, LED displays, fluid lines, piping, sensors, switches, and electrical circuitry. Major components of the chlorination system, their basic functions, and their location on the barge are listed in Table 4-1.

Table 4-1. Major Components of Chlorination System

Component	Quantity	Function	Location
Chlorination	1	Generates and automatically maintains a hypochlorite solution for treatment of ROWPU product water entering drinking water tanks	Void 2 port
Chlorination unit holding (recycle) tank	1	Holds hypochlorite solution, which is circulated to the cell assembly by the recirculating pump, and provides chlorine to the metering pump	Void 2 port on chlorination unit skid, inboard of brine tank
Chlorination unit brine tank	1	Holds brine solution which is automatically added to the holding tank by the brine pump when needed	Void 2 port on chlorination unit skid outboard of holding tank
Chlorination unit acid tank	1	Holds acid which is used to remove cell assembly scale during scale flushing operation	Void 2 port on chlorination unit skid outboard of holding tank
Chlorination unit circulating pump	1	Recirculates solution from holding tank through cell assembly and back to holding tank	Void 2 port on chlorination unit skid
Chlorination unit brine pump	1	Automatically provides brine solution to the holding tank when needed	Void 2 port on chlorination unit skid
Chlorination unit control cabinet	1	Controls chlorination unit operation	Void 2 port on chlorination unit skid on top of power supply

Table 4-1. Major Components of Chlorination System (Continued)

Component	Quantity	Function	Location
Drip pan sump tank and pump	1	Discharges drainage from chlorination unit directly overboard	Void 2 port outboard of chlorination unit skid
Metering pump	1	Injects measured amounts of chlorine into ROWPU product water stream	Void 2 port on in-board bulkhead forward
Chlorine sensor	1	Senses amount of chlorine being injected into ROWPU product water stream	Void 3 port in product water overhead piping
Metering pump motor controller	1	Starts and stops metering pump bulkhead forward	Void 2 port on inboard
Metering pump control unit	1	Controls amount of chlorine being injected into ROWPU product water by controlling metering pump operation	Void 2 on inboard bulkhead forward
Paddle flow switch	1	Automatically starts and stops metering pump when motor controller is in AUTO mode	Void 3 port in product water overhead piping

4-3 Chlorination system description. The chlorination system generates a strong solution of sodium hypochlorite (commonly called chlorine) for treating water produced by the Reverse Osmosis Water Purification Units (ROWPU's). Adding this solution to the water makes it safe for human consumption. A metering pump adds this solution, upon demand, to water processed by the ROWPU system just before the water enters the four drinking water storage tanks. The chlorination system's major components are shown in Figure 4-1 for Barge 1 and in Figure 4-2 and for Barges 2 and 3. Major components are listed in Table 4-1. The system generates and maintains a 5000 to 6000 parts per million (ppm) solution of chlorine and then meters this solution into product water from the ROWPU I system to obtain a chlorine concentration of 5 to 7 ppm in the drinking water.

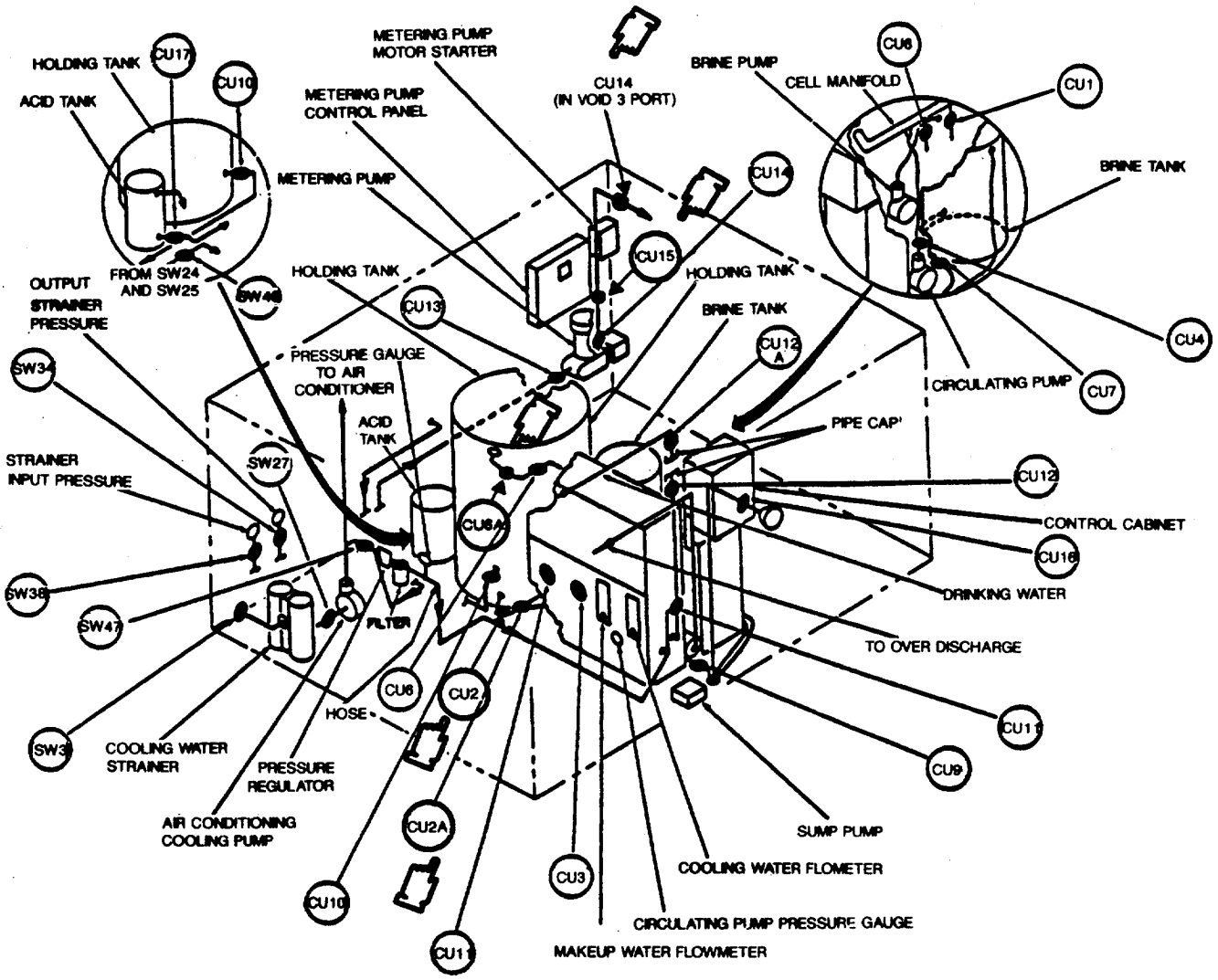


Figure 4-1. Chlorination System (Barge 1)

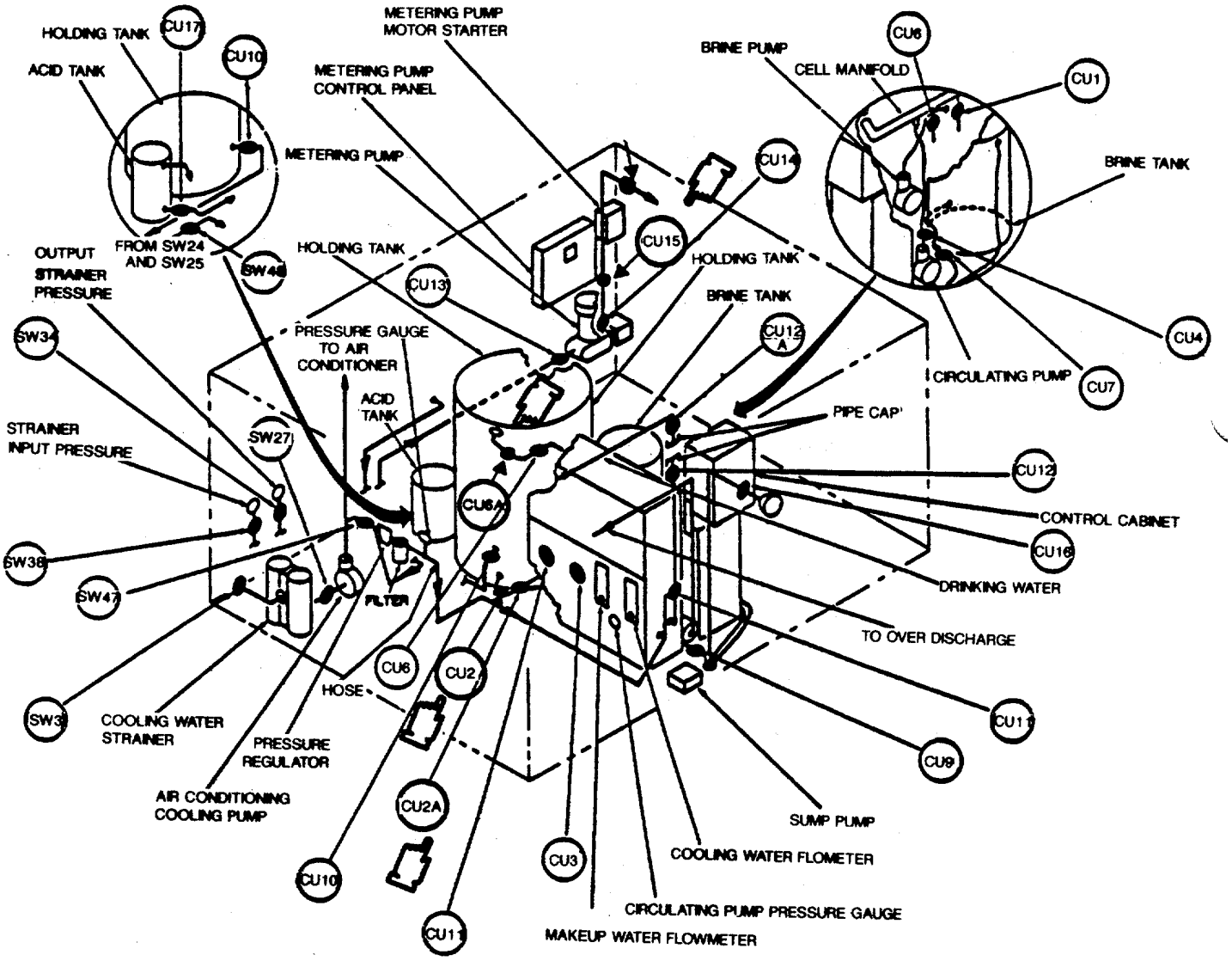


Figure 4-2. Chlorination System (Barges 2 and 3)

Section II

Table 4-2. Preventive Maintenance Checks and Services for ROWPU System

B - Before D - Daily Q - Quarterly
D - During W - Weekly S - Semiannually
A - After M - Monthly A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										CHLORINATION SYSTEM	**WARNING** Be sure electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions at the beginning of this manual. Hazardous chemical materials are used with this equipment. Always use approved breathing devices when working with chemicals. Avoid chemical contact with eyes, skin and clothing. Always wear safety glasses, gloves, and rubber aprons when handling chemicals.	
1										All Components	**NOTE** When performing BEFORE and AFTER PMCS, make sure all circuit breakers are open (OFF): 1. Circuit breakers P5 and P8 are open (OFF) to panels 1 and 2. 2. Power panel circuit breaker 9P5 is open (OFF) to chlorinate unit control panel. 3. Power panel 1 circuit breaker 10P5 is open (OFF) to metering pump controller motor. 4. Power panel 2 circuit breaker 8P8 in open (OFF) to vent for 8 controller motor.	
	•		•	•							a. .Wipe all components clean, especially flowmeters, indicators, control panels and electrolytic cells (Void 2 port).	
	•		•	•							b. Check for leaks paying special attention to joints, valves, fittings and piping. Report leaks to shift leader or bargemaster for corrective action.	Class III leaks.

Table 4-2. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	•		•	•							c. Check for damage, especially to flowmeters, indicators, control panels, and electrolytic cells. Repair as necessary.	Flowmeter inoperable.
	•		•	•							d. Check for loose or missing securements and fasteners. Tighten or replace as necessary.	
	•		•	•							e. Remove rust and corrosion and touch up paint in accordance with TB43- 0144 as necessary. Do not paint threads or labels.	
2	•		•	•						Wiring	a. Check wiring for loose or missing connections and frayed cables. Tighten or replace as necessary, using insulated tools.	Cables damaged.
			•								b. Visually check wiring for loose connections. If sparks are seen, report to shift leader or bargemaster so corrective action can be taken. Shut off power. Use insulated tools while performing inspection.	Sparks are seen.
3	•		•							Seawater Filter	Make sure seawater filter (filter 3) in line to chlorination system is clear and seawater pressure regulator is set to 10 psi.	
4	•									Circulating Pump	Check oil level on chlorinations unit circulating pump (Void port 2) to make sure oil is up to mark. Add oil as necessary.	
5		•								Chlorination Unit Panel, Meters and Gauges	a. Monitor the following: 1) Makeup water flowmeter to assure 36 gph. 2) Cooling water flowmeter to assure 80 gph. 3) Cooling water pressure gauge to assure 20-40 psi. 4) Heat exchanger pressure gauge to assure 30-60 psi.	

Table 4-2. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	•			•							b. Check cooling and makeup water flowmeters to assure they are not clogged with mineral deposits or rust. Remove and clean when necessary as follows: 1) Turn the black valve knob counter-clockwise until the threads are disengaged. Then withdraw the stem from the valve by gently pulling on the knob. 2) Remove the two large mounting bracket screws which secure the flowmeter to the system. 3) Unscrew the four recessed screws located on the back side of the flowmeter, then gently pull the body from the rear plate. Keep the body parallel with the back plate to prevent undue strain on the body. 4) Remove the slip cap with a push on a screwdriver, then remove the plug ball stop using a 1/2 in Allen wrench. 5) Remove the ball float by inverting the body and allowing the ball to fall into your hand. (Cover the discharge port to avoid losing the float thru that opening.) 6) Clean the flow tube and flowmeter body with ordinary soap and water. Do not use liquid soaps or detergents which may contain chlorinated solvents. 7) Reassemble the unit by reversing the procedure outlined; then place the flowmeter in service. c. Adjust makeup water flowmeter flow rate for higher flow rate during summer months and lower flow rate during winter months. Local climatic conditions determine final flow rate.	Flowmeters are clogged.

Table 4-2. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
6		•								Brine Tank	a. Check brine tank salt level and add salt as necessary. b. Check cooling water and makeup water flowmeter and ammeter readings. water and brine feed control. c. Check condition of cells for scale buildup. Descale when necessary as follows: 1) Flush with seawater. (a) Check that seawater system is operating and providing sea-water to chlorination system thru seawater SW47 or SW48. (b) Tum alarm ON/OFF switch on control cabinet to OFF. (c) Turn function switch on control cabinet to OFF/RESET. (d) Position chlorination unit (CU) valves as indicated below: O = open X = closed A = position A B = position B C = position C CU Valve No. Valve Position 2 X 2A X 3 B 5 A 6 X 6A X 8 X 9 X 12 X 16 O (e) Position valve CU4 halfway between positions A and C to reduce flow thru system. (f) Turn brine pump ON/OFF switch inside control cabinet to OFF.	
		•										Adjust
		•										

Table 4-2. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
		•									(g) Turn cooling water flowmeter OFF by closing valve at bottom of flowmeter. (h) Turn makeup water flowmeter OFF by closing valve at bottom of flowmeter. (i) Turn function switch on control cabinet to FLUSH. (j) Allow seawater to flow thru chlorination unit for about 5 minutes, then turn function switch on control cabinet to OFF/RESET. (k) Open chlorination valve CU 9 to allow chlorination unit to drain. If sump appears to be overfilling, partially close valve CU 9 to reduce drain flow to sump. (l) After chlorination unit has drained, close valves CU 8 and CU 9 to position C (OFF).	
									•		d. Drain and clean sludge buildup from brine tank and holding tank.	
7			•							Acid Tank	**WARNINGS** Wear rubber gloves, safety goggles or faceshield, and chemical dust mask when working with acid crystals and acid solution. Always add acid to water. Do not add water to acid. If any acid crystals or solution splash on skin, flush skin with water immediately. Immediately flush eyes at eyewash station if acid crystals or solution splash in eyes. a. Flush acid tank with sulphuric acid as follows:	

Table 4-2. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
				•							1) Remove tank lid and fill with 25 gal of drinking water from fill hose attached to bib in void 2 port above holding tank. 2) Add two cans (14 lbs) of sulphuric acid to water in tank for acid flush. 3) Turn valve CU3 to position A, ACID. Turn valve CU5 to position B, ACID. Open valve CU 17. Make sure valve CU 16 is open. 4) Turn function switch on control cabinet to FLUSH. 5) Descale until all visible signs of scale are gone from anodes (cells), approximately 5 minutes, then turn function switch to OFF/RESET. **NOTE** Sump tank pump automatically empties sump tank. Level switch in sump tank starts and stops sump pump. 6) Turn valve CU5 to position A, DRAIN, to allow solution to drain to sump tank. 7) Remove acid tank lid to observe level of solution in tank. 8) Turn function switch on control cabinet to FLUSH. Acid tank should be emptied by circulating pump. 9) When acid tank is empty, turn function switch to OFF/RESET. 10) Close valve CU17 and CU3 to B. 11) Replace lid on acid tank.	

Table 4-2. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
					•						12) Flush chlorination unit with seawater before returning to normal operation as follows: (a) Turn valve CU3 to position B, WATER, to allow seawater to flush out acid. (b) Turn valve CU5 to position A, DRAIN, to allow flushing seawater to drain to sump tank. (c) Turn function switch to FLUSH. (d) Flush to remove acid for 5 minutes. Turn function switch on control cabinet to OFF/RESET. (e) Return system to normal operation.	
8				•						Brine Feed Pump	Check that oil level in chlorination unit brine feed pump is above indicated mark in air bleeder filler reservoir. Add oil if necessary.	
9		•								Metering Pump	Check sight on metering pump to ensure oil level is at mark. Add oil as necessary.	
10		•								Metering Pump Control Unit	Monitor metering pump control unit to assure chlorine status on LED display.	
11		•								Chlorination Unit Control Cabinet	a. Monitor ammeter to assure reading is between 950-1000A (0.95-1.OkA). b. Monitor voltmeter to assure reading is between 6.0-6.5 Vdc.	
12			•							Equipment Monitoring System	a. Monitor CHLORINE STATUS display page for chlorine content and pump position. b. Monitor SYSTEM STATUS display page to assure: 1) CHLORINE OPERATING OFF is normal.	

Table 4-2. Preventive Maintenance Checks and Services for ROWPU System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
											2) CHLORINATOR PWR SUPPLY is normal. 3) BRINE RCIR PMP OPERATING OFF is normal.	
13							•			Voltage Connection on Cells	Check for cracked or frayed connections. Notify shift leader or bargemaster for corrective action.	Connections are frayed or cracked.
14						•				Ball Valves	Check that ball valves turn freely. shift leader or bargemaster for corrective action.	Notify Ball valves do not turn freely.

CHAPTER 5 DRINKING WATER SYSTEM PMCS

Section I. General

5-1 Introduction. Chapter 5 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Unit Barge Drinking Water System. Operating and maintenance procedures are described in detail in TM 55-1930-209-14&P-5. TM 55-1930-209-14&P-5, Appendix C also contains complete Preventive i Maintenance Checks and Services for the Drinking Water System.

5-2 Major components. The drinking water system consists of four storage tanks, reserve tank, two discharge pumps, drinking water pressure set, sink, shower, washdown station, valves, piping, and electrical controls and circuitry. Table 5-1 lists the major components of the drinking water system, their basic function and location on the barge.

Table 5-1. Major Components of Drinking Water System

Component	Function	Location
4 storage tanks	Store drinking water	Tanks 1 and 3 - void 3 starboard Tanks 2 and 4 - void 3 port
4 storage tank liquid tank level indicators with level switches	Indicate water level in storage tanks. level switches automatically start/stop discharge pump. Liquid level data is monitored and transmitted to monitoring system	One on each storage High and low tank
250-gallon reserve	Stores drinking water for use onboard barge	Void 3 port - near shell tank
Reserve tank liquid level indicator	Indicates water level in reserve tank	On reserve tank
Drinking fountain	Provides drinking water onboard barge	Dayroom
Sink	Provides water onboard barge for personal hygiene and other uses	Dayroom
2 discharge pumps	Pump drinking water to shore facility or to port discharge	Discharge pumps 1 an J 2 - void 3 port near aft bulkhead
Drinking water pressure set	Supplies drinking water for use onboard barge including filling of reserve tank	Void 3 port - near shell
Salinity cell	Monitors drinking water salinity and transmits data to monitoring system	Void 3 port - in discharge pump discharge line

Table 5-1. Major Components of Drinking Water System (cont.)

Component	Function	Location
Flow sensor	Monitors drinking water flow rate, transmits data to monitoring system and indicates flow rate on meter	Void 3 port - in discharge pump discharge line
Pressure sensor	Monitors drinking water pressure, transmits data to monitoring system	Void 3 port - in discharge pump discharge line
Pressure gauge	Indicates pressure in discharge line	Void 3 port - in discharge pump discharge line
Water filter	Filters any impurities in drinking water discharge line	Void 3 port - in pressure set
5 washdown stations	For washing down decks and shore discharge hose during retrieval	4 stations in ROWPU space and 1 on top of deckhouse
Shower 2 motor controllers discharge pumps 1 and 2	Personal hygiene Control automatic and manual operation of discharge pumps	Weatherdeck forward Void 3 port on aft bulkhead
Motor controller pressure set	Controls manual operation of pressure set	Void 3 port near filter for water
2 remote switches for discharge pumps 1 and 2	Control remote operation of discharge pumps	ROWPU space on forward bulkhead
Pump and storage tank selection switch	Selects discharge pump and storage tank whose liquid level switches automatically start and stop discharge pump	Void 3 port on aft bulkhead

5-3 Drinking water system description. The drinking water system provides storage for water produced by the ROWPU system and discharges it to shore, or another vessel, or for use onboard the barge. The pressure set supplies onboard drinking water to the reserve tank the dayroom drinking fountain and sink, the shower on the forward deck, the four washdown stations in the ROWPU space, the chlorination system in void 2 port, and to the washdown station on deckhouse top (Figure 5-1). The system has a total storage capacity of 15,000 gallons plus 250 gallons reserve and operates in a maximum allowable sea state 3 condition.

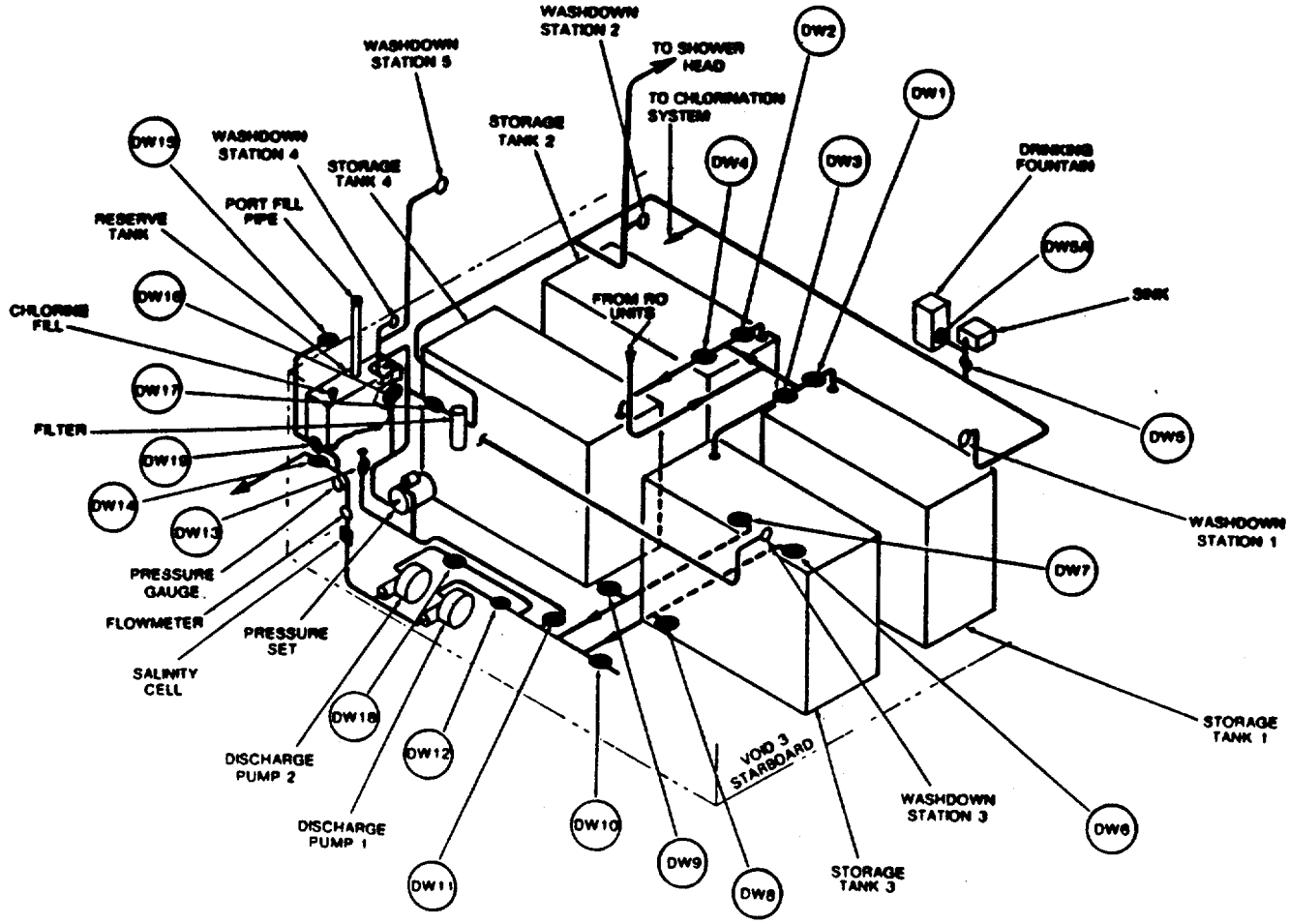


Figure 5-1. Drinking Water System

Table 5-2. Preventive Maintenance Checks and Services for Drinking Water System

B - Before	**D - Daily**	**Q - Quarterly**
D - During	**W - Weekly**	**S - Semiannually**
A - After	**M - Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										DRINKING WATER SYSTEM	**WARNING** Be sure electrical power is OFF before performing maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE." Observe all safety precautions listed in the beginning of this manual.	
1	•		•	•	•		•			All Components	a. Wipe components clean, especially gauges and control panels.	
											b. Check for leaks, paying special attention to joints, valves, fittings, and piping. Report leaks to shift leader or bargemaster.	Class III leaks.
	•		•	•							c. Check for loose or missing securements or fasteners. Tighten or replace as necessary.	
	•		•	•							d. Check for damage, especially to pressure gauges, filters, and control panels. Notify shift leader or bargemaster so repairs can be made.	Pressure gauges damaged.
											e. Remove rust and corrosion. paint in accordance with TB 43-0144 as necessary. Do not paint threads or labels.	Touch or
2	•		•	•						Wiring	a. Check wiring for loose or missing connections and frayed cables. Secure, tighten as necessary.	Cables frayed.
		•		•							b. Visually check wiring for loose connections. If sparks are seen, report to shift leader or bargemaster. Shut power off.	Sparks are seen.

Table 5-2. Preventive Maintenance Checks and Services for Drinking Water System (Continued)

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
3	•		•						·	Water Filter	a. Check water filter cartridge - replace if necessary as follows: **NOTE** **Allow water to flow Into drain deck.** 1) Close drinking water system valves DW5 and DW17. 2) Unscrew filter, install new filter cartridge and replace filter. 3) Open valves DW5 and DW17.	
					•						b. Operate each valve through its cycle of operation.	
4						•				Discharge Pump Bearing	Lubricate discharge pump bearings using lithium, lithium soda, or calcium base grease.	
5						•				Storage and Reserve Tanks	a. Check vent valves on storage and reserve tanks located on top of deckhouse for clogging and corrosion. Clean or replace as follows: 1) On face of valve, remove three cap screws holding cap in place. 2) Carefully remove cap, protective mesh, space ring, and flame screen from valve body. 3) Clean all these components with soap and water, using a stiff brush if necessary. 4) Replace in air escape body in reverse order as removed. 5) Tighten three cap screws holding cap in place.	
									•		b. Drain tanks and flush level indicator with potable drinking water. This prevents magnetic buildup and subsequent errors in indications.	
						•					c. Check storage and reserve tank for leaks. Repair or replace as necessary.	Class III leaks.

CHAPTER 6 SHORE DISCHARGE SYSTEM PMCS

Section I. General system information

6-1 Introduction. Chapter 6 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Unit Barge Shore Discharge System. Operating and maintenance procedures are described in detail in TM 55-1930-209-14&P-6. TM 55-1930-209-14&P-6, Appendix C also contains complete Preventive Maintenance Checks and Services for the Shore Discharge System.

6-2 Major components. The shore discharge system consists of winch with flexible hose winch hydraulic motor, hydraulic power unit, levelwind, chute, PIG, PIG launcher, PIG receiver, gate, valve, control station, (winch hydraulic power unit remote switch, shore winch, valves, piping, and start/stop electrical circuitry). Table 6-1 lists the major components of the shore discharge system, their basic function and location on the barge.

Table 6-1. Major Components of Shore Discharge System

Component	Function	Location
Hose reel winch	Deploys and retrieves hose	Centerline of barge at stem
Hydraulic power unit	Provides power to winch and levelwind	Void 5
Levelwind	Guides hose onto reel during hose retrieval	Aft of winch
Chute	Supports hose when deployed	Aft of levelwind
PIG	Forces water out of hose	ROWPU space cage
PIG insertion point	Inserts PIG into flexible hose	Stem portside in shore discharge water pipe connection to hose
PIG receiver	Catches PIG on shore	On shore end of discharge hose
Messenger line	Attaches to hose end cap on end of hose to allow shore winch to pull hose to shore	On dispensing reel on aft of workboat
Shore winch	Pulls discharge hose to shore	Stored on bow forward of bow crane. Remains on shore when barge is deployed.

6-3 Shore discharge system description. This system transfers drinking water from barge storage tanks to holding/storage facilities ashore (Figure 6-1). The system can move 300,000 gallons of water per day under optimum conditions and has been designed to operate in conditions not exceeding Sea State 3.

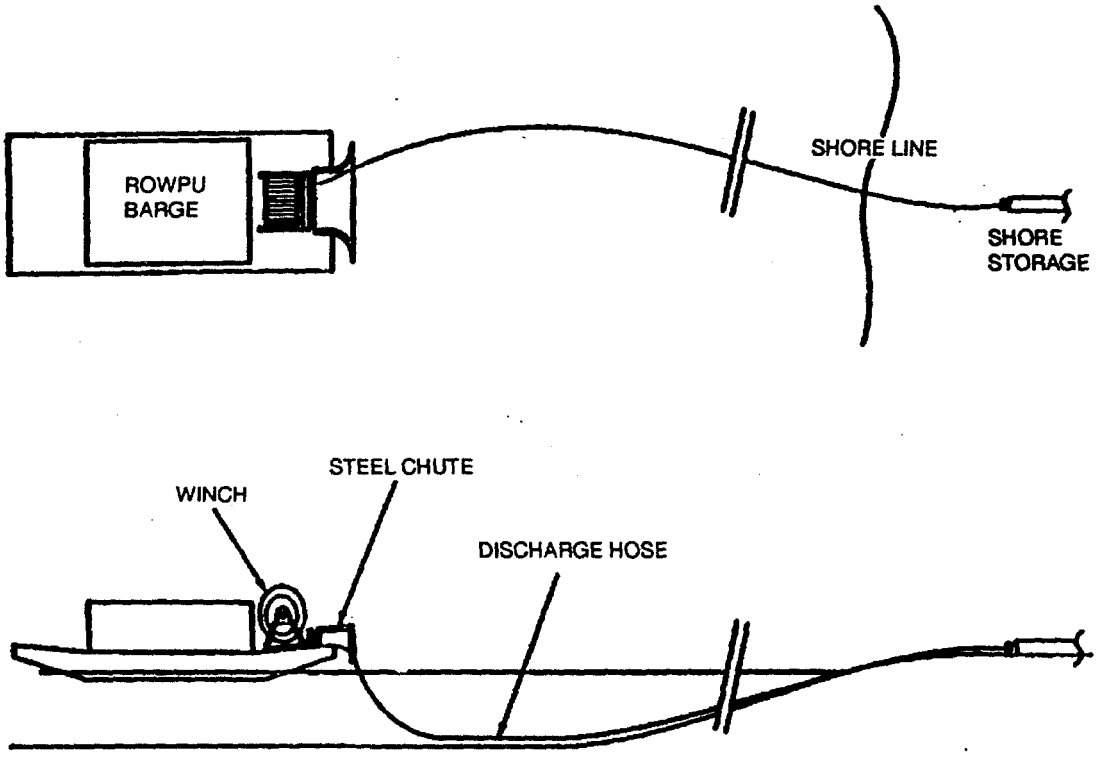


Figure 6-1. Shore Discharge System

Section II

Table 6-2. Preventive Maintenance Checks and Services for Shore Discharge System

B -	Before	D -	Daily	Q - Quarterly
D -	During	W -	Weekly	S - Semiannually
A -	After	M -	Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										SHORE DISCHARGE SYSTEM	**WARNING** Be sure electrical power Is off before performing maintenance or repair on this system. OPEN circuit breakers. Redtag circuit breakers or motor controller with 'WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe safety precautions listed at the beginning of this manual.	

Table 6-2. Preventive Maintenance Checks and Services for Shore Discharge System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
1	•		•	•						All Components	a. Wipe components clean, especially gauges and control panels.	
	•		•	•							b. Check for leaks, paying special attention to joints, valves, fittings, and piping. Report leaks to shift leader or bargemaster.	Class III leaks.
	•		•	•							c. Check for loose or missing securements or fasteners. Tighten or replace as necessary.	
	•		•	•							d. Check for damage, especially to pressure gauges, filters, and control panels. Notify shift leader or bargemaster so repairs can be made.	Pressure gauge damaged.
			•		•						e. Remove rust and corrosion. Touch-up or paint in accordance with TB 43- 0144 as necessary. Do not paint threads or labels.	
2	•		•	•						Wiring	a. Check wiring for loose connections and frayed cables. Secure as necessary. Repair or replace damaged cables.	Cables frayed or connections loose.
		•									b. Visually check wiring for loose connections. If sparks are seen report to shift leader or bargemaster. Shut power off.	Sparks are seen.
3	•			•						Hydraulic Power Unit Reservoir Level Gauge	a. Check reservoir level gauge (Void5) to assure reservoir full of oil. Add oil if necessary (use proper grade for extreme heat/cold).	
	•			•							b. When oil temperature is 45°F or less, set heater ON/OFF switch to ON.	
	•			•							c. Replace hydraulic fluid in the hydraulic power unit reservoir. Fill with Gulf Harmony 46 AW or military equivalent as follows: 1) Place container under reservoir to catch hydraulic fluid. 2) Remove drain plug. Drain fluid into sludge tank by sucking up fluid with bilge drain system foot valve.	

Table 6-2. Preventive Maintenance Checks and Services for Shore Discharge System (Continued)

B - Before	**D - Daily**	**Q - Quarterly**
D - During	**W - Weekly**	**S - Semiannually**
A - After	**M - Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	•		•								3) When reservoir is completely drained, replace plug. Wipe plug and area around plug clean. 4) Remove and clean suction strainer. 5) Remove filler/breather cap. 6) Clean filter if necessary. 7) Fill reservoir with Gulf Harmony 46 AW or military equivalent until oil level sight gauge indicates 100 percent full. 8) Replace cap. 9) Wipe clean reservoir and immediate area.	
4		•								Hydraulic Power Unit Charge Pressure Gauge	Check that charge pressure gauge on hydraulic power unit reads no less than 250 psi. Minimum pressure needed for proper stroke control and makeup flow for winch circuit.	
5				•						Hydraulic. Power Unit Level Gauge	Check hydraulic fluid level is 80 percent or more full. Add fluid if necessary as follows: **WARNING** **Wear safety glasses when adding hydraulic fluid. In case of eye contact, wash with lots of water. In case of skin contact, wipe and then wash with soap and water**. 1) Remove filler/breather cap. 2) Clean filter. 3) Add Gulf Harmony 46AW or military equivalent hydraulic fluid until level gauge indicates 100 percent full. 4) Replace cap. 5) Wipe reservoir and immediate area clean.	

Table 6-2. Preventive Maintenance Checks and Services for Shore Discharge System (Continued)

B -	**Before**	**D -**	**Daily**	**Q -**	**Quarterly**
D -	**During**	**W -**	**Weekly**	**S -**	**Semiannually**
A -	**After**	**M -**	**Monthly**	**A -**	**Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
6							•			Hydraulic Power Unit Electric Motor	**NOTE** **Use Mobil Oil Co. Mobilux #2, Shell Oil Co. Alvania #2, Exxon Beacon 325, Standard Oil Company of California, Chevron SR1 No. 2, or some military equivalent lithium-based grease unless a special grease is recommended on the motor nameplate.** a. Lubricate hydraulic power unit electric motor as follows: 1) Replace one pipe plug on one end shield with grease fitting. 2) Remove other pipe plug for grease relief. 3) Using a low-pressure grease, pump in grease until new grease appears at grease relief hole. 4) Remove grease fitting and replace pipe plug. 5) Repeat steps a thru d on other end shield. 6) After lubricating both end shields, allow motor to run for 10 minutes before replacing relief plug.	
							•				b. Lubricate hydraulic power unit motor/ pump coupling as follows: **NOTE** **Electric motors have a tendency to run hot and stop due to overload. Allow motor to start automatically after it cools off.** 1) Remove both grease plugs. 2) Insert grease fitting in one of the grease plug holes. 3) Fill until excess No. 2 bearing grease or military equivalent grease comes out of opposite hole. 4) Replace both grease plugs.	

Table 6-2. Preventive Maintenance Checks and Services for Shore Discharge System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
7		•								Hydraulic Power Unit Piston Pump	a. With hose reel winch control lever in NEUTRAL position on Barge 1 or in OFF position on barges 2 and 3, check that piston pump low (return) and high (supply) pressure gauge readings are the same.	
		•									b. If the 2 readings differ, zero bias by adjusting zero adjustment screen (socket-headscrew) on end of piston pump.	
8		•					•			Hydraulic Power Supply and Return Filters	a. Check supply pressure gauge. If necessary replace filter element as follows: 1) Unscrew old filter. 2) Coat gasket on new filter with light coat of oil. 3) Screw on new filter. 4) When operating after replacement, check for leaks and make sure indicator is operating normally.	Pressure gauge cracked or broken.
		•					•				b. Check return pressure gauge. If necessary, replace filter element as follows: 1) Turn bypass valve to bypass filter. 2) Unscrew old filter. 3) Coat gasket on new filter with light coat of oil. 4) Screw on new filter. 5) Turn bypass valve to allow flow through filter. 6) When operating after replacement, check for leaks and make sure indicator is operating normally.	Pressure gauge cracked or broken.

Table 6-2. Preventive Maintenance Checks and Services for Shore Discharge System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
9				•						Discharge Hose Outer Jacket	**NOTE** **Minor damage to the discharge hose outer jacket, such as surface tears, cuts, and scratches need not be repaired. If the entire outer jacket layer Is damaged to the next layer, repair the damage as follows, using outer jacket repair kit** Check that hose is secure and outer jacket is not damaged. Repair as necessary as follows: 1) Set hot air gun on 3. 2) Hold gun about 1 in. from area to be repaired to melt material around the damage. **NOTE** **Use original outer jacket material. Add new material only if necessary. During repair use stainless steel bands if needed to hold outer jacket In place.** 3) When outer jacket material melts, use putty knife to press softened material into damaged area until repair is completed as shown in Figure 3-13. 4) if necessary, use stainless steel bands to hold the repaired area.	Hole is visible in hose.
10				•						Hand (Band) Brake	a. Check brake for excessive wear and that hand brake holds when set Notify shift leader or bargemaster of deficiencies. b. Make sure hand brake on starboard side of winch is set. f not, set as follows: 1) Open valve SD3. 2) Obtain hand brake pump handle from stowed position and insert in pump extension. **CAUTION** **While pumping, do not exceed 4,000 psi as indicated on hand brake pressure gauge.**	Excessively worn.

Table 6-2. Preventive Maintenance Checks and Services for Shore Discharge System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
				•							**WARNING** **Pressure should not exceed 4000 psi.** 3) Pump until hand brake piston enters cylinder and band is tight on brake drum. 4) Position valve SD3 in NEUTRAL position (midway between OPEN and CLOSE position) to lock the cylinder in the set position.	
11				•						Buoys	Check that buoys are in place. Replace if missing.	
12				•						Status Signals/ Lights	Check that status signalslights are displayed as follows on top of deckhouse center most: Time / Top Signal / Middle Signal / Bottom Signal Daytime / Black Ball / Black Diamond / Black Ball Nightime / White Light / Red Light / While Light **CAUTION** Roughness on steel chute surfaces could damage hoses.	Any light is inoperable.
13				•						Steel Chute Surfaces (weatherdeck aft)	Check that surfaces are smooth and free of gouges, damage, or roughness. Repair as necessary.	
14						•				Reduction Gear Boxes	a. Check fluid level in levelwind reduction gear boxes as follows: **NOTE** **If oil cannot be filled thru breather hole, Install street elbow In hole to aid In filling.** 1) Remove oil level plug in gear box located on portside of levelwind. 2) Check oil level. Oil level must be near bottom of oil level plug hole. 3) If Gulf Harmony 43 AW or military equivalent oil has to be added, remove breather plug. 4) Fill lowly thru breather hole until oil begins to drain from oil level plug.	Fluid level low.

Table 6-2. Preventive Maintenance Checks and Services for Shore Discharge System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						•					5) Replace oil level plug. Wipe clean oil plug and area around plug. 6) Remove street elbow if installed previously. 7) Replace breather plug. 8) Wipe gear box and immediate area clean.	
						•					b. Check and if necessary add fluid in main winch reduction gear box as follows: 1) Remove oil level check plug. 2) Check oil level. Oil must be near bottom of oil level check hole. 3) If #8-GL32HT or military equivalent oil has to be added, remove oil fill plug. 4) Add oil into fill hole until half full. Oil will drain into check plug hole. 5) Replace oil level check plug and oil fill plug. 6) Wipe gear box and immediate area clean.	Fluid level low.
15						•	•			Bearings	Lubricate the following with No. 2 bearing grease or military equivalent: 1) Ten bearings on levelwind traveler head. 2) Ten roller shafts on levelwind traveler head. 3) Two thrust bearings on band brake drive shaft. 4) Levelwind gear pump outboard bearing. 5) Two bearings on winch hose roller.	
									•		6) Replace fluids in the following components: (a) Levelwind reduction gear box (primary for Barge 1). (b) Secondary levelwind reduction gear box (c) Main winch reduction gear box. (d) Two winch shaft bearings.	

Table 6-2. Preventive Maintenance Checks and Services for Shore Discharge System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											(7) Replace hydraulic fluid in power unit reservoir. Fill with Gulf Harmony. 46 AW or Military equivalent.	
16						•				Swivel Joint	Lubricate with No. 2 bearing grease or military equivalent.	

CHAPTER 7 COMPRESSED AIR SYSTEM PMCS
Section I. General system information

7-1 Introduction. Chapter 7 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Unit Barges Compressed Air System. Operating and maintenance procedures for the compressed air system are described in TM 55-1930-209-14&P-7. TM 55-1930-209-14&P-7, Appendix C also contains complete Preventive Maintenance Checks and Services for the Compressed Air System.

7-2 Major components. Major components, their basic functions and location on the barges are listed in Table 7-1.

Table 7-1. Major Components of Compressed Air System

Component	Function	Location
Electric Controller	ROWPU space port bulkhead near compressor	Starts, stops, and provides automatic compressor operation
Compressor w/Receiver	ROWPU space portside aft. Barge 1, Figure 7-1. Barge 2 and 3, Figure 7-2.	Compresses air to 155 psi and stores it in an 80 gallon receiver
Automatic Air Pressure Regulator (Pressure Switch)	On top of receiver	Turns compressor on and off to maintain pressure in receiver within factory set limits
Receiver Pressure Gauge	Mounted on side of receiver	Indicates air pressure in receiver :
Receiver Safety Valve	Mounted on top of receiver	Relieves air pressure in receiver when it exceeds 175 psi
Receiver Drain Cock	Bottom of receiver	Provides opening to relieve air pressure in receiver. Drains moisture from receiver.
Main Supply Valve	Forward end of receiver	Controls flow of compressed air to air supply lines. Isolates receiver from lines.
Air Filter 1	In air supply pipe near compressor.	Removes particles and moisture from air passing from receiver to air supply lines, Figure 7-3.
Air Filter 2	In air supply line immediately in front of air station 6.	Removes oil and particles from line to air station 6 to preclude contamination of drinking water shore discharge hose, Figure 7-3.

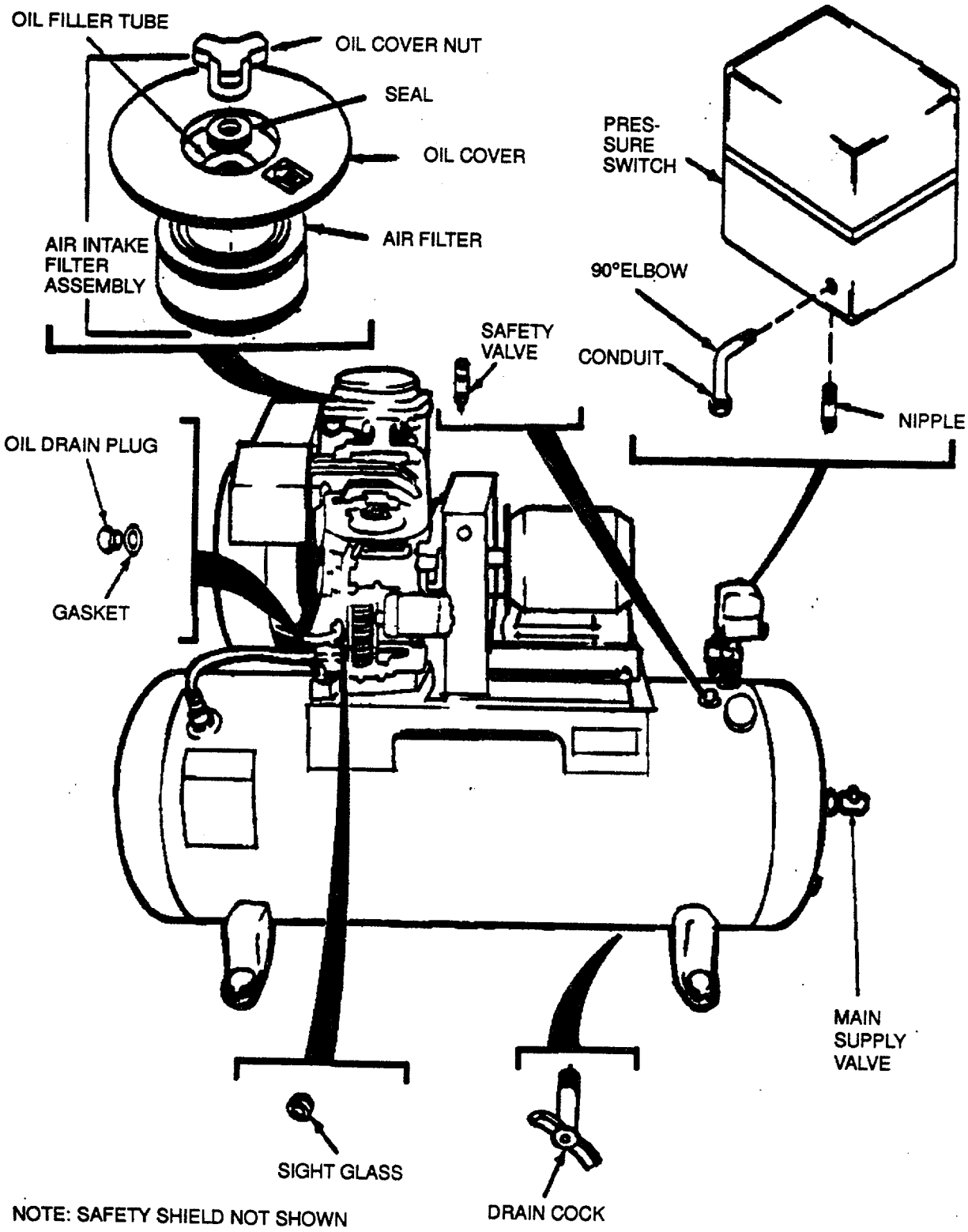
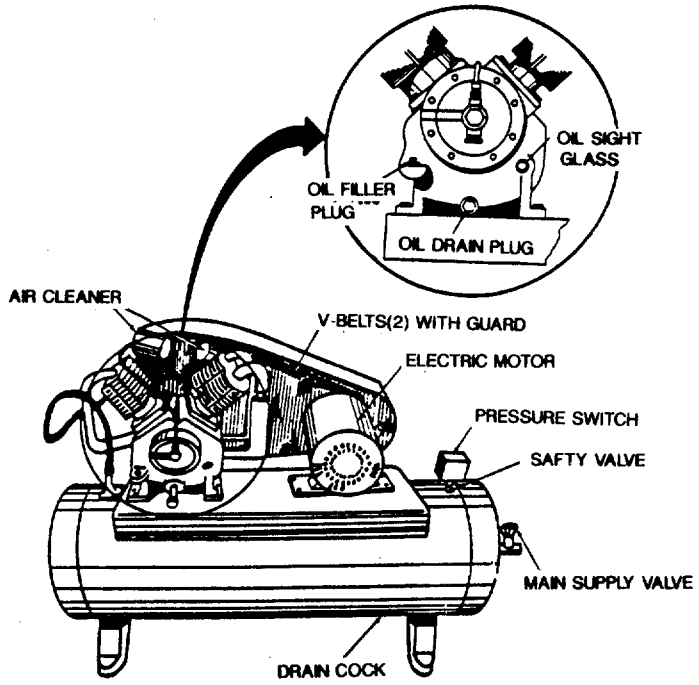


Figure 7-1. Barge 1 Air Compressor/Receiver



NOTE: SAFTY SHIELD NOT SHOWN

Figure 7-2. Barges 2 and 3 Air Compressor/Receiver

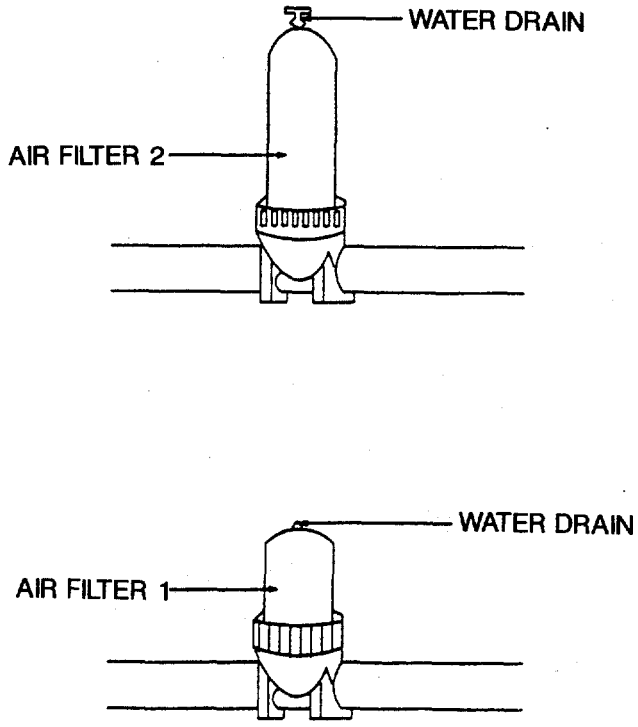


Figure 7-3. Exterior View of Air Filter 1 and Air Filter 2

Table 7-1. Major Components of Compressed Air System (Continued)

Component	Location	Function
Air Pressure Regulator 1 w/Air Pressure Gauge	Workshop port bulkhead	Reduces air pressure to 40 psi for blowdown of seachest in void port 2. Indicates air pressure in line beyond regulator
Air Pressure Regulator 2 w/Air Pressure Gauge	ROWPU space aft bulkhead behind void 4 air ducts	Reduces air pressure to 40 psi for blowdown of seachest in void 4 port. Indicates air pressure in line beyond regulator
Air Station 1	ROWPU space port bulkhead near air compressor	Provides air to quick disconnect coupling for pneumatic equipment, Figure 7-4
Air Station 2	ROWPU space port bulkhead amidships	Same function as Air Station 1
Air Station 3	Workshop port bulkhead	Same function as Air Station 1
Air Station 4	ROWPU space starboard bulkhead forward	Same function as Air Station 1
Air Station 5	ROWPU space starboard bulkhead aft of sliding door	Same function as Air Station 1
Air Station 6	Weatherdeck stern portside	Provides 155 psi to quick disconnect exclusively for powering PIG through shore discharge hose, Figure 7-5
Air Station 7	ROWPU space port bulkhead aft of switchboard	Same function as Air Station 1
Air Station 8 Seawater Seachest Blowdown Valve w/air pressure gauge	Workshop port bulkhead in air supply line beyond air pressure regulator 1 seawater valve SW30	Controls air for blowdown of seachest in void 2 port. Used in conjunction with
Air Station 9 Generator Cooling Seachest Blowdown Valve	ROWPU space aft bulkhead in air supply line beyond air pressure regulator 2 w/air pressure gauge	Controls air for blowdown of seachest in void 4 port. Used in conjunction with seawater valve SW44

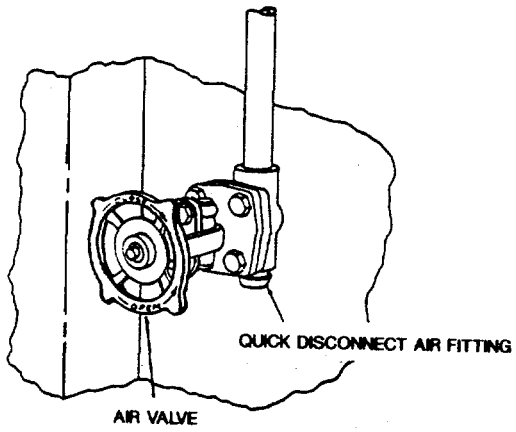


Figure 7-4. Air Station Air Valve and Quick Disconnect

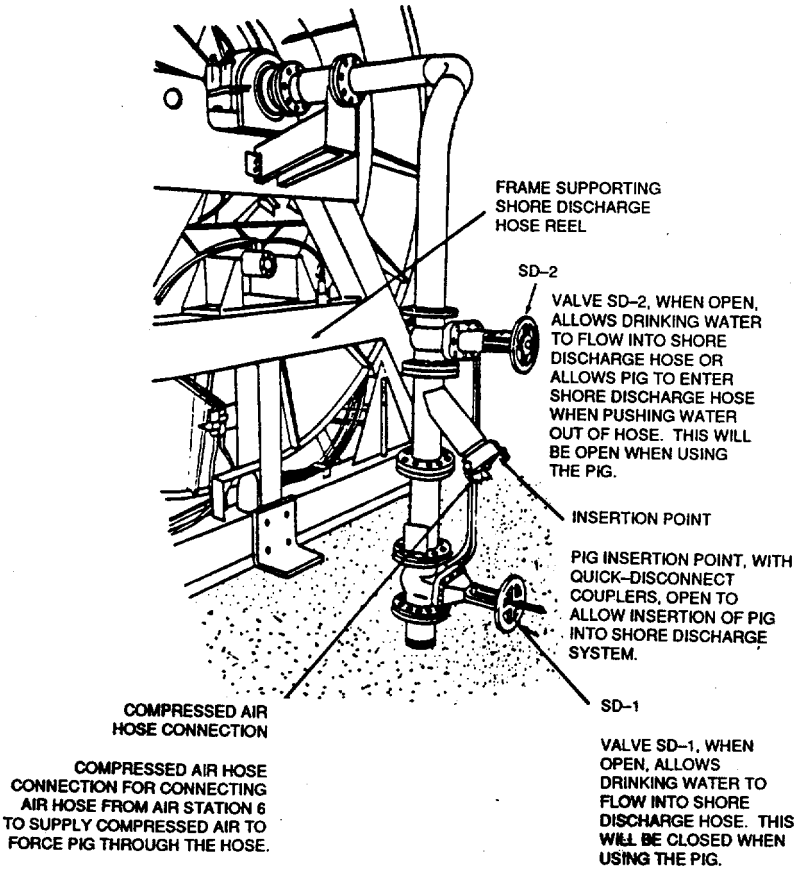


Figure 7-5. PIG Launcher Controls

Table 7-1. Major Components of Compressed Air System (Continued)

Component	Location	Function
Airhose, 50 Feet Self-Retracting	Attached to air stations	Provides air pressure from air stations to pneumatic equipment
Airhose, 25 Feet Self-Retracting	Dedicated	Used only to provide air pressure to drive PIG through shore discharge hose
Seawater Valve SW30	Workshop port bulkhead	With seawater seachest blowdown valve, used to blowdown seachest in void 2 port. Opened, valve vents forward seachest to atmosphere through venting pipe to deckhouse top. Closed, valve forces air from air station into sea-chest for blowdown
Seawater Valve SW44	ROWPU space rear bulkhead	Similar function as SW30

7-3 Compressed Air System Description. The compressed air system provides compressed air to five air stations in the ROWPU space, one in the workshop, and one on stern weatherdeck. It also provides compressed air to two air stations. for blowdown of seachests in void 2 starboard and void 4 port. These outlets, with other major components, valves, and piping are shown schematically in Figure 7-6 for Barge 1 and in Figure 7-7 for Barges 2-and 3.

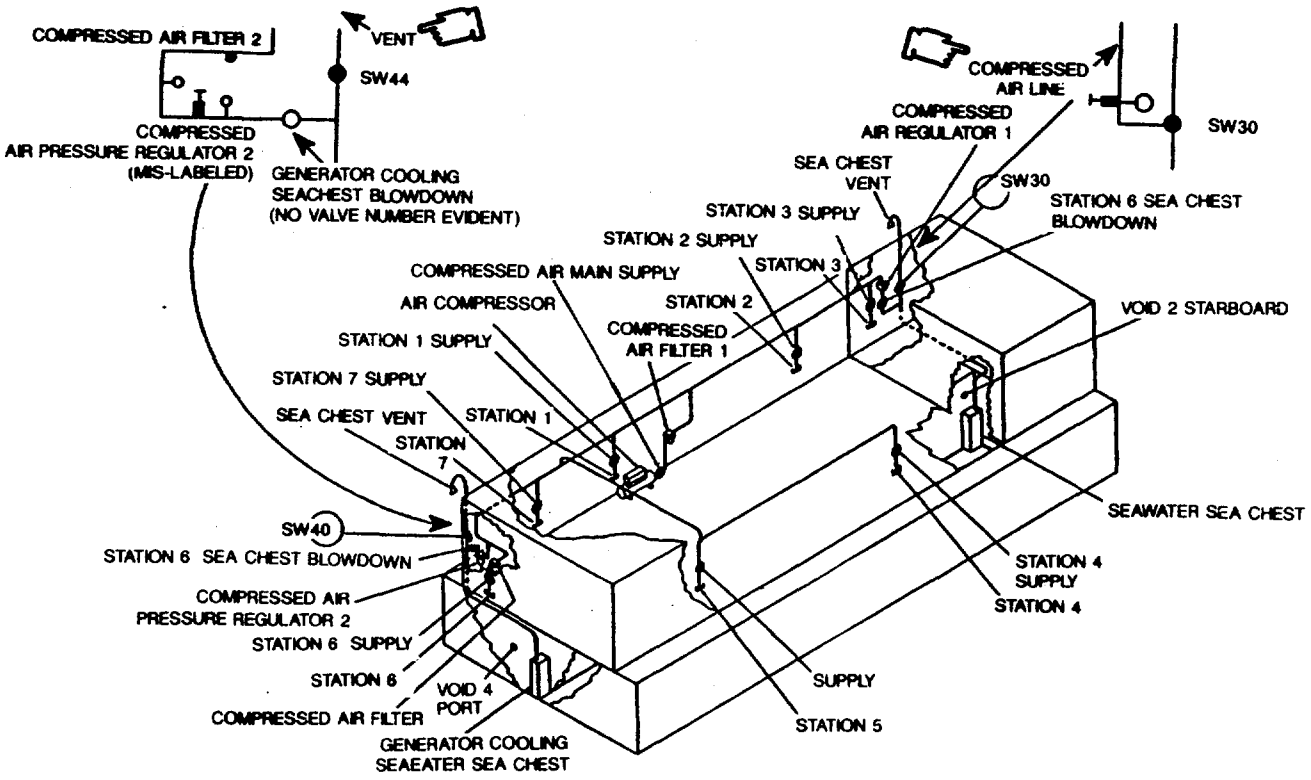


Figure 7-6. Location of Compressed Air System Components-Barge 1

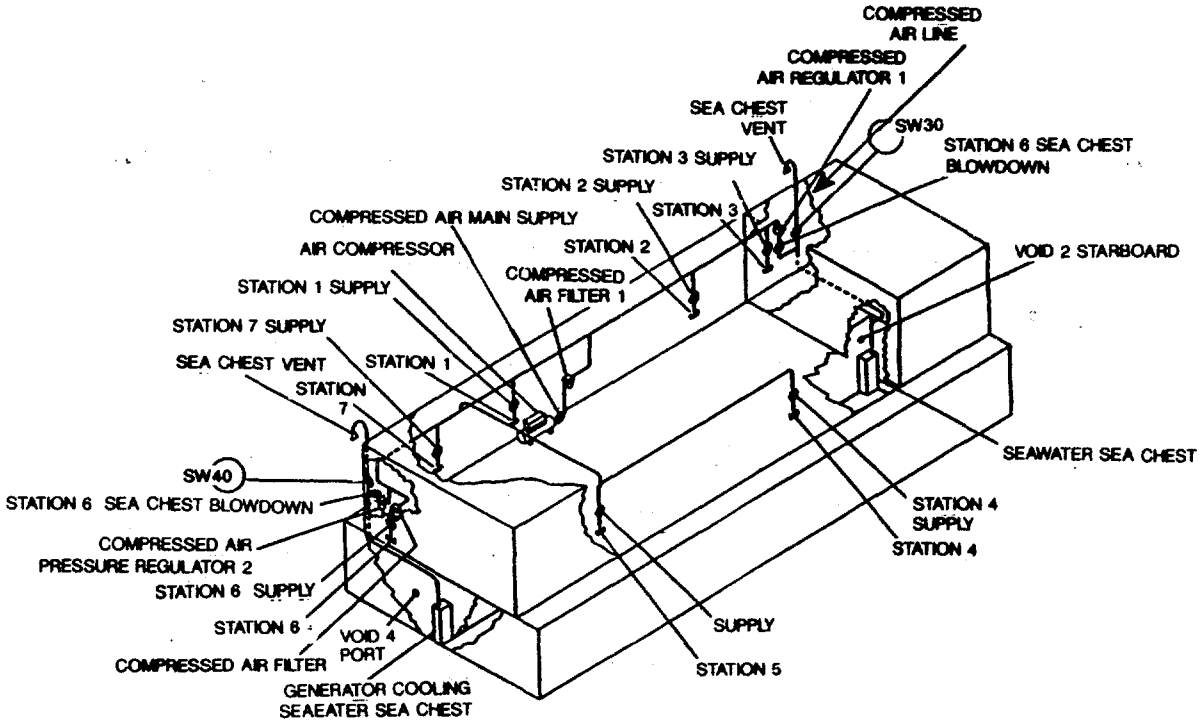


Figure 7-7. Location of Compressed Air System Components-Barges 2 and 3

Section II

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
										COMPRESSED AIR SYSTEM	**WARNING** **Be sure electrical power is OFF before performing maintenance or repair on this system. Open circuit breakers. Redtag circuit breakers or motor controller with "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.**	
1	•		•							All Components	a. Wipe components clean, especially gauges and control panels.	
	•		•								b. Check for leaks, paying special attention to joints, valves, fittings, and piping. Report leaks to shift leader or bargemaster.	Any leaks.
	•		•								c. Check for loose or missing securements or fasteners. Tighten or replace as necessary.	Securements or fasteners loose or missing.
	•		•								d. Check for damage, especially to pressure gauges, filters, and control panels. Notify shift leader or bargemaster so repairs can be made.	Pressure gauges, filters and/or control panels damaged.
			•								e. Remove rust and corrosion. Touch-up or paint in accordance with TB 43-0144 as necessary. Do not paint threads or labels.	
2	•		•							Receiver	Drain receiver by turning drain cock clockwise (small T-handle) on bottom of tank. When receiver is completely drained, close valve.	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
3	•		•	•						Oil Level	a. Check oil in sight glass on compressor: 1) Barge 1 - If oil cannot be seen in sight glass, remove oil cover nut in center of air intake assembly. Pour oil, one pint at a time, until level is at halfway mark on sight glass. DO NOT overfill. Use nondetergent, rust, and oxidation inhibiting industrial oil with viscosity equivalent to SAE 20, 20-90°F or SAE 10,90° +. **CAUTION** **On barges 2 and 3 air compressors, NEVER allow oil level to fall more than 1/8 in. below full level mark on sight glass.** 2) Barges 2 and 3 - Oil level should be up to full mark on sight glass. To add oil, unscrew oil plug to left of sight glass and add nondetergent, rust, and oxidation inhibiting industrial oil with a viscosity equivalent to an SAE grade 20 weight motor oil. Add oil to full level mark on sight glass. DO NOT overfill. Replace oil filter plug. **NOTE** **EXTENDED SHUTDOWN** **Follow procedures e through k for extended shutdown of 12 hours or more.**	Oil level low.
			•								b. Turn AUTO-MANUAL switch on electric controller to MANUAL.	
			•								c. Push electric controller STOP button.	
			•								d. Close main supply valve on forward end of receiver by turning handle at right angle to pipe.	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											WARNING **When bleeding receiver drain cock, ALWAYS use protection shield to protect eyes and face from flying particles. Wear gloves and avoid skin damage by rolling down shirt sleeves on clothing and closing buttons and collars.**	
			•								e. Open drain cock on bottom of receiver to drain air and water. Turn small handle clockwise. When receiver pressure reads 0 psi, close drain cock.	
			•								f. Open drain valves on bottom of air filters 1 and 2.	
			•								g. Open air station valves 1 through 5 and 7 by turning counter-clockwise until they stop. Leave them open.	
			•								h. Make sure air station valves 6, 8 and 9 are closed.	
		•									i. Check that receiver pressure gauge indicates no more than 155 psi when compressor set for AUTO. If pressure greater, pull test link on air safety valve. If air does not escape, replace safety valve. Valve cannot be adjusted or repaired. To replace valve: 1) Shut down air compressor system. 2) Redtag power panel 1 circuit breaker 3P5 to indicate, "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) Unscrew safety valve. 4) Screw in new safety valve (Barge 1 - P/N 9710-5332-00) (Barges 2 and 3 - P/N 91A0331 75-001) wrench tight. 5) Start air compressor system.	Pressure gauge indicates more than 155 psi.

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
		•									6) When receiver pressure gauge reads at least 100 psi, check receiver safety valve by pulling safety link. If air does not escape from receiver valve repeat above procedures to install another new safety valve. 7) Remove redtag from power panel 1 circuit breaker 3P5.	Air does not escape from receiver valve.
		•									j. Check that air pressure gauges on air pressure regulators 1 and 2 indicate 40 psi. If not, set pressure regulators 1 and 2 by turning adjusting screw on bottom of regulator clockwise to decrease and counterclockwise to increase air pressure beyond regulator.	
		•									k. Check for normal operation - when set on AUTO, compressor cycles on and off to maintain proper air pressure. If not normal, shut down using extended shutdown procedures and troubleshoot. Make repairs/adjustments as required. **WARNINGS** **DO NOT use compressed air to clean clothing or work space. High pressure (HP) air turns small particles into dangerous projectiles that may cause bodily injury.** **When using compressed air to clean equipment, ALWAYS use protective shield to protect eyes and face from flying particles. Wear gloves and avoid skin damage by closing buttons and collars and rolling down sleeves on clothing.**	Air pressure does not maintain normal level.

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
		•									I. Check air station 6 outlet PIG launcher controls as follows: **CAUTION** **Shore discharge hose must remain free from oil and dirt. Use only designated 25-ft air hose on compressed air station 6 for supplying compressed air to power PIG through shore discharge hose.** 1) Hold clean, white, dry cloth in front of air station 6 outlet and turn valve counterclockwise to open. Blow compressed air through cloth. Smell air coming out of air valve. If air smells oily or specks of dirt, oil or grease show on cloth, check oil level in air compressor. 2) If oil is overfilled, drain to authorized level. Change air filter and repeat air quality check with white cloth. Continue until air station 6 is free of oil smell and stain.	Oil is present in line.
4										Air Impact Wrench	**WARNINGS** **Always wear safety glasses when operating air impact wrench.** **Use only impact wrench sockets. DO NOT use sockets from a hand wrench set.**	
	•										a. Make sure compressed air system has been purged of moisture within last 4 hours. If not, open drain cock on bottom of air filter 1 until all moisture has been drained from system.	
	•										b. Check all air station valves and quick-disconnect fittings for damage or improper operation. Notify shift leader or bargemaster of any problem.	Valves and/or quick disconnect fittings damaged or inoperable.

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	•										c. Check for loose, worn, or cracked sockets which reduce wrench impact power and may create a hazard for the operator.	Sockets loose, cracked or worn.
	•										d. Inspect air hoses for damage or wear. Replace as required.	Air hoses damaged or worn.
	•										e. Each day, before using wrench, pour one tablespoon of oil into air inlet (turbine or spindle grade oil with 100-150 Saybalt Universal Seconds viscosity - contains rust inhibitor). **NOTE** **Oil is in the air inlet lubricator where hose is connected to assure constant supply of lubricant to the motor. DO NOT put oil in the oil hole on the side of the wrench body.**	
	•										f. Check to be sure air inlet screen is clean and properly installed in hose adapter. **WARNING** **DO NOT operate system without an operating safety valve.** **WARNING** **When bleeding pressure from air compressor drain cock, ALWAYS use protective shield to protect eyes and face from flying particles. Wear gloves, close buttons and collars and roll down sleeves on clothing.**	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											NOTE **AFTER OPERATION**	
	·										**· For less than 12 hour shutdown:** **1. Turn AUTO-MANUAL switch on electric controller to MANUAL.** **2. Push electric controller STOP button.** **3. Close main supply valve on forward end of receiver by turning handle at right angle to pipe.** **4. Follow procedures a through d below.** **· For extended shutdown - 12 hours or more follow procedures e through m below.**	
5	•		•							Compressor	a. Drain filters 1 and 2 by opening drain valves on bottom of filters. b. Close drain valves when water and moisture have drained.	
	•		•								**NOTE** **Weekly or after every 40 hours of equipment operation (whichever occurs first).**	
					•						c. Barge 1. Clean compressor air filter by the following procedures. 1) Redtag power panel circuit breaker 3P5 indicating. WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 2) Shut down air compressor system. 3) Unscrew by turning clockwise oil cover nut on top of air intake assembly on top of compressor. 4) Remove oil seal and oil cover.	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B - Before	**D - Daily**	**Q - Quarterly**
D - During	**W - Weekly**	**S - Semiannually**
A - After	**M - Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
					•						5) Lift out air filter and blow out with compressed air, blowing from inside towards outside of filter. If filter still shows signs of dirt, lint and/or oil in the mesh, wash in soapy water and dry with compressed air. If still dirty, replace with new filter (P/N1503-0189-00). 6) Carefully wipe out inside of air filter assembly, being very careful not to get dirt or lint into air intakes on each side. 7) Place clean or new filter into assembly, making sure it seats properly in bottom. 8) Place oil cover on top of air filter, install gasket and screw on oil cover nut. 9) Start air compressor system and check for leaks or other operating discrepancies. Correct as necessary. 10) Remove red tag from power panel 1 circuit breaker 3P5.	
					•						d. Barges 2 and 3. Clean cooling surfaces of compressor intercooler and aftercooler by wiping with a cloth soaked in solvent and then wipe dry. Clean other components as necessary. Clean electrical components. **NOTE** **Monthly or after every 160 hours of equipment operation (whichever occurs first).**	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B - Before	**D - Daily**	**Q - Quarterly**
D - During	**W - Weekly**	**S - Semiannually**
A - After	**M - Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
valve on all com-					•						e. pressors (Barges 1, 2, and 3).	Check receiver safety valve.
on safety valve			Air does not								in top of receiver. Air should escape from valve.	1) Pull up on safety link. Air does not escape from valve.
											WARNING **System MUST NOT be operated without an operating receiver safety valve. In the event that the compressor continues to run beyond factory set pressure, this valve reduces receiver pressure to a sale level.**	
escape, replace											receiver safety valve. This valve can not be adjusted or repaired. Replace as follows: (a) Shut down air compressor system. (b) Redtag power panel 1 circuit breaker 3P5 indicating, "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." (c) Unscrew safety valve. (d) Screw in new safety valve (Barge 1 - P/N 9710-5332-00) (Barges 2 and 3 - P/N 91A033175-001) wrench tight. (e) Start air compressor system. (f) When receiver pressure gauge reads at least 100 psi, check receiver safety valve by pulling safety link. Air should escape from receiver thru valve. If not, repeat above procedures and install another new safety valve. This valve is NOT adjustable or repairable. (g) Remove red tag from power panel 1 circuit breaker 3P5.	2) If air does not

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						•					f. Barges 2 and 3. Remove two compressor intake air cleaners on top of compressor and replace with two clean air cleaners. (If air cleaners are not dirty after 1 month of use, time between changing these cleaners may be extended to every other month.) Replace as follows: 1) Shut down air compressor system. 2) Redtag power panel 1 circuit breaker 3P5 indicating, "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) On top of compressor on each of two air intake filters, loosen setscrews holding air filters to intake manifold. Remove assembly by pulling away from intake manifold. 4) Place cleaned, used air filters onto air intake manifolds by sliding over end of manifold and tightening setscrews. 5) Start air compressor system. 6) Remove red tag from power panel 1 circuit breaker 3P5. **WARNING** **When using compressed air for cleaning components, ALWAYS use protective shield to protect eyes and face from flying particles. Wear gloves and avoid skin damage by closing buttons, collars, and rolling down shirt sleeves on work clothing.** 7) Clean replaced air filters by using compressed air blowing from inside towards outside. Clean thoroughly until no more dust or particles are blown out of assembly. Return cleaned air filters to stock for use at next scheduled maintenance.	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						•					**NOTE** **Semiannually, replace both air filters with new assemblies (FSCM 16327, P/N Z66A, muffler assembly, intake).** g. Check Barges 2 and 3 pulley clamp bolts and setscrews for tightness and drive belts for correct tension, condition, and alignment as follows: 1) Drivebelt replacement: (a) Shut down air compressor system. (b) Redtag power panel 1 circuit breaker 3P5 indicating, "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." (c) Remove belt guard from compressor by unscrewing three bolts (two have spinlock nuts). Place bolts, washers, and nuts with guard and place where it will not be damaged. (d) With two V-belts exposed, check appearance for frayed, worn, or extra hard and shiny edges or breaks in underneath side of belts. If belts show these signs, belts must be replaced in pairs (FSCM 16327, P/N 3X645). (e) Loosen four belts holding electric motor to base plate, slide motor towards compressor until belts can be slipped off pulleys. Discard old belts. (f) With belts off, and using a torque wrench, check tightness of bolt holding compressor pulley on compressor shaft. Torque to 500 in-lb. With normal wrench, check tightness of setscrew holding puley on electric motor shaft. Setscrew must be wrench tight.	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B -	Before	D -	Daily	Q - Quarterly
D -	During	W -	Weekly	S - Semiannually
A -	After	M -	Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						•					(g) Place two new belts on compressor pulley and then on motor pulley. (h) Pull motor away from compressor until belts are as tight as possible and while another crew member holds motor in this position, tighten four bolts holding motor to base plate. **NOTE** **When installing new pulley belts, make sure belt tension is as tight as possible. Pulley belts stretch with use and must be checked for proper tension at next monthly maintenance service.** (i) With a straight edge, check that pulleys are at right angles to their shafts and that belts in their grooves are running straight. If not, slightly loosen bolts holding electric motor and move motor until pulleys and belts are running straight in their grooves and are square with compressor and motor shafts. Tighten motor bolts. Again check alignment with straight edge. If not properly lined up, loosen motor bolts and try again. When belts are straight, tighten four motor bolts wrench tight. 2) Belt alignment/tension check: (a) Shut down air compressor system. (b) Redtag power panel 1 circuit breaker 3P5 indicating, "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						•					(c) Remove belt guard from compressor by unscrewing three bolts (two have spinlock nuts). Place bolts, washers and nuts with guard and place where it will not be damaged. (d) With two V-belts exposed, check appearance for frayed, worn, or extra hard and shiny edges or breaks in underneath side of belts. If belts show these signs, belts must be replaced in pairs in accordance with procedures in paragraph 1, above. If belts are in acceptable condition, proceed with belt alignment/tension check. (e) With torque wrench, check tightness of bolt holding compressor shaft. Torque to 500 in-lb. (f) With normal wrench, check tightness of setscrew holding pulley on electric motor shaft. Setscrew must be wrench tight. (g) Lay a straight edge across top of belts from compressor pulley to electric motor pulley and press down on belts with a thumb. Belts should depress between ¼ and ½ in. If belts depress more than this, loosen four bolts holding motor to base plate and move motor away from compressor until belts are within tolerances. Tighten motor bolts, check belt tension, and then check belt alignment. If all are acceptable, tighten motor bolts wrench tight. (h) Install belt guard using three bolts, spinnuts, and washers.	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						•					3) Start air compressor system. Check for any deficiencies and correct. 4) Remove red tag from power panel 1 circuit breaker 3P5. **NOTE** **Quarterly or after every 250 hours of equipment operation (whichever occurs first).** h. Compressor oil change. 1) Shut down air compressor system. 2) Redtag power panel 1 circuit breaker 3P5 indicating, "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) Unscrew oil drain plug and gasket and drain oil into container. 4) While oil is draining, remove oil filler plug. 5) Upon completion of draining, install oil drain plug with new gasket. 6) Add oil in oil filler hole until oil level in sight glass is within 1/8 in of full level mark on glass. Do NOT overfill. 7) Install oil filler plug and wrench tighten. 8) Start air compressor system. 9) Check oil level in sight glass. It must not be above halfway mark in glass or lower than 1/8 in below mark. If not within these markings, add more oil, or drain oil to bring it within these markings. 10) When compressor is operating, check drain plug and oil filler plug for leaks. Tighten as necessary. 11) Remove red tag from power panel 1 circuit breaker 3P5.	
							•					

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
							•				i. Barges 2 and 3 compressor air intake filters. Clean and replace as described in paragraph 3-7.3.b if the time between deaning has been extended to every other month.	
							•				j. Compressor oil change (Barge 1). When oil change is required as part of semiannual maintenance services, perform these procedures: 1) Shut down air compressor system. 2) Redtag power panel 1 circuit breaker 3P5 indicating, 'WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) Unscrew oil drain plug and gasket and drain oil into container. 4) While oil is draining, remove oil cover nut, seal, and oil cover. 5) Upon completion of draining, install oil drain plug with new gasket. 6) Add oil down oil tube until level can be seen in lower half of sight glass. 7) Install oil cover, seal, and oil cover nut. Tighten nut hand tight. 8) Start air compressor system. 9) When compressor is operating, check drain plug and oil cover for leaks (see paragraph 2-1.4). Tighten as necessary. 10) Remove red tag from power panel 1 circuit breaker 3P5.	
							•				k Check overall operation of system by going thru prestart, start, and operating procedures. Shut down system and repair or replace components as necessary. Notify shift leader or barge-master of operating discrepancies.	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											I. Air filter 1. When pressure regulators indicate dirt and grit in the system and for semiannual PMCS, perform the following: 1) Shut down air compressor system. 2) Redtag power panel 1 circuit breaker 3P5 indicating: 'WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) Manually, without using a wrench, unscrew ring nut attaching bowl guard and plastic filter bowl to filter head and remove guard, bowl, and bowl gasket. 4) Unscrew filter element screw and carefully remove lower baffle, gasket, filter element, gasket, shroud, and upper baffle. Place them on dean cloth in the sequence shown. 5) Wash filter element in soap and water, rinse, and allow to dry. Replace element (NSN 4330-00803-1028) if cracked, chipped, or deformed or if unable to clean to original color. 6) Wash filter bowl and all other parts with soapy water. Rinse and dry with lint-free cloth. 7) Inspect each part and replace any damaged or worn parts using bowl kit (CAGEC 04049, P/N 36017-BKF-329). 8) Assemble parts in sequence on the filter element screw. Screw filter element screw into filter head. 9) Carefully install plastic filter bowl, guard, and gasket. Then secure to filter head with ring nut. Tighten hand-tight without using a wrench. 10) Start air compression system. Check for and correct any deficlencies. 11) Remove red tag from power panel 1 circuit breaker 3P5.	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B - Before		D - Daily		Q - Quarterly
D - During		W - Weekly		S - Semiannually
A - After		M - Monthly		A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
								•			m. Air filter 2 (oil removal filter). I air station 6 fails air quality check and for semiannual maintenance services, perform these procedures: 1) Shut down air compressor system. 2) Redtag power panel 1 circuit breaker 3P5 indicating, 'WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) Without using a wrench, manually unscrew oil removal filter bowl ring nut attaching metal bowl to filter head. Remove bawl ring nut, metal bowl, and bowl O-ring. 4) Unscrew hex nut and remove rod 0-ring gasket, filter element, and gasket O-ring. Rod/element screw should remain attached to filter head. If rod/element screw unscrews from filter head, screw it back into filter head. 5) Replace filter element (CAGEC 31408, P/N CKF-507). If gasket O-ring and rod O-ring gasket are worn or damaged, replace them. 6) Place gasket O-ring on top of new filter element and slide element over rod/element screw. Hold in place by hand and install rod O-ring gasket over rod/element screw. Screw on hex nut. Before tightening nut, check that filter element is squarely set against filter head. Then tighten hex nut hand tight. 7) Clean metal bowl with warm soapy water, rinse, and dry with lint-free cloth. **NOTE** Bowl O-rlng must be replaced dry, without any silicone lubricant.	

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
								•		Air Pressure Regulator	8) Replace bowl O-ring if damaged or worn. 9) Carefully install bowl O-ring and metal bowl. Hold in place by hand and screw bowl ring nut onto threads on filter head. Make sure O-ring is properly seated and then tighten hand-tight. 10) Start air compressor system. 11) Remove red tag from power panel 1 circuit breaker 3P5. **NOTE** **Semiannually or after 1000 hours of equipment operation (whichever occurs first).** Air pressure regulators 1 and 2. Upon detection of leaks, pressure fluctuation, pressure creep, or for semiannual maintenance services, perform these procedures: 1) Shut down air compressor system. 2) Redtag power panel 1 circuit breaker 3P5 indicating, 'WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) On air pressure regulator, unscrew bottom plug (or pressure gauge if installed in this manner) and remove bottom plug O-ring, bottom spring and disc assembly. Inspect valve seat for damage or wear. 4) Inspect valve seat in head casting for foreign material or damage. Clean with soapy water, rinse, and dry with lint-free cloth.	
								•				

Table 7-2. Preventive Maintenance Checks and Services for Compressed Air System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
								•			5) Replace any damaged parts using repair kit (CAGEC 04049, Part No. 1586R) parts (bottom plug O-ring, bottom spring, and/or disc assembly). 6) Assemble pressure regulator in sequence. 7) Start air compressor system. 8) Check for proper operation. If still malfunctioning, shut down air compressor system and perform steps 10 thru 17. 9) If working properly, proceed to step 17. 10) Remove six screws attaching bonnet to head casting and remove bonnet. 11) Remove spring button, adjusting spring, and relieving diaphragm. 12) Inspect diaphragm and diaphragm seat in head casting for tears, wear, or foreign material. 13) Replace damaged or worn parts using adjusting spring kit parts (relieving diaphragm, adjusting spring, and/or spring button). 14) Assemble parts in sequence. Install bonnet and secure with six screws. 15) Back off adjusting screw until it turns freely. 16) Start air compressor system. 17) Adjust pressure regulator to required setting of 40 psi. Turn adjusting screw clockwise to increase pressure reading and counterclockwise to decrease pressure reading. 18) Remove red tag from power panel 1 circuit breaker 3P5.	

CHAPTER 8 FUEL OIL SYSTEM PMCS

Section I. General system information

8-1 Introduction. Chapter 8 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Unit Barge Fuel Oil System. Operating and maintenance procedures are described in detail in TM 55-1930-209-14&P-8. TM 55-1930-209-14&P-8, Appendix C also contains complete Preventive Maintenance Checks and Services for the Fuel Oil System.

8-2 Major components. The fuel oil system consists of two storage tanks, a day tank, draining tanks, and the workboat filling station. In addition, it includes the fuel oil transfer pump and pump motor controller, fuel oil filter, fluid level indicators, switches, gauges, valves, piping, and associated electrical circuitry. Table 8-1 lists the major components of the fuel oil system, their basic function and location on the barge.

Table 8-1. Major Components of Fuel Oil System

Component	Function	Location
Fuel oil port storage tank	Stores 3600 gal of fuel oil	Void 3 port
Fuel oil starboard storage tank	Stores 3600 gal of fuel oil	Void 3 starboard
Fuel oil storage day tank	Stores 320 gal of fuel oil	ROWPU space starboard
3 fuel oil liquid level indicators	Indicate level of fuel in each tank visually with high level switch	One on each storage tank and one on day tank
Fuel oil transfer pump	Used to transfer fuel oil from storage tank to day tank	Void 3 starboard
Fuel oil transfer pump motor controller	For starting and stopping fuel oil transfer pump	Void 3 starboard
Fuel oil transfer pump remote stop switch	For starting and stopping fuel oil transfer pump from ROWPU space	ROWPU space starboard bulkhead
Fuel oil filter	Filters foreign materials from fuel oil before entering fuel oil transfer pump	Void 3 starboard
Workboat fuel oil filling station	Fuel nozzle for filling workboat fuel oil tank	Deckhouse starboard side on weatherdeck forward of sliding door
Fuel oil filling stations (fuel oil fill connection)	Fuel oil connection for filling storage tanks from fuel oil source	Deckhouse starboard side on weatherdeck aft of dayroom door
Fuel oil storage tank vent (air escape valve)	Allows free flow of air into fuel oil storage tanks and day tank prevents vacuum or excessive pressure build-up	Top of deckhouse starboard side-rail
Drains	For draining fuel oil tanks in void 3 and one in	One on day tank, one void 2 on storage tanks

8-3 Fuel Oil System Description. The fuel system on board the ROWPU barge provides fuel for two 155 kW diesel ship service generators, a ship auxiliary generator, and two ROWPU high pressure (HP) pump diesel engines, and a fueling station for the wordboat. The system provides a centralized receiving, storage and distribution system for all barge operations. Refer to Figure 8-1.

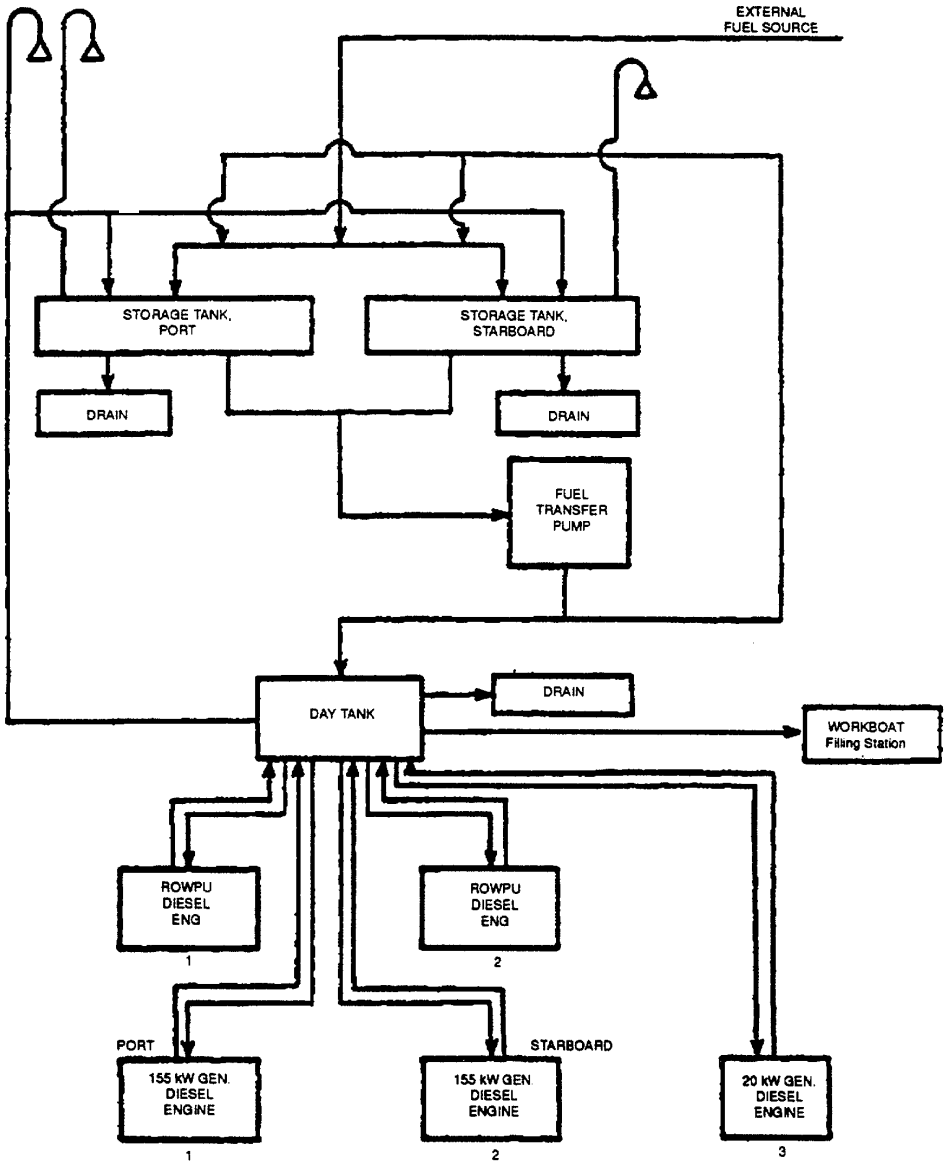


Figure 8-1. Fuel Oil System

Section II

Table 8-2. Preventive Maintenance Checks and Services for Fuel Oil System

B - Before	**D - Daily**	**Q - Quarterly**
D - During	**W - Weekly**	**S - Semiannually**
A - After	**M - Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										FUEL OIL SYSTEM	**CAUTION** **When transferring fuel between storage tanks, monitor storage tank liquid level indicators. Always operate transfer pump motor controller in a manner to avoid tank overfills. Avoid excess fuel splashes from hose nozzle when using workboat fill station. Clean up fuel spillage immediately; careless fuel handling causes spills and increases hazards of shipboard fire.**	
1	•	·	•	·	•	•				All Components	a. Wipe components clean, especially fuel oil storage tank and day tank liquid level indicators.	
	•	•	•	•	•	•					b. Check for leaks, paying special attention to joints, valves, fittings and piping. Report leaks to shift leader or bargemaster.	Class III leaks.
	•		•		•	•					c. Check for loose or missing securements or fasteners. Tighten or replace as necessary.	Securements or fasteners missing or loose.
	•		•		•	•					d.. Check for damage especially to pressure gauges, filters, and control panels. Notify shift leader or bargemaster so repairs can be made.	Pressure gauges, filters or control panels damaged.
	•		•		•				•		e.	Remove rust and
corrosion.	Touch up										or paint in accordance with TB 43-0144 as necessary.	Do not paint threads or labels.
2										Fuel Transfer Pump	**NOTE** **Before filling storage tanks or workboat fuel tank, be sure all posted safety precautions are observed. Notify US Coast Guard of overboard spills into surrounding water.**	

Table 8-2. Preventive Maintenance Checks and Services for Fuel Oil System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	•		•		•						a. Check wiring for loose connections and frayed cables. Use insulated tools to secure, repair or replace cables as necessary.	Connections loose or cables frayed.
	•										b. Start up after administrative or longterm storage: **CAUTION** **Pump must start within 60 seconds. DO NOT try to turn over pump for more than 60 seconds. Pump will be damaged.** 1) Start pump. If pump does not start within 60 seconds, notify shift leader or bargemaster of problem. 2) If authorized by shift leader or bargemaster, prime pump, using lubricating liquid, if available. 3) Start pump. If fuel does not flow within 2 minutes, stop and vent discharge line until fuel flows into container placed under discharge line. 4) If pump still does not discharge fuel, notify shift leader or bargemaster.	
		•									c. Check that fuel transfer pump is operating normally and not leaking more than a slight weep (Class II). If fuel oil flow does not start within 1 minute, notify shift leader or bargemaster.	Class II leaks.
	•										d. Note unusual noises or overheating of fuel transfer pump motor which might indicate a pending malfunction. e. Lubricate fuel transfer pump using grease gun with #2 ball bearing grease for normal operation. Use appropriate grease for hot or cold weather. In extreme heat, lubricate with hot weather lubricant such as SAE 40.	Fuel transfer pump motor overheating.

Table 8-2. Preventive Maintenance Checks and Services for Fuel Oil System (Continued)

B - Before	**D - Daily**	**Q - Quarterly**
D - During	**W - Weekly**	**S - Semiannually**
A - After	**M - Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											f. Check transfer pump for leaks, capacity and pressure. If leakage is greater than a slight weep, replace mechanical seal as follows. **CAUTION** **Never touch sealing faces with anything except fingers or a clean cloth to ensure a good seal.** 1) Remove capscrews attaching end cap. 2) Remove end cap to expose mechanical seal. 3) Remove mechanical seal by sliding off end of shaft. 4) Check end of pump shaft for sharp burrs or edges which might cut seal bellows. 5) Spread a film of lubricating oil on inside diameter of synthetic rubber bellows. 6) Slide seal rotary member over shaft and up against set collar, so that spring washer and spring go on first. 7) Coat synthetic rubber seal seat with lubricating oil and push seal seat into end cap. 8) Put end cap gasket on end of casing. 9) Slide end cap over shaft. 10) Flush both seal seat and carbon wear ring in seal rotary member with oil. 11) Push end cap up until mating surfaces of end cap and casing or seal meet. 12) Install capscrews and tighten evenly.	Class III leaks.

Table 8-2. Preventive Maintenance Checks and Services for Fuel Oil System (Continued)

B - Before	**D - Daily**	**Q - Quarterly**
D - During	**W - Weekly**	**S - Semiannually**
A - After	**M - Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											If pump is loosing capacity or pressure, adjust end clearance as follows: **NOTE** **If pump is furnished with relief valve, it is not necessary to remove valve from pump head.** 1) Remove capscrews attaching head to casing. 2) Remove head gasket. 3) Install proper amount of head gaskets to provide necessary end clearance within pump, so pump turns freely with no end play. 4) Attach head to casing using cap-screws.	
3	•			•					·	Storage and	a.	Check liquid levels in
storage tanks and										Day Tanks		day tank before
transferring fuel. Fil												tanks as necessary.
		•		•						·	b.	Check fuel storage and
day tank visual												
											liquid level indicators for damage. Report mal or nonfunctioning level switches to shift leader or bargemaster.	
.									•		c. Drain and flush clean the liquid level indicator to reduce magnetic buildup. Dry surfaces with a clean, lint-free cloth.	
											d. Monitor proper operation of fuel storage tank liquid level switches on EMS video displays on fuel oil system.	
											e. Check that day tank high level switch automatically stops fuel transfer pump when day tank is full.	
											f. Check air tank escape valve frame screen and protective mesh for clogging and excessive corrosion. Clean or replace as necessary.	

Table 8-2. Preventive Maintenance Checks and Services for Fuel Oil System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
4	·					•	•			Valves	a. Operate each valve through its full range of operation. b. Check valves. Replace or remake worn or damaged valves in accordance with TM 55-503.	
5	·						•			Fuel Oil Line Filter Element	a. Remove and replace screw-on fuel line filter element. b. Discard old filter.	
6	•	·	•			•				Fuel Catch	a. Check for clogging in catch basin. If Basin clogged, use compressed air to unclog strainer. b. Check for fuel in catch basin. Clean basin with water.	
7	•·	·	•			•			·	Fuel Oil Filling Station	a. Check fuel hose and nozzle for leaks, cracks and bends. Repair or replace as required. b. Check that ball valve moves freely. Repair or replace as required.	Class III leaks. Ball valve inoperable.

CHAPTER 9 ELECTRICAL POWER SYSTEMS PMCS

Section I. General equipment Information

9-1 Introduction. Chapter 9 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Barge Electrical Power Systems. Operating and maintenance procedures are described in detail in TM 55-1930-209-14&P-9. TM 55-1930-209-14&P-9, Appendix C also contains complete Preventive Maintenance Checks and Services for the Electrical Power Systems.

9-2 Major components. The Electrical Power Systems consists of the Normal Electrical System, the Emergency Electrical System, the 155 kW Ship Service Generators and the 20 kW Ship Auxiliary Generator Set. The major components for these systems are listed in Tables 9-1 and 9-2. Also listed are basic functions and locations on the barge for each component.

Table 9-1. Major Components of Electrical Power System

Component	Quanitiy/Function	Location
Switchboard	1 - Controls and distributes electrical power	ROWPU space port bulkhead aft
Shore power receptacle	1 - Receives power from outside source	Stem weatherdeck portside
SSG	2 - Provides electrical power	Voids 4 port & starboard
SAG	1 - Provides electrical power	Void 4 starboard
Power panel 1	1 - Distributes 440 Vac power	ROWPU space port bulkhead forward near door to weatherdeck
Power panel 2	1 - Distributes 440 Vac power	ROWPU space starboard bulkhead forward of sliding door
Power panel 3	1 - Distributes 220 Vac power	ROWPU space forward bulkhead
Power panel 4 (Barge 1)	1 - Distributes 440 Vac power to heaters	ROWPU space starboard bulkhead
Deck lighting panel	1 - Controls electrical power for deck lights	ROWPU space starboard bulkhead
Void lighting panel	1 - Controls electrical power for void lights	ROWPU space starboard bulkhead near dayroom door
Receptacle panel	1 - Controls electrical power to receptacles	Workshop aft bulkhead
Ground detector panel	I - Indicates ground in 115 Vac power system	ROWPU space forward bulkhead
Emergency shutdown	7 - Shut down electric-powered equipment or total electric power	ROWPU space starboard bulkhead aft of personnel door
	6 - Shut down total electric power	ROWPU space starboard bulkhead aft of personnel door Outside ROWPU space starboard door on weatherdeck Outside ROWPU space port door on weatherdeck Inside ROWPU space port door to weatherdeck Outside dayroom door to weatherdeck Inside dayroom door to weatherdeck

Table 9-2. Major Components of Emergency Electrical System

Component	Location	Function
24 Vdc battery charger	Workshop	Keeps battery bank charged
DC-AC standby inverter	Workshop	Converts 24 Vdc from batteries to 115 Vac for emergency lighting panel
Battery bank	Deckhouse top forward	Provides 24 Vdc to DC power panel and to input side of inverter
24 Vdc power panel	Workshop	Provides 24 Vdc power for Army radio and telephone system, foghorn, bilge alarm module, emergency shutdown system, and navigation and status lights
120 Vac emergency lighting panel	ROWPU space forward bulkhead	Provides power to emergency lights in deckhouse and voids, marine radio and telephone buzzer system

9-3 System description.

9-3.1 Normal electrical system description. The normal electrical system provides electrical power for the operation of major auxiliary systems on the barge including the emergency system battery charger.

Normal electrical power is generated onboard by one of three diesel-powered generator sets. These generators, located in voids 4, are normally operated and controlled from a master switchboard in the ROWPU space. Chapter 4 provides detailed information on the two ship service generator (SSG) sets, and Chapter 5 provides similar information on the ship auxiliary generator (SAG) set. When all generator sets are shut down, a shore-based powerplant or another vessel can be used to provide electrical power to operate onboard equipment. This outside source is connected to the barge through electrical cabling to awatertight shore power receptacle on aft weatherdeck portside. These sources provide 440 Vac, 60 Hz, 3 ph electrical power.

Power control and distribution is provided by a main switchboard on the port bulkhead aft of diesel high pressure (HP) pumps in the ROWPU space. This unit has six panels, three above the grab rail and three below. The three panels above the grab rail are controls and indicators for the three diesel generators in voids 4. The lower left (as operator faces the switchboard) distribution panel has two rows of circuit breakers that provide initial normal power distribution. Two lower right panels contain controls and indicators for the electrical systems. This panel also has indicators for ground detection system. Normal electrical system controls and indicators are discussed in paragraph 2-10.

9-3.2 Emergency Electrical System. The emergency electrical system provides a limited amount of 120 Vac and 24 Vdc power for selected essential lighting and power requirements.

This system's central unit is a battery bank on the deckhouse top that is maintained at full charge by a battery charger in the workshop. The charger receives its power from the normal electrical system.

When normal power is disrupted, the battery bank provides 24 Vdc to an inverter. The inverter converts this power to 120 Vac, which is supplied to the 120 Vac emergency lighting panel. In addition, this battery bank provides continuous 24 Vdc power directly to a DC power panel.

Components of this system are listed in Table 9-2
.
This system automatically provides 120 Vac power for emergency lighting in the ROWPU space and voids and 24 Vdc power for direct current equipment.

9-3.3 155 kW Ship Service Generators. Two diesel powered generator sets, each rated at 155 kW, serve as primary electrical power sources for the barge. When shore power is not used, one SSG must be online when any of the ROWPU major systems are being operated. These SSG's, number 1 in void 4 port and number 2 in void 4 starboard, are Caterpillar diesel engine driven generator sets. Each SSG consists of a Caterpillar 3306TA diesel engine and a Caterpillar Model SR4 generator mounted, with isolation isolators, on a common base. The set weighs 3960 pounds dry and 4180 pounds wet and is 118 inches long, 39 inches wide, and 59 inches high. The third generator set, rated at 20 kW, supplies power for the barge when ROWPU major systems are not operating and there is a lower demand for electrical power.

9-3.4 20 kW Service Auxiliary Generator. The 20 kW SAG set supplies limited amounts of electrical power for the barge when ROWPU systems are not in operation. It provides sufficient power for operating normal lighting, dayroom equipment, workshop equipment, and battery chargers. It must never be used to provide power for any major system onboard.

This generator set consists of a Perkins Model 4.236M engine and a Newage Stamford SC144E generator mounted, with vibration isolators, on a common base. It has free standard switching gear and is capable of parallel operations. The set weighs 1300 pounds dry and 1451 pounds wet and is 74 inches long, 26 inches wide, and 40 inches high.

Section II

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										NORMAL ELECTRICAL POWER SYSTEM	**NOTE** **Only qualified personnel, using proper and authorized test equipment, are authorized to work on electrical power system components. This system has been designed and constructed to be primarily maintenance free between major shipyard overhauls.** **NOTE** **If electrical system fails to operate, troubleshoot according to TM 55-1930-20914&P-9. Report deficiencies and failures to shift leader or bargemaster. Keep electrical power systems operational and PMCS logs current.** **WARNING** **Make sure electrical components and circuits are turned OFF before starting any inspection and/or cleaning. Observe all posted warnings and safety precautions. Circuit breakers must be open (OFF). Redtag appropriate switches and circuit breakers with: "WARNING DO NOT ACTIVATE. REPAIRS BEING MADE."**	
1	•			•				·	·	Cables	a Visually check for loose or damaged cables. Make sure all cables are firmly attached, corrosion free, and not subject to rubbing or chafing.	Loose or damaged cables.
2	•·	·	•	•						Electrical Switches, Mounting Systems and Wiring tighten.	b.Check for loose or damaged electrical connections, switches, wiring, mounting systems, hangars, and electrical insulating material. Use insulated tools to damaged.	Electrical connections, switches, wiring, mounting systems loose or

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											CAUTION **DO NOT use solvents to clean electrical components. Solvents may leave a greasy film that reduces electrical conductivity.**	
3	•		•	•						Panel Covers, Housings and Metal Surfaces	c. Check components such as panel covers, housing, and metal surfaces for rust corrosion, and worn or chipped paint. Use a wire brush to remove rust and corrosion and paint with zinc chromate primer and finish to match surrounding area in acordance with TB 43-0144. Do not paint threads or labels.	
4	·	•								Failure Lights	d. Check engine failure lights by using PRESS-TO-TEST button. If lamps do not light, change bulbs when generator being operated is off-line.	
5						•				All Components	e. **NOTE** **Avoid using solvents for cleaning internal portions of electrical system. Solvents often leave a greasy film on components that may reduce electrical conductivity.** 1) Clean electrical equipment. Avoid damaging insulation, mounting system, and hardware, or impairing electrical properties of item being cleaned. 2) Vacuum internal portions of switchboard, power panels, electrical controllers, inverters, battery chargers, and receptacles. Vacuum grit, iron dust, and copper particles from enclosed areas. 3) Wipe dirt from external surfaces of electrical equipment with dry cheesecloth or, if necessary, with a damp soapy cloth. Wipe dry.	Cleaning

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before **D - During** **A - After** | **D - Daily** **W - Weekly** **M - Monthly** | **Q - Quarterly** **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
						•				.	4) Clean circuit breakers, contacts and relays with fine sandpaper to remove black discoloration. Do NOT use emery cloth.	
										.	5) Clean arc chutes on circuit breakers with a fine file. Vacuum to remove residue.	
										EMERGENCY ELECTRICAL POWER SYSTEM	**WARNING** **Fumes from battery electrolyte may be flammable and explosive. DO NOT smoke or have open flames when checking electrolyte, or when working on battery bank. Avoid contact with eyes and skin. Wear safety glasses, gloves, and rubber aprons when handling electrolyte. Electrolyte is highly toxic to skin, eyes and respiratory system and can cause severe burns.**	
1 .	•		•	•				.	.	Batteries	a. Check batteries in bank for proper electrolyte level. Add distilled water or clean water to bring level above plates.	Electrolyte level low.
.	•										b. Check that battery bank is secure and that electrical cable fittings are tight and coated with anti-corrosion grease. Correct as necessary.	
.											c. Check for damage and loose fittings, wires and fasteners. Replace or tighten as necessary.	Fittings, wires and/or fasteners damaged or loose.
.	•										d. Wipe all battery components clean.	
		•									e. Replace defective status lamps.	
				•							f. Check electrolyte level daily and make sure it covers plates in each cell of all batteries.	
											g. Visually check for loose or damaged cabling. Make sure cabling is firmly attached, free of corrosion, and not subject to rubbing or chafing.	Cables loose or damaged.
.											h. Check for loose or damaged electrical -connections, switches, wiring, mounting systems, hangers, and insulating material. Repair, replace, or tighten as necessary using insulated tools.	Electrical connections, switches, wiring, and mounting systems loose or damaged.

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before	**D - Daily**	**Q - Quarterly**
D - During	**W - Weekly**	**S - Semiannually**
A - After	**M - Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
				•							i. Wipe any corosion or dirt from electrical components using dry cheesecloth or wipe with a damp soapy cloth, then wipe dry. Avoid using solvents to clean electrical components. Solvents often leave a greasy film that reduces electrical conductivity.	
					•						j. Check electrolyte specific gravity. **NOTE** **Extreme temperatures may have an adverse effect on the battery bank. Since it is on the deckhouse top, battery bank is exposed to high temperatures and climatic changes. This exposure increases evaporation of electrolyte from batteries and requires more frequent checks of electrolyte level and specific gravity.**	
2						•				Cables	a. Clean and inspect all components. Starting from power panel 3 circuit breaker 1 OP13, inspect each cable as it leaves the panel. Check fastenings as they exit switchboard and all fasteners, mounting hardware, and hangers to make sure they are tight.	
						•					b. Check each cable on both sides of its passage thru bulkheads. Check that cables and/or electrical conduit are tight, not rubbing or chafing, and free of corrosion and dirt. Conduct same inspection of cables as they pass thru decks and other structural parts of barge.	Electrical cables and conduits are corroded or dirty.
						•					c. Check each cable at its destination to make sure it is firmly attached, not rubbing or chafing, and is free of corrosion and dirt.	Cables not firmly attached.
					•					All Components	a. Check that all components are securely fastened. Tighten any loose fasteners. b. Check all components for possible damage. Repair or replace as necessary. If emergency system has not been activated for 7 days, activate the system and make sure all components are oparational. Troubleshoot and repair as indicated.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
					SHIP SERVICE GENERATOR (SSG) SYSTEM	**WARNING** **Ear protection must be worn in voids 4 when any generator is operating.** **WARNING** **At operating temperatures, engine coolant is hot and under pressure. It also contains alkaline materials harmful to eyes and skin. To avoid personal injury check coolant level only when engine is stopped and filler cap is cool enough to be touched by the bare hand. If coolant comes in contact with eyes or skin, immediately flush affected area with clean water and seek medical assistance.** **CAUTION** **Sensing element must be submerged in coolant to operate. If coolant is low, engine can overheat and automatic shutoff will not function to prevent damage to engine.**	
1	•			10 hrs	Engine	a. Check engine coolant level-should not be more than ½ in. below filler pipe. Fill with clean, fresh water (low in scale-forming minerals but not softened water)-see table below. Add cooling system conditioner to water before filling. Conditioner should be 3 percent by volume of total coolant capacity (about ½ pint of conditioner per 2 gallons of water). Water Content — 50% Antifreeze 50% Water — Without Antifreeze Chlorides — 100 ppm or less — 50 ppm or less Sulfates — 100 ppm or less — 50 ppm or less Hardness as CaCo3 — 200 ppm or less — 100 ppm or less Dissolved Solids — 500 ppm or less — 250 ppm or less pH — 6.5 or higher — 6.5 or higher ppm = parts per million	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	•				10 hrs	b. Check that engine crankcase oil is between ADD and FULL marks on dipstick. If necessary, add oil at oil fill located above oil dipstick on accessory end of engine. Oil must meet engine service classification CD(MIL-L-2104) or CD/TO-2. See table below for engine crankcase lubrication. Diesel engines on board use 15W40 crankcase lubricant for normal temperatures. Use SAE40 if temperatures consistantly exceed 120°F.	
	•			10 hrs		c. Clean air cleaner element by performing the following: 1) On air cleaner, unlatch two rackover latches. Remove air cleaner cover and filter element. 2) Cover turbocharger intake opening located inside the air cleaner body. 3) Clean inside of air cleaner cover and body with clean cloth and solvent. Wipe dry.	

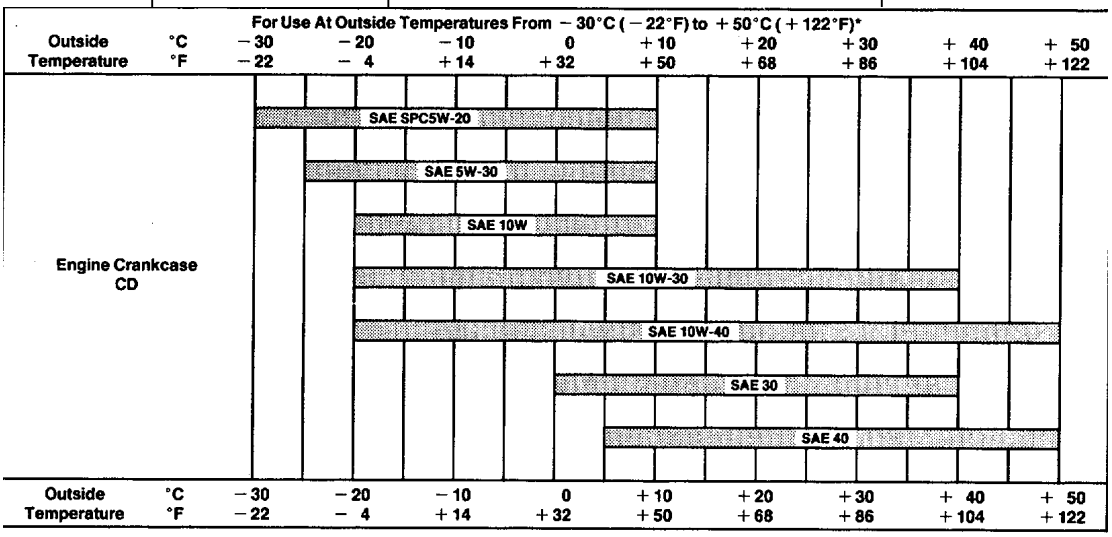


Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
	•				10 hrs	**WARNING** **When using compressed air for cleaning filter elements, wear face shield and clothing that completely covers the body and limbs. Shirtsleeves must be rolled down and buttoned and collar buttons fastened.** **CAUTION** **Do not clean element by bumping or tapping them on hard objects.** 4) Clean filter element with compressed air directed first inside along the length of pleats in the element and then outside along the length of pleats and again on the inside. Filter elements may also be cleaned with a vacuum cleaner if element is not too greasy. **NOTE** **If compressed air does not clean elements, wash in a warm soapy water solution. Rinse and blow dry.** 5) Inspect filter element by placing a light inside a clean, dry element. Check for rips, tears, or holes in element material. If damaged, discard and obtain new. **NOTE** **If excessive exhaust smoke and/or or loss of power continue after servicing air cleaner, discard that element and install a new one.** 6) Remove covering from turbocharger inlet inside air cleaner body. 7) Install cleaned or new element. Place cover on body and lock in place with two rackover latches.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
						d. With generator load applied, check from switchboard: 1) PRESS-TO-TEST Engine Failure Lights. 2) PRESS-TO-TEST 440-Volt Ground Detection Light. 3) Report failures to shift leader or bargemaster.	
			•			e. With engine idling, check that oil pressure gauge shows positive pressure. If not, stop engine and report problem to shift leader or bargemaster.	Oil pressure gauge does not indicate positive level.
			•			f. With engine idling, check that fuel pressure gauge on engine is normal (green) range. If not, report problem to shift leader or bargemaster.	Fuel pressure gauge does not indicate normal (green) range.
			•			g. With engine idling, check that coolant temperature gauge is registering. As engine warms up, gauge should move to higher reading. If gauge does not register or if temperature exceeds operating limits, stop engine and report problem to shift leader or bargemaster.	Gauge does not register or temperature exceeds operating limits.
		•		50 hrs		h. Check that batteries and battery cables and connections are tight, corrosion free and coated with anti-corrosion grease. **WARNING** **Fumes from batteries may be flammable and explosive. Do NOT smoke or have open flame when checking or working on battery bank. Battery electrolyte presents potential health hazards. Contact with eyes and skin should be avoided. Safety glasses, gloves, and rubber aprons must be worn when handling this chemical. Electrolyte contains sulfuric acid which can cause severe burns and is highly toxic to skin, eyes, and respiratory system.**	
		•		50 hrs		i. Check batteries for proper electrolyte level. Add distilled or clean tap water to bring level above plates.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
		•				j. From switchboard, with generator load applied, check that battery charger ammeter indicates batteries being charged. Report failures to shift leader or bargemaster.	
	•			10 hrs		k. Drain water and sediment from fuel/ water separator (on barges 2 and 3 only).	
						I. Check that seawater is available for heat exchanger. Make sure both stern seawater strainer baskets are clean and operable.	Seawater is not available for heat exchanger.
				250 hrs		g. Change crankcase oil and oil filter element by performing the following: 1) Run engine until oil is hot. Turn off engine by following procedures: (a) Make sure electrical load has been transferred to other generator sets and that applicable circuit breaker (P1 for SSG 1 or P2 for SSG 2) is open (OFF). (b) Operate engine at idle speed for 5 minutes. (c) At engine, push engine START/ STOP switch to STOP. 2) Redtag affected SSG on switchboard panel indicating, "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) Open bilge drain valve (BD16 for SSG 1, BD17 for SSG 2) below oil dipstick. Drain at least 1 pint of oil into clean container for Army Oil Analysis Program (AOAP). Close valve. Send marked oil sample to IDS or IGS unit for analysis.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				250 hrs		4) Plug flexible utility hose from bilge pump into quick-disconnect connection below oil dipstick. Open engine oil drain valve (BD16 or BD17). Set bilge drain valves as follows: (a) Open valves BD7 and BD11. (b) Close valves BD1 thru BD6, BD8 thru BD10, and BD14. 5) Start bilge pump. 6) When oil has been pumped out of crankcase, close valves BD16 or BD17. Disconnect bilge utility hose and clean any oil spills. Drain and clean bilge utility hose before storing. 7) Above oil dipstick, unscrew cylindrical oil filter element by turning from right to left. Discard old filter element. 8) Clean oil filter housing and lip where oil filter element fits into housing. Make sure all of old gasket is removed and gasket seat on housing is clean. 9) Lubricate new gasket with clean oil and place on seat of new filter element. Screw on new filter element until gasket contacts base of filter housing. Hand tighten filter an additional 3/4 turn. 10) Fill engine with 7.3 gal of lubricating oil that meets engine service classification CD (MIL-L-2104) or CD/TO-2. For operating in normal temperatures, use SAE 15W40. If temperature in the voids consistently exceeds 120 F, use SAE 40. Filler cap is above oil filter and at the accessory end of the engine. 11) Start engine and run for 5 minutes at idle. Shut down and check oil level. Top off if necessary.	Filter element leaks.

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				250 hrs		h. Check and maintain the crankcase ventilation system as follows: 1) Empty and clean glass collecting bowl located at bottom of filtering system. (a) Remove bowl by pulling down metal tab of cage holding the bowl. (b) Unsnap wire cage on each side of bowl bottom. (c) Remove bowl, wipe with clean cloth. Do not use abrasives. (d) Replace bowl in reverse order. 2) Change engine crankcase filter system vapor filter element. (a) Snap off two metal clips on top of filter body. (b) Lift off top and replace element. Discard and replace with new element. (c) Reinstall in reverse order.	
				250 hrs		**CAUTION** **Never add coolant to an overheated engine. Allow engine to cool first.** i. Check engine coolant level and add as required. 1) Mix antifreeze to provide protection to the lowest expected ambient temperature. **NOTE** **When filling cooling system, allow for addition of conditioner.**	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				250 hrs		2) To avoid air pockets, add coolant slowly, at 5 US gal (19 L) per minute or less. Cooling system holds 5.25 US gal. **WARNING** **Cooling system conditioner contains alkali. Avoid contact with skin and eyes.** **CAUTION** **Never use both the liquid cooling system conditioners and coolant conditioner elements at the same time.** **Do not use cooling system conditioner or coolant conditioner elements with Dowtherm 209 Full-Fill coolant.** 3) Add cooling system conditioner to achieve a 3 percent concentration or insert the proper precharge element. 4) Bring the coolant level to within 1/2 in (1 cm) of the bottom of the fill pipe. **NOTE** **When refilling cooling system, coolant level must be rechecked when engine reaches operating temperature.** 5) Start engine with coolant cap off. Add coolant, if necessary, when engine reaches operating temperature and coolant level stabilizes.	
				250 hrs		j. Test, as required, for defective glow plugs and replace as follows (on barges 2 and 3 only): 1) Disconnect the wire lead from the glow plug terminal on the HEAT-START switch. 2) Install an ammeter with a capacity of over 75 A, in a series, between the disconnected lead and the terminal on the HEAT-START switch.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
				250 hrs		3) Turn HEAT-START switch to HEAT. 4) Observe the ammeter. Each 12 V glow plug draws approximately 12.5 A and each 24 V glow plug draws approximately 6.5 A. The ampere draw of one glow plug multiplied by the number of engine cylinders will be the total ampere draw of the glow plugs in the engine. A low reading indicates one or more defective glow plugs. 5) If a defective glow plug is indicated, disconnect one glow plug lead at a time. 6) Turn switch to the HEAT position. Observe the ammeter. Reconnect the lead. 7) The glow plug that does not change the reading on the ammeter, when the switch is turned on, is the defective glow plug. 8) To replace the defective glow plug, disconnect the lead wire at the defective glow plug. 9) Remove the defective glow plug. 10) Apply anti-seize compound to the threads of the new glow plug. 11) Install the new glow plug and tighten to a torque of 45 to 53 N (10 to 12 lb/ft). 12) Turn the HEAT-START switch to the HEAT position and observe the ammeter reading. 13) Release the switch. 14) Install the lead wire. 15) Turn the HEAT-START switch to the HEAT position. The reading should be increased. If the reading is the same, check the glow plug wiring. 16) Disconnect the test ammeter.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				250 hrs		k. Check zinc anode module on right side of heat exchanger (Figure 3-20). Unscrew plug. Remove anode and compare to new anode. If 50 percent or more has been consumed, replace anode. l. Remove red tag from SSG switchboard panel.	
				250 hrs		m. Drain, flush if necessary, and refill cooling system. 1) Remove coolant filler cap and engine block drain plug between oil filter and power end of block. Also remove drain plug from coolant interchange tank. Allow coolant to drain to bilge. When operation is completed, pump bilge dry. 2) Clean drain plug and install. 3) Check filler cap gasket. If damaged, obtain new cap or install new gasket in cap. 4) Fill coolant system slowly with 5 gal of clean fresh water. 5) Drain fresh water from cooling system and check for impurities and discoloration. If water is clean, install drain plug and proceed. If water is excessively dirty or cloudy, flush using the following procedures: (a) Remove engine block and radiator drain plugs to completely drain system. (b) Install drain plugs. Fill system with a commercially available cleaning solution or 1 kg (2 lb) Sodium Bisulfate ($NaHSO_4$) per 40 L (10 US gal.) water. (c) Start and run for 1/2 hour. Stop engine and drain cleaning solution. (d) Flush system with clean water until draining water is clean. Do not run engine while flushing.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
				250 hrs		(e) Install all drain plugs. Fill system with neutralizing solution or 250 g (1/2 lb) Sodium Carbonate Crystals (Na2CO.H20) per 40 L (10 US gal) water. (f) Start and run engine for 10 minutes. Stop engine and drain neutralizing solution. (g) Flush system with clean water, until draining water is clean. Do not run engine while flushing. (h) Install all drain plugs. (i) Fill engine with clean water. Run the engine for 10 minutes and drain. Repeat until drained water is clean. (j) Add 1 L (1 qt) of Caterpillar Cooling System Conditioner, or equivalent, for each 30 L (8 gal) of cooling system capacity so cooling system will have a 3 percent to 6 percent concentration of conditioner. Most systems will require 2L (2 qt) of conditioner at initial fill and .50 L (1 pt) every 250 service hours. (k) Mix antifreeze and water to provide protection to the lowest expected ambient temperature. (l) To help avoid air locks, add coolant slowly, at 19 L (5 US gal) per minutes or less. 6) Fill cooling system with 5 gal of clean fresh water. Add 2 qt of coolant system conditioner. 7) Bring coolant level to within 1/2 in of bottom of filler pipe. 8) Start engine with radiator cap off. When coolant level stabilizes, add additional water if necessary.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				250 hrs		9) When coolant is at proper level and level stabilizes, replace radiator cap.	
				250hrs		n. Check tubes in heat exchanger expansion tank for scaling.	
						1) If obstructed or scaled, clean tubes by passing a rod slightly smaller than the internal tube bore thru the tubes. Do not use excessive force.	
						2) If expansion tank tubes are so clogged that a rod cannot be passed thru them, completely remove the core and clean by boiling in a caustic soda solution or with a commercial cooling system cleaner.	
						3) Reassemble the heat exchanger and activate.	
						o. Remove red tag from generator switchboard.	
				500 hrs		a. Service primary and final fuel filters by performing the following:	
						1) Redtag affected SSG on switchboard panel indicating, "WARNING-DO NOT ACTIVATE. REPAIRS BEING MADE."	
						2) Shut off fuel tank supply valve on engine.	
						3) Loosen nut on top center of primary filter body. Lower filter case.	
						4) Remove filter element. Wash both element and filter case in clean, non-flammable solvent.	
						5) Reinstall element in reverse order.	
						6) Remove and discard final filter element by turning from left to right (right- hand thread).	
						7) Remove all old gasket material. Clean gasket sealing surface in filter mount.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				500 hrs		8) Lubricate gasket of new filter with clean fuel. 9) install new filter and tighten by hand until gasket contacts base. Then tighten 1/2 to 3/4 turn more.	
				500 hrs		b. Prime engine fuel system by performing the following: 1) Move governor control to OFF. 2) Open vent valve on fuel injection pump housing and spread spill cloths to absorb fuel from vent valve. 3) Unlock fuel priming pump by turning knurled knob counterclockwise. Operate priming pump until fuel flows from vent valve in a continuous stream without bubbles. 4) Close vent valve. Lock fuel priming pump by turning knurled knob clockwise. Clean any spilled fuel oil. 5) Move governor control to RUN. **NOTE** **If engine misfires or has excessive exhaust smoke, further bleeding of fuel system is necessary. Loosen fuel lines at the cylinder head and crank engine until fuel flows free of air bubbles. Tighten fuel lines. Clean any spilled fuel oil.**	
				500 hrs		c. Change air cleaner element. Instead of cleaning old element, replace with new element.	
				500 hrs		d. Lubricate fan bearing fitting NLGL No. 2 Grade Multipurpose-type Grease. e. Remove red tag from SSG switchboard panel.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
				1000 hrs		a. Notify Direct/General Support for 1000 hours service requirements for operational check of engine shutoff controls for: 1) High water temperature 2) Low oil pressure 3) Overspeeding 4) Overcranking 5) Reverse power b. Redtag affected SSG on switchboard panel indicating, "WARNING-DO NOT ACTIVATE. REPAIRS BEING MADE." c. Lubricate governor linkage. d. Fill the oil cup on the synchronizing motor for the Woodward PSG Governor. e. Lubricate one fitting on the tachometer drive. f. Change fuel filter.	
				2000 hrs		a. Notify Direct/General Support for 2000 hour service meter requirement for measuring and if necessary, adjusting valve lash and valve rotation as follows: 1) Redtag affected SSG on switchboard panel indicating, "WARNING-DO NOT ACTIVATE. REPAIRS BEING MADE." 2) Stop engine and clean the base of the valve cover to prevent dirt from getting into valve mechanism. 3) Remove the valve cover. 4) Remove the flywheel housing timing plug.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				2000 hrs		5) Using flywheel Engine Turning Tool 5P7307, turn the flywheel to close No. 1 exhaust and inlet valves, aligning plug hole in the flywheel housing with the hole in the flywheel. The engine is now on Number 1 Top Center Compression Stroke. 6) Install a 63.5 mm (2 1/2 in) long 9.40 mm (3/8 in) NC bolt into the flywheel through the flywheel housing. 7) Measure the lash for the valves shown in the Compression Stroke Charts. If valve clearance is within + .003 in (0.07 mm of the clearance given), adjustment is not required. If clearance is not within these limits, adjust the valves. **3306** **COMPRESSION STROKE** **VALVES — CYLINDERS** **INLET — 1-2-4** **EXHAUST — 1-3-5** **EXHAUST STROKE** **VALVES — CYLINDERS** **INLET — 3-5-6** **EXHAUST — 2-4-6** 8) Remove the timing bolt from the flywheel. 9) Rotate the flywheel 360° and install the timing bolt in the flywheel. 10) Measure the lash for the valves shown in the Exhaust Stroke Charts. 11) Remove bolt from flywheel and install plug in flywheel housing. 12) Remove the engine turning group and install the starting motor. 13) To adjust valves, loosen the locknut on the adjusting screw.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				2000 hrs		14) Turn the adjusting screw to obtain the proper valve lash. 15) Hold the adjusting screw and tighten the locknut to 29 ± 7 N•m (21± 5 lb/ft). 16) Measure the valve lash and adjust as necessary. 17) After adjusting valve lash, and before installing the valve cover, start the engine and run at low idle. 18) Watch the valve rotocoils for rotation. 19) Each valve rotocoil should turn slightly each time the valve opens. If a valve fails to rotate, IDS/IGS maintenance should remove valves and make necessary repairs. 20) Stop the engine. Inspect the valve cover gasket. Use a new gasket if the used gasket is damaged. 21) Install the valve cover. Tighten bolts to 11 ±3 N•m (8 ± 2 lb/ft).	
				4000 hrs		a. Lubricate inboard and rear bearings as follows: 1) Redtag affected SSG on switchboard panel indicating, "WARNING-DO NOT ACTIVATE. REPAIRS BEING MADE." 2) To lubricate the rear bearing, remove the two lower panels from the rear of the generator housing and: (a) Remove the upper and lower grease fitting plugs. (b) Install a grease fitting in the upper threaded hole.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
				4000 hrs		(c) Lubricate with grease gun, two pumps. Use MPG. NLGI No. 2 grade is suitable for most temperatures. Use NLGI No. 1 or 0 grade for extremely low temperatures. (d) Install the lower plug. Wipe off excess grease. (e) Remove the fitting from the upper threaded hole. (f) Start the engine and allow the grease to expand. (g) Stop the engine. Install the plug in the lower hole and wipe off excess grease. (h) Install the two panels. 3) To lubricate the inboard bearing, remove the cowl cover from the rear of the generator housing and: (a) Remove the right side and lower grease pipe plugs. (b) Install a grease fitting in the right side threaded grease pipe. (c) Using a grease gun, lubricate tow pumps. Use Multipurpose-type Grease (MPG). NLGI No. 2 grade is suitable for most temperatures. Use NLGI No. 1 or 0 Grade for extremely low temperatures. (d) Install the lower plug. Wipe off excess grease. (e) Remove the fitting from the right side grease pipe.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
						(f) Start the engine and allow the grease to expand. (g) Stop engine. Install the plug in the lower grease pipe and wipe off excess grease. (h) Install the cowl cover. b. Remove red tag from affected SSG switchboard panel.	
					SHIP AUXILIARY GENERATOR (SAG) SYSTEM	**WARNING** **Make sure all electrical components are electrically dead before starting any cleaning or inspection procedures. Circuit breakers must be open (OFF) and appropriately tagged to avoid accidental activation during these procedures.** **CAUTION** **Never overfill crankcase. Fill only to maximum level as indicated on dipstick.**	
1	•			•	Engine	a. Check crankcase engine oil level on dipstick on left side of engine. If not up to FULL mark, add lubricating oil through filler on top of engine. Use SAE 15W40 that meets MIL-L-2104 (API "CD"). If temperature in voids consistantly exceeds 120°F, use SAE 40. **WARNING** **At operating temperature, engine coolant is hot and under pressure. To avoid personal injury, check coolant level only when engine is stopped and the filler cap is cool enough to be opened with a bare hand.**	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
						NOTE **Cooling system has an anticorrosion zinc anode in coolant heat exchanger. Do not use water conditioner.**	
	•		•			b. Check coolant in heat exchanger (header) tank. Level should be less than 1 in below bottom of neck opening. If necessary, add clean fresh water to bring to required level. If cap gasket is torn or damaged, repair or replace gasket.	
	•					c. With engine idling, check that oil pressure gauge shows positive pressure. If not, stop engine and report problem to shift leader or bargemaster.	Oil pressure gauge does not show positive pressure.
	•					d. With engine idling check that fuel pressure gauge on engine is normal (green) range. If not, report problem to shift leader or bargemaster.	Fuel pressure gauge on engine does not read normal (green).
	•					e. With engine idling check that coolant temperature gauge is registering. As engine warms up, gauge should move to higher reading. If gauge does not register or if temperature exceeds operating limits, stop engine and report problem to shift leader or bargemaster.	Gauge does not register or temperature exceeds operating limits.
3	•				Switchboard Control Panel	a. Check that VOLTMETER reads 440 Vac. If not report to shift leader or bargemaster.	Voltmeter does not read 440 Vac.
	•					b. Check that FREQUENCY METER reads 60 Hz. If not, report to shift leader or bargemaster.60 Hz.	Frequency meter does not read
	•					c. Check that AMMETER reads 0. If not, report to shift leader or bargemaster.	Ammeter does not read 0.
•		•				d. In extreme humidity, check for condensation buildup which causes corrosion. Apply low level heat for several hours as soon as condensation becomes noticeable.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
4					Batteries	**WARNING** **Fumes from batteries may be flammable and explosive. Do NOT smoke or have open flame when checking or working on battery bank. Battery electrolyte presents potential health hazards. Contact with eyes and skin should be avoided. Safety glasses, gloves, and rubber aprons must be worn when handling this chemical. Electrolyte contains sulfuric acid which can cause severe burns and is highly toxic to skin, eyes, and respiratory system.**	
	•		•			a. Check batteries and battery cables and connections are tight and corrosion free and coated with anti-corrosion grease.	Batteries, cables and connections are loose or corroded.
	•		•			b. Check batteries for proper electrolyte level. Add distilled or clean tap water to bring level above plates.	
5	•		•		Crankcase	Check and maintain the crankcase ventilation system as follows: 1) Empty and clean glass collecting bowl located at bottom of filtering system. a) Remove bowl by pulling down metal tab of cage holding the bowl. (b) Unsnap wire cage on each side of bowl bottom. (c) Remove bowl, wipe with clean cloth. Do not use abrasives. (d) Replace bowl in reverse order. 2) Change engine crankcase filter system vapor filter element. (a) Snap off two metal clips on top of filter body. (b) Lift off top and replace element. Discard and replace with new element. (c) Reinstall in reverse order.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
6				250 hrs	Fuel Pump Filters	Primary andService primary and fuel pump filters by performing the following: 1) Shut off fuel tank supply valve on engine. 2) Clean exterior of filter assembly. 3) Loosen setscrew on top of primary filter head. Remove filter and lower base. 4) Make sure all of old gasket material (sealing ring) is removed from inside filter head. 5) Wash both filter head and lower base in clean nonflammable solvent. Dry with lint-free cloth. Make sure parts are free of any lint, threads, dirt, or matter that could plug fuel lines. 6) Lubricate new gasket (sealing ring) with clean fuel oil. Install filter head. Place new filter element on lower body squarely against filter head and tighten setscrew. 7) On fuel pump, loosen screw in center of housing. Remove round cover and pulsator diaphragm. 8) Clean sediment chamber in fuel pump. Clean diaphragm; make sure it is not torn, punctured, or otherwise damaged. If not serviceable, replace with new diaphragm. 9) Refit pulsator diaphragm and cover. Tighten securing screw just sufficiently to make a tight seal. Do NOT use any sealant or lubricant on fuel pump base/ diaphragm/cover connection.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
7				250 hrs	Engine Fuel System	After servicing fuel filters, prime engine fuel system by performing the following: **CAUTION** **Air must be vented from fuel system whenever any part of system between fuel tank and injection pump has been disconnected for any reason or when system has been emptied of fuel. Injection pump is lubricated by the fuel it is pressurizing and metering. If air enters injection pump, it may be severely damaged. Never attempt to start engine until injection pump has been filled and primed. Procedures to make sure injection is primed with fuel if system has been run dry, are on pages N.14- 15, Perkins Engines Workshop Manual, 4.236M. The following instructions are only for priming fuel system after a PMCS of fuel filters.** 1) Remove vent plug on filter cover. Loosen joint at filter end of filter to tank return pipe. 2) Place shop cloths below filter assembly to absorb fuel oil spills. 3) Operate fuel pump priming lever until fuel oil that comes out of filter cover vent is free from bubbles. **NOTE** **If fuel pump priming lever will not operate, cam on engine camshaft driving fuel pump is on maximum lift. Engine must be turned by hand one complete revolution before priming lever will operate.** 4) Replace vent plug on filter cover. Continue operating priming lever until fuel oil that comes from around threads of the return pipe is free from bubbles. Tighten return pipe joint. 5) Loosen joint at filter to injection pump feed pipe. Operate priming lever until fuel oil that comes from around threads of this pipe is free from bubbles. Tighten joint.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
						NOTE **Some 4.236M engines may not have a vent plug on filter assembly. In this case, remove, rather than loosen, filter end of filter-to-tank return pipe. Use this as vent plug.** **If engine misfires or has excessive exhaust smoke, further bleeding of fuel system is necessary. Loosen fuel lines at cylinder head. Crank engine until fuel flows free of air bubbles. Tighten fuel lines. Clean any spilled fuel oil.**	
8				250 hrs	Cooling System	a. Drain, flush if necessary, and refill cooling system by performing the following: 1) Remove coolant filler cap. Open engine block drain on right side of engine block just in front of flywheel housing. Also open drain tap on exhaust manifold housing. Remove drain plug from coolant interchange tank. Allow coolant to drain to bilge. When operation is completed, pump bilge dry. 2) Clean drain plug and reinstall. 3) Check filler cap gasket. If damaged, obtain new cap or install new gasket in cap. 4) Fill cooling system slowly with 3.5 gal of clean, fresh water. 5) Drain fresh water from cooling system. Check for impurities and discolorations. If water is clean, install drain plug and proceed. If water is excessively dirty or cloudy, flush using the following procedures: (a) Remove engine block and radiator drain plugs to completely drain system.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
				250 hrs		(b) Install drain plugs. Fill system with a commercially available cleaning solution or 1 kg (2 lb) Sodium Bisulfate (NaHSO4) per 40 L (10 US gal) water. (c) Start and run for 1/2 hour. Stop engine and drain cleaning solution. (d) Flush system with clean water until draining water is clean. Do not run engine while flushing. (e) Install all drain plugs. Fill system with neutralizing solution or 250 g (1/2 lb) Sodium Carbonate Crystals (Na2CO.H20) per 40 L (10 US gal) water. (f) Start and run engine for 10 minutes. Stop engine and drain neutralizing solution. (g) Flush system with clean water, until draining water is clean. Do not run engine while flushing. (h) Install all drain plugs. (i) Fill engine with clean water. Run the engine for 10 minutes and drain. Repeat until drained water is clean. (j) Refill with antifreeze and water to provide protection to the lowest expected ambient temperature. (k) To help avoid airlocks, add coolant slowly, bringing coolant level to within 1/2 in of bottom of filler pipe. 6) Start engine with radiator cap off. When coolant level stabilizes, add additional water if necessary. 7) When coolant is at proper level and level stabilizes, replace radiator cap.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				250 hrs		b. If engine runs cooler or warmer than normal or engine coolant temperature fluctuates, check thermostat. Perform the following: 1) Remove water connection between header tank and exhaust manifold by loosening both hose clips and sliding hose toward exhaust manifold. 2) Remove two setscrews holding water pipe to header tank. 3) Remove setscrews holding top cover on thermostat housing. Remove cover and lift out thermostat. 4) Place thermostat in container of water and gradually heat. With an accurate thermometer, check water temperature at frequent intervals. Valve should start to open at temperature stamped on top face of thermostat next to valve seat. 5) If thermostat test shows it is opening and closing at designated temperature, reinstall in housing in reverse order of removal. 6) If thermostat does not open and close at designated temperature, install new thermostat in reverse order of removal.	
9				125 hrs	Air Intake Filter	**NOTE** **Every 125 hours of operation or every 3 months (whichever comes first).** a. Clean air intake filter. 1) Redtag auxiliary generator switchboard control panel indicating, "WARNING-DO NOT ACTIVATE. REPAIRS BEING MADE." 2) Remove air cleaner cover and filter element.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
				125 hrs		3) Inside air cleaner body, cover intake opening. 4) Clean inside of air cleaner cover and body with clean cloth and solvent. Wipe dry. **WARNING** **When using compressed air for cleaning filter elements, wear face shield and clothing that completely covers body and limbs. Shirt sleeves must be rolled down and buttoned and collar buttons fastened.** **CAUTION** **Do not clean elements by bumping or tapping them on hard object.** **NOTE** **Air filter element may be either a disposable paper- type element or a reusable wire mesh screen. The following pertains to a reusable filter element.** 5) Clean filter element with compressed air. Direct air first inside along length of pleats in element and next outside along length of pleats. Then clean the inside again.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				125 hrs		**NOTE** **If compressed air does not clean element, wash in a warm soapy water solution. Rinse and blow dry.** 6) Inspect filter element by placing a light inside a clean, dry element. Check for rips, tears, or holes in element material. If damaged, discard and obtain new element. 7) Remove covering from inlet inside air cleaner body. 8) Install clean or new element. Place cover on body and tighten in place.	
				125 hrs		**NOTE** **Every 125 hours of operation or every 3 months (whichever comes first).** b. Check zinc anode (zinc pencil) in power end of heat exchanger on right side of engine. Unscrew cover. Remove anode and compare to new anode. If 50 percent or more has been consumed, replace anode.	
				125 hrs		c. Check engine for oil, fuel, coolant, and seawater leaks. Tighten as necessary.	Class III leaks.
	•			125 hrs		d. Check exterior of engine for loose screws, nuts, bolts, fittings, and attachments. Tighten as necessary.	
	•			125 hrs		e. Check connections to generator and make sure they are tight, but not rubbing or frayed. Correct as necessary. f. Remove red tag from SSG switchboard panel.	Connections are rubbing or are frayed.
				250 hrs		**NOTE** **Every 125 hours of operation or every 6 months (whichever comes first).**	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
10				250 hrs		a. Change crankcase oil and oil filter element. 1) Run engine until oil is hot. Turn off engine using engine STOP control after running engine at idle for 5 minutes. 2) Redtag auxiliary generator switchboard panel indicating, "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE. 3) Open valve bilge drain (BD) valve BD1 8. Drain at least 1 pt of oil into clean container for AOAP. Close valve BD1 8. Send marked oil sample to maintenance support unit for analysis. 4) Using quick-disconnect coupling on bilge drain BD1 8 on the SAG engine crankcase, connect bilge utility hose. 5) Connect other end of bilge utility hose to bilge drain quick-disconnect coupling near centerline in void 2 starboard. 6) Open engine bilge drain valve BD1 8 and set valves as follows: (a) Open valves BD7 and BD11. (b) Close valves BD1 thru BD6, BD8 thru BD10, and BD14. 7) Start bilge pump by turning on bilge pump controller. Controller is on void 2 starboard bulkhead above bilge pump. 8) When oil has been pumped out of crankcase, simultaneously close valve BD1 8 and turn off bilge pump. 9) Disconnect bilge utility hose, clean, and return to storage in void 5.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
						10) Unscrew cylindrical oil filter element by turning from right to left. Discard old filter element. 11) Clean oil filter housing and lip where oil filter element fits into housing. Make sure all of old gasket is removed and gasket seat on housing is clean. 12) Lubricate new gasket with clean oil. Place on seat of new filter element. Screw on new filter element until gasket contacts base of filter housing. Hand tighten filter an additional 3/4 turn. **CAUTION** **Never overfill crankcase. Fill only to maximum level as indicated on dipstick.** 13) Fill engine thru oil filler on top of engine with 8.4 qt of lubricating oil. Use SAE 15W40 that meets Military Specification MIL-L-2104 (API "CD") for normal temperatures. When temperature in the voids consistently exceeds 120° F, use SAE 40. 14) Start engine and run at idle for 5 minutes. Turn off engine. 15) Check crankcase oil on dipstick and add oil if necessary to bring to maximum mark on stick. Check for leaks around filter. Tighten by hand, if necessary. 16) Clean all oil spills. 17) Make appropriate entry in maintenance records. **NOTE** **The Perkins diesel 4.236M engine has been modified to accept installation of the Oildex filtered and controlled crankcase ventilation system.**	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				250 hrs		b. Check water pump belts for damage, fraying, improper wear, and correct tension. **CAUTION** **When belt replacement is necessary, belts must be replaced in complete, matched sets. Never replace only one belt. The new belt will carry all the load and fail rapidly.** 1) To check belt tension, press down on the longest unsupported length of the belt without using undue exertion. Normal tension should allow the belt to be depressed approximately 3/8 in. Adjust belt tension, as required as follows: (a) Loosen adjusting setscrews and bracket support bolts. (b) Move the alternator or water pump to obtain the correct belt tension. Hold in correct position. (c) Tighten the adjusting setscrews. 2) To replace water pump belts: (a) Loosen the adjusting lever setscrews and bracket support bolts. Pivot the alternator/water pump towards the cylinder block. (b) Turn the engine by hand to work the belts off the pulleys. (c) Remove and replace the belts. (d) Reverse the process for refitting the belts on the pulleys.	Belts damaged, frayed, worn.

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				250 hrs		(e) Adjust the belts for proper tension and tighten setscrews and bracket support bolts. (f) At the following daily PMCS inspection, recheck the belts to ensure proper tension. **CAUTION** **Under no circumstances should the engine be allowed to operate at a higher than specified speed. Severe engine damage may result. Check engine speed specification when performing PMCS.**	
				250 hrs		c. Adjust engine speed by turning the idling screw clockwise to increase speed and counterclockwise to decrease speed.	
				250 hr		d. Inspect engine for any fluid leakage. Correct as required.	
				250 hrs		e. Remove red tag from switchboard control panel.	
				250 hrs		f. Empty and change glass collecting bowl.	
11				200 hrs		a. Notify Direct Support maintenance of 200 hours of engine operation on auxiliary generator and request check of valve clearances as follows: **NOTE** **When rotating engines, they should always be turned in their normal direction of rotation, i.e., counterclockwise when viewing from the gearbox end. The exception is contra-rotating engines, or rotating them clockwise from the gearbox end.** 1) The clearance is set between the top of the valve stem rocker and arm and should be 0.012 in (0.30 mm) cold.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
				200 hrs		2) When setting valve clearances, the following should be adopted: (a) With the valves rocking on No. 4 cylinder (i.e., the period between the opening of the intake valve and the closing of the exhaust valve), set the valve clearances on No. 1 cylinder. (b) With the valves rocking on no. 2 cylinder, set the valve clearances on No. 3 cylinder. (c) With the valves rocking on No. 1 cylinder, set the valve clearances on No. 4 cylinder. (d) With the valves rocking on No. 3 cylinder, set the valve clearances on No. 2 cylinder. b. Request Direct Support maintenance to service fuel injectors as follows: 1) Normally, defective injectors can be isolated by loosening the pipe union nut on each injector in turn while the engine is running at approximately 800 rpm. As each nut is loosened, fuel will not be injected into the associated cylinder and, as a result, the engine rpm will decrease if the injector was previously functioning normally. If the engine rpm remains constant, the injector is probably defective.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
				200 hrs		2) When installing a replacement injector remember to include also a new copper seating washer. These are special washers and ordinary washers cannot be used for this purpose. The recess in the cylinder head, the faces of the washer, and the corresponding face of the nozzle holder cap must be perfectly clean to ensure a leakproof seal. The importance of injectors being seated squarely and secured with the correct torque cannot be emphasized too strongly. Even a slight "canting" of the injector can result in fouling and distortion of the nozzle and needle valve. This canting can also result in leakage between injector and cylinder head, with a resultant engine misfire. 3) Torque-To ensure squareness and free entry of the nozzle into its bore, the securing nuts must be tightened evenly until a torque of 12 lb/ft (1.7 N•m) is attained. Overtightening of these securing nuts can result in a fractured injector flange and/or a fouled nozzle needle valve.	
				200 hrs		c. Request Direct Support maintenance support to examine and service accessory equipment, fuel injector pump, alternator, starter, seawater pump, heat exchanger, engine oil cooler, and coolant pump. Service engine crankcase filter system. 1) Remove system and disassemble. 2) Clean all components except filter element. 3) Reassemble with new filter element and all new connecting hoses.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
12				400 hrs		**NOTE** **Every 400 hours of operation or every 12 months (whichever comes first).** a. Redtag SAG on switchboard panel indication, "WARNING-DO NOT ACTIVATE- REPAIRS BEING MADE." b. Check hoses and clamps. Replace hoses if there is any evidence of deterioration to hose material. Tighten clamps as necessary.	
13				400 hrs	Fuel Lift Pump	a. Notify Direct Support maintenance to Chamberclean the fuel lift pump chamber: 1) Remove the fuel lift pump cover and pulsator diaphragm by unscrewing and removing the cover screw. 2) Clean the sediment chamber and check the pulsator diaphragm for condition. Replace if necessary. 3) Refit the pulsator diaphragm and cover. Tighten the securing screw just sufficiently to make a tight sealing joint. 4) Vent and bleed the fuel system as follows: **CAUTION** **Air must be vented from the fuel system whenever any part of the system between the fuel tank and injection pump has been disconnected for any reason or if the system has been emptied of fuel.** (a) Unscrew by two or three turns, the vent plug on top of the fuel filter cover (not the return pipe to the tank). Later type fuel filters are self venting and do not have a vent plug. Air vent the fuel filter by removing the excess fuel return pipe, to the fuel tank, from the filter head. Operate the fuel feed pump priming lever until diesel fuel, free from air bubbles, issues from the nonreturn valve. Refit fuel return pipe.	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems(Continued)

B - Before D - During A - After H - Hourly Interval

ITEM NO.	INTERVAL				ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	H			
						(b) Loosen the vent screw on the hydraulic head locking screw on the side of the fuel injection pump body. (c) Loosen the air vent screw on the side of the governor control cover. (d) Operate the priming lever of the fuel lift pump. (If the cam on the engine camshaft driving the fuel lift pump is on maximum lift, it will not be possible to operate the hand primer and the engine should be turned one complete revolution.) When diesel fuel, free from air bubbles, issues from each vent point, tighten the connections in the following order: (1) Filter cover vent screw. (2) Head locking screw vent valve. (3) Governor cover vent valve. (e) Loosen the pipe union nut at the pump inlet. Operate the priming device and retighten when diesel fuel, free from air bubbles, issues from around the pipe threads. (f) Loosen the unions at the atomizer ends of two of the HP pipes. (g) Set the accelerator at the fully open position and ensure that the "stop" control is in the "run" position. (h) Turn the engine until fuel oil, free from air bubbles, issues from both fuel pipes. (i) Tighten the unions on both fuel pipes. The engine is ready for starting. (if fuel has been drained from the thermostat feed pipe, the pipe must be disconnected at the thermostat and all air bled from the pipe before the thermostat is operated.)	

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems (Continued)

B-Before D-During A-After D-Daily H-Hourly Interval

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	H			
14					800 hrs.		b. Drain and clean fuel tank. c. Remove red tag from switchboard control panel. Notify Direct Support maintenance to perform the following maintenance: **NOTE** **Every 800 hours of operation.** a. Check and service the heat exchange system for corrosion and scaling. b. Redtag auxiliary generator switchboard control panel indicating. "WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE." c. Perform check of seawater pump impeller as follows: 1) The rubber impeller type water pump is used for raw water circulation. It should never be run in a dry condition (impeller blades will tear). If the engine is not to be operated for any length of time, it will be necessary to pack the water pump with MARFAK 2HD grease. (If this is not available, glycerine may be used.) This is effected by removing the pump end plate to give access to the interior of the pump. Insert the grease, or glycerine, thru the top-most pipe connection (after removing the rubber hose). Turn the engine over to spread the lubricant. This treatment is usually effective for about 3 months and should be repeated if stored for a longer period of time. 2) A heat exchanger usually consists of a casing with a core (tube stack), which is the actual heat exchanger. The oil cooler usually has a smaller core and is sometimes an integral part of the engine heat exchanger.	Heat exchanger system corroded or scaling.

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems (Continued)

B-Before D-During A-After D-Daily H-Hourly Interval

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	H			
							3) The heat exchanger and coolers should be serviced every season. Depending on operating conditions, this period may have to be reduced. Normal operating temperatures will vary slightly from engine to engine because of design tolerances, installation, and hull variations. Once the normal operating temperature has been establihsed for a particular engine, any excessive rise in temperature should be considered abnormal and immediately investigated. If a cooling system problem is suspected (or comfirmed) the following guidelines will provide a means for isolating the cause. **WARNING** **The coolant in an operating or recently stopped engine is very hot and under pressure. If the filter pressure cap is suddenly removed the liquid may spurt and cause injury by scalding. Always stop an engine and allow it to cool before removing the cap. Once cool, loosen the cap slowly to relieve the pressure.** (a) Check the coolant level in the header tank and ensure the proper pressure cap is being used. (b) Check the sea cock and strainer for obstructions; clean where necessary. (c) Check the seawater pump impeller. Replace if damaged. Ensure that no pieces of the impeller (if broken) have passed into the connecting pipes (i.e., inlet and outlet) to restrict water flow. (d) Check heat exchanger for obstructions within the cooling core tubes on the seawater side. Once the end cap and/or plates are removed, any scaling within the core tubes can be removed by passing a rod (slightly smaller than the internal bore) thru the tubes. Do not use excessive force when pushing the rod thru the tubes.	Seawater pump impeller damaged.

Table 9-3. Preventive Maintenance Checks and Services for Electrical Power Systems (Continued)

B-Before D-During A-After D-Daily H-Hourly Interval

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	H			
							(e) f the tubes are so dogged that a rod can not be passed thru them, the core will have to be removed from its casing and boiled in a caustic soda solution. Commercial cooling system cleaners can be used for this purpose. Reassemble with new gaskets, seals, and 'O" rings. (f) I a reduced power and/or excessive smoke condition exists in addition to an increase in coolant temperature with a turbocharged engine having an air charge cooler (intercooler), check the intercooler and, if necessary, clean as described for heat exchangers. (g) Check the exhaust manifold outlet elbows and the exhaust water injection connections for mud or silt, especially if the engine was operated in muddy or silty water. (h) Oil Coolers - both engine and gear box - can also affect engine coolant temperatures. Oil coolers should be checked and cleaned as described for heat exchangers. 4) Reconnect heat exchanger and reactivate. Check for leaks. d. Remove red tag from switchboard control panel.-	

CHAPTER 10 LIGHTING SYSTEM PMCS

Section I. General system information

10-1 Introduction. Chapter 10 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Unit Barge Lighting System. Operating and maintenance procedures for the lighting system are described in TM 55-1930-209-14&P-10. TM 55-1930-209-14&P-10, Appendix C also contains Preventive Maintenance Checks and Services for the Lighting System.

10-2 Major components. The lighting system consists of normal and emergency interior lighting and exterior searchlights and floodlights. Major components, their basic functions and location on the barge are listed in Table 10-1 and Table 10-2.

Table 10-1. Major Components of Interior Lighting System

Component	Location	Function
Power panel 3	ROWPU space on forward bulkhead	Supplies power to deck, void, and emergency lighting panels, exterior lights, and other deckhouse electrical equipment
Deck lighting panel	ROWPU space on starboard bulkhead forward	Distributes power from power panel 3 circuit breaker 2P13 to ROWPU space, dayroom, and workshop normal lights, searchlights, and other deckhouse equipment
Void lighting panel	ROWPU space on starboard bulkhead forward, near dayroom door smoke detector	Distributes power from power panel 3 circuit breaker 3P13 to normal lights in voids and
74 fluorescent lights (Barge 1) 77 fluorescent lights (Barges 2 & 3)	33 in ROWPU space 4 in dayroom 5 in workshop (includes light over workbench) 4 in void 1 5 in void 2 port 4 in void 2 starboard 4 in void 3 port 3 in void 3 starboard (Barge 1) 5 in void 3 starboard (Barges 2 and 3) 4 in void 4 port 4 in void 4 starboard 4 in void 5 (Barge 1) 5 in void 5 (Barges 2 and 3)	Provide normal lighting in deckhouse and voids
10A rotary snap switch	In workshop by door to ROWPU space (labeled WORKSHOP LIGHTS)	Turns workshop fluorescent lights on/off

Table 10-1. Major Components of Interior Lighting System (cont)

Component	Location	Function
30A 3-way rotary snap switch	In dayroom by doors to ROWPU space and weather-deck (labeled DAYROOM LIGHTS)	Turns dayroom lights on/off
3 PST door switch	In dayroom above starboard door	Automatically turns on normal lights in dayroom when door is dosed. Automatically turns off lights when door is opened.
Two 6 PST door interlocking switches	In ROWPU space above port and starboard doors	Automatically turns on normal lights in ROWPU space when door is dosed. Automatically turns off lights when door is opened.

Table 10-2. Major Components of Exterior Lighting System

Component	Location	Function
Emergency lighting panel	ROWPU space on forward bulkhead near power	Supplies power to ROWPU space, dayroom, workshop, panel 3 and void emergency fluorescent and red lights
18 fluorescent lights (Barge 1) 1 in dayroom 19 fluorescent lights (Barges 2 and 3)	6 in ROWPU space in deckhouse and voids 1 in workshop 1 in void 1 1 in void 2 port 1 in void 2 starboard 2 in void 3 port 2 in void 3 starboard 1 in void 4 port 1 in void 4 starboard 1 in void 5	Provide emergency lighting
4 incandescent red lights	2 in ROWPU space 1 in workshop 1 in dayroom	Supply lighting for night use in case fluorescent lights must be blacked out
4 emergency light toggle switches	2 in ROWPU space by port and starboard doors to weatherdeck 1 on switchboard in ROWPU space. 1 in dayroom by door to weatherdeck.	Tum emergency lights throughout barge on/off
Green (Barge 1) or blue (Barges 2 and 3) indicator light	On forward panel of switchboard above emergency light toggle switch	Indicates that emergency power is available from battery bank

10-3 Interior Lighting System Description. The interior lighting system provides both normal and emergency lighting in the deckhouse ROWPU space, dayroom, workshop, and voids. The normal lighting system is illustrated in Figure 10-1. Power is provided by the service generator, auxiliary generator, or shore power. ROWPU space and void lights are operated from their corresponding lighting panels by dosing circuit breakers. Dayroom and workshop lights are operated and controlled from bulkhead-mounted rotary switches. The ROWPU space port and starboard doors and dayroom door to the weatherdeck are each equipped with an interlocking switch that automatically turns off these lights when one of these doors is opened.

In the event of normal power loss, an inverter automatically converts 24 Vdc battery bank power to 120 Vac power. This power is supplied to the emergency panel for emergency lighting and for communications.

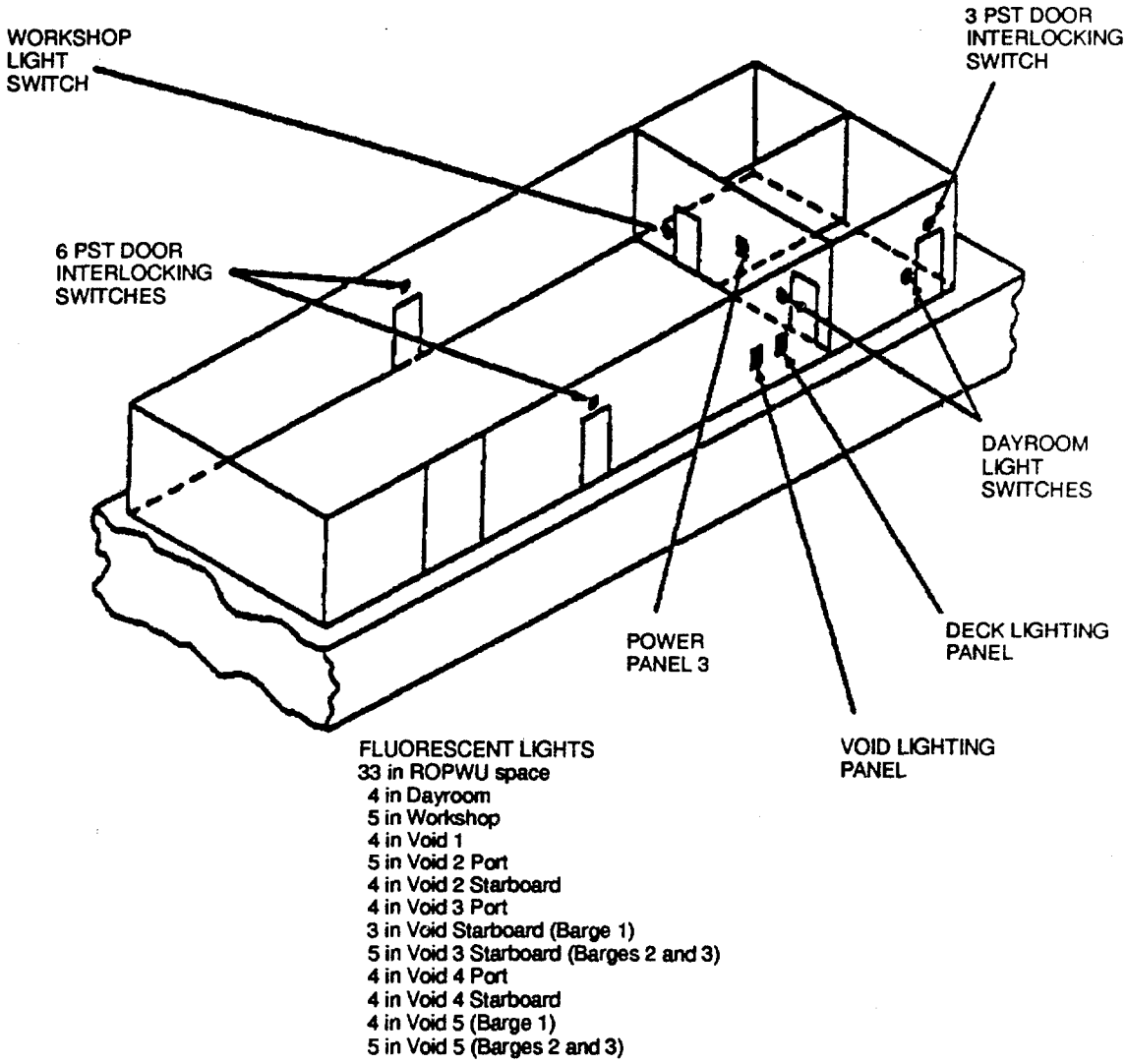
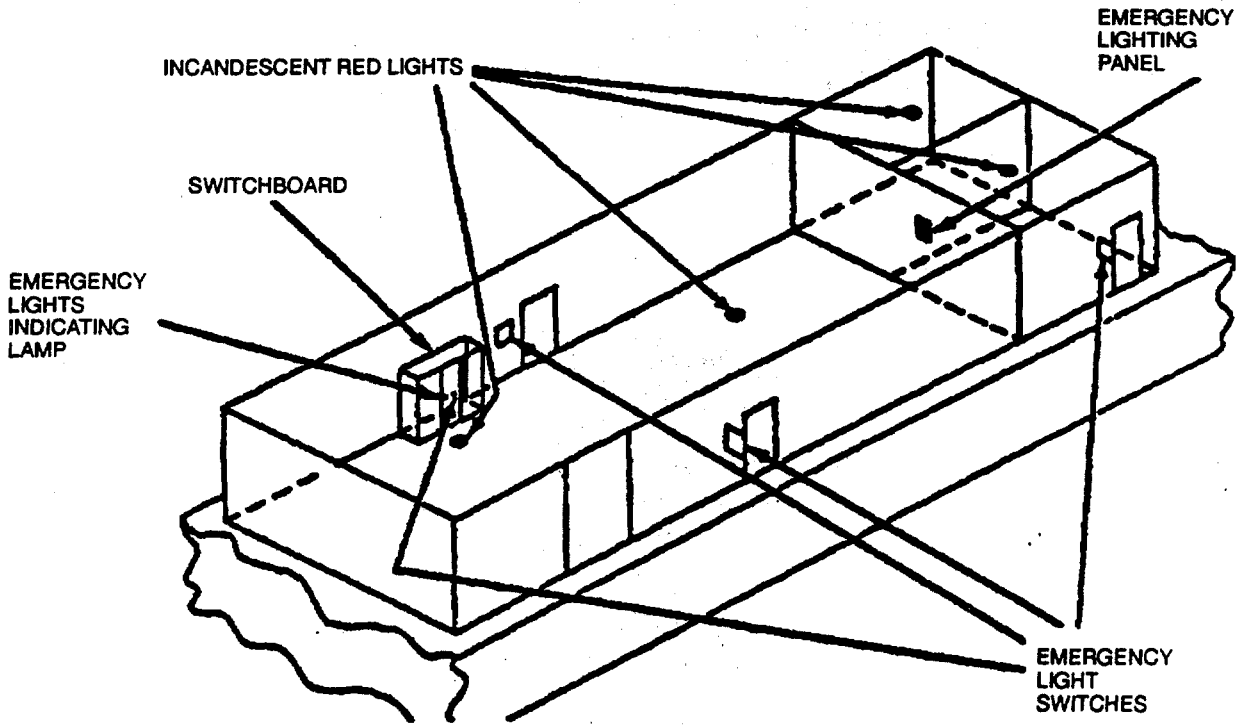


Figure 10-1. Normal Interior Lighting Arrangement

Emergency lighting consists of (Figure 10-2) fluorescent and red incandescent lights and communications power consists of marine radio and telephone system. A green lamp (Barge 1) or blue lamp (Barges 2 and 3), located on the forward panel of the switchboard, indicates that emergency power from the battery bank is available. An emergency light switch is located on the switchboard and next to each door to the weatherdeck so that emergency lights can be readily turned off.



FLUORESCENT LIGHTS

6 in ROPWU space
1 in Dayroom
1 in Workshop
1 in Void 1 (Barge 1)
2 in Void 1 (Barges 2 and 3)
1 in Void 2 Port
1 in Void 2 Starboard
2 in Void 3 Port
2 in Void 3 Starboard
1 in Void 4 Port
1 in Void 4 Starboard
1 in Void 5

Figure 10-2. Emergency Interior Lighting

Section II

Table 10-3. Preventive Maintenance Checks and Services for Lighting System

B - Before **D - During** **A - After**
D - Daily **W - Weekly** **M - Monthly**
Q - Quarterly **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										LIGHTING SYSTEMS		
1										Interior Lighting System	**WARNING** **Be sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."**	
	•		•		•						a. Check for damaged, loose, or frayed cables and loose connections. Repair, replace or tighten as necessary.	Cables damaged, loose or frayed. Connections loose.
											b. Check for loose or missing securements and fasteners. Tighten and replace as necessary.	
	•		•		•						c. Clean lighting panels and switches with dry, lint-free cloth or vacuum cleaner.	
		•		•							d. Check for burned out bulbs. Replace as necessary.	
			•								e. Remove rust and corrosion. Touch up paint in accordance with TB 43-0144 as necessary. Do not paint threads or labels.	
2										Exterior Lighting System	**WARNING** **Be sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."** **Observe all safety precautions listed at the beginning of this manual.**	
	•		•								a. Check for damaged, loose, or frayed cables, and loose connections. Repair, replace or tighten as necessary.	Cables damaged, loose or frayed. Connections loose.

Table 10-3. Preventive Maintenance Checks and Services for Lighting Systems (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	•		•								b. Check for loose or missing fasteners and securements. Tighten and replace as necessary.	
	•		•		•						c. Clean lighting panels and switches with a dry, lint-free cloth or with a vacuum cleaner. Remove rust and corrosion. Touch up paint in accordance with TB 43-0144 as necessary. Do not paint threads and labels.	
		•		•		•					d. Check for burned-out exterior side lights. Replace as follows: 1) Turn exterior side lights OFF at rotary switches. 2) Redtag appropriate switch with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) Remove light guard. Remove and clean globe with warm, soapy water, rinse and dry. 4) Replace burned-out bulb. 5) Reinstall glove, making sure gasket is properly seated; reinstall guard. 6) Check to see new light works. 7) Remove redtag.	Side lights inoperable.
		•		•		•					e. Check for burned-out floodlights. Replace as follows: 1) Turn floodlights OFF at rotary switches. 2) Redtag appropriate rotary switch with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) Remove cover. Clean inside reflector and lens with fresh water. Wipe dry and polish.	Floodlights inoperable.

Table 10-3. Preventive Maintenance Checks and Services for Lighting Systems (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											4) Replace burned-out bulb. 5) Check to see new light works. 6) Remove redtag.	
		•				•					f. Check for burned-out searchlights. Replace as follows: 1) Turn searchlights OFF at rotary switch on searchlight base. 2) Redtag appropriate rotary switch with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) Open three quick-release latches to open front door of searchlight. 4) Remove burned-out bulb. 5) Clean reflecting mirror and inside of lens with fresh water. Wipe dry and polish. 6) Install new bulb, close door and secure quick-release latches. 7) Check to see new light works. 8) Remove redtag.	Searchlights inoperable.
		•		•		•					g. Check for burned-out shore discharge hose deployment status lights. Replace as follows: 1) Open (OFF) circuit breaker 5P14 on 24 Vdc power panel to turn off status lights. 2) Redtag appropriate circuit breaker with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." 3) Unplug status light at topdeck and lower mast.	Status lights inoperable.

Table 10-3.Preventive Maintenance Checks and Services for Lighting Systems (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											4) Loosen cover set screw. Turn cover by hand counterclockwise and lift off. Clean with fresh water and wipe dry. 5) Replace burned-out bulb. 6) Reinstall cover, turn counterclock-wise, and tighten set screw. 7) Raise mast and plug light cord into receptacle. 8) Check to see new light works. 9) Remove redtag.	
		•		•		•					h. Check anchor light for burned-out bulbs. Replace as follows: 1) Open (OFF) circuit breaker 7P14 on 24 Vdc power panel to turn off anchor lights. 2) Redtag appropriate circuit breaker with: WARNING - DO NOT ACTI-VATE. REPAIRS BEING MADE." 3) Remove anchor light cover. Clean with fresh water and wipe dry. 4) Replace burned-out bulb. 5) Reinstall light cover. 6) Check to see new light works. 7) Remove redtag.	Anchor light inop-erable.
		•		•		•					i. Check navigation lights for burned-out bulbs. inoperable. 1) Open (OFF) circuit breaker 2P14 on 24 Vdc power panel to turn off naviga-tion lights. 2) Redtag appropriate circuit breaker with: WARNING - DO NOT ACTI-VATE. REPAIRS BEING MADE."	Navigation lights Replace as follows:

Table 10-3.Preventive Maintenance Checks and Services for Lighting Systems (Continued)

B -	Before	D -	Daily	Q - Quarterly
D -	During	W -	Weekly	S - Semiannually
A -	After	M -	Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											3) Remove navigation light cover. Clean with fresh water. Wipe dry. 4) Replace burned-out bulb. 5) Reinstall light cover. 6) Close (ON) circuit breaker 2P14 to make sure bulb works. 7) Remove redtag.	

CHAPTER 11 EQUIPMENT MONITORING SYSTEM (EMS) PMCS

Section I. General system Information

11-1 Introduction. Chapter 11 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Barge Equipment Monitoring System. Operating and maintenance procedures are described in detail in TM 55-1930-209-14&P-11. TM 55-1930-209-14&P-11, Appendix C also contains complete Preventive Maintenance Checks and Services for the Equipment Monitoring System.

11-2 Major components. The equipment monitoring system consists of the alarm/casualty monitoring | equipment, two 12 V dry cell batteries, a battery charger, two strobe lights, two horns, and a buzzer. The alarm/casualty monitoring equipment consists of various sensors and switches, a main processor, keyboard, video monitor, alarm relay module, main power switch, and bilge alarm module. Major EMS components, including location and function, are listed in Table 11-1 and EMS sensor data, including location and function, are listed in Table 11-2.

Table 11-1. Major Components of Equipment Monitoring System

Component	Quantity	Function	Location
Main processor	1	Receives and processes data from sensors and keyboard, displays data on video monitor and activates two strobe lights, two horns and buzzer	ROWPU space, forward, bulkhead
Keyboard	1	Selects page for viewing on video monitor, acknowledges alarms, in edit mode sets time and date, activates/deactivates sensors and sets alarm and reference points	ROWPU space, forward bulkhead under video monitor
Video monitor	1	Displays data processed by main processor in display page formats board	ROWPU space, forward bulkhead above key-
Alarm relay	1	Activates alarms in ROWPU space and dayroom on signal from main processor	ROWPU space under keyboard
Bilge alarm module	1	Activates alarms on deckhouse top on signal from bilge sensors processor	ROWPU space, outboard of main
Horn	2	Sounds warning to crew in ROWPU space and weatherdecks that an abnormal condition exists	One on mast on deckhouse top, one in ROWPU space on forward bulkhead (Barge 1) and on overhead (Barges 2 and 3)
Strobe light	2	Rashes warning to crew that an abnormal condition exists	One with each horn
Buzzer	1	Sounds warning to crew in dayroom that abnormal condition exists	Dayroom, aft bulk-head

Table 11-1. Major Components of Equipment Monitoring System (Continued)

Component	Quantity	Function	Location
12-volt gel cell battery	2	Connected in series, provides 24 Vdc power to EMS	ROWPU space, under main processor
Battery charger	1	Maintains batteries at full charge	ROWPU space, under main processor
Main power switch	1	Maintains batteries at full charge. Provides or disconnects power to monitoring system from batteries	ROWPU space, near main processor

Table 11-2. Equipment Monitoring System Sensor Data

Type	Data Sensed	Qty	Location
Analog	Amount of drinking water in storage tanks	4	One in each drinking water storage tank
Analog	Product water salinity (ROWPU #1 & ROWPU #2)	2	One on each RO block
Analog	Drinking water salinity (FW DISCHG)	1	Discharge pump output
Switch	Chlorination unit operating status	1	Chlorination unit
Switch	Chlorination unit power supply failure	1	Chlorination unit
Switch	Recirculating pump operating status	1	Chlorination unit

Table 11-2. Equipment Monitoring System Sensor Data (Continued)

Type	Data Sensed	Qty	Location
Rate	Drinking water discharge rate	1	Discharge pump output
Analog	Drinking water discharge pressure	1	Discharge pump output
Switch	High sludge tank level	1	Sludge tank
Switch	High fuel oil level	2	One in each fuel oil storage tank
Switch	High water temperature	5	One on each diesel engine
Switch	Low oil pressure	5	One on each diesel engine
Switch	High bilge liquid level	9	One in each void except 2 in void 1
Analog	Drinking water chlorine content	1	Drinking water line down-stream of mixer
Analog	Metering pump percentage of	1	Chlorination system metering pump
Analog	Amount of fuel in main fuel tanks	2	One on each fuel oil main storage tank
Analog	Amount of water in ballast	1	On ballast tank tank content

11-3 Equipment Monitoring System Description. This system can accept information from as many as 168 different inputs. On the barge, however, only 39 are used. The keyboard and video monitor make up the station from which an operator selects and views any page of monitored information, acknowledges alarms and sets or changes alarm conditions. The system is designed to operate between 32 and 131 degrees F. See Figure 11-1 which is a block diagram of the equipment monitoring system.

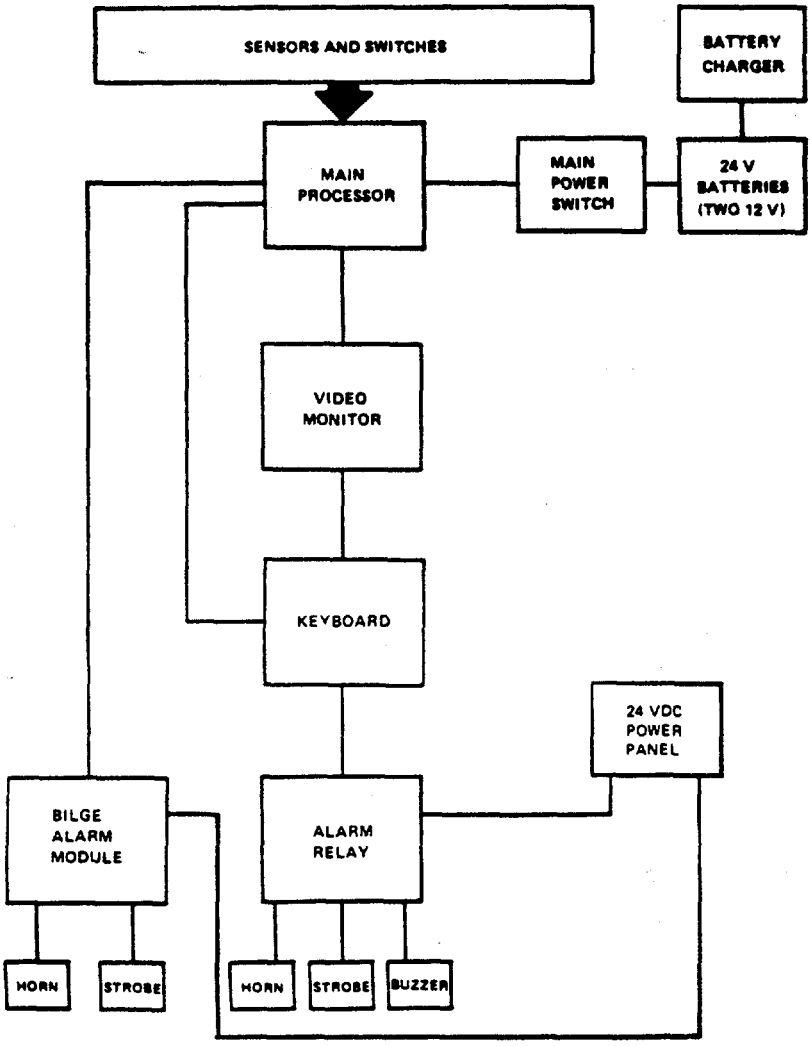


Figure 11-1. Equipment Monitoring System Block Diagram

Table 11-3. Preventive Maintenance Checks and Services for Equipment Monitoring System

B -	**Before**	**D -**	**Daily**	**Q - Quarterly**
D -	**During**	**W -**	**Weekly**	**S - Semiannually**
A -	**After**	**M -**	**Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										EQUIPMENT MONITORING SYSTEM (EMS)	**WARNING** **Be sure that electrical power Is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.**	
1	•			•						All Components	a. Wipe clean or vacuum major EMS components and check for loose fitting wires. Use insulated tools.	
		•									b. Allow EMS 5 to 10 minutes warmup before operation.	
			•			•					c. Check for damage or corrosion. Repair touchup paint in accordance with TB 43-0144 as necessary. Do not paint threads or labels.	
					•						d. Check all fasteners, mounting hardware, and cable attachments for loose or missing components. Tighten or replace as necessary using insulated tools.	
2										Batteries	**WARNING** **Fumes from batteries may be flammable and explosive. Do NOT smoke or have open flame when checking or worldng on battery bank. Battery electrolyte presents potential health hazards. Contact with eyes and skin should be avoided. SafUty glasses, gloves, and rubber aprons must be worn when handllng this chemical. Electrolyte contains sulfuric acid which can cause severe bums and Is highly toxic to skin, eyes, and respiratory system.**	

Table 11-3. Preventive Maintenance Checks and Services for Equipment Monitoring System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	•			•							a. Check that batteries are secure and that electrical cable fittings are tight. Use insulated tools to tighten as necessary. fittings not tight.	Batteries and cables are not secure and
	•		•								b. Check batteries for proper electrolyte level. Add distilled water or clean tap water to bring to proper level.	
		•		•							c. Make sure battery charger select switch is on FLOAT for normal charges and volt-meter reads about 24V. The HIGH switch setting is for rapid recharge. **CAUTION** **Do not allow battery charger to remain on HIGH setting for more than 24 hours.**	
3		•		•						Keyboard Lamp and Alarm	a. Perform keyboard lamp and alarm test as follows: 1) Press EDIT key. 2) Press key 6 (KEYBOARD LAMP TEST). All keyboard keys, except ACK key, should light and alarm should sound. Make sure all alarm devices operate.	Keyboard lamp inoperable.
		•									b. Using insulated tools, replace bad lamps and fuses.	Monitor does not return to normal operation.
		•									c. After completion of test, press EDIT key to initiate normal monitoring. **NOTE** **Keyboard lamp and alarm test may be run without affecting monitoring anytime edit mode Is not in use.**	

Table 11-3. Preventive Maintenance Checks and Services for Equipment Monitoring System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
4		•								EMS Main Processor	a. Check that EMS main processor internal temperature is maintained between 32° and 131 ° F. b. When EMS temperature reaches 125° F, initiate the following: 1) Check that all ROWPU space overhead fans are operating and hatches and doors are open. 2) If available, use additional portable fans blowing on main processor. 3) If necessary, cover main processor with damp cloths and portable fans blowing directly on processor. 4) If temperature cannot be maintained below 131 ° F, turn EMS off during hottest part of day, and visually monitor tank level indicators, gauges, flowmeters, etc., to assure all systems are operating normally.	
			•								c. Pull main power switch OFF after operation.	
			•								d. DO NOT turn main processor and video monitor switches to OFF unless barge is to be out of operation for more than 7 days.	
	•		•								e. Check fuses. Replace if necessary.	Fuses blown.

CHAPTER 12. COMMMUNCATIONS SYSTEM PMCS

Section I. General system information

12-1. Introduction. Chapter 12 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Barge Communications System. Operating and maintenance procedures are described in detail in TM 55-1930-209-14&P-12. TM 55-1930-209-14&P-12, Appendix C also contains complete Preventive I Maintenance Checks and Services for the Communication System.

12-2 Major components. The communications system consists of an Army radio, commercial marine radio, and three walkie-talkies. The major components of the communication system are listed in Tables 12-1 through 12-3 with basic functions and location on the barge.

Table 12-1. Major Components of Radio System

Component	Location	Function
Army AN/VRC-46 transceiver/i	Mounted on shelf on aft bulkhead in dayroom	For radio communications with military stations
Army M-80/GR micro-phone/1	Connected to ANNVRC-46 transceiver on aft bulkhead in dayroom	For transmitting voice messages
Army PP-6224 A/U (Barge 1) Army PP-2953/U (Barges 2 and 3) power supply/i each	Mounted on shelf on aft bulkhead in dayroom transceiver operation	Provides a regulated +25.2 Vdc for ANNRC-46
Army HF antenna AS-1729NRC/1 Marine 866S VHF/FM transceiver/2	Mounted on deckhouse top, starboard Mounted under shelf on aft bulkhead in dayroom and in workboat cabin	For receiving or trans-mitting radio waves For radio communications within FCC-assigned commercial marine band
Marine regulated dc power supply/i	Mounted on shelf on aft bulkhead in dayroom	Supplies a regulated +13.8 Vdc power supply for 866S VHF/FM marine transceiver operation
Marine VHF antenna/2	Mounted on deckhouse top, starboard and on workboat cabin	For receiving or trans-mitting radio waves
HX500S VHF/FM marine handheld transceivers (walkide-talkies)/3	Positioned in battery charger on portside of operator's desk or workshop rack	For radio communications within the FCC-assigned commercial marine bank
Handheld transceiver CSBSO AM battery charger/i	Mounted in workshop on supply rack battery packs	Supplies a 7.5 Vdc output for charging ni-cad

Table 12-2. Major Components of Foghorn

Component	Location	Function
Foghorn remote control	Dayroom on forward bulkhead	For manual or automatic activation of foghorn
Regulator foghorn	Dayroom on forward bulkhead	Converts 24 Vdc input to 12 Vdc output required by
Foghorn	Deckhouse top on portside forward	Produces an omni-directional signal that can be heard 1/2 mile away

Table 12-3. Major Components of Telephone System

Location	Station	Equipment
Dayroom	Control station 1 speaker	1 buzzer selector box 1 headset station 1 stowage box
Workshop	Station 1	1 headset station 1 buzzer
ROWPU space	Station 2	4 headset stations: 1 near switch-board, 1 near Equipment Monitoring System (EMS), 1 near ROWPU 1 control station, 1 near ROWPU 2 control station. 1 strobe light on overhead 1 stowage box
Void 2 port (chlorination)	Station 3 1 buzzer	1 headset station
Void 1 (bow crane hydraulic pump)	Station 4 1 buzzer	1 headset station
Void 3 port (SD pump) 1 buzzer	Station 5	1 headset station
Void 2 port, starboard	Station 6	2 headset stations, one in each Void; 2 buzzers, one in each void; 2 strobe lights, on each void overhead; 1 stowage box in star-board
Void 5 (SD hydraulic pump)	Station 7	1 headset station 1 buzzer
Weatherdeck aft	Station 8	2 headset stations, one near each anchor winch 2 stowage boxes 2 buzzers
Deckhouse top	Station 9	2 headset stations, one forward, one aft 2 stowage boxes fore and aft 2 buzzers

12-3. Communications System Description. This system consists of the methods of communication described below:

12-3.1. Radio communications equipment. This equipment, located in the barge dayroom and cabin of the workboat, consists of the type AN/VRC-46 High Frequency (HF) Frequency Modulation (FM) Army issue radio (hereafter called the HF/FM Army radio), a Very High Frequency/Frequency Modulation (VHF/FM) commercial marine radio, and Ultra High Frequency (UHF) FM handheld walkie-talkie transceivers.

12-3.2 Army radio. The HF/FM Army radio provides communications with other stations equipped with radio frequencies reserved for military (primarily US Army) use. This radio enables the barge to communicate with its towing vessel, other military support vessels, military shore-based radio stations, and military aircraft. Transmission distance is normally 25 miles or less.

12-3.3 Commercial marine radios. These provide VHF/FM radio communications between workboat and barge and between workboat or barge and other vessels equipped with radios working these same channel frequencies. Transmission distance is normally 25 miles or less.

12-3.4 Walkie-talkies. These preset, crystal-controlled, hand-held, nickel cadmium (ni-cad) battery-powered portable radios can be preset to the same frequencies available on commercial marine radio channels. They provide VHF/FM communications between crew personnel onboard, between shore and crew personnel, and between crew personnel on workboat and barge. Transmission distance is normally 5 miles or less.

12-3.5 Foghorn equipment. This equipment sounds the foghorn to warn oncoming vessels of barge location during poor visibility.

12-3.6 Telephone system. This system provides intercommunications between dayroom system operator and crewmembers at any telephone station on the barge. Telephone stations provide jack receptacles for connecting a headset. By using dayroom telephone equipment, operator can page and communicate with personnel at any telephone station. When on line with operator, crewmembers at telephone stations can communicate with operator or crewmembers plugged into other stations.

Section II

Table 12-4. Preventive Maintenance Checks and Services for Communications Systems

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										COMMUNICATION SYSTEMS		
1										Radio System	**WARNING** **Do not touch Army radio antenna while radio is operating. Antenna contains high voltage which will seriously injure a person touching the antenna during transmissions.** **Be sure that electrical power is OFF before performing any maintenance on electrical (communication) systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.**	
	•		•	•		•					a. Make sure Army and Marine radio installations are complete, connected to a power source and electrically connected.	
	•		•	•		•					b. Make sure walkie-talkie battery pack is fully charged. Replace if necessary.	
											c. Check battery charger indicator lights for proper operation. Notify shift leader or bargemaster for corrective action.	Battery charger indicator lights inoperable.
											CAUTION **Use only clean water and a cloth to clean plastic surfaces. Do not paint plastic surfaces. Damage to plastic will result if cleaned with solvent or painted. Avoid damage to insulation and mounting system. DO NOT impair electrical/electronic properties of item being cleaned. DO NOT use solvents to clean internal parts of electrical/electronic components.**	
	•		•			•					d. Clean components as follows: 1) Vacuum internal portions of electrical components. 2) Wipe dirt from external components, except plastics, with dry cheesecloth or, if necessary, with a soapy cloth. Cloth should be damp, but not dripping wet.	

Table 12-4. Preventive Maintenance Checks and Services for Communications Systems (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	•		•		•						e. Check controls of components for missing, loose or broken knobs. Check that controls turn properly.	
	•		•		•						f. Check for loose plugs and jacks. Tighten if necessary.	
	•		•		•						g. Check for loose, missing or broken mountings, hardware brackets, etc. Tighten or replace as necessary.	
	•		•		•						h. Check for proper installation and operation of Army and Marine radio antennas.	Antennas inoperable.
	•	•									i. Check for normal operation of radios. Notify shift leader or bargemaster of malfunctions so that corrective action can be taken.	
					•						j. Check antenna base for collection of water.	Drain if necessary.
					•						k. Check for frayed or damaged cables. Replace as necessary. In cold weather, do not bend cables or cords.	Cables frayed or damaged.
						•					l. Make sure connector/receptacle pins on interconnecting cables are straight and free of corrosion and rust. Straighten pins and remove rust as necessary.	
2	•		•	•						Foghorn Equipment	a. Check for complete installation of foghorn equipment.	Installation incomplete.
	•		•								b. Check for corrosion or rust. Clean and touch up paint as necessary in accordance with TB 43-0144 to match surrounding area. DO NOT paint threads or labels.	
	•		•		•						c. Check controls for missing, loose or broken switches and pushbuttons. loose or broken.	Switches and pushbuttons missing,

Table 12-4. Preventive Maintenance Checks and Services for Communications Systems (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	•	•			•						d. Check for normal operation of foghorn. Foghorn should sound at 18 second intervals. In cold weather, allow foghorn remote control to warm up before sounding foghorn. Notify shift leader or bargemaster so that malfunction can be corrected.	Foghorn does not sound at 18 second intervals.
	•		•		•						e. Check for loose plugs and jacks. as necessary.	Tighten
	•		•		•						f. Check for loose mountings, hardware, brackets, etc. Tighten as necessary.	
											g. Check for frayed or damaged cables. Replace if necessary.	Cables damaged or frayed.
3	•		•		•					Telephone System	a. Check for complete installation of telephone system components.	
	•		•								b. Check for corrosion or rust. touch up paint as necessary in accordance with TB 43-0144 to match surrounding area. threads or labels.	Clean and DO NOT paint
	•		•		•						c. Check controls for missing, loose or brroken switches and pushbuttons. or broken.	Switches or pushbuttons missing
	•		•		•						d. Check for normal operation of phone. Notify shift leader or bargemaster so that malfunction can be corrected.	
	•		•		•						e. Check for loose plugs and jacks. Tighten as necessary.	
	•		•		•						f. Check for loose mountings, hardware, brackets, etc. Tighten as necessary.	
	•		•		•						g. Check for frayed or damaged cables. Replace as necessary.	Cables frayed or damaged.

CHAPTER 13 HANDLING EQUIPMENT PMCS

Section I. General system Information

13-1 Introduction. Chapter 13 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Barges. Operating and maintenance procedures for the handling equipment are described in detail in TM 55-1930-209-14&P-13. TM 55-1930-209-14&P-13, Appendix C also contains complete Preventive L Maintenance Checks and Services for Handing Equipment.

13-2 Major components. Handling equipment for the ROWPU Barge consists of a bridge crane, bow crane, and trolley hoist. Refer to Appendix A of TM 55-1930-209-14&P-20 for the Components of End Items List for this equipment.

13-3 Handling equipment description. The handling equipment is used for lifting, transporting, and repositioning equipment and materials onboard the barge. This system includes a bridge crane, bow crane, and void 4 trolley hoist. The bridge crane is installed in the reverse osmosis water purification unit (ROWPU) space, bow crane on the forward weatherdeck, and the trolley hoist in void 4 starboard. The bridge crane is used also to load and off load supplies and equipment through the deckhouse starboard sliding door. The bow crane is used primarily to unload and load the workboat from the deckhouse top and to load and unload the shore winch from its carrying position in front of the bow crane on the forward weatherdeck. The trolley hoist is used to lift or reposition equipment in void 4.

13-3.1 Bridge crane system. The bridge crane system, in the ROWPU space, lifts and transports heavy equipment and materials, such as diesel generators and 55-gallon drums. The bridge crane is also used for loading and unloading equipment and materials through the deckhouse starboard sliding door. Bridge crane major components (Figure 13-1) include: two 5-ton capacity, motor-driven, overhead cranes with end truck assemblies; a manual, chain-operated, geared trolley hoist; a cable reel located midway each system and an "I" beam rail system. The "I" beam rail system, over which the cranes move, is suspended from the deckhouse structure by a series of support posts. Two crossover members located between the port and starboard bridge cranes provide for transfer of the geared trolley hoist. A four-button, hand-held electrical control is used for controlling fore and aft crane movement. Electric power is provided to the crane through a cable that is extended or retracted by the cable reel as the crane moves forward or aft. Additionally, a 2-ton electric hoist provides for lifting lighter loads. A jib rail provides a method for moving suspended loads through the barge sliding door. The bridge crane system installation is shown on drawings listed in Appendix A.

13-3.2 Bow crane system. The bow crane is a hydraulically operated articulating boom crane with a maximum outreach of approximately 47 feet. Maximum lift capacity at this extension is 2,425 pounds. Maximum lift is 41,895 at an outreach of only 6 feet, 7 inches. The crane is corrosion-proof and suitable for operation in a marine environment. The crane has five major assemblies: crane body, inner boom, outer boom, mounting base, and hydraulic control unit. When not in daily use, bow crane must be placed in its traveling (stowed) configuration (Figure 13-2).

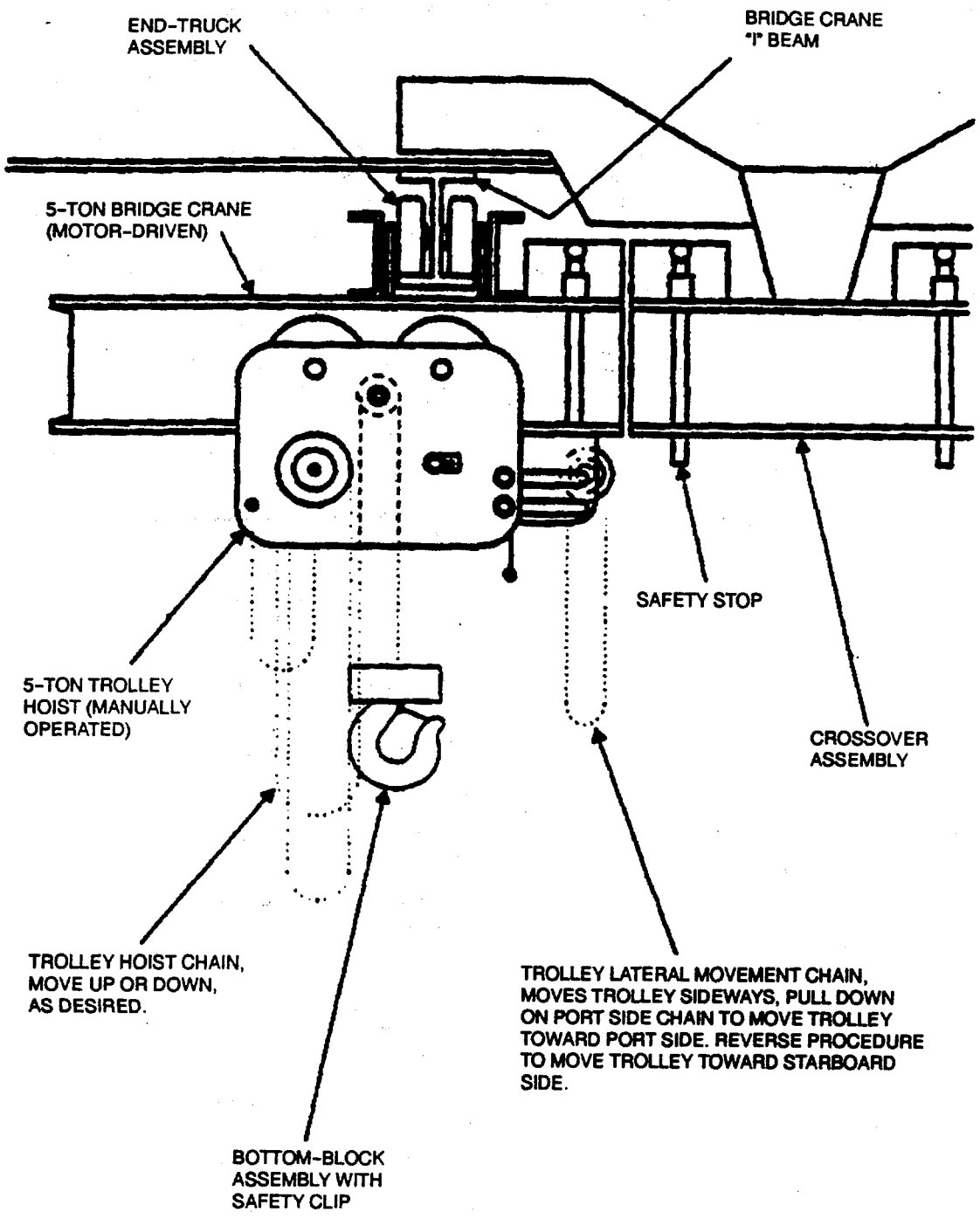


Figure 13-1. Bridge Crane

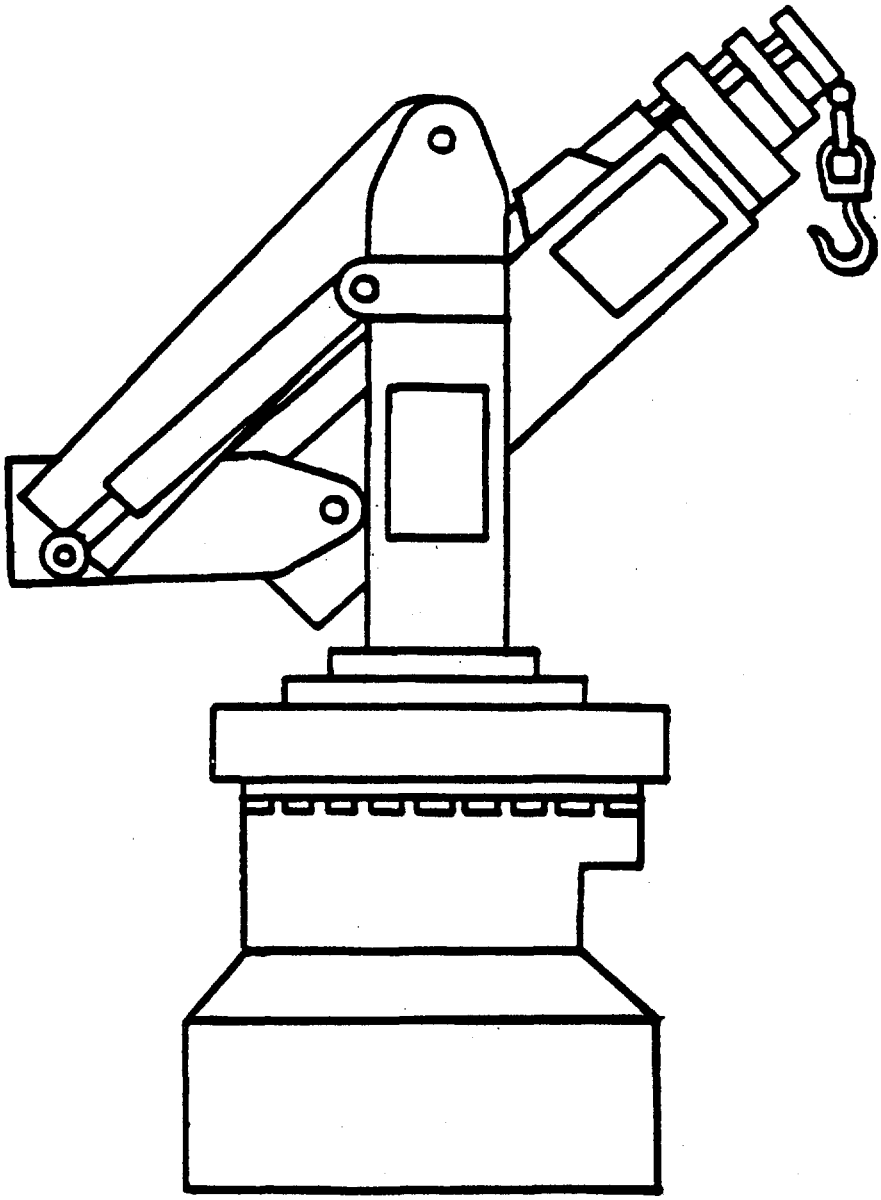


Figure 13-2. Bow Crane in Traveling (Stowed) Position

The crane body is a steel casting with the upper part being a closed welded box design through which hydraulic hoses are routed to inner and outer boom actuating cylinders. Inner and outer boom assemblies are positioned, as required, by extending or retracting hydraulic actuators. A winch assembly is mounted on top of the primary element of the boom for retrieving loads of 10,000 pounds or less. To winch loads greater than 10,000 pounds, the sheave block must be installed on the end of the outer boom.

Operator controls for the crane are on the forward side of the deckhouse top. They include five control levers for controlling crane movement, a START/STOP control switch, and a key lock for the anti-2-block control system. The START/STOP control switch, and a key lock for the anti-2-block control system. The START/STOP control switch and anti-2-block key lock are in a watertight storage box aft of the crane control levers. Another START/STOP control switch, primarily for emergency use, is on the weatherdeck forward bulkhead.

Hydraulic pressure for the bow crane is supplied by a hydraulic power unit in void 1 port. A 30 Hp electric motor drives the pump to produce 3600 psi of hydraulic pressure. A motor controller in void 1 (Figure 3-4), starts and stops the local unit and supplies power to the two remote START/STOP control switches. The motor controller requires 440 Vac, 3 phase, 60 Hz power.

13-3.3 Void 4 Trolley Hoist. Void 4 trolley hoist (Figure 13-3) in void 4 starboard is a low-headroom, manually operated hoist. Major components include an "I" beam suspended from the void 4 overhead structure, a manual hoist assembly, load chains, a block hook, and a brake mechanism. The trolley hoist has a net weight of 230 pounds and a standard lift height of 8 feet. The load chains measure approximately 9 feet 6 inches and require 41 pounds of pull to lift a full load. The hook assembly has a diameter of 1 3/7 inches. The "Ul beam measures approximately 6 inches in width.

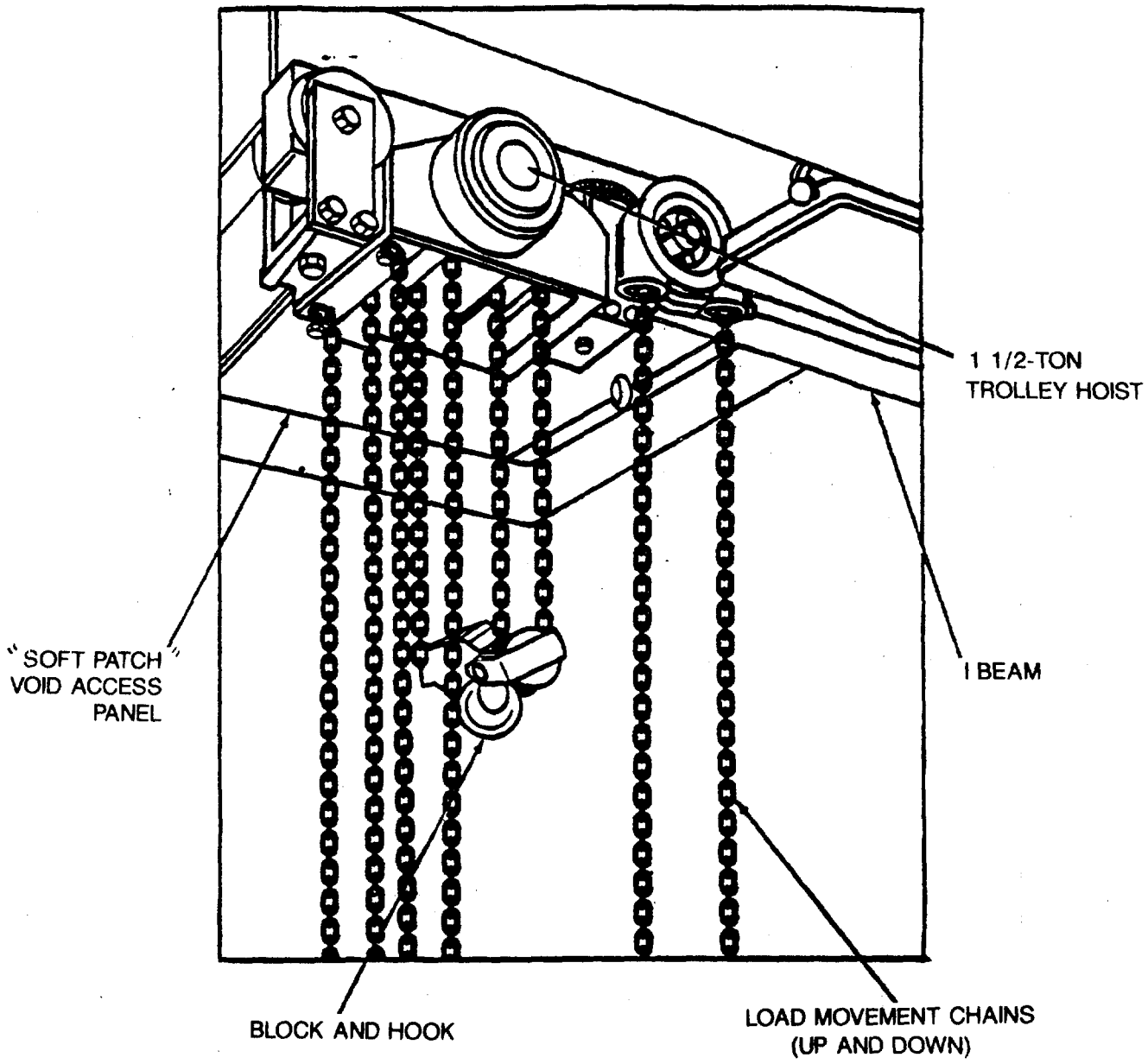


Figure 13-3. Void 4 Trolley Hoist

Section II

Table 13-1. Preventive Maintenance Checks and Services for Handling Equipment

B - Before D - Daily Q - Quarterly
D - During W - Weekly S - Semiannually
A - After M - Monthly A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										HANDLING EQUIPMENT	**NOTE** **If Handling Equipment System equipment fails to operate, troubleshoot according to TM 55-1930-209-14 & P-13. Report deficiencies and failures to the shift leader or bargemaster. Use proper forms to describe maintenance or repair problems. Keep Handling Equipment System operations and PMCS logs current.** **WARNINGS** **Severe personal injury and equipment damage may result from improperly attaching slings, lifters, or hoisting rigs. Maximum load lift for trolley hoist is 5-tons and not more than 2-tons when using electric hoist. Observe all safety recommendations in this manual, in the manufacturers' service manual, and in TB 43-0142.** **Be sure electrical power is OFF before performing maintenance or repair on this system. OPEN circuit breakers. Redtag circuit breakers or motor controller with "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe safety precautions listed in the beginning of this manual and in manufacturers' manuals instructions.** **CAUTIONS** **Avoid excessive jogging and inching. This causes crane and hoist to absorb impulse loads that can overload the system and shorten system life.** **Avoid swinging load when transporting it. DO NOT allow load to twist. If used, make sure lifting rig is properly seated in center of hook and properly attached to load.** **Always disengage interlocks on crane before attempting to move crane to avoid misalignment and difficult operation.**	

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										BRIDGE CRANE SYSTEM		
1	●	●	●		●				·	Hooks, Cables and Chains	a. Visually inspect hooks, cables, and chains for damage. Make sure crane and hoist cables and chains are properly secured, and clean. Avoid overloads.	Hooks, cables or chains damaged.
						●	●				b. Check cables and chains for fraying, bends, kinks, or loose connections. Repair, replace or tighten as necessary.	Cables frayed.
						●	●				c. Check pendant control cable for cuts or abrasions that might lead to electrical shorts on controls.	Cable has cuts or abrasions.
					●	●					d. Check hoisting hook for wear, heavy nicks, cracks, or bends. Make sure hook turns freely and that latch has freedom of movement.	Hook does not turn freely.
2	●	●			●					Brake and Brake Assembly	a. Check interlocks are set properly for through travel.	
		●			●						b. Check brakes frequently. If brakes do not hold when lifted a few inches, do not use equipment until brakes are adjusted.	Brakes do not hold.
		●			●						c. Avoid bumping safety stops and protective stops. Use for emergency stop only.	
					●	●					d. Check rotating friction disc for wear adjustment. Adjust as necessary or replace if total wear is 1/16 in.	Wear is 1/16 inch.
					●	●					e. Visually check brake assembly and manual release for broken or damaged parts. Replace or repair as required.	
							●				f. Clean brake magnet faces if dirty. Insert clean sheet of paper between magnet faces and energize brake. Move paper around between magnet faces to dislodge dirt. Remove paper.	

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
							●				g. Troubleshoot according to instructions contained in Dings Co., bulletin BK 4613, 60 series, for heavy duty unipac brake, included in Appendix B, TM 55-1930-209-14 & P-13. **WARNING** **To avoid the risk of injury to personnel or damage to equipment, make sure clamp ends on drum lifter are not broken, bent, or otherwise damaged.**	
3						●				Cable Reel Assembly, Cable Hand Held Controls	a. Visually check reel assembly and mounting for damage, broken or missing parts, or loose or missing fasteners and securements. Repair, replace, and/or tighten as necessary.	Damaged, broken or missing parts.
						●					b. Check cable guide to make sure that cable pays reel in a straight line without bends. Adjust as necessary.	Cable line is not in straight line without bends.
						●					c. Visually check securement of secondary safety chain to prevent reels from falling from overhead.	Safety chain is not secured.
						●					d. Troubleshoot according to instructions contained in Aero-Motive bulletin SM 3120-04 LL, Service Manual Series 0931 cord reel, included in Appendix B, TM 55-1930-209-14 & P-13.	
4	●						●			Electric Hoist	a. Check tracking mechanism. Lift a load a few inches off deck and lower to original position while checking for slippage or free run. Adjust or repair as necessary. **WARNINGS** **· Notify higher level of maintenance after repairing or replacing parts on any lifting equipment, slings, and rigs on the barge. They must safety- inspect and proof test the repaired item in accordance with TB 43-0142. In addition, all lifting equipment, slings, and rigs must be proof tested to these standards every 12 months. Record and maintain certification of all proof testing.** **· Never leave suspended loads unattended. Always transport load to final destination.**	Tracking mechanism slips or does not run free.
			●									

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL B	D	A	D	W	M	Q	S	A	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
		●									b. Raise hoist block to top and move bridge crane to ROWPU space aft end.	
		●									c. Secure chains with special attachments on sides of ROWPU aft of stowage area.	
			●	●							d. Clean crane hoist components as necessary. Clean and/or remove debris and foreign matter from work area.	
											NOTE **All bearings and bushings except the lower hook thrust bearing are prelubricated and require no lubrication.**	
						●					e. Lubricate lower hook thrust bearing.	
						●					f. Check hooks and latches for damage, cracks, twists, excessive opening or wear. Repair as necessary.	Hooks and /or latches damaged, cracked, twisted, or worn excessively.
											WARNING **Never degrease the protector or attempt to disassemble this device. Degreasing the protector may damage parts and using a device that has been degreased may cause erratic, inconsistent operation. If the protector has been degreased, it must be replaced by a factory calibrated device.**	
											CAUTIONS **The Lodestar Protector friction clutch assembly should operate for the normal life of the hoist without service. The device has been lubricated and calibrated at the factory for a specific model of Lodestar Hoist and is not adjustable or interchangeable with other models.** **The CM Lodestar Protector is to be used with "American Lubricants #6283" Grease. Do not use any other grease or the protector will not operate properly and parts could be damaged.** **The gears and protector (Part Nos.S-327 and S-328) are packed at assembly with grease and should not need to be renewed unless the gears have been removed from the housing and degreased.**	

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
							●				g. Inspect the loose end link, loose end screw, and dead end block on double reeved units. Replace the loose end link if it has opened, and check the operation of lower limit switch.	End link is loose or open.
							●				h. Check that the loose end screw is tight and the pin seated at the dead end of chain.	
							●				i. Inspect the upper suspension adapter making sure it is fully seated in the recess and that both cap screws are tight. If screws continue to be loose, replace the self-locking nuts in hoist frame.	Capscrews are loose.
							●				j. On single phase units (without a contactor) and two speed units, check operation of the control station switching arm that it pivots freely and does not stick in either position.	Switching arm does not pivot freely and/or sticks in either position.
							●				k. Inspect electric brake friction linings and friction surfaces for wear, scoring, or warping. Check air gap between armature and field. Adjust if the gap exceeds 0.045 in.	Gap exceeds 0.045 in.
							●				l. Inspect the liftwheel pockets for wear. Severely worn liftwheel should be replaced.	Liftwheel is severely damaged.
							●				m. Inspect the chain guides for wear or burring where chain enters hoist. Severely worn guides should be replaced.	Chain guides severely worn.
							●				n. Inspect trolley trackwheels for external wear on the tread and flange, and for wear on internal bearing surfaces as evidenced by a looseness on the stud.	Excessive wear on tread and flange. Internal bearing exhibits looseness on stud.
							●				o. Inspect collector wheels or collector shoes and cotter pins for wear. Check the wheels and studs for corrosion and free turning. Badly worn parts should be replaced.	Collector wheels, shoes and other pins are worn.

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
							●				p. Inspect the gasket between the gear housing and back frame for signs of leaks. Tighten the screws holding back frame to gear housing. If leaking persists, repack housing and gears with grease and install a new gasket.	Class III leaks.
								●			q. Apply light film of machine oil to the limit switch shaft threads.	
5	●				●					Miscellaneous	a. Check hoists and crane for proper lubrication. Lubricate as necessary.	
	●				●						b. Inspect all end stops and tighten bolts if required.	
	●				●						c. Inspect all structural components for loose connections, and secureness. Repair, replace, and/or tighten as required.	Structural components are loose or not secured.
	●				●						d. Check that weight of pushbutton hand-held control device is not supported by its electric cable. Pendant cable must hang freely. Repair or replace as necessary.	Cable does not hang freely.
6										Void 4 Geared Trolley Hoist	**WARNING** **Notify higher maintenance unit after repairing or replacing parts on the void 4 trolley hoist. They must safety inspect and proof test the repaired item in accordance with TB 43-0142. In addition, all slings and lifting devices must be proof tested to these standards every 12 months. Record and maintain certification of all proof testing.**	

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											CAUTIONS **Always center hoist over the load before lifting. This prevents side loading and uneven tension on load-bearing components. Avoid swinging load when transporting it.** **Bent hooks indicate component has been overloaded. Replace hook and inspect all other load-bearing parts for damage.**	
											NOTE **When repairing or replacing parts, use parts of original construction. All materials used should be according to void 4 trolley hoist drawing and appropriate repair manual.**	
	●										a. Check barge maintenance log for discrepancies that would prevent using trolley hoist.	
	●		●			●	●				b. Check hoist for damaged hook or chains. Check that hoist and attaching hardware are secure, clean, and properly lubricated.	Hooks and/or chain damaged.
											WARNING **Corrosive prevention compounds are flammable and slightly toxic. Avoid contacting skin and eyes as well as breathing vapors. Skin, eye, and breathing protection is required.**	
	●		●				●				c. Remove rust and corrosion from hoist and components. Touch up paint in accordance with TB 43-0144 as necessary. Do not paint threads or labels.	
							●				d. Visually check chain drive wheels for excessive wear. Repair as necessary.	Chain drive wheels are excessively worn.
							●				e. Check braking and locking device for proper operation. Repair as necessary.	Brakes and locking device inoperable.

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
							●				f. Check hook for free swivel movement. Adjust or repair as necessary.	

NOTE

Lubricant	Location	Instructions
NLGI No. 2 Grease pins (roller bearings)	Fittings on chain sheave	Annually or as required.
	* Trolley wheels	After prolonged use or at reassembly
	Pawl Stud	Coat lightly at reassembly
	Brake square thread	Coat lightly at reassembly
NLGI No. 2 with E.P. additive	Gears	After prolonged use or at reassembly
Intermediate oils preferably with E.P. additives	Chain	Immerse in container or swab with oil soaked rag. Wipe off excess oil. Should maintain chain rust free.
Bonded lubricants (similar to Dow Molykote M-88)	Chain	Use in place of oil, if oil residues are objectionable.

*** Not required on units equipped with sealed ball bearings. (Wheels will not have grease fittings. See also service lubrication specifications contained in MIL-L-2104 and MIL-L-46152)**

							●	●			g. Inspect load chain for lubrication, wear, damaged links, or foreign matter. Lubricate, clean or repair as necessary.	Load chain damaged.
							●				h. Check hook block for damage, rust, or corrosion. Clean as required.	Hook block damaged.
							●				i. Inspect trolley track wheels for external wear on the tread and flange. Repair as necessary.	Tread and flange excessively worn.
							●				j. Inspect chain guides for wear or burring where chain enters hoist. Replace severely worn guides.	Chain guides show severe wear or burring.

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	●						●				k. Check trolley hoist tracking mechanism. Lift load a few inches off deck and lower to original position while checking for slippage or free run. Adjust or repair as necessary.	Tracking mechanism does not run free or slippage occurs.
							●				l. Inspect load bearing parts such as hand chain wheels, chain attachments, suspension bolts, shafts, gears, and bearings.	
										BOW CRANE SYSTEM	**WARNING** **Be sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.** **CAUTION** **Due to high pressure in hydraulic system, do NOT operate crane with any visible leaks. Repair crane prior to use. Correct leaks in flexible hose, hard piping, or joints. Do not confuse seepage around hydraulic packing on actuator arms with leaks. A small amount of seepage is acceptable.**	
7	●									Hydraulic System	a. Check maintenance log for bow crane and associated hydraulic system to assure there are no discrepancies that prohibit operation.	
	●			●							b. In void 1, visually inspect hydraulic pump motor and hard piping of crane hydraulic system for leaks or damage. Do not use system if such leaks are present. Notify shift leader or bargemaster so corrective action can be taken.	Class III leaks.

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	●			●							c. Remove filler cap on hydraulic tank to assure fluid level is within 1 in. of bottom of filler neck. If fluid is low, add hydraulic fluid before using crane. Screw cap on tightly before hydraulic pump.	Fluid level is low.
	●										d. Check hydraulic system operations. To test, turn main switch on at hydraulic power unit motor controller (void 1 aft bulkhead) and set HAND/OFF/AUTO switch to HAND position. **NOTE** **Hydraulic power unit pump is started locally by pushing green START button on motor controller or pushing black START button on START/STOP control station on deckhouse top. If bow crane has not been used recently, start pump by pressing green motor controller START button and make sure pump starts.**	
	●			●							e. On forward weatherdeck, visually check exposed hard piping and flexible hydraulic lines for cracks and leaks. Check crane base to ensure that it is secure and make sure forward weatherdeck is clear of material that might obstruct bow crane movement. Inspect hold-down bolts for damage and check for tightness. If tightening is required, tighten to 350 ft lb. **WARNING** **The anti-two-block alarm system consists of an emergency switch which when activated prevents the hook block from being raised to the boom nose level. The switch lights a warning lamp on the crane operator's control panel and sounds a horn signal. Allowing the hook block to rise above the boom hose level could cause serious damage to the crane structure and could cause severe personal injury.**	Class III leaks. Crane base is not secure.
	●	●			●						f. Activate crane hydraulic unit. ready for BEFORE functional test deployment when hydraulic pump reaches high pitched whine.	Crane is

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	●	●			●						g. Activate the anti-two block alarm and visually check that system is operational.	
	●	●			●						h. Using crane control levers, deploy crane from traveling position and exercise crane, without load, as follows: 1) Extend all booms to their maximum length and slew crane around in one complete circle. 2) During each movement, check for a change in pitch of hydraulic pump noise and any jerky, sticking, or uneven movements of any part of crane. 3) Note any symptoms and check crane carefully before using.	Crane jerks sticks or parts move unevenly.

NOTE

Lubricant	Temperature Range	Type
Grease		**ESSO Multipurpose Grease H AGIP F1Grease 16**
Industrial Oil	**less than -15 °C -15 °C - + 35 °C greater than + 35 °C**	**ESSO NUTO H15 ESSO NUTO H46 ESSO NUTE H4100**
Motor Oil	**less than -15 °C -15 °C - + 35 °C greater than + 35 °C**	**ESSO NUTO HD5W ESSO NUTO HD20W ESSO NUTO HD30**

NOTE

Industrial oil can not be mixed with motor oil. When industrial oil is not available use the motor oil. (See also service lubrication specifications contained in MIL-L-2104 and MIL-L-46152.)

	WARNINGS Sheave block must be installed before using bow crane winch to lift loads of more than 10,000 lb. Maximum lift for crane winch with sheave block installed must not exceed 20,000 lb.	
250 hrs	i. Check return and suction filters. as necessary	Replace

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
8						●				Hoisting Machinery	a. Inspect hoist cables for fraying, bends or kinks. Repair or replace as necessary. Lubricate with wire rope compound.	Cables are frayed, bent or kinked.
						●					b. Inspect hook block for worn sheaves or broken sheave flanges. Repair or replace as necessary.	Sheaves and/or flanges excessively worn.
						●					c. Check block for loose or frozen bearings and lubricate.	Bearing loose or frozen.
						●					d. Inspect sheave guards and repair if necessary.	Sheave guards inoperable.
						●					e. Check the oil level in gearcase and add MIL-L-2105C oil if necessary using type and grade as specified by hoist manufacturer.	
						●					f. Inspect electrical connections for loose connection or damaged wiring.	Wiring damaged.
						●					g. Inspect collectors for shoe wear and alignment, and check the electrical connections.	Shoes worn or misaligned.
						●					h. Test brakes for operation and adjust if necessary.	Brakes inoperable.
						●					i. Lubricate points of wear and bearings in all controllers.	Bearing and/or controllers excessively worn.
						●					j. Inspect all magnetic contactors and check operation.	Magnetic contactors inoperable.
						●					k. Check contactor surfaces for wear or pitting; replace worn parts.	
						●					l. Check control items for weak springs and worn bearings. Replace worn items. Adjust and lubricate the bearing points with a drop of oil.	Springs and bearings worn.
						●					m. Inspect limit switches and test operation. Check contacts. Clean and adjust if necessary.	Limit switches inoperable

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
9						●	●			Crane and Carrier Drive Equipment	a. Inspect and test interlocks for proper clearances and freedom of operation.	
						●	●				b. Inspect current collectors for shoe wear and alignment and adjust if necessary.	
						●	●				c. Inspect for loose electrical connections or damaged wiring.	Connections loose or wiring damaged.
						●	●				d. Check oil level in gearcases and add BP LSEP-2 ALT BEACON EP2 machine oil if required.	
						●	●				e. If equipment is equipped with travel brakes, test operation and adjust if necessary.	Brakes inoperable.
						●	●				f. Inspect lineshaft for loose bearing support bolts.	Bearing support bolt loose.
						●	●				g. Check crossbridge conductors for bends or kinks and loose splices. Correct if necessary.	Crossbridge conductor bent, kinked or loose.
						●	●				h. Inspect motor mounting bolts and tighten if necessary.	Motor mounting bolts loose.

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
10										Miscellaneous Equipment	**WARNING** **If hook is twisted or has throat opening greater than normal, notify IDS/IGS maintenance unit to inspect and/or replace.**	
	●		●		●						a. Check hooks and pulleys for cracks, bends, or deformed parts. Check cables for kinks or fraying. Repair as necessary.	Hooks and pulleys cracked, bent or deformed. Cables frayed.
	●		●			●					b. Inspect structural components for cracks and excessive play in joints and connections. Repair as necessary. joints and connections.	Cracks or excessive play in structural components,
			●			●					c. If crane is not in traveling position, cover all exposed stainless steel rods with heavy coating of general purpose anti-corrosion grease or hydraulic fluid.	
	●					●					d. Clean grease from stainless steel rods before operation.	
	●	●	●			●					e. Check for leaks on hard piping, hoses, and hydraulic seals. Notify shift leader or bargemaster so that leaks can be repaired.	Class III leaks.
						●					f. Inspect all interlocks and crossovers for alignment, clearance, and freedom of operation. restricted or misaligned.	Interlocks or crossovers are
						●					g. Extend winch cable to full length and carefully inspect it. Make sure that it is securely fastened to drum. Carefully record any broken strands or deterioration in winch cable and request IDS/IGS maintenance to determine whether further use of the winch constitutes a safety hazard.	Drum not securely fastened.

Table 2-4. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						●					h. Check all slings used to hoist workboat for broken or frayed wires, smooth or worn spots, and corrosion. Remove slings with broken or frayed wires from service immediately. Inspect smooth or worn spots to determine cause of condition and take corrective action. If no further maintenance is required, coat the spots with a thin coat of oil, remove corrosion, and treat as appropriate.	Slings have broken or frayed wires.
						●					i. While crane is folded, check hydraulic fluid level. Level should be between minimum and maximum.	
						●					j. Remove and clean oil filter located at the base of the crane.	
						●					k. Remove and clean filter mounted on the suction way. Remove the cartridge, wash with suitable solvent, and dry with low pressure compressed air.	
						●					l. With grease gun, grease all joints.	
						●					m. Lubricate all jointed lever rods.	
						●					n. Clean components as necessary.	
				●							o. Remove rust, corrosion, and worn or chipped paint by wire brushing, chipping, or scraping. Immediately paint cleaned area with zinc chromate paint and finish to match surrounding area according to TM 43-0144.	
								●			p. Replace oil filter element.	
								●			q. Clean the air filter in the oil filter cap.	
								●			r. Drain and replace the hydraulic oil.	
									●		s. Request annual proof testing of bow crane and allied slings and lifting devices. Test in accordance with TM 43-0142. Record and maintain certification of all proof testing.	

CHAPTER 14 ANCHOR, MOORING, AND TOWING EQUIPMENT SYSTEM PMCS

Section I. General equipment information

14-1 Introduction. Chapter 14 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Barge Anchor Mooring, and Towing Equipment System. Operating and maintenance procedures are described in detail in TM 55-1930-209-14&P-14. TM 55-1930-209-14&P-14, Appendix C also contains I complete Preventive Maintenance Checks and Services for Anchor, Mooring, and Towing Equipment.

14-2 Major components. The anchor, mooring, and towing system consists of anchor winches, anchors, turnbuckles with jamnuts, fairleads, winch wire rope, winch electric gear motors, and ropes. The major components for this system are listed in Tables 14-1 through 14-3. Also listed are basic functions and location on the barge for each component.

Table 14-1. Anchoring Components

Component	Quantity	Function	Location
Anchor winch right-hand	2	Anchor deployment	1 & 3 bow starboard comer, stem port comer
Anchor winch left-hand	2	Anchor deployment	2 & 4 bow port comer, stem starboard comer
Fairleads	4	Cable routing	Two on stem, two on bow, paired with anchor winch and cable
Anchors	4	Anchoring barge	Two on stem, two on bow, attached to anchor cable and stowed on bolsters
Chocks (Barge 1 only)	4	Not used	Two on bow comers, two on stem corners
Bolsters	4	Stowing anchors	Two on bow near winches, two on stem near winches

Table 14-2. Mooring Components

Component	Quantity	Function	Location
Bitts	4	Mooring barge	Two on port weather-deck, two on starboard weatherdeck
Cleats	4	Mooring barge	Two on port weather-deck, two on starboard weatherdeck
Cleats	8	Mooring workboat	Four on port weather-deck, four on starboard weatherdeck

Table 14-3. Towing Components

Component	Quantity	Function	Location
Link chain	4	Towing bridle	Two with flounder plate, one on port and starboard bow shackle
Chain	2	Towing bridle	Connects flounder plate to port and starboard shackles
Shackle tow	4	Towing bridle	Attaches to port and starboard tow padeyes
Flounder plate	1	Towing bridle	Used to connect towing bridle assembly with tow line

14-3. Anchor Mooring and Towing Equipment System Description. This system provides a four-point anchoring system to hold the barge in a fixed offshore position while processing water and for mooring the barge at pierside or to another vessel. When the seabottom provides firm anchor holding, this system is capable of holding the barge in an offshore position in a Sea State 3 condition in depths not exceeding 50 feet.

14-3.1. Anchoring system has four electrically powered winches, two on the bow and two on the stem, each with 600 feet of 1-inch wire rope (cable) hooked to a 1000-pound Danforth type anchor. Winches have both manually and electrically operated brakes.

14-3.2. Each winch is powered by a 10 hp Dresser electric gear motor in a totally enclosed housing specifically designed for maritime use. For added protection against moisture and corrosion, the motor has an internally mounted 120 V, single phase electric space heater that will maintain internal temperature between 38 to 55 degrees F depending upon outside ambient temperature. This motor drives the winch through a drive chain and gears which are running in lubricant in a sealed housing on the side of the winch frame.

14-3.3. Within the motor housing is a Steams 105 ft-lbs self adjusting electric disc brake. This brake is always on except when voltage applied to a solenoid depresses the spring and allows the disc and motor to turn freely. For anchor winch manual operation (without power), this solenoid operated electric brake is manually turned off. This brake has a 120 V, 25-watt space heater to minimize adverse effects of condensation. To work in a saltwater atmosphere, this brake has naval brass friction discs instead of the usual fiber discs.

14-3.4. Each winch is designed so reeling-in action pulls cable onto the drum underside (bottom-spooling) and is equipped with a heavy duty levelwind assembly to ensure proper spooling of cable. To assist in spooling cable onto the nongrooved drum, each winch uses only “rightlay” cable (wire rope).

14-3.5. Each winch has electrical controls including an ON/OFF switch, an OUT button, an IN button, a STOP button, and a RESET button. Manual controls provide for engaging/disengaging levelwind mechanism, operating manual drum brake, and selecting either manual or electrical power for the winch.

14-3.6. The manual method of operating the winch, when selected, may be used to allow anchor to free-fall. This is not recommended. Anchor cannot be manually retrieved with this system. With two ship service generators providing electrical power, a manual backup system with full capability is not considered necessary.

14-3.7. Each winch cable passes through a fairleader before attaching to the anchor. This prevents the anchor cable from becoming entangled with other equipment on the weatherdeck.

14-3.8. Anchoring and mooring system components are listed in Tables 14-1 and 14-2.

Section II

Table 14-4. Preventive Maintenance Checks and Services for Anchor, Mooring, & Towing Equipment

B - Before **D - During** **A - After** **D - Daily** **W - Weekly** **M - Monthly** **Q - Quarterly** **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										ANCHOR, MOORING, AND TOWING EQUIPMENT	**WARNING** Be sure electrical power is OFF before performing maintenance or repair on this system. OPEN circuit breakers. Redtag circuit breakers or motor controller with "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe safety precautions listed at the beginning of this manual and in manufacturers' manuals/instructions.	
1	●			●		●				Anchoring Components	a. Visually check each anchor, exposed cable and connections, fairleader, and anchor winch for damage (all items located on weatherdeck). If damaged, notify shift leader or bargemaster so repairs can be made. If not operational, modify anchoring procedures to adjust for nonfunctioning anchor winch.	Anchor, cables, connections, fairleader and/or anchor winch damaged.
	●						●				b. Use grease gun with extender to lubricate each winch and fairleader as follows: 1) Eight grease fittings on fairleader (two on each of four rollers).	

Table 2-4. Preventive Maintenance Checks and Services for Anchor, Mooring, & Towing Equipment (Cont)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											2) Eleven grease fittings on levelwind traveler (two on each of four rollers and three on top of Barge 1 traveler). On barges 2 and 3, traveler has four fittings on top. 3) One grease fitting on gear case (outboard) side. 4) Two grease fittings on brake (inboard) side (one on levelwind release mechanism, one on water end of cover on levelwind gears). 5) Three fittings on inside shaft behind the manual/power selector. 6) Levelwind compound helix shaft and guide bars.	
	●										c. Check oil level in gear motor reduction box as follows: **CAUTION** If unit has been in storage, gear motor reduction box may be full of oil and must be drained to operating level prior to operation. 1) Remove gearbox breather plug/oil filler plug near top of gearbox. 2) Remove gear oil check plug near top of gearbox end of unit. Oil should be level with bottom of check hole. 3) If overfull from storage requirements allow excess oil (about 3 qt.) to run out of check hole into a container. When oil stops flowing, replace plug. Dispose of excess oil into bilge system. 4) If oil level is lower than bottom of check hole, add oil through breather and oil filler plug on side of gearbox until oil flows out of check hole. Use nontoxic rust-inhibiting gear oil, AGMA No. 7. Replace both plugs.	

Table 2-4. Preventive Maintenance Checks and Services for Anchor, Mooring, & Towing Equipment (Cont)

B -	**Before**	**D -**	**Daily**	**Q -**	**Quarterly**
D -	**During**	**W -**	**Weekly**	**S -**	**Semiannually**
A -	**After**	**M -**	**Monthly**	**A -**	**Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											5) Check gearbox breather plug/oil filler plug on side near top of gear motor reduction box. plug "out" to uncover breather holes. Make sure breather holes are not covered with paint.	Screw inner portion of
	●						●				d. Check oil level in gear case on outer side of winch as follows:	
											1) Unscrew oil level plug just below center line of gear case. level with bottom of hole.	Oil should be
											2) Remove gear lube access plate above oil level check hole.	
											3) Add 90 weight gear oil until it runs out of hole.	
											4) Replace oil level plug in hole.	
											5) Replace access plate.	
									●		e. Change oil in gear lube on outer side of winch.	
											1) Gearcase oil should be warm but winch not in use.	
											2) Remove gear lube access plate and oil drain plug. Catch oil in container and empty into sludge tank.	
											3) Replace oil drain plug.	
											4) Remove oil level plug.	
											5) Fill with 90 weight gear oil until it runs out oil level hole.	
											6) Replace oil level plug.	
											7) Replace gear lube access plate.	

Table 2-4. Preventive Maintenance Checks and Services for Anchor, Mooring, & Towing Equipment (Cont)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
								●			f. Change oil in gear motor reduction box. 1) Run motor a short time to warm gear motor oil. Turn off motor. 2) Remove gearbox breather plug/oil filler plug and gear oil drain plug. Catch oil in container. Dispose of oil into sludge tank. 3) Replace gear oil drain plug. 4) Remove gear oil check plug. 5) Add oil thru oil filler plug until it runs out of gear oil check plug hole. Use a nontoxic rust-inhibiting warm gear oil, AGMA NO. 7 compound, suitable for ambient temperatures of 50' to 140° F. 6) Replace gear oil check plug and gear-box breather plug/oil filler plug.	
	●		●						●		g. Apply multipurpose, water-resistant grease (MIL-G-24139) on anchor cable fairleader rollers, and all exposed, unpainted surfaces. **CAUTION** **During anchor retrieval, if winch panel circuit breaker trips several times dur-ing operation, this may indicate a wrong recovery method. Continuing to operate winch under these conditions will damage winch motor.**	
		●					●				h. Check condition of cable as it is pulled into drum. If cable is frayed, smashed, or cut, note location on drum and notify shift leader or bargemaster so repairs or replacement can be done.	Drum cable is frayed, smashed, or cut.
			●	●			●				i. Remove rust and corrosion. Clean and touchup all painted surfaces in accor-dance with TB 43-0144.	

Table 2-4. Preventive Maintenance Checks and Services for Anchor, Mooring, & Towing Equipment (Cont)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
		●									j. Make sure power panel 3 (120 Vac) circuit breaker 11 P13 is closed (ON) to provide heat to electric motors and brakes to combat moisture and corrosion.	
				●			●				k. Visually check electric winch motors, motor controllers, and wiring for damage or malfunction. Report deficiencies to shift leader or bargemaster for corrective action-	Wiring is frayed or damaged.
							●				l. Check winch manual brakes to assure brake bank is properly fastened and not excessively worn.	Brake bank is excessively worn.
*							●				m. Check and clean all electrical components and wiring.	

CHAPTER 15 MISCELLANEOUS EQUIPMENT PMCS

Section I. General equipment information

15-1 Introduction. Chapter 15 contains Preventive Maintenance Checks and Services for Miscellaneous Equipment onboard the Reverse Osmosis Water Purification Barge. Operating and maintenance procedures are described in TM 55-1930-209-14&P-15. TM 55-1930-209-14&P-15, Appendix C also contains complete E Preventive Maintenance Checks and Services for Miscellaneous Equipment.

15-2 Major components. Miscellaneous equipment includes the Dayroom Equipment, Workshop Equipment, Accesses System, Sanitation System, Bilge System and Eyewash Stations.

15-3 Miscellaneous equipment description

15-3.1 Dayroom Equipment. This equipment includes a drinking fountain, hotplate, coffee maker, refrigerator, range hood three berthing units with three bunks each, filing cabinet, mess table with six seats, writing table, sink, and radio operator's desk and chair (See Figure 15-1).

15-3.2 Workshop equipment. Figure 15-2 shows both operational and nonoperational items. Operational equipment includes an arbor press, drill press, and grinder with dust collector. Nonoperational equipment includes stowage bins and workbench with vise. The workshop includes an arc welder in the ROWPU space portside, under the air compressor motor controller near the life preserver stowage box.

15-3.3 Accesses system. This system includes deckhouse doors and portholes, accesses to voids, and doors behind voids. Accesses to the weatherdeck allow crew and equipment to enter and leave areas of the barge and give protection against adverse weather and sea conditions. See Figure 15-3 for layout of this system.

15-3.4 Sanitation systems. The barge contains two sanitation systems, the ship's toilets and the bilge system. The two systems are not interconnected.

15-3.4.1 Ship's toilet. The ship's two toilets are located in the ROWPU space; one against the workshop aft bulkhead, the other in an enclosure on the port side near the stem bulkhead. Ship's toilets are self-contained electric incinerating disposal systems that reduce human waste to a substance similar to wood ash. Waste is deposited in the toilets on a waxed paper liner and then incinerated along with the liner in an incineration chamber. This chamber is cooled during and after incineration by a blower system, which vents to the outside. The incineration process is begun by pushing a foot pedal. Since the toilet uses no water or chemicals, a bowl liner must be used with every operation. Waste deposited on this liner is flushed and incinerated automatically when the pedal is pressed.

The indicator lamp on the starboard side lights when the heater is on during the incineration cycle. Incineration cycle lasts about 20 minutes, during which time the heater switches on and off. The blower, which switches on at the same time as the heater, force vents the system. It stays on continuously through the cycle until the incinerator chamber cools to about 140 degrees This takes 35 to 45 minutes after the heater and light go off.

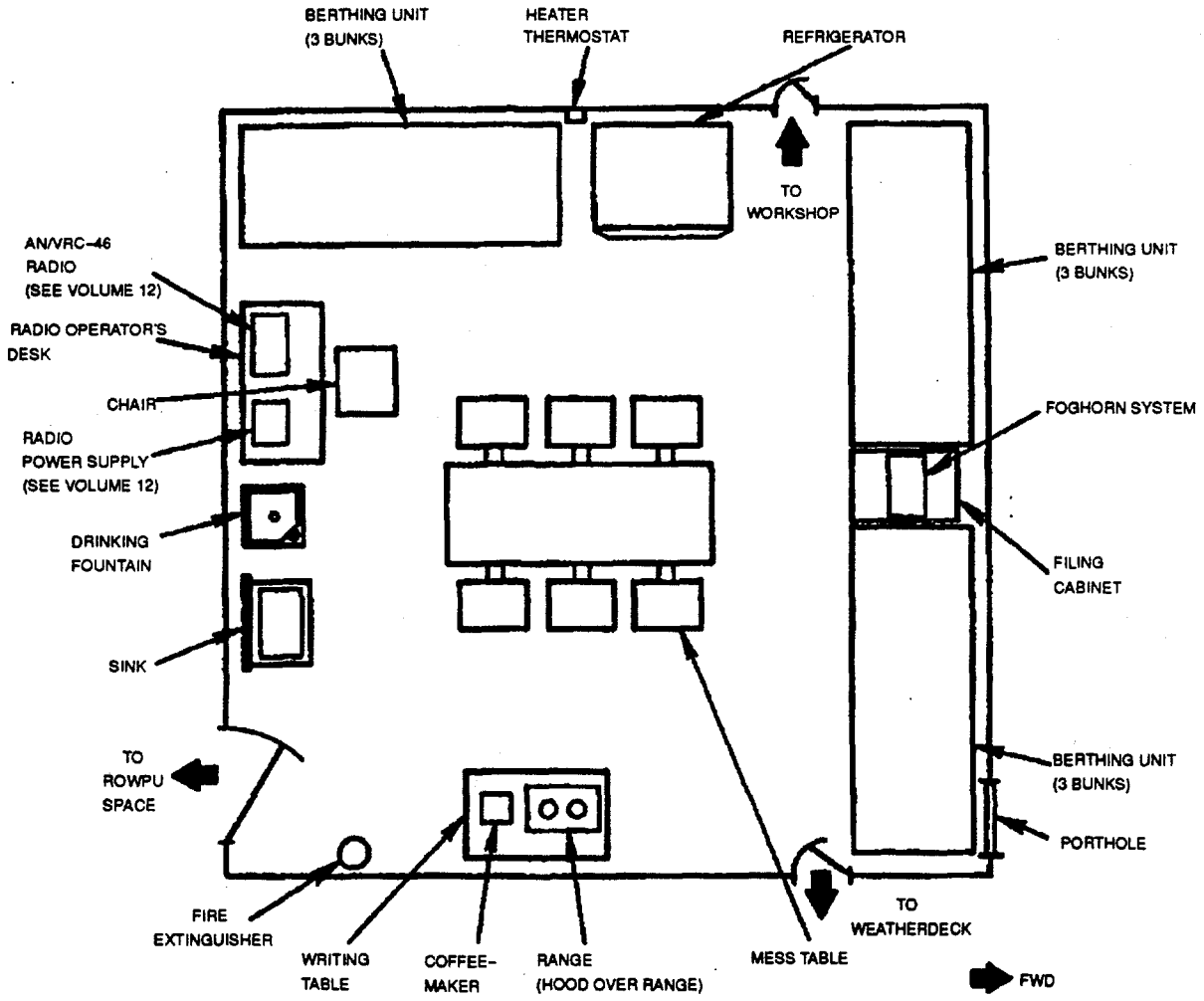


Figure 15-1. Dayroom Arrangement

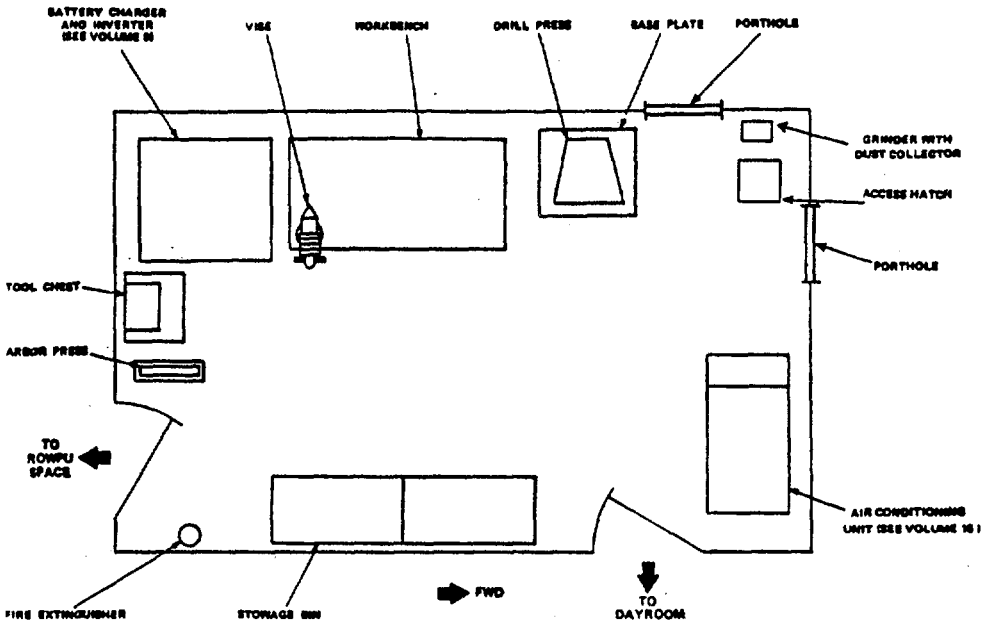


Figure 15-2. Workshop Arrangement

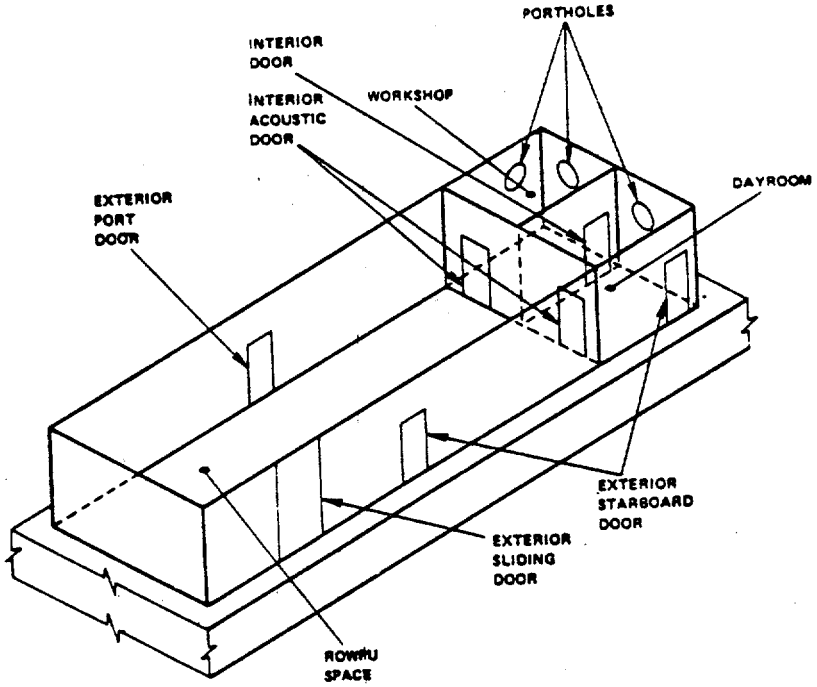


Figure 15-3. Accesses System

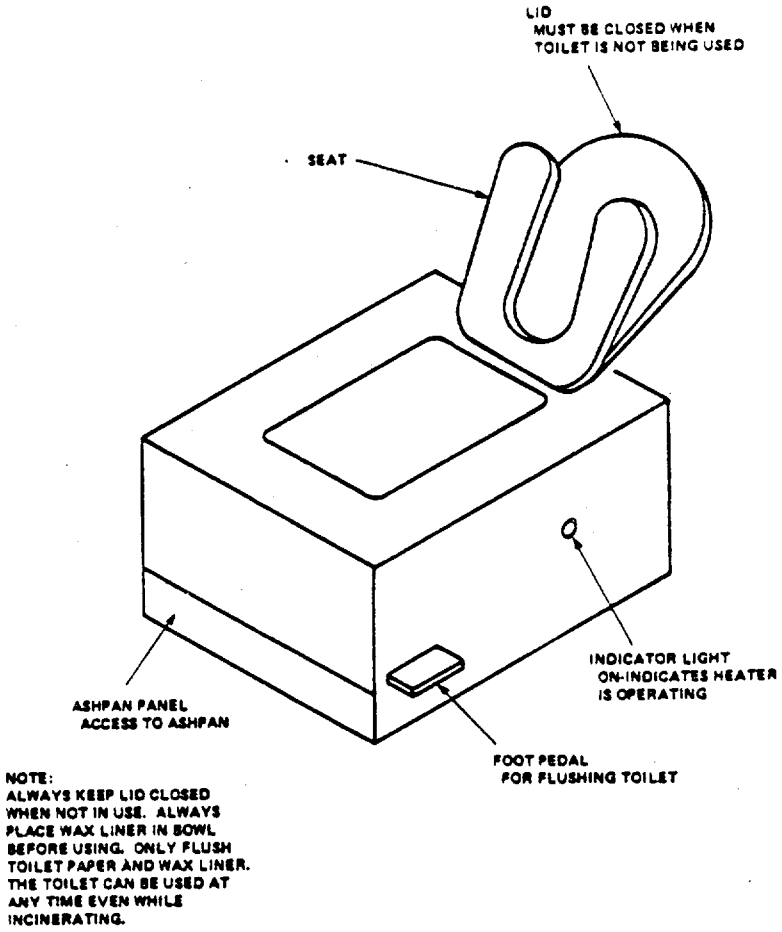
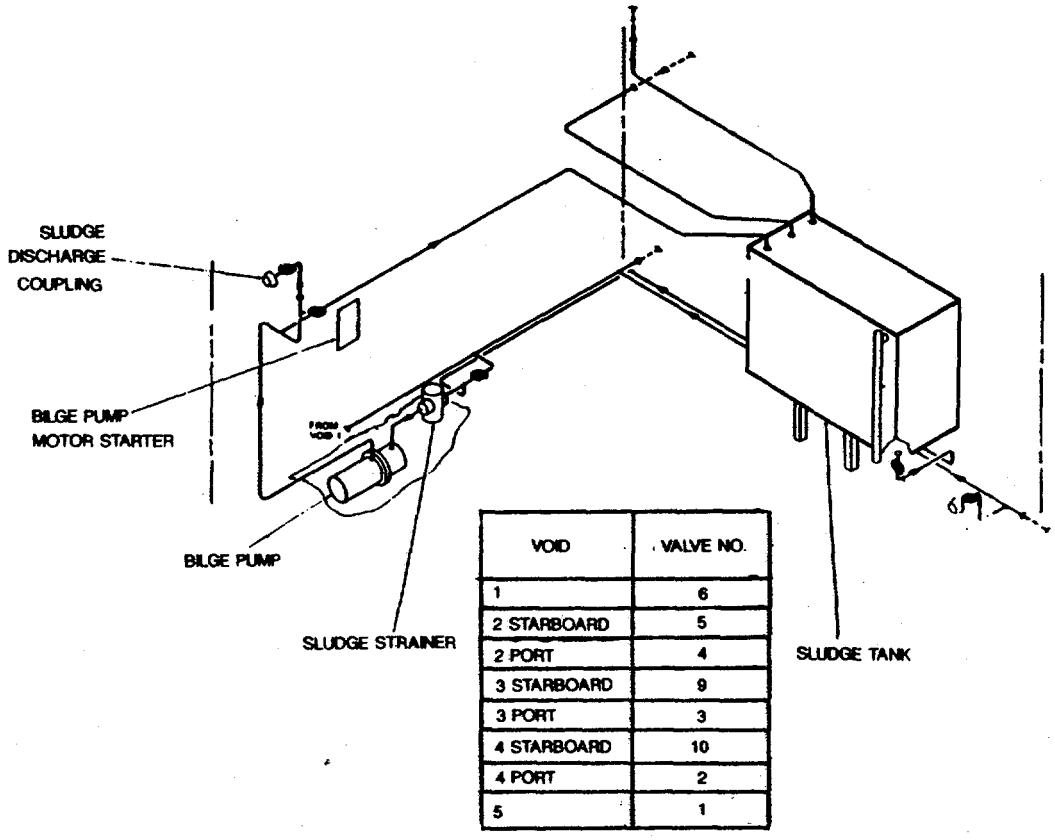


Figure 15-4. Ship's Toilet

15-3.4.2 Bilge System. The bilge system, in the voids, collects and removes equipment waste from the barge and keeps the bilges dry. See Figure 15-5.

A bilge pump transfers liquid containing oil to the sludge tank. This oily liquid includes bilge water from the voids, waste lubricating oil from three diesel generators (two ship service generators and one ship auxiliary generator) in void 4 and waste lubricating oil from two ROWPU HP pump diesel engines in ROWPU space. Bilge water from a void is pumped to the sludge tank using a portable hose with foot valve to suck up the bilge water. Waste lubricating oil is pumped to the sludge tank from the generator diesel engine crankcase after a hose is connected between the generator crankcase drain valve (BD1 6, BD1 7 or BD1 8) and a void 4 suction valve (BD2 or BD10). Waste lubricating oil is pumped to the sludge tank from the HP pump diesel engine crankcase drain valves (BD12 or BD13) and valve (BD19) located between the high pressure pumps.



VOID	VALVE NO.
1	6
2 STARBOARD	5
2 PORT	4
3 STARBOARD	9
3 PORT	3
4 STARBOARD	10
4 PORT	2
5	1

Figure 15-5. Bilge System

Section II

Table 2-4. Preventive Maintenance Checks and Services for Miscellaneous Equipment (Cont)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										MISCELLANEOUS EQUIPMENT	**WARNING** **Be sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.** **WARNING** **Do not immerse coffee maker nor hot plate in water.**	
1	●			●						Dayroom Equipment	a. Check that all exterior surfaces of appliances, including range hood, are clean and grease-free.	
	●			●							b. Check that inside of refrigerator and coffee maker are clean. Clean with soapy water and sponge.	
	●			●							c. Make sure that all plugs are firmly seated in receptacles labeled for use with equipment.	
	●			●							d. Make sure hot plate and coffee maker are secured to table top.	
		●		●							e. Make sure loose equipment has been stowed properly.	
		●		●							f. Make sure refrigerator temperature gauge indicates normal operating temperature.	
		●		●							g. Check indicator lights for proper operation. Replace bulbs as necessary.	
		●		●							h. Check for loose cables and loose or missing securements and fasteners. Tighten or replace as necessary.	

Table 2-4. Preventive Maintenance Checks and Services for Miscellaneous Equipment (Cont)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
				●							i. Check all equipment for dirt or grime, rust, corrosion, and worn or chipped paint. Wipe or scrub clean with household detergents; remove rust and corrosion by wire brushing, scraping, or chipping. Immediately paint cleaned areas with zinc chromate primer and finish paint to match surrounding area in accordance with TB 43-0144. DO NOT paint threads or labels.	
2										Workshop Equipment	**WARNING** Be sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual. **WARNING** DO NOT operate power tools if cords are frayed or operating controls are defective.	
	●		●			●					a. Check for frayed or loose cords and damaged or loose power cables, electric outlet receptacles, and switches. Replace as necessary.	Cords and cables frayed or damaged.
	●		●			●					b. Check for loose or missing fasteners and securements. Tighten or replace as necessary.	Fasteners and securements missing.
	●		●	●							c. Make sure equipment and work areas are clean and free of foreign objects.	
	●			●							d. Check that power plugs are properly seated in dedicated receptacles.	
		●									e. Check that correct speed and depth adjustment are selected on drill press.	

Table 2-4. Preventive Maintenance Checks and Services for Miscellaneous Equipment (Cont)

B - Before D - During A - After | D - Daily W - Weekly M - Monthly | Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	●										f. Make sure that all chucks, adjusting keys, or wrenches are removed from drills, grinders, or other power tools before turning these tools ON.	
		●									g. Make sure that the item being drilled, ground, pressed, or welded is being held securely in place.	
		●		●	●						h. Check that indicator lights are operating properly. Replace bulbs as necessary.	
		●									i. With welder started, but before welding, rotate current control through its entire range to lessen the possibility of contact freezing.	
	●		●			●					j. Check that arc welder electrode and work connections are tight. Tighten as necessary. **WARNING** **Grinding wheels can explode if they have received minor cracks when shipped or during replacement. When starting a grinder for the first time or after installing a replacement wheel, the operator must stand to one side of the grinder for 1 minute after turning it ON.**	
	●		●			●					k. Check grinder wheel for wear. Replace after diameter is reduced to 2 inches below original size.	Grinder wheel is reduced to 2 inches below normal size.
	●		●			●					l. Check safety guard and vacuum bag for proper operation. Repair or replace as necessary.	Safety guard missing or inoperable.
			●			●					m. Remove rust or corrosion. Touch up paint in accordance with TB 43-0144.	
3		●								Accesses System	a. Visually check accesses for damage or defects which could impair effectiveness and operability of doors, hatches, or portholes, etc. Repair as necessary.	
			●			●					b. Remove rust and corrosion. Touch up paint in accordance with TB 43-0144 as necessary. DO NOT paint threads or labels.	

Table 2-4. Preventive Maintenance Checks and Services for Miscellaneous Equipment (Cont)

B -	**Before**	**D -**	**Daily**	**Q -**	**Quarterly**
D -	**During**	**W -**	**Weekly**	**S -**	**Semiannually**
A -	**After**	**M -**	**Monthly**	**A -**	**Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
4										Sanitation System Ship's Toilet	**CAUTION** **Two toilets are onboard, one forward and one aft in the ROWPU space. Do not use toilet when incinerator is full. Always keep lid closed when toilet is not in use to prevent anything from dropping into toilet.**	
	●		●		●						a. Wipe components clean and check for damage. Repair as necessary.	
	●	●	●								b. Check that bowl wax liners and tissue paper are available.	
	●		●	●							c. Make sure incinerator ashpan is not full. Empty if necessary.	
	●										d. Perform prestart operations: 1) Make sure power panel 3 circuit breaker 5P13 for forward toilet or 4P13 for aft toilet is closed (ON). 2) Place waxpaper liner in bowl before using toilet. **CAUTION** **The incinerating toilets will incinerate human waste, both solids and urine, toiletpaper, and sanitary napkins. Toilets may be used at any time, even while incinerating a prior waste deposit, provided toilet capacities not exceeded. The incinerating toilet will NOT incinerate cans or bottles and should NOT be used to incinerate highly combustible products, such as oily rags.** e. After stepping on foot pedal, make sure incineration cycle starts.	
		●										
	●	●									f. Make sure blower comes on.	

Table 15-1. Preventive Maintenance Checks and Services for Miscellaneous Equipment (Continued)

B - Before **D - During** **A - After** | **D - Daily** **W - Weekly** **M - Monthly** | **Q - Quarterly** **S - Semiannually** **A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
			•								g. Close incinerating toilet lid after each use.	
			•	•							h. Make sure toilet and cubicle are clean.	
			•			•					i. Remove rust and corrosion. Touch up paint in accordance with TB 43-0144 as necessary. Do not paint threads or labels.	
5		•		•	•					Bilge System	a. Wipe all components clean, especially sludge tank liquid level indicator glass cover.	
	•		•		•						b. Check for leaks and damaged or missing securements and fasteners. Repair, replace and/or tighten if required.	Class III leaks.
	•				•						c. Check wiring for loose connections and frayed cables. Secure, repair, or replace cables as necessary.	Cables frayed.
	•				•						d. Check that strainer basket is clean and properly installed. Clean or replace basket as follows: 1) Loosen yoke screw until yoke swings free. 2) Pull basket handle straight up to remove basket. Go to step 3 to clean and step 4 to replace basket. **CAUTION** **Do NOT have basket well open for more than 10 minutes. Diverter plug does not completely cut off water and water will seep into open well.**	

Table 15-1. Preventive Maintenance Checks and Services for Miscellaneous Equipment (Continued)

B -	Before	D -	Daily	Q -	Quarterly
D -	During	W -	Weekly	S -	Semiannually
A -	After	M -	Monthly	A -	Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											3) Clean basket as follows: **CAUTION** **Do NOT use any petroleum based products to clean basket. Be careful not to damage basket. Do not use wire brush.** On weatherdeck, clean basket with soft brush and flush with drinking water. - Use compressed air to dislodge difficult particles. - Flush with drinking water. - Wipe interior of basket with clean cloth before replacing basket. 4) Lower basket into well. 5) Swing yoke over basket well until end fits over stud. 6) Check O-rings on cover. Replace if damaged. 7) Be sure O-rings on cover rest in machined groves before tightening yoke screw securely. Do NOT overtighten.	
		•		•							e. Check that foot valve is not clogged. Clean if necessary.	
	•	•	•								f. Inform shift leader of unusual noises or overheating of bilge pump motor which may indicate a pending malfunction.	Bilge pump motor overheating.
			•								g. Log and repart all corrective actions taken and their locations to shift leader.	
			•			•					h. Remove rust and corrosion. Touch up paint in accordance with TB 43-0144 as necessary. Do not paint threads or labels.	

Table 15-1. Preventive Maintenance Checks and Services for Miscellaneous Equipment (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
6	•		•		•					Eyewash Stations	a. Wipe eyewash stations clean. b. Check water level. Add water if necessary. c. Remove rust and corrosion. Touch up paint in accordance with TB 43-0144 as necessary. Do not paint threads and labels.	Water level low.

CHAPTER 16 VENTILATION, HEATING, AND AIR CONDITIONING SYSTEMS PMCS
Section I. General equipment Information

16-1 Introduction. Chapter 16 contains Preventive Maintenance Checks and Services for the Ventilation, Heating, and Air Conditioning Systems onboard the Reverse Osmosis Water Purification Barge. Operating and maintenance procedures are described in TM 55-1930-209-14&P-16. TM 55-1930-209-14&P-16, Appendix C also contains Preventive Maintenance Checks and Services for the Ventilation, Heating, and Air Conditioning Systems.

16-2 Major components

16-2.1 Deckhouse ventilation system. The major components of the deckhouse ventilation system are listed in Table 16-1. Also listed are their location on the barge and their function.

Table 16-1. Major Components of Deckhouse Ventilation System

Component	Quantity	Function	Location
Watertight hatches	17	Control supply of fresh air entering deckhouse	10 on deckhouse port and 7 on deckhouse starboard
Light-proof louvers	17	Prevent light penetration through open louvers	Inside deckhouse watertight hatches
Hooded roof for fans 1 thru 6	6	Exhaust air from ROWPU space	On deckhouse top
Fan motor controllers	6	Control fan motors 1 thru 6	In ROWPU space, fans 3 and 5 on starboard 1, bulkhead, fans 2, 4 and 6 on port bulkhead
Emergency shutdown button	1	Provides emergency shutdown of ventilating fan motors	Second button from left on row of seven RED buttons on starboard bulkhead aft of door
Power panel 2	1	Controls ventilating system fans in deckhouse and voids	Starboard bulkhead forward of sliding door

16-2.2 Voids ventilation system. Table 16-2 lists the major components of the voids ventilation system, their function and location on the barge.

Table 16-2. Major Components of Voids Ventilation System

Component	Quantity	Function	Location
Mushroom exhaust air roof outlets	2	Exhaust air from voids 4 port and starboard	On topdeck for fans 9 and 10
Ventilating fans (vertical)	2	Exhaust air from voids 4 port and starboard	In ROWPU space near aft bulkhead
Ventilating fans (horizontal)	2	Blow forced air into voids	In ROWPU space high on port and starboard bulkheads
Round blower covers with fittings	2	Protect fan motors, provide air intake	In ROWPU space high on port and starboard bulkheads
Fan motor controller with interlock	1	Controls fan motor 8	In ROWPU space on port bulkhead forward of door
Fan motor controllers	3 10	Control fan motors 7, 9 and	1 on deckhouse starboard bulkhead, 2 on deckhouse aft bulkhead
Ventilation emergency button	1	Provides emergency shutdown of all ventilating fan motors	Second button from left on row of seven RED buttons located starboard bulkhead aft of door
Power panel 2	1	Controls ventilating system fans in voids and deckhouse	ROWPU starboard bulkhead forward of sliding door
Louvered air intake ventilation hatches	2	Provides fresh air to voids 4 for diesel engines	Aft deckhouse bulkhead
Louvered hatch covers	2	Provides weathertight seal on air intake ventilation hatches	Aft deckhouse bulkhead

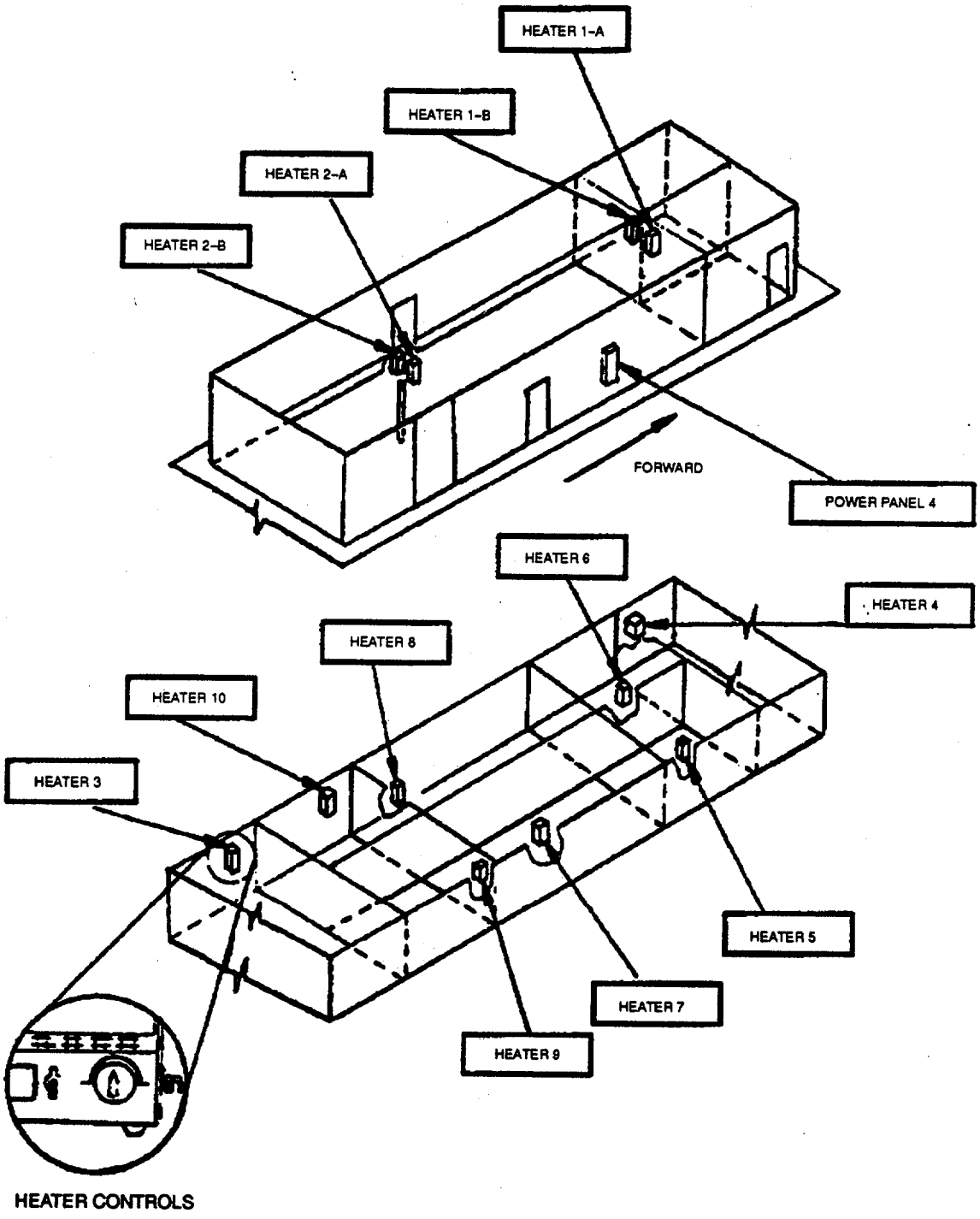


Figure 16-5. Heating Systems Locations and Operating Controls

Section II

Table 16-4. Preventive Maintenance Checks and Services for Ventilation, Heating and Air Conditioning System

B - Before	**D - Daily**	**Q - Quarterly**
D - During	**W - Weekly**	**S - Semiannually**
A - After	**M - Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										DECKHOUSE VENTILATION SYSTEM	**NOTE** **If the deckhouse ventilation system equipment fails to operate, troubleshoot according to TM 55-1930-209-14&P-16. Report deficiencies and failures to the shift leader or bargemaster. Use proper forms to describe maintenance or repair problems Keep ventilation, heating, and air conditioning system operations and PMCS logs current**	
1	•					•				Hatches	a. Make sure hatch covers that are in open position are secured with cotter pins and cotter keys.	
			•			•					b. Check for damage to watertight hatches and light-proof louvers. Repair as necessary.	Hatches leak.
			•			•					c. Check for rust, corrosion, and worn or chipped paint. Remove by wire brushing, chipping or scraping. Immediately paint cleaned area with zinc chromate paint and finish to match surrounding area in accordance with TB 43- 0144. **WARNING** Always make sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: 'WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.	
2	•		•							Air Ducts	a. Make sure that air ducts are free of obstructions, dents, and other damage.	Air ducts obstructed or damaged.

Table 16-4. Preventive Maintenance Checks and Services

for Ventilation, Heating, and Air Conditioning System (Continued)

B - Before	**D - Daily**	**Q - Quarterly**
D - During	**W - Weekly**	**S - Semiannually**
A - After	**M - Monthly**	**A - Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	•		•			•					b. Check for rust, corrosion, and worn or chipped paint. Remove by wire brushing, chipping, or scraping. Immediately paint cleaned area with zinc chromate paint and finish to match surrounding area in accordance with TB 43-0144. Do not paint threads or labels.	
	•		•								c. Check for loose or missing fasteners and securements. Tighten or replace as necessary.	
3										Fans and Motors	**WARNING** **Always make sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.**	
	•		•		•						a. Visually inspect fans and motors for damage. damaged.	Fans or motors
	•		•		•						b. Check fan blades for sufficient clearance and cleanliness.	Fan blades do not have sufficient clearance.
	•		•		•						c. Check that electrical connections are tight. Tighten or repair as necessary using insulated tools.	
		•									d. Listen for and check any fan or motor which indicates a motor overload condition or unusual vibration which could result in or be caused by loose mountings, bad bearings, broken impeller blades, or a broken housing. Shutdown and notify shift leader for repair or replacement.	
			•								e. Visually check deckhouse roof fans for corrosion or damage. Repair as necessary.	
			•		•						f. Check all fans and motors for rust and corrosion. Remove with wire brush and paint as necessary in accordance with TB 43-0144. Do not paint threads or labels.	

Table 16-4. Preventive Maintenance Checks and Services

for Ventilation, Heating, and Air Conditioning System (Continued)

B -	**Before**	**D -**	**Daily**	**Q -**	**Quarterly**
D -	**During**	**W -**	**Weekly**	**S -**	**Semiannually**
A -	**After**	**M -**	**Monthly**	**A -**	**Annually**

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										VOIDS VENTILATION SYSTEM	**NOTE** **If the voids ventilation system equipment fails to operate, troubleshoot according to TM 55-1930-209-14&P-16. Report deficiencies and failures to the shift leader or bargemaster. Use proper forms to describe maintenance or repair problems. Keep ventilation, heating, and air conditioning system operations and PMCS logs current.**	
1	•									Hatches	a. Make sure hatch covers that are in open position are secured with cotter pins and cotter keys.	
		•									b. Check for damage to watertight hatches and light-proof louvers. Repair as necessary.	Hatches are damaged or leak.
		•									c. Check for rust, corrosion, and worn or chipped paint. Remove by wire brushing, chipping or scraping. Immediately paint cleaned area with zinc chromate paint and finish to match surrounding area in accordance with TB 43- 0144.	
2	•		•							Air Ducts	**WARNING** **Always make sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.**	
											a. Make sure that air ducts are free of obstructions, dents, and other damage.	Air ducts are damaged or obstructed.
	•		•								b. Check for rust, corrosion, and worn or chipped paint. Remove by wire brushing, chipping, or scraping. Immediately paint cleaned area in accordance with TB 43-0144. Do not paint threads or labels.	
	•		•								c. Check for loose or missing fasteners and securements. Tighten or replace as necessary.	

Table 16-4. Preventive Maintenance Checks and Services for Ventilation, Heating, and Air Conditioning System (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
3										Fans and Motors	**WARNING** **Always make sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.**	
	•										a. Visually inspect fans and motors for damage. damaged.	Fans or motors
	•										b. Check fan blades for sufficient cleanliness and clearance. Clean as necessary. clearance.	Fan blades do not have sufficient
	•										c. Check that electrical connections are tight. Tighten or repair as necessary using insulated tools.	
		•									d. Listen for and check any fan or motor which indicates a motor overload condition or unusual vibration which could result in or be caused by bad bearings, broken impeller blades, or housing shutdown and notify shift leader for repair or replacement.	
			•								e. Visually check deckhouse roof fans for corrosion or damage. Repair as necessary.	
			•								f. Check all fans and motors for rust and corrosion. Remove with wire brush and paint as necessary in accordance with TB 43-0144. Do not paint threads or labels.	

Table 16-4. Preventive Maintenance Checks and Services for Ventilation, Heating, and Air Conditioning System (Continued)

B - Before		D - Daily		Q - Quarterly
D - During		W - Weekly		S - Semiannually
A - After		M - Monthly		A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										HEATING AND AIR CONDITIONING (HAC) SYSTEM	**WARNING** **Make sure electrical components and circuits are turned OFF before starting any inspection and/or cleaning. Observe safety precautions specified in this manual.**	
	•		•								a. Make sure that air outlets and ventilators are free of obstruction and not damaged.	Air outlets and ventilators are damaged or obstructed.
	•		•								b. Inspect HAC system operating controls for damage. Notify shift leader of deficiencies.	Controls not operable.
		•									c. Check HAC cooling and heating systems for proper operation. Notify shift leader of deficiencies.	
	•		•								d. On barge 1 only, check each activated forced air heater for proper operation. Check fuses and replace as necessary.	Fuses blown.
	•	•									e. On barge 1 only, check that air flow from activated forced air heater is unobstructed. Clear area around heater of any material which could be a fire or safety hazard.	
											f. Check drain for condensation or leaks. Notify shift leader of class III leaks.	Class III leaks.

CHAPTER 17 WORKBOAT, LIFESAVING, AND FIREFIGHTING EQUIPMENT SYSTEM PMCS
Section I. General equipment information

17-1 Introduction. Chapter 17 contains Preventive Maintenance Checks and Services for the Reverse Osmosis Water Purification Barge Workboat, Lifesaving, and Firefighting Equipment System. Operating and maintenance procedures are described in detail in TM 55-1930-209-14&P-17. TM 55-1930-209-14&P-1 7, Appendix C also I contains Preventive Maintenance Checks and Services for the Workboat, Lifesaving and Firefighting Equipment System.

17-2 Major components. The workboat, lifesaving and firefighting system consists of a 23-foot, reinforced aluminum-hulled, triple-V-bottomed craft, liferafts, lifevests, lifesaving ring buoys, a Halon 1301 system, CO2 hose reel units, a smoke detector system, fire extinguishers, breathing apparatuses, and a portable firefighting pump. The major components for this system are listed in Tables 17-1 through 17-3. Also listed are basic functions and location on the barge for each component.

Table 17-1. Workboat Components

Component	Quantity	Function	Location
Push knees	2		On bow
Aluminum tubular protective frame	1		Around outboard drive
Mooring bitts	4	Secures cables for anchoring vessel	2 bow and 2 stem
Diving ladder	1	Access on and off vessel	Aft of cabin and forward of aft guard rail
Lifevest	8	Lifesaving equipment	Stowed under cabin benchseats
Ring lifebuoy	1	Lifesaving equipment	
Inboard/outboard engine	1	Supplies power	Engine compartment
50-gallon diesel fuel tank	1	Supplies fuel	Engine compartment
Hydraulic steering	1	Steers by hydraulically operated controls	Operator's station
Compass	1	Instrumentation	Top center of dashboard
Bilge pump	2	Removes water from bilge	Engine compartment

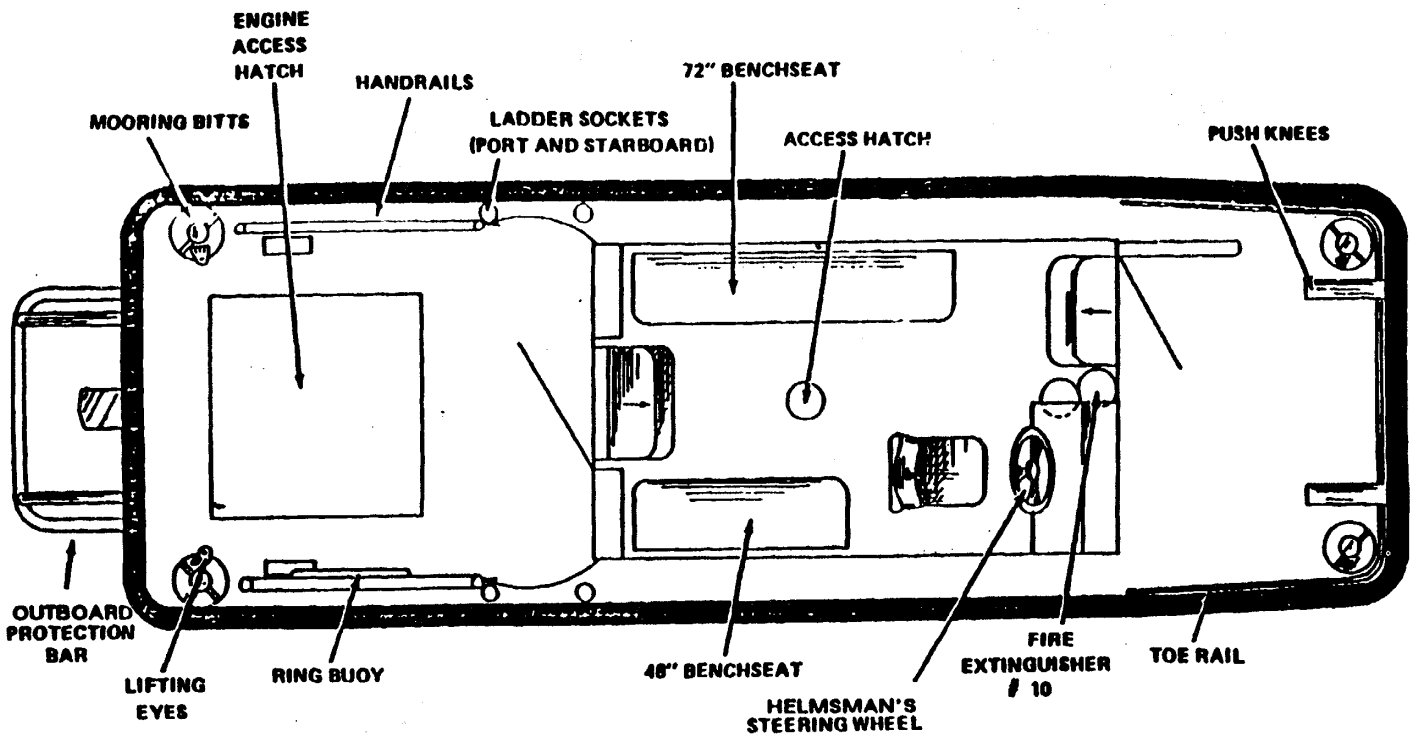


Figure 17-1. Workboat Components and Location

Table 17-2. Lifesaving Components

Component	Quantity	Function	Location
Liferafts	2	Lifesaving equipment	One on forward weather-deck portside and one on aft weatherdeck portside.
Lifevest	24 Type V 15 Type II	"Work vest" model for wear while doing physical work	24 Type V in stowage box on ROWPU space aft port bulkhead. 6 Type II in workboat cabin under starboard passenger benchseat. 9 Type II stowed under each of nine bunks in dayroom
Lifesaving ring buoys	4	Lifesaving equipment	On weatherdeck, two on each side of deckhouse, two forward and two aft

Table 17-3.Firefighting Components

Component	Quantity	Function	Location
Halon 1301 System	1	Suppresses all three types of fires: cellulose (type A), flammable liquids (type B), and electrical (type C)	
CO2 hose reel unit	2	Fighting type A, B and C fires	One on ROWPU space forward bulkhead near door to dayroom, one in center of ROWPU space aft of diesel high pressure pumps
Marine smoke detector system	1	Detects smoke, sounds alarm and identifies which void is producing smoke	Smoke detector cabinet on ROWPU space forward bulk-head starboard side suction blower cabinet on deckhouse top and one bell above detector cabinet and another in dayroom.

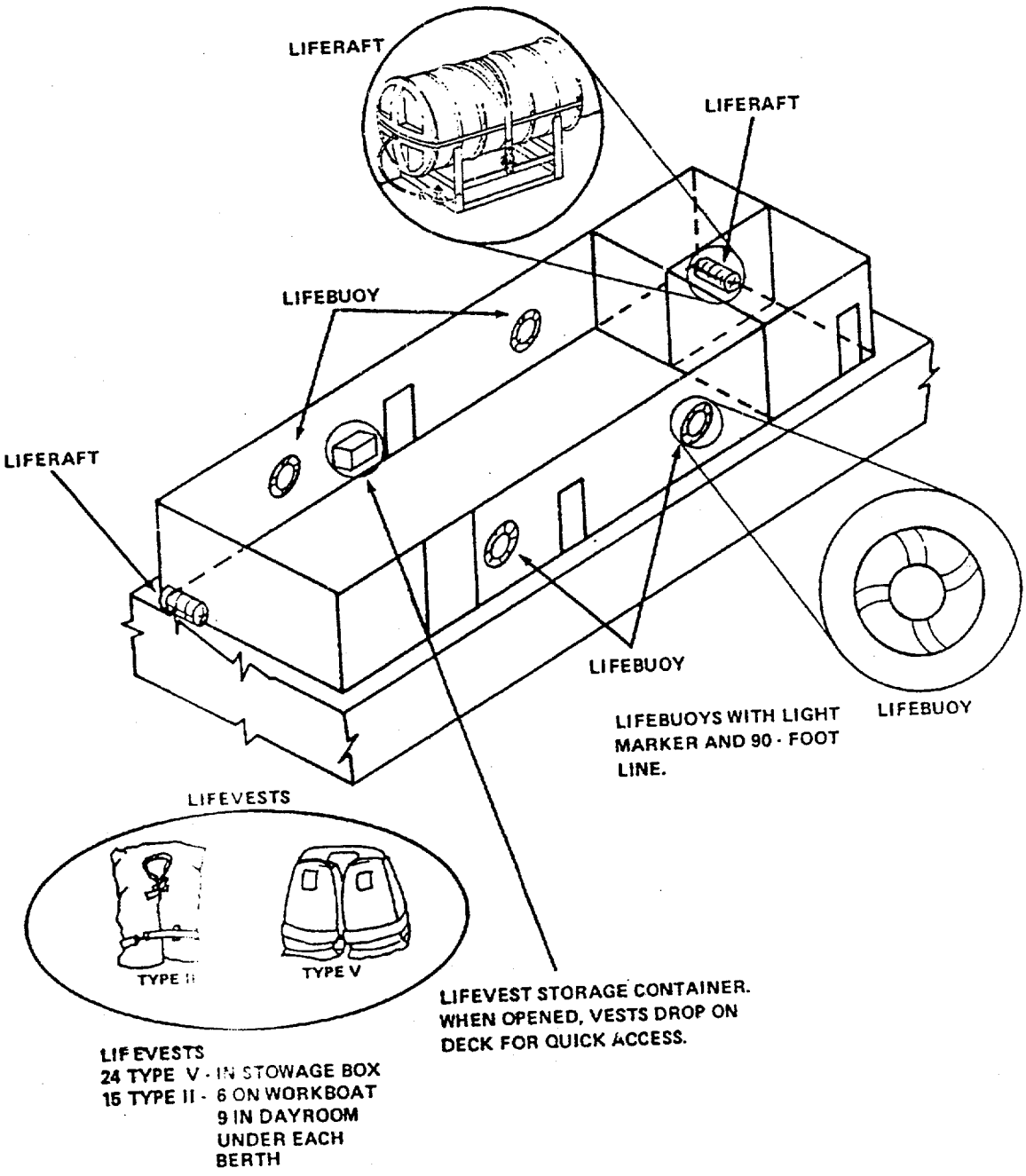
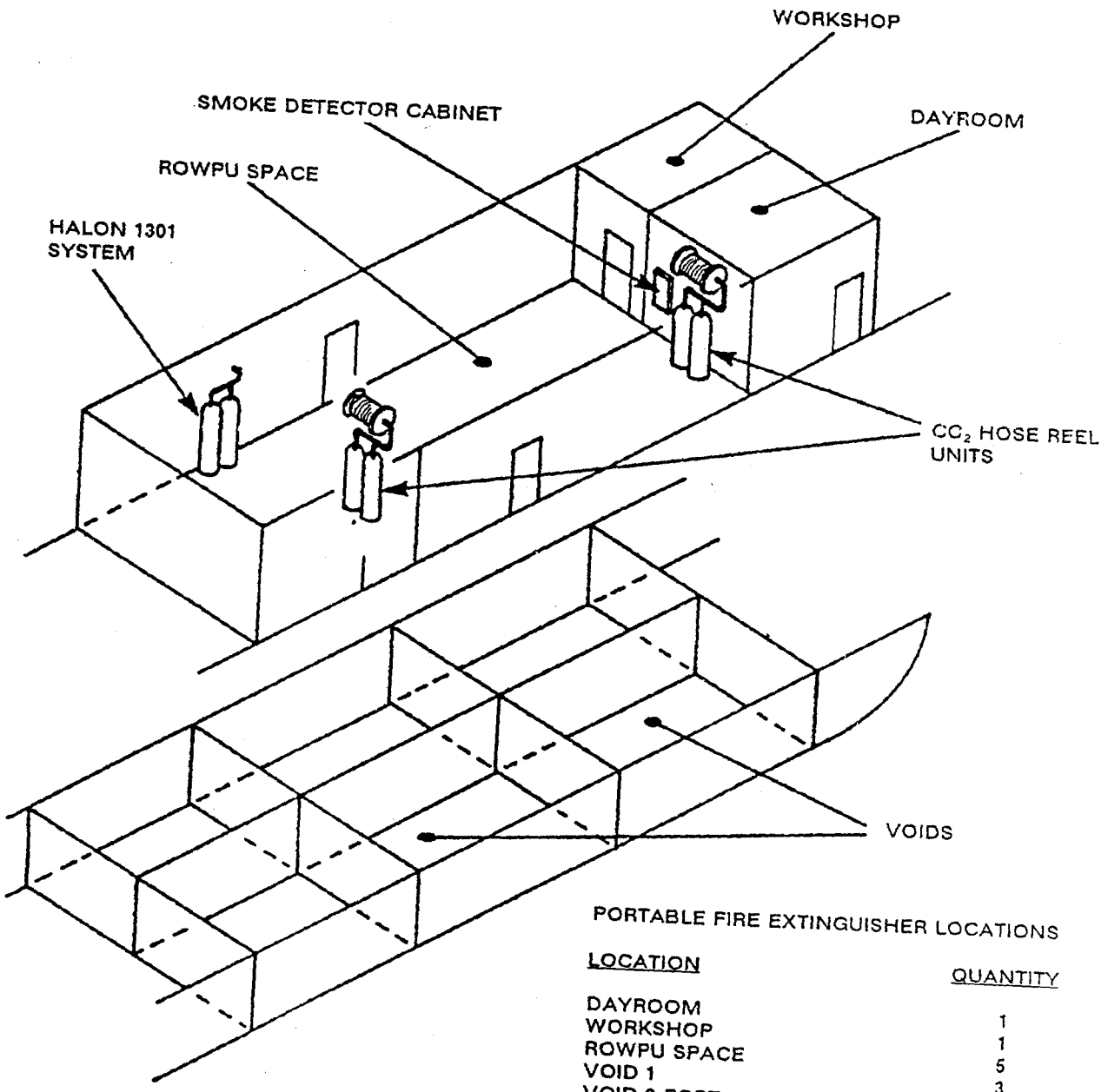


Figure 17-2. Lifesaving Equipment and Location

Table 17-3. Firefighting Components (Continued)

Component	Quantity	Function	Location
Fire extinguishers	22	Extinguish all three types of fires	17 CO2 extinguishers in ROWPU space, workshop and dayroom mounted 5 ft. above deck on bulkheads. 5 day chemical exting-uishers located in voids mounted on bulkheads, 5 ft. above deck
Self-contained breathing apparatus (SCBA)	5	Protects user from smoke and toxic fumes	Two units in block fiber-glass storage containers, one stored in workshop, the other in ROWPU space. Three smaller units in green containers, one stored in void 2 port, another mounted on side of workshop AC unit and third mounted on forward side of switchboard
Portable, engine-driven firefighting pump	1	Draws seawater through hose, pumps through hoses and nozzles under high pressure to fight fire	Secured aft of ROWPU HP diesel pumps near the aft C02, hose reel unit



PORTABLE FIRE EXTINGUISHER LOCATIONS

LOCATION	QUANTITY
DAYROOM	1
WORKSHOP	1
ROWPU SPACE	5
VOID 1	3
VOID 2 PORT	2
VOID 2 STARBOARD	2
VOID 3 PORT	2
VOID 3 STARBOARD	2
VOID 4 PORT	1
VOID 4 STARBOARD	1
VOID 5	2
WORKBOAT CABIN	1

Figure 17-3. Firefighting Equipment and Location

17-3. Workboat, Lifesaving and Firefighting Equipment System Description. This system provides water transportation for crewmembers and visitors, small cargo, transporting the messenger line for shore discharge hose and similar work-related tasks associated with operating the ROWPU barge in a safe manner.

17-3.1 Workboat (see Figure 17-1) is a 23-foot, reinforced aluminum-hulled, triple-V-bottomed craft with a forward cabin for six passengers plus the operator and a flush after-deck for small cargo and messenger line reel unit. Closed cell flotation foam has been used to fill the forward compartment, under the cabin floor, and small compartments on both sides of the engine compartment. Workboat has two push knees on the bow, an aluminum tubular protective frame around the outboard drive, and two bow-and two stern mooring bitts. Workboat has a diving ladder that fits into sockets on either port or starboard just aft of cabin and forward of aft guard rail. Lifesaving equipment includes eight lifevests stowed under cabin benchseats and a ring lifebuoy with floating marker light and line.

17-3.2 Power is supplied by a six cylinder inline turbocharged diesel engine, inboard/outboard configuration, driving a single propeller. Engine revolutions per minute (rpms) and engagement are controlled by one lever at the operator's station. Steering is by hydraulically operated controls at the operator's station. Complete instrumentation, including a 4-inch compass and engine hour meter, is included at the operator's station. Workboat has two automatic bilge pumps, and a 50-gallon diesel fuel tank in the engine compartment.

17-3.3 Workboat, when not in daily use, is stowed in its cradle on deckhouse top. It is held in place by three strap winches on each side. These straps are hooked into three eyes on each side of boat just under the rubber bumper. The boat is launched from storage using a three-point suspension harness attached to specially constructed points on the hull and lifted overboard by a hydraulic bow crane and lowered into the water. The boat is lifted from the water and stored on the cradle in the same manner.

17-3.4 Lifesaving Equipment, shown in Figure 17-2, consists of 2 liferafts, 15 type 11, and 24 type V lifevests and 4 lifesaving ring buoys. These liferafts are designed primarily to protect personnel until rescue vessels arrive. They are equipped with two small paddles for maneuvering only. Life buoys and lifevests are designed to sustain a conscious person in the water while awaiting immediate rescue, not for moving any distance while in the water.

17-3.5 Barge firefighting equipment consists of Halon 1301 system, 2 CO2 hose reel units, a smoke detector system, 17 portable C02 fire extinguishers, 5 dry chemical fire extinguishers, 5 self-contained breathing apparatuses, and a portable, engine-driven firefighting pump. Location of this equipment onboard is shown in Figure 17-3. In addition, there is a 10-pound, portable, dry chemical fire extinguisher on the workboat.

Section II
Table 17-4. Preventive Maintenance Checks and Services
for Workboat, Lifesaving, and Firefighting Systems

B - Before D - During A - After D - Daily H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	D	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
						WORKBOAT	**NOTE** **These procedures start with the workboat in the water and secured to the side of the barge with four lines using the small workboat cleats on the forward two- thirds of the barge on either side in the area with the vertical fenders.**	
1	•		•	•		Hull	Make visual check of hull and installed equipment, such as running lights and searchlights. Make sure it is properly secured with lines and bumpers.	
2	•		•	•		Engine Compartment	a. To check engine compartment, open cabin and make sure master switch is OFF. Obtain engine hatch tool from under operator's seat.	
	•		•	•			b. Using hatch tool, rotate lock nuts on each corner one-half turn counterclockwise and slowly open engine compartment (aft deck closure). Check for escaping air which indicates that water may be entering engine compartment and forcing air out.	
	•		•	•			c. Check engine compartment for diesel fuel, water, oil, or hydraulic fuel leaks. Tighten filters and fittings as necessary.	Class III leaks.
3						Engine		
3a		•		•		Engine Start/ Workboat Controls Activation	Perform the following engine start and workboat controls activation procedures: 1) With all electrical circuits OFF, except bilge pump on AUTO setting, turn master switch ON. 2) Turn ignition switch to position 1 to check engine electrical accessories. 3) Lower outboard drive, if in the TILT range. Small red light on outboard drive panels is ON if outboard drive is in TILT range. **CAUTION** **Engine must NOT be started with outboard drive in TILT range. When engine is in TILT UP position, water pickup point on outboard drive is out of water and engine cannot receive seawater to cool closed coolant system.**	

Table 17-4. Preventive Maintenance Checks and Services

for Workboat, Lifesaving, and Firefighting Systems (Continued)

B - Before D - During A - After D - Daily H - Hourly Interval

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	H			
		•		•			4) Release engine speed control from shift control lever in NEUTRAL position, and while holding in on button at bottom of lever, move lever forward. 5) Check fuel gauge on instrument panel. Refuel, if necessary, in accordance with Item 3 c b. 6) Turn ignition switch to position 2, activating diesel engine glow plugs. If engine is cold, hold in this position for 30 seconds. An automatic cold starting device is built into fuel injection pump. This warmup of glow plugs is not necessary on a warm engine. **WARNING** **Operator and passengers onboard workboat must wear ear protectors whenever engine rpm exceeds 1500 rpm.** 7) Pull shift control lever to neutral position. This will engage shifting mechanism with engine speed control. While workboat is still tied to the barge, move control lever to FORWARD at idle. Check that boat starts moving forward. Go immediately to NEUTRAL and then do the same in REVERSE. With shift control lever in NEUTRAL, turn wheel strongly to starboard and then to port. Have observer check that outboard drive moves in response to wheel movements. If these checks indicate power and control, and engine instruments are indicating normal conditions, proceed with normal operations. If workboat does NOT respond to these checks, notify shift leader or bargemaster for corrective action.	Outboard drive does not respond to wheel movement. Engine does not respond to FORWARD or REVERSE gears.

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting Systems (Continued)

B - Before D - During A - After D - Daily H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	D	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
		•		•			8) Start engine and release starter switch, and it will return to position 1, master switch, all electrical accessories on. Check instruments. Oil pressure gauge and voltmeter readings should be normal. If instrument readings are not in normal range or if engine alarm buzzer sounds, stop engine immediately. Notify shift leader or bargemaster for corrective action.	Instrument readings not normal or engine alarm buzzer sounds.
							9) Run engine at high idle (900-1200) until gauges reach normal operating ranges and check that cooling water Is being discharged overboard.	Cooling water being discharged overboard.
							10) Reduce engine speed to normal idle (600 rpm) and check that engine is running smoothly.	
3b	•		•	•		Oil Level	a. Check oil level. Dipstick is on top of engine between branches of intake manifold. Oil level should be between top and bottom of hatch marks of stick. Fill if necessary through oil filler cap on top of engine. Use diesel lubricating oil CD (MIL-L-2104), SAE 20W30, above 50 °F and oil CD, SAE 10W, below 50 °F. **WARNING** At operating temperatures, engine coolant is hot and under pressure. It also contains alkaline materials harmful to eyes and skin. To avoid personal injury, check coolant level only when engine is stopped and filler cap is cool enough to be touched with a bare hand. Should engine coolant come in contact with eyes or skin, immediately flush affected area with clean water and seek medical assistance if necessary.	Oil level is below hatch marks on dipstick.

Table 17-4. Preventive Maintenance Checks and Services

for Workboat, Lifesaving, and Firefighting Systems (Continued)

B - Before D - During A - After D - Daily H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	D	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
3c	•		•	•		Engine Fuel System	a. Check fuel tank for leaks and cracks. **WARNING** **During fueling operations, neither open flame nor smoking is permitted within 25 feet of fueling operations. Only minimum number of persons necessary to conduct fueling are permitted in area. Make sure all electrical accessories are off before a refueling operation begins.**	Class III leaks.
	•		•		200 hrs		b. Check fuel gauge on instrument panel. It necessary to refuel, follow these procedures: **WARNINGS** **ELECTRICAL HIGH VOLTAGE CAN KILL YOU** **•Electrical high voltage cannot be seen but it can kill you. Electricity is unlike most other dangerous things you can come in contact with because it gives no warning and no symptoms to be wary of. Its effect is immediate. It can kill you, render you unconscious, or severely burn you. To ensure your safety and that of other maintenance personnel, always observe the following precautions:** **ALWAYS make sure the unit is properly grounded.** 1) Secure engine compartment hatch. 2) Attach ground wire from barge to workboat, assuring good contact from clamp to metal part of workboat. 3) Use Perko special key or large screwdriver to open fuel filler cap on portside aft of cabin. 4) Monitor fuel gauge on instrument panel at operator's station while filling tank. Do NOT fill fuel tank full. Leave room for expansion of cool fuel coming from voids storage tank into warmer workboat fuel tank. 5) Close fuel filler cap. 6) Remove ground wires and reattach to fueling stations. 7) Clean fuel spills immediately.	Workboat not properly grounded.

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting Systems (Continued)

B - Before D - During A - After D - Daily H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	D	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
					200 hrs		c. Change air filter. Clean around air filter housing. Loosen four clamps and remove cover on air intake housing. Change filter and install in reverse order. Make sure dirt does not enter housing while changing filter.	
					200 hrs		d. Change crankcase ventilation air filter. Unscrew old filter and discard. Screw in new filter.	
					200 hrs		e. Turn off fuel valves: 1) Barge 1. Turn off both incoming and return fuel line valves on portside stem bulkhead above the Racor fuel filter. These two shutoff valves are not installed on Barges 2 and 3. 2) Barges 2 and 3. Turn off fuel oil at turnoff valves on top of fuel tank. Be prepared for more fuel oil spills as fuel in line drains out through filter mounting.	
					200 hrs		f. Change engine-mounted fuel filter (may not be mounted on all workboat engines). 1) Unscrew old filter and discard. Avoid fuel oil splashes and spills. 2) Check that contact surface in cover and filter gasket are clean and undamaged. 3) Carefully fill new filter with clean fuel oil and screw on by hand until gasket touches cover. Tighten no more than another 1/2 turn.	Filter gasket damaged.
					200 hrs		g. Change Racor fuel filter on stem bulkhead. 1) Use T-handle on top of filter to unscrew top. 2) Inspect gasket. If reusable, clean and retain. If not reusable, replace gasket. 3) Remove old filter element and discard. 4) Insert Racor replacement element (Racor part 2010SM, or military equivalent) over center tube with a turning motion. 5) Fill filter with clean fuel oil. Lubricate gasket and T-handle O-ring with fuel oil.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting Systems (Continued)

B - Before D - During A - After D - Daily H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	D	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
					200 hrs		6) Replace top of filter and tighten with T-handle. Clean any fuel oil spills. h. Open fuel valves. 1) Barge 1. Open two fuel oil shutoff valves closed in paragraph e above. 2) Barges 2 and 3. Open fuel oil shutoff valves closed in paragraph e. i. Vent fuel system. 1) Open vent screw, on top of engine-mounted fuel filter bracket, about four turns. Place container under fuel filter to catch leaking oil. 2) Use hand operated pump extension on bottom of fuel pump and pump fuel until it flows freely, without bubbles, from vent. 3) Close vent. j. Clean fuel oil spills. k. Check V-belt tension by depressing belt midway between pulleys. Belt should depress about 3/8 in. Belts must have proper tension to get full alternator output and proper cooling water temperature. Check belts for wear and cracks. Replace both belts if there are any indications of deterioration. Never replace only one belt.	Belt tension is more than 3/8 in. Belts cracked or worn.
3d	•		•	•	25 hrs	Engine Cooling System	a. Check coolant level in heat exchanger by opening cap at front of engine. If necessary, fill to upper edge of splash plate on the thermostat housing. Coolant must be either a 50-50 mixture of fresh, clean water, and corrosion-protective antifreeze or fresh, clean water with a corrosion-protective additive. If coolant level is very low, check again after engine has started and is idling. If necessary, add additional coolant to bring level to upper edge of splash plate on thermostat housing. b. Check three zinc anodes in engine cooling system for wear. If worn more than 50 percent, replace with Volvo Pewnta part 800476-4. 1) Check anode one on aft bottom end of oil cooler on portside of block.	Coolant level is below upper edge of splash plate.

Table 17-4. Preventive Maintenance Checks and Services

for Workboat, Lifesaving, and Firefighting Systems (Continued)

B - Before D - During A - After D - Daily H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	D	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
							2) Check anode two on bottom of forward end of water exchanger housing. 3) Check anode three on bottom of after-cooler housing.	
3f					10 hrs 50 hrs	Seawater Filter	If operating in dirty water, clean seawater filter. If water is relatively clean or if several 10 hour checks indicate cleaning is not necessary at this interval, schedule cleaning at 25 hour intervals. Unscrew cover (should come off by hand) and remove gasket and filter basket. Clean basket with soap and water, rinse and replace. Make sure gasket is installed properly and replace cover hand-tight. When engine is started, check cover for leaks and tighten if necessary.	Class III leaks.
3g					50 hrs	Crankcase	a. Check crankcase ventilation air filter and oil valve. If vent air, mixed with oil, starts to flow out at oil valve, this indicates crankcase ventilation air filter is clogged and must be changed. Unscrew old filter and discard. Screw in new filter.	Crankcase is clogged.
					100 hrs		b. Change crankcase oil. 1) Run engine until operating temperature is normal. 2) With engine turned off, suck oil through tube of drain pipe located on top of engine next to oil dipstick. 3) Without a filter change (normally scheduled every 200 hours), use 10 qt to bring oil level to between marks on dipstick. Fill through oil filler cap on top of engine. Use diesel lubricating oil CD (MIL-L-2104), SAE 20W30, above 50 °F and oil CD SAE 1 O0W, below 50 °F. With filter change, use 11 qt of oil.	
					200 hrs		c. Change oil filter. 1) After draining oil, place a cloth beneath oil filter and screw off old filter. Do not spill oil. If filter is difficult to remove, use oil filter wrench or punch a hole in filter and use long screwdriver to remove filter. 2) Discard old filter. Remove old rubber seal with old filter.	

Table 17-4. Preventive Maintenance Checks and Services

for Workboat, Lifesaving, and Firefighting Systems (Continued)

B - Before D - During A - After D - Daily H - Hourly Interval

ITEM NO.	INTERVAL					ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	H			
4	•		•		200 hrs	Battery Box and Batteries	3) Clean mating surfaces on new filter and filter receptacle. Coat new rubber seal with clean oil and install. 4) Screw on new filter by hand until it touches contact surfaces of filter receptacle. Turn filter 1/2 turn more. Do not tighten filter any further. 5) Fill crankcase with 11 qt of oil. 6) Start engine and run at idling speed. Check that oil gauge shows normal pressure. 7) Check oil filter for leaks. If necessary to stop seepage, tighten very slightly by hand. Check oil level to make sure it is between dipstick marks. **WARNING** Fumes from batteries may be flammable and explosive. Do NOT smoke or have open flame when checking or working on battery bank. Battery electrolyte presents potential health hazards. Contact with eyes and skin should be avoided. Safety glasses, gloves, and rubber aprons must be worn when handling this chemical. Electrolyte contains sulfuric acid which can cause severe burns and is highly toxic to skin, eyes, and respiratory system. a. Check battery boxes (located in engine compartment, port and starboard) for loose or missing securements or fasteners. Tighten and replace as necessary. b. Check batteries, casings, and battery cables for cracks and tight connections. c. Check batteries for proper electrolyte level. Add distilled or clean tap water to bring level above plates. d. Make sure battery selector switch is set to ALL position. e. Check that batteries, cables, and casings are corrosion-free and coated with anti-corrosion grease.	Battery casing loose or cracked.

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting Systems (Continued)

B - Before D - During A - After D - Daily H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	D	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
5	•		•	•	200 hrs	Depth Finder	a. Clean depth finder with a damp cloth.	
	•		•	•			b. Unplug transducer and power cables and wipe clean. Check for corrosion or damage to insulation. Correct as necessary.	
	•		•	•			c. Check that power cable and transducer cable are firmly seated in bottom of depth finder unit.	
6	•		•		200 hrs	Hydraulic Steering	a. Inspect hydraulic hoses for chafing, damage, and wear. Check for leaks. Replace or repair as necessary.	Class III leaks.
	•		•		200 hrs		b. Check for loose nuts, bolts, and fittings. Tighten or replace as necessary.	Loose fittings.
	•		•		200 hrs		c. Check for corrosion, dirt, and rust. as necessary using cloth or brush and a light coating of grease.	Clean
	•		•		200 hrs		d. Check that all moving parts are well lubricated.	
7	•		•		200 hrs		a. Inspect and clean clutch and throttle control cables as follows:	
							1) Wipe metallic parts, such as screwheads, cable sleeves, etc., with oil or light grease to prevent corrosion.	
							2) Wipe chrome-plated hand levers and covers with a clean cloth.	
							3) Inspect control mechanism for loose or damaged fastenings. Tighten or repair as required.	Control mechanism loose or missing.
							4) Ensure that control mechanism moving parts are lubricated with marine grease.	
							5) Examine cables and engine connections for signs of damage or wear. aged or won.	Cables on engine connections dam-

Table 17-4. Preventive Maintenance Checks and Services

for Workboat, Lifesaving, and Firefighting Systems (Continued)

B - Before D - During A - After D - Daily H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	D	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
8	•			•	200 hrs	Compass	Inspect the compass unit for bubble in compass oil, sticking dial, or discolored compass oil. Any of these conditions indicates an improperly operating compass. Replace the compass and return the old compass for repair.	
9	•			•	200 hrs	Navigation Lights	Inspect workboat navigation lights. Replace cracked lenses and burned out bulbs, as required.	Navigation lights burned out.
10	•			•	200 hrs	Bilge Pump	a. Check the bilge pump as follows: 1) Check bilge pump strainer and clean as necessary. 2) Make sure that bilge pump wiring is corrosion-free and connections are tight. 3) Check automatic switch to ensure that bilge pump operates normally. 4) Check for leaks in pump hoses. Repair or replace as necessary. Make sure all bilge pump and hose fasteners are secure.	Wiring damaged. Switch does not operate pump.
11					25 hrs	Outboard Drive	a. Check that outboard drive oil level is between marks on dipstick when inserted in oil hole and NOT screwed down. Do not screw dipstick into threads when checking oil level. Outboard drive must be in FULL DOWN position when checking oil. Be careful to keep any water from entering oil hole. Fill with same grade of oil as in engine, filling through dipstick hole. Do not lose O- ring in groove under dipstick top, and be sure to screw dipstick in tightly when finishing this maintenance procedure.	O-ring missing.
					25 hrs		b. Lubricate steering bearings on top of outboard drive inside engine compartment. Use a grease gun with water-resistant grease, and pump in grease until it is forced out at the bearings.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting Systems (Continued)

B - Before D - During A - After D - Daily H - Hourly Interval

ITEM NO.	INTERVAL B	D	A	D	H	ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
					25 hrs		c. Check corrosion protection devices (zinc anodes) and replace when they have been worn down by 50 percent or more. This includes three zinc anodes - one on each side and one underneath outboard drive along bottom of transom - and zinc ring behind propeller (Volvo Penta part 839388).Three zinc anodes in the engine are checked at 200 hour service.	Zinc anodes are worn down by 50% or more.
					25 hrs		d. Make sure propeller locking nut is tight.	Loose propeller locking nut.
					25 hrs		e. Check fluid level in hydraulic helm pump by removing cap on top of steering housing behind wheel at operator's position. Fluid should be within 1 in. of top when boat is level. If necessary, fill with Seastar hydraulic fluid or Texaco aircraft oil HO-1 5. Replace cap.	Hydraulic fluid low.
					200 hrs		f. With workboat on its cradle, change oil in outboard drive. 1) Remove oil dipstick and do not loosen O-ring on dipstick. 2) On outboard, remove plug (outboard must be in full TILT UP position before placing boat on cradle) under propeller gear housing and drain oil into receptacle for disposal. 3) Refit plug with O-ring installed. 4) Remove oil filter plug and fill with 2.5 qt of same type and grade of oil used in engine. Do not overfill. Install filter plug and its O-ring. 5) Lower outboard drive and check oil level using dipstick. Do not screw dipstick into threads when checking oil. If additional oil is required, fill through dipstick hole. If overfull, drain oil until proper level shows on dipstick. 6) Refit dipstick, with O-ring fitted, by screwing into its receptacle. Check that drain plug is not leaking. Tighten if necessary.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting Equipment Systems (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										LIFESAVING SYSTEM	**NOTE** **All life vest and lifesaving equipment must be inspected and certified by the United States Coast Guard (USCG) not less than once every 12 months. Immediately correct or dispose of equipment not passing inspection. Replace life rafts and contents and obtain new USCG certification every 5 years.**	
1	•		•						•	Life Rafts	a. Visually inspect life rafts for damage, loose or missing fasteners. tighten or replace as necessary.	Life rafts damaged Repair,or missing.
					•		•				b. Clean life rafts with soap and water.	
					•		•				c. Make sure rafts are installed and secured in their designated position.	
					•		•				d. Check that hydrostatic release is not damaged or jammed with foreign material.	Hydrostatic release inoperable.
					•		•				e. Check that painter/lanyard is intact, securely attached to cradle or bulkhead, and free from damage.	
					•		•				f. Wipe container clean.	
2	•				•		•			Buoy Rings	a. Visually inspect rings for damage, loose or missing fasteners. replace as necessary.	Repair, tighten or
	•				•		•				b. Inspect ropes for frays and breaks. Replace as necessary.	Ropes frayed or broken.

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting Equipment Systems (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
3	•				•		•			Life Vests	c. Check marker light batteries. Replace or recharge as necessary. or missing. **CAUTION** **Keep life vests away from lubricants and fuels. If splashed with oil, lubricants, or fuel oil, wipe off immediately. Then wash clean with soap and water. Rinse thoroughly. Never store wet life vests or other lifesaving items in a closed storage container. Hang in a well-ventilated space until completely dry. When dry, brush life vests and inspect other items for damage or wear before returning lifesaving equipment to its authorized stowage point.**	Marker light batteries not charged
	•			•	•			.	.	.	a. Check that fife vests are clean and free of oil, lubricants, or fuel oil. Clean with soapy water, rinse and dry as necessary.	
	•			•	•			.	.	.	b. Ensure that clean and dry life vests are stored in a clean, dry stowage area.	
										FIREFIGHTING SYSTEM	**WARNING** Monobromotrifluoromethane liquid or gas can cause **DEATH** Or serious injury if personnel fail to observe safety precautions. • Inhalation of monobromotrifluoromethane gas (Halon 1301) at concentrations of 5% to 6% for more than 4 or 5 minutes may result in serious cardiac or central nervous system effects. • Liquid Halon 1301 (including the spray in the immediate vicinity of discharge) may freeze the skin (frostbite) on contact. Wear protective clothing and eye protection to avoid such contact. In the event of frostbite, warm the affected area quickly to body temperature. Immerse hands in warm water or place hands in armpits. Get medical attention promptly.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
1	●		●	●	●					Halon 1301 System	a. Visually check for damage, heavy accumulation of dirt or grease and for obstructions to discharge nozzles and manifold assembly. Notify bargemaster or shift leader of damage or inoperability of system.	Discharge nozzles or manifold assembly obstructed.
	●		●								b. Notify supporting Fire Marshal of requirement to recharge empty cylinders.	
					●						c. Avoid dropping or rough handling. During transportation or storage, secure cylinders firmly to avoid rough handling.	
					●						d. Store only in a cool, dry area in an upright position. Do not expose to temperatures above 120°F (48 °C).	
					●						e. Visually inspect for any signs of corrosion or mechanical damage. If such indicators are present, immediately request supporting Fire Marshal to conduct an inspection and weight test.	Corrosion or mechanical damage.
					●						f. Check spare Halon cylinder not attached to system and make sure anti-recoil plug is assembled to valve outlet on top of cylinder.	
					●						g. Check extinguisher pressure gauges for proper operating pressure. 1) If pressure gauge is color coded, needle must be in green range. 2) If pressure gauge is not color coded, needle should indicate 370 psi at 70 °F, 395 at 80 °, 430 at 90 °, and 470 at 100 °.If pressure loss, adjusted for temperature, is greater than 10 percent, replace active cylinder with spare. Request supporting Fire Marshal to check and recharge Halon 1301 cylinder as necessary, and also check the manifold assembly.	Gauges inoperable.
								●			h. Request supporting Fire Marshal to conduct semiannual inspection, including weight check of Halon cylinders.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
2										CO2 Hose Reel Unit	**WARNINGS** C02 (carbon dioxide) gas used as an extinguishing agent does not contain oxygen in any form for supporting combustion or sustaining human life in breathing. Caution must be used before entering any space filled with C02 gas. Unless the space has been thoroughly ventilated with fresh air, a self- contained breathing apparatus must be worn when entering enclosed areas where C02 gas has been released. When releasing C02, operators must stay out of fumes and oxygen-starved area created by the C02 gas. Operators must hold release nozzle horn by its handle or wear thick gloves to protect hands from freezing to nozzle. C02 gas generates extreme cold which can cause personal injury. The maximum safe storage temperature for all C02 cylinders is 130 °F. To avoid accidental release of C02 gas through activation of the cylinder safety relief valve, ensure that each cylinder is kept or stored in places where the temperature will not reach critical levels.	
	●		●	●	●						a. Visually check for damage to hoses and other equipment and for obstructions to discharge nozzles. Notify bargemaster or shift leader of damage or inoperability of system.	Hoses or nozzles obstructed or damaged.
											CAUTION **C02 can cause corrosion of equipment. Clean all materials with soapy water immediately after use of this agent.**	
	●		●								b. Clean hoses and other hardware with soapy water.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
			●								c. Make certain that horn valve is left open until all pressure is relieved from hose.	
			●								d. Notify shift leader or bargemaster for requirement to remove or replace C02 gas cylinders.	
			●								e. Rewind hose on rack or reel and replace horn in clip. The valve must be left in its closed position.	
			●		●						f. For remote control systems, pull the control cable back and forth between the cylinder(s) and break-glass pull box to make certain it operates freely. Replace glass at the pull box.	
						●					g. Check control head to make sure safety pin is installed and activating lever has not been pulled.	
						●					h. Check SET/RELEASED indicator on side of control head to make sure it is in SET position. If not, take screwdriver and move to SET position.	
						●					i. Check hoses for cracks, breaks, loose piping connections to cylinders, and loose nozzles. Operate horn valve several times to make sure the valve does not stick. **CAUTION** **Do NOT use water or oxygen for blowing out. The use of oxygen, especially, is dangerous as the possible presence of even a minute quantity of oil may cause an explosion.**	Hoses cracked or broken.
									●		j. Blow out C02 hose/reel system with air or carbon dioxide to make sure that it is not plugged. Run hose out to its full length.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
3	●		●		●					Marine Smoke Detector	a. Check that smoke detector cabinets in ROWPU space and blower assembly cabinet on deckhouse top are clean. Clean with damp cloth to remove dirt.	Smoke detector cabinets are dirty.
.	●		●		●						b. Check that air hoses and electrical connections are tight and secure. Use insulated tools to tighten.	Electrical connections are loose.
.	●		●		●						c. Check all indicators and alarms by operating ALARM TEST/TROUBLE TEST switch as follows:	ALARM TEST/ TROUBLE TEST switch inoperable.
											1) Hold switch in ALARM TEST position to simulate presence of smoke in each of eight voids.Check that red smoke indicator light on each module and red ALARM INDICATOR light comes on and alarms sound in ROWPU space and dayroom.	Red indicator light does not come on.
											2) Release switch and push blue RESET button to silence alarms and return system to normal operation. indicate trouble, notify bargemaster or shift leader for corrective action.	System does not RESET. If lights
											3) Hold switch in TROUBLE TEST position to simulate trouble condition. Make sure trouble buzzer on detector cabinet sounds, amber - VOID MODULE TROUBLE indicator on each one of eight modules comes on, and the following amber lights in ZONE TROUBLES come on: - Power supply No. 1 - Power supply No. 2 - Alarm bell - Main panel - Blower - Ground fault - Timer disconnect - Clock HI speed	Amber lights in ZONE TROUBLES does not come on.

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											4) Release switch to return system to normal operation. If lights indicate trouble, notify bargemaster or shift leader for corrective action.	System does not return to normal.
					●						d. Inspect and clean smoke detector for corrosion, dirt, grime, loose wiring, faulty lamps, or other deficiencies. Correct, repair, and replace worn or damged parts as necessary.	Any deficiencies exist.
					●						e. After verifying smoke detector system is operating normally with all detector modules in place and the suction blower operating normally, conduct the following test: 1) Smoke testing must be carried out by two persons: one to note the results at the detector cabinet and one to introduce smoke into the accumulators throughout the vessel. 2) Before commencing the smoke test, make certain the 3-way valves are in the correct position with the handle reading "Smoke Detector." 3) To perform smoke tests, use a smoke test source device. **NOTE** A smoke test source device can be fabricated using specifications suggested in manufacturer's manual or procured through authorized supply, as recommended by the supporting Fire Marshal. 4) It is necessary for the operator of the smoke tester to carry a portable light so that smoke entering the accumulator may be observed. 5) The tester must produce smoke continuously for a period of 1 to 4 minutes, the actual time being dependent on the length of that particular line and the number of installed accumulators connected to it.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
					●						6) It is essential that the smoke flow be continuous and not a series of isolated puffs as the detector will sense the clear spaces between the smoke as a return to normal, non-smoke condition. 7) If the smoke testing team has difficulty with their initial attempts, refer to smoke detecor system sensitivity adjustment and smoke testing procedures contained in the manufacturer's manual. 8) As smoke is introduced into the module, the delta voltage should decline. 9) If the voltage appears to modulate (decline and increase), this indicates smoke is not being introduced continuously into the accumulator. If no voltage decline is observed, it indicates: (a) There are seriously discontinuities in the pipework. (b) There are blockages in the pipework. (c) The pipework does not run to the module being tested. 10) The smoke test procedure is performed by two persons: (a) One man operates the smoke tester and applies smoke to each accumulator installed in the vessel. (b) The second man, stationed at the detector cabinet, observes the system alarming, resets it, and records the specific accumulator causing a specific detector module to alarm.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
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ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
					●						11) The notes by the team member at the cabinet are used to provide an accurate layout of the accumulators, C02 pipework, and their connections to the detector modules. 12) It is necessary that each and every accumulator be tested in this manner to ensure accumulators are all connected to the pipework and none are blocked. 13) The detection cabinet is always operated at maximum sensitivity (as shipped), provided the delta voltage is at the approximate level noted under the section on sensitivity adjustment. 14) Notify shift leader or bargemaster of any discrepancy or bargemaster of any test failure.	Any tests fail.
4	●		●	●	●		●	·		Portable Fire Extinguisher	**WARNINGS** C02 (carbon dioxide) gas used as an extinguishing agent does not contain oxygen in any form for supporting combustion or sustaining human life in breathing. Caution must be used before entering any space filled with C02 gas. Unless the space has been thoroughly ventilated with fresh air, a self- contained breathing apparatus must be worn when entering enclosed areas where C02 gas has been released. When releasing C02, operators must stay out of fumes and oxygen-starved area created by the C02 gas. The maximum safe storage temperature for all C02 cylinders is 130 °F. To avoid accidental release of C02 gas through activation of the cylinder safety relief valve, ensure that each cylinder is kept or stored in places where the temperature will not reach critical levels.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
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ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	●		●	●	●		●				a. Check that each portable fire extinguisher is clearly marked and at its authorized fire station.	
.	●		●	●	●		●				b. Check that each fire extinguisher is undamaged, clean and free from obstruction which could cause delay for emergency access to the device. bargemaster or shift leader of damage or inoperability of equipment. **CAUTION** C02 can cause corrosion of equipment. Clean all materials with soapy water immediately after use of this agent.	Fire extinguisher has been discharged or the Notify inspection tag is outdated or missing.
.	●		●		●						c. Clean hoses and other hardware with soapy water.	
.	●		●		●		●				d. Notify supporting Fire Marshal of requirement to recharge empty cylinders.	
5	●		●	●						Self-Contained Breathing Apparatus (SCBA)	**WARNINGS** All SCBA's onboard must contain an air cylinder marked with a large yellow strike or triangle. Different SCBA's, although similar in appearance, use different types of air cylinders. Those onboard use low-pressure, natural air (not oxygen) pressured to 2216 psi when full and marked with a yellow stripe or triangle. Other SCBA's have similar cylinders pressured to 4500 psi and marked with green. If a SCBA is attached to the wrong type of cylinder, it may initially check out but could fail during use. The SCBA may not provide a satisfactory face seal if the user wears a full beard or sideburns. An improper seal around the facepiece limits the protection provided by the SCBA. If such a condition exists, the user assumes all risks of death or serious bodily injury that may result.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											WARNING There are two black SCBA's with carrying case and three green SCBA air mask units. The two black SCBA's have a 24-30 minute capacity and the three green ones have a 9-15 minute capacity. SCBA components are facepiece, breathing tube, pressure-demand regulator, carrier and harness assembly, and cylinder valve assembly.	
	•		•	•		•					a. Check that each SCBA is at its authorized station.	
						•					b. Check that each SCBA is undamaged, clean and free from obstruction which could cause delay for emergency access to the device. Notify bargemaster or shift leader of damage or inoperability of equipment.	SCBA is damaged or obstructed.
						•					c. Check that air tank is fully charged and does not leak. Notify supporting Fire Marshal of requirement to recharge empty tanks.	Air tank leaks or is not fully charged.
			•			•					d. Unlock lever on cylinder valve and close valve. Do not use excessive force as the valve closes leaktight easily.	
			•			•					e. Release pressure in high pressure hose by breathing until air is exhausted and then remove facepiece. DO NOT USE BY-PASS VALVE TO EXHAUST AIR PRESSURE.	
			•			•					f. Disconnect the hand tight coupling nut at the cylinder valve. Do not disconnect with pressure shown on the demand regulator gauge.	
			•			•					g. Ultralite Cub and Ultralite Mask: 1) Ultralite Cub. Loosen cylinder clamp screw on the band with key screwdriver (in strap loop) and slide cylinder out.	Seals are broken on mask.

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											2) Ultralite Mask. Release the cylinder clamp drawbolt and remove the cylinder.	
			•								h. Ultralite Cub: 1) Replace depleted cylinder with a fully charged cylinder. Slide cylinder, valve end first, through the band. Place spacer, without D-ring, of metal frame assembly in line with pressure gauge on cylinder; tighten screw on band. Connect with hand tight coupling nut at the cylinder valve.	Cylinder not charged.
											2) Ultralite Mask: Replace depleted cylinder with a fully charged cylinder and connect the hand tight coupling nut at the cylinder valve.	Cylinder not charged.
											CAUTION Cleaning and sanitizing at the recommended 120 oF temperature will avoid unneccessary replacement. Overheating and resulting distortion of parts of the respirator would necessitate replacement.	
			•								i. Remove the facepiece assembly and clean and sanitize it with MSA Cleaner-Sanitizer (Pt. No. 34337). 1) Add one package (1 oz) of powered Cleaner-Sanitizer to a gallon of warm water (about 120 oF). 2) Immerse facepiece and tube in the solution and scrub gently until clean. 3) Rinse in clean warm water and allow to air dry by removing the regulator cap, spring, and diaphragm. Use a paper towel or dry cloth to dry the low pressure side of the regulator. Do not bend lever assembly arms.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - Daily Q - Quarterly
D - During W - Weekly S - Semiannually
A - After M - Monthly A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											CAUTION Before placing mask in case, release pressure from system, as described in step b immediately above.	
			•								j. Examine the mask(s) for missing, cracked, or broken parts in the facepiece, breathing tube assembly, regulator, Audi-Larm assembly, and harness. Visually check the exhalation valve.	Masks have missing, cracked or broken parts.
			•								k. Place cylinder in cradle of case. Arrange harness around the lower right corner and front of case. Place regulator facedown in plastic dish. Place facepiece and attached hose assembly on its side, lens away from cylinder, between harness and cylinder.	
			•								l. Store flat, in a cool, dry place where possible.	
											WARNING Never attempt to connect a 4500 psig cylinder to a 2216 psig apparatus. The coupling nut will not thread completely. There are two bleed holes drilled at the bottom of the 4500 psig cylinder valve. If the system is connected by accident, air will bleed out instead of being introduced into the Audi-Larm.	
					•						m. Check the cylinder pressure gauge. The needle should be on the FULL mark. If not full, change the cylinder, as described in paragraph 3-17.3.6.1.	Cylinder not FULL.
					•						n. Check the mask for damage and leaks. Make sure all SCBA's are at their leaking. assigned locations and are easily accessible.	Mask damaged or
					•						o. Notify the shift leader or bargemaster if any SCBA is damaged or fails its inspection	SCBA fails any portion of inspec-

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
.						•					p Test for air leaks between the cylinder and the regulator outlet by observing changes in gauge pressure. First, open both cylinder and main-line regulator valves and note the indicated regulator pressure (blocking the breathing tube outlet on pressure demand units).	Leaks exist between cylinder and regulator outlet.
.						•					q. After observing the regulator pressure, close the cylinder valve and watch the regulator pressure gauge. If the indicator drops more than 100 psig in 30 seconds, leaks are present. They may be located by applying soapy water to connections and couplings. Expanding bubbles indicate leaks. Close mainline valve to conserve air supply.	iIndicator drops more than 100 psig in 30 seconds.
						•					r. Check the Audi-Larm Function by observing the regulator gauge pressure at which the alarm rings. This test should be performed with a minimum cylinder pressure of 1200 psig.	Alarm inoperable.
											1) To check a pressure demand apparatus, pressurize the system by opening the cylinder valve for a moment, then close it. Place your hand or the rubber protective cover over the regulator outlet to block it leak-tight. Open the mainline valve. The alarm should NOT ring.	Alarm sounds.
											2) Slowly remove your hand or the rubber protective cover from the regulator outlet and observe the drop in pressure on the regulator gauge and the point at which the Audi-Larm begins to ring (Table 3-5). The ringing will continue until air in the system is exhausted.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						•					Audi-Larm No.* / Stamp Cyl. Press / Filled Cyl. Press. / Norm. Ring. Press. / Min. Ring. Press. / Max. Ring. Press. 1310 / 1800 / 1980 / 400 / 375 / 475 2015 / 2216 / 540 / 500 / 580 13E27 449910 449911 460255 460256 *Audi-Larm Bureau of Mines Approval Number or NIOSH/MSHA Part Number is located on alarm body. 3) To check a demand apparatus, pressurize the system (1200 psig minimum), close the cylinder valve, open the by-pass valve slightly to permit the air to bleed out of the system, and observe the drop in pressure on the regulator gauge and the point at which the alarm rings. When the air is completely exhausted, close the by-pass valve.	
						•					s. Check the Diaphragm Function. Remove the breathing tube and check that the cylinder and the regulator valves are closed and that the system is not pressurized: 1) Gently INHALE through the regulator outlet and hold for about 10 seconds. If the negative pressure is maintained, there is no leakage. 2) Gently EXHALE through the regulator outlet for about 10 seconds. If the positive pressure is maintained, there is no leakage. 3) The regulator outlet should be sanitized after testing. Do not use the apparatus if air flow through the regulator is detected in either test.	Diaphragm leaks.

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
			•			•					t. Check the Regulator Function. The regulator function should be checked monthly and preferably after each use to verify that performance is within specifications. The Portable Regulator Tester is used to measure the resistance and the flow of air through the regulator at the proper suction or positive pressure. Check the Main-Line and By-Pass Valves: 1) Operation of the main-line valve and by-pass valve is tested by putting on the device and operating it normally. Venting of pressure relief valves, or continuing flow of air through the regulator when the user is not inhaling, indicates the regulator needs to be repaired. In addition, any unusual sounds such as whistling, chattering, clicking, or rattling means that the regulator should be further checked. 2) Clean and sanitize the apparatus, inspect the entire unit, and record information on the inspection tag or check list. Store the unit.	There is any malfunction in regulator.
6										Portable Firefighting Pump {Model PE-250)	**WARNING** Do NOT operate pump in closed area without exhaust hose connected and routed safely to outside fresh air. Exhaust gases are hazardous to personnel.	
.	•		•		•						a. Visually check pump assembly set for deficiencies that could cause hazardous conditions for personnel and equipment. Notify bargemaster or shift leader of deficiencies which require corrective action.	Class III leaks.
.	•		•		•						b. Check fuel supply. with mixture of two cans of BIA- TC-W-Service oil (NSN 9150-00-117-8791) is blended with each 6 gal of 90 octane gasoline.	Refuel as necessary

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting Equipment System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
	●										c. Check that all hoses and fittings are undamaged and not excessively worn. Replace as required.	Hoses worn or damaged.
	●										d. Check battery connections.make sure cables are securely fastened and free of corrosion. Clean as necessary and coat with protective grease.	Battery is cracked or damaged.
	●										e. Check that engine exhaust hose and gaskets are tight and properly sealed. Check for leaks. Tighten, replace or repair as necessary.	Exhaust hose leaks.
			●								f. Flush pump assembly with clean, fresh water.	
			●								g. Drain and thoroughly dry all hoses, pipes, and valves.	
			●								h. Check for rust and corrosion. paint in accordance with TB 43-0144 as necessary. Do not paint threads or labels.	Touch up
					●						i. Inspect pump assembly set for visible deficiencies that, if not corrected, could become hazardous to people or equipment. **WARNING** Do NOT operate pump in closed area without exhaust hose connected and routed safely to outside fresh air. Exhaust gases are hazardous to personnel.	
					●						j. Make sure engine exhaust hose and gaskets are tight and sealed properly with no leaks.	Exhaust hose leaks.

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
			●		●						k. After each use with contaminated water or salt water, wash down and flush out the pump with clean, non-contaminated, fresh water as follows: 1) Mix 2 cans BIA-TC-W service oil (NSN 9150-00-117-8791) and 6 gal of 90 octane gasoline in fuel tank. 2) Connect fuel hose to engine. 3) Connect fittings and hose to suction, discharge, and exhaust connections. 4) Place suction hose with foot valve and strainer into fresh water supply. 5) Prime pump until full, inspect for leaks. 6) Shut discharge valve. **WARNING** Ensure exhaust gases discharge to outside atmosphere. 7) Start engine. Switch to start, advance speed slightly, pres start button, choke as necessary. 8) Prime pump; push priming button and hold, when water discharges from priming pump; ensure discharge hose is manned; open water discharge valve slowly. Release priming button. **NOTE** Primer pump should evacuate air from impeller housing and suction hose in approximately 60 seconds. **CAUTION** Do not operate pump more than 2 minutes unless pressure shows on gauge or priming pump discharges water.	
			●		●							

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
											9) Operate pump; switch to run; adjust engine speed to obtain desired discharge pressure. 10) Operate pump for 1 minute; inspect for leaks, unusual noises, and vibrations. 11) Slow engine speed to idle and push primer button; observe discharge at primer pump; allow primer pump to run for 30 or 45 seconds to flush out; release primer button. 12) Shut discharge valve. 13) Stop engine by disconnecting fuel hose on suction side and allowing engine to run until excess fuel is burned off. 14) Depressurize and remove fuel tank. 15) Check oil level in priming pump oiler; fill if necessary. Switch engine control to OFF position, then push both starter and priming buttons to oil priming for storage. Hold both buttons for approximately 5 seconds. Release buttons. 16) Disconnect hoses and fittings. 17) Drain pump by opening pump drain valve fully counterclockwise. 18) Dry unit, replace caps on all openings; close pump drain valve. 19) Stow pump hoses and connectors.	Class III leaks.

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						●					I. Perform all daily checks.	
						●					m. Check specific gravity of battery and charge and clean as follows: 1) Remove vent caps and check individual cell specific gravity. 2) Place hydrometer in each cell and take reading and recharge if required. The following table provides ranges of specific gravity (S.P.Gr.) for a cell of 80 °F (26.7 °C). *Cold and Temperate Climates* 1.265 S.P.Gr. 100 percent charged 1.225 S.P.Gr. 75 percent charged 1.190 S.P.Gr. 50 percent charged 1.155 S.P.Gr. 25 percent charged 1.120 S.P.Gr. Discharged *Tropical Climates* 1.225 S.P.Gr. 100 percent charged 1.185 S.P.Gr. 75 percent charged 1.150 S.P.Gr. 50 percent charged 1.115 S.P.Gr. 25 percent charged 1.080 S.P.Gr. Discharged 3) Remove battery from pump if charging is required. 4) Connect battery to 12 V battery charger at 10 amp hr charging rate or equivalent. 5) Replace hydrometer in each cell and take reading; continue charge if required.	Battery not charged.

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						●					6) Check water level in each cell and fill with distilled water, if available, or ordinary tap water as required. 7) Reinstall battery in pump. 8) Check battery for cracks and terminals and cables for cleanliness. If corrosion is indicated, proceed as follows: (a) Remove battery cables from terminals. (b) Using a wire brush, clean cable terminals and battery terminals. (c) Coat battery terminals with grease. **CAUTION** Connect positive battery cable to positive (+) terminal on battery and negative battery cable to negative (-) terminal on battery. (d) Reconnect battery cables.	Battery cracked.
					●						n. Check for belt tension and wear using these procedures: 1) Shut down pump and tag "OUT OF SERVICE." 2) Remove fan belt guard by removing the two attaching screws, then remove fan cover. 3) Check fan belt tension by pressing in on fan belt. Fan belt deflection should be 5/32 in. 4) Adjust fan belt as follows: (a) Loosen the four bolts on the priming pump mounting bracket and the two bolts on the priming pump stabilizer bracket.	Belts cracked or broken.

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						●					(b) Slide the priming pump out to tighten fan belt. (c) When fan belt deflection is 5/32 in, tighten the four bolts on the priming pump mounting bracket and the two bolts on the priming pump stabilizer. 5) If fan belt shows signs of wear or proper tension cannot be obtained, replace fan belt as follows: (a) Remove retractable starter by removing three hex head bolts. (b) Using a wrench, hold fan pulley while removing nut and washer. (c) Unscrew and remove three hex head bolts and remove starter pulley. (d) Remove old fan belt and install a new one. (e) Install starter pulley and secure with three hex head bolts. (f) Install washer and nut. Torque tighten nut to 35 lb/ft. (g) Check belt tension and adjust in accordance with steps 3 and 4 above.	
						●					o. Check the oil level in the priming pump oiler as follows: 1) Shut down pump and tag pump "OUT OF SERVICE." 2) Check oil level in priming pump oiler.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
						●					**NOTE** The priming pump oiler should be filled full to provide oil for priming operation. 3) If oil level is below full, add oil per Military Specification MIL-L-46152 until oil level reaches full.	
								●			p. Check and adjust the carburetor as follows: 1) Shut down the pump and tag "OUT OF SERVICE." **CAUTION** Fuel adjustment screws must be bottomed lightly. Do not force. 2) Turn idle fuel and main fuel adjustment screws clockwise until they bottom. 3) Turn idle fuel and main fuel adjustment screws counterclockwise one turn. **NOTE** The carburetor is now adjusted slightly to the rich side. If a leaner adjustment is required, turn adjustment screws clockwise 1/8 of a turn.	
									●		q. Annually or when starting is difficult, remove each spark plug and inspect as follows: 1) Shut down pump and tag "OUT OF SERVICE." 2) Remove spark plug cables from spark plugs.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
									●		3) Unscrew and remove spark plugs. 4) Spark plugs should be replaced if the electrodes are black or white or if porcelain is cracked. **NOTE** Spark plugs whose electrodes are tan in color need not be replaced. 5) If new spark plugs are required, use Champion RN-3 spark plugs. 6) Install spark plugs and torque tighten to 20 lb/ft. 7) Reinstall spark plug cables. 8) If the spark plugs were replaced because their electrodes were either black or white. 9) Remove the "OUT OF SERVICE" tag.	Electrodes are black or white or if porcelain is cracked.
										●	r. Check the ignition timing annually or when starting is difficult. Perform the procedure as follows: 1) Shut down the pump and tag "OUT OF SERVICE." 2) Remove spark plug wires from spark plugs. 3) Remove retractable starter by removing three hex head bolts. 4) Unscrew and remove three hex head bolts and remove starter pulley. 5) Twist fan belt out of the way. **CAUTION** When adjusting the stator assembly, take care not to damage the coil windings.	

Table 17-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
									●		6) Loosen the stator assembly mounting screws through the holes in the flywheel. To correct timing, rotate the stator assembly as required (clockwise to retard the timing; counterclockwise to advance the timing). 7) Tighten the stator assembly mounting screws. 8) Install lower fan pulley, fan belt, and secure with three hexhead bolts. 9) Install retractable starter and secure with three hexhead bolts. 10) Remove the "OUT OF SERVICE" tag.	
									●		s. Check the water seal annually or when the water seal is leaking, as follows: 1) Shut down the pump and tag "OUT OF SERVICE." **WARNING** Water seal is spring loaded. 2) Remove section head and hose adapter assembly. 3) Remove and discard gasket. 4) Remove impeller screw, washer, and impeller seal. 5) Screw a 5/8-11 X 2-1/2 in long hex head bolt into impeller untilsnug, then continue screwing in bolt until impeller comes free. 6) Remove water seal and inspect for wear and/or defects. 7) If damge is indicated, install new water seal.	Class III leaks. Seal is worn or damaged.

Table 2-4. Preventive Maintenance Checks and Services for Workboat, Lifesaving, and Firefighting System (Continued)

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
									●		8) Reassemble parts in reverse order of disassembly using new gasket and impeller seal. Tighten impeller screw to 70 lb/ft torque, mounting screw to 24 ib/ft, and cover nuts to 14 lb/ft. 9) Remove pump "OUT OF SERVICE" tag upon completion.	
									●		t. Inspect pump suction hoses and exhaust hose for damage or wear. Notify shift leader or bargemaster if repair or replacement is required.	Exhaust hose damaged.
									●		u. Inspect valves, strainer, and adapter for damage and wear. Clean as necessary. Operate valves to prevent sticking. Notify shift leader or bargemaster of any deficiencies.	Valves inoperable.

CHAPTER 18 DOUBLE DRUM WINCH PMCS

Section I. General

18-1 Introduction. Chapter 18 contains Preventive Maintenance Checks and Services for the Winch, Double Drum, Diesel Engine Driven, 40,000 LB Capacity, CONMACO Model 27 which is used on the Reverse Osmosis Water Purification Barge. Operating and maintenance procedures for the winch are described in detail in TM 55-1930-209-14&P-21. TM 55-1930-209-14&P-21, Appendix C also contains complete Preventive Maintenance Checks and Services for the Double Drum Winch.

18-2 Major components. The CONMAC Model 270 Winch is diesel engine driven with winched drums. It consists of a winch power unit and the winch mechanism mounted on a skid base.

18-3 System description. The winch mechanism is driven by a Detroit Diesel, 4-71N series, Model 1043-7000, water cooled diesel engine that develops 152 rated HP at 2100 RPM. The winch assembly is contructed of steel with cast iron drums. The main drive shaft and 2 drums are run on tapered roller bearings. The drums are engaged by an air actuated dutch and are equipped with air operated brakes. Refer to figures 18-1 and 18-2 for top and right side views of winch assembly.

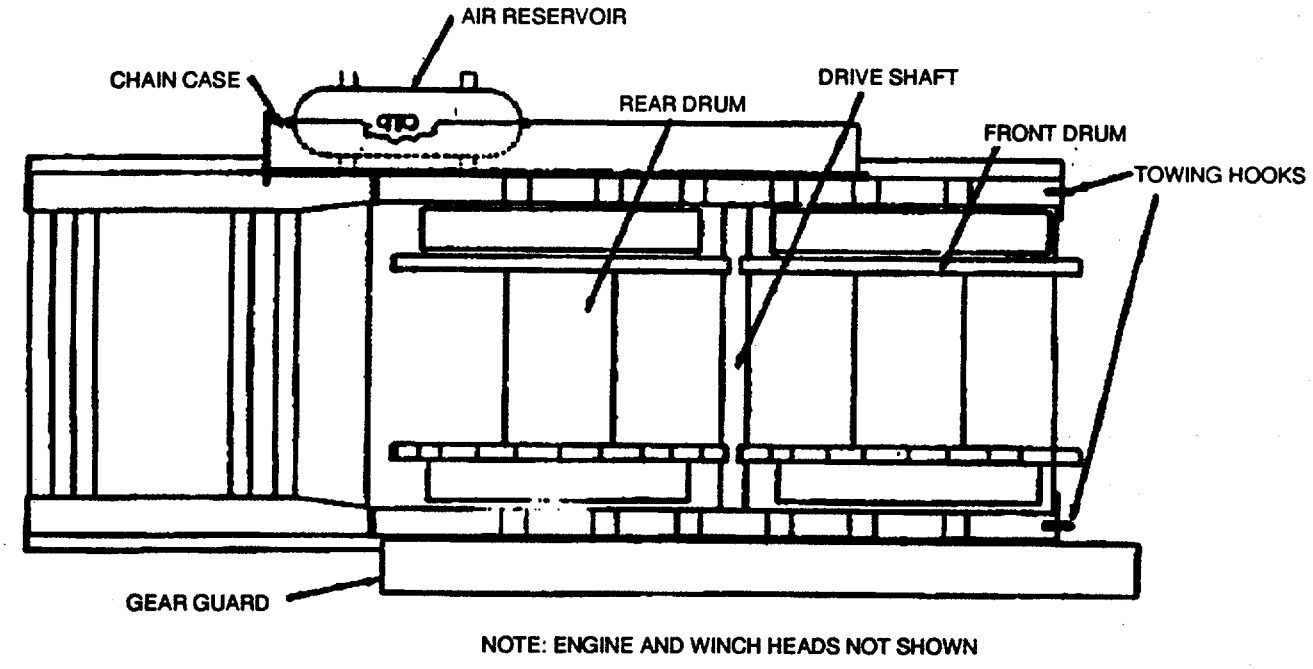

Figure 18-1 . Winch Assembly Top View

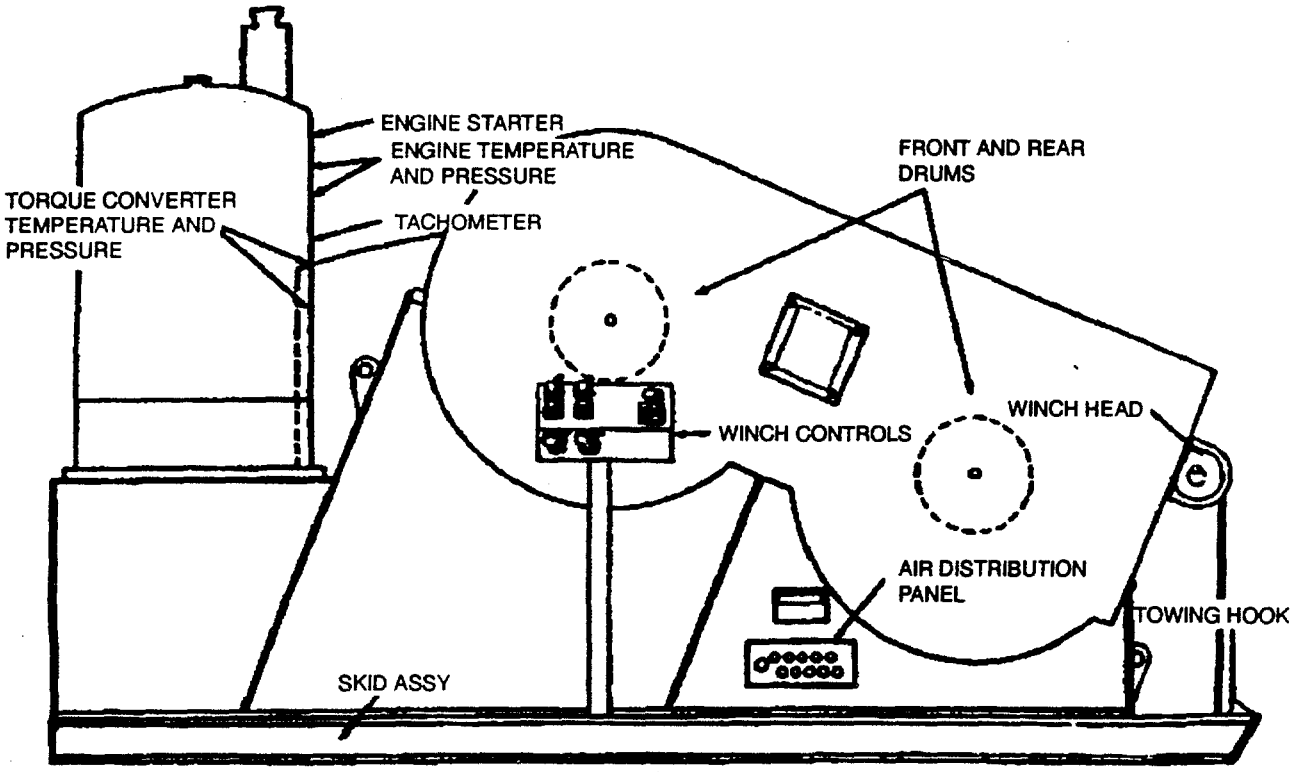

Figure 18-2 . Winch Assembly Side View

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Section II

Table 18-1. Preventive Maintenance Checks and Services for Double Drum Winch

B - Before D - During A - After
D - Daily W - Weekly M - Monthly
Q - Quarterly S - Semiannually A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
										DOUBLE DRUM WINCH		
1	●		●							Engine Lubricating Oil	a. Check oil level. Add (OEHDO-30 (MIL-L-21040)) oil to full mark on dipstick as necessary. If engine has been in operation, allow 20 minutes for oil to drain down to the crankcase before adding more oil. b. Change oil after every 150 hours of operation. c. Replace strainer and filter every 500 hrs.	
2		●								Engine Lubrication Oil Lines	Check all lubricating lines for leaks. shift leader or bargemaster for corrective action.	Notify Class III leaks.
3	●		●							Engine Cooling System	**WARNING** At operating temperatures, engine coolant is hot and under pressure. It also contains alkaline materials harmful to eyes and skin. To avoid personal injury, check coolant level only when engine is stopped and filler cap is cool enough to be touched with a bare hand. Should engine coolant come in contact with eyes or skin, immediately flush affected area with clean water and seek medical assistance if necessary. a. Check coolant level and add coolant as required. b. Check all water connections and hoses for damage or leaks. Tighten, replace or repair as necessary.	Class III leaks.

Table 18-1. Preventive Maintenance Checks and Services for Double Drum Winch

B - Before
D - During
A - After

D - Daily
W - Weekly
M - Monthly

Q - Quarterly
S - Semiannually
A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
4	●		●		●					Fuel Tank	a. Check fuel level. Add fuel as necessary.	Class III leaks.
	●		●		●						b. Check tank and lines for damage or leaks. Repair or replace as required.	
	●		●		●						c. Check mountings and fittings for damage or leaks. Repair or replace as necessary.	
											d. Check for loose or missing securements and fasteners. Tighten and replace as necessary.	
5	●	●								Torque Converter	a. Check hydraulic fluid level and replenish as necessary.	
	●	●									b. Check for leaks. If fluid loss is evident with no sign of external leakage, remove chain drive cover and inspect drive shaft area for signs of hydraulic leaks. If leaks are found, notify bargemaster or shift leader so corrective action can be taken.	Class III leaks.
		●			●		●				c. Check oil level on converter after running unit for a few minutes. Add oil as necessary.	
							●				d. Clean aspirator valve.	
					●						e. Remove inspection cover and oil clutch release levers and link pins. Lubricate clutch. Throw out bearing through the grease fittings on the side of housing.	
6					●		●	●		Air Compressor	a. Clean air compressor/air strainer element every 150 hrs by immersing in cleaning solvent and manually squeezing until element is clean.	
											b. Dip clean element in lubricating oil and squeeze it dry before replacing in strainer.	
7	●		●							Fuel Filter	Check for sediment and water in fuel filter. Open drain cock at bottom of filter and drain 1/4 pint of fuel to remove sediment and water.	

Table 18-1. Preventive Maintenance Checks and Services for Double Drum Winch (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
8	●		●							Alternator and Fan Belts cracks.	Check alternator and fan belt tension and Adjust or replace as necessary.	Fan belt cracked.
9	●		●							Air Reservoir	Slowly open petcock on bottom of reservoir and let all water drain from tank. All moisture should be removed before air pressure is lost. If water continues to drip after pressure is lost, start the diesel engine and pressurize reservoir. Continue to drain water.	
10	●		●		●					Water Pump Belt	Check water pump belt tension and cracks. Adjust as necessary.	Water pump belt cracked.
11	●									Alternator Asembly	a. Inspect alternator assembly for loose or missing fasteners and securements. Tighten or replace as necessary.	
						●	●				b. Lubricate bearings/bushings with five or six drops of engine oil in the hinge cap oiler.	
						●	●				c. Inspect and clean slip rings and brushes through the end frame. Clean with 400 grain or finer polishing cloth. Do not use emery cloth to clean slip rings while alternator is in operation, hold polishing cloth against slip ring. Blow any accumulated dust away after cleaning. Replace rough or out-of-round slip rings.	Slip rings are out-of-round or rough.
12	●	●			●					Controls and Instruments	Inspect controls and instruments for secure and missing mountings and securements. Tighten or replace as required.	
13	●	●				●				Winch Cables	a. Check winch cables for signs of wear fraying. Repair or replace as necessary.	Cables frayed.
	●	●				●					b. Check that cables are well lubricated. Lubricate as necessary.	
	●	●				●					c. Check that cable clamps are tight and properly installed. Adjust as necessary.	Cable clamps are not installed.
	●		●		●						d. Check cables for rust. brush and lubricate.	Clean with wire

Table 18-1. Preventive Maintenance Checks and Services for Double Drum Winch (Continued)

B - Before	D - Daily	Q - Quarterly
D - During	W - Weekly	S - Semiannually
A - After	M - Monthly	A - Annually

ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A			
14			●							Air Cleaners	a. Remove dirty oil and sludge from oil bath cups after each 8 hours of operation. b. Wash cups and elements with clean fuel oil and refill cups with oil of same grade and viscosity as engine lube oil. Increase frequency of cleaning in dusty, rainy or snowy conditions.	
15							●			Overspeed Governor	Lubricate overspeed governor with five or six drops of engine oil. Avoid excesive lubrication. Do not lubricate governor while engine is in operation.	
16						●				Throttle Controls	Lubricate throttle control mechanism with all purpose grease. Use no.2 grade at temperatures above 30' F. Use no.1 grade at temperatures below 30' F.	
17						●				Drive Belts	Check tension on all drive belts so that a firm push with thumb will depress each belt at least 1/2 inch but no more than 3/4 inch. If one belt from a set needs to be replaced, replace the complete set.	Belts cracked.
18					●					Tachometer Drive	Lubricate tachomeer drive with an all-purpose grease at the grease fitting. At temperatures above + 30°F (-1 'C) use a No. 2 grade grease. Use a No. 1 grade grease below this temperature.	
19				●						Turbocharger	a. Inspect mountings, intake and exhaust ducting and connections for leaks. b. Check oil inlet and outlet lines for leaks or restrictions to air flow. c. Check for unusual noise or vibration and, if excessive, notify shift leader or barge-master for corrective action.	Class lll leaks.

By Order of the Secretary of the Army:

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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 = 3.2808.8 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

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu in.
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Square measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. in.
1 sq. decimeter = 100 sq. centimeters = 15.5 inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 feet
1 sq. dekameter (are) = 100 sq. meters = 1.076.4 sq. ft.
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 hectometers = .386 sq. miles

Liquid Measure

1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons
1 liter = 10 deciliters = 33.81 fl. ounces
1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3 38 fl. ounces
1 metric ton = 10 quintals = 1.1 short tons

Approximate Conversion Factors

To change	To	Multiply by
inches	centimeters	2.540
feet	meters	.305
yards	meters	.914
miles	kilometers	1.609
sq. inches	sq. centimeters	6.451
sq. feet	sq. meters	.093
sq. yards	sq. meters	.836
sq. miles	sq. kilometers	2.590
acres	sq. hectometers	.405
cubic feet	cubic meters	.028
cubic yards	cubic meters	.765
fluid ounces	milliliters	29.573
pints	liters	.472
quarts	liters	.946
gallons	liters	3.785
ounces	grams	28.349
pounds	kilograms	.454
short tons	metric tons	.907
pound inches	newton-meters	.11296

To change	To	Multiply by
ounce inches	newton-meters	.0070062
centimeters	inches	.394
meters	feet	3.280
meters	yards	1.094
kilometers	miles	.621
sq. centimeters	sq. inches	.155
sq. meters	sq. yards	10.764
sq. kilometers	sq. miles	1.196
sq. hectometers	acres	2.471
cubic meters	cubic feet	35.315
milliliters	fluid ounces	.034
liters	pints	2.113
liters	quarts	1.057
grams	ounces	.035
kilograms	pounds	2.205
metric tons	short tons	1.102
pound-feet	newton-meters	1.356

Temperature (Exact)

°F Fahrenheit temperature — 5/9 (after subtracting 32) — Celsius Temperature °C