TECHNICAL MANUAL

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)

FOR

WATER PURIFICATION BARGES (NSN 1930-01-234-2165) VOLUME 5 DRINKING WATER SYSTEM

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

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

***This manual supersedes TM 55-1930-209-14&P-5, 30 January 1989.**

HEADQUARTERS, DEPARTMENT OF THE ARMY
15 OCTOBER 1992

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 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 is 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 compressed 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 lifevests when on weatherdeck and throughout the barge during storm conditions.
- Lifevests are to be worn 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 clothing 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, deck plating 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 hazardous materials, or electrical equipment or wiring.
- When welding, keep your head out of the fumes and make sure area is well ventilated.
- Before welding on surfaces which 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. Cover the 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 1) removing all liquid from tank, 2) cleaning tank thoroughly, 3) seeing that tank is thoroughly dry, and 4) force ventilating 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 or 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.

1. Do not try to pull or grab individual.
2. Turn off electrical power when possible.
3. 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.
4. Get medical help as soon as possible.
5. After the injured person Is free of contact with the source of electrical shock, move the person a short distance away and, if needed, start CPR Immediately.

INTRODUCTION TO

TM 55-1930-209-14&P-5

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

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 or to 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 hypochloirte 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 man 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 rubber 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 Purification 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 CO_2 hose reel units, a smoke detector system, 17 portable CO2 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

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 Purificabon Barges.

23. VOLUME 21 -- WINCH, DOUBLE DRUM, DIESEL

    This volume contains operation and maintenance procedures for the 20-ton double drum diesel engine winch used on the Water Purification Barges. Appendix B of Volume 21 contains the Maintenance Allocation Chart and the Repair Parts and Special Tools List for the winch.

TECHNICAL MANUAL
NO 55-1930-209-14&P-5

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

TECHNICAL MANUAL

OPERATORS', UNIT, DIRECT SUPPORT AND GENERALSUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)

FOR

WATER PURIFICATION BARGES (NSN 1930-01-234-2165) VOLUME 5 DRINKING WATER SYSTEM

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help Improve this manual If you find any mistakes or If you know of a way to improve 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

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

* Supersedes TM 55-1930-209-14&P-5, 30 January 1989

TABLE OF CONTENTS

VOLUME 5

TABLE OF CONTENTS (Continued)

VOLUME 5

TABLE OF CONTENTS (Continued)

VOLUME 5

LIST OF APPENDICES

TABLE OF CONTENTS (Continued)

VOLUME 5

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 (ESML)
REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)
REPAIR PARTS LIST TO FIGURE NUMBER CROSS-REFERENCE LIST

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) and BASIC ISSUE ITEMS LIST (BIILL)
ADDITIONAL AUTHORIZED ITEMS LIST (AAL)

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1 INTRODUCTION

Section I. General information

1-1 Purpose. This Technical Manual (TM) describes the operation and maintenance of drinking water system Installed onboard Water Purification Barges Information on other systems onboard the barge is In TM 55-1930-20914&P-1 thru P-4 and P6 thru P-17. 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. The drinking water system provides storage for water produced by the Reverse Osmosis Water Purification Units (ROWPU's) and Includes pumps and valves to move that water from onboard storage tanks to the shore discharge system, to another vessel, or overboard It also provides a pressurized water supply for drinking and washing onboard the barge

1-3 Warranties and guarantees. Warranty/guarantee information Is in Chapter 7

1-4 Maintenance forms and records. Required maintenance forms and records are explained in DA PAM 738-750, The Army Maintenance Management System (TAMMS)

1-5 Destruction of Army materiel to prevent enemy use. This shall be as directed In TM 750-244-3

1-6 Storage For storage of this system, refer to Chapter 5

Section II. Description and data

1-7 Description. The drinking water system for Barge 1 (Figure 1-2) and for Barges 2 and 3 (Figure 1-3) stores 15,000 gallons of drinking water In four 3,750-gallon tanks and 250 gallons In a reserve tank The system supplies drinking water by one of two discharge pumps to a shore facility or to another vessel, or water can be discharged directly overboard through a port discharge valve The pressure set supplies onboard drinking water to the reserve tank, to the dayroom drinking fountain and sink, to the shower on the forward deck, to four washdown stations In the ROWPU space to the chlorination system In void 2 port, and to the washdown station on deckhouse top Major components of the drinking water system are shown In Figures 1-2 and 1-3, and listed in Table 1-1 A block diagram of the drinking water system is shown In Figure 1-4 for Barge 1 and Figure 1-5 for Barges 2 and 3

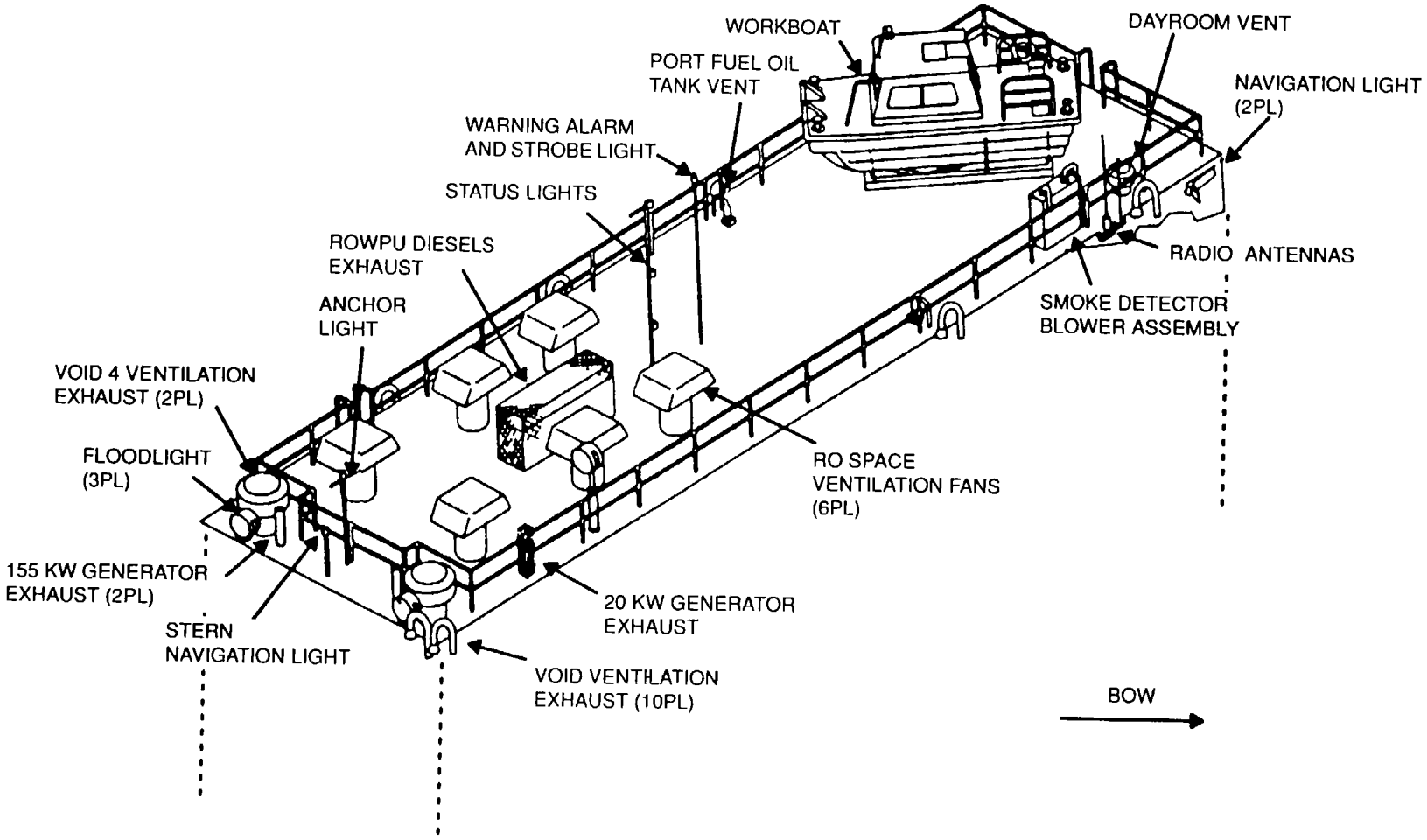


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment - Deckhouse Roof (Sheet 1 of 3)

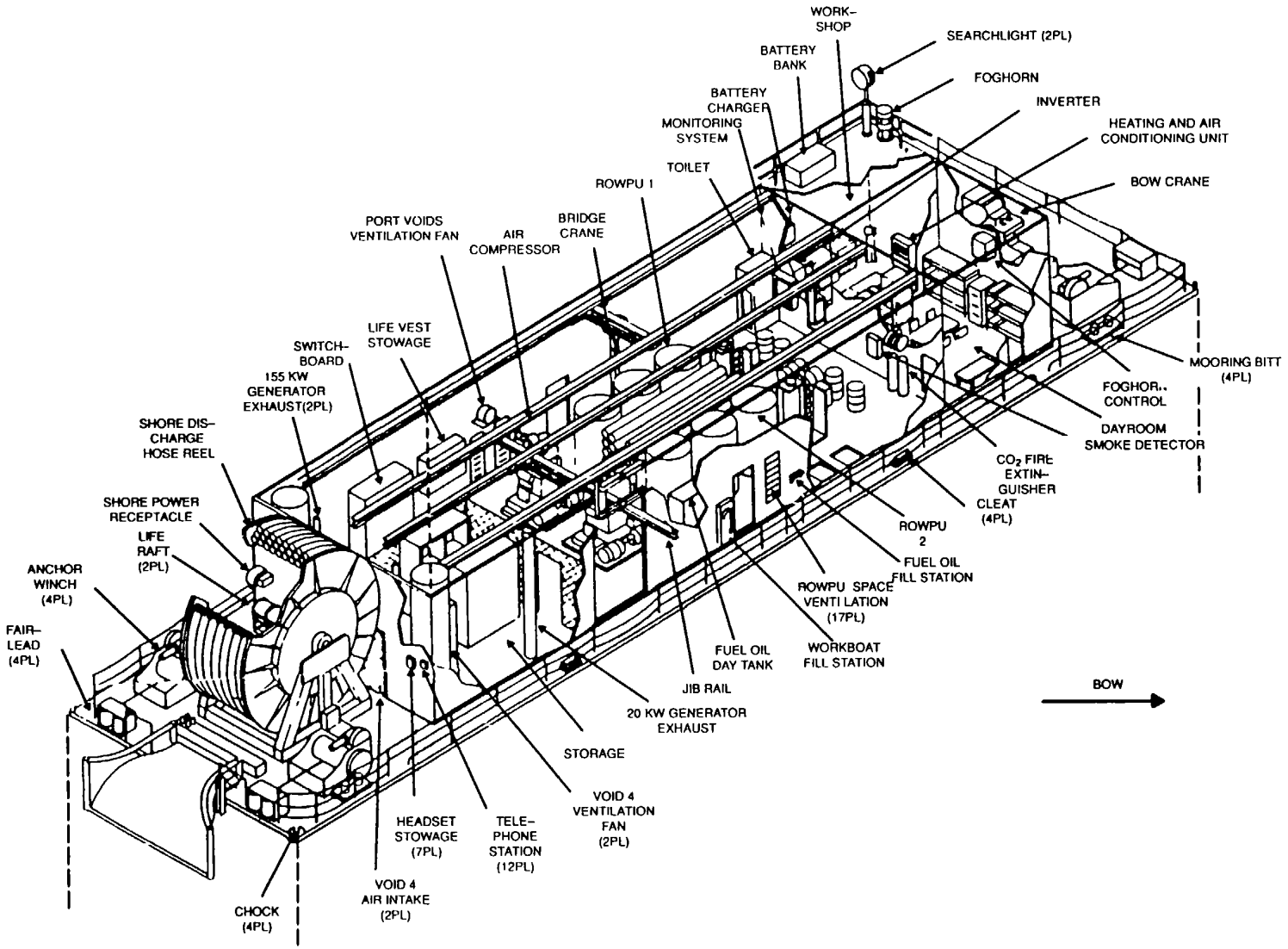


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment - Deckhouse (Sheet 2 of 3)

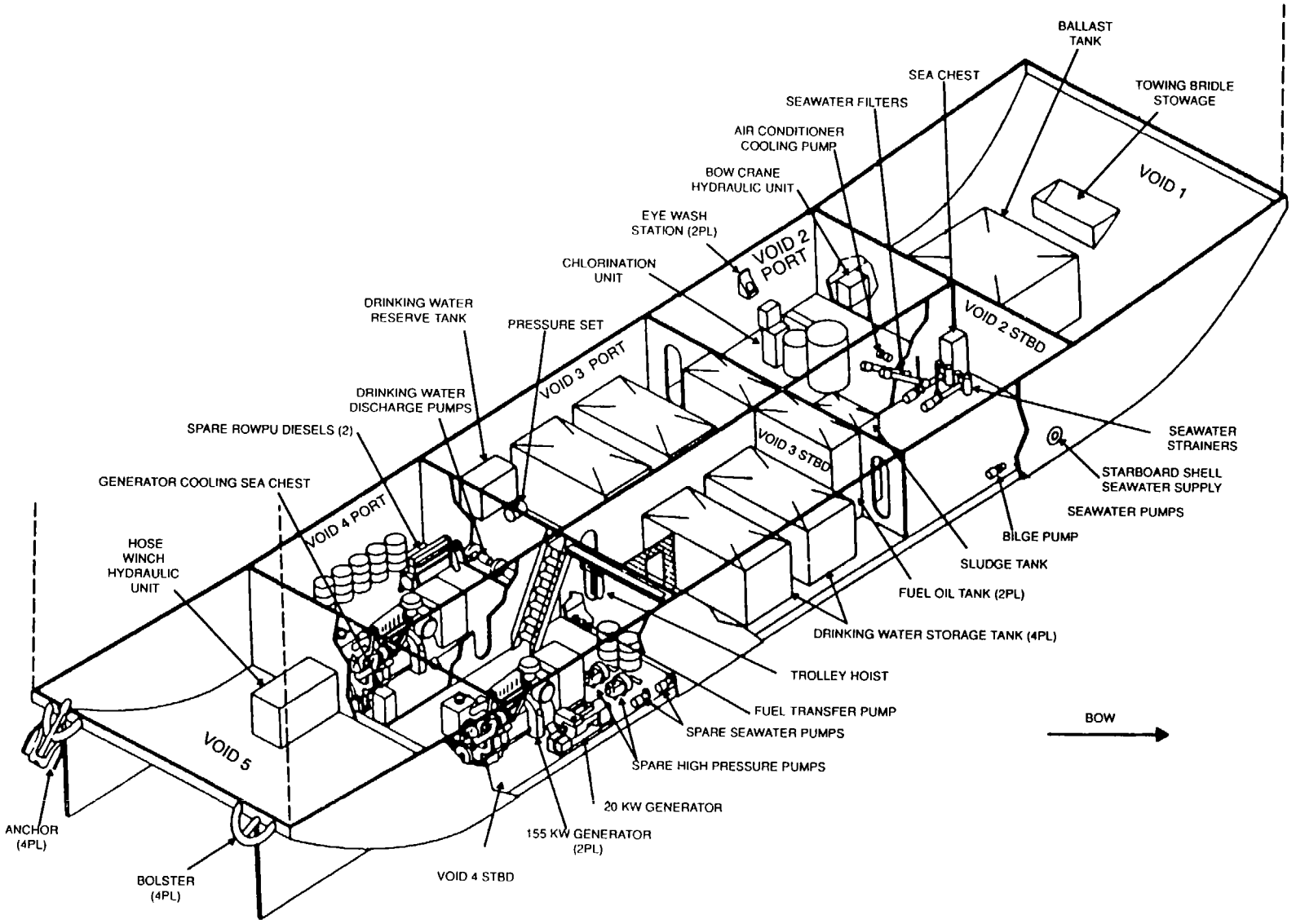


Figure 1-1. Major Components of ROWPU Barge Systems and Equipment - Voids (Sheet 3 of 3)

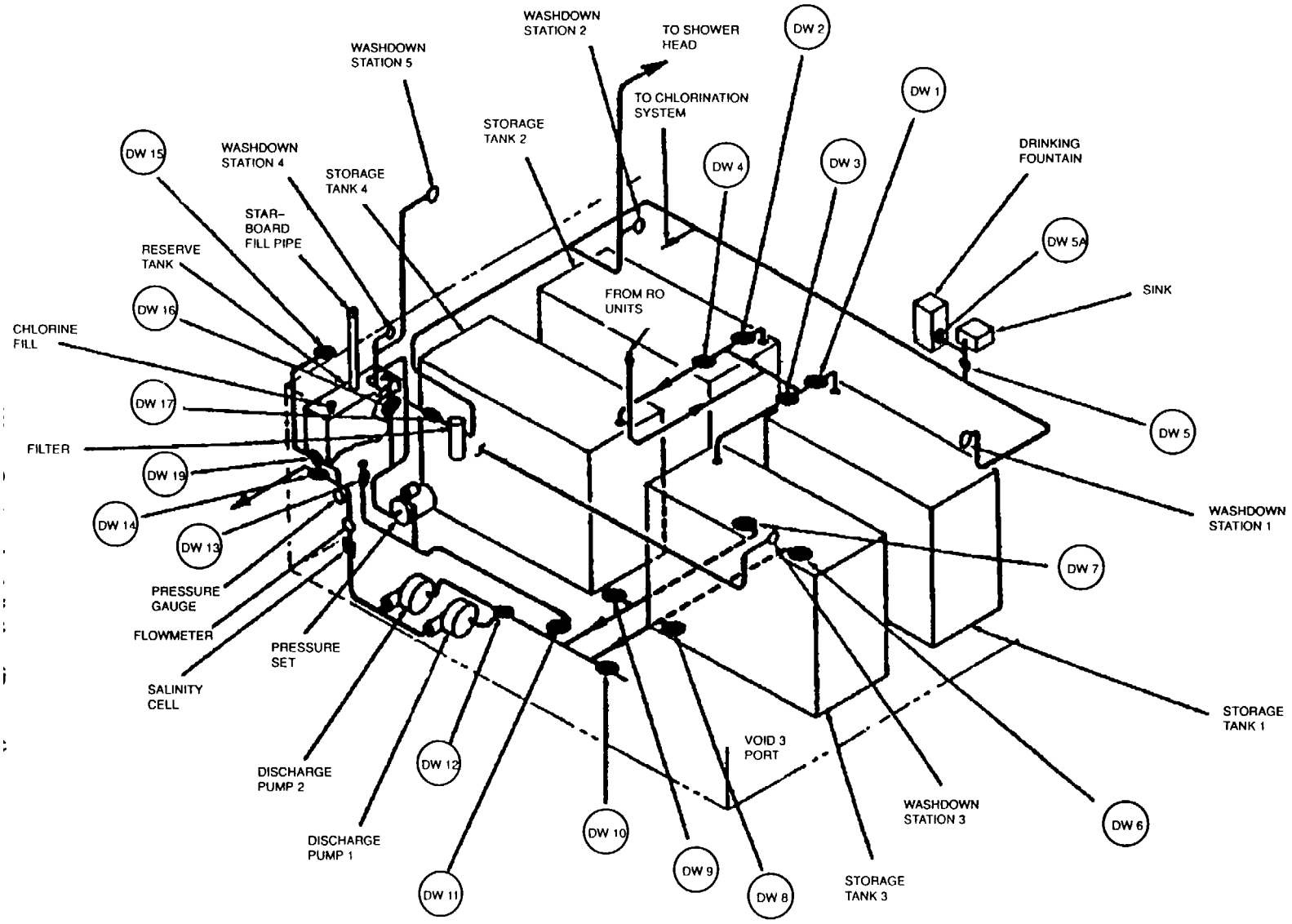


Figure 1-2. Drinking Water System Installation (barge 1)

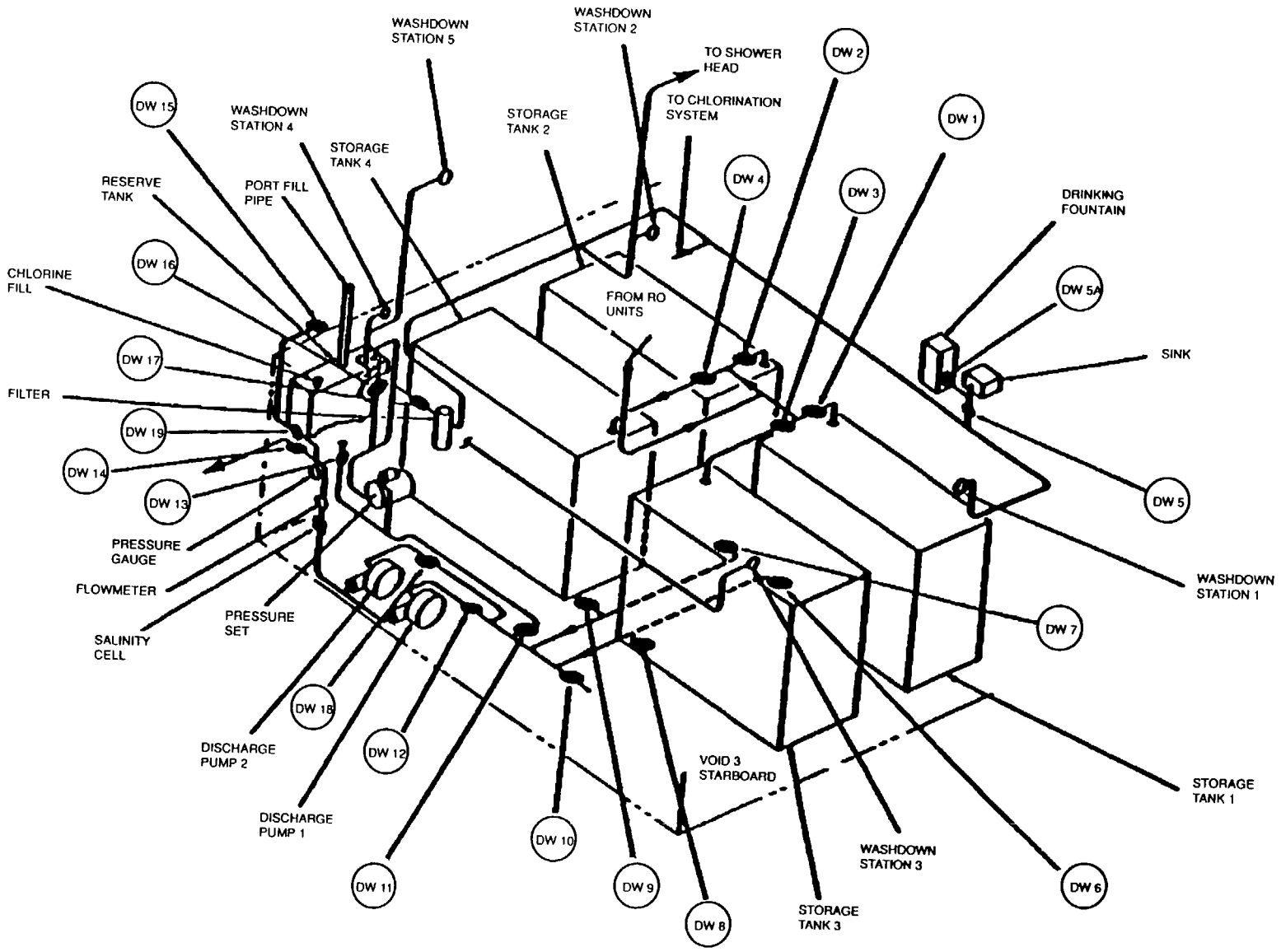


Figure 1-3. Drinking Water System Installation (Barges 2 and 3)

Table 1-1. 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. High and low level switches automatically start/stop discharge pump. Liquid level data is monitored and transmitted to monitoring system	One on each storage tank
250-gallon reserve tank	Stores drinking water for use onboard barge	Void 3 port - near shell
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 and 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
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	Void 3 port - In discharge pump discharge line	Void 3 port - In discharge pump discharge line
Water filter	Filters any impurities in drinking water	Void 3 port - in pressure set discharge line
5 washdown stations	For washing down decks and shore discharge hose during retrieval	Void 3 port - in pressure set discharge line
Shower	Personal hygiene	Weatherdeck forward
2 motor controllers for discharge pumps 1 and 2	Control automatic and manual operation of discharge pumps	Void 3 port on aft bulk head

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

Component	Function	Location
Motor controller	Controls manual operation for pressure set of pressure set	Void 3 port near filter 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 bulk-head

1-8 Capabilities. The total onboard storage capacity Is 15,000 gallons plus 250 gallons reserve. The maximum discharge pressure is 140 pounds per square inch (psi) and the maximum discharge rate with both ROWPU's operating Is 300,000 gallons per day (gpd), 15,000 gallons per hour (gph), or 250 gallons per minute (gpm).

1-9 Limitations. The drinking water system shall not be operated in rough sea conditions exceeding Sea State 3. For acceptable drinking water standards, the chlorine content must be from 5 to 7 parts per million (ppm) and the salinity level must not be greater than 1500 ppm

1-10 Performance characteristics

a Drinking water discharge pump

Rating	260 gpm @250 ft
Revolutions	1,750 rpm
Rating	440 Vac, 3 ph, 60 Hz, 30 HP
Flow sensor capacity	600 gpm, 5 gpm
Pressure sensor rating	0-300 psi

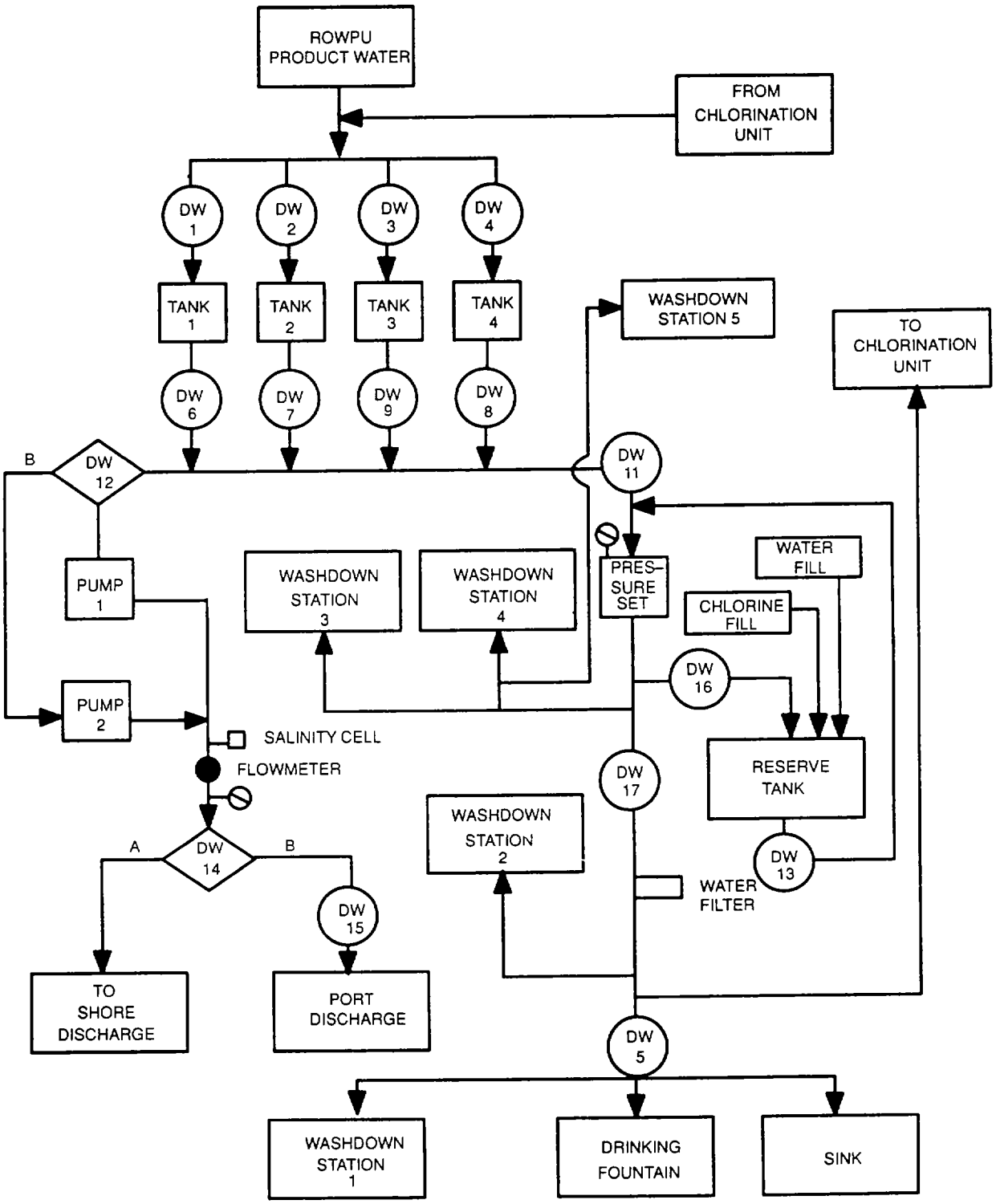


Figure 1-4. Drinking Water System Block Diagram (Barge 1)

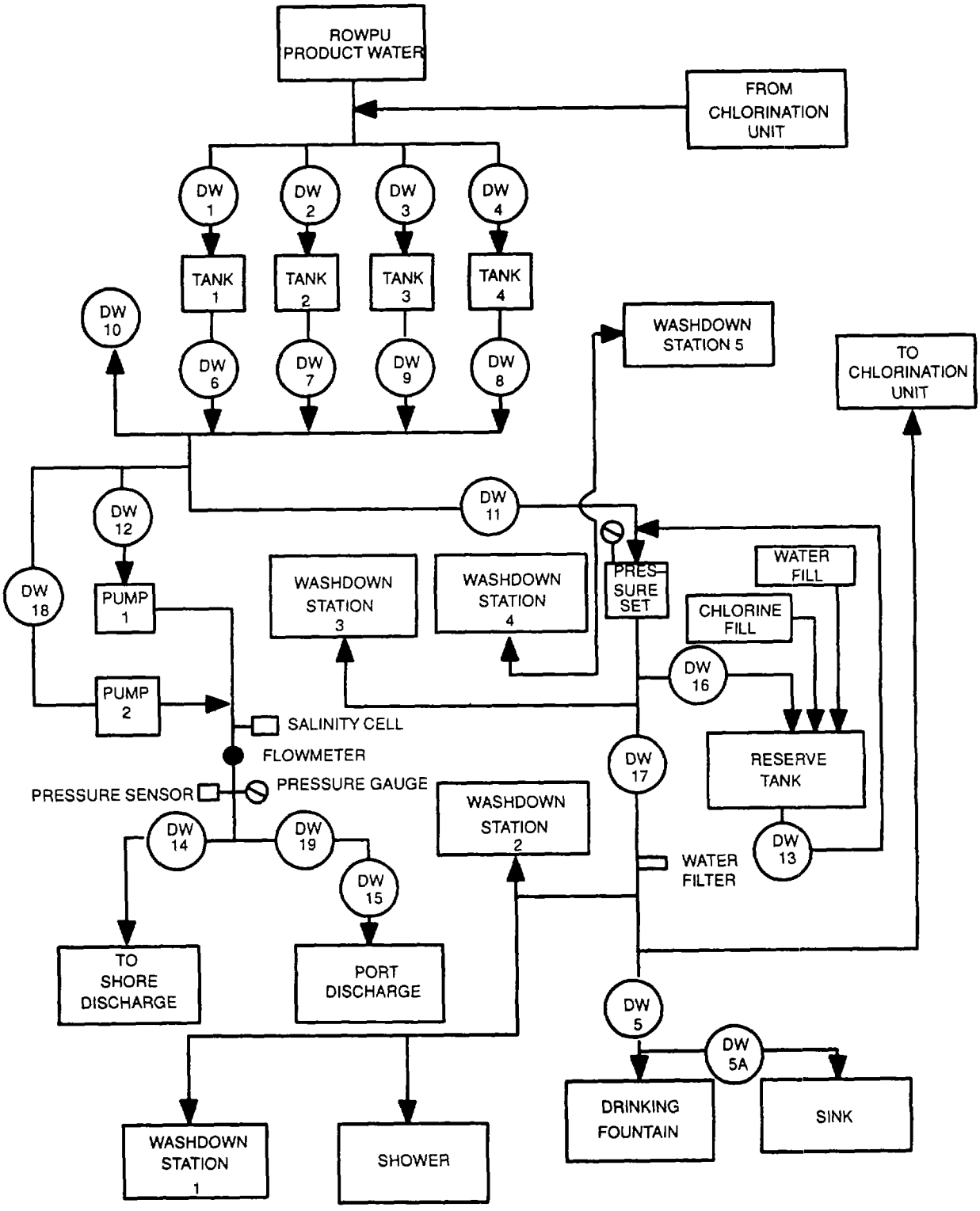


Figure 1-5. Drinking Water System Block Diagram (Barges 2 and 3)

1-11 Equipment specifications

a. Drinking water discharge pump

Manufacturer	Aurora Pump A unit of General Signal Corp.
CAGEC	04579
Supplier	Wood Equipment Co., Inc
Model no.	Series 421, 3x4x14A
Type	Centrifugal
Flow rate	260 gpm
Head	250 ft
Motor manufacturer	General Electric Co
Horsepower	30
Rating	440 Vac, 3 ph, 60 Hz,1,750 rpm
Material	Bronze
Quantity	2

b. Globe valve

Manufacturer	William E Williams Valve Corp
Part no.	Fig. 115F w/cap and chain
Size	2 1/2 in. nominal
Connection	Hose thread
Material	Bronze
Quantity	1

c. Drinking water pressure set

Manufacturer	Dayton Electric Manufacturing Co.
CAGEC	16327
Supplier	W W. Grainger, Inc
CAGEC	25795
Part no.	3P648
Rating	220 Vac, 1 ph, 60 Hz
Tank capacity	30 gal
Quantity	1

d. Water filter

Manufacturer	Brunswick Technetics Filterite Subdivision of Brunswick Corp
CAGEC	05430
Part no	LM020S-1/2 In Cartridge
Cartridge	
Part no	C20P-P
Type	Granular carbon
Material	316 CRES
Quantity	1

e. Gate valve

Manufacturer	William E. Williams Valve Corp
Part no	Fig 141F
Size	4 in nominal
Rating	150 lb
Connection	Flanged
Material	Bronze
Quantity	6

f. Gate valve

Manufacturer	Milwaukee Valve Co, Inc
CAGEC	76364
Part no	1169
Size	1-1/4 in nominal
Rating	150 lb
Connection	Silver braze
Material	Bronze
Quantity	2

g. Washdown station hose bib

Manufacturer	Mott Co of Pennsylvania
CAGEC	76581
Part no	M-222
Size	1/2 in nominal
Material	Bronze
Quantity	5

h. Globe valve

Manufacturer	Crane Co
CAGEC	14959
Part no	4197
Size	3 in nominal
Connection	Flanged
Rating	150 lb
Material	Bronze
Quantity	5

i. Drain cock (tank sample valves)

Military specification	MS35782-2
Type	Center drain
Size	1 in.
Material	Brass
Quantity	5

j. Swing check valve

Military specification	MIL-V-18436
Part no	Group "A" Type III
Size	1-1/4 in. nominal
Connection	Solder joint
Rating	150 lb
Material	Bronze
Quantity	1

k. Storage tank air escape valve

Manufacturer	Robert H. Wager Co.
CAGEC	79128
Part no.	Type 1600W
Size	3-1/2 in. nominal
Connection	Welded
Material	Steel
Quantity	2

l. Sink faucet

Manufacturer	W. W. Grainger, Inc
CAGEC	25795
Part no	1 P942
Type	Single, self-closing
Inlet size	1/2 in
Quantity	1

m. Reserve tank air escape valve

Manufacturer	Robert H Wager Co.
CAGEC	79128
Part no.	Type 1600T
Size	1-1/2 In. nominal
Connection	Threaded
Material	Steel
Quantity	1

n. Globe valve

Manufacturer	Milwaukee Valve Co, Inc.
CAGEC	76364
Part no	1590
Size	1/2 In nominal
Rating	150 lb
Connection	Silver braze
Material	Bronze
Quantity	4

o. Salinity cell

Manufacturer	Beckman Industrial Corp
CAGEC	30646
Supplier	Tracor Marcon, Inc
CAGEC	1U276
Part no.	23236-01
Rating	0-2500 ppm
Connection	3/4 In NPT with cable
Quantity	1

p. Flow sensor (turbine flow meter)

Manufacturer	Kent
Supplier	Tracor Marcon, Inc.
CAGEC	1 U276
Part no	23235-01
Capacity	600 gpm continuous, 5 gpm minimum
Size	4 in. nominal
Rating	125 lb
Connection	Flanged w/pulser
Material	Bronze
Quantity	1

q. Pressure sensor

Manufacturer	Barksdale Controls Division
Supplier	Tracor Marcon, Inc
Part no	22723-01
Rating	0-300 psi
Connection	1/4 in.-18 NPT
Quantity	1

r. Reserve tank liquid level indicator

Manufacturer	Transamerica DeLaval, Inc Gems Sensors Division
CAGEC	04034
Part no	86210, Type 1
Size	1/2 in
Length	44 In
Connection	1/2 In NPT
Quantity	1

s. Storage tank liquid level Indicator

Manufacturer	Transamerica DeLaval, Inc Gems Sensors Division
CAGEC	04034
Part no	86615
Type	C
Indicating length	80 in with Roli, 4-20 MA and high/low level switches
Connection	1 in NPT
Quantity	4

t. Chlorine/ROWPU product water mixer

Manufacturer	Komax Systems, Inc
Part no.	X040-080-PVC-033-33
Type	3 stage, static, inline
Size	4 in nominal
Connection	Flanged
Material	PVC
Quantity	1

u. Shower head

Supplier	McMaster-Carr Supply Co
CAGEC	39428
Part no	3024K11
Type	On-off control
Material	Chrome plated brass
Quantity	1

v. Check valve

Manufacturer	Crane Co.
CAGEC	14459
Part no	4033
Size	4 In. nominal
Connection	Flanged
Rating	150 lb
Material	Bronze
Quantity	2

w. Globe valve

Manufacturer	Milwaukee Valve Co, Inc
CAGEC	76364
Part no	1590
Size	2 in
Connection	Silver braze
Material	Bronze
Rating	150 lb
Quantity	1

x. Washdown adjustment nozzle

Supplier	McMaster-Carr Supply Co
CAGEC	39428
Type	Non-rising sleeve
Size	3/4 in
Material	Bronze
Quantity	2

y. Shower valve

Supplier	McMaster-Carr Supply Co
CAGEC	39428
Part no	4608K32
Type	Quick opening w/chain
Material	Bronze
Quantity	1

z. Globe valve

Manufacturer	Milwaukee Valve Co, Inc
CAGEC	76364
Part no	1502
Size	3/8 in nominal
Connection	Silver braze
Rating	125 lb
Material	Bronze
Quantity	1

aa. Washdown hose

Supplier	McMaster-Carr Supply Co
CAGEC	39428
Part no	7453T17
Diameter	3/4 in
Length	25 ft
Material	Rubber
Quantity	2

ab. Hose cock (void 2 port)

Supplier	McMaster-Carr Supply Co
CAGEC	39428
Size	3/8 in. nominal
Material	Brass
Quantity	1

ac. Discharge pump motor controller

Manufacturer	Square D Co Milwaukee Manufacturing Plant
CAGEC	81487
Part no.	8538-SEA-21-ACFT-440/11OV-3ph-60Hz

Type	Non-fusible disconnect switch w/AUTO/OFF/MANUAL control
Rating	30 Hp, 440 Vac, 3 ph, 60 Hz
Quantity	2
Thermal unit	
Part no.	CC 59 4
Type	Melting alloy
Quantity	3 per motor controller

ad. Discharge pump remote START/STOP control switch

Manufacturer	Square D Co Milwaukee Manufacturing Plant
CAGEC	81487
Part no.	BW 240
Type	Class 9001, NEMA Type 4
Quantity	2

ae. Pressure set motor controller

Manufacturer	Square D Co Milwaukee Manufacturing Plant
CAGEC	81487
Part no.	8538-SBA-21 -AFT-440/110V- 3ph-60Hz
Type	Non-reversing w/nonfusible disconnect switch
Rating	5 HP, 440 Vac, 3 ph, 60 Hz
Quantity	1

1-12 Items furnished

1-12.1 Components installed as part of the drinking water system are listed on the parts list of drawings referenced in Appendix A and In the Components of End Item List In Appendix F of TM 55-'1930-209-14 & P-18.

1-12.2 Common and bulk Items onboard are listed in the Expendable Supplies and Materials List In Appendix E of TM 55-1930-209-14& P-1 8

1-12.3 Repair parts and special tools onboard are listed in the Repair Parts and Special Tools List In Appendix G of TM 55-1930-209-14&P-18

1-13 Items required but not furnished All required Items are furnished

1-14 Tools and test equipment. Use existing tools and equipment onboard. A complete list of tools and test equipment Is in the Tools and Test Equipment List In Appendix D of TM 55-1930-209-14&P-18

CHAPTER 2 DESCRIPTION OF OPERATION

2-1 Drinking water supply. When product water flows from the ROWPU's, chlorine Is added. With the addition of Chlorine, this ROWPU product water becomes drinking water and flows into four storage tanks. As the drinking water In each tank rises, the water level Is shown on a liquid level Indicator mounted on each tank The water level in each tank is also sensed by a level sensor, which transmits a signal to the Equipment Monitoring System (EMS). The EMS video monitor's POTABLE WATER TANKS display page shows the water level, in gallons, In each tank and the total amount In all four tanks

2-2 Drinking water supplied to shore or port discharge valve. With the pump motor controller AUTO/OFF/HAND switch In AUTO, the shore discharge pump automatically transfers drinking water to one of two delivery systems when water In a tank reaches the high level switch. In normal operation, water Is pumped to the stern-mounted shore discharge hose which transports the water to a storage facility ashore In the other option, the water is pumped through a valve on the portside to another vessel or simply overboard When the tanks are being filled and the high level switch does not start the pump, alarms sound when the water In the tank reaches another switch at a higher level These alarms warn the crew that corrective action must be taken. When the tanks are being emptied and the water level reaches the low level switch, the discharge pump automatically stops If this low level switch does not stop the pumps, alarms sound when tank water levels reach another switch at a lower level in the tank

These alarms warn the crew that the pumps must be stopped and corrective action taken The tanks can be emptied manually, when motor controller AUTO/OFF/HAND switch is In HAND, by operating the START and STOP buttons on the local motor controller or the remote switches on the forward bulkhead In the ROWPU space As the drinking water Is discharged by the pump, the following items are monitored water pressure, flow rate, salinity, and total water discharged A pressure sensor measures the discharge water pressure (Indicated on a pressure gauge In void 3 port and shown on the EMS video monitor). The flow rate and total gallons of water pumped are shown on a meter In void 3 port In addition, flow rate and salinity values are shown on the EMS video monitor If either discharge pressure or salinity falls outside acceptable values, visual and sound alarms are activated These alarms warn the crew that corrective action must be taken

2-3 Drinking water for onboard use. Drinking water for use onboard flows from the storage tanks to the pressure set The pressure set pumps water to the drinking fountain and sink In the dayroom, shower on the forward weatherdeck, and washdown stations in the ROWPU space and deckhouse top The pressure set also supplies water to the chlorinating system As a reserve backup, the pressure set pumps water from the reserve tank, If water is not available from the storage tanks This tank also can be filled with water from another vessel or shore supply through a fill pipe located on the weatherdeck near the port discharge valve

CHAPTER 3 OPERATING INSTRUCTIONS

Section I. Operating controls and indicators

3-1. Operating controls and indicators. Information about the drinking water system's operating controls and Indicators is in Table 3-1 Information about system valves (Figures 1-2 and 1-3) is in Table 3-2.

Section II. Prestart procedures

3-2. Prestart procedures

3-2.1. Before performing any drinking water system operation, be sure to check system for damage and perform before operation checks as given in Appendix C

NOTE

EMS monitors water level In each storage tank as well as discharge water pressure, flow rate, salinity, and total water discharged.

3-2.2. Make sure EMS is operating If not, start up by following procedures In TM 55-1930-209-14&P-11

Section III. Operating procedures

3-3. Normal operating procedures. Procedures for operating this system are in the following paragraphs

a. Filling drinking water storage tanks - paragraph 3-4

b. Discharging drinking water to shore - paragraph 3-5

c. Discharging drinking water through port discharge valve - paragraph 3-6.

Table 3-1. Operating Controls and Indicators

Control/Indicator	Figure	Location
Discharge pump 1 and 2 motor controllers	3-1	Void 3 port - aft bulkhead
Discharge pump 1 and 2 remote START/STOP switches	3-1	ROWPU space - forward bulkhead near workshop door
Drinking water pump and tank selector switch	3-1	Void 3 port - aft bulkhead
Pressure set motor controller	3-1	Void 3 port - forward bulkhead
Tank liquid level indicator	3-2	Void 3 port - one each on storage tanks 1 and 3 and reserve tank. Void 3 starboard - one each on storage tanks 2 and 4
Discharge pressure gauge	3-3	Void 3 port - aft bulkhead
Discharge pressure sensor	3-3	Void 3 port - aft bulkhead
Discharge flow rate meter	3-3	Void 3 port - aft bulkhead
EMS SYSTEM STATUS display page shows discharge pressure, flow rate, and total water discharged	3-3	ROWPU space - forward bulkhead outboard of workshop door
Discharge salinity cell	3-4	Void 3 port - aft bulkhead
EMS SALINITY display page on video monitor	3-4	ROWPU space - forward bulkhead outboard of workshop door
EMS POTABLE WATER TANKS display page on EMS video monitor	3-5	ROWPU space - forward bulkhead outboard of workshop door
Pressure set pressure gauge	3-6	Void 3 port - on pressure set

Table 3-2. Drinking Water System Valves

Type	Figures 1-2 and 1-3 Callout	Location	Label Identification and Valve Function
3-in globe valve	DW1	Void 3 port (Barge 1) starboard (Barges 2 & 3) - in storage tank 1 fill line on top of tank	STORAGE TANK 1 FILL: Allows chlorine treated product water from ROWPU's to flow into tank 1 and isolates tank
3-in globe valve	DW2	Void 3 starboard (Barge 1) port (Barges 2 & 3) - in storage tank 2 fill line on top of tank	STORAGE TANK 2 FILL Allows Chlorine treated product water from ROWPU's to flow into tank 2 and Isolates tank
3-in globe valve	DW3	Void 3 port (Barge 1) starboard (Barges 2 & 3) - In storage tank 3 fill line on top of tank	STORAGE TANK 3 FILL: Allows Chlorine treated product water from ROWPU's to flow into tank 3 and Isolates tank
3-in globe valve	DW4	Void 3 starboard (Barge 1) port (Barges 2 & 3) - in storage tank 4 fill line on top of tank	STORAGE TANK 4 FILL Allows chlorine treated product water from ROWPU's to flow into tank 4 and Isolates tank
1/2-in globe valve	DW5	Dayroom - In water line between pressure set and drinking fountain	DAYROOM SUPPLY Allows drinking water to flow to and Isolates drinking fountain and sink
3/8-in globe valve (Barges 2 and 3 only)	DW5A	Dayroom - In water line to fountain isolates drinking fountain	DRINKING FOUNTAIN SUPPLY Allows drinking water to flow to
4-in gate valve	DW6	Void 3 port (Barge 1) starboard (Barges 2 & 3) - in storage tank 1 drain line near tank	STORAGE TANK 1 DRAIN Allows drinking water to drain from tank 1 and Isolates tank
4-in gate valve	DW7	Void 3 starboard (Barge 1) port (Barges 2 & 3) - in storage tank 2 drain line near tank	STORAGE TANK 2 DRAIN Allows drinking water to drain from tank 2 and Isolates tank
4-in gate valve	DW8	Void 3 port (Barge 1) starboard (Barges 2 & 3)- In storage tank 3 drain line near tank	STORAGE TANK 3 DRAIN Allows drinking water to drain from tank 3 and isolates tank
4-in gate valve	DW9	Void 3 starboard (Barge 1) (Barges 2 & 3) - in storage tank 4 drain line near tank	STORAGE TANK 4 DRAIN gate Allows drinking water to drain from tank 4 and Isolates tank
2-in globe valve (Barges 2 and 3 only)	DW10	Void 3 starboard - under deck in storage tank drain line near fuel pump	STORAGE TANK DRAIN TO BILGE. Allows drainage of drinking water from storage tank(s) to bilge
1-1/4 in gate valve	DW11	Void 3 port - in pressure set inlet line between main drinking water supply line and pressure set	PRESSURE SET SUPPLY Allows drinking water to flow to pressure set and Isolates pressure set
4-in ball valve (3-way)	DW12	Void 3 port - In discharge pump suction line near pump 1	DISCHARGE PUMP I SUPPLY Allows pump to drain drinking water from storage tank(s)

Table 3-2. Drinking Water System Valves (continued)

Type	Figures 1-2 and 1-3 Callout	Location	Label Identification and Valve Function
1-1/4-in gate valve	DW13	Void 3 port - in reserve tank drain line reserve tank	RESERVE TANK DRAIN: Allows drinking water to drain from
3-in globe valve	DW14	Void 3 port - in pump shore discharge line stern shore discharge hose	STERN OR PORT DISCHARGE Allows drinking water to flow to
2 1/2-in globe valve	DW15	Weatherdeck - portside near stern	PORT OVERBOARD DISCHARGE: Allows drinking water to be discharged overboard or to vessel tied alongside
1/2-in globe valve	DW16	Void 3 port - In reserve tank fill line	RESERVE TANK SUPPLY Allows drinking water from pressure set to flow Into reserve tank and isolates tank
1/2-in globe valve	DW17	Void 3 port - in dayroom supply line near pressure set	PRESSURE SET DISCHARGE Allows drinking water to flow from water pressure set to dayroom and chlorination unit
4-in gate valve (Barges 2 and 3 only)	DW18	Void 3 port - In discharge pump suction line near pump 2	DISCHARGE PUMP 2 SUPPLY Allows pump to drain drinking water from storage tank(s)
3-in globe valve (Barges 2 and 3 only)	DW19	Void 3 port - in pump overboard discharge line	DISCHARGE PUMP TO PORT OVERBOARD Allows drinking water to flow to port overboard discharge valve
3/8-in spigot		In void no 2 port	To wash down chlorination unit and void no 2 port deck plates
Washdown hose bib		ROWPU space - on each of 4 washdown stations, deckhouse top-2 washdown stations	For connection of washdown station hoses
Washdown adjustment nozzle		On washdown hose	For washdown station hose
Drain cock		Void 3 port and starboard	Sample valve on each storage tank and reserve tank

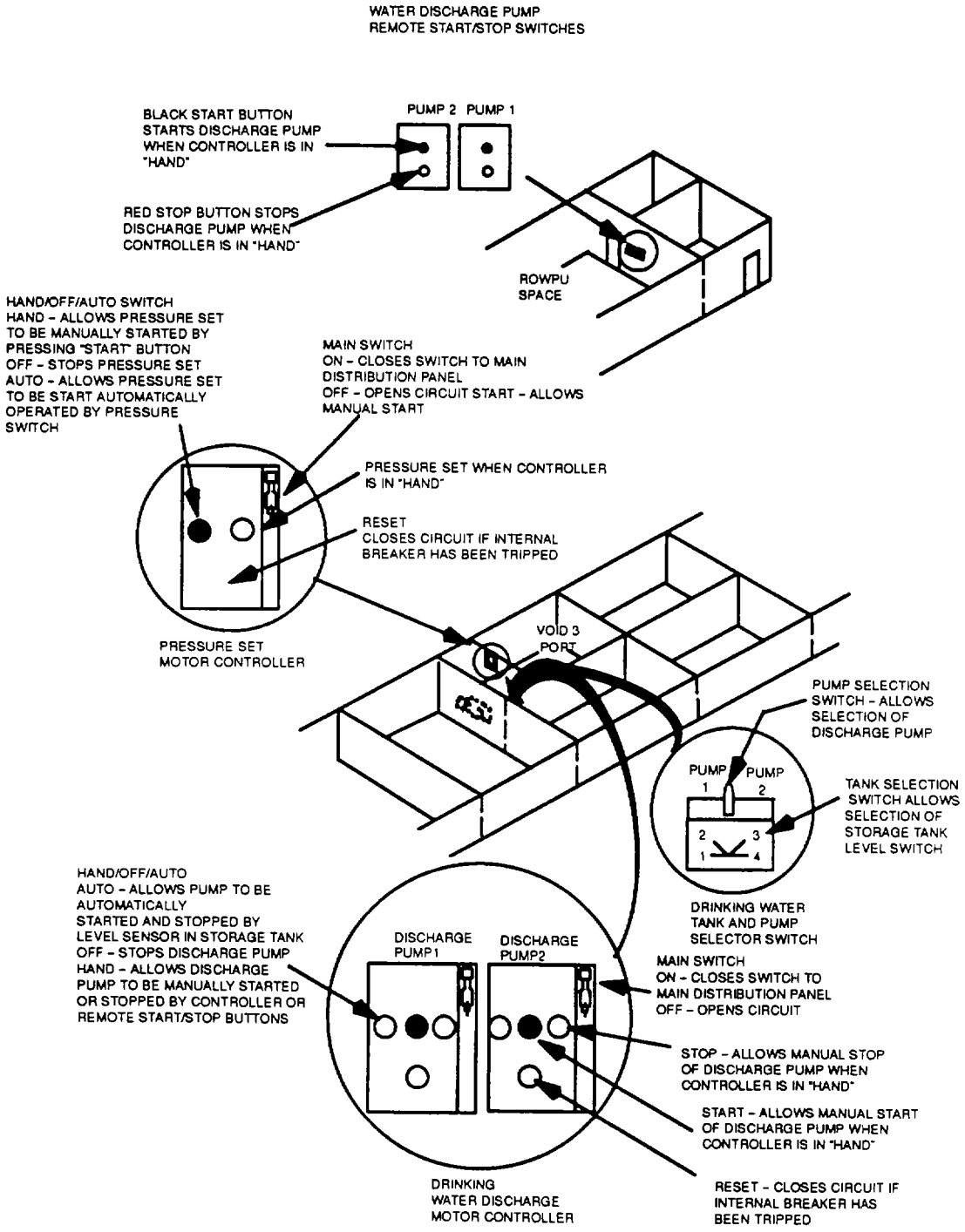


Figure 3-1. Drinking Water System Electrical Controls

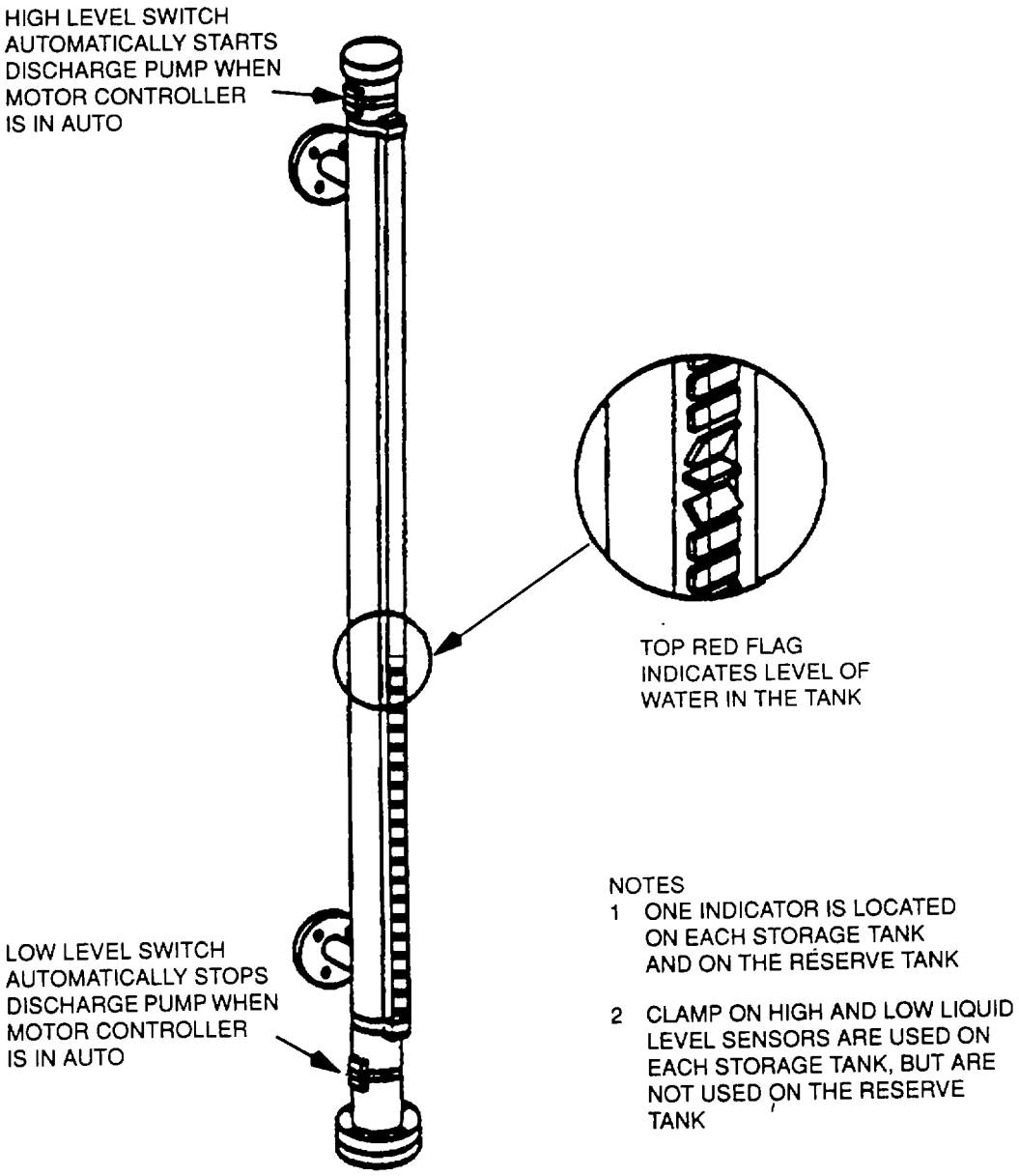
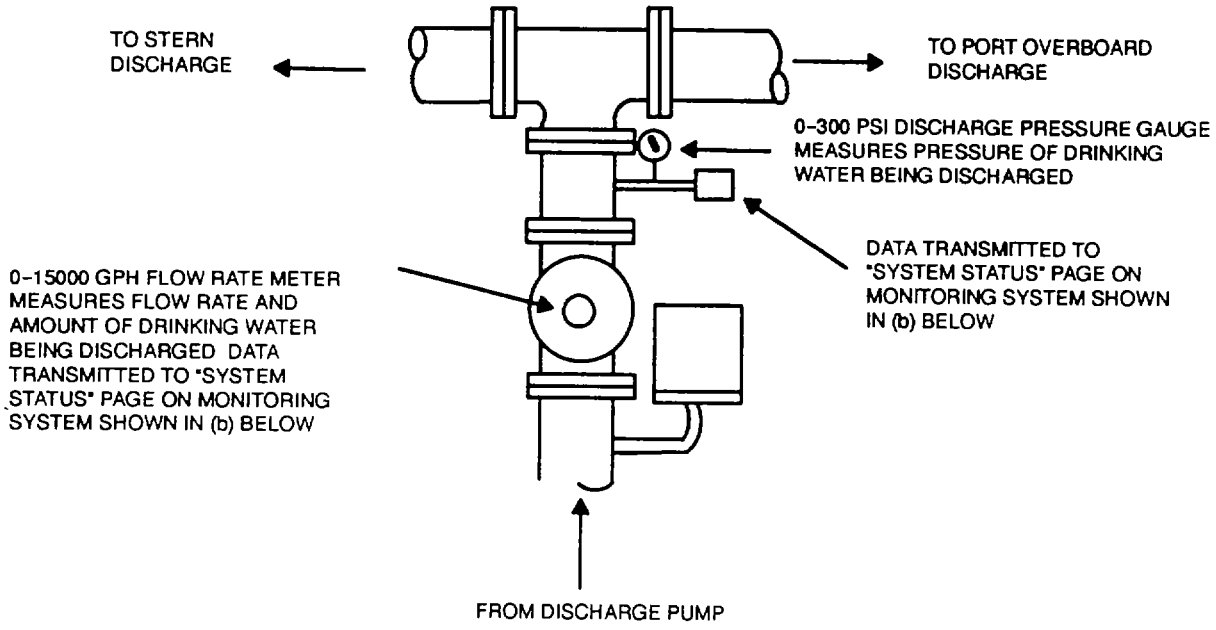
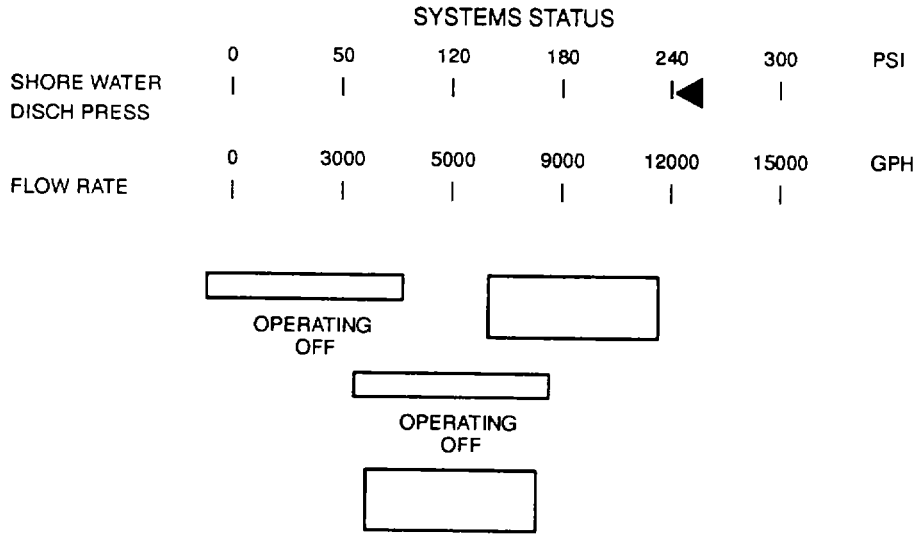


Figure 3-2. Tank Liquid Level Indicator

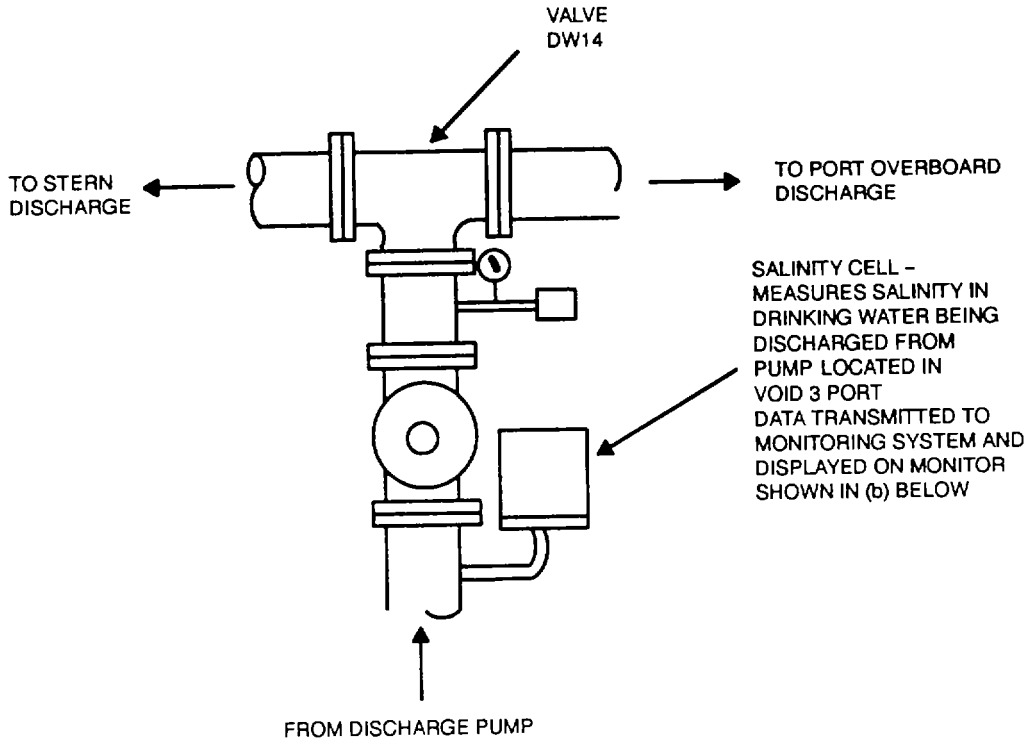


(a) DISCHARGE PRESSURE AND FLOW RATE INDICATORS

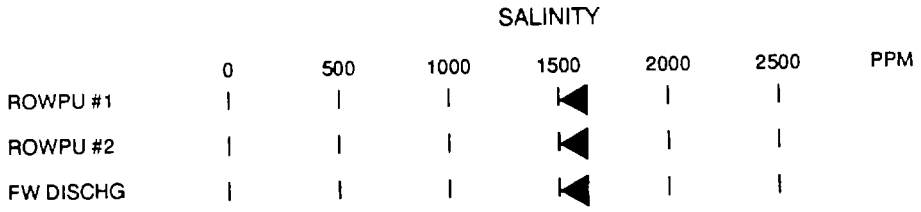


(b) MONITORING SYSTEM DISCHARGE PRESSURE DISPLAY FLOW RATE AND TOTAL WATER DISCHARGE

Figure 3-3. ROWPU Control Station (ROWPU 1 Station Shown)



(a) SALINITY CELL



NOTE FW DISCHG = DRINKING WATER DISCHARGE SALINITY MEASURED BY SALINITY CELL IN PUMP DISCHARGE LINE SHOWN IN (a) ABOVE

(b) SALINITY DISPLAY ON MONITORING SYSTEM

Figure 3-4. Drinking Water Salinity Sensor and Monitoring System Display

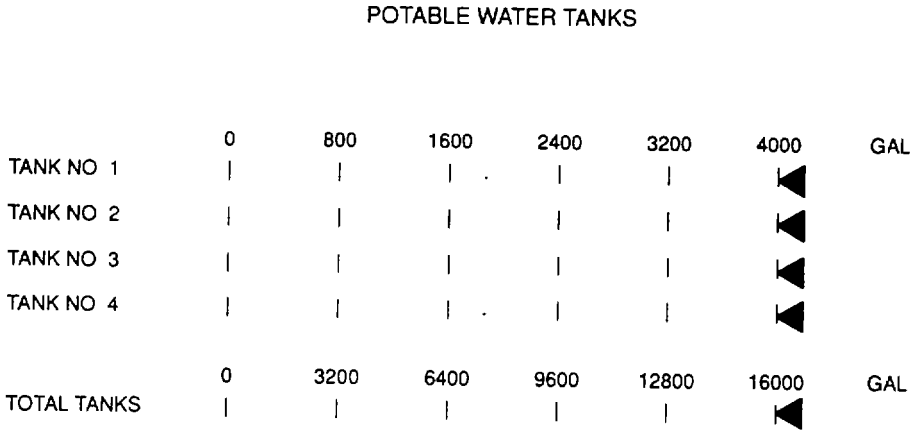


Figure 3-5. Drinking water Pressure Set Pressure Gauge

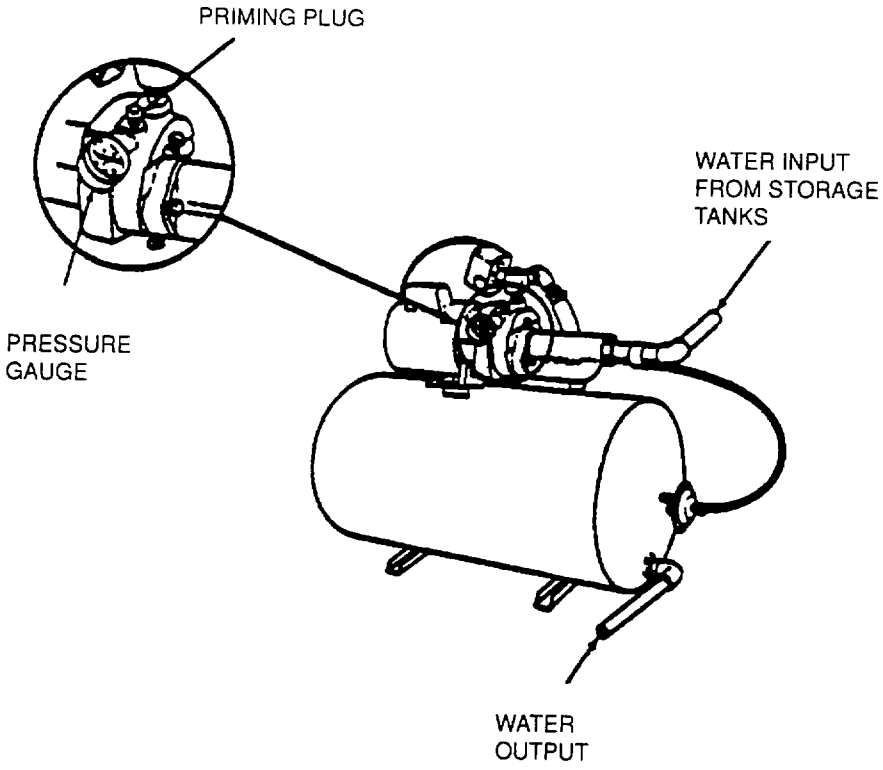


Figure 3-6. Drinking Water Pressure Set Pressure Gauge

d. Supplying storage tank drinking water to pressure set for use onboard barge - paragraph 3-7.

e. Filling drinking water reserve tank - paragraph 3-8.

f. Supplying drinking water onboard barge from reserve tank- paragraph 3-9.

g Supplying drinking water to dayroom, washdown stations, chlorination unit, and shower - paragraph 3-10.

3-4. Filling drinking water storage tanks

a. Open appropriate drinking water valves as shown in table below. Make sure valves of tank(s) not to be filled are closed.

To fill drinking water storage tank	Open valves
1	DW1, DW6
2	DW2, DW7
3	DW3, DW8
4	DW4, DW9

b. Close drinking water valves DW11, DW12, and DW18 (Barges 2 and 3 only) and make sure drinking water valves DW10 and DW13 are closed.

NOTE

Storage tanks are now ready to be filled with water from ROWPU 's.

c. Make sure chlorine Is being added to the ROWPU product water before water enters storage tanks. If chlorination system Is not operating, start up by following procedures In TM 55-1930-209-14&P-4.

NOTE

EMS monitors and indicates water level in each storage tank (Figure 3-5) and amount of chlorine in water entering tanks.

d. Make sure EMS Is operating and monitoring water level in each tank and amount of chlorine In water entering tanks If not, start up by following procedures in TM 55-1930-209-14&P-11.

NOTE

Water level in each tank is also shown on each tank's liquid level indicator.

e. As tanks are being filled, periodically check EMS video monitor POTABLE WATER TANKS display page for water levels and CHLORINE STATUS display page to make sure chlorine input Is 5 to 7 ppm.

NOTE

If water level rises above full level In tank(s) as shown on EMS video monitor, horn and strobe light in ROWPU space are activated and buzzer In dayroom sounds. In addition, EMS keyboard alarm sounds and video monitor automatically switches to ALARM page which shows full tank levels alarm condition In flashing double intensity. POTABLE WATER TANKS key on keyboard flashes red.

f. When alarms are energized, stop filling tanks.

g. Press red flashing POTABLE WATER TANKS key on keyboard to change ALARMS display page back to POTABLE WATER TANKS alarm display page.

h. Press ACK key on keyboard to stop alarms and automatically change red flashing POTABLE WATER TANKS key to white and flashing display on video monitor POTABLE WATER TANKS page to double intensity.

NOTE

Display stays double intensity until abnormal condition is corrected.

3-5. Discharging drinking water to shore

a. Make sure discharge hose is properly deployed, valves are properly set, and shore facility is ready to receive drinking water.

b. Make sure storage tanks are being tilled per instructions In paragraph 34.

NOTE

EMS monitors water level in each storage tank and amount of chlorine In water entering tanks. It also monitors salinity, flow rate, pressure, and total amount of drinking water being discharged.

c. Make sure EMS Is operating If not, start up by following procedures in TM 55-1930--209-14&P-11.

d. Position drinking water valves as follows

o = open x = closed

Discharge pump used	Valve no DW12	DW 14	DW18*	DW19*
1	o	o	x	x
2	x	o	o	x

'On Barges 2 and 3 only

e. Open drain valve(s) of storage tank(s) to be drained as shown In table below Make sure valves of tank(s) not being drained are closed

Tank	1	2	3	4
Valve no	DW6	DW7	DW8	DW9

CAUTION

To prevent operating shore discharge pump when dry, make sure that drain valve (DW6, DW7, DW8, or DW9) of tank selected on selector switch Is open.

f. On drinking water tank and shore discharge pump selector switch (Figure 3-1), position switches as follows

(1) Set pump selector switch to pump 1 or pump 2.

CAUTION

Normally, all four tanks are filled and drained at same time. In this case, tank selector switch can be positioned to any of the four tank numbers (1, 2, 3, or 4). However, when all four tanks are not being drained, tank selector switch must be positioned to a tank number of any of tanks being drained.

(2) Position tank selector switch (Figure 3-1) to number 1, 2, 3, or 4 tank to be drained. High and low level switches on liquid level Indicator (Figure 3-2) of tank selected then automatically start and stop pump selected In step 1.

(3) Close switchboard circuit breaker P9 for shore discharge pump 1, or circuit breaker P15 for shore discharge pump 2.

NOTE

When high level switch senses a full tank, discharge pump starts automatically if motor controller HAND/OFF/AUTO switch is on AUTO. When low level switch senses tank is empty, pump stops automatically.

g. On discharge pump motor controller of pump selected in step f(1), close main switch (Figure 3-1) to ON. Then position HAND/OFF/AUTO switch to AUTO.

NOTE

Tank(s) are manually drained when motor controller HAND/OFF/AUTO switch is on HAND. Discharge pump is started or stopped by pushing START or STOP button on motor controller or pushing START or STOP button on ROWPU space remote START/STOP switch (Figure 3-1) on ROWPU space forward bulkhead.

NOTE

As tank(s) Is/are being filled and drinking water is being discharged to shore, EMS continuously monitors water level In tanks, discharge flow rate, water discharge pressure, and salinity.

h. As drinking water Is being discharged to shore, periodically check the following:

(1) On EMS video monitor, check following Indications.

Page	Indication
POTABLE WATER TANKS	Level In each tank Total level in all four tanks
CHLORINE STATUS	Chlorine content between 5 and 7 ppm
SALINITY	Salinity of drinking water being discharged not greater than 1000 ppm
SYSTEM STATUS	Water pressure for shore discharge flow is not greater than 140 psi, flow rate is 250 gpm (15,000 gph) and total amount discharged is being indicated

(2) If EMS indications are not within these tolerances, take corrective action Periodically, manually check chlorine content and salinity according to TM 5-6630-215-12. Obtain sample at storage tank sample valve If readings do not agree with EMS reading, take corrective action.

(3) On tank liquid level indicator, compare level In each tank to EMS reading If not in agreement, take corrective action.

(4) On flow meter In void 3 port, check flow rate and total water discharged and compare to EMS reading If not In agreement, take corrective action.

NOTE

Level in each tank is monitored by a liquid level sensor. When water rises above the level that starts, or falls below the level that stops, the discharge pump, EMS visual alarms flash and audible alarms sound. Alarms are also activated when discharge pressure or salinity falls outside acceptable values. EMS video monitor automatically changes to ALARM page which displays problem condition In flashing double intensity. In addition, POTABLE WATER TANKS key flashes red and sounds an alarm. These alarms warn crew that appropriate corrective action must be taken.

i. If alarms are activated, perform procedures (1), (2), (3), (4), or (5) as appropriate

(1) If alarms are activated by tank high liquid level switch due to a full tank(s), while shore discharge pumps are operating normally, perform the following

(a) Stop discharge pump by moving HAND/OFF/AUTO switch on motor controller to OFF

(b) Press red flashing POTABLE WATER TANKS key on EMS keyboard to change EMS video monitor ALARM display page back to POTABLE WATER TANKS display page

(c) Press EMS keyboard ACK key to stop alarms and automatically change red flashing POTABLE WATER TANKS key to white and stop flashing display on video monitor POTABLE WATER TANKS display page This display (tank no 1,2, 3, or 4) continues to show in double intensity until problem is solved

(d) Check video monitor POTABLE WATER TANKS display page to find the overflowing tank(s)

(e) Isolate overflowing tank(s) by closing drinking water valves as follows'

Tank 1 close DW 1 and DW 6,

Tank 2 close DW 2 and DW 7,

Tank 3 close DW 3 and DW 8,
Tank 4 close DW 4 and DW 9.

(f) Continue discharging drinking water from remaining tanks by starting discharge pump by turning HAND/OFF/AUTO switch on motor controller to AUTO.

(g) Drain off enough water from isolated tank(s) through sampling valve(s) until water level reaches normal high level as indicated on liquid level Indicator

(h) Troubleshoot as provided In Chapter 4, Table 4-1, problem 13.

(i) Upon completion of troubleshooting, open valves closed in step (e) when remaining tanks are as full as isolated tank(s).

(2) If alarms are activated by tank high liquid level switch due to a malfunctioning pump, perform the following

(a) Stop discharge pump by moving HAND/OFF/AUTO switch on motor controller to OFF.

(b) Press red flashing POTABLE WATER TANKS key on EMS keyboard to change EMS video monitor ALARM display page back to POTABLE WATER TANKS display page.

(c) Press EMS keyboard ACK key to stop alarms and automatically change red flashing POTABLE WATER TAN KS key to white and Stop flashing display on video monitor POTABLE WATER TANKS display page. This display (tank 1, 2, 3, or 4) will continue to show In double intensity until problem Is solved.

(d) On Barge 1, position valve DW12 for discharge pump 1 or 2 On Barges 2 and 3, position valve DW12 for pump 1 or valve DW18 for pump 2 to allow water to bypass nonfunctioning pump.

(e) Reposition pump selection switch (Figure 3-1).

(f) On discharge pump motor controller of pump selected in step (e) above, close main switch to ON. Then position HAND/OFF/AUTO switch to AUTO. Discharge pump starts and stops automatically.

(g) Troubleshoot as provided in Chapter 4, Table 4-1, problem 7.

(3) If alarms are energized by tank low liquid level switch, while shore discharge pumps are operating normally, perform the following:

(a) Stop discharge pump by moving HAND/OFF/AUTO switch on motor controller to OFF.

(b) Press red flashing POTABLE WATER TANKS key on EMS keyboard to change EMS video monitor ALARM display page back to POTABLE WATER TANKS display page

(c) Press ACK key on EMS keyboard to stop alarms and automatically change red flashing POTABLE WATER TANKS key to white and stop flashing display on video monitor POTABLE WATER TANKS display page This display (tank 1, 2, 3, or 4) continues to show in double intensity until problem is solved.

(d) Troubleshoot as provided in Chapter 4, Table 4-1, problem 14.

(e) When drinking water is to be discharged again, start shore discharge pump by positioning HAND/OFF/AUTO switch on motor controller to AUTO.

(4) If alarms are energized by salinity sensor, perform the following:

(a) Stop discharge pump by moving HAND/OFF/AUTO switch on motor controller to OFF.

(b) Press red flashing SALINITY key on EMS keyboard to change EMS video monitor ALARM display page back to SALINITY display page.

(c) Press ACK key on EMS keyboard to stop alarms and automatically change red flashing SALINITY key to white and stop flashing display on video monitor SALINITY display page. This FW DISCHG display continues to show in double intensity until problem is solved.

(d) Troubleshoot as provided in Chapter 4, Table 4-1, problem 3.

(e) When drinking water IS to be discharged again, start shore discharge pump by positioning HAND/OFF/AUTO switch on motor controller to AUTO.

(5) If alarms are energized by pressure sensor, perform following steps'

(a) Stop discharge pump by moving HAND/OFF/AUTO switch on motor controller to OFF.

(b) Press red flashing SYSTEM STATUS key on EMS keyboard to change EMS video monitor ALARM display page back to SYSTEM STATUS display page.

(c) Press ACK key on EMS keyboard to stop alarms and automatically change red flashing SYSTEM STATUS key to white and stop flashing display on video monitor SYSTEM STATUS display page This DISCH PRESS display continues to show in double intensity until problem is solved.

(d) Troubleshoot as provided In Chapter 4, Table 4-1, problem 4.

(e) When drinking water Is to be discharged again, start shore discharge pump by positioning HAND/OFF/AUTO switch on motor controller to AUTO

j. When discharge pump operation Is to be stopped, set HAND/OFF/AUTO switch to OFF

3-6. Discharging drinking water through port discharge valve

3-6.1. Discharging drinking water to another vessel

a. Perform steps b and c In paragraph 3-5

b. Close valve DW14 (Barges 2 and 3 only).

c. Perform step f In paragraph 3-5

d Remove protective cap from discharge line at valve DW15.

e. Open valve DW19 on Barges 2 and 3. On Barge 1, position valve DW14 to port discharge

f. Connect hose from other vessel to valve line.

g Open valve DW15.

NOTE

If drinking water is to be supplied through valve DW15 to another vessel, and this valve outlet has not been used recently, flush system for several minutes before connecting discharge hose. After this has been completed, hook up discharge hose from other vessel.

h. On Barge 1, position valve DW12 for discharge pump 1 or 2 On Barges 2 and 3, open valve DW12 and close DW18 to use discharge pump 1 Open valve DW18 and close DW12 to use discharge pump 2.

i. Start discharging drinking water and monitor water being discharged as given in steps g thru i In paragraph 3-5

j. Stop discharge pump operation as necessary, by setting HAND/OFF/AUTO switch to OFF

k. Close valve DW15

I. Disconnect fill hose

m. Reinstall cap

n. Close valve DW19 (Barges 2 and 3 only).

3-6.2. Emptying storage tanks by discharging overboard

a. Open appropriate valve(s) of storage tank(s) to be drained, as shown in table below.

Tank.	1	2	3	4
Valve no	DW6	DW7	DW8	DW9

b. Close valve DW14 (Barges 2 and 3 only)

c. Remove protective cap from discharge line at valve DW15 and open valve.

d. Set shore discharge pump selector switch (Figure 3-1) to pump 1 or 2.

e. Open valve DW19 on Barges 2 and 3 On Barge 1, position valve DW14 to port discharge.

NOTE

To prevent low level alarm from sounding and flashing while tank is being emptied, ALARM RELAY circuit breaker 4P14 on 24 Vdc power panel must be open (OFF).

f. On Barge 1, position valve DW12 for discharge pump 1 or 2 On Barges 2 and 3, open valve DW12 and close DW18 to use discharge pump 1. Open valve DW18 and close DW12 to use discharge pump 2

g. Close switchboard circuit breaker P9 for shore discharge pump 1 or circuit breaker P15 for shore discharge pump 2.

h. In void 3 port, on shore discharge pump motor controller for pump selected In d, start pump by setting HAND/OFF/AUTO switch to HAND

i. Start discharge pump by pushing START button on motor controller.

CAUTION

While emptying storage tank(s), with alarm circuitry turned off, liquid level Indicator on tank(s) must be observed to prevent running pump dry.

j. When tank Is dry, set HAND/OFF/AUTO switch on motor controller to OFF

k. Close valves DW15 (all barges) and DW19 (Barges 2 and 3 only).

I Reinstall cap on overboard discharge outlet.

3-7 Supplying storage tank drinking water to pressure set for use on barge

a. If drinking water is not being discharged from storage tanks, perform steps (1) and (2) If drinking water is being discharged from the storage tanks, go to step b.

(1) Check liquid level Indicator to be sure storage tank(s) contains water.

(2) Open appropriate valve(s) of storage tank(s) to be drained, as shown in table below.

Tank	1	2	3	4
Valve no:	DW6	DW7	DW8	DW9

b. Open valve DW11

c. Close reserve tank valve DW13

d. Close power panel 1 circuit breaker 11 P5 to provide power to drinking water pressure set motor controller

e. Prime water pressure set as follows, If necessary.

(1) Position HAND/OFF/AUTO switch on pressure set motor controller to HAND.

(2) Start pressure set by pushing START button on motor controller

(3) Close valve DW16

(4) Open priming port petcock on pressure set

(5) Close petcock when steady flow appears

f. Open drinking water valves DW5, DW5A (Barges 2 and 3 only), and DW17.

g. Position pressure set motor controller HAND/OFF/AUTO to AUTO

NOTE

Pressure set automatically supplies on demand drinking water to dayroom fountain and sink, washdown stations in ROWPU space and on deckhouse top, shower on forward weatherdeck, and void 2 port chlorination unit.

3-8. Filling drinking water reserve tank

NOTE

Drinking water In reserve tank is for onboard use when drinking water Is not available from storage tanks

3-8.1. Filling drinking water reserve tank from storage tanks

CAUTIONS

Water level in reserve tank must be checked daily by monitoring liquid level indicator. Add water if necessary. Chlorine content must also be checked daily.

Obtain sample at reserve tank sample valve and check chlorine content according to TM 5-6630-215-12. Add chlorine through chlorine fill on top of reserve tank if chlorine content is not between 2 and 5 ppm.

a. Check liquid level indicator on storage tank(s) to make sure tank(s) contains drinking water

b. Make sure pressure set motor controller HAND/OFF/AUTO switch is OFF

c. Close valves DW13 and DW17

d. Open valves DW11 and DW16

e. Close power panel 1 circuit breaker 11 P5 to provide power to pressure set motor controller

NOTE

Pressure set automatically fills reserve tank.

f. Position HAND/OFF/AUTO switch on pressure set controller to AUTO and pressure set automatically fills reserve tank.

g. When reserve tank Is full, as shown on liquid level indicator, close DW16

h. When drinking water storage tanks are full, open drinking water valves DW11 and DW17. Pressure set supplies onboard drinking water directly from storage tanks and bypasses pressure set reserve tank.

3-8.2. Filling drinking water reserve tank from other vessel or shore supply

NOTE

If drinking water Is not available from storage tanks, reserve tank can be filled from other available drinking water supplies.

a. Remove cap from water fill pipe located near port discharge valve DW15 on weatherdeck.

b. Attach or insert hose from drinking water supply.

c. Close valves DW13 and DW16.

NOTE

Use telephone headsets for communications between weatherdeck and void 3 port.

d. When reserve tank is full, as indicated by reserve tank liquid level indicator, stop filling tank

e. Reinstall cap on water fill pipe.

3-9 Supplying drinking water on barge from reserve tank

NOTE

Drinking water in reserve tank is for use onboard barge when water Is not available from storage tank(s).

a. Obtain sample of drinking water from reserve tank at sample valve Check chlorine content according to TM 5-6630-215-12 Add chlorine through chlorine fill on top of reserve tank If chlorine content Is not between 5 and 7 ppm.

b. Make sure filter cartridge Is clean Replace if necessary

c. Close valves DW11 and DW16

d. Open drinking water valves DW5, DW5A (on Barges 2 and 3 only), DW13, and DW17

NOTE

Pressure set automatically supplies, on demand, drinking water to dayroom, washdown stations, chlorination unit, and shower.

e. Close power panel 1 circuit breaker 11 P5 to provide power to pressure set motor controller.

f. Set HAND/OFF/AUTO switch on pressure set motor controller to AUTO.

g. Make sure pressure set is operating normally.

NOTE

Pressure set automatically stops when reserve tank Is empty. Before It becomes empty, refill by following procedures in paragraph 3-8.

3-10. Supplying drinking water to dayroom, washdown stations, chlorination unit, and shower

a. Make sure drinking water Is In storage tanks or reserve tank.

b. Perform steps a thru g In paragraph 3-7 to supply drinking water from storage tank(s) Perform steps a thru g In paragraph 3-9 to supply drinking water from reserve tank

c. Supply drinking water as follows

(1) At dayroom sink, open valve DW5 and open faucet

(2) At dayroom fountain, open valves DW5 and DW5A (on Barges 2 and 3 only) and operate fountain.

(3) At ROWPU and deckhouse top washdown stations, open bib at each station

(4) At shower on bow weatherdeck, open valve on showerhead

(5) At chlorination unit, open valve as directed by procedures In TM 55-1930209-14&P-4.

3-11. Shutdown procedures.

a. If system will be shut down for less than 12 hours and personnel will remain onboard'

(1) Stop ROWPU systems according to procedures in TM 55-1930-209-14&P-3 to stop drinking water from flowing into storage tanks

(2) Stop shore discharge pumps by positioning motor controller HAND/OFF/AUTO switch to OFF

(3) When an onboard water supply is not required, stop pressure set by positioning Its motor controller HAND/OFF/AUTO switch to OFF

b. If system will be shutdown for more than 12 hours but less than 7 days and personnel will not be onboard:

(1) Perform steps (1) thru (3) in step a

(2) Open switchboard circuit breakers P9 (shore discharge pump 1) and P15 (shore discharge pump 2)

(3) Open power panel 1 circuit breaker 11 P5

3-12. Emergency shutdown

3-12.1. General. The barge has two emergency shutdown modes One mode shuts down Individual systems such as the drinking water system or a diesel high pressure pump, and the other shuts down all barge operating systems

Both systems are operated by pushing a red button protected by a metal guard On system shutdowns, either fuel or electrical power is shut off to that system only On total shutdown, all fuel and electrical power is shut off to all operating systems.

Emergency system shutdown red buttons are on the ROWPU space starboard bulkhead just aft of the personnel door These seven emergency system shutoff buttons (Figure 3-7) control shore power, ventilation systems, ROWPU 1 diesel high pressure pump, ROWPU 2 diesel high pressure pump, ship auxiliary generator, ship service generator 1, ship service generator 2

Emergency total shutdown red buttons are located as follows

- On ROWPU space starboard bulkhead aft of personnel door, above and forward of row of system emergency shutoff buttons
- 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

3-12.2. Emergency shutdown procedures

a. In an emergency, push the appropriate red button to shut down either a selected system or all operating systems

b. When emergency situation has been corrected, reset emergency button by turning collar behind button one-quarter turn clockwise Button will pop out and again be in the ready position

c. When emergency button is reset, any systems turned off by that emergency button must be restarted with their individual controls If drinking water system has been disabled, restart using procedures In Chapter 3

Section IV. Operation under extreme conditions

3-13. Operation under extreme conditions. The operation of the drinking water system in extreme hot or cold temperatures creates special problems with lubricants Lubrication under these extreme conditions is discussed below Additional Information Is contained In the manufacturers' service manuals/instructions in Appendix B

3-13.1. Operation in extreme cold. Cold weather lubricants must be used. Drain system if there Is any danger of freezing

3-13.2. Operation in extreme heat. Hot weather lubricants must be used Electric motors have a tendency to run hotter than normal during such conditions When they become too hot for the safety of the motor, safety circuits within the motor stop the motor to prevent damage to It When this happens, allow the motor to cool When It reaches a safe operating temperature, It automatically starts again If the motor has to be reset and restarted manually, be sure the motor has cooled down before attempting to start It

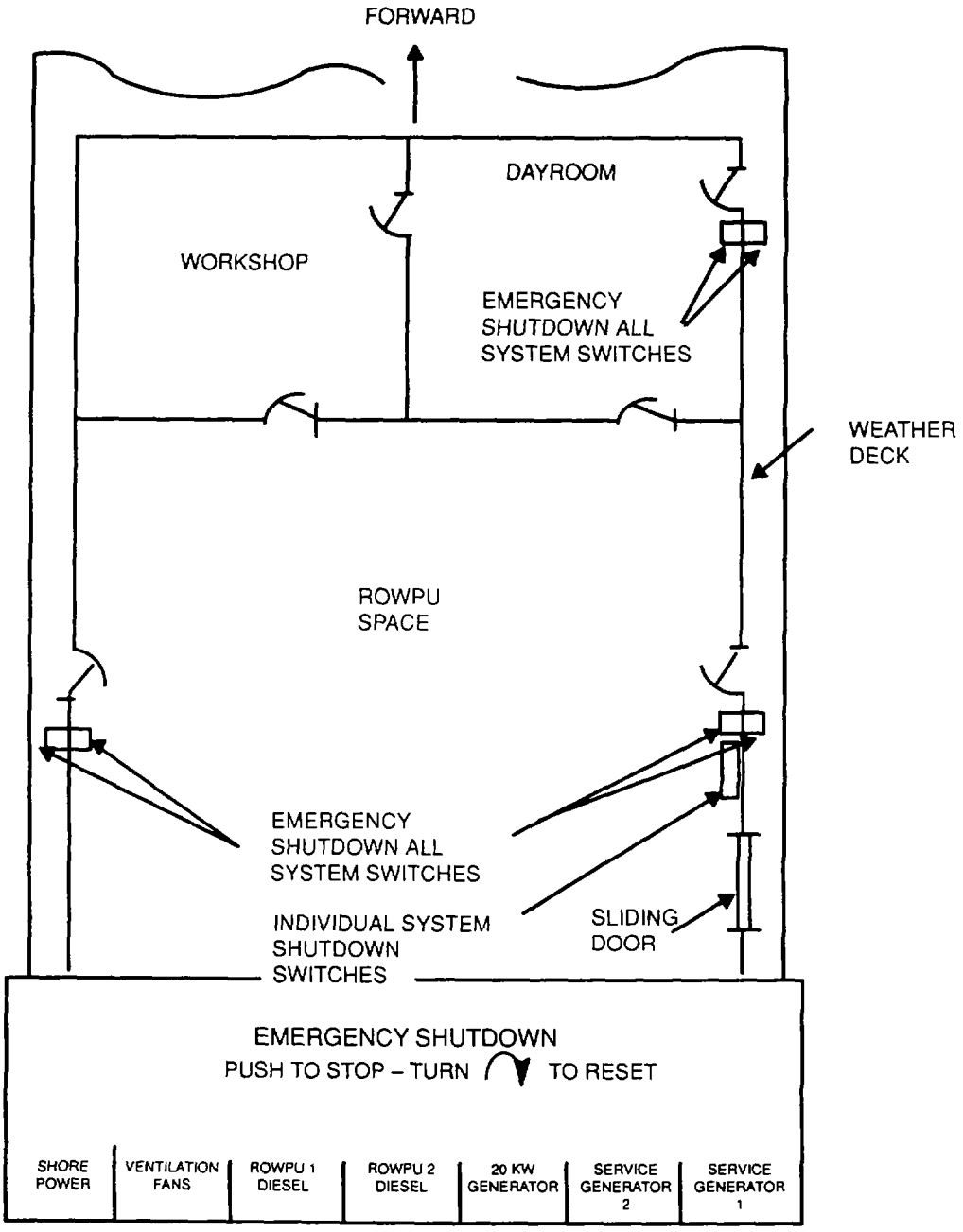


Figure 3-7. Location of Control Buttons for Emergency Shutdown Systems

CHAPTER 4 MAINTENANCE INSTRUCTIONS

Section I. General

4-1. Maintenance concept

4-1.1. Unit level and Intermediate Direct Support and Intermediate General Support (IDS/IGS) maintenance on this system is performed by barge crewmembers whenever possible

4-1.2. Any IDS/IGS maintenance beyond capability of crewmembers Is provided by a shore-based area support maintenance unit. This unit also determines depot support requirements

4-1.3. Intermediate support maintenance is accomplished by replacement of components or major end items

4-1.4. Unless other Intermediate support procedures are directed, IDS/IGS maintenance Is provided by an Army Transportation Corps floating craft Intermediate support maintenance unit serving terminal operating area Components to be disposed of are processed by this unit

4-1.5. Maintenance Allocation Chart (MAC) Is in Appendix C of TM 55-1930-209-14 & P-18 Consult appropriate manual for maintenance of other equipment onboard

4-2. Maintenance Instructions. Maintenance Instructions are presented as follows Section II, Preventive maintenance, Section III, Troubleshooting, and Section IV, Maintenance procedures

Section II. Preventive maintenance checks and services

4-3 See TM 55-1930-209-14&P-5, Appendix C for preventive maintenance checks and services for the Drinking Water System See TM 55-1930-209-14&P-19 for complete preventive maintenance checks and services for all ROWPU Barge Systems

Section III. Troubleshooting

4-4. Components

4-4.1. Discharge pump. Troubleshoot as given in repair instructions in Aurora Pumps Instruction Manual in Appendix B

4-4.2. Pressure set. Troubleshoot as given in troubleshooting chart In The Teel Convertible Jet Pump System Operating Instructions and Parts Manual in Appendix B

4-5. Drinking water system. Troubleshoot drinking water system by following procedures In Table 4-1

NOTE

For problems not covered by Table 4-1, consult manufacturers' service manuals for particular component involved.

Section IV. Maintenance procedures

4-6. General. Maintenance for this system consists of lubncating, disassembling, repairing, and/or replacing and reassembling components using repair parts listed In Appendix G In TM 55-1930-209-14&P-18 No special tools are required

4-6.1. General maintenance practices. When performing maintenance, be sure to observe procedures In manufacturers' manuals/instructions and these approved general shop practices:

a. Always use new seals and gaskets before reassembling components disassembled for repair. Be sure to use only new seals and gaskets identical to original. Install them carefully so as not to damage seals and gaskets during assembly

Table 4-1. Drinking Water System Troubleshooting

Problem	Probable Cause	Suggested Action
1. Water not flowing into storage tanks	a. Valve(s) DW1, 2, 3, or 4 closed (Figures 1-2 and 1-3)	a. Open valve(s)
	b. ROWPU(s) not in operation, or malfunctioning	b. Start up or troubleshoot ROWPU system (TM 55-1930-209-14&P-3)
2. Chlorine content In drinking water not acceptable	a. Chlorination system malfunctioning including seawater pumps	a. Stop discharge pump 1 or 2, ROWPU system, 1 and 2; and chlorination system Troubleshoot chlorination system (TM 55-1930-209-14&P-4)
3. Drinking water salinIty level not acceptable as indicated by EMS video monitor SALINITY display page	a. ROWPU's malfunctioning EMS video monitor	a. Troubleshoot ROWPU's (TM 55-1930-209-14&P-3)
	b. Salinity sensor malfunctioning	b. Troubleshoot salinity sensor (Tracor Marcon Drawing No 23236 In Appendix B)
	c. Monitoring system malfunctioning	c. Troubleshoot monitorIng system (TM 55-1930-,209-14&P-1 1)
4. Drinking water pressure too high or too low as indicated by system status page on monitoring system	a. Discharge pump malfunctioning	a. Troubleshoot discharge pump as given in problem 7 below
	b. Pressure sensor malfunctioning	b. Troubleshoot pressure sensor (Tracor Marcon Drawing no. 22723 rev D In Appendix B
	c. Monitoring system malfunctioning	c. Troubleshoot monitorIng system (TM 55-1930-209-14&P-11)
	d. Valve In discharge line closed	d. Open valves
	e. Leak in discharge line or hose Is damaged	e. Check and repair discharge line

Table 4-1. Drinking Water System Troubleshooting (continued)

Problem	Probable Cause	Suggested Action
5. Drinking water flow rate too high or too low as indicated by system status page on monitoring system	a. Discharge pump malfunctioning in problem 7 below	a. Troubleshoot discharge pump as given
	blow sensor malfunctioning	b. Troubleshoot flow sensor (Tracor Marcon Drawing no 23235 rev A in Appendix B)
	c. Monitoring system malfunctioning	c. Troubleshoot monitor-Ing system TM 55-1930-209-14&P-11)
	d. Valve in discharge line closed	d. Open valves
	e. Leak In discharge line or hose Is damaged	e. Check and repair discharge line
6. Water not being discharged from storage tank(s) 1, 2, 3, or 4 with discharge pump motor operating closed	a. Valve(s) DW6, 7, 8, or 9 closed (Figure 1-2)	a. Open valve(s)
	b. Valve DW12 (all barges) or DW18 (Barges 2 and 3)	b. Open valve
	c. Valve DW14 closed	c. Open valve
	d. Discharge pump malfunctioning	d. Troubleshoot discharge pump (Aurora Pumps Instruction Manual in Appendix B)
7. Discharge pump not operating	a. Circuit breaker P9 (discharge pump 1) or circuit breaker P15 (discharge pump 2) open (OFF)	a. Close appropriate circuit breaker
	b. Motor controller main switch OFF	b. Turn switch ON
	c. Motor controller HAND/ OFF/AUTO not set in proper position	c. Position switch to HAND (local control) or AUTO (continuous use)
	d. Motor controller mal-functioning unit and fuse	d. Troubleshoot motor controller and Its thermal
	e. Level switches mal-functioning	e. Troubleshoot level switches (Transamerica DeLavel Instructions In Appendix B). Check orientation of switches (Drawing no 87707)
	f. Discharge pump motor not operating	f. Troubleshoot pump (Aurora Pumps Instructions Manual in Appendix B)

Table 4-1. Drinking Water System Troubleshooting (continued)

Problem	Probable Cause	Suggested Action
8. Water not being supplied to chlorination unit from storage tanks with pressure set operating	a. Valves DW6, DW7, DW8, DW9, DW11, and/or DW17 closed	a. Open valve(s)
	b. Water filter clogged cartridge	b. Replace filter
	c. Pressure set malfunctioning	c. Check circuit breaker 11 P5 on power panel 1 and troubleshoot pressure set (Teel Convertible Jet Pump System Instructions and Parts Manual In Appendix B)
	d. Valve DW16 open	d. Close valve
9. Water not being supplied to water fountain and dayroom sink from storage tank(s)	a. Valve(s) DW5, DW5A (Barges, 2 and 3 only) DW6, DW7, DW8,DW9, DW11, and/or DW17 closed	a. Open valve(s)
	b. Water filter clogged	b. Replace filter cartridge
	c. Pressure set malfunctioning	c. Check circuit breaker 11 P5 on power panel 1 Troubleshoot pressure set (Teel Convertible Jet Pump System Instructions and Parts Manual in Appendix B)
	d. Valve DW16 open	d. Close valve
	e. Valves on washdown station(s) open	e. Close valve(s)
10. Water not being supplied to chlorination unit from reserve tank	a. Reserve tank empty	a. Fill reserve tank
	b. Valve DW16 open	b. Close DW16
	c. Valve(s) DW13 and/or DW17 closed	c. Open valve(s)
	d. Water filter clogged	d. Replace filter cartridge
	e. Pressure set malfunctioning	e. Check circuit breaker 11 P5 on power panel 1. Troubleshoot pressure set (Teel Convertible Jet Pump System Instructions and Parts Manual in Appendix B)
11. Water not being supplied to drinking water fountain or sink from reserve tank	a. Reserve tank empty	a. Fill reserve tank
	b. Valve DW16 open	b. Close DW16
	c. Valve(s) DW5, DW5A (Barges, 2 and 3 only) DW13, and/or DW17 closed	c. Open valve(s)

Table 4-1. Drinking Water System Troubleshooting (continued)

Problem	Probable Cause	Suggested Action
	d. Water filter clogged	d. Replace filter cartridge
	e. Pressure set malfunctioning	e. Check circuit breaker 11 P5 on power panel 1. Troubleshoot pressure set (Teel Convertible Jet Pump System Instructions and Parts Manual in Appendix B)
	f. Valves on washdown station(s) open	f. Close valve(s)
12. Water pressure set not operating	a. Circuit breaker 11P5 on power panel 1 open	a. Close circuit breaker
	b. Motor controller turned off	b. Turn motor controller to AUTO
	c. Motor controller mal-functioning controller. unit and fuse	c. Troubleshoot motor Check thermal
	d. Water pressure set malfunctioning	d. Troubleshoot pressure set (Teel Convertible Jet Pump System Instructions and Parts Manual in Appendix B)
13. High level alarm sounds sounds with discharge pump operating	a. Water not being dis-charged from storage tank(s)because valves DW6, DW7, DW8, and/or DW9 closed (Figure 1-2)	a. Open valves
	b. Tank high level switch malfunctioning	b. troubleshooting high level switch (Trans-amenca De Laval Instructions in Appendix B) Reonent switch (Drawing no 87707)
14. Low level alarm sounds with dis-charge pump operating	a. Water not flowing into storage tanks because valve(s) DW1, DW2, DW3, and/or DW4 closed (Figure 1-2)	a. Open valve(s)
	b. ROWPU(s) not in opera-tion or malfunctioning (TM 55-1930-209-14&P-3)	b. Startup or trouble-shoot ROWPU systems
	c. Tank low level switch malfunctioning	c. Troubleshoot low level switch (Trans-america DeLavel in-structions in Appendix B). Reonent switch (Drawing no. 87707)

b. When replacing O-rings, make sure all surfaces are clean and free of dirt, grit, or foreign material.Prior to Installation, apply a thin coat of silicone grease to O-ring for ease of assembly Protect O-rings by applying tape over threads, sharp corners, and edges.

c. When replacing gaskets, make sure mating surfaces are clean and free of old gasket material, adhesive, oil, or grease These precautions will ensure a leak-proof joint.

WARNING

Be sure electrical power is off before performing maintenance. Open (OFF) circuit breakers. Redtag circuit breakers or motor controller with: WARNING DO NOT ACTIVATE REPAIRS BEING MADE. Observe safety precautions In this TM and those specified in manufacturers' manuals and instructions.

d. When replacing electrical components, follow proper procedures for soldering or crimping connections Check all grounding Make sure current carrying members are properly insulated to avoid short-circuiting Check wire and cable insulation for abrasions and chafing Repair with tape or replace as necessary.

NOTE

Due to this vessel's mission and crew capabilities, maintenance normally assigned to organizational level or higher echelons of maintenance may be assigned to the crew.

4-7. Drinking water system. Lubrication and repair procedures of the drinking water system are presented herein

WARNING

Shut down drinking water system before attempting any repairs. Be sure to open circuit breakers. Redtag circuit breakers with: WARNING-- DO NOT ACTIVATE. REPAIRS BEING MADE. Be sure pumps are cool before starting repairs.

4-7.1. Lubrication. Lubricate discharge pump as given In Aurora Pumps Instruction Manual In Appendix B

NOTE

Drinking water fountain and sink data, including maintenance, is given In TM 55-1930-209-14&P-15.

4-7.2. Repair or replacement of system components

4-7.2.1. Discharge pump assembly

WARNING

Make sure shore discharge pump motor controller is electrically dead before starting removal. Redtag motor controller with: WARNING DO NOT ACTIVATE REPAIRS BEING MADE.

4-7.2.1.1. Pump

a. Removal

(1) Make sure shore discharge pump motor controller Is electrically dead

(a) Open (OFF) switchboard circuit breaker P9 for pump 1 or P15 for pump 2

(b) On motor controller for pump being removed, open main switch (Figure 3-1) and redtag controller with WARNING DO NOT ACTIVATE REPAIRS BEING MADE.

(2) On Barge 1, position drinking water valve DW1 2 to Isolate discharge pump being removed On Barges 2 and 3, close valve DW12 to Isolate discharge pump 1. Close valve DW18 to isolate discharge pump 2.

(3) Place container under piping and disconnect piping Seat pipe connections to prevent foreign materials from entering pipe.

(4) Disconnect electrical wiring and tag each wire indicating where it was connected.

(5) Remove guard from coupling and disconnect coupling from pump shaft.

(6) Remove mounting bolts and remove pump

b. Cleaning and inspection

CAUTION

Do not use solvent for cleaning since pump Is used to discharge drinking water. Seal pipe connections.

(1) Clean exterior of pump with brush and hot, soapy water Rinse thoroughly and dry with filtered compressed air

(2) Visually check pump for evidence of cracks.

c. Disassembly and repair Disassemble, repair and reassemble discharge pump In accordance with Aurora Pumps Instruction Manual in Appendix B. Use repair parts listed In Appendix G of TM 55-1930-209-14&P-18 Wipe parts clean with lint-free cloth before reassembly

d. Installation

(1) Install pump assembly and tighten mounting bolts

(2) Connect piping

(3) Connect electrical wiring in same manner as previously installed and Indicated on wire tags

(4) Activate pump motor controller by closing switchboard circuit breakers P9 or P15 and closing (ON) main switch on pump motor controller (Figure 3-1)

(5) On Barge 1, position valve DW12 to pump to be used On Barges 2 and 3, open valve DW12 (for pump 1) or DW18 (for pump 2)

CAUTION

Before starting pump, pump body must be completely filled with drinking water. Running pump dry will cause seal failure.

(6) Bleed out all air and vapor from Inside pump and make sure It Is primed with water as follows

(a) Remove priming plug

(b) Fill pump with drinking water through priming plug opening in pump body until all air has been expelled from pump and suction pipe

(c) Replace priming plug, screwing In only far enough to seal

(d) Start pump

(e) If pump falls to build up pressure within 3 minutes, stop pump and reprime by repeating steps (a) through (e)

NOTE

In some cases, priming may have to be repeated several times, until all air is expelled.

(f) When pump starts, tighten priming plug

(g) If pump does not start after several priming attempts, troubleshoot pump.

(7) Jog pump by pushing START button momentarily and checking pump rotation If rotation Is not the same as before, change any two wires on electrical connections to pump and check rotation again

(8) When rotation Is correct, remove red tag from motor controller and enter this maintenance action In logbook.

(9) After 10 hours of operation, check for leaks and tighten as necessary.

4-7.2.1.2. Coupling

a. Removal

(1) Make sure shore discharge pump motor controller Is electrically dead

(a) Open (OFF) switchboard circuit breaker P9 for pump 1 or P15 for pump 2

(b) On motor controller for pump being removed, open main switch (Figure 3-1) and redtag controller with. WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE.

(2) Remove hardware attaching coupling guard to foundation and remove guard

(3) Remove coupling

b. Cleaning and inspection

(1) Clean coupling with brush and hot, soapy water. Rinse thoroughly and dry with filtered compressed air

(2) Visually Inspect for damage, corrosion and cracks Repair as necessary

c. Installation

(1) Install coupling

(2) Attach coupling guard to foundation

(3) Return discharge pump to normal operation.

(4) Paint coupling guard In accordance with TB 43-0144

4-7.2.1.3. Motor

a. Removal

(1) Make sure discharge pump motor controller is electrically dead

(a) Open (OFF) switchboard circuit breaker P9 for pump 1 or P15 for pump 2

(b) On motor controller for pump being removed, open main switch (Figure 3-1) and redtag controller with WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE

(2) Remove motor terminal cover

(3) Tag and disconnect leads to motor

(4) Remove coupling guard and disconnect coupling from motor shaft

(5) Remove hardware securing motor to foundation

(6) Remove motor

b. Cleaning and inspection

(1) Clean motor exterior using filtered compressed air Wipe off using rag moistened with approved solvent Clean terminals and wipe wires with lint-free cloth or electrician's brush moistened with an approved solvent

(2) Visually Inspect for burned, bent, loose, corroded or otherwise damaged terminals Inspect wiring for breaks, loose connections or other obvious damage Replace damaged parts

c. Installation

(1) Install motor on foundation making sure shaft is aligned with coupling Shim if necessary Loosely install mounting hardware

(2) Secure motor to foundation by tightening mounting hardware Add shims If necessary

(3) Secure motor shaft to coupling and install coupling guard

(4) connect leads to motor terminal

(5) Install terminal cover.

(6) Retouch or paint motor in accordance with TB 43-0144

(7) Return discharge pump to normal operation Make sure rotation is as indicated on Identification plate

4-7.2.2. Pressure set

WARNING

Before servicing water pressure set, disconnect power, release all pressure, and drain all liquids from system. Redtag motor controller with: WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE.

4-7.2.2.1. Repair

a. Removal

(1) Make sure pressure set motor controller is electrically dead

(a) Open (OFF) power panel 1 circuit breaker 11P5 to disconnect power to motor controller

(b) On motor controller, open main switch (Figure 3-1) and redtag controller with WARNING - DO NOT ACTIVATE REPAIRS BEING MADE

(2) Close drinking water valves DW11, DW13, DW16, and DW17

(3) Place container under piping and disconnect piping

(4) Disconnect electrical wiring and tag each wire indicating where it is connected

(5) Remove mounting bolts and remove pressure set

b. Cleaning and inspection

(1) Wipe exterior of pressure set with rag soaked with an approved solvent Clean terminals and wipe wires with lint-free cloth or electrician's brush moistened with an approved solvent

(2) Visually Inspect for damage. Inspect for burned, bent, loose, corroded or otherwise damaged terminals Inspect wiring for breaks, loose connections or other obvious damage Repair as necessary

c. Disassembly and repair

(1) Air volume control replacement

(a) After releasing air pressure, remove plastic tubing from ejector body and from air volume control

(b) Remove air volume control and replace with new control Make sure orifice of control is iIn down position

(c) Connect new tubing to air volume control and ejector body

(2) Pump rotary seal assembly replacement (Figure 4-1)

CAUTION

Rotary seal assembly must be handled carefully to avoid damaging precision lapped faces of sealing components.

(a) Disengage pump body from mounting frame

(b) Unscrew impeller from motor shaft

NOTE

These motors have two flats between pump and motor so that the shaft can be held by an open end wrench to facilitate easy impeller and seal removal.

(c) Detach mounting frame from motor Carbon seal face, friction ring, and brass and spring shell of rotary seal assembly will come loose at this time.

(d) Using a screwdriver, remove ceramic seal and rubber gasket from the recess of mounting frame

(e) Clean mounting frame recess and motor shaft thoroughly

NOTE

Replace slinger washer rf removed from motor shaft.

(f) Installation of new rotary seal assembly:

(1) Insert ceramic seal and rubber gasket into recess of mounting frame

NOTE

To facilitate installation, apply a light coating of oil to outside diameter of rubber gasket. Keep ceramic seal clean and free of dirt and oil.

(2) Attach mounting frame to motor face, carefully guiding shaft through ceramic seal.

(3) Slip remaining parts of rotary seal assembly onto motor shaft

NOTE

Apply a light coating of oil to Inside diameter of rubber drive ring.

(g) Replace Impeller

(h) Reassemble pump body to mounting frame.

d. Installation

(1) Install pressure set and tighten mounting hardware

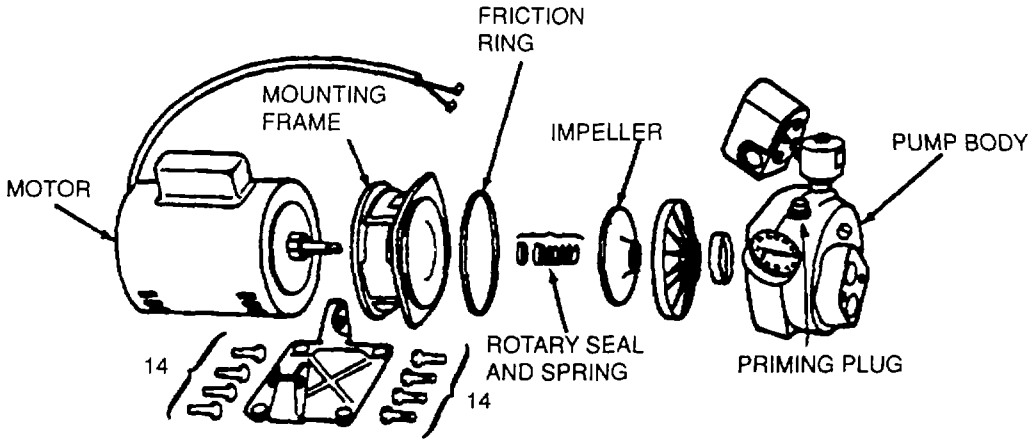


Figure 4-1. Pressure Set Pump Assembly, Exploded View

(2) Connect piping

(3) Connect electrical wiring In same manner as previously Installed and indicated on wire tags

(4) Touch up or paint In accordance with TB 43-144.

(5) Activate pressure set motor controller by closing (ON) power panel 1 circuit breaker 11 P5 and closing (ON) main switch on pressure set motor controller (Figure 3-1).

(6) Open drinking water valves DW11, DW13, DW16, and DW17.

(7) Prime water pressure set as follows, it necessary:

(a) Position HAND/OFF/AUTO switch on pressure set motor controller to HAND.

(b) Start pressure set by pushing START button on motor controller.

(c) Close valve DW16

(d) Open pnming port petcock on pressure set

(e) Close petcock when steady water flow appears

(f) Open valve DW16

(g) Position pressure set motor controller HAND/OFF/AUTO switch to AUTO so that pressure set automatically provides onboard drinking water.

4-7.2.2.2. Replacement

a. Removal Remove pressure set as indicated In step a in paragraph 4-7 2 2.1

b. Installation Install new pressure set as indicated In step d In paragraph 4-7 2 2.1

4-7.2.3. Water filter

4-7.2.3.1. Service. Water filter servicing Involves replacement of the water filter as follows

NOTE

Allow water to flow into deck drain

a. Close valves DW5 and DW17

b. Wipe clean, unscrew filter body, install new filter cartridge and install filter body

c. Open valves DW5 and DW17

4-7.2.3.2. Replacement

a. Removal

NOTE

Allow water to flow into deck drain

(1) Close valves DW5 and DW7

(2) Wipe clean, and unscrew filter body

(3) Disconnect filter head from piping

b. Installation

(1) Connect filter head to piping

(2) Install cartridge filter in filter body

(3) Screw filter body into filter head

(4) Open valves DW5 and DW7

4-7.2.4. Salinity cell sensor

4-7.2.4.1. Test

NOTE

Salinity cell analog sensor test Is to be performed using the equipment monitoring system discussed in TM 55-1930-209-14&P-11.

a. Select level 1 editing by entering access combination for level 1 edit as given In paragraph 3-6.2 in TM 55-1930-209-14&P-11.

b. Select EDIT MENU option 1 to activate sensors as given in paragraph 3-6.2 1 in TM 55-1930-209-14&P-11.

c. Check that the following reference values as shown on Drawing 23236 in Appendix B and the values shown on the edit page agree

Reference Marker	Value
Offset	-960
Span	2366
Range	0
Calibration	3

d. If values do not agree, replace sensor as given In paragraph 4-7.2.4.2

4-7.2.4.2. Replacement

WARNING

Make sure equipment monitoring system is off before starting removal.

a. Removal

(1) Close drinking water valve DW14 on Barge 1 or valves DW14 and DW19 on Barges 2 and 3

(2) Tag and disconnect wires from sensor

(3) Remove sensor from piping Cover pipe opening to prevent foreign material from entering

b. Installation

(1) Install new sensor In piping

(2) Connect wires to sensor

(3) Open valves DW14 on Barge 1 or valves DW14 and DW19 on Barges 2 and 3

(4) Start equipment monitoring system

(5) Select level 1 editing by entering level 1 edit as given In paragraph 3-6. 2 In TM 55-1930-209-14&P-11

CAUTION

Be careful when using complete edit mode as improper entries can cause sensor reading to become erratic, inaccurate, or Inoperative.

(6) Use EDIT MENU 1 to set reference marker values as given In paragraph 3-6 2.2 In TM 55-1930-209-14&P-11.

Reference Marker	Value
Offset	-960
Span	2366
Range	0
Calibration	3

4-7.2.5. Turbine flow meter

4-7.2.5.1. Test

NOTE

Turbine flow meter sensor test is to be performed using the equipment monitoring system discussed in TM 55-1930209-14&P-11. This test is to be used only for on scale and stable but inaccurate sensor readings.

a. Select level 1 editing by entering access combination for level 1 edit as given In paragraph 3-6.2 in TM 55-1930-209-14&P-1

b. Select EDIT MENU option 1 to activate sensors as given in paragraph 3-6.2.1 In TM 1930-209-14&P-11

c. Check that the following reference values as shown on Drawing 23235 In Appendix B and the values shown on the edit page agree

Reference Marker	Value
Offset	480
Span	2700
Range	1

d. If values do not agree, replace sensor as given In paragraph 4-7 2 5 2.

4-7.2.5.2. Replacement

WARNING

Make sure equipment monitoring system is off before starting removal.

a. Removal

(1) Close drinking water valve DW14 on Barge 1 or valves DW14 and DW19

(2) Tag and disconnect wires from sensor

(3) Remove sensor from piping Cover pipe opening to prevent foreign material from entering

b. Installation

(1) Install new turbine flow meter In piping Make sure arrow on meter points in direction of flow

(2) Connect wires to sensor

(3) Open valve DW14 on Barge 1 or valves DW14 and DW19 on Barges 2 and 3

(4) Start equipment monitoring system

(5) Select level 1 editing by entering level 1 edit as given In paragraph 3-6 2 in TM 55-1930-209-14&P-11.

CAUTION

Be careful when using complete edit mode as Improper entries can cause sensor reading to become erratic, Inaccurate, or Inoperative.

(6) Use EDIT MENU 1 to set reference marker values as given in paragraph 3-6.2.2 in TM 55-1930-209-14&P-11.

Reference Marker	Value
Offset	480
Span	2700
Range	1

4-7.2.6. Pressure sensor

4-7.2.6.1. Test

NOTE

Salinity cell analog sensor test is to be performed using the equipment monitoring system discussed In TM 55-1930-209-14&P-11. This test is to be used only for on scale and stable but inaccurate sensor readings.

a. Select level 1 editing by entering access combination for level 1 edit as given in paragraph 3-6 2 in TM 55-193-209-14& P-1

b. Select EDIT MENU option 1 to activate sensors as given in paragraph 3-6.2.1 in TM 55-1930-209-14&P-1

c. Check that the following reference values as shown on Drawing 22723 In Appendix B and the values shown on the edit page agree

Scale	Reference Marker	Value
0-300 psi	Offset	0
	Span	1893
	Range	1
	Calibration	3

d. If values do not agree, replace sensor as given In paragraph 4-7 2 6 2

4-7.2.6.2. Replacement

WARNING

Make sure equipment monitoring system is off before starting removal.

a. Removal

(1) Close drinking water valve DW14 on Barge 1 or valves DW1 4 and DW19 on Barges 2 and 3

(2) Tag and disconnect wires from sensor

(3) Remove sensor from piping Cover pipe opening to prevent foreign material from entering piping

b. Installation

(1) Install new sensor in piping

(2) Connect wires to sensor

(3) Open valves DW14 on Barge 1 or valves DW14 and DW19 on Barges 2 and 3

(4) Start equipment monitoring system

(5) Select level 1 editing by entering level 1 edit as given in paragraph 3-6. 2 In TM 55-1930-209-14&P-11

CAUTION

Be careful when using complete edit mode as improper entries can cause sensor reading to become erratic, inaccurate, or Inoperative.

(6) Use EDIT MENU 1 to set reference marker values as given In paragraph 3-6 2 2 In TM 55-1930-209-14&P-11

Reference Marker	Value
Offset	0
Span	1893
Range	1
Calibration	3

4-7.2.7. Pressure gauge. Replace pressure gauge as follows:

a. Removal

(1) Close drinking water valve DW14 on Barge 1 or valves DW14 and DW19 on Barges 2 and 3

(2) Remove pressure gauge

(3) Cover pipe opening to prevent foreign material from entering pipe

b. Installation Install new pressure gauge in reverse order of removal in step a

4-7.2.8. Storage tanks. Repair storage tank when leak is noted at access plate as follows:

a. Empty storage tank as given in paragraph 3-6 2

b Remove 24 screws attaching access plate with synthetic rubber gasket

c. Remove access plate with gasket

d Remove gasket from access plate

e Clean tank and access plate gasket mating surface

f. Install access plate with new gasket

g. Secure access plate with 24 screws

h. Touch up paint in accordance with TB 43-144

i. Check for leaks when tank is full

4-7.2.9. Reserve tank. Repair reserve tank when leak Is noted at access plate as follows

a. Empty reserve tank as follows

(1) Close drinking valves DW13 and DW16

(2) Open drain cock valve on reserve tank and empty tank

(3) Close drain cock

b. Replace synthetic rubber gasket and touch up or paint as given in steps b thru i in paragraph 4-7 2 8

4-7.2.10. Storage tank liquid level indicator. Recalibrate liquid level Indicator as follows

4-7.2.10.1. Test

NOTE

Storage tank liquid level indicator test is to be performed using the equipment discussed in TM 55-1930-20-14&P-11.This procedure is to be used when sensor readings are on scale and stable but are inaccurate.

a. Select level 1 editing by entering access combination for level 1 edit as given in paragraph 3-6 2 In TM 55-1930-209-14&P-11

b. Select EDIT MENU option 1 to activate sensors as given In paragraph 3-6.2 1 in TM 55-1930-209-14&P-11

c. Check that the following span reference value as shown on Drawing 23285 In Appendix B and the value for drinking water tanks shown on the edit page agree

Scale In	Offset	Span	Range	Calibration
120	0	1832	0	6
107	0	1962	0	6
86	0	2255	0	6

d. Calibrate sensor by calculating new offset using the following equation

$$\frac{\text{Actual Reading - Displayed Reading) x 3840 + Old Offset}}{\text{Full Scale}}$$

e. Repeat calculation until monitor screen value is within + 1 percent of desired reading.

f. desired reading cannot be obtained, notify shift leader or bargemaster that liquid level indicator must be replaced and IGS should be notified.

4-7.2.10.2. Replacement

a. Removal

(1) Empty storage tank as given in paragraph 3-6.2

(2) Tag and disconnect wires

(3) Disconnect two piping unions connecting liquid level indicator

(4) Remove liquid level indicator

b. Disassembly and repair

(1) Unclamp transmitter which includes switches

(2) Unclamp flag channel assembly from casing

(3) Remove top and bottom end caps and remove float assembly from inside of casing.

(4) Wipe clean flag channel assembly

(5) Reinstall new ROLI transmitter, visual flag channel assembly and switches as necessary Orient parts as shown in Transamerica Delaval Drawing No 87707 In Appendix B.

c. Installation

(1) Install liquid level indicator with two unions to tank

(2) Connect wires tagged previously

(3) Refill tank and recalibrate liquid level sensor as given In 4-7 2.10 1

4-7.2.11. Reserve tank liquid level indicator. Replace indicator as follows

a. Removal

(1) Empty reserve tank as follows

(a) Close drinking valves DW13 and DW16

(b) Open drain cock valve on reserve tank and empty tank

(c) Close drain cock

(2) Disconnect two piping unions connecting liquid level indicator.

(3) Remove tank liquid level Indicator.

b. Installation

(1) Install liquid level Indicator and connect to unions

(2) Fill reserve tank from storage tank as given in paragraph 3-8 1 or from other vessel or shore supply as given in paragraph 3-8 2.

4-7.2.12. Washdown stations

4-7.2.12.1. Piping and valves. Replace piping or valves, including washdown hose assembly nozzle, or repack worn or damaged valves according to procedures in TM 55-503.

4-7.2.12.2. Washdown hose. Repair leaking hose with tape or replace fittings Replace hose when not repairable.

4-7.2.13. Shower.

4-7.2.13.1. Piping and valves. Replace piping or valves, including shower head, or repack worn or damaged valves according to procedures in TM 55-503.

4-7.2.13.2. Shower curtain. Repair torn curtain using tape Replace when not repairable.

4-7.2.14. Discharge pump motor controller.

WARNING

Make sure shore discharge pump motor controller is electrically dead before starting repair or removal. Red tag switchboard circuit breaker P9 for pump I or P15 for pump 2 with: WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE.

4-7.2.14.1. Cleaning and inspection

a. Make sure discharge pump motor controller for pump being repaired is electrically dead by opening (OFF) switchboard circuit breaker P9 for pump 1 or P15 for pump 1 or P15 for pump 2 Redtag circuit breaker with WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE

b. Open motor controller door and vacuum clean or clean with electrician's brush.

c. Check fuse Replace If necessary.

d. Visually Inspect for indications of burns, corrosion, loose connections, or damaged parts Clean corrosion from contacts and terminals, tighten loose connections and replace damaged parts.

4-7.2.14.2. Test and repair

a. Check line voltage coming In across points DS1 and DS2, DS2 and DS3, and DS1 and DS3 (Figure 4-2) If voltage between any lines Is 0, power source Is at fault If reading Is 440 between all lines, go to step b

b. Rotate MAN/OFF/AUTO switch(S1) in Figure 4-2 to AUTO position. Check voltage between terminals 14 and 15 on terminal board If voltage Is 0, check connections and replace faulty wires, if necessary If voltage Is indicated, check pump and storage tank selector switch and level switches as given In paragraph 4-7 2.17

c. Check voltage on all terminal pairs going out across points OL4 and OL5, OL5 and OL6, and OL4 and OL6 If voltage readings on all three of the terminal pairs Is 0, check motor controller continuity using Figure 4-2 as given below If voltage readings across all terminal pairs Is 440, pump motor Is at fault and check motor as given In paragraph 4-7 2 1 3

   (1) After securing switchboard circuit breaker P9 for pump 1 or P15 for pump 2, open motor controller cover and clean by vacuuming or with electrician's brush.

   (2) Visually Inspect fuse, contacts, and connections for burns, looseness and corrosion Clean and tighten or replace damaged fuse, contacts, or connections Inspect wiring for breaks or other damage Replace winning If necessary.

   (3) Check relay continuity across points R 1 and X2, OL1 and OL4, OL2 and OL5, and OL3 and OL6 If open condition Is indicated, reset or replace relay. If closed condition exists, go to step (4)

   (4) Reapply power to motor controller and check transformer voltage across points Xl and X2 If voltage reading Is 110, go to step 5 If voltage reading is not 110, check voltage between point H1 and H4 If voltage Is not 440, replace wires to transformer If voltage Is 440 and voltage across points Xl and X2 was 0, replace transformer.

   (5) Turn off and secure power source to motor controller and check MAN/OFF/AUTO switch (S1) continuity across points S1 P1 and S1 P4 with switch In MAN position, and across points Sl P2 and S1 P3 with switch In AUTO position If either check indicates an open circuit, replace switch If circuit closed, go to step (6) .

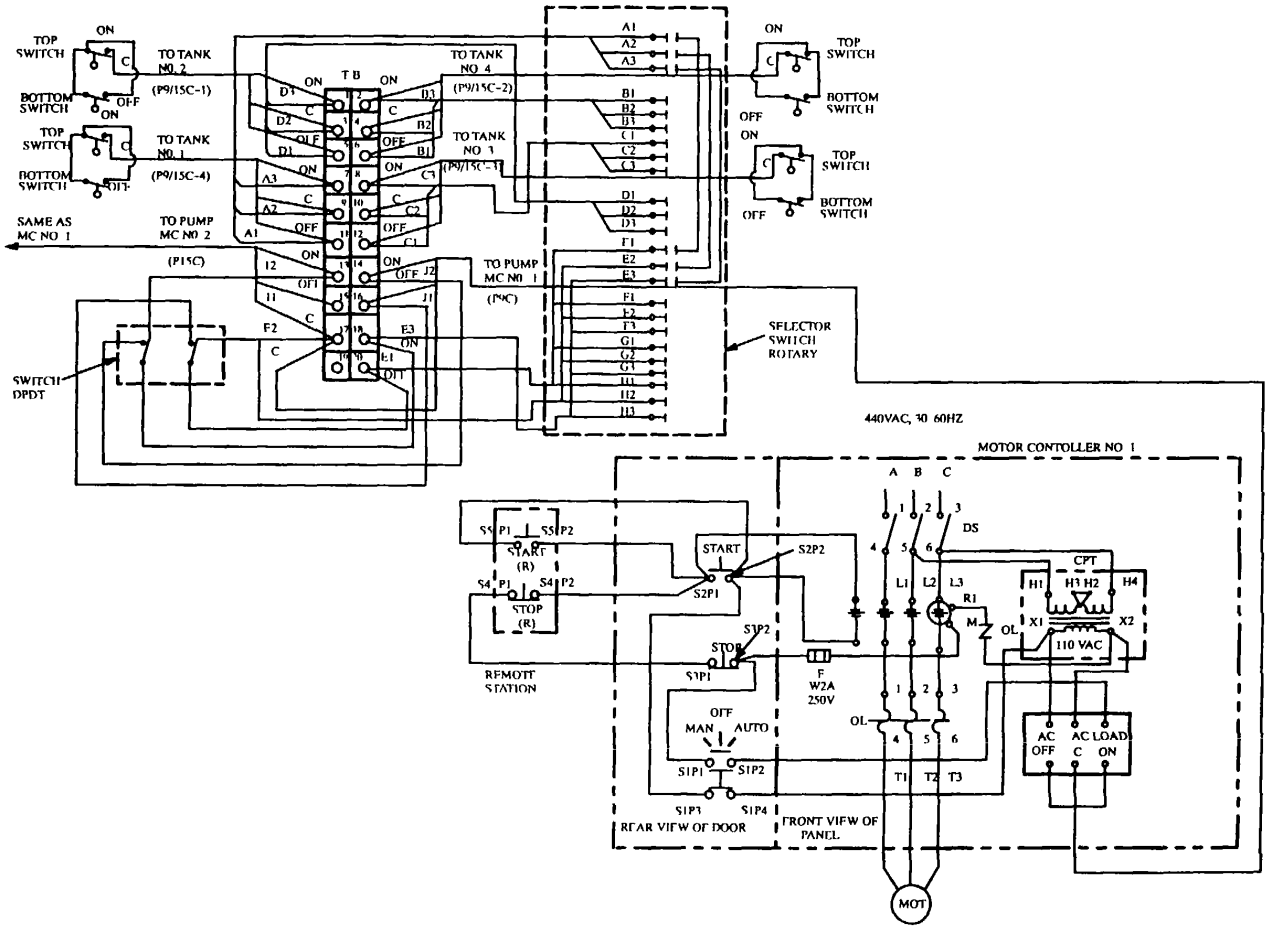


Figure 4-2. Drinking Water Discharge Pump No. 1 and No. 2 Motor Controllers, Tank Selector Switch, and Tank Top and Bottom Level Switches

(6) Depress and check START switch (S2) continuity across points S2P1 and S2P2 If check indicates an open circuit, replace switch. If check indicates a closed circuit, go to step (7)

(7) Depress and check STOP switch (S3) continuity across points S3P1 and S3P2 If check indicates an open circuit, replace switch If check indicates a closed circuit, go to step (8)

(8) Depress and check remote station STOP button (S4) continuity across points S4P1 and S4P2. If check indicates an open circuit, replace switch If check indicates a closed circuit, go to step (9)

(9) Depress and check remote station START button (S5) continuity across points S5P 1 and S5P2 If check indicates an open circuit, replace switch If check Indicates a closed circuit, switch is good.

4-7.2.14.3. Replacement

a. Removal

(1) Make sure discharge pump motor controller for pump being replaced is electrically dead by opening (OFF) switchboard circuit breaker P9 for pump 1 or P15 for pump 2. Redtag circuit breaker with WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE

(2) Disconnect and tag wiring with connection Information.

(3) Remove attaching hardware and remove motor controller

b. Installation

(1) Install motor controller using attaching hardware

(2) Connect wiring

(3) Close (ON) switchboard circuit breaker P9 for pump 1 or P15 for pump 2

(4) Check operationally that motor controller operates normally

4-7.2.15. Discharge pump remote switch

WARNING

Make sure shore discharge motor controller is electrically dead before starting repair or removal. Redtag motor controller with: WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE.

4-7.2.15.1. Repair and test

a. Make sure discharge pump motor controller IS electrically dead

(1) Open (OFF) switchboard circuit breaker P9 for pump 1 or P15 for pump 2

(2) On motor controller for pump remote switch being repaired, open main switch and redtag controller WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE.

b. Visually inspect for loose connections and corrosion Clean corrosion and tighten loose connections

c. Check switch continuity as given In step c(8) and c(9) In paragraph 4-7.2.14 2

4-7.2.15.2. Replacement

a. Removal

(1) Perform steps a in paragraph 4-7.2.15 1 if necessary.

(2) Disconnect and tag wires

(3) Remove switch

b. Installation

(1) Install switch In reverse order of removal In step a

(2) Check operationally that remote switch operates normally

4-7.2.16. Pressure set motor controller

WARNING

Before servicing water pressure set, check that motor controller Is electrically dead before starting repair or removal. Redtag power panel circuit breaker 11P15 with: WARNING - DO NOT ACTIVATE - REPAIRS BEING MADE.

4-7.2.16.1. Cleaning and inspection

a. Make sure pressure set motor controller is electrically dead before starting cleaning or Inspection by opening (OFF) circuit breaker 11 P15 on power panel Redtag circuit breaker with WARNING - DO NOT ACTIVATE- REPAIRS BEING MADE

b. Open motor controller door and vacuum clean or clean with electrician's brush

c. Check fuse Replace If necessary

d. Visually Inspect for indications of burns, corrosion, loose connections, or damaged parts Clean corrosion from contacts and terminals, tighten loose connections and replace damaged parts

4-7.2.16.2. Test and repair

a. Close controller door and check line voltage coming in across points Al and B1 (Figure 4-3) If voltage between lines Is 0, power source Is at fault If voltage Is 220, go to step b

b. Check line voltage to HI/LO pressure switch across points S3P1 and S3P2 (Figure 4-3) when MAN/OFF/AUTO switch Is In AUTO. If voltage is 110, check switch continuity

(1) Release pressure from pressure set

(2) Check continuity across points S3P1 and S3P2

(3) If continuity Indicates open circuit, replace pressure switch

c. Check voltage going out across points T1 and T2. If voltage Is 0, check motor controller continuity using Figure 4-3 as given below If voltage Is 220, pressure set Is malfunctioning Repair or replace pressure set as given in paragraph 4-7 2 2.

(1) After securing circuit breaker 11P15, open motor controller cover and clean by vacuuming or with electrician’s brush

(2) Visually Inspect fuse contacts and connections for burns, looseness, and corrosion. Clean and tighten or replace damaged fuse contacts or connections Inspect wiring for breaks or other damage Replace wiring If necessary

(3) After correcting condition, reapply power If motor controller does not operate, go to step (4)

(4) Check disconnect switch voltage across points A1 and B2 and A2 and B1. If no voltage is present across one pair of points, replace disconnect switch. If voltage is present across both pairs of points, go to step (5)

(5) Check relay voltage across points L1 and L5 and L2 and L4 If a voltage Is present only across one pair of points, replace relay If no voltage Is detected between both pairs of points, go to step (6).

(6) Check transformer voltage across points X1 and X2 If voltage is 0, replace transformer If voltage reading Is 110, go to step (7)

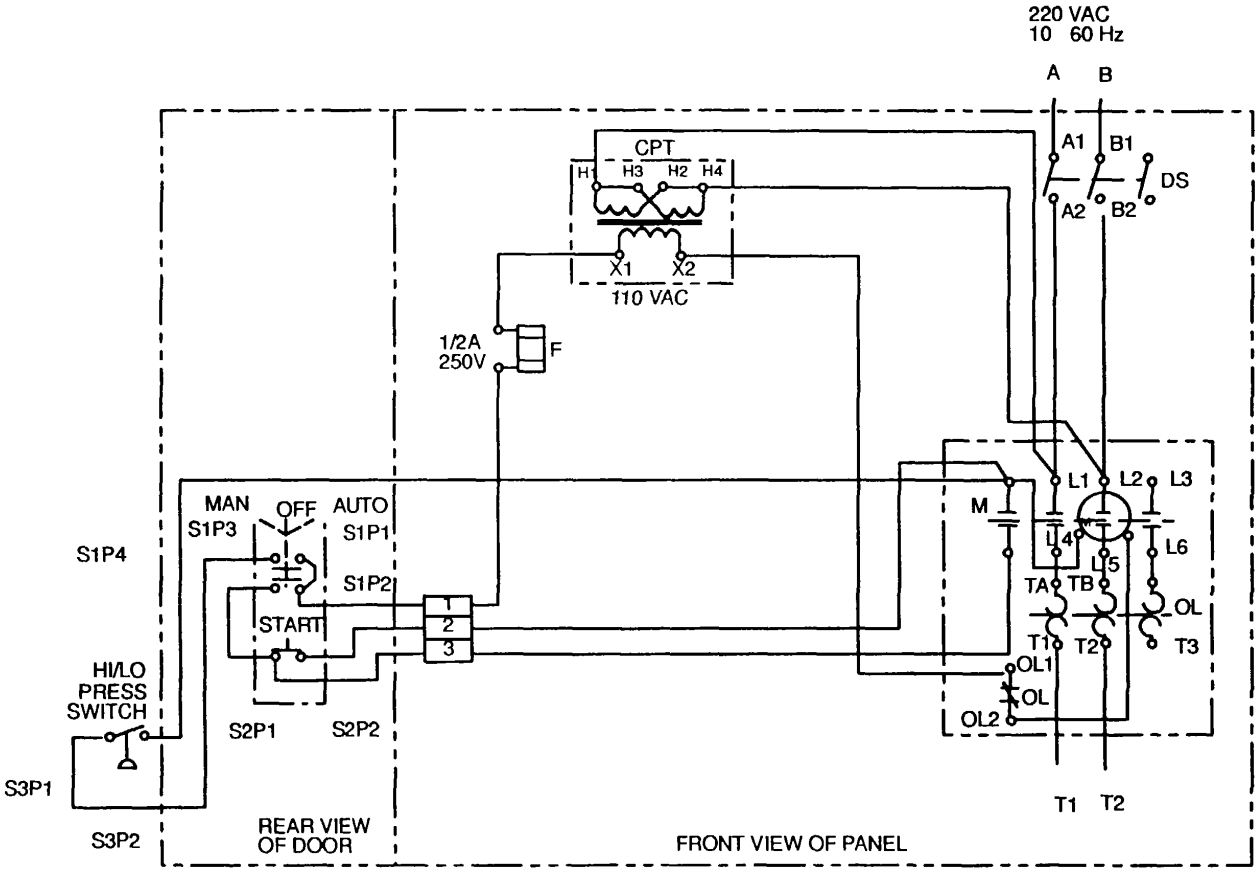


Figure 4-3. Drinking Water Pressure Set Motor Controller

(7) Turn off and secure power source to motor controller and perform continuity checks across OL relay points TA and T1, and points TB and T2. If any of these show an open condition, reset or replace relay If closed condition exists, go to step (8).

(8) Check MAN/OFF/AUTO switch (S1) continuity as follows:

(a) Place switch in AUTO position and check continuity across points S1 P1 and S1 P2

(b) Place switch In MANUAL position and check continuity across points S1 P3 and S1 P4

(c) If either continuity check Indicates an open circuit, replace switch. If both checks indicate a closed circuit, go to step (9)

(9) Depress START switch (S2) and check continuity across S2P1 and S2P2 If continuity check indicates an open circuit, replace switch.

4-7.2.16.3. Replacement

a. Removal

(1) Make sure pressure set motor controller is electrically dead before starting repair by opening (OFF) circuit breaker 11 P15 on power panel 1 Redtag circuit breaker with WARNING DO NOT ACTIVATE REPAIRS BEING MADE

(2) Disconnect and tag wiring with connection information

(3) Remove attaching hardware and remove motor controller

b. Installation

(1) Install motor controller using attaching hardware

(2) Connect wiring

(3) Close (ON) circuit breaker 11P15 on power panel 1

(4) Check operationally that motor controller operates normally

4-7.2.17. Pump and storage tank selector switch

WARNING

Make sure shore discharge pump motor controller is electrically dead before starting repair or removal of pump and storage tank selector switch. Redtag switchboard circuit breaker P9 for pump 1 or P15 for pump 2 with: WARNING DO NOT ACTIVATE REPAIRS BEING MADE.

4-7.2.17.1. Cleaning, inspection, test, and repair

a. Make sure discharge pump motor controller for pump being repaired Is electrically dead

(1) Open (OFF) switchboard circuit breaker P9 for pump 1 or P15 for pump 2

(2) On discharge pump motor controller, open main switch and redtag controller with. WARNING DO NOT ACTIVATE REPAIRS BEING MADE

b. Remove cover from tank selector switch and clean with electrician's brush moistened with an approved solvent.

c. Visually Inspect for corrosion, loose connections and indications of burns. Clean corrosion and tighten loose connections

d. Check continuity of pump selector switch and tank selector switch and top and bottom switches on storage tanks In all positions

e. Replace cover

4-7.2.17.2. Replacement

a. Removal

(1) Perform step a In paragraph 4-7.2 17 1 if necessary.

(2) Disconnect and tag wires

(3) Remove switch

b. Installation

(1) Install switch In reverse order of removal In step a

(2) Check operationally that switch operates normally

4-7.2.18. Water and chlorine mixer. Replace mixer as follows.

a. Removal

(1) Close drinking water valves DW1 thru DW4

(2) Close ROWPU valve R015

(3) Close chlorination valve CU14

(4) Disconnect chlorine line from mixer located above drinking water tanks In void 3 port

(5) Remove flange bolts connecting mixer to drinker water piping

b. Installation Install mixer In reverse order of removal In step a

4-7.2.19. Tank air escape valve

4-7.2.19.1. Repair

a. On face of valve located on top of deckhouse, remove three cap screws holding cap In place

b. Carefully remove cap, protective mesh, space ring, and flame screen from valve body

c. Clean all these components with soap and water using a stiff brush if necessary

d. Visually inspect parts for damage and replace damaged parts

e. Install parts In air escape body In reverse order of removal Tighten three cap screws holding cap In place

4-7.2.19.2. Replacement

a. Removal Burn off storage tank escape valve and unscrew reserve tank escape valve

b. Installation Weld on new storage tank escape valve and screw on new reserve tank escape valve

4-7.2.20. Piping and valves. Replace piping or valves, or repack worn or damaged valves according to procedures In TM 55-503

CHAPTER 5 STORAGE

5-1. Short-term storage. If barge is taken out of service for more than 7 days but less than 30 days, follow normal shutdown procedures in paragraph 3-11. Inspect for corrosion, damage, and pilferage

5-2. Administrative storage. If the barge is to be taken out of service for more than 30 days but less than 6 months, perform the administrative storage procedures in paragraph 5-2.1 While in storage, perform the inspection procedures in paragraph 5-2 2

5-2.1. Administrative storage procedures

NOTE

Valve numbers referred to in the following procedures are the same as shown in Figures 1-2 and 1-3.

a. Stop Row's by following procedures in TM 55-1930-209-14&P-3

b. Stop chlorination system by following procedures In TM 55-1930-209-14&P-4

c. Position drinking water valves as follows.

o = open x = closed

DW valve	1	2	3	4	5	5A	6	7	8	9	10	11	12	13	14	15	16	17	18*	19*
Position	o	o	o	o	o	o	o	o	o	o	x	o	o	o	x	o	o	o	o	o

*On Barges 2 and 3 only

*On Barges 2 and 3 only

d. Discharge water from storage tanks through port valve DW15 In accordance with paragraph 3-6 2

e. Open drinking water valve DW10 to drain remaining water from storage tanks to bilge

f. Open all remaining drinking water valves

g. Drain pressure set and discharge pumps by breaking open pipes at lowest point on line

h. Open access cover hatches on four storage tanks and reserve tank and check zinc coating on Inside of tanks. If any rust is showing, clean off rust and touch up with zinc coating If necessary, clean sediment from bottom of tanks

i. Clean glass pressure gauges and Indicators with a lint-free cloth

j. Open switchboard circuit breakers P9 (shore discharge pump 1) and P15 (shore discharge pump 2) to turn off electrical power to pump motor controllers

k. Open power panel 1 circuit breaker 11 P5 to turn off electrical power to pressure set motor controller.

I. Clean grease-coated surfaces with a clean, lint-free cloth moistened with cleaning solvent P-D-680, Type

II. Scrub off hard deposits with a bristle brush dipped In solvent. Dry surfaces with a clean, lint-free cloth

m. Thoroughly clean all other external surfaces to remove any corrosion or other foreign matter Clean all surfaces, except electrical parts. with soapy water and a stiff bristle brush Then flush with clean water Clean motor controllers and remote start/stop switches by wiping with a clean cloth moistened with silicone spray lubricant. Remove corrosion by wire brushing or sanding.

n. Touch up paint, as necessary, to match surrounding areas In accordance with TB 43-0144. Do not paint threads

5-2.2. Administrative storage inspection. While In storage, shore discharge system must be inspected and operated every 6 months as follows

a. Perform before operation checks as given In Appendix C

b. Lubricate as given in paragraph 4-7 1.

c. Check that drinking water system operates satisfactorily while performing procedures In paragraphs 3-3 thru 3-10

d. Perform during operation checks as given in Appendix C

e. Upon successful completion of Inspection, return drinking water system to administrative storage condition (paragraph 5-2 1)

5-3. Long-term storage. If barge Is to be taken out of service for 6 months or more, turn It Into depot for preparation and placement into long-term storage If barge is in administrative storage and is to be taken out of service and placed In depot long-term storage (6 months or more), process drinking water system for normal operations before releasing to depot

CHAPTER 6 MANUFACTURER'S SERVICE MANUALS/INSTRUCTIONS

6-1. General. The manufacturers' service manuals/instructions listed below provide additional information on components of the drinking water system. A copy of each manual/set of instructions is contained In Appendix B. It may be necessary to refer to both these manuals/Instructions and drawings listed In Appendix A while performing the procedures In this TM.

Component	Document title	Manufacturer
Liquid level Indicators 86210 Type 1 and 86615 Type C	Gems Liquid Level Indicators	Transamerica DeLaval, Inc Gems Sensors Division Cowles Rd Plainville, CT 06062 Ph' (203) 677-1311
Storage tank liquid level indicator 86615 Type C w/ROLI 4-10 ma	Gems Liquid Level Indicators Dwg no. 87707, Flag Position	
Discharge pump series 421, 3x4x14A	The Aurora Pumps Instruction Manual, Repair Model 421 & 485 Section 6, Item 421	Aurora Pump General Signal Corp 800 Airport Rd North Aurora, IL 60542 Ph (312) 859-7000
Drinking water pressure set Teel 3P648	Form 5S2092, Convertible Jet Pump System Operating Instructions and Parts Manual System Model 3P648A	Dayton Electric Manufacturing Co 5959 W. Howard St, Dept TR Chicago, IL 60648 Ph: (910) 223-3651
Tank air escape valve 1600 W	Tank Air Escape Valve Model 1600	Robert H Wager Co., Inc Passaic Ave Chatham, NJ 07928, Ph (201) 635-9200
Water filter LM020S - 1/2 in	Brunswick Technetics Filterite Bulletin No 1651 Micro-carbon series	Brunswick Technetics Fllterite Timonium MD 21093 Ph (301) 252-0800
Salinity cell 23236-01	Drawing No 23236, Sensor Specification Conductivity Monitorinng Current, 4-20 ma D C	Tracor Marcon, Inc 13433 NE 20th St Bellevue, WA 98005 Ph (206) 643-0912
Flow sensor 23235-01	Drawing No. 23235 Rev. A, Sensor Specification Flow, 10-1000 GPM	
Pressure sensor 22723-01	Drawing No 22723 Rev D, Sensor Specification Pressure Sensor 0-300 PSI	
Discharge pump motor controllers	TM 55-1930-209-14 & P-9, Electrical Power Systems	
Pressure set motor controller		
Chlorine/ROWPU product water mixer	Operation, Installation and Maintenance Instructions	Komax Systems, Inc 1947-T E 223rd St Long Beach, CA 90810 (213) 830-4320

CHAPTER 7 MANUFACTURERS' WARRANTIES/GUARANTEES

7-1. General. Information on the warranty/guarantee for components of the seawater system Is supplied below

Component	Manufacturer	Duration	Coverage
Salinity cell 23235-01	Tracor Marcon, Inc. 13433 NE 20th St Bellevue, WA 98005 Ph: (206) 643-0912	1 year from date of acceptance	Material and workmanship
Flow sensor 23235-01			
Pressure sensor 22723-01			
Liquid level indicator 86210 Type 1 and 86615 Type C	Transamenca DeLaval, Inc Gems Sensor Division Cowles Rd Plainville, CT 06062 Ph (203) 677-1311	1 year from date of purchase	Material and workmanship
Discharge pump series 421, 3x4x14A	Aurora Pump General Signal Corporation 800 Airport Rd N Aurora,lL 60542 Ph (312) 859-7600	1 year from date of shipment	Material and workmanship
Drinking water pressure set TEEL 3P648A	Dayton Electric Manu-facturing Company 5959 W Howard St Dept TR, Chicago, IL 60648 Ph (910) 223-3651	1 year from date of purchase	Material and workmanship
Tank air escape valve part no 1600 W	Robert H Wager Co, Inc Passaic Ave Chatham, NJ 07928 Ph (201) 635-9200	1 year from date of purchase	Material and workmanship
Discharge pump motor controller	TM 5-1930-209-14&P-9 Electrical Power Systems		
Pressure set motor controller			

APPENDIX A

REFERENCES

A-1. Drawings

US Army Belvoir Research, Development and Engineering Center (97403)

13226E1892	ROWPU/Barge Arrangement
13226E1893	List of Label Plates
13226E1896	Drinking Water System
13226E1897	Drinking Water System Operational Instruction Placard
13226E1900	ROWPU Installation
13226E1904	ROWPU Operational Instruction Placard
13226E1923	Chlorination System
13226E1928	Alarm/Casualty Monitoring System
13226E1932	Electrical Power Schematic Diagram
13226E1933	Communication System
13226E1935	Electrical Power System Layout
13226E1939	Motor Controllers Schematic and Winning Diagram
13226E1941	Chlorination System Operational Instruction Placard
13226E1944	Equipment Shut Down System

A-2. Painting

TB 43-0144	Painting of Vessels

A-3. Demolition To Prevent Enemy Use

TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use

A-4. Cleaning

Fed Spec P-D-680	Metal Cleaning Solvent for Army Use

A-5. Maintenance

DA PAM 738-750	The Army Maintenance Management System (TAMMS)
TM 53-503	Mane Salvage and Hull Repair
TM 5-6630-215-12	Operator and Organizational Maintenance, Water Quality Analysis/Sets

APPENDIX B

MANUFACTURERS' SERVICE MANUALS/INSTRUCTIONS

Component	Document title	Manufacturer
Pumps	Instruction Manual Repair Model 421 and 485	Aurora Pumps
Convertible Jet Pump System	Operating Instructions and Parts Manual Model 3P648A	Dayton Electric Manufacturing Co
Tank Air Escape Valves	Model 1600	Robert H Wagner Co.
Motionless Mixers	Operation, Installation, and Maintenance Instructions	Komax

SECTION 6 ITEM 421
DATED JULY 1980
SUPERSEDES ITEM 421
DATED JANUARY 1972

AURORA® PUMPS

INSTRUCTION MANUAL
REPAIR
MODEL 421 & 485

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, lubrication and occasional cleaning. The intent of inspection is to prevent breakdown, thus obtaining optimum service life.

LUBRICATION OF BEARINGS

Model 421 pump is available with two options for lubricating the shaft bearings. They are:

1. Regreasable (standard)
2. Oil Lubrication

Regreasable bearings will require periodic lubrication and can be accomplished by using the zerk or lubrication fittings in the bearing cartridge cap. Lubricate the bearings at regular intervals using a grease of high quality. Lithium, lithium soda or calcium base grease is recommended as lubricants for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands which could damage the bearings. Accordingly, avoid grease of vegetable or animal base which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should grease be reused.

Over lubrication should be avoided as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, each bearing will need lubrication at least every 4,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least after every 2,000 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

Oil lubricated bearings are optional on all Model 421 pumps. A fixed oil level is maintained within the bearing cartridge by an oiler which allows visual indications of reserve oil.

At initial installation and before starting a unit that *has been shut down for repairs or for any extended* length of time, run enough 10/20 weight motor oil through the oiler to maintain a constant oil level to insure that the bearing will never be without an oil supply. Oil will have to be added at intervals to maintain a constant level in the oiler. This interval can only be determined by experience.

Under working conditions, oil will breakdown and need to be replaced at regular intervals. The length of these intervals will depend on many factors. Under normal operation, in clean and dry locations, the oil should be changed about once a year. However, when the pump is exposed to dirt contamination, high temperatures (200° F. or above) or a wet location, the oil may have to be changed every 2 or 3 months.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200° F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent, and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor which drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

REPAIRS

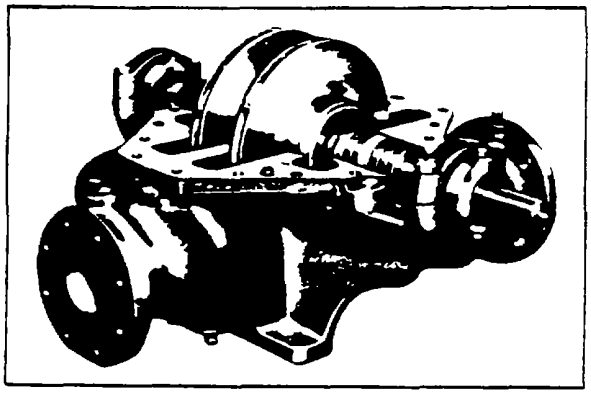
The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustrations accompanying the disassembly instructions show the pump at various stages of disassembly. The illustrations are intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be

© 1980 AURORA PUMP
AURORA, ILLINOIS

reused. All packing and gaskets should be replaced with new ones at reassembly simply as a matter of economy; they are much less expensive to replace routinely than to replace as the need occurs. In general it is economical to return to the manufacturer f motor controller.



A Upper casing removed

Disassembly of the Pump. Disassemble only what is needed to make repairs or accomplish inspection Proceed to disassemble the pump as follows (See Figure 4)

1. Break the electrical connection to motor or take similar steps to make certain that drive unit will not be unintentionally energized during disassembly.

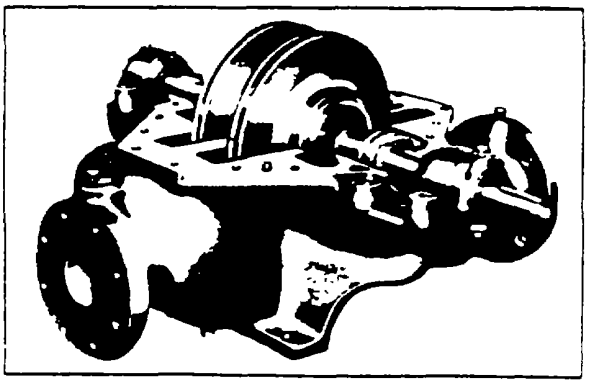
2. Close such valves or flow-control devises necessary to make certain that flow of liquid will not take place during disassembly

NOTE

Discharge and suction piping need not be disturbed unless complete pump assembly is to be removed.

3. Drain liquid from pump by removing plugs (1 and 2) Disconnect by-pass lines if applicable.

4. Loosen and remove capscrews (6) securing upper casing (8) to remainder of pump assembly.



B Bearing caps and packing removed

NOTE

If pump being disassembled is 3 x 4 x 14A or larger, remove capscrews (7) before attempting to separate the upper casing.

5. Make certain that all securing capscrews are removed, then carefully remove upper casing (8) using hoist or crane with sling attached to cast hooks.

6. Remove gasket (9) and scrape mating surfaces of casing halves to remove pieces of gasket which may have adhered in separation. Take care not to scratch or mar mating surfaces.

7. Loosen setscrews in flexible coupling and slide halves apart.

8. Remove capscrews (25) securing bearing caps (26). Lift off bearing caps (26) and pins (27). Mark caps to insure correct replacement and orientation on the respective bearing arms

9. Loosen and remove nuts (18), washers (19), and clamps (20), securing split halves of packing glands (21). Remove swing bolts (22).

10 Assuming that further work is required on shaft and impeller assembly, use properly secured rope slings and hoist or crane as required to lift it from lower pump casing (74) and place it on suitable bench or work surface

CAUTION

Take care not to dent or damage impeller and/or other parts. Use of a supporting cradle or work stand is recommended.

NOTE

Disassembly procedure from this point covers pumps having standard packing If pump has mechanical seals, refer to specific instructions.

11. Remove and discard rings of packing (23), since replacement with new packing is recommended whenever pump is disassembled.

12. Slide pump half of flexible coupling off shaft (71) and remove key (24). Pry up on end of key so as not to damage shaft. If preferred, key may be removed by carefully tapping from outer end with a brass drift or similar non-marring tool, using a small hammer.

13. Remove casing wearing rings (28).

14. If pump is grease lubricated, remove zerks (10) and pipe plugs (12) from cartridge caps (32 and 42). If pump has oil lubrication option, remove breather cap from top of cartridge caps and remove close nipples from bottom of cartridge caps The remaining oil cup, street elbows and nipples are loose at this point and can be removed as an assembly.

15 Loosen and remove capscrews (31) from cartridge cap (32). Outboard shaft end protector (29)

may be removed from its recess in outboard cartridge cap at this time if necessary

NOTE

If unit has tandem shaft, protector (29) is not used Remove slinger and capscrews (31) Slide cartridge cap (32) and grease seal off shaft Press grease seal out of cartridge cap if it is necessary to replace this seal. Remove retainer ring (35) with truarc pliers. Remove gasket (34).

16 Outboard bearing (38) is press fitted onto shaft (71). To remove it, place a puller on bearing cartridge (36) and pull cartridge, grease seal (37), and bearing from shaft.

The grease seal can be pressed from the bearing cartridge if it needs replacing. Slide slinger (39), lantern ring (52), and bushing (56) off shaft (71)

17 Removal of the inboard bearing is basically the same as the outboard bearing Remove capscrews (41) and slide slingers (40), cartridge cap (42), grease seal (43), and gasket (44) off shaft.

18 Pull or press off bearing cartridge (45), grease seal (46), and bearing (47). Remove slinger (48), lantern ring (52), and bushing (56) from shaft.

19 If unit has right hand rotation, unscrew and remove outboard sleeve (57) first Remove gasket (58) If unit has left hand rotation, unscrew and remove inboard sleeve (65) Remove gasket (66)

20 On right hand unit, balance of the parts will be removed as follows: Pull or tap impeller (59) off shaft (71) using care not to damage impeller Remove gasket (60). Slide casing bushing (61) off separator sleeve (62) Pull separator sleeve, gasket (64), and impeller (67) off shaft. Remove gasket (66) and key (68) Unscrew and remove shaft sleeve (65)

Left hand unit disassembly will begin with impeller (67) and end with sleeve (58)

21 Disassemble wearing ring(s) (70) (optional) from impeller(s) (59) and (67) only if necessary On power frame 5, remove setscrews (78). Apply a puller and gradually withdraw wearing rings (70) from impellers (59) and 67) Wearing rings may have to be cut or trimmed off the impeller If a lathe is used to trim rings off, use care not to clamp impeller too tight and cause distortion. Also use care not to remove any metal from impeller

22. Remove locking and locating pins (62, 69, 72, and 73) from lower casing half (74) only if replacement is necessary

23 Nameplate (76) and its securing screws (75) should only be removed if replacement is necessary.

Disassembly of Pumps with Mechanical Seals

1 Perform disassembly procedures as previously given through step 8.

2 Loosen and remove nuts (18), and washers (19), thus freeing swing bolts (22) to allow shaft and impeller assembly to be lifted from lower casing (74) with sling and hoist or crane as described in paragraph 10 above

CAUTION

Use extreme care in moving assembly. Ceramic seats can be cracked by just sliding loose on shaft To prevent this, wrap seal securely in a shop cloth or other protective covering.

3 *With shaft and impeller assembly on a suitable* bench, cradle, or work stand, loosen and remove pipe plug (12) from inboard cartridge cap (42). Remove grease zerk (10) and capscrews (41) and slide the cartridge cap with grease seal (43) off end of shaft (71). Remove gasket (44).

4. Pull or press bearing cartridge (45), grease seal (46), and bearing (47) off shaft. Remove slinger (48).

5. One piece gland (49) used with mechanical seal assembly can now be removed from shaft. Gasket (51) and "O" ring (50) can be removed from seal gland if desired.

CAUTION

Exercise great care in removing seal assembly (53) to keep from marring or otherwise damaging precision ground mating surfaces

6. Scribe a mark on shaft sleeves for relocating seal collar on reassembly Loosen setscrews (55), securing seal collars (54) to shaft sleeves and slide them off

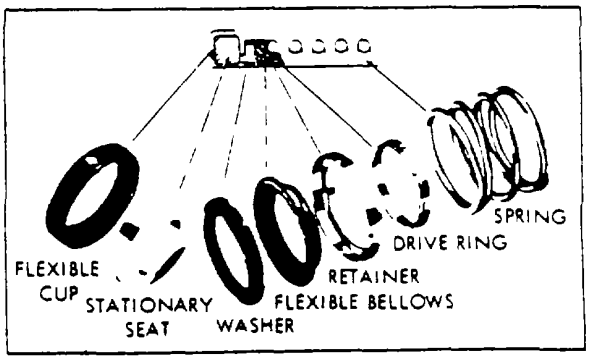


Figure 1. Mechanical Seal

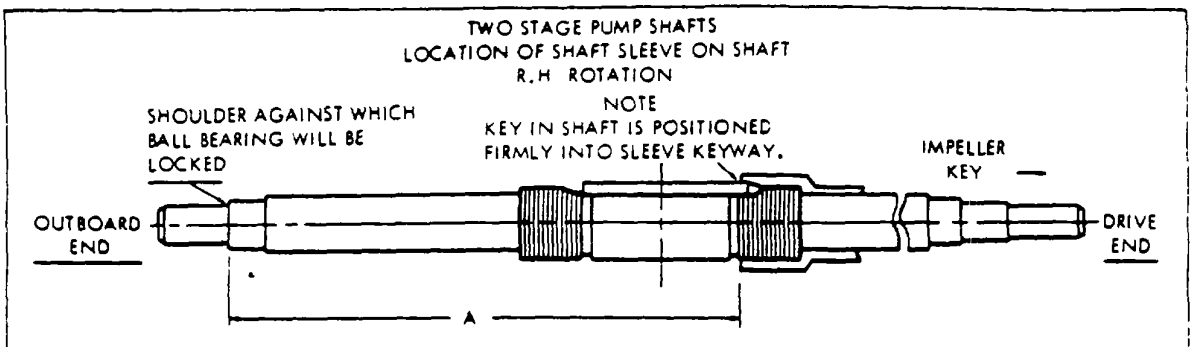
7. Proceed with further disassembly of outboard ball bearing and seal assembly using same basic procedure.

8. After removal of mechanical seals proceed with balance of disassembly in same manner as described for packing design.

REASSEMBLY

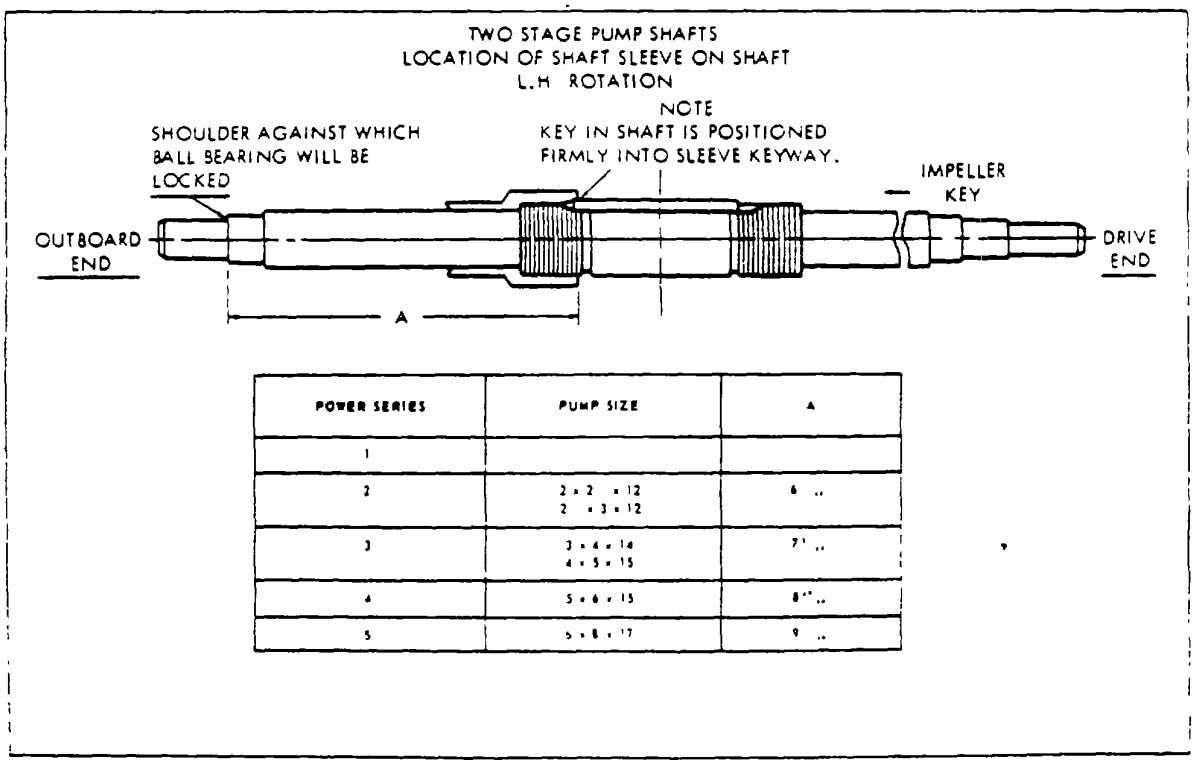
(Refer to Figure 4) Reassembly will generally be in reverse order of disassembly If disassembly was not complete, use only those steps related to your particular repair program

MODEL 421



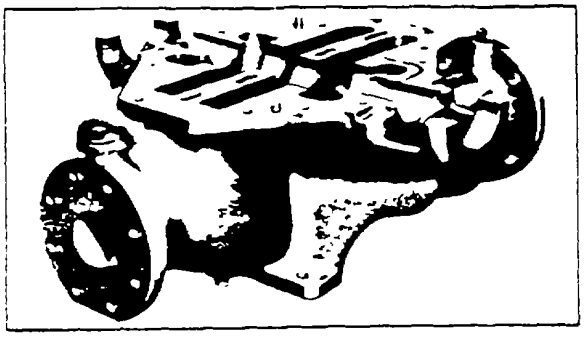
POWER SERIES	PUMP SIZE	A
1		
2	2 x 2 x 12 2 x 3 x 12	12"
3	3 x 4 x 14 4 x 5 x 15	15"
4	5 x 6 x 15	17"
5	6 x 8 x 17	18"

Figure 2



POWER SERIES	PUMP SIZE	A
1		
2	2 x 2 x 12 2 x 3 x 12	6"
3	3 x 4 x 14 4 x 5 x 15	7"
4	5 x 6 x 15	8"
5	6 x 8 x 17	9"

Figure 3



C Rotating element removed from lower casing

only those steps related to your particular repair program.

1 Position locating pins (72) in lower casing (74), adding swing bolt pins (73) if used on your pump. Install wearing ring pins (69) and casing bushing pins (63) Tap pins gently to seat them in place

If nameplate (76) was removed, install it with screws (75)

2. On a right hand unit, thread inboard sleeve (65) onto shaft (71) distance "A" (refer to Figure 2). On a left hand unit, thread outboard sleeve (57) onto shaft distance "A" (refer to Figure 3) When the sleeve is in position, its keyway should align with keyway on shaft. Coat key and keyway with loctite sealant grade CVV Insert key (68) into keyways of shaft and sleeve Tap key firmly in place.

3 Coat inside diameter of impeller wearing rings (70 (optional) with Loctite sealant Grade AV and press them over hubs of impeller(s) (59) and (67) Do not attempt to hammer impeller wear rings into position, since they are a press fit Use of an arbor press is preferred However, placing a block of wood over the impeller wearing ring and pressing it in will work satisfactorily For power frame 5 only, four setscrews (78) will be installed by drilling into wearing rings and impeller The opposite surface of the impeller should be protected from damage throughout the procedures by resting it against soft wood on the surface of work bench

CAUTION

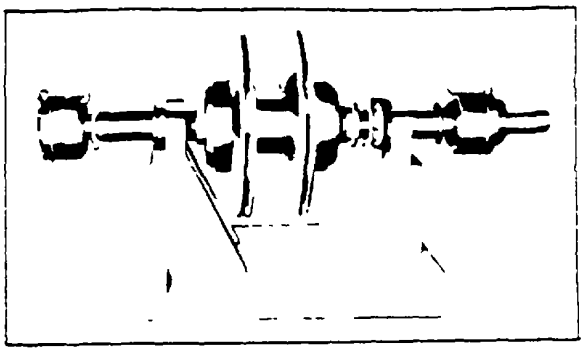
Impeller wearing rings must be given special care because they are press fit. Be sure rings are positioned squarely over hubs of impeller A soft headed hammer may be used to gently tap impeller wearing rings into correct alignment before they are pressed into place

4 On right hand unit proceed to assemble the rotating element as follows.

Place gasket (66) against shaft sleeve (65) and coat impeller (59) keyway with loctite sealant grade CVV, slide impeller (67) onto shaft (71).

Place gasket (64) on shaft and slide separate sleeve (62) against it Place casing bushing (61) over separator sleeve Place gasket (60) on shaft, coat impeller (59) keyway with loctite sealant grade CVV and slide impeller (59) in place Key (68) should not protrude beyond impeller (59) hub after impeller has been positioned Set gasket (56) against impeller, then thread shaft sleeve (57) tight onto shaft (71)

On left hand unit use same procedure only starting with impeller (59).



D Rotating element placed in a protective cradle for further disassembly

NOTE

When assembling rotating element of a 421 Model Pump it is important that the curve of impeller blades is in agreement with pump rotation (See insert in Figure 4)

CAUTION

Carefully check to see that the proper shaft sleeve has been keyed into place for rotation of pump If the correct shaft sleeve is not keyed onto the shaft, it can spin loose during operation of pump and cause extensive damage.

5. Install packing or mechanical seals and secure according to the following specific instructions

Standard Packing

a. Slide bushings (56) onto each end of shaft The raised shoulder on bushings must face away from impeller.

b. Seven pieces of packing (23) are placed on outboard end of shaft (71) over shaft sleeve Two pieces of packing, a lantern ring (52), and three more pieces of packing are placed on inboard shaft sleeve.

Stagger breaks in packing rings so that pump will not leak excessively

Mechanical Seal

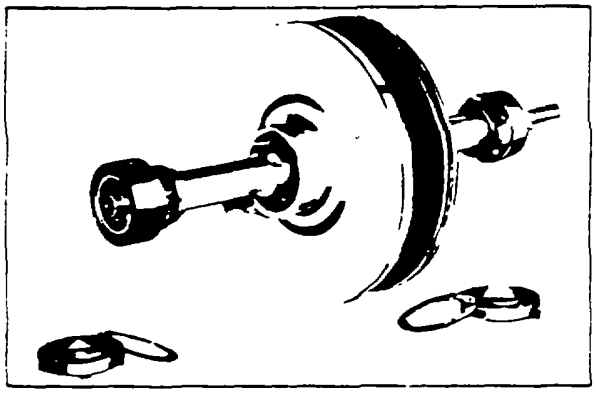
a. Single seal and balanced single seals.

I. Slide one seal lock collar with setscrews (55) facing the impeller onto each end of the shaft. Position on scribe mark made during disassembly and lock in place.

II Put a light coat of liquid dishwashing detergent on the shaft sleeve Check rotating parts of seal to make sure they are clean. Spread a light coat of liquid detergent on inside diameters of flexible bellows and washer

III. Place the seal's spring, drive ring, retainer, flexible bellows, and washer on shaft sleeve in respective order (Refer to Figure 1.)

IV. Thoroughly inspect cavity of seal gland (49) for burrs or nicks which could damage the seat of seal. Apply a film of liquid detergent to seal seat and install it in seal gland cavity, taking care to seat it evenly and squarely



E Bearing cartridge cap and gasket removed from shaft

NOTE

If it is not possible to insert seat with fingers, place a cardboard protecting ring furnished with seal over the lapped face of seat and press into place with a piece of tubing having end cut square. Tubing should be slightly larger than the diameter of shaft. Remove cardboard after seat is firmly in place.

CAUTION

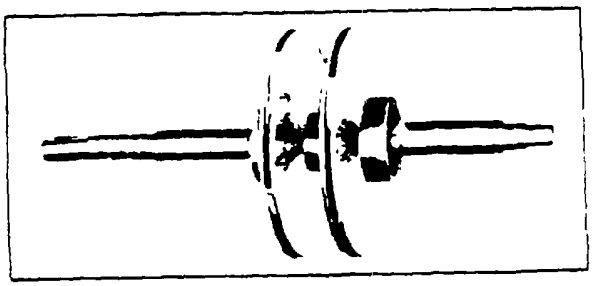
Never place a mechanical seal into service after it has been used without replacing or relapping stationary seat and washer faces

V. Place "O" rings (50) around the seal glands and slide seal glands onto the ends of the shaft.

b. Double Seal

1. Place one seal seat in collar (54), the other one fits into seal gland (49). These parts are set into their cavities in the same manner as they are with a single seal.

II. Place "O" rings (51) around collars (54) and put the collars with stationary seats facing away from impeller on ends of the shaft, then slide flexible bellows washers and springs on the shaft in



F Inboard and outboard bearings and bearing cartridges removed

order shown in figure 1, for each half of double seal assembly (53).

III. Place "O" rings (50) around the seal glands (49) and slide seal glands onto ends of the shaft with stationary seats facing impeller.

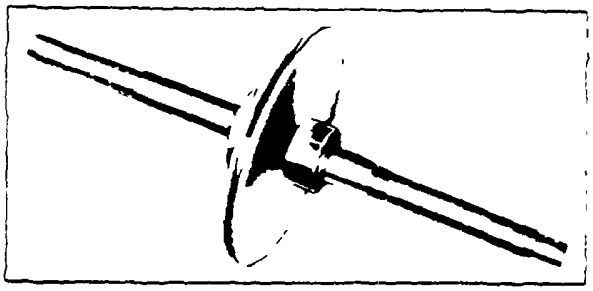
6. Place slinger (39) onto outboard end of shaft (71).

7. *Press grease seal* (37) into bearing cartridge (36). Place outboard double row ball bearing (38) in bearing cartridge and press parts onto outboard end of shaft. Snap retainer ring (35) in place to secure outboard bearing. Place gasket (34) and cartridge cap (32) in position and secure it with capscrews (31).

NOTE

Both grease zerk holes in bearing cartridges and pipe plug holes in cartridge caps must be facing in opposite directions when assembled.

8. Protector (29) can be placed in cartridge cap or if unit has tandem shaft press a grease seal into cartridge cap and slide a slinger onto shaft



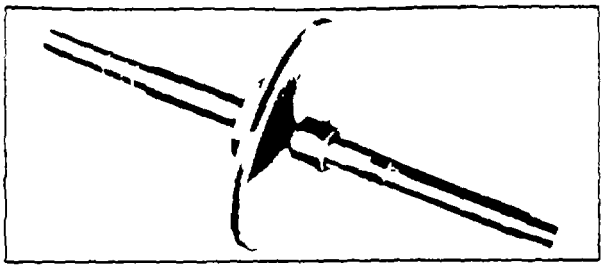
G Shaft sleeve and outboard impeller removed from shaft

9. Place slinger (48) on inboard end of shaft.

10. Press grease seal (46) into bearing cartridge (45). Place inboard ball bearing (47) in bearing cartridge and press this assembly onto inboard end of shaft.

11. Press grease seal (43) into cartridge cap (42) Position gasket (44) and cartridge cap against bearing cartridge and secure it in place with capscrews (41). Be sure to align grease zerk holes and pipe plug hole on opposite sides.

12 Place slinger (40) onto shaft. Place grease zerks (10) in bearing cartridges and pipe plugs (12) in bearing caps. If pump is oil lubricated, breather tubes are placed in each bearing cartridge Oilers with nipple and elbow are placed in cartridge caps.



Casing bushing removed from impeller separator sleeve

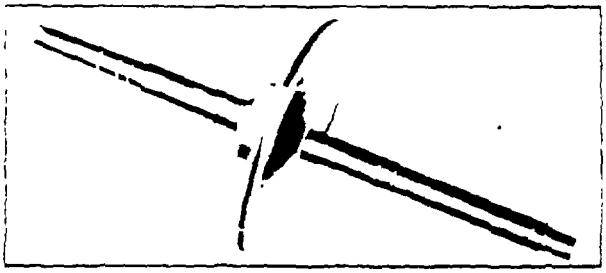
13. Slide casing wearing rings (28) over impeller wearing rings (70) and set rotating element into lower casing (74) Make certain that drill holes in bottom surface of casing wearing rings are located over pins (69). The drill hole in casing bushing (61) is over pin (63) previously set in lower casing (74).

NOTE

Grease zerks or breather tubes should face up

14. Install key (24) in motor end of shaft (71) Check positioning and alignment of packing rings or seal components Install swing bolts (22) and split gland halves (21) if pump has packing. Position clamps (20), washers (19), and nuts (18), securing loosely in place Swing bolts (22) are set over pins (73) on 3 x 4 x 14A or smaller units On larger units swing bolts are held in place by capscrews (7) after upper casing is in position

15 Place pins (27) into bearing cartridges Place bearing caps (26) in position and secure with capscrews (25)

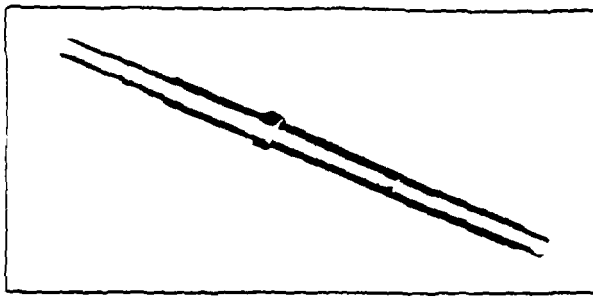


Impeller separator sleeve removed from shaft

16. Position new casing gaskets (9) on lower casing (74). Set upper casing (8) in place. Secure it to casing half (74) with capscrews (6). Pins (72) are used as a means of locating the position of casing halves.

17. On pumps larger than 3 x 4 x 14A thread in capscrews (7) making sure they are placed through eye of swing bolts (22).

On standard pumps with packing place gland halves (21) into position and install gland clamps (20) over gland halves and swing bolts (22) Place washers (19) and thread nuts (18) over swing bolts until finger tight



Inboard impeller removed Shaft sleeve in place

18. Place drain plugs (1) in (2) back in casing halves.

19. If lower casing was removed from base, see section on Installation for proper methods of realigning pump to motor and piping.

20. Replace any flushing or cooling lines that were removed. Connect electricity back to motor.

Starting Pump After Reassembly Do not start pump until all air and vapor have been bled. Make sure that there is liquid in the pump to provide necessary lubrication.

NOTE

Do not over tighten standard packing assembly before returning unit to operation.

CAUTION

Read operating instructions carefully before starting pump. Jog pump to check for proper rotation. Allow it to run a short time Gradually tighten nuts (18) until dripping has been reduced to its normal level.

Over tightening the packing will cause the stuffing box to overheat resulting in excessive wear of the shaft sleeve and packing

MODEL 421 LIST OF PARTS (SEE FIGURE 4)

1 Plug	34 Gasket	55 Setscrew
2 Plug	35 Retaining Ring	56 Bushing
6 Capscrew	36 Cartridge	57 Sleeve
7 Capscrew	37 Grease Seal	58 Gasket
8 Casing	38 Bearing	59 Impeller
9 Gasket	39 Slinger	60 Gasket
10 Grease Fitting	40 Slinger	61 Bushing
12 Plug	41 Capscrew	62 Sleeve
18 Nut	42 Cartridge Cap	63 Pin
19 Washer	43 Grease Seal	64 Gasket
20 Clamp	44 Gasket	65 Sleeve
21 Gland Half	45 Cartridge	66 Gasket
22 Swing Bolt	46 Grease Seal	67 Impeller
23 Packing	47 Bearing	68 Key
24 Key	48 Slinger	69 Pin
25 Capscrew	49 Gland	70 Wearing Ring
26 Bearing Cap	50 "O" Ring	71 Shaft
27 Pin	51 "O" Ring	72 Pin
28 Case Ring	52 Lantern Ring	73 Pin
29 Protector	53 Seal	74 Casing
31 Capscrew	54 Collar	75 Drive Screw
32 Cartridge Cap		76 Nameplate
		78 Setscrew

NOTE

WHEN ORDERING SPARE PARTS ALWAYS INCLUDE THE PUMP TYPE SIZE SERIAL NUMBER, AND THE PIECE NUMBER FROM THE EXPLODED VIEW IN THIS MANUAL

ORDER ALL PARTS FROM YOUR LOCAL AUTHORIZED DISTRIBUTOR FACTORY BRANCH SALES OFFICE OR THE FACTORY AT NO AURORA ILLINOIS

MODEL 421

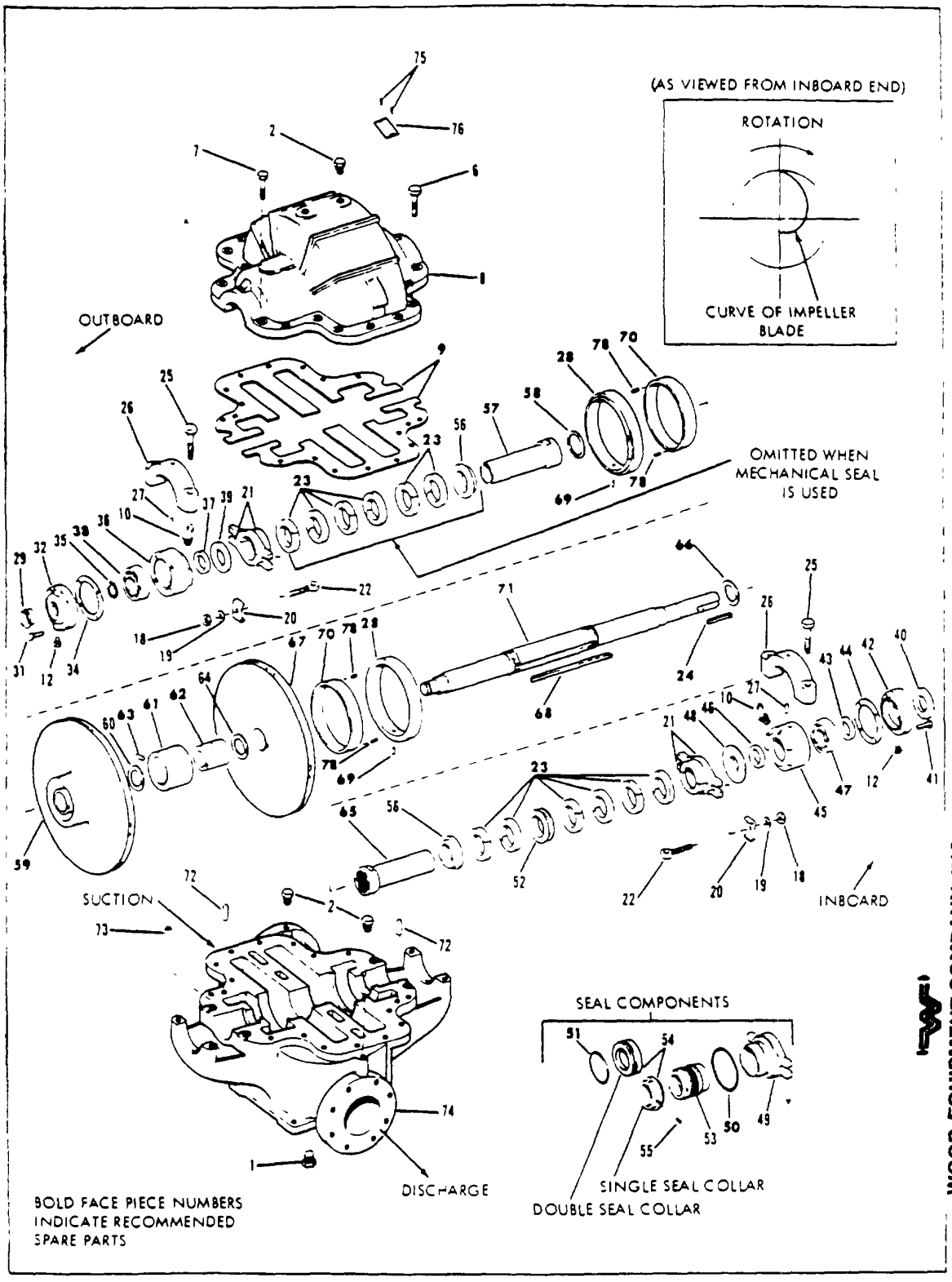


Figure 4. 421 Pump Exploded view

TEEL

OPERATING INSTRUCTIONS & PARTS MANUAL

CONVERTIBLE JET PUMP SYSTEM

MODEL 3P648A

FORM
5S2092
04223

DAYTON ELECTRIC MANUFACTURING CO. CHICAGO 60648

0581,154/1M

ATTENTION: READ CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE YOUR TEEL PUMP. PROTECT YOURSELF AND OTHERS BY OBSERVING ALL SAFETY INFORMATION AND ADDITIONAL INSTRUCTIONS INCLUDED WITH THIS EQUIPMENT. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE! RETAIN FOR FUTURE REFERENCE.

Description

Your Teel jet pump system consists of a convertible jet pump mounted on a 30 gallon horizontal tank 3P557 It can be used on either shallow well (0-25 ft) or deep well (25-60 ft) application Each unit is shipped partially assembled to save on-site installation and consists of the following components convertible ejector pressure switch flow control valve foot valve pressure gauge capacitor start motor and the pressure tank

The air volume control tubing and connection fittings are included but not assembled

Unpacking

Open carton remove pump and tank unit Remove air volume control package and ejector carton Check for loose missing or damaged parts

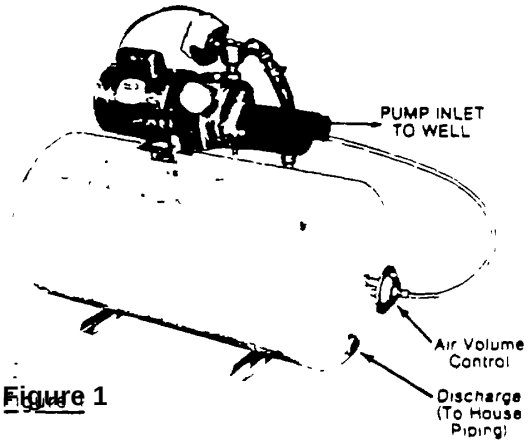


Figure 1

Specifications

MODEL	HP	MOTOR VOLTAGE	PHASE	HZ	RPM	MOTOR CONNECTED FOR	PRESSURE SWITCH SETTING	INCHES NPT			DIMENSIONS				TANK CAPACITY GALLONS
								SUCTION INLET	PRESSURE PORT	DISCHARGE OUTLET	H	W	L	WT	
3P648A	1/2	115.230 V	1	60	3450	115V	20-40 PSI	1¼	1"	¾"	27½"	16"	35"	108	30 GAL

Performance Chart

MODEL	HP	PUMP TYPE	APPLICATION	PSI	GPH @ PSI DEPTH MEASURED FROM PUMP TO WATER TABLE								
					5'	10'	15'	20'	25'	30'	40'	50'	60'
3P648A	1-2	convertible	S W	20	720	660	540	470	320	—	—	—	—
				40	580	620	520	440	310	—	—	—	—
				60	470	440	400	360	300	—	—	—	—
			D W	20	—	—	—	—	—	740	650	540	410
				40	—	—	—	—	—	500	400	300	200
				60	—	—	—	—	—	—	—	—	—

General Safety Information

1 Know the pump application, limitations, and potential hazards

WARNING: Do not use to pump flammable or explosive fluids such as gasoline, fuel oil, kerosene, etc. Do not use in explosive atmospheres. Pump should only be used with liquids compatible with pump component materials. Failure to follow this warning can result in personal injury and/or property damage.

2. Make certain that the power source (electric motor or gas engine) conforms to the requirements of your equipment
3. Provide adequate protection and guarding around moving parts
4 Disconnect power before servicing
5 Release all pressure within the system before servicing any component.
6 Drain all liquids from system before servicing
7 Secure the discharge line before starting the pump An unsecured discharge line will whip, possibly causing personal injury and/or property damage
8 Check hoses for weak or worn condition before each use making certain that all connections are secure
9 Periodically inspect pump and system components Perform routine maintenance as required (See MAINTENANCE Section)
10 Provide a means of pressure relief for pumps whose discharge line can be shut-off or obstructed
11 Personal Safety
   a Wear safety glasses at all times when working with pumps
   b Wear a face shield and proper apparel when pumping hazardous chemicals
   c Keep work area clean uncluttered and properly lighted — replace all unused tools and equipment
   d Keep visitors at safe distance from work area
   e Make workshop child-proof — with padlocks master switches and by removing starter keys
12 When wiring an electrically driven pump, follow all electrical and safety codes, as well as the most recent National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA)
13 This equipment can be used for either 120V (single phase) or 240V (single phase) This unit can be wired for either portability, with flexible three wire cord, or permanent installation using a power supply with a ground

   The green (or green and yellow) conductor in the cord is the grounding wire The motor must be securely and adequately grounded for your protection against shock hazards! This can be accomplished by either: 1) Inserting plug (portable) directly into a properly installed and grounded three prong grounding type receptacle (as shown in Figure A for 110-120V, or Figure D for 220-240V), 2) Permanently wiring the unit with a grounded, metal raceway system, 3) By using a separate ground wire connected to the bare metal of the motor frame; or 4) Other suitable means

   CAUTION: NEVER CONNECT THE GREEN (OR GREEN AND YELLOW) WIRE TO A LIVE TERMINAL!

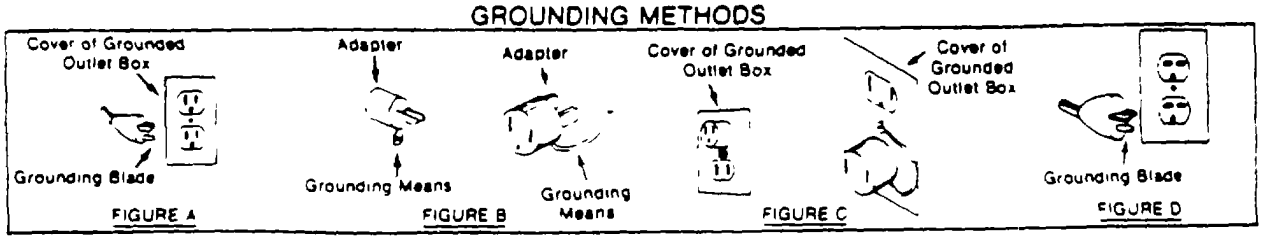
   Where a two prong wall receptacle is encountered, it must be replaced with a properly grounded three prong receptacle installed in accordance with the National Electrical Code and local codes and ordinances

   A three prong to two prong grounding adapter (as shown in Figures B and C) is available for connecting plugs as shown in Figure A

   Do not use a three prong grounding adapter unless permitted by national and local codes and ordinances (a three prong to two prong adapter is not permitted in Canada) Where permitted, the rigid green tab or terminal on the side of the adapter must be securely connected to a permanent electrical ground such as a properly grounded outlet box, or a properly grounded water system Many cover plate screws, water pipes and outlet boxes are not properly grounded To ensure a proper ground, the grounding means must be tested by a qualified electrician No adapter is available for a plug as shown in Figure D

   Use only three wire extension cords that have three prong, grounding type plugs, and three pole receptacles that accept the equipment plug
14 All wiring should be performed by a qualified electrician
15 Protect electrical cord from sharp objects, hot surfaces, oil, and chemicals Avoid kinking the cord Replace or repair damaged or worn cords immediately
16 Keep fingers and foreign objects away from ventilation and other openings. Do not insert any objects into the motor
17 Use wire of adequate size to minimize voltage drop at the motor
18 Disconnect power before servicing a motor or its load If the power disconnect is out-of-sight, lock it in the open position and tag it to prevent unexpected application of power

GROUNDING METHODS



04223

Installation

1 SHALLOW WELL APPLICATIONS

a On single pipe installations attach foot valve to the end of the suction line and set in well making certain that the valve is below the water surface (see Figure 4) The foot valve should be at least 5 feet from the bottom of the well to prevent sand from being drawn into the system (See Figure 4 Ref #6)

b When connected to a drive point, a check valve must be used in the suction line instead of a foot valve (see Figure 4, Ref #5) For easy priming, connect the check valve as close to the well as possible

c Unions in the suction line near pump and well will aid in servicing Be sure to leave enough surrounding room so that wrenches can be used without difficulty

2 DEEP WELL (DOUBLE PIPE SYSTEM) APPLICATIONS

a Attach the foot valve to ejector using a plastic or galvanized steel pipe nipple (see Figure 5) Add sufficient pressure pipe (1¼) and suction pipe (1¼") to submerge ejector 10 to 15 feet below pumping water level The foot valve should be at least 5 feet from the bottom of the well If pressure and suction pipes of the same diameter are used, be sure to identify them clearly so that they will be connected to the proper taps on the pump

If a known weak well exists, replace nipple with 34 feet of 1¼" tail pipe between the ejector and the foot valve This will provide a continuous source of water for the pumping system

b Check pipe and foot valve for leaks by filling pipes with water A continuing loss of water indicates a leak in the piping, foot valve or unions and must be corrected

c If no leaks are found connect pressure and suction pipes from well to pump using piping of the same diameter as the suction (1¼") and pressure (1") pipe tapping of the pump

d Attach house piping to discharge of pump tank This is located at one end of tank on the bottom (see Figure No 1) This outlet is 1" pipe thread

NOTE The pump requires an ejector matched to the characteristics of the pump If an existing pump is being replaced, the new ejector supplied should be used to insure proper pump performance

3 WIRING

a All wiring and electrical connections must comply with the National Electrical Code, and local electrical codes in effect In particular refer to Article 430 (Motors, Motor Circuits and Controllers) of the NEC

b For proper electrical connections, refer to the connection diagram located on the nameplate or inside the terminal box of the motor Make sure connections are correct for the voltage being supplied to the motor

c Whenever possible, the pump should be powered from a separate branch circuit of adequate capacity to keep voltage drop to a minimum during starting and running For longer runs, increase wire size in accordance with the Wire Selection Guide

d. For proper wiring the following procedures should be followed (See diagrams below)

1 Select the voltage you are to use, either 115V or 230V, single phase

2. Check motor wiring to verify which voltage the motor is currently wired for

3 If the motor wiring must be changed to conform to your specific voltage requirements than the motor and pressure switch should be rewired to conform to one of the following diagrams (either 115V or 230V, single phase) Make sure unit is properly grounded

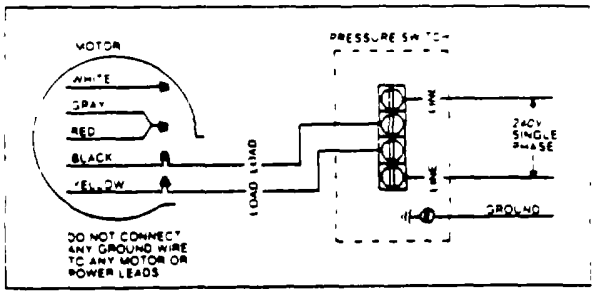
4 If the above information or the following wiring diagrams are confusing than an electrician familiar with motor wiring should be consulted

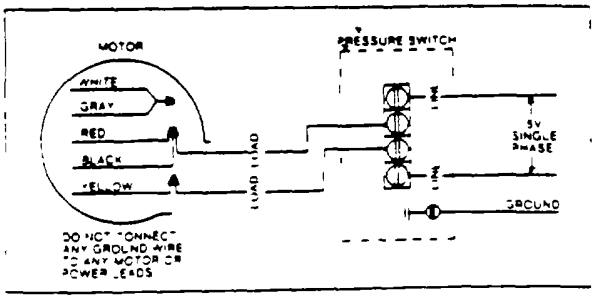
WARNING: a wrong connection can burn out the pump motor, cause an electrical short, or produce an electrical shock. Failure to follow the above warning can result in property damage and/or personal injury.

WIRE SELECTION GUIDE

DISTANCE FROM MOTOR TO FUSE BOX OR METER	MOTOR H P 1/2	
	115V	230V
0 to 50 ft	12 GA	14 GA
50 to 100 ft	10 GA	14 GA
100 to 150 ft	8 GA	14 GA
150 to 200 ft	8 GA	14 GA
200 to 300 ft	6 GA	12 GA
FUSE SIZE	30 AMP	15 AMP

NOTE ½ HP pumps are factory connected for 115V at the motor





General Safety Information (con't.)

19 Do not touch an operating motor Modern motors are designed to operate at high temperatures

WARNING: Do not handle a pump or pump motor with wet hands or when standing on a wet or damp surface, or in water.

WARNING: The pump motor is equipped with an automatic resetting thermal protector and may restart unexpectedly. (See Specification Chart). Protector tripping is an indication of motor overloading as a result of operating the pump at low heads (low discharge restriction), excessively high or low voltage, inadequate wiring, incorrect motor connections, or a defective motor or pump.

Assembly

1 For shallow well applications (0-25 ft), attach ejector to the face of the pump with gasket and bolts provided

2. Assemble air volume control to the ⅜" tapping of the pressure tank making certain that the orifice of the control is in the down position

3 Connect plastic tubing to air volume control

4 On shallow well installations connect other end of plastic tubing to the ¼" tapping on the side of the ejector body (See Fig No 2)

5 On deep well installations the air volume control tubing is connected to the ¼ tapping located on the pump case directly above the suction pipe tapping (See Fig No 3)

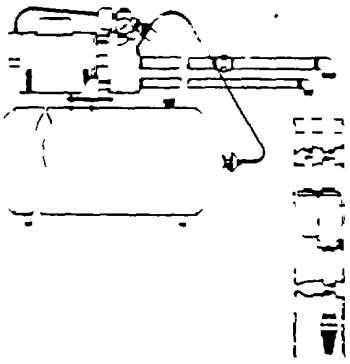


Figure 2 - Shallow-Well Hook Up

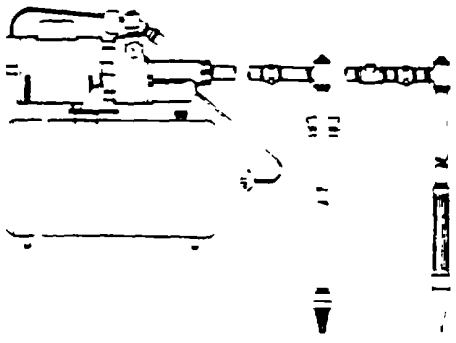


Figure 3 - Deep-Wall Hook Up

Preinstallation

IMPORTANT If a piping system already exists, make sure it s in good condition and free from dirt and scale With new piping, ream all threaded joints to minimize restrictions Use pipe dope on male threads only Remember that the entire system must be completely leakproof This means that all piping must be pulled up tight. Take extra care to keep dirt pipe dope, thread cuttings etc. from getting into the system where they might clog the jet nozzle

GENERAL CONSIDERATIONS

Performance and efficiency of your Teel jet pumping system depends on four factors

1 Condition of Well

Before the pump installation is made, a new well should be pumped clean of sand and gritty material Presence of this material will clog and damage the pump Old wells should also be cleaned out to prevent accumulated sand and grit from contaminating the water supply being pumped

2 Depth of Water

- a Shallow Well (Maximum depth of 25 ft)
  - (1) As a single-pipe system, can be used with a well point or in 2" ID and larger wells
  - (2) Mount jet on pump and run suction pipe to the water supply
- b Deep Well (from 25 to 60 ft)
  - (1) Well must be 4" ID or larger
  - (2) Installation must be a 2-pipe system
  - (3) The jet must be installed in the well 10 to 15 ft below the water level

3 Ability of Well to Supply Water (Yield)

- a The well yield must be equal to or greater than the pump's performance at any given depth (see Performance Chart)
- b When the well yield is questionable, it is wise to have it checked out by a well contractor

4 Proper Location of Pump

- a For best performance, pump should be as close to the well as possible
- b Locate pump in a basement, a pit below ground, or in an above-ground, frost protected pump house
- c Horizontal runs should be kept to a minimum Short runs improve pump performance

5 Offset Piping

All offset piping should slope up from well to pump, avoid dips or pockets in offset piping or air will accumulate at high points, making priming difficult Unions near pump and well will aid in servicing, be sure to leave enough surrounding room so that wrenches can be used without difficulty

Maintenance

VENTILATION AND DRAINAGE

Ventilation and drainage must be provided to prevent moisture damage to motor and pressure switch, and to prevent pipe from freezing When not in use, pump and pipeline must be drained if there is any danger of freezing

LUBRICATION

The motor has prelubricated bearings which should not require oiling in normal pump service

ROTARY SEAL ASSEMBLY REPLACEMENT

Should the rotary seal assembly require replacement, proceed as follows (Refer to Figure 6 as an aid in disassembly and assembly procedures)

CAUTION: The rotary seal assembly must be handled carefully to avoid damaging the precision lapped faces of the sealing components.

1 Disengage pump body (Ref No 10, from mounting frame (Ref No 2)

2 Unscrew impeller (Ref No 5) from the motor shaft.

NOTE These motors have two flats between pump and motor so that the shaft can be held by an open end wrench to facilitate easy impeller and seal removal

3 Detach mounting frame from the motor The carbon seal face, friction ring, and brass & spring shell of the rotary seal assembly will come loose at this time

4 Using a screwdriver, remove the ceramic seal and rubber gasket from the recess of the mounting frame

5 Clean the mounting frame recess and the motor shaft thoroughly.

NOTE. Replace slinger washer, if removed from the motor shaft

6 Install the new rotary seal assembly

a Insert the ceramic seal and the rubber gasket into the recess of the mounting frame

NOTE. To help facilitate installation, apply a light coating of oil to the outside diameter of the rubber gasket. Make certain that the ceramic seal is kept clean and free of dirt and/or oil

b Attach the mounting frame to the motor face, carefully guiding the shaft through the ceramic seal

c Slip the remaining parts of the rotary seal assembly onto the motor shaft

NOTE Apply a tight coating of oil to the inside diameter of the rubber drive ring

7 Replace the impeller

8 Reassemble the pump body to the mounting frame.

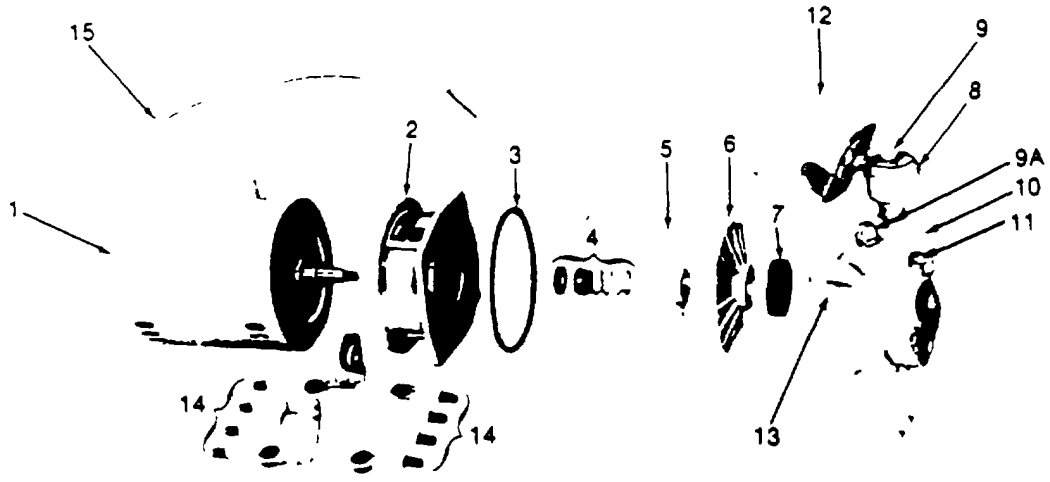
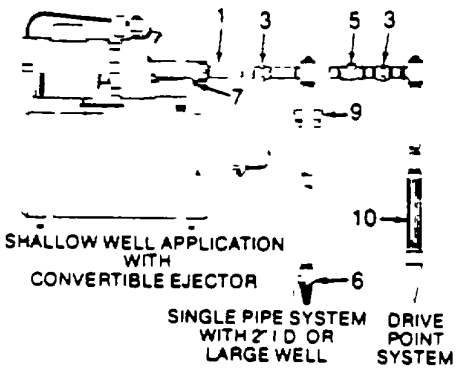


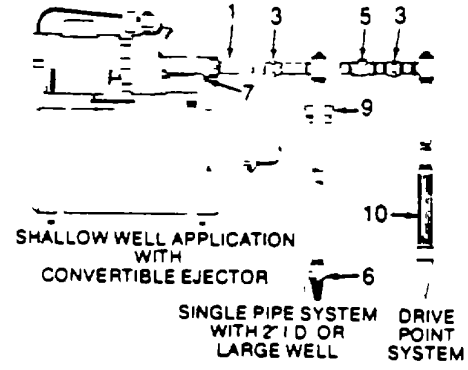
Figure 6

04223

Installation (Con't)



Installation (Con't)



SYSTEM COMPONENTS

1	Suction pipe	6	Foot valve
2	Pressure pipe	7	Convertible ejector
3	Union	8	Tail pipe
4	Slip coupling	9	Well seal
5	Check valve	10	Drive point

Operation

PRIMING AND ADJUSTMENT

CAUTION: Before starting motor, the pump body must be completely filled with water. Running the pump dry will cause seal failure.

a SHALLOW WELL

To prime pump, remove priming plug (Ref No 9A on the following page) from the priming opening. Fill pump with water through priming opening until all air has been expelled from pump and suction pipe. Replace plug, screwing in only far enough to seal and start the motor If pump fails to build up pressure within three minutes, shut-off pump and reprime In some cases this procedure may have to be done several times, until all air is expelled

Once the pump is primed, tighten priming plug If unit will not stay primed see Trouble Shooting

NOTE The brass flow control screw fits on top on control box (Ref No 8) supplied with the convertible ejector is not used in a shallow well installation A specially threaded plug (Ref No 9) is used in its place

B DEEP WELL

Remove the priming plug from the priming opening (See Figure 7) and fill pump with water until all air has been expelled Replace priming plug

Remove plug (Ref No. 9) from control body and replace with flow control screw (Part No 124330) which is found in ejector carton

Tighten flow control screw completely by turning clockwise, then start the pump

If pump is properly primed, pressure will quickly build and register on the gauge mounted directly on the pump body If pressure does not build repeat priming operation. On deeper well installation all air must be vented from the drive and suction pipes as well as the body before the pump will prime Several fillings of the pump body may be necessary to achieve the prime

With pump operating at high pressure and no pressure in the tank (two or more faucets open) slowly unscrew the flow control screw until maximum flow is obtained This steady pressure will be minimum operating pressure and is 27 PSI for this pump The flow control screw diverts the proper amount of water to operate the ejector

The optimum control valve setting is dependent upon the type of well installation and pressure switch setting for the particular pump

NOTE Pump will not prime if there is any leakage in suction piping

LIMITED WARRANTY

Jet convertible jet pump system Model 3P648A is warranted by Dayton Electric Mfg Co Dayton to the original user against defects in workmanship or materials under normal use rental use excluded for one year after date of purchase Any part which is determined to be defective in material or workmanship and returned to an authorized service location as Dayton designates shipping costs prepaid will be repaired or replaced at Dayton's option For warranty claim procedures see "Prompt Disposition" below This warranty gives purchasers specific legal rights and purchasers may also have other rights which vary from state to state

WARRANTY DISCLAIMER Dayton has made a diligent effort to illustrate and describe the products in this literature accurately however such illustrations and descriptions are for the sole purpose of identification and do not express or imply a warranty that the products are merchantable or fit for a particular purpose or that the products will necessarily conform to the illustrations or descriptions

Except as provided below no warranty or affirmation of fact express or implied other than as stated in "LIMITED WARRANTY" above is made or authorized by Dayton and Dayton's liability in all events is limited to the purchase price paid

Certain aspects of disclaimers are not applicable to consumer products e g some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you Also some states do not allow limitations on how long an implied warranty lasts consequently the above limitation may not apply to you and rights by law during the period of this Limited Warranty any implied warranties of merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers may not be excluded or otherwise disclaimed

PROMPT DISPOSITION Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within warranty For any product believed to be defective within warranty write or call dealer from whom product was purchased Dealer will give additional directions If unable to resolve satisfactorily write to Dayton at address below giving dealer's name address date and number of dealer's invoice and describing the nature of the defect If product was damaged in transit to you file claim with carrier

DAYTON ELECTRIC MFG CO, 5959 W HOWARD ST CHICAGO, ILLINOIS 60648

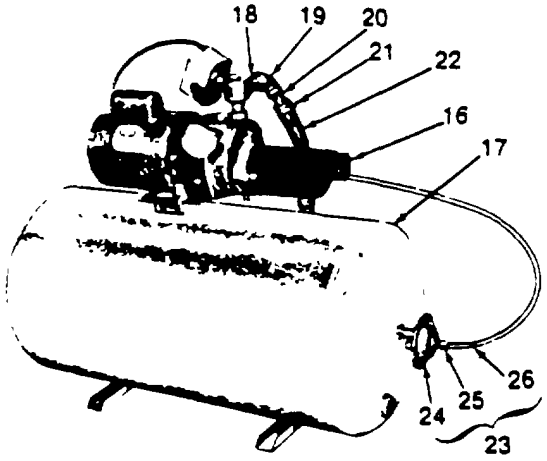


Figure 7

Replacement Parts List

Ref No	DESCRIPTION	QTY	PART NO
1	Motor, Nema J	1	9K573
2	Mounting Ring	1	134162
3	Ring, (sq cut)	1	132583
4	Seal, rotary w/spring	1	131100
5	Impeller	1	132613
6	Diffuser	1	132424
7	Rubber (diffuser)	1	132428
8	Control body	1	134532
9	Plug (For Control Body)	1	128794
9A	Priming plug (½ NPT)	1	120836
10	Body pump	1	134530
11	Plug (¼" NPT)	2	*
12	Pressure switch	1	131202
13	Pressure gauge	1	123168
14	Cap screws (⅜" x ¾")	8	*
15	Lead wire	1	125096
16	Ejector Package	1	1P971A
—	Ejector body	1	132433
—	Gasket kit (gasket & 2 cap screws)	1	132404
—	Flow control assembly	1	124330
—	Nozzle	1	4C39-18
—	Venturi	1	4C40-38
—	Foot valve	1	127511
17	Pressure tank	1	130775
18	Nipple (¾" x 1⅜")	1	*
19	Elbow (¾")	1	*
20	Nipple, threaded one end (¾" x 2¾")	1	*
21	Clamps	2	*
22	Hose (1" x 8½")	1	128000
23	Air volume control assembly kit	1	128045
24	Air volume control	1	126722
25	Nut	2	125034
—	Ferrule	2	125035
26	Tubing (¼" x 38")	1	130238
—	Straight connector	1	125033

*Standard hardware item available locally

FORM 5S2092 **MODEL 3P648A**

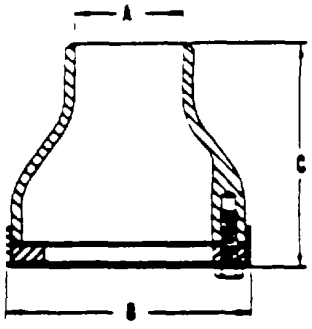
04223

Trouble Shooting Chart

SYMPTOM	POSSIBLE CAUSES	CORRECTIVE ACTION
Pump won t start or run	1 Blown fuse	1 If blown, replace with fuse of proper size
	2 Low line voltage	2 If voltage under recommended minimum check size of wiring from main switch or property If OK, contact power company
	3 Loose broken, or incorrect wiring	3 Rewire any incorrect circuits Tighten connections replace defective wires Check motor connections
	4 Defective motor	4 Replace motor
	5 Defective pressure switch	5 Adjust switch settings Replace switch or clean contacts of old switch with fine emery cloth if dirty or badly pitted
	6 Impeller or seal	6 If impeller won t turn, remove housing and locate source of binding
Pump starts and stops too often	1 Leak in pressure tank	1 Repair leaks or replace tank
	2 Defective air volume control (Water-logged tank — no air cushion)	2 Clean or replace defective control
	3 Faulty pressure switch	3 Adjust switch settings Replace switch or clean contacts of old switch with emery cloth if dirty or badly pitted
	4 Leak on discharge side of system	4 Repair leaks as necessary
	5 Leak on suction side of system	5 Make sure above ground connections are tight and repeat test If necessary pull piping and repair leak
	6 Leak in foot valve	6 Repair or replace
Pump won t shut off	1 Wrong pressure switch setting or setting drift	1 Adjust switch to proper setting
	2 Defective pressure switch	2 Replace switch if defective
	3 Loss of prime	3 Reprime if necessary
	4 Low well level	4 If undersized replace pump or ejector Lower ejector
	5 Fouled ejector	5 Clean
Pump operates but delivers little or no water	1 Low line voltage	1 If voltage under recommended minimum check size of wiring from main switch on property If OK contact power company
	2 System incompletely primed	2 Reprime if necessary
	3 Air lock in suction line	3 Rearrange piping to eliminate air lock
	4 Undersized piping	4 Replace undersized piping or install pump with higher capacity
	5 Leak in air volume control or tubing	5 Tighten all fittings and replace control if necessary
	6 Pressure regulating valve stuck or incorrectly set (Deep well only)	6 Reset, clean, or replace valve as needed
	7 Leak on suction side of system	7 Make sure above ground connections are tight Repeat test If necessary, pull piping and repair leak
	8 Low well capacity	8 If well is "weak" lower ejector (deep well pumps) or switch from shallow well to deep well arrangement
	9 Plugged ejector	9 Clean and reinstall if dirty
	10. Defective or plugged foot valve and/or strainer	10 Clean repair, or replace as needed
	11 Worn or defective pump parts or plugged impeller	11 Replace worn parts or entire pump Clean parts if required

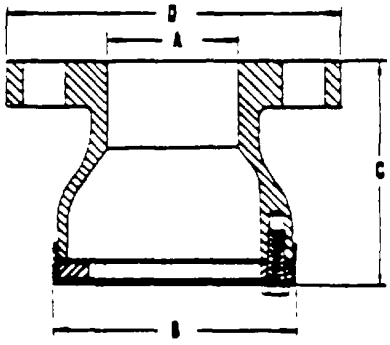
Tank Air Escape Valves

Weld Type 1600-W



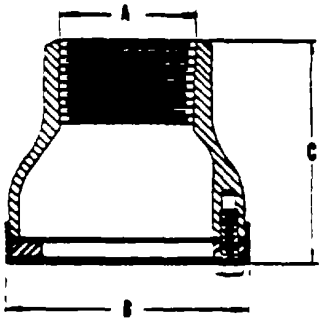
A	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
B	3-5/8	4-1/2	5-3/8	6-1/4	–	7 1/4	10-1/4	11 1/2	14-1/2	17 1/8	20-3/4
C	3 11/32	3 11/32	3 27/32	3 27/32	–	4 11/32	7 3/4	8-3/4	9-3/4	12 3/4	15 1/8
Wt.	2 1/2	3 1/4	4 1/4	5	–	6 1/2	20 1/2	28	48	68	100

Flanged Type 1600-F



A	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
B	3-5/8	4-1/2	5-3/8	6-1/4	–	7 1/4	10-1/4	11 1/2	14-1/2	17-1/8	20-3/4
C	3 11/32	3 11/32	3 27/32	3 27/32	–	4 11/32	7 3/4	8-3/4	9-3/4	12 3/4	15 1/8
D	5	6	7	7 1/2	–	9	10	11	13 1/2	16	19
Wt.	5 1/2	8 1/4	10	13	–	19 1/2	41	53	87	128	200

Threaded Type 1600-T



A	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
B	3-5/8	4-1/2	5-3/8	6-1/4	–	7 1/4	10-1/4	11 1/2	14-1/2	17 1/8	20-3/4
C	3 11/32	3 11/32	3 27/32	3 27/32	–	4 11/32	7 3/4	8-3/4	9-3/4	12 3/4	15 1/8
Wt.	2 1/2	3 1/4	4 1/4	5	–	6 1/2	20 1/2	28	48	68	100

WAGER

Tank Air Escape Valves

Model 1600

Description: Model 1600 Wager Tank Air Escapes consist of a body (of any material) equipped with a 30 x 30 mesh monel flame screen and a ¼ x ¼ mesh monel protecting screen, separated by a spacer ring. These parts are held in place on the body by means of a monel cap and #316 stainless steel screws.

Connections are either screwed IPS, flanged ASA or weld type as required.

Although somewhat similar in design to the Wager Inverted Vent Check Valves, these Tank Air Escapes are *not* equipped with a ball float.

Function: Wager Tank Air Escapes serve to allow the free passage of air into tanks, dry cargo holds, or storage spaces . . . and prevent vacuum or pressure build-up during pumping operations. Since these valves have no float for automatic closing, they should be placed in locations which are not accessible to sea water. The fine monel flame screen protects tank fluids or dry cargo dust from igniting in the event of deck fires and prevents the entrance of insects into areas serviced by these valves.

A coarse monel Protecting Screen, separated from the Flame Screen by a spacer ring, prevents any mechanical damage to the Flame Screen and acts as a deterrent to clogging this inner screen with paint.

Features:

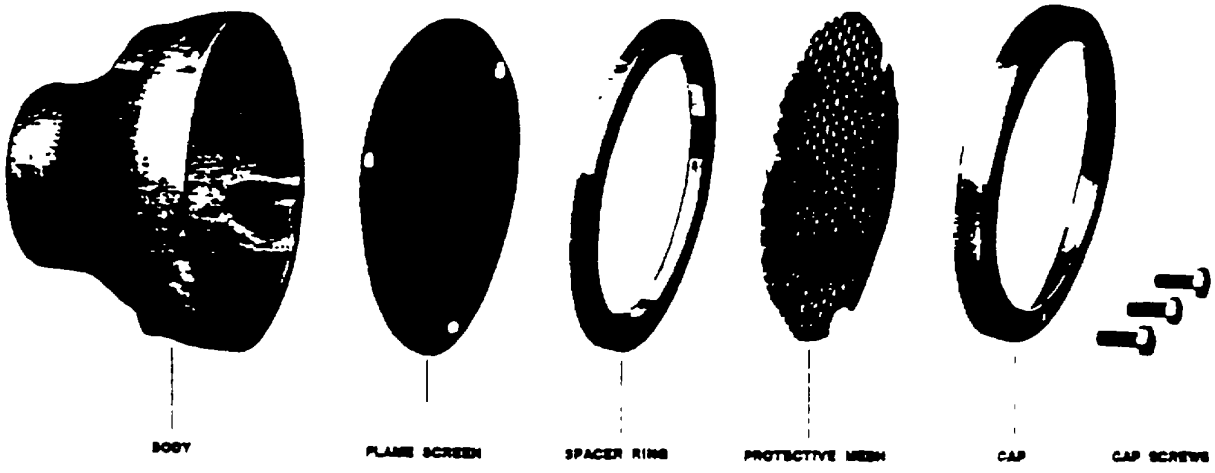
1 — OPEN AREA RATIO. Meets latest requirements for ABS, USMA, USCG and U. S. Navy.

2 — ACCESSIBILITY OF PARTS: Removal of the cap screws facilitates cleaning, inspection and/or replacement.

3 — RESISTANCE TO CORROSION: Monel and Stainless Steel are used for trim insuring long life.

4 — BODY MATERIAL. Steel, Stainless Steel, Cast Iron or Bronze.

Exploded View



Robert H. Wager Co., Inc. – Passaic Ave., Chatham, N. J. 07928 • Tel. 201-635-9200

REV.	ECO. NO.	DESCRIPTION OF CHANGE	DRN.	CHK.	DES.	PROJ.	REL.
A		HEADER WAS 22446-1, ADDED JUMPER @ +IN -EX & MOD. CAL				WHG	2-20 85

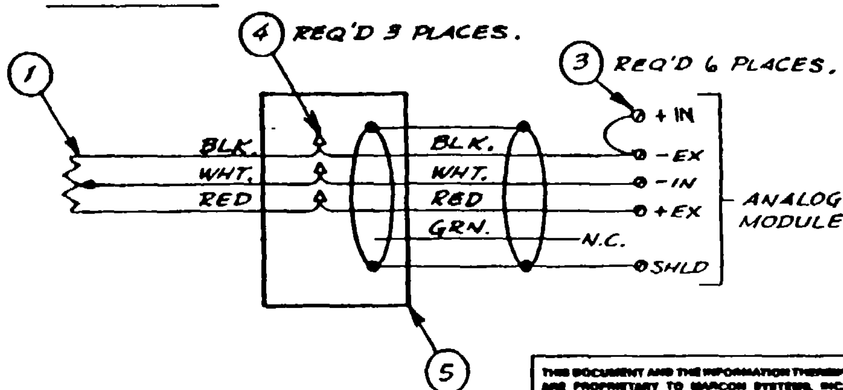
NOTES:

1. CUSTOMER SUPPLIED.
2. SEE SHT. 3, FOR SENSORS, & ADDITIONAL HARDWARE.

MOUNTING RECOMMENDATION:

1) MOUNT VERTICALLY IN TANK AS ACCESS REQUIRES.

WIRING:



ITEM	PART NUMBER	QTY	DESCRIPTION	REF DES
5	1	1	BOX - SPLICE	
4	1	6	SPLICE - CRIMP, CLOSED END	
3	1	4	TERMINAL - #6 RING LUG	
2	22638	1	CABLE - 4 COND. W/SHIELD	
1	TLI	2	SENSOR	

MATERIAL LIST

THIS DOCUMENT AND THE INFORMATION THEREIN ARE PROPRIETARY TO MARCON SYSTEMS, INC. AND SHALL BE USED ONLY FOR THE PURPOSES OF SUBMITTAL TO YOU. FURTHER, THE DOCUMENT AND THE INFORMATION THEREIN SHALL NOT BE REPRODUCED, OR DISCLOSED IN WHOLE OR IN PART TO OTHERS WITHOUT THE WRITTEN PERMISSION OF MARCON SYSTEMS, INC.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCE: FRACTIONS = ± 1/4; DECIMALS = X ± .1, .XX ± .03, .XXX ± .010; ANGLES = ± 1/2°

MODEL | NEXT ASSY

DRN. | CHK. | DES. | PROJ. WHG | REL. 12-8-83

MARCON SYSTEMS, INC. BELLEVUE, WASH. 98005

DWG. TITLE: SENSOR SPECIFICATION: GENERAL, GEMS TANK LEVEL SENSOR

CODE IDENT. NO. — | SIZE B | DWG. NO. 23285 | REV A

SCALE — | DO NOT SCALE DWG | SHEET 1 OF 3

DWG NO 23285 REV A

REV	ECO NO.	DESCRIPTION OF CHANGE	DRN	CHK	DES	PROJ	ENG
		SEE SHEET 1.					

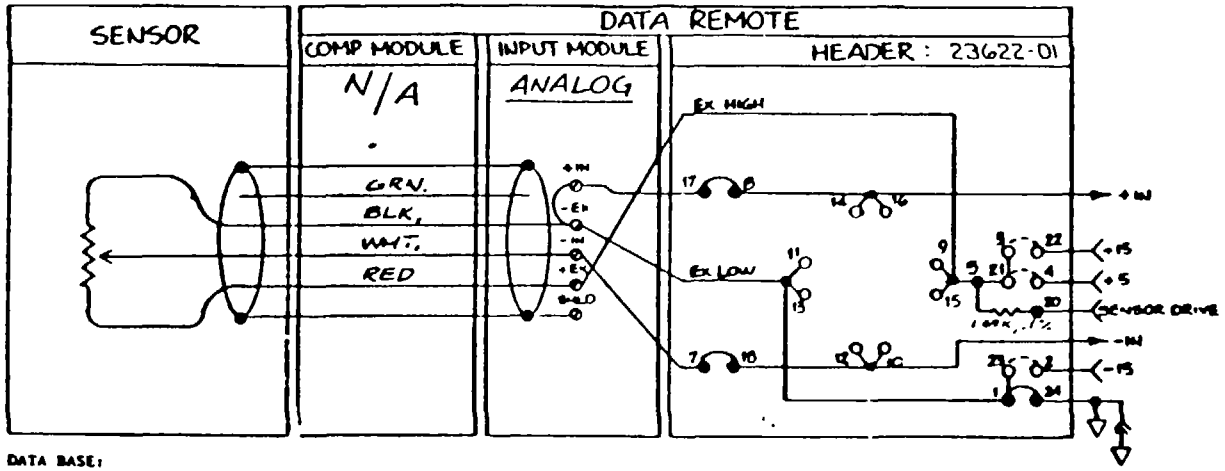
FUNCTION: Level Sensor

PARAMETERS: Linear Displacement

INPUT SCALE: Varying Voltage Divider

OUTPUT SCALE: Gallons

ACCURACY: ± X"



DATA BASE:

SCALE		OFFSET	SPAN	RANGE	CAL
A C B L Tank Tables	112"	0	1902	0	6
ACBL (Bill Elmer) Tank Tables					
	120"	0	1832	0	6
	107"	0	1967	0	6
	86"	0	2255	0	6

(Non-Linear Scale. Accurate 0)

CALCULATION:

$$V_{out\ max} = -10v \left(\frac{1.12k}{1.69k + 1.12k} \right) = -3.98$$

Vout min = 0v

The sensor is a pot with approx. 10^ change for each 1" change in level from 0-115". Refer to Sensor Library for details.

CALIBRATION:

The display is generated from a non-linear lookup table. Use the formula

$$\left[\frac{(\text{Actual Reading} - \text{Displayed Reading})}{\text{Full Scale}} \times 3840 \right] + \text{OLD OFFSET}$$

to generate a new offset. Repeat the New Offset calculation until within 1% of Actual Reading.

TEST _____:

DRN	RVANZANOT
CHK	
DES	
PROJ	
ENG	

MARCON SYSTEMS, INC
BELLEVUE, WASH. 98005

DWG TITLE
SENSOR SPECIFICATION:
GENERAL,
GEMS TANK LEVEL SENSOR

CODE IDENT NO	SIZE	DWG NO	REV
—	B	23285	A

SCALE N/A DO NOT SCALE DWG SHEET 2 OF 3

REV	ECO NO.	DESCRIPTION OF CHANGE	DRN	CHK	DES	PROJ	REL
		SEE SHT. 1					

FUNCTION: 4-20ma Conductivity Sensor

PARAMETERS: PPM

INPUT SCALE: PPM

OUTPUT SCALE 4-20ma

ACCURACY:

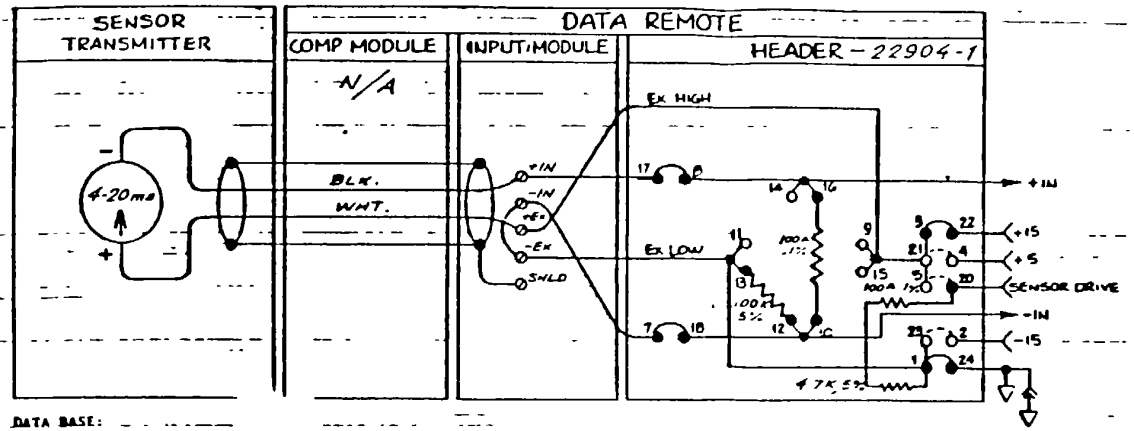
CALCULATION:

Vmin = 4ma x 100 = 400mv

Vmax = 20ma x 100 = 2v

Offset $\frac{-400}{1\ 6v}$ x 3840 = -960

Span = $\frac{.486}{1\ 6v}$ x 3840 = 2366



DATA BASE:

SCALE	ZERO	OFFSET	SPAN	TYPE	RANGE	CAL
ALL		-960	2366		0	5

DWG NO. 23236 REV

DRN RZ

CHK

DES

PROJ

REL

MARCON SYSTEMS, INC
BELLEVUE WASH 98005

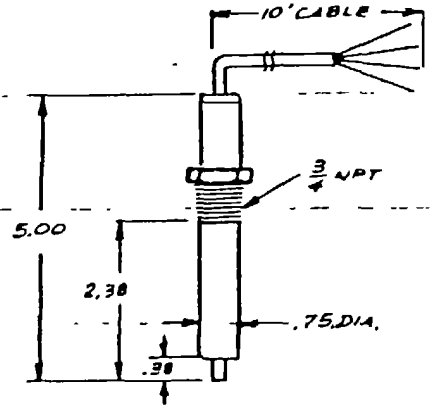
DWG TITLE
SENSOR SPECIFICATION
CONDUCTIVITY MONITORING
CURRENT, 4-20 ma D.C.

CUSTOMER DRWG NO. | SIZE | DWG NO 23236 | REV

SCALE DO NOT SCALE DWG SHEET 2 OF 2

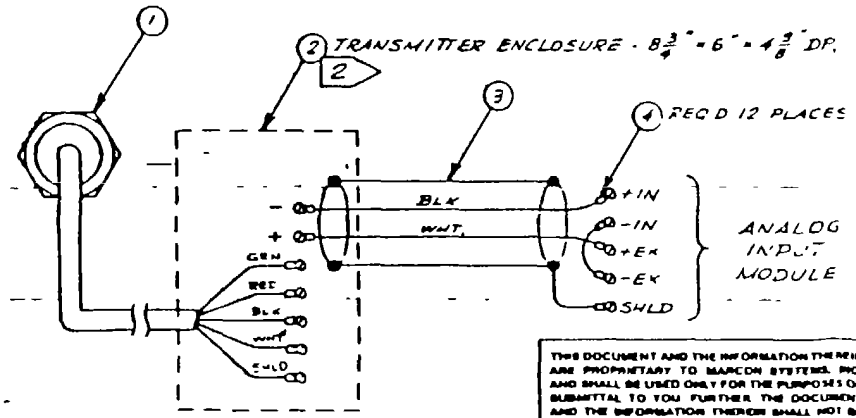
REV	ECO NO	DESCRIPTION OF CHANGE	DRN	CHK	DES	PROJ	REL

PHYSICAL OUTLINE



MOUNTING RECOMMENDATIONS : 2

WIRING :



THIS DOCUMENT AND THE INFORMATION THEREIN ARE PROPRIETARY TO MARCON SYSTEMS, INC. AND SHALL BE USED ONLY FOR THE PURPOSES OF SUBMITTAL TO YOU. FURTHER, THIS DOCUMENT AND THE INFORMATION THEREIN SHALL NOT BE REPRODUCED OR DISCLOSED IN WHOLE OR IN PART TO OTHERS WITHOUT THE WRITTEN PERMISSION OF MARCON SYSTEMS, INC.

NOTES :

1. CUSTOMER SUPPLIED.
2. REFER TO MANUFACTURERS INSTRUCTION MANUAL FOR OUTLINE & MOUNTING INSTALLATION RECOMMENDATIONS

MATERIAL LIST

ITEM	PART NUMBER	QTY	DESCRIPTION	REF DES
6	CGE-194	1	STUFFING TUBE - 2 COND CABLE	
5	1	7	TERMINAL - #6 RING LUG	
4	22366	1	CABLE - 2 COND. W/SHLD.	
3	CGB-193	1	STUFFING TUBE - 4 COND CABLE	
2	SCT I 210-J KFX57-M2	1	TRANSMITTER - 2 WIRE	
1	MODEL 414	1	SENSOR	

DWG. NO 22236 REV

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCE FRACTIONS = ± 1/4 DECIMALS = X ± .1 XX ± .03 XXX ± .010 ANGLES = ± 1/2°

MODEL | NEXT ASSY

DRN VZ | CHK | DES | PROJ WJG | REL 4-7-94

MARCON SYSTEMS, INC
BELLEVUE WASH 98005

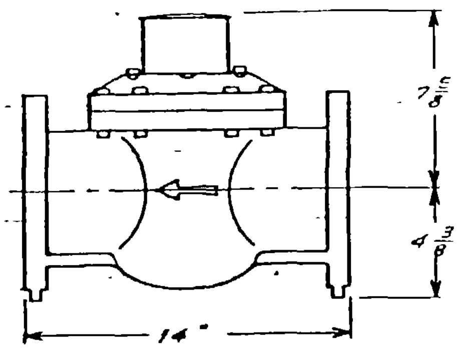
DWG TITLE
SENSOR SPECIFICATION
CONDUCTIVITY MONITORING
CURRENT, 4-20 ma D.C.

CONTRACT NO	SIZE	DWG NO	REV
	B	22236	

SCALE | DO NOT SCALE DWG | SHEET 1 OF 2

REV	ECO NO	DESCRIPTION OF CHANGE	DRN	CHK	DES	PROJ	REL
A		CHG DATA BASE		[signature]	[signature]	WWC	2 8 84

PHYSICAL OUTLINE



NOTES

1 Customer Furnished

2 Non-Clogging Rotor assembly construction allows passage of small solids
Not a Positive Displacement Type If a rock jams the rotor, flow through meter will not be blocked

3 Meter flange drilling patterns conform to both ASA125 and ASA150 The companion flanges are cast iron ASA125 pound flanges with NPT ends

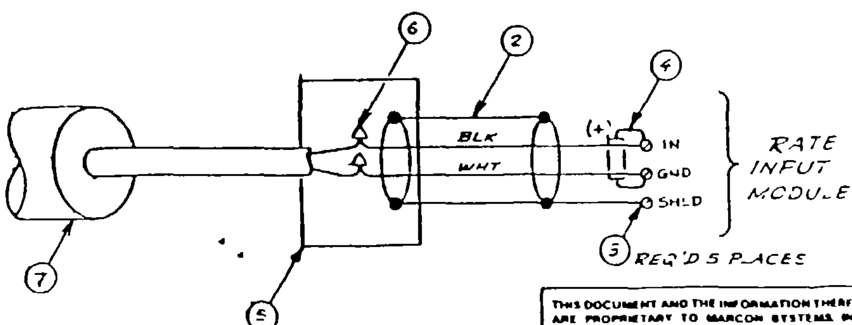
4 Pulser (p/n MRA4806) is a weatherproof, O-ring sealed unit with 9'10, 2-wire unshielded cable exiting from an epoxy sealed fitting The pulse element is a reed switch rated at 10 watts, non-inductive, magnetically actuated to provide a 50/50 open/closed ratio Closure rate is 1 contact/10 gallons

5 Mount pulser on sensor per mfg instructions enclosed with pulser assy

MOUNTING RECOMMENDATION

Mount sensor per mfg instructions
Plumb for correct direction of flow

WIRING:



7	PULT2-MRA4806	1	PULSER	
6	1	3	SPLICE, - CRIMP, CLOSED END	
5	22463-1	1	J-BOX / CABLE, 2 COND	
4	150D105x9020B2	1	CAPACITOR - ELEC., 1μ, 20 V.	
3	1	5	TERMINAL - #6 RING LUG	
2	22366	1	CABLE - 2 COND W/ SHLD	
1	225C01C0U00S?	1	TRANSDUCER - FLOW, 4" BRONZE	
ITEM	PART NUMBER	QTY	DESCRIPTION	REF DES

MATERIAL LIST

THIS DOCUMENT AND THE INFORMATION THEREIN ARE PROPRIETARY TO MARCON SYSTEMS, INC. AND SHALL BE USED ONLY FOR THE PURPOSE OF SUBMITTAL TO YOU. FURTHER, THE DOCUMENT AND THE INFORMATION THEREIN SHALL NOT BE REPRODUCED OR DISCLOSED IN WHOLE OR IN PART TO OTHERS WITHOUT THE WRITTEN PERMISSION OF MARCON SYSTEMS, INC.

MODEL | NEXT ASSY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE
FRACTIONS = ± 1/4
DECIMALS =
.X ± .1
.XX ± .03
.XXX ± .010
ANGLES = ± 1/2°

DRN
CHK
DES [signature]
PROJ WWG
REL 1-17-84

MARCON SYSTEMS, INC
BELLEVUE WASH 98005

DWG TITLE
SENSOR SPECIFICATION
FLOW, 10 - 1000 G P M

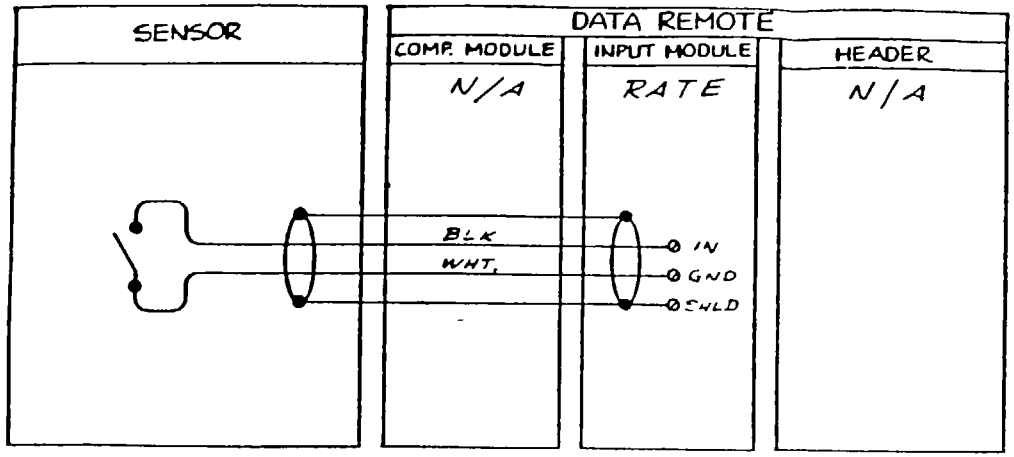
CODE IDENT NO | SIZE B | DWG NO 23235 | REV A

SCALE | DO NOT SCALE DWG | SHEET 1 OF 2

DWG NO 23235 REV A

REV	ECO NO.	DESCRIPTION OF CHANGE	DRN.	CHK.	DES.	PROJ.	REL
A		SEE SHEET 1					

FUNCTION: Flow Measurement
PARAMETERS Gallons (10-1000)GPM
INPUT SCALE 10 Gallon
OUTPUT SCALE: 1 Switch Closure
ACCURACY 2%



CALCULATION

$T_{max} = 15000 G/H \frac{1}{\frac{1\ P}{10\ G} \times \frac{1\ P}{360 - S}} = 2\ 4\ S$

$Span = T_{max} \times 281.25 \times \frac{4}{Range + 1} = 2^{*}4 \times 281.25 \times 4 = 2700$

CALIBRATION

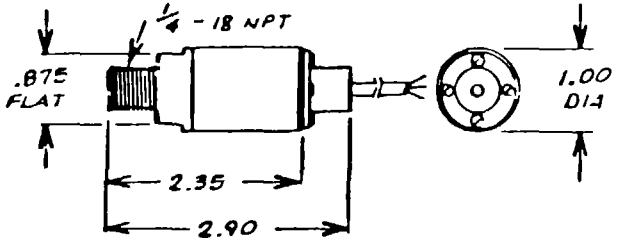
None needed

DATA BASE

SCALE	ZERO	OFFSET	SPAN	TYPE	RANGE	CAL
0-15000 GPM		480	2700		1	

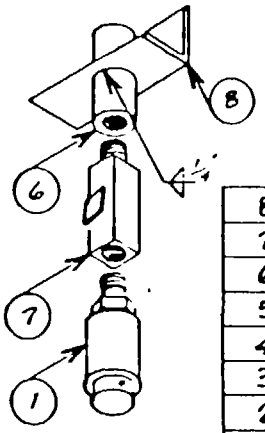
DRN.	MARCON SYSTEMS, INC. BELLEVUE WASH 98005
CHK.	
DES.	DWG. TITLE: SENSOR SPECIFICATION FLOW-10-1000 G.P.M.
PROJ.	
REL.	CONTRACT NO. / SIZE / DWG NO. 23235 / REV A
	SCALE DO NOT SCALE DWG / SHEET 2 OF 2

PHYSICAL OUTLINE

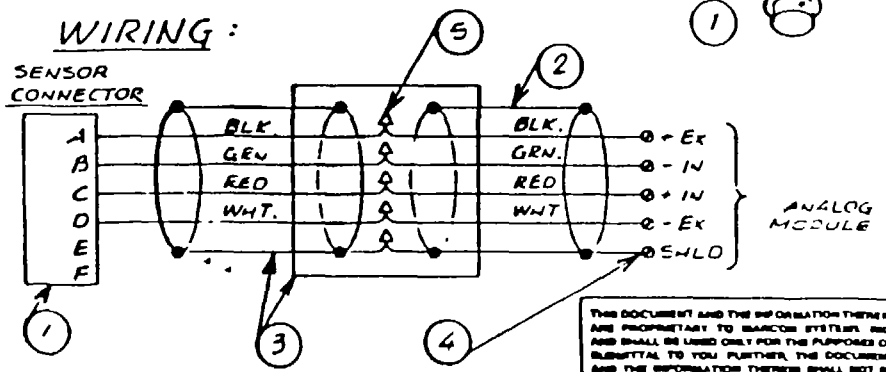


MOUNTING RECOMMENDATION:

— MOUNT OFF ENGINE VIA PRESSURE HOSE WITH SHUT OFF VALVE.
— INSTALL SNUBBERS (NOT SHOWN) IN APPLICATIONS SUBJECT TO PRESSURE PULSES.
— MOUNT AS SHOWN (ELECTRICAL CONNECTION DOWN)
— DON'T PAINT SENSOR.



WIRING:



NOTES:

1. CUSTOMER SUPPLIED.

REV	ECO NO.	DESCRIPTION OF CHANGE	DRN	CHK	DES	PROJ	DATE
A		Added 0-180 and 0-240 to Data Base				WJG	3-1 93
B		HEADER WAS 22464-1	VZ			WJG	4-14 93
C		ITEM #1 WAS 301T3-07CG-07-J (VK)	VZ			WJG	4-27 93
D		Added 0-150 to Data Base				WJG	10-27 93

ITEM	PART NO.	QTY.	DESCRIPTION
8	1	1	ANGLE IRON
7	1	1	GATE VALVE
6	1	1	COUPLING
5	1	5	CR.MF SPLICE - CLOSED END WIRE JOINT
4	1	5	TERMINAL LUG - #6 RING
3	22464-1	1	CABLE/J-BOX ASSY
2	22368	1	CABLE
1	301T3-07CG-Q6	1	SENSOR (BARKSDALE)

MATERIAL LIST

DWG NO 22723 REV D

THIS DOCUMENT AND THE INFORMATION THEREIN ARE PROPRIETARY TO MARCON SYSTEMS, INC. AND SHALL BE USED ONLY FOR THE PURPOSES OF SUBMITTAL TO YOU. FURTHER, THE DOCUMENT AND THE INFORMATION THEREIN SHALL NOT BE REPRODUCED OR DISCLOSED IN WHOLE OR IN PART TO OTHERS WITHOUT THE WRITTEN PERMISSION OF MARCON SYSTEMS, INC.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCE FRACTIONS ± 1/4 DECIMALS .X ± .1 .XX ± .05 .XXX ± .010 ANGLES ± 1/2°

MODEL | NEXT ASSY

DRN. RVZ. CHK. 93 DES. PROJ. WJG APP. BO

MARCON SYSTEMS, INC. BELLEVUE WASH 98005

DWG. TITLE: SENSOR SPECIFICATION PRESSURE SENSOR 0-300 PSI

CODE IDENT NO. — SIZE b DWG NO. 22723 REV C

SCALE 1.0 C DO NOT SCALE DWG SHEET 1 OF 2

REV	ECO NO	DESCRIPTION OF CHANGE	DRN	CHK	ENGR	PROJ	APP
D		SEE SHEET 1					

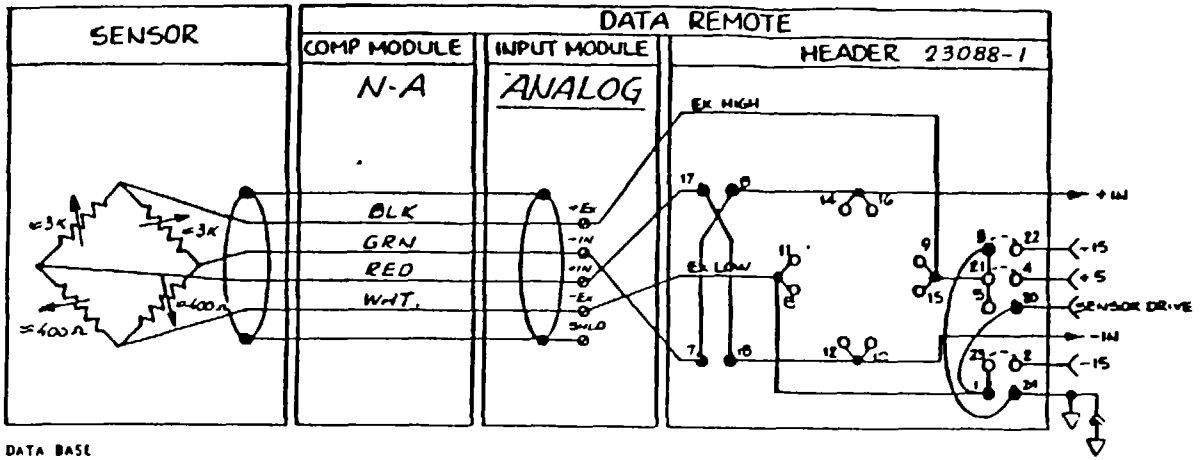
FUNCTION: Pressure Sensor

PARAMETERS: 0-300 PSI

INPUT SCALE: 0-300 PSI

OUTPUT SCALE: 0-100 mv

ACCURACY: ±2%. Thermal zero shift 2%/100F, +30 - +130 F, thermal sensitivity shift 2%/100F, +30- +130 F



DATA BASE

SCALE	OFFSET	SPAN	RANGE	CAL
0-300 PSI	0	1893	1	3
0-200 PSI	0	2840	2	3
0-180 PSI	0	3155	2	3
0-240 PSI	0	2366	1	3
0-150 PSI	0	3786	2	3

CALCULATION:

$100mv = \frac{\text{CRT Scale}}{\text{Sensor F.S.}} = V_{max}, V_{min}=0$

CALIBRATION:

These sensors have good accuracy. However, if field calibration is desired it can be done. At 80°F the sensors are accurate within ±2% of sensor full scale. At elevated temperature there are accuracy shifts. So if field calibration is not done in the media to be measured at temperature with a backup highly accurate gauge it is not going to be worth it.

DWG NO 22723 REV D

DRN	RVZ
CHK	
ENGR	
PROJ	
APP	

MARCON SYSTEMS, INC
BELLEVUE WASH 98005

DWG TITLE
SENSOR SPECIFICATION
PRESSURE SENSOR
0 - 300 PSI

DESIGNATION NO	SIZE	DWG NO	REV
—	B	22723	D

SCALE NONE DO NOT SCALE DWG SHEET 2 OF 2

LEF 1896 F/N 6

KOMAX® MOTIONLESS MIXERS

OPERATION, INSTALLATION AND MAINTENANCE INSTRUCTIONS

CONTENTS

MIXING BY DESIGN
KOMAX

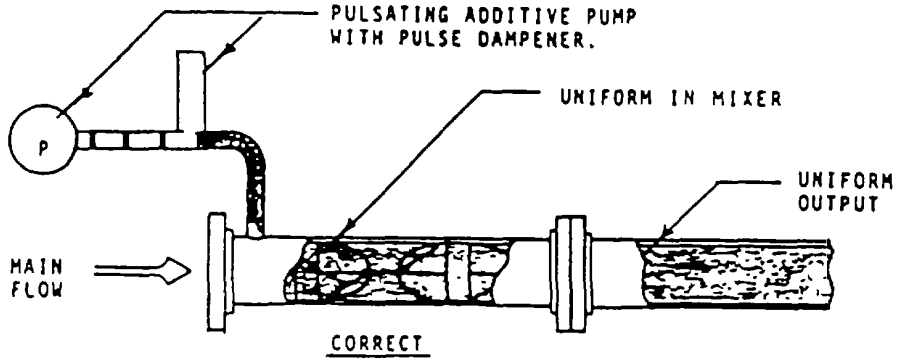
APPLICATION BULLETIN NO. 5180

PRINCIPLES OF OPERATION

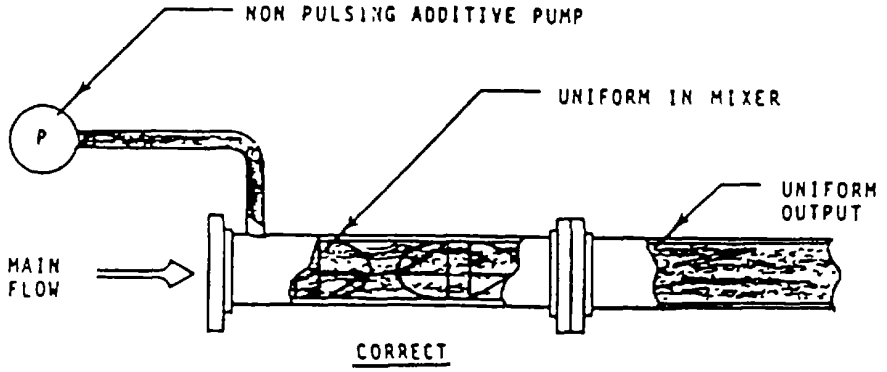
Komax motionless mixers produce mixing or blending of two or more input streams by a series of specially shaped elements. These elements produce multiple divisions and recombinations of the material so that under laminar flow conditions each element doubles the number of striations. If we have "m" input streams on "n" elements, the number of output striations is $m \times 2^n$. Under turbulent flow conditions the mixing is much further enhanced by elliptical counter rotating vortices on each side of each mixing element.

It is important to recognize that the input flow rates of materials must correspond to the output ratios required in the mixture. This must be kept in mind when selecting the material pumping system. Low viscosity materials for example may be handled by centrifugal pumps, while high viscosity materials will require positive displacement pumps.

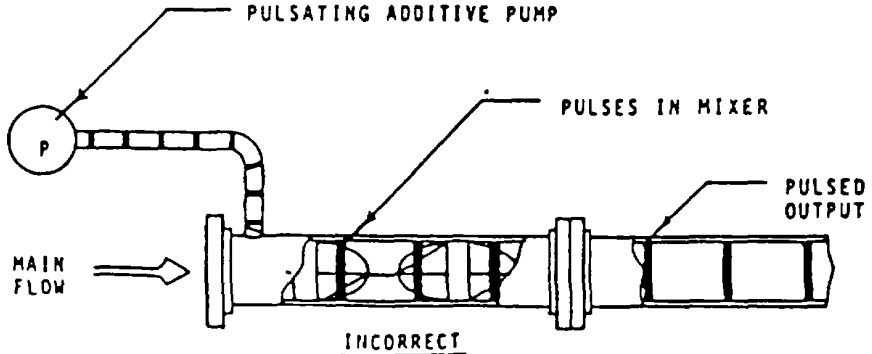
Additives to a main product flow must be introduced in a non-pulsating manner in order to avoid a pulsating output.



CORRECT



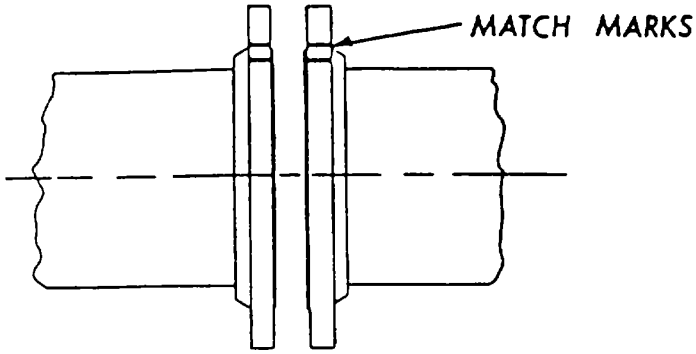
CORRECT



INCORRECT

MATCH MARKING

When two Komax mixers must be connected together, match marks are provided to assure correct operation.



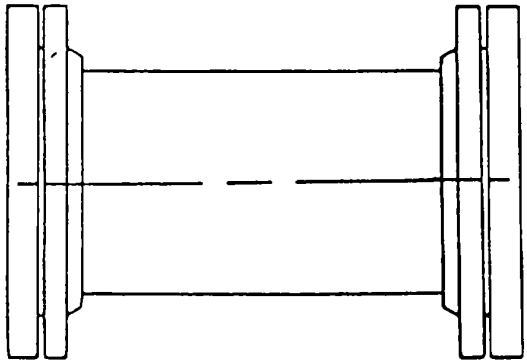
Failure to properly align the match marks may severely reduce mixing efficiency.

CONSTRUCTION MATERIALS & CONFIGURATION

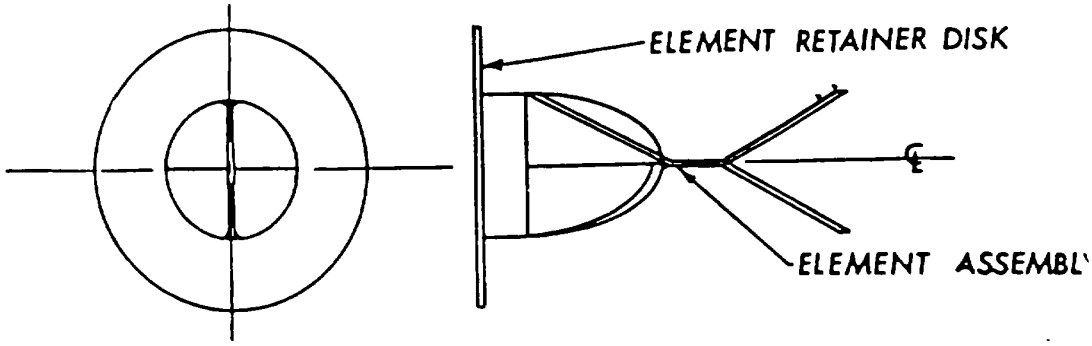
Construction materials include carbon steel, stainless steels, special alloys such as Carpenter 20 and Hastelloy B2, plastics such as PVC and CPVC, FRP (Fiberglass Reinforced Plastic) and combinations such as carbon steel spool pieces with Teflon or Kynar lining. End configurations include plain, prepared for welding, threaded and flanged.

Teflon and Kynar lined spool pieces can have elements retained in one of two ways.

One way is with element retainer disks of Teflon or Kynar as shown below. In this configuration elements are not removable by the customer.



Another method which applies to metal elements in a Teflon or Kynar lined spool piece is shown below. In this case, elements are removable as an assembly by the customer.



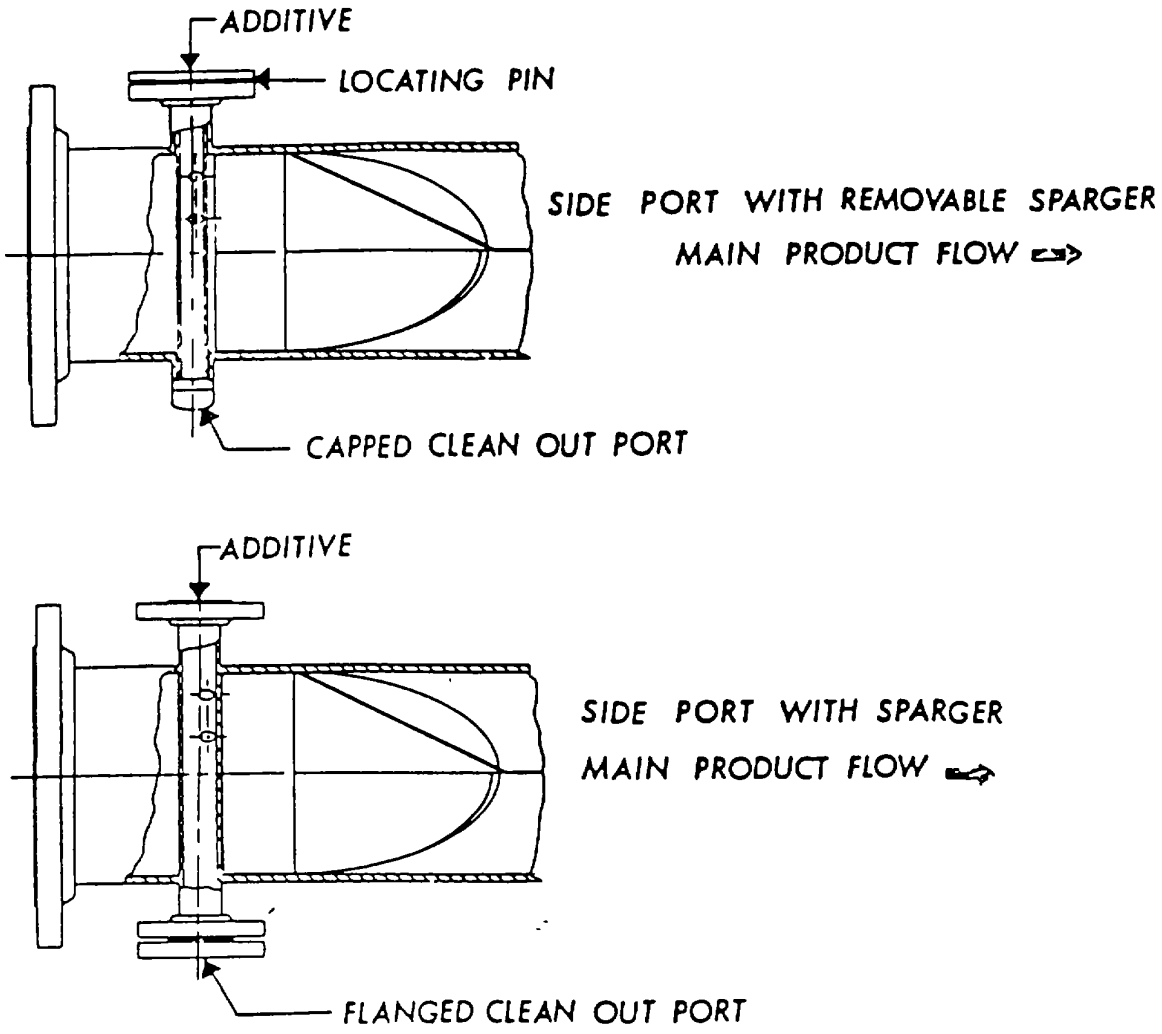
The following torque recommendation should be followed when installing lined pipe mixers.

Pipe Size	Torque ft.lbs.	Pipe Size	Torque ft.lbs.
1"	8 - 9	6"	35 - 50
1½"	9 - 12	8"	45 - 60
2"	18 - 24	10"	75 - 85
2½"	23 - 30	12"	95 - 110
3"	23 - 30		
4"	27 - 36		

The following torque recommendations should be followed when installing FRP mixers.

Pipe I.D. Inches	Recommended Bolt Torque in Foot Pound at Pressure Ratings					
	25 PSI	50 PSI Option	75 PSI	100 PSI Standard	125 PSI	150 PSI
2	25	25	25	25	25	25
3	25	25	25	25	25	25
4	25	25	25	25	25	25
6	25	25	25	25	35	40
8	25	25	30	40	50	60
10	25	25	35	45	60	80
14	25	30	40	60	75	100
16	25	30	50	70	80	100
18	30	35	50	80	100	
20	30	35	60	90		
24	35	40	70	100		

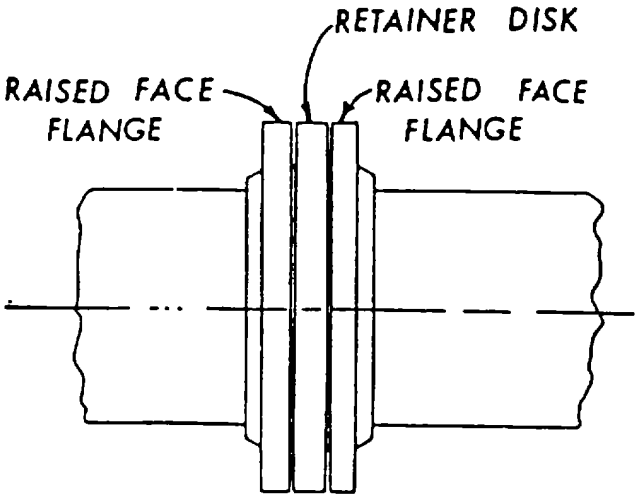
When installing FRP mixers, consideration must be given to the fact that the expansion coefficient for FRP - approximately 15 x 10^{-6} inch/inch^{o}F, is substantially higher than that for steel - approximately 7 x 10^{-6} inch/inch^{o}F.



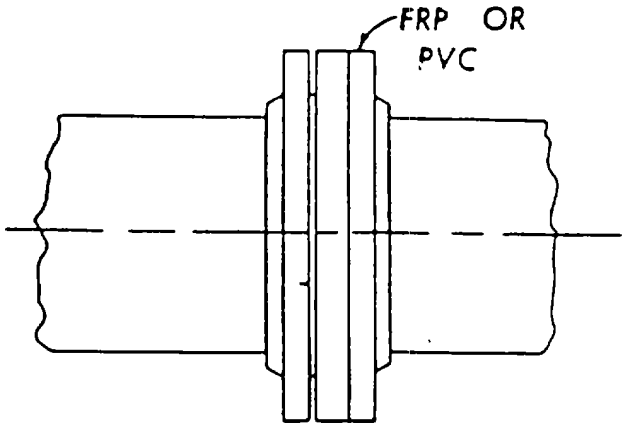
MAINTENANCE

Once installed, a Komax motionless mixer requires no routine maintenance since there are no moving parts to repair or replace. If a mixer has been supplied with internals designed for removal by the customer, these internals can be removed by him for inspection or cleaning. If elements have any special coating such as Teflon or Kynar, great care must be taken not to damage the protective coating.

Note that units configured with a pair of element retainer disks are treated as raised face units. Although the retainer disk is flat, the flange to flange forces are from the spool raised face to the mating flange raised face.



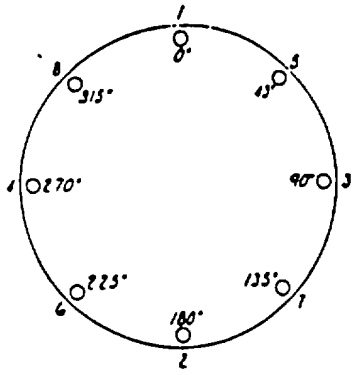
YES



NO

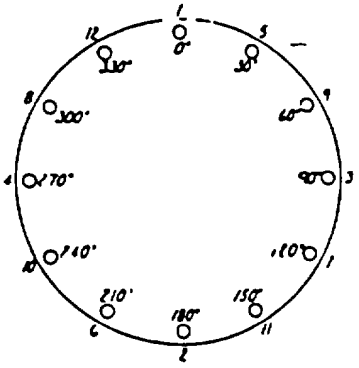
TORQUE PROCEDURE

Correct torquing procedures must be followd to assure uniform stress.



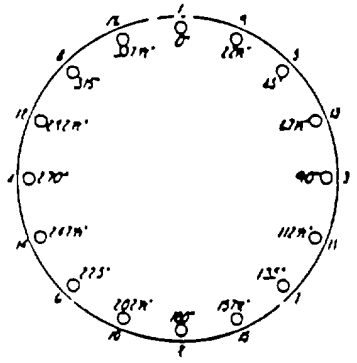
8 BOLTS

SEQUENCIAL ORDER	ROTATIONAL ORDER
1-2	1
3-4	5
5 6	3
7 8	7
	2
	6
	4
	8



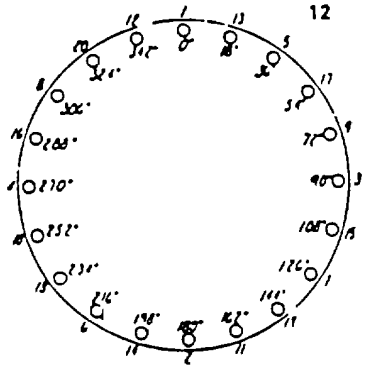
12 BOLTS

SEQUENCIAL ORDER	POTATIONAL ORDER
1-2	1
3-4	5
5-6	9
7-8	3
9 10	7
11-12	11
	2
	6
	10
	4
	8
	12



16 BOLTS

SEQUENTIAL ORDER	ROTATIONAL ORDER
1 2	1 2
3 4	9 10
5 6	5 6
7 8	13 14
9 10	3 4
11 12	11 12
13 14	7 8
15 16	15 16



20 BOLTS

SEQUENTIAL ORDER	ROTATIONAL ORDER
1-2	1 2
3 4	13 14
5 6	5 6
7-8	17 18
9 10	9 10
11-12	3 4
13 14	15 16
15 16	7 8
17 18	19 20
19 20	11 12

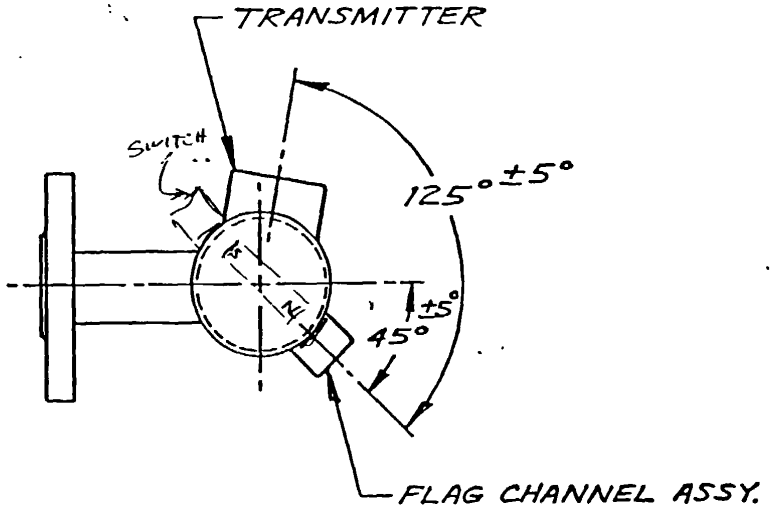
ISSUE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	TOTAL

DWG. NO. 87707 REV A

1. transmiter must be 125° counter clockwise from the flag assembly
2. switch capsule must be 180° from the flag assembly.

REVISIONS

CDN.	LTR.	DESCRIPTION	DATE	APPROVED
85-672	A	ADDED "TOP VIEW"	8/20	RT



TOP VIEW

		UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. TOLERANCES EXCEPT AS NOTED: DECIMAL .XX ±.01C, .XXX = 005 FRACTIONAL ±1/64" ANGULAR ±2° MACHINE FILLETS AND BREAK MACHINED EDGES .005 –.015	CONTRACT NO.	TRANSAMERICA DELAVAL INC GEMS SENSORS DIVISION PLAINVILLE, CONN 06062 Transamerica Delaval
			CUSTOMER	TITLE FLAG POSITION
NEXT A...	U... JN	MATERIAL	DWN. S.PUPECI DATE 1/24/85	SIZE A CODE IDENT. NO. 87707 DWG. NO. REV. A
APPLICATION			CHKD. DPD DATE 5/28/85	

APPENDIX C

Preventive maintenance checks and services (PMCS) for the Shore Discharge System

C-1. Introduction to PMCS

NOTE

TM 55-193-209-14&P-19 contains PMCS for all systems on the ROWPU Barge. This appendix contains only PMCS for the Shore Discharge System

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) 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 738750).

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

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

(e) 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 checkedlinspected 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

C-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 Chapter 1 lists the major components of the drinking water system, their basic function and location on the barge.

C-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. 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.

Table C-1. 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 B	D	A	D	W	M	Q	S	A	Item To Be Inspected	Procedures	Readiness reporting criteria
										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 Touch up paint in accordance with TB 43-0144 as necessary. Do not paint threads or labels.	
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 C-1. Preventive Maintenance Checks and Services for Drinking Water 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	Readiness reporting criteria
	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 car-tndge 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 deck-house 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 neces-sary 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

By Order of the Secretary of the Army

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

Official: 

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
08670

DISTRIBUTION

To be distributed in accordance with DA Form 12-25E, qty rqr block no. 3631, requirements for TM 55-1930-209-14&P-5

*U.S. GOVERNMENT PRINTING OFFICE 1194-555-121/80101

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

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

PIN: 065354-000