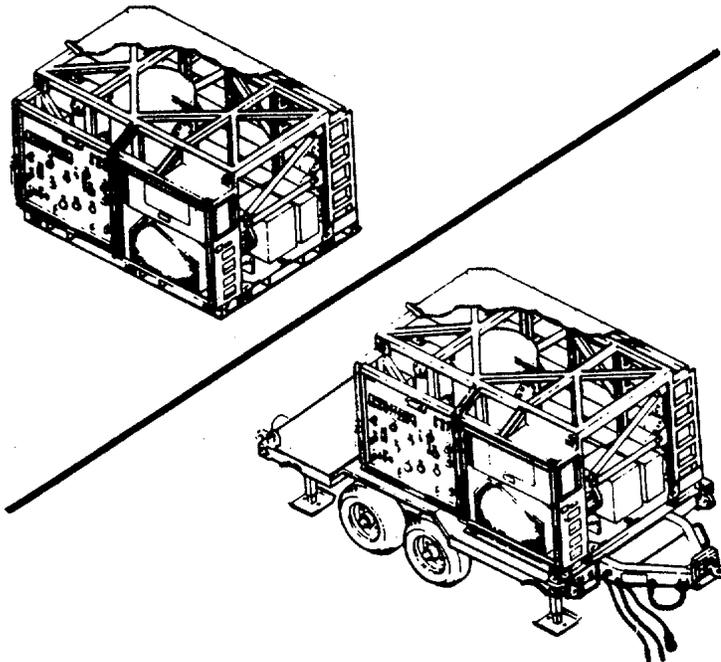


TECHNICAL MANUAL  
UNIT, DIRECT SUPPORT,  
AND GENERAL SUPPORT  
MAINTENANCE MANUAL



WATER PURIFICATION UNIT,  
REVERSE OSMOSIS, 600-GHP

TRAILER-MOUNTED, FLATBED CARGO,  
5-TON, 4-WHEEL TANDEM  
MODEL 0996109001 (ARMY)  
(NSN 4610-01-234-2196)

AND  
SKID-MOUNTED  
MODEL 0996108001 (MARINE CORPS)  
(NSN 4610-01-234-2190)

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\* Supersedes TM 5-4610-21 5-24/2/TM08580B-24/3, 22 July 1988 including all changes.

HEADQUARTERS, DEPARTMENT OF THE ARMY  
HEADQUARTERS, U.S. MARINE CORPS  
20 APRIL 1992

**WARNING**

**HIGH VOLTAGE**

is used in the operation of this equipment.

**DEATH ON CONTACT**

may result if personnel fail to observe safety precautions

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Be careful not to contact high-voltage connections of 115-volt ac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

**WARNING**

**Do not be misled by the term "low voltage."  
Potentials as low as 50 volts may cause  
death under adverse conditions.**

For Artificial Respiration, refer to FM 4-25.11.

**WARNING**

**SOLVENT HAZARD**

Drycleaning solvent, M711 Type I and II, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact by wearing rubber or nonporous gloves when handling the solvent or material wet with dry cleaning solvent. Wash hands immediately after exposure with soap and water and use a lanolin based skin cream to prevent skin drying. Do not use near open flame or excessive heat. Flash point of solvent is 100°F(38°C). Do not work with solvent in a closed room. Be sure there is good ventilation or the solvent vapors will build up in the air and become a poisonous mixture which can cause physical injury or even death.

**WARNING**

**HIGH PRESSURE HAZARD**

ROWPU piping and equipment can contain extremely high pressure during and after operation. If this pressure is not relieved before working on these pipes or equipment, serious injury or death may occur. Be sure to open all drains and vents before beginning any disassembly.

**WARNING**

**HEAVY EQUIPMENT HAZARD**

Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.

**WARNING**

**COMPRESSED AIR HAZARD**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.

**WARNING**

**DRY ICE HAZARD**

- Dry ice is solid CO<sub>2</sub> at a temperature below -90°C (-112°F); it can burn. Wear temperature-resistant apron and gloves.
- CO<sub>2</sub> displaces oxygen; work in a well-ventilated area to avoid asphyxiation.

**WARNING**

- Compressed air in airbrake system can blow dust into eyes. Do not work on airbrake system until air pressure is released. Wear eye protection.
- Open draincock on air reservoir slowly to avoid a sudden rush of air when releasing air pressure from airbrake system.

**WARNING**

- Always use assistant during lifting operations. Use guide ropes to move hanging assemblies.
- Lack of attention or being in an improper position during lifting operations can result in serious injury or death. Pay close attention to movements of assemblies being lifted. Do not stand under lifted assembly or in a position where you could be pinned against another object. Watch your footing.

**WARNING**

Flatbed cargo trailer is unstable and can tip over when jacks are not down. Before raising or removing jack assemblies; make sure that trailer wheels are chocked, trailer is level, and front of trailer is supported.

**WARNING**

**TOXIC CHEMICAL HAZARD**

Sodium bisulfate is toxic to skin, eyes, and breathing passages. Wear rubber gloves and apron and eye and respiratory protection. Avoid repeated or prolonged contact.

**WARNING**

Rivets can shatter during removal or installation and cause serious injury to eyes. Wear eye protection.

CHANGE  
NO. 1

HEADQUARTERS  
DEPARTMENT OF THE ARMY AND  
HEADQUARTERS U.S. MARINE CORPS  
WASHINGTON, D.C. 16 October 2006

UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT  
MAINTENANCE MANUAL

WATER PURIFICATION UNIT, REVERSE OSMOSIS, 600 GPH  
TRAILER MOUNTED, FLATBED CARGO  
5 TON 4 WHEEL TANDEM  
MODEL 0996109001 (ARMY)  
(NSN 4610-01-234-2196)

AND

SKID MOUNTED  
MODEL 0996108001 (MARINE CORPS)  
(NSN 4610-01-234-2190)

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i and ii  
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TM 10-4610-239-24  
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1-0 thru 1-7/(1-8 blank)	0		
2-1 thru 2-43/(2-344 blank)	0		
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B-1 thru B-16	1		
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TECHNICAL MANUAL

HEADQUARTERS,  
DEPARTMENT OF THE ARMY AND  
HEADQUARTERS, U.S. MARINE CORPS  
Washington, D.C., 20 April 1992

NO: 10-4610-239-24

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

**WATER PURIFICATION UNIT, REVERSE OSMOSIS, 600 GPH,  
TRAILER-MOUNTED, FLATBED CARGO,  
5-TON, 4 WHEEL TANDEM,  
MODEL 0996109001 (U.S. ARMY)  
NSN 4610-01-234-2196  
AND  
SKID-MOUNTED  
MODEL 0996108001 (U.S. MARINE CORPS)  
NSN 4610-01-234-2190**

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS  
ARMY**

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## HOW TO USE THIS MANUAL

Spend a few minutes looking through this manual. It has a new look that is very different from the manuals you've been using. You'll find the new look is a lot easier to use, and you can find what you're looking for a lot faster.

Each chapter begins with an index that lists each paragraph or section in the chapter. Each section in the maintenance chapter also has an index that lists the procedures in the section and gives page numbers. Or you can look for the information you want in the alphabetical subject index at the back of the manual.

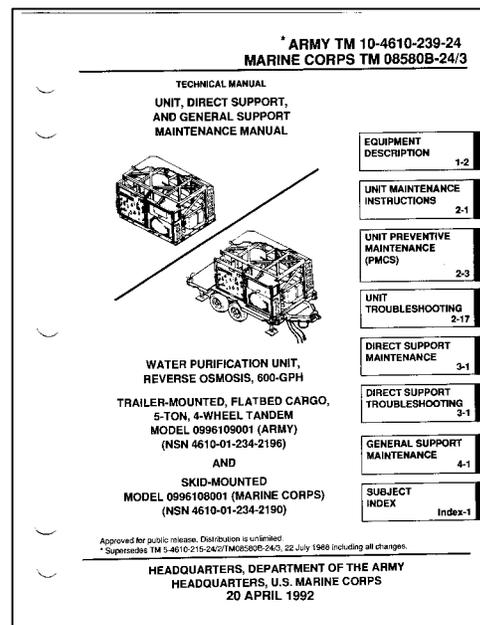
We got rid of as many words as we could and put in lots of illustrations to show just about everything you'll be doing to maintain your equipment.

The text is keyed to the illustrations with callout numbers (sometimes words). The callout numbers are in parentheses in the text.

So HOW DO YOU USE THIS MANUAL?

Like This:

1. Suppose the trailer vibrates when being towed and you want to troubleshoot the unit.
2. Look at the cover and you'll see index boxes near the right-hand edge with subject titles in them. You'll find "UNIT TROUBLESHOOTING 2-17." You can skip over to page 2-17.  
OR
3. Bend the pages a bit and look at the edges. You'll see black bars on some of the pages that are lined up with the index boxes on the cover.



TM 5-4610-215-24/2  
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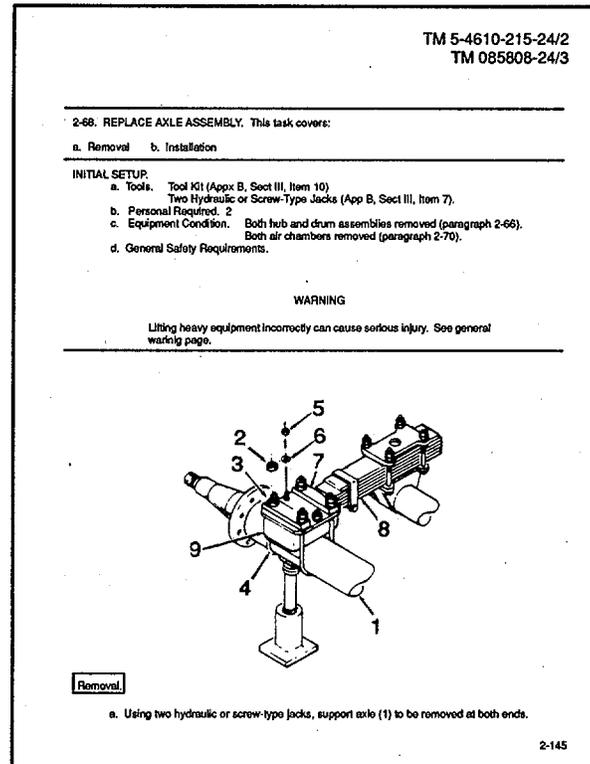
4. If you put your thumbnail on the black bar that is lined up with the box on the cover for UNIT TROUBLESHOOTING and open the manual, you'll be on page 2-17.

5. On page 2-17, you'll find Section V, TROUBLESHOOTING. The first item in the section is a SYMPTOM INDEX listing the systems and major assemblies that make up the flatbed cargo trailer and the ROWPU. Look for SUSPENSION ASSEMBLY in the Equipment column. Item 3 under SUSPENSION ASSEMBLY will give you page number 2-38 for "TRAILER VIBRATES WHEN BEING TOWED."

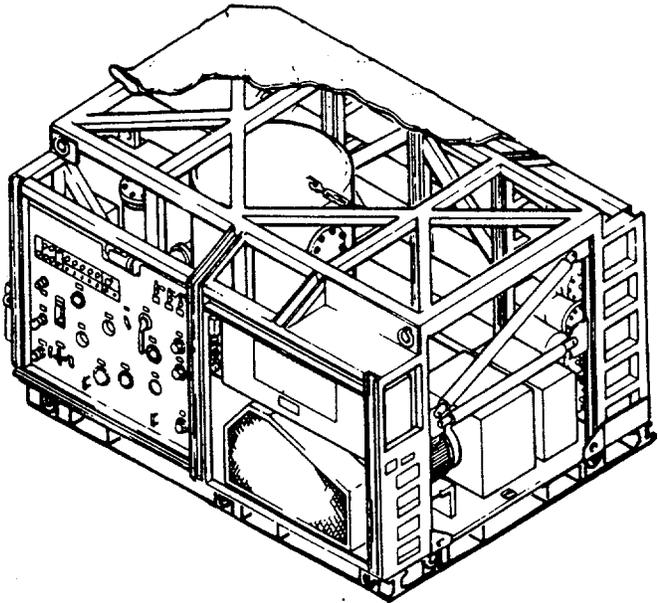
TM 5-4610-215-24/2 TM 08580B-24/3	
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Malfunction	
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Step 3. Inspect wheel bearings for overheating or damage. Refer to paragraph 2-65.	Replace damage wheel bearings. Refer to paragraph 2-65.
<b>3. TRAILER VIBRATES WHEN BEING TOWED</b>	
Step 1. Jack up trailer on all four leveling jacks and spin each tire to check for bent wheels and out of round or damage tires. Refer to figure 2-7 for tire wear chart.	If wheels and tires are good, go to step 2. If any wheel is bent or any tire is out of round or damaged, replace defective wheel or tire. Refer to paragraph 2-67.
Step 2. Check for bent axles.	If axles are not bent, go to Step 3. If any axle is bent, replace defective axle. Refer to paragraph 2-68.
Step 3. Check wheel bearing adjustments are good, Refer to paragraph 2-65.	If wheel bearing adjustments are good, notify Intermediate Direct Support Maintenance. If wheel bearings are out of adjustment, adjust wheel bearings. Refer to paragraph 2-65.
<b>4. TIRES WEAR UNEVENLY</b>	
NOTE Refer to figure 2-7 for tire wear chart.	
Step 1. Check for bent axles.	If axles are not bent, go to step 2.

6. Turn to page 2-38 and find the symptom "TRAILER VIBRATES WHEN BEING TOWED."

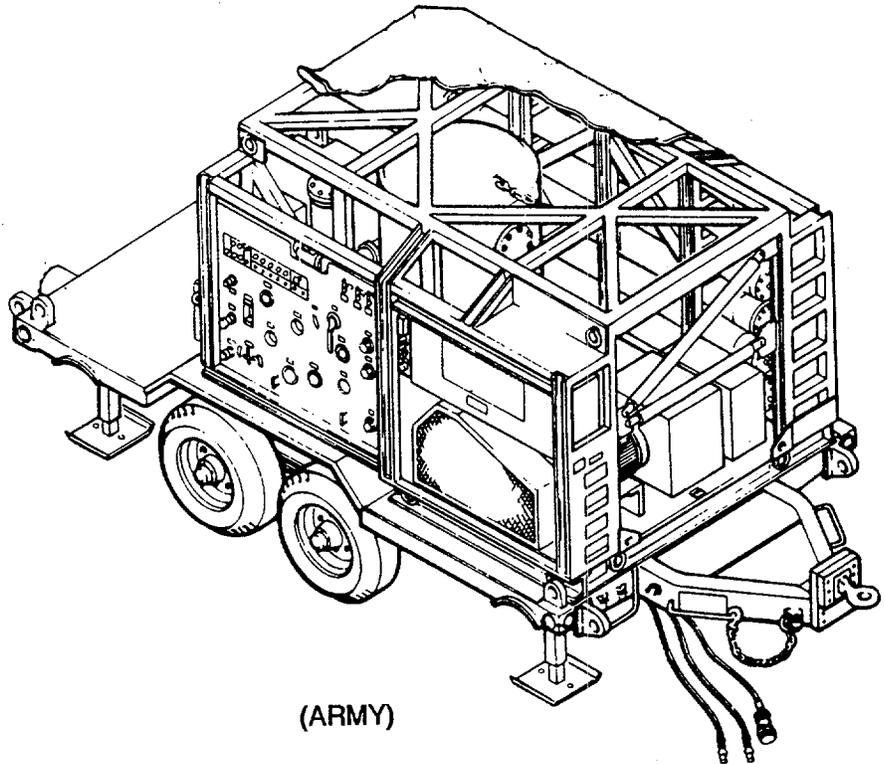
7. As you do the tests and corrective actions in the order listed, you will get to "If any axle is bent, replace defective axle. Refer to paragraph 2-68."



8. Turn to paragraph 2-68 and look at the procedure. The "INITIAL SETUP" section tells you what tools, materials, and parts are needed to do this task. It also tells you anything you must do before starting this task and it gives general warnings about hazards that can exist while you do this task.
9. The procedure itself has a picture to show you where to look and what to look at, plus the steps you will do to perform the task.
10. Notice the numbered arrows. These are the callout numbers. As you read each step, we tell you where to look by including the callout number (in parentheses) after the name of each thing we call out.
11. Do the procedure, then check to see if you have corrected the fault symptom.



(MARINE CORPS)



(ARMY)

**Figure 1-1. Reverse Osmosis Water Purification Unit (ROVVPU)**

## CHAPTER 1 INTRODUCTION

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### Section I. GENERAL INFORMATION

**1-1. SCOPE.** This manual covers unit, direct support, and general support troubleshooting and maintenance procedures required to repair and maintain the 600-gallon per hour (gph) Reverse Osmosis Water Purification Unit (ROWPU), Models 0996109001 (Army) and 0996108001 (USMC) (figure 1-1). The ROWPU produces up to 600 gph of drinking water from any nonpure water source; i.e., streams, rivers, lakes, or salt water.

#### **1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS.**

- a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, as contained in Maintenance Management Update. USMC personnel refer to TM 4700-15/1 for equipment records and forms procedures.
- b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 [Report of Discrepancy (ROD)] as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73B/MCO 4430.3H.
- c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/MCO P4610.19D/DLAAR 4500.15.

**1-3. CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS.** Refer to the latest issue of DA Pam 25-30 to determine whether there are new additions, changes, or additional publications pertaining to the equipment. USMC users refer to SL-1-2.

**1-4. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.** Methods and/or procedures for the destruction of Army materiel to prevent enemy use are covered in TM 750-244-3.

**1-5. PREPARATION FOR STORAGE OR SHIPMENT.** Instructions on preparation for storage or shipment are found in Chapter 2, Section XIX.

**1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).**

a. Army. If your ROWPU needs improvement, let us know. Send us an EIRZ. You, the user, are the only one who can tell us what you don't like about your equipment. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at: Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MDO, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. We'll send you a reply.

b. Marine Corps. USMC personnel submit EIRs in accordance with MCO 16550.17.

**1-7. WARRANTY INFORMATION.** The ROWPU is warranted by Mechanical Equipment Company in accordance with the terms of contract DAAK-01-85-C-B312 for a period of 3 years from the date of delivery. Report all defects in material or workmanship to your supervisor who will take appropriate action.

## Section II. EQUIPMENT DESCRIPTION AND DATA

**1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.** For information on equipment characteristics, capabilities, and features of the equipment covered in this manual, refer to TM 10-4610-239-10/TM08580B-10/1.

**1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.** For information on the location and description of the major components, refer to TM 10-4610-239-10.

**1-10. DIFFERENCES BETWEEN MODELS.** There are two models of the ROWPU:

Model 0996109001 Trailer-mounted with generator (Army)

Model 0996108001 Skid-mounted (Marine Corps)

**1-11. EQUIPMENT DATA.** For equipment data pertaining to the ROWPU, refer to TM 10-4610-239-10.

**1-12. SAFETY, CARE, AND HANDLING.** Observe all WARNINGS, CAUTIONS, and NOTES in this manual. This equipment can be extremely dangerous if these instructions are not followed.

### Section III. PRINCIPLES OF OPERATION

**1-13. OVERALL SYSTEM OPERATION.** This section contains a description of how the ROWPU works. This paragraph describes the operation of the complete system. Paragraph 1-14 describes the functions of each of the main components. (See figure FO-1.)

- a. Raw water is drawn through a strainer, which keeps large quantities of trash from entering the system. Depending on the distance between the ROWPU and water source, one or two raw water pumps are used to move the raw water. As water enters the ROWPU, the chemical feed metering pump assembly adds two chemicals to it. The polymer drive unit adds polyelectrolyte (polymer) solution and the sodium hex drive unit adds sodium hexametaphosphate (sodium hex). The polymer material collects small pieces of floating solid matter into groups large enough to be removed by the multimedia filter. Sodium hex prevents scaling.
- b. The raw water containing the added chemicals flows through the multimedia filter, which performs first stage filtration by breaking down impurities, then through cartridge filter, second stage of filtration, which further removes impurities. The R.O. pump then raises the pressure to that needed to force water through the membranes of the R.O. elements. Since the R.O. pump output pulsates, it is passed through the pulse dampener, which smoothes the flow before the water reaches the R.O. elements. These R.O. elements are connected in series and the waste water (brine) from all elements is sent out of the ROWPU to the backwash water tank. When that tank is full, any additional brine is discharged to the ground downstream of the suction hose strainer.
- c. The chlorine drive unit adds chlorine to the filtered output of the R.O. elements to kill any bacteria present and the chlorinated water is carried out of the ROWPU through a hose for storage in two product water tanks connected in series. When water is needed, the distribution pump sends the stored potable (drinkable) water through the distribution nozzle to a container provided by the user.
- d. There are two cleaning procedures performed after 20 operating hours and one cleaning procedure performed whenever water flow rate or water pressure exceed certain limits. After 20 operating hours, citric acid is injected into the system before ROWPU shutdown. After shutdown, the multimedia filter is backwashed. When system conditions require it, an R.O. element cleaning procedure is performed.
- e. In the first procedure, the citric acid drive unit injects citric acid into the multimedia filter output. The citric acid removes scaling that accumulated in the system during operation. When procedure is complete, ROWPU is shut down.
- f. After shutdown, multimedia filter backwash is manually activated then controlled by a solid-state timer. Brine stored in the backwash tank is forced backward through the multimedia filter by the backwash pump.

Flow is in the direction opposite to that followed by the raw water during filtration, so trapped particles are forced from the filter and are discharged through a drain connected to the top of the multimedia filter.

- g. A brine and citric acid solution or detergent solution is circulated through the R.O. elements to clean them. Citric acid or detergent is added to brine that remains in the backwash water tank after backwash is complete. The backwash pump is then connected to the input of the R.O. elements. This routes the solution through the elements, then back to the backwash water tank. When repeated recirculation has cleaned the R.O. elements, the ROWPU is operated normally to remove residue and drain it outside the product water tank.
- h. When chemical or nuclear contaminants are present in product water, they are filtered out between the two product water tanks. The ROWPU is overpacked with two portable filters that can be connected with one of the raw water pumps in the line that connects the two tanks. One of the filters is used when the water is contaminated with chemicals. The other filter is used for nuclear contaminants.

#### **1-14. FUNCTION OF MAIN COMPONENTS.**

- 1. SUCTION HOSE STRAINER. Prevents large pieces of trash from entering system.
- 2. FLOAT. Holds suction hose strainer between surface and bottom of raw water source.
- 3. RAW WATER PUMPS. Draw raw water through suction hose strainer and send it under pressure to multimedia filter. When chemical or radiological filters are used in the product water line, one raw water pump is used between the two product water tanks to force water through the filter.
- 4. CHEMICAL FEED METERING PUMP ASSEMBLY. Draws chemical solutions from cans and injects them into water at various points in purification system.
- 5. CHEMICAL FEED METERING PUMP MOTOR. Provides power for four chemical feed metering pump drive units.
- 6. POLYMER DRIVE UNIT. Adds polymer solution to raw water. Polymer solution collects small pieces of floating solid matter into groups large enough to be removed by multimedia filter.
- 7. SODIUM HEX DRIVE UNIT. Adds sodium hex to raw water. Sodium hex prevents scaling.
- 8. CITRIC ACID DRIVE UNIT. Adds citric acid to output of multimedia filter prior to ROWPU shutdown. Citric acid removes scaling developed in system during operation.
- 9. RAW WATER FLOW METER. Indicates rate of flow of water drawn in by raw water pumps.
- 10. BACKWASH VALVE. In NORMAL position, allows raw water to enter multimedia filter and closes the backwash line. In BACKWASH position, allows brine to enter multimedia filter and closes raw water line.

11. MULTIMEDIA FILTER CONTROL VALVE. Routes water flow into and out of multimedia filter. During normal ROWPU operation, the multimedia filter control valve routes raw water from backwash valve to top of multimedia filter while routing filtered output from bottom of multimedia filter to booster pump. During backwash, the multimedia control valve routes brine from backwash valve to bottom of multimedia filter while routing contaminated water from top of multimedia filter out of ROWPU through WASTE outlet on front panel. The multimedia filter control valve also changes flow rate during different stages of backwash.
12. MULTIMEDIA FILTER. Performs first stage filtration. Removes most dissolved solids.
13. MULTIMEDIA FILTER GAGE. Indicates differential pressure across multimedia filter.
14. VENT MULTIMEDIA FILTER VALVE. Releases air from multimedia filter while filter is filling during ROWPU startup.
15. BOOSTER PUMP. Forces output of multimedia filter through the cartridge filter.
16. CARTRIDGE FILTER. Performs second stage filtration. Removes very small dissolved solids.
17. CARTRIDGE FILTER GAGE. Indicates differential pressure across cartridge filter.
18. VENT CARTRIDGE FILTER VALVE. Releases air from cartridge filter while filter is filling during ROWPU startup.
19. LOW-PRESSURE SWITCH. Senses pressure in output line from cartridge filter. When line pressure drops below 10 psi, causes R.O. pump to shut down and R.O. PUMP LOW PRESSURE indicator light.
20. R.O. PUMP. Develops high pressure needed to force output of cartridge filter through R.O. elements.
21. RUPTURE DISK. Ruptures to relieve pressure if pressure reaches 1425 psi as indicated on R.O. PRESSURE PSI gage. Prevents damage to system if high-pressure relief valve fails to open and high-pressure switch fails to shut down the R.O. pump.
22. PULSE DAMPENER. Reduces pulsing effect of R.O. pump. Smooths flow of water through R.O. elements.
23. VENT PULSE DAMPENER VALVE. Releases air from pulse dampener while pulse dampener is filling during ROWPU startup.
24. HIGH-PRESSURE RELIEF VALVE. Opens to relieve pressure if pressure in line between pulse dampener and R.O. elements goes above 1100 psi.
25. HIGH-PRESSURE SWITCH. Senses pressure in line between pulse dampener and R.O. elements. If pressure rises above 1250 psi and high-pressure relief valve fails to open, causes R.O. pump to shut down and R.O. PUMP HIGH PRESSURE indicator to light.

26. R.O. PRESSURE PSI GAGE. Indicates output pressure of R.O. pump.
27. R.O. ELEMENTS. Perform final filtration. Water from pulse dampener flows into outer shell of one pressure vessel. Inside the pressure vessel, pure water is forced into the two filter elements through their permeable membrane surfaces. Water still containing foreign matter flows through the other three pressure vessels in series. In each pressure vessel, pure water is forced into the filter elements. The remaining unfiltered water (brine) flows out of the ROWPU for storage in the backwash water tank. Pure water flows out of the center of each pair of filter elements into a common pipe that carries the water out of the ROWPU for storage in the product water tanks. Connections between pressure vessels are different in the two models, but operation is identical.
28. R.O. VESSELS GAGE. Indicates differential pressure across the R.O. elements.
29. BRINE FLOW METER. Indicates rate of brine flow out to backwash water tank.
30. BACKWASH WATER TANK. Collects water rejected by R.O. elements (brine) for use in backwashing multimedia filter and in cleaning the R.O. elements.
31. BACKWASH TANK VALVE. Controls flow of brine from backwash water tank.
32. BACKWASH PUMP. Forces brine backward through multimedia filter during backwash. Output of multimedia filter is dumped out of ROWPU through WASTE hose. When backwash cycle is complete, output of backwash pump is connected to VENT VESSELS line. Brine mixed with citric acid is then forced through R.O. elements to clean them. The solution is returned to backwash water tank and recirculate by backwash pump. Product water is sent to backwash water tank during this procedure to keep the citric acid solution from becoming concentrated.
33. BACKWASH PUMP STRAINER. Filters brine before it enters multimedia filter or R.O. elements.
34. BACKWASH WATER FLOW GAGE. Indicates rate of brine flow into multimedia filter during backwash.
35. CHECK VALVE. Prevents raw water from entering backwash water line.
36. VENT VESSELS VALVE. During ROWPU startup, bypasses R.O. pump output around R.O. elements until multimedia filter stabilizes. During element cleaning, passes brine/citric acid solution from backwash pump to R.O. elements.
37. PRODUCT WATER SAMPLE BALL VALVES. Provide samples of filtered water at input ends of pressure vessels.
38. PRODUCT WATER SAMPLE ELLIPTIC VALVES. In normal position, pass product water out of R.O. elements to product water tanks. In sample position, direct product water out of each R.O. vessel as a sample. Design prevents shutdown of water flow while switching between normal and sample positions.

39. CHEMICAL FEED METERING PUMP CHLORINE DRIVE UNIT. Adds chlorine to product water to prevent bacteria growth.
40. REGULATE PRODUCT FLOW VALVE. Controls rate of product water flow to product water tanks.
41. CHECK VALVE. Prevents backflow in product water line.
42. PRODUCT WATER FLOW GAGE. Indicates rate of product water flow to product water tanks.
43. WATER METER. Totalizer type meter. Indicates total amount of potable water produced by ROWPU.
44. IN-LINE TDS MONITOR. Indicates quality of product water. Calibrated in total dissolved solids (TDS). Sensor is installed in product water line. Meter is an overpack item installed on control panel during ROWPU operations.
45. PRODUCT WATER TANKS (2). Store product water.
46. VALVE. Controls flow of product water from first product water tank to second.
47. DISTRIBUTION NOZZLE. Controls rate of flow of product water from product water tanks to user.
48. CHEMICAL/RADIOLOGICAL FILTERS. Overpack items used to remove chemical or radiological contaminants from product water. Overpack contains all hardware and tubing needed to connect both filters in series between the two product water tanks. Only installed when needed. Operating life is 100 hours for either type.

**CHAPTER 2**  
**UNIT MAINTENANCE INSTRUCTIONS**

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## Section I. LUBRICATION INSTRUCTIONS

Refer to Lubrication Instructions LO 10-4610-239-12/LI 08580A-12.

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

**2-1. COMMON TOOLS AND EQUIPMENT.** For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit. USMC, refer to Table of Authorized Material (TAM) applicable to your unit.

**2-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.** Refer to TM 10-4610-239-24P and the Maintenance Allocation Chart in Appendix B of this manual.

**2-3. REPAIR PARTS.** Repair parts are listed and illustrated in the repair parts and special tools list, TM 10-4610-239-24P, covering unit, direct support, and general support maintenance for this equipment.

## Section III. SERVICE UPON RECEIPT

**2-4. SITE AND SHELTER REQUIREMENTS.** When not in use, the ROWPU does not require special siting or shelter. If shelter is available, storing the ROWPU under cover will minimize routine maintenance. For site and shelter requirements during routine operation, refer to TM 10-4610-239-10.

### 2-5. SERVICE UPON RECEIPT OF MATERIAL.

#### a. Checking Unpacked Equipment.

- (1) Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report. Marine Corps personnel refer to MCO 4430.3.
- (2) Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750. Marine Corps personnel refer to TM 4700-15/1.
- (3) Check to see whether the equipment has been modified.

#### b. Deprocessing Unpacked Equipment.

### WARNING

Drycleaning solvent, AA 711 I & II, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact by wearing rubber or nonporous gloves when handling the solvent or material wet with Drycleaning solvent. Wash hands immediately after exposure with soap and water and use a lanolin based skin cream to prevent skin drying. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C). Do not work with solvent in a closed room. Be sure there is good ventilation or the solvent vapors will build up in the air and become a poisonous mixture which can cause physical injury or even death.

- (1) Remove all preservative coatings and grease from all bare metal surfaces.
- (2) Drain shipping fluid from R.O. pump crankcase.

**2-6. INSTALLATION INSTRUCTIONS.** For installation instructions, refer to TM 10-4610-239-10.

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

##### **2-7. INTRODUCTION.**

- a. The preventive maintenance checks and services (PMCS) listed in the PMCS table cover procedures to be performed by unit maintenance personnel. Preventive maintenance checks and services are done to find and to fix problems before they can cause major damage to the equipment. To save time and make sure that all items are checked, do the PMCS in the order given in the table. Write down any problems on the proper forms. Refer to DA PAM 738-750.
- b. If something doesn't work, troubleshoot it with the instructions in this manual or notify your supervisor.
- c. Always do your preventive maintenance in the same order so it gets to be a habit. Once you have had some practice, you will spot anything wrong in a hurry.

**2-8. PROCEDURES FOR SERVICES AND INSPECTIONS.** The following general procedures are for unit maintenance PMCS and for all inspections. They are just as important as the specific procedures. In addition to the specific procedures, any of these general procedures that apply to PMCS items will be done automatically.

- a. Check to see if items are in good condition, properly assembled or stowed, not leaking, loose, or excessively worn, and properly lubricated.
  - (1) Checking that items are in good condition is usually a visual check to see if the items are safe and usable. Good condition means not bent or twisted, not chafed or burred, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut, not rusted or rotted, and not leaking.
  - (2) Checking that items are properly assembled or stowed usually is a visual inspection also. See if the items are in normal positions in the ROWPU and if all parts are present.
  - (3) Excessively worn means worn beyond usable limits and likely to fail before the next scheduled inspection. This includes too much play (lash or lost motion) in linkages and mating parts. This also includes unbreakable markings, data and caution plates, and other printed matter.
  - (4) Check that bolts, nuts, and screws are not loose, missing, bent, or broken. You can't try them all with a tool of course, but look for chipped paint, bare metal, or rust around bolt heads. Tighten any that you find loose.
  - (5) Inspect welds for loose or chipped paint, rust, or gaps where parts are welded together. If you find a bad weld, report it to Direct Support Maintenance.

- (6) Check electric wires and connectors for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connections and make sure the wires are in good condition
- (7) Check hoses and fluid lines for wear, damage, and leaks. Make sure clamps and fittings are tight. Wet spots show leaks, of course, but a stain around a fitting or connector can mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, either correct it or report it to Intermediate Direct Support Maintenance (refer to the Maintenance Allocation Chart, Appendix 13).

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It is necessary for you to know how fluid leaks affect the status of your equipment. The following are definitions the types/classes of leakage you need to know to be able to determine the status of your equipment. Learn and familiar with them and remember, when in doubt, notify your supervisor.

#### CAUTION

When operating with class I or II leaks, continue to check fluid levels in addition to that required in PMCS. Parts without fluid will stop working and/or cause damage to the parts.

#### NOTE

Equipment operation is allowable with minor leakage (class I or II). Consideration must be given to the fluid capacity in the item, being checked/inspected. When in doubt, notify your supervisor.

- b. Leakage definitions for unit PMCS:

CLASS I Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.

CLASS II Leakage of fluid great enough to form drops but not enough to cause drops to drip from the item being checked/inspected.

CLASS III Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

- c. The specific PMCS procedures do not say "adjust if necessary" or "replace .if necessary." It is understood that whenever inspection shows the need for adjustment, repairs, or replacement, that work will be done.
- d. Any special cleaning instructions for certain items are in the maintenance sections for those items. General cleaning instructions are as follows:
  - (1) Remove dust or loose dirt with a clean, soft cloth or brush.

### WARNING

- Drycleaning solvent, M 711 Type I & II, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact by wearing rubber or nonporous gloves when handling the solvent or material wet with Drycleaning solvent. Wash hands immediately after exposure with soap and water and use a lanolin based skin cream to prevent skin drying. Do not use near open flame or excessive heat. Flash point of solvent is 100°F (38°C). Do not work with solvent in a closed room. Be sure there is good ventilation or the solvent vapors will build up in the air and become a poisonous mixture which can cause physical injury or even death.
  - Eye protective equipment must be worn when scraping rust and loose paint.
  - Clean components with compressed air no greater than 30 psi (207 kPa). Protective eye wear must be worn when cleaning with compressed air.
- (2) Remove grease, fungus, and ground-in dirt with a clean, soft cloth dampened (not wet) with Drycleaning solvent.
- (3) Clean meter faces and control panels with water and a mild detergent.
- e. Steel nameplates, caution plates, and instruction plates may rust rapidly. If rusty, clean plates well and coat heavily with clear lacquer. Refer to TM 9-213.
- f. General precautions for cleaning are in the maintenance sections.
- g. The equipment operator usually helps unit maintenance personnel in doing the PMCS. The operator should make sure the equipment is fairly clean. However, the equipment should not be washed right before inspection. Certain problems, such as loose parts or oil leaks, may not show up after a wash.
- h. Unit maintenance services are those general procedures listed below, unless approval is given for other services.
- (1) Adjust. Make all adjustments by following the procedures given in this manual or in bulletins.
  - (2) Clean. Clean items by following the general cleaning procedures given in paragraphs 2-8.d and 2-20 through 2-26.
  - (3) Service. Normally, service includes filling the tires with air and changing or cleaning filters.
  - (4) Tighten. Tighten items with enough force on the wrench handle to tighten according to good mechanical practice. Do not overtighten; this may strip threads or cause distortion. Tightening includes using lockwashers, locknuts, lock wire, or cotter pins when needed. Use a torque wrench when the procedure calls for one.
  - (5) Modification work order application. Write all needed modification work orders (MWO) for the equipment on DA Form 2408-5.

- i. When it is hard to do all of the PMCS procedures at one time, they can sometimes be done in parts. If possible, plan to do all the procedures within 24 hours. All available time at halts and in bivouac areas must be used, if needed, to make sure that the PMCS is done.

**2-9. PMCS PROCEDURES.**

- a. PMCS Support Diagrams. Figure 2-1 gives location of components for the flatbed cargo trailer and figure 2-2 gives location of components for ROWPU.
- b. PMCS Table. Table 2-1 gives PMCS procedures. The PMCS table is made up of the following columns:
  - (1) Item No. This column gives the order in which the checks and services are to be done. Use these item numbers when filling out the TM Item No. column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, or Marine Corps forms as prescribed by TM 4700-15/1.
  - (2) Interval. These columns state, in calendar days, the amount of time between scheduled checks and services. A dot (•) is placed in the column that applies to each procedure.

**M-Monthly**

**Q-Quarterly**

**A-Annually**

- (3) Item To Be Inspected. This column names the item to be checked or serviced.
- (4) Procedures. This column gives the checks and services that need to be done on the item.

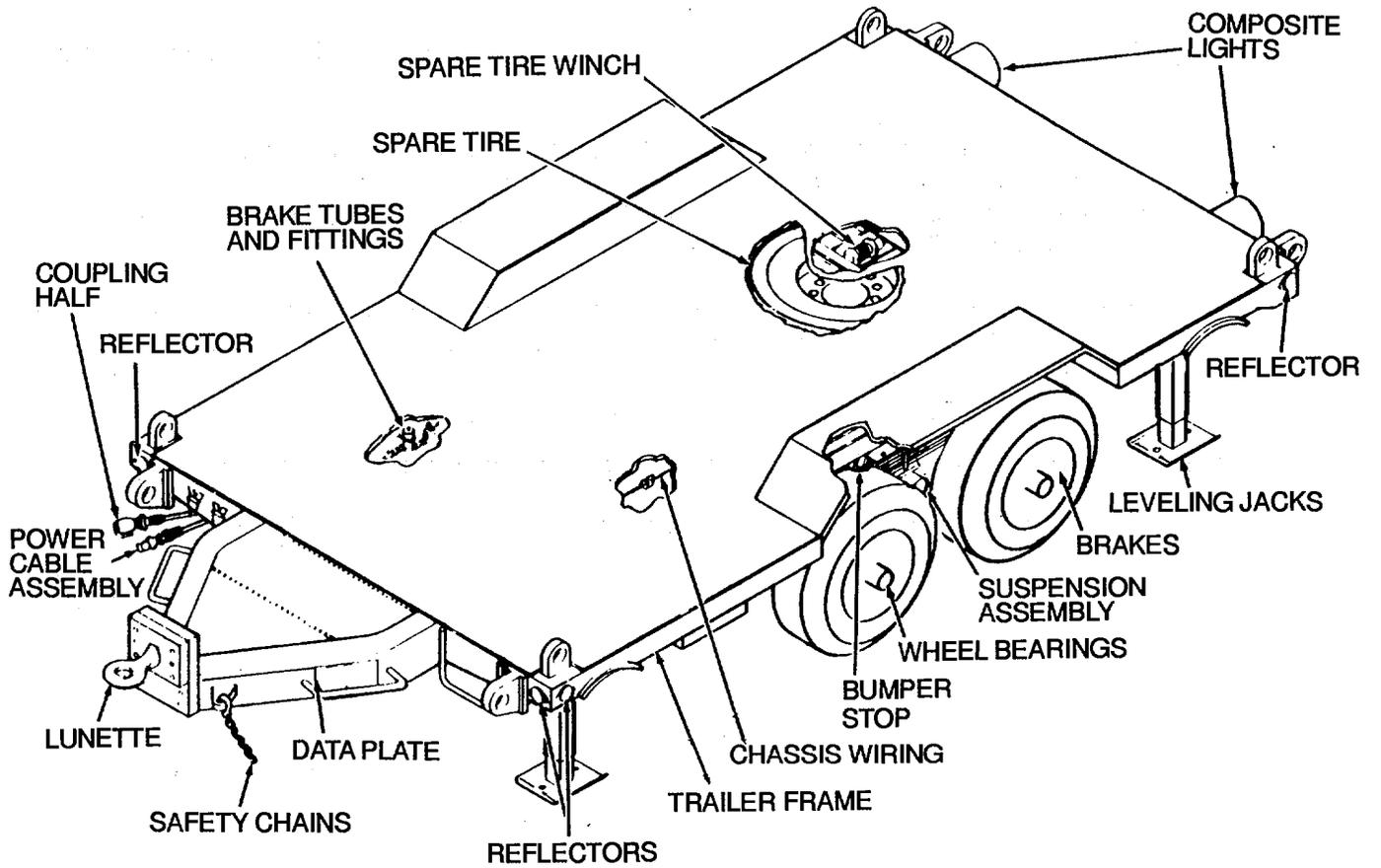


Figure 2-1. Flatbed Cargo Trailer

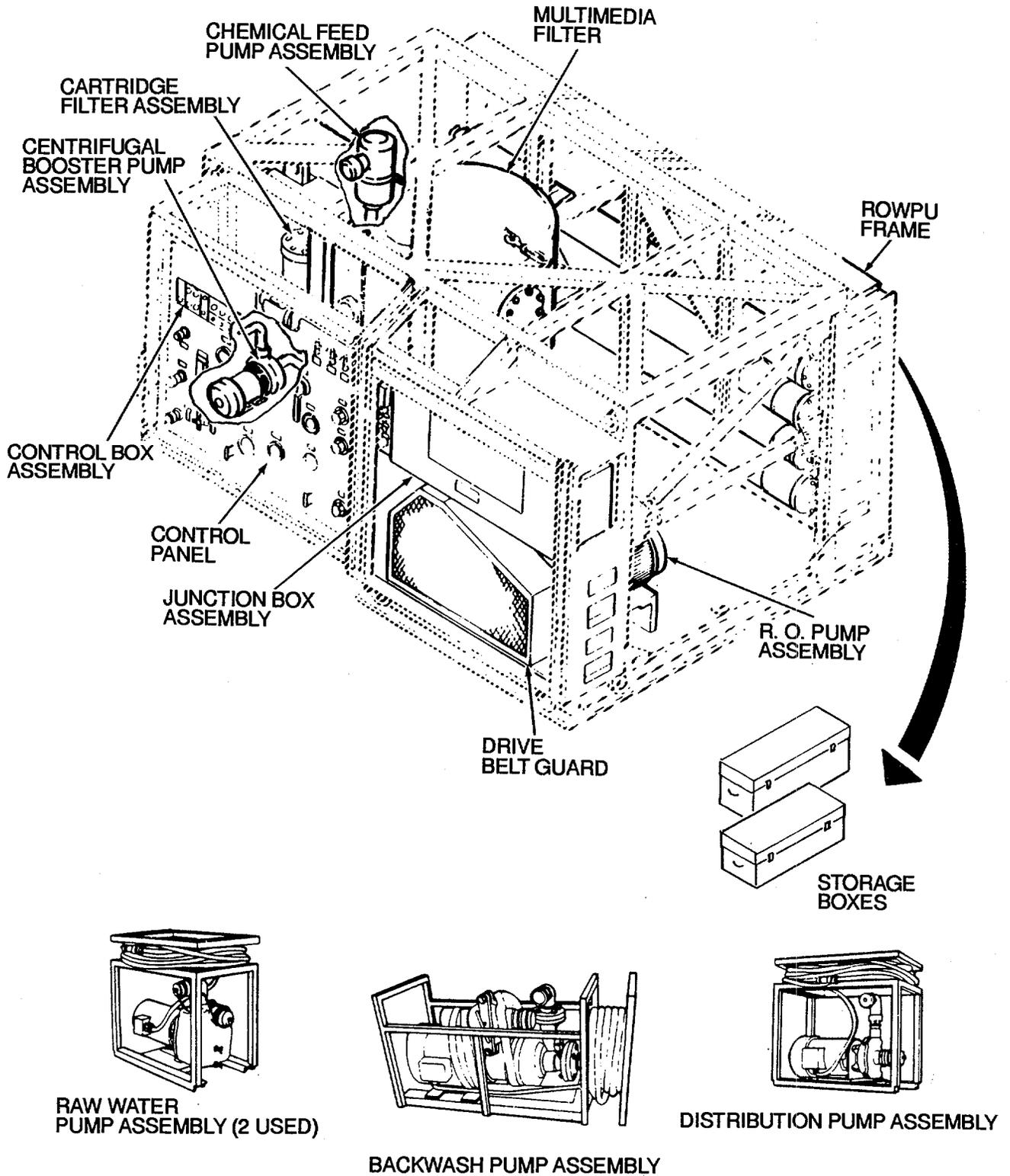


Figure 2-2. ROWPU

**Table 2-1. Unit Preventive Maintenance Checks and Services**

**NOTE**

- These checks are to be made in the order listed, within the designated interval.
- If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without distributing operation. Make the complete checks and serviced when the equipment can be shut down.

M-Monthly

Q-Quarterly

A-Annually

Item No.	Interval			Item To Be Inspected	Procedures
	M	Q	A		
1		•		Trailer frame	Inspect for broken welds
2		•		Lunette	Inspect for loose or damaged bolts
3		•		Safety chains	Inspect for rusted or worn links.
4	•			Leveling jacks	Inspect for broken welds and proper operation
5		•		Trailer tires	Check for proper inflation, 75 psi (5.27 kg/cm <sup>2</sup> ).
6	•			Spare tire winch	Inspect spare tire winch for worn loose parts, and proper operation
7		•		Spare tire	Inspect tire for proper inflation and dry or cracked rubber.
8		•		Stop bumper	Inspect for cracks or wear or crushed
9		•		Data plates	Check that data plates can be read and markings and are firmly attached.
10		•		Reflectors	Inspect for cracked or broken reflectors.

**Table 2-1. Unit Preventive Maintenance Checks and Services - Continued**

Item No.	Interval			Item To Be Inspected	Procedures
	M	Q	A		
11	•			Airbrake system	Check that wheels do not turn
12	•			Tubes and fitting	Inspect for rusted, crimped, crushed and broken tubes and fittings.
13	•			Coupling halves	Inspect hoses for cracks and damage..
14	•			Chassis wiring	Inspect for frayed or damaged areas Inspect for corrosion on all connectors.
15	•			Power Cable assembly	Inspect for frayed or damaged areas Inspect for corrosion.
16	•			Composite light	Inspect for broken lenses. Inspect connectors for corrosion.
17		•		Suspension assembly	Inspect for broken springs, corrosion, and missing bolts.
18			•		
				Brakes	Inspect brake linings for wear. Inspect brake assembly for rusted or worn parts.
19			•	Wheel bearings	Clean and repack
20	•			ROWPU frame	Inspect for broken welds, cracks or rust. Inspect for missing bolts and nuts. Inspect overall condition of paint. Inspect for water leaks.

**Table 2-1. Unit Preventive Maintenance Checks and Services - Continued**

M - Monthly

Q - Quarterly

A - Annually

Item No.	Interval			Item To Be Inspected	Procedures
	M	Q	A		
21	•			Tool and Storage boxes	Inspect for cracks and rust. Inspect for operations of lids. Inspect for worn points.
22	•			Generator	Perform generator PMCS. Refer to generator maintenance manual.
23	•			Install piping	Inspect for leaks
24	•			Valves	Check valves for cracks leaks, and ease of operation.
25	•			Control panel gages and fitting	Inspect for operation of all flow meters and pressure gages
26	•			Cartridge filter assembly	Inspect for leaks. Inspect for rust. Inspect for worn paint.

**Table 2-1. Unit Preventive Maintenance Checks and Services - Continued**

M - Monthly

Q - Quarterly

A - Annually

Item No.	Interval			Item To Be Inspected	Procedures
	M	Q	A		
27	•			Cable assemblies	<p><b>WARNING</b></p> <p>High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.</p> <p>Inspect for cracked , broken and cut insulation.</p> <p>Inspect connectors for damage and corrosion.</p> <p>Clean and treat connectors with approved corrosion control substance.</p>
28	•	•		Booster pump assembly	<p>Inspect for water leaks.</p> <p>Inspect for loose mountings.</p> <p>Listen for unusual noises from pump and pump motors during operation.</p> <p>Remove motor conduit box cover; clean and treat wiring and connectors with approved corrosion control substance.</p>
29		•		Chemical feed metering pump assembly	<p>Inspect for chemical leaks.</p> <p>Inspect for loose mountings.</p> <p>Listen for unusual noises from pump and pump motor during operation.</p> <p>Check for oil leaks.</p> <p>Change pump oil.</p> <p>Inspect priming valves for leaks, chemical corrosion, and ease of operation.</p>

**Table 2-1. Unit Preventive Maintenance Checks and Services - Continued**

Item No.	M - Monthly			Q - Quarterly	A - Annually
	Interval				
	M	Q	A	Item To Be Inspected	Procedures
29 Cont					Remove motor top cover plate and conduit box covers; clean and treat wiring and connectors with approved corrosion control substance.
30	•			Control box assembly	<p>Test all switches and indicator assembly lamps for operation.</p> <p>Check power receptacle for operation.</p> <p>Inspect wiring harness for corrosion.</p> <p>Inspect all jacks and connections for damage and corrosion.</p> <p>Ensure that ground rod has a solid electrical connection.</p> <p>Clean and treat wiring and connectors with approved corrosion control substance.</p>
31	•			Junction box assembly	<p>Inspect wiring harness for corrosion.</p> <p>Inspect all jacks and connections for damage and corrosion.</p> <p>Inspect all cable plugs and pins for damage and corrosion.</p> <p>Inspect motor starters for loose mounting screws, pitted and corroded electrical terminal connections, loose terminal screws, damaged or broken wiring, and dirt or foreign matter.</p>

**Table 2-1. Unit Preventive Maintenance Checks and Services - Continued**

Item No.	M - Monthly			Q - Quarterly	A - Annually	Procedures
	Interval					
	M	Q	A	Item To Be Inspected		
31 Cont						Clean and treat wiring and connectors with approved corrosion control substance.
32	•			R.O. pump assembly		<p>Inspect for leaks.</p> <p>Check sight gage for breaks or cracks.</p> <p>Check that filter cover fits tightly and that breather is not clogged.</p> <p>Check that drain is closed.</p> <p>Inspect for traces of water in sight gage and in filler opening.</p> <p>Listen for unusual noises from pump and motor during operation.</p> <p>Inspect five V-belts for cracks and signs of wear.</p> <p>Check belt tension; belt should push down 1/2 inch at center of span.</p> <p>Inspect pulleys for wear and damage.</p> <p>Inspect for missing, loose, or damaged drive belt guard..</p> <p>Remove motor conduit box cover; clean and treat wiring and connectors with approved corrosion control substance.</p>
33	•			Multimedia filter assembly		<p>Inspect for leaks.</p> <p>Inspect for loose mountings.</p>
34	•			Distribution pump		<p>Check pump for leaks.</p> <p>Check pump frame assembly for bent rails, broken welds, or missing hardware</p>

**Table 2-1. Unit Preventive Maintenance Checks and Services - Continued**

M - Monthly

Q - Quarterly

A - Annually

Item No.	Interval			Item To Be Inspected	Procedures
	M	Q	A		
34 Cont					<p>Check cable for severe cracks and plugs for bent pins and cracked or broken shells.</p> <p>Remove motor conduit box cover; clean and treat wiring and connectors with approved corrosion control substance.</p>
35	•			Raw water pump assemblies (2)	<p>Check pump for leaks.</p> <p>Check pump frame assemblies for bent rails, bent rails, broken welds, or missing hardware.</p> <p>Check cable for severe cracks and plugs for bent pins and cracked or broken shells.</p> <p>Listen for unusual noises from pump and motor during operation.</p> <p>Remove motor conduit box cover; clean and treat wiring and connectors with approved corrosion control substance.</p>
36	•			Backwash pump assembly	<p>Check pump for leaks.</p> <p>Check pump frame assembly for bent rails broken welds, or missing hardware.</p> <p>Inspect power cable for cracked insulation and damaged cable plug.</p> <p>Check pump strainer assembly for cracks or damage.</p> <p>Remove motor conduit box cover; clean and treat wiring and connectors with approved corrosion control substance.</p>

**Section V. UNIT TROUBLESHOOTING**

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## 2-10 GENERAL.

- a. Troubleshooting at the unit maintenance level requires location of any trouble as quickly as possible. Once the trouble is located, repair or replace the item if authorized by the Maintenance Allocation Chart. This section is designed to aid in quick, accurate diagnosis of problems associated with the ROWPU. In its simplest state, troubleshooting the ROWPU is an exercise in logic.
- b. It is most important to understand that the ROWPU is really made up of a series of systems with each system having a number of assemblies. Some of these systems are interrelated; others are not. The ROWPU operates within a framework of understanding of all the systems and their assemblies.

### NOTE

Before using the troubleshooting table, check your work order and talk to the operator, if possible, for a description of the symptoms and the steps that have been taken to correct them.

- c. This section breaks the ROWPU down into its systems and assemblies, allowing the problem to be isolated. The troubleshooting table lists the most common problems and the most probable causes of trouble. It would be impossible to list every possible problem that could happen along with every possible cause, but it will locate most problems and eliminate a lot of unnecessary guesswork. The systematic format will locate problems within a given assembly but, because many of the ROWPU assemblies are interrelated, the solution to a particular problem may be found in more than one assembly.

2-11. USING THE TROUBLESHOOTING TABLE. The following columns are used in the troubleshooting table:

TM 5-4610-215-24/2  
TM 08580B-24/3

Table 2-2. Unit Troubleshooting – Continued

Malfunction	Test or Inspection	Corrective Action
<b>AIRBRAKE SYSTEM – Continued</b>		
<b>2. ONE BRAKE DRAGS – Continued</b>		
	If air chamber assembly pushrod moves out and returns quickly as brakes are engaged and released, go to step 2.	
	If air chamber assembly pushrod on any wheel returns slowly, go to step 4.	
	Step 2. Check brakeshoe adjustment on wheel that drags. Refer to paragraph 2-73.	
	If brakeshoe adjustment is good, go to step 3.	
	If brakeshoe adjustment is too tight, adjust brakeshoes. Refer to paragraph 2-73.	
	Step 3. Remove hub and drum assembly for wheel that drags (refer to paragraph 2-66) and check for rusted or damaged brake parts or weak return spring.	
	Repair service brake assembly. Refer to paragraph 2-72.	

2-38

- Malfunction (1). Malfunctions given are those that cause symptoms seen or heard at the equipment without using test equipment.
- Test of Inspection (2). Test or inspections are procedure steps that isolate the damaged part.
- Corrective Action (3). Corrective actions tell the technician what needs to be done to correct the problem.
- Illustrations (4). Illustrations show what the text is talking about.

**2-12. TROUBLESHOOTING TABLE.** Table 2-2 lists common malfunctions which may be found during operation or maintenance of the ROWPU group or its assemblies. Perform the tests/inspections and corrective actions in the order listed.

**NOTE**

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

**Table 2-2. Unit Troubleshooting**

Malfunction	Test or Inspection	Corrective Action
-------------	--------------------	-------------------

**AIRBRAKE SYSTEM**

**NOTE**

- Connect trailer coupling halves to towing vehicle with towing vehicle running.
- Ensure that towing vehicle brakes are operating properly.
- Refer to figure 2-3 for airbrake system support diagram.

**1. POOR OR NO BRAKING ACTION**

Step 1. Check all compressed air system tubes, fittings, and components for leaking air.

If compressed air system is not losing air pressure, go to step 2.

If compressed air tube or fitting is leaking air, repair airbrake system tubing. Refer to paragraph 2-53.

If coupling half is leaking air, repair brake line air filter. Refer to paragraph 2-49.

If brake line air filter is leaking air, repair brake line air filter. Refer to paragraph 2-55.

If reservoir is leaking air, replace reservoir. Refer to paragraph 2-50. If reservoir drain cock is leaking air, replace reservoir drain cock. Refer to paragraph 2-51.

If air chamber assembly is leaking air, replace air chamber assembly. Refer to paragraph 2-70.

If airbrake relay valve is leaking air, repair airbrake, relay valve. Refer to paragraph 2-58.

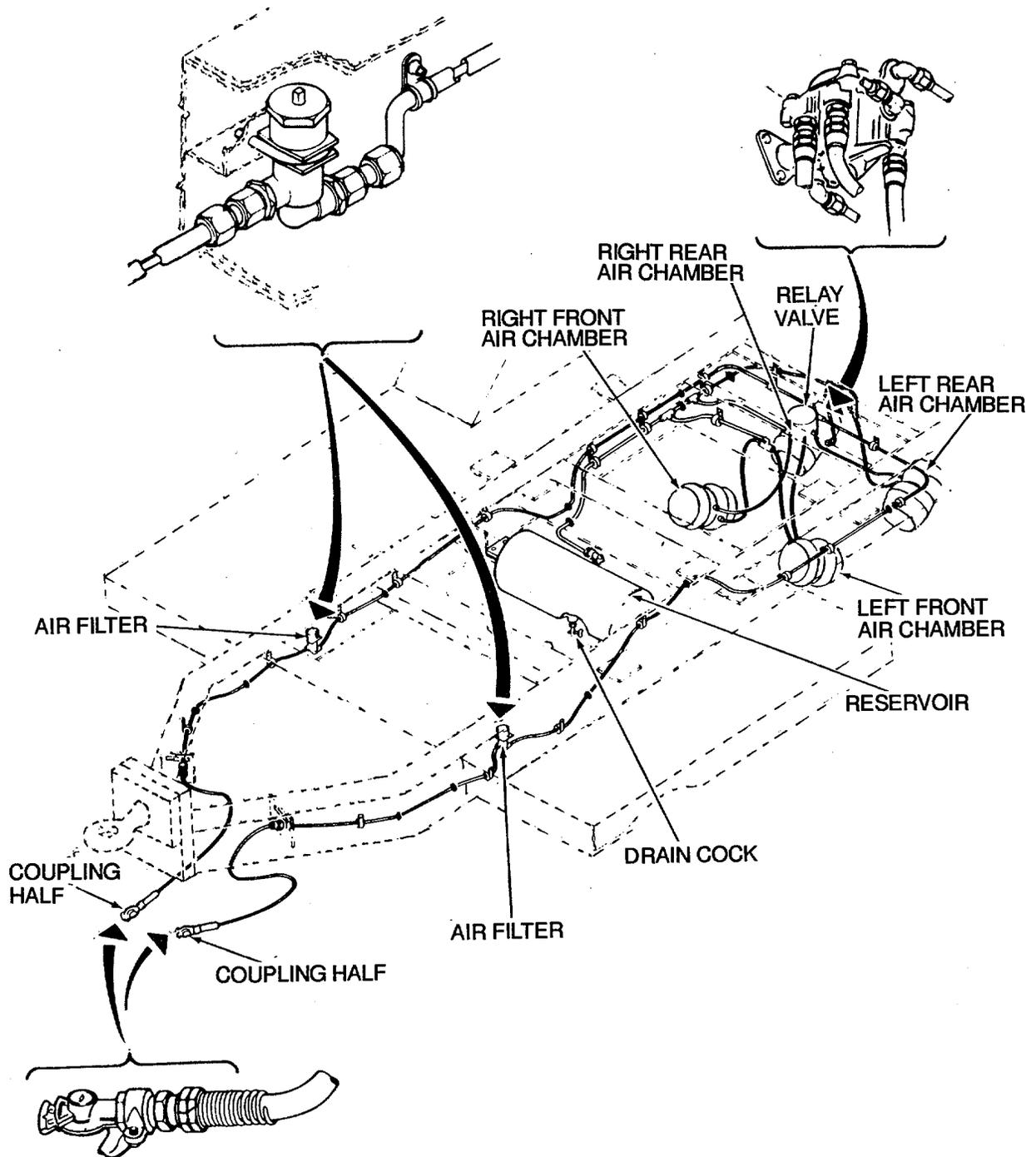


Figure 2-3. Airbrake System Support Diagram

Table 2-2. Unit Troubleshooting - Continued

Malfunction	Test or Inspection	Corrective Action
-------------	--------------------	-------------------

**AIRBRAKE SYSTEM - Continued**

1. POOR OR NO BRAKING ACTION - Continued

Step 2. Loosen service brake line air filter tube fitting on tube leading to airbrake relay valve. Check for high-pressure air leaking.

If high-pressure air is leaking, tighten fitting and go to step 3.

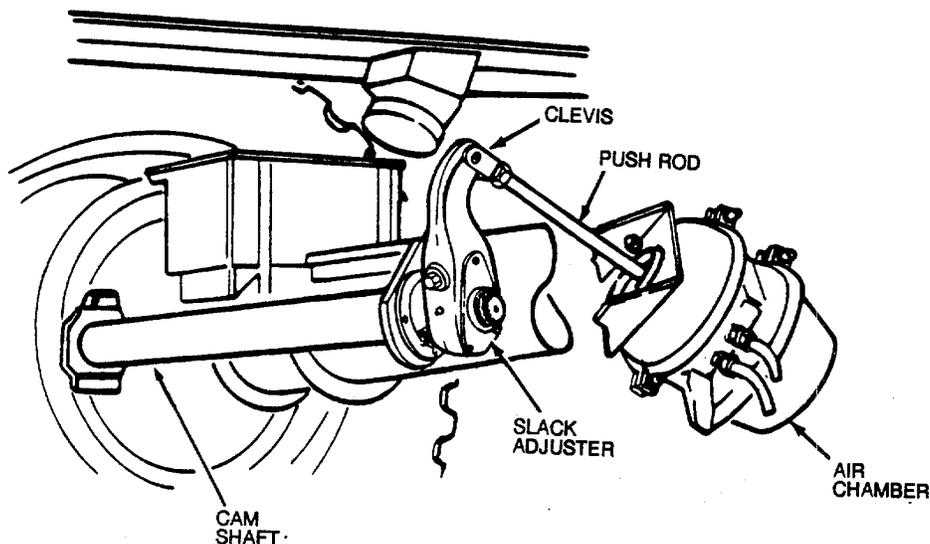
If air leaks slowly or not at all, repair service brake line air filter. Refer to paragraph 2-56.

Step 3. Tell assistant to pump towing vehicle brake pedal several times while you are watching air chamber action on all four brakes.

If all air chambers assemblies operate, go to step 4.

If one or more air chamber assembly pushrods fail to operate, replace defective air chamber. Refer to paragraph 2-70.

If all air chamber assembly pushrods do not operate or operated slowly, repair airbrake relay valve. Refer to paragraph 2-58.



Step 4. Remove hub and drum assembly for each wheel (refer to paragraph 2-66). Inspect brakeshoe linings for wear. Using 6-inch scale, measure brakeshoe lining thickness.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**AIRBRAKE SYSTEM - Continued**

1. POOR OR NO BRAKING ACTION - Continued

If brakeshoe linings are greater than 1/8 inch (3.2 mm) thick, adjust service brakes. Refer to paragraph 2-73.

If brakeshoe linings are less than 1/8 inch (3.2 mm) thick, repair service brake assembly. Refer to paragraph 2-72.

2. ONE BRAKE DRAGS

Step 1. Tell assistant to pump towing vehicle brake pedal several times while you are watching air chamber action on wheel that drags.

If air chamber assembly pushrod moves out and returns quickly as brakes are engaged and released, go to step 2.

If air chamber assembly pushrod on any wheel returns slowly, go to step 4.

Step 2. Check brakeshoe adjustment on wheel that drags. Refer to paragraph 2-73.

If brakeshoe adjustment is good, go to step 3.

If brakeshoe adjustment is too tight, adjust brakeshoes. Refer to paragraph 2-73.

Step 3. Remove hub and drum assembly for wheel that drags (refer to paragraph 2-66) and check for rusted or damaged brake parts or weak return spring.

Repair service brake assembly. Refer to paragraph 2-72.

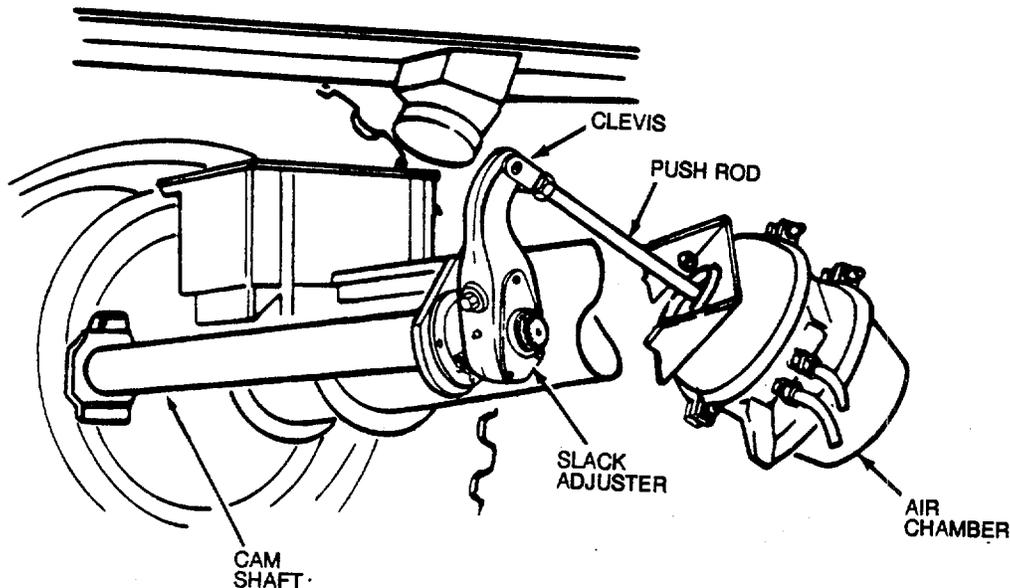
Table 2-2. Unit Troubleshooting - Continued

---

Malfunction
Test or Inspection
Corrective Action

---

**AIRBRAKE SYSTEM - Continued**



**2. ONE BRAKE DRAGS - Continued**

Step 4. Tell assistant to hold down towing vehicle brake pedal. Loosen uppermost hose fitting on slow returning air chamber.

If air chamber assembly pushrod returns slowly, go to step 5.

If air chamber assembly pushrod returns quickly, tighten hose fitting and repair airbrake relay valve. Refer to paragraph 2-58.

Step 5. Disconnect clevis from slack adjuster and do step 4.

If air chamber assembly pushrod returns quickly, tighten hose fitting and go to step 6.

If air chamber assembly pushrod returns slowly, replace defective air chamber assembly. Refer to paragraph 2-70.

Step 6. Remove hub and drum assembly for wheel that drags (refer to paragraph 2-66) and check for rusted or damaged brake parts or weak return spring.

Repair service brake assembly. Refer to paragraph 2-72.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**AIRBRAKE SYSTEM - Continued**

**3. BRAKES DRAG OR REMAIN LOCKED**

Step 1. Check all compressed air system tubes, fittings, and components for leaking air.

If compressed air system is not losing pressure, repair relay valve. Refer to paragraph 2-58.

If compressed air tube or fitting is leaking air, repair air brake system tubing. Refer to paragraph 2-53.

If coupling half is leaking air, repair airbrake hose assembly. Refer to paragraph 2-49.

If brake line air filter is leaking air, repair brake line air filter. Refer to paragraph 2-56.

If reservoir is leaking air, replace reservoir. Refer to paragraph 2-50.

If reservoir drain cock is leaking air, replace reservoir drain cock. Refer to paragraph 2-51.

If air chamber assembly is leaking air, replace air chamber assembly. Refer to paragraph 2-70.

If airbrake relay valve is leaking air, repair airbrake relay valve. Refer to paragraph 2-58.

**4. TRAILER ROLLS WHEN DISCONNECTED FROM TOWING VEHICLE**

Step 1. Check all compressed air system tubes, fittings, and components for leaking air.

If compressed air system is not losing pressure, go to step 2.

If compressed air tube or fitting is leaking air, repair airbrake system tubing. Refer to paragraph 2-53.

If coupling half is leaking air, repair airbrake hose assembly. Refer to paragraph 2-49.

If brake line air filter is leaking air, repair brake line air filter. Refer to paragraph 2-56.

If reservoir is leaking air, replace reservoir. Refer to paragraph 2-50.

If reservoir drain cock is leaking air, replace reservoir drain cock. Refer to paragraph 2-51.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction	Test or Inspection	Corrective Action
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---

**AIRBRAKE SYSTEM - Continued**

4. TRAILER ROLLS WHEN DISCONNECTED FROM TOWING VEHICLE -- Continued

2- If airbrake relay valve is leaking air, repair airbrake relay valve. Refer to paragraph 58.

Step 2. Check that compressed air system tubes between reservoir and air chamber assemblies are not crimped or crushed.

If compressed air system tubes are good, go to step 3.

If compressed air system tubes are damaged, repair airbrake system tubing. Refer to paragraph 2-53.

Step 3. Remove hub and drum assembly for each wheel (refer to paragraph 2-66). Inspect brakeshoe linings for wear. Using 6-inch scale, measure brakeshoe lining thickness.

If brakeshoe linings are greater than 1/8 inch (3.2 mm) thick, adjust service brakes. Refer to paragraph 2-73.

If brakeshoe linings are less than 1/8 inch (3.2 mm) thick, repair service brake assembly. Refer to paragraph 2-72.

5. BRAKES SLIP

Remove hub and drum assembly for each wheel (refer to paragraph 2-66). Inspect brakeshoe linings for wear, using 6-inch scale to measure brakeshoe lining for thickness, and check for rusted or damaged brake parts.

If brakeshoe linings are less than 1/8 inch (3.2 mm) thick or brake parts are rusted or damaged, repair service brake assembly. Refer to paragraph 2-72.

If brakeshoe linings are greater than 1/8 inch (3.2 mm) thick and brake parts are good, adjust service brakes. Refer to paragraph 2-73.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**FLATBED CARGO TRAILER ELECTRICAL SYSTEM**

**WARNING**

Flatbed cargo trailer electrical system contains 24 V dc which can cause electrical shock. Use proper measures to ensure personal safety.

**CAUTION**

Testing electrical system with power connected can cause damage to flatbed cargo trailer electrical system. Take proper measures to ensure wires do not touch trailer chassis during testing.

**NOTE**

- Before troubleshooting flatbed cargo trailer electrical system, ensure that towing vehicle's battery is fully charged.
- Ensure that there are no burned out lamps on trailer.
- Turn lights on at towing vehicle.

1. ALL LAMPS FAIL TO LIGHT

**NOTE**

Refer to figure 2-4 for power cable assembly support diagram.

Step 1. Check that power cable assembly is connected to towing vehicle receptacle.

Plug in power cable assembly.

Step 2. Unplug power cable assembly from towing vehicle and check that 24 V dc and ground are present at towing vehicle receptacle.

If 24 V dc and ground are present, go to step 3.

If 24 V dc and ground are not present, refer to towing vehicle maintenance manual.

Step 3. Check that chassis ground wire is attached to chassis.

If chassis ground wire is secured, go to step 4.

If chassis ground wire is not secured, attach chassis ground wire to chassis.

Step 4. Remove chassis ground wire and check for dirt or corrosion on ground lug and chassis.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**FLATBED CARGO TRAILER ELECTRICAL SYSTEM - Continued**

1. ALL LAMPS FAIL TO LIGHT - Continued

If no dirt or corrosion is present, go to step 5.

If dirty or corroded, clean and go to step 5.

Step 5. Check continuity between power cable assembly pin D and ground wire terminal.

If continuity is present, install chassis ground wire and go to step 7.

If continuity is not present, go to step 6.

Step 6. Check six in-line connectors, one ground lug, and associated wires on end of power cable for damage.

If connectors and wires are not damaged, install chassis ground wire and go to step 7.

If connector or wire is damaged, replace power cable assembly. Refer to paragraph 2-63.

Step 7. Plug power cable assembly into towing vehicle receptacle and unplug connector wire number 21 from chassis wiring harness and check that 24 V dc is present.

If 24 V dc is present, plug connector into chassis wiring harness and notify Direct Support Maintenance.

If 24 V dc is not present, replace power cable assembly. Refer to paragraph 2-63.

Step 8. Check that chassis wiring harness is not damaged or broken.

2. ONE OR MORE LAMPS FAIL TO LIGHT

**NOTE**

- Refer to figure 2-4 for power cable assembly support diagram.
- Refer to figure 2-5 for chassis wiring harness support diagram.
- Refer to figure 2-6 for chassis wiring support diagram to locate wire number for unlit lamp.

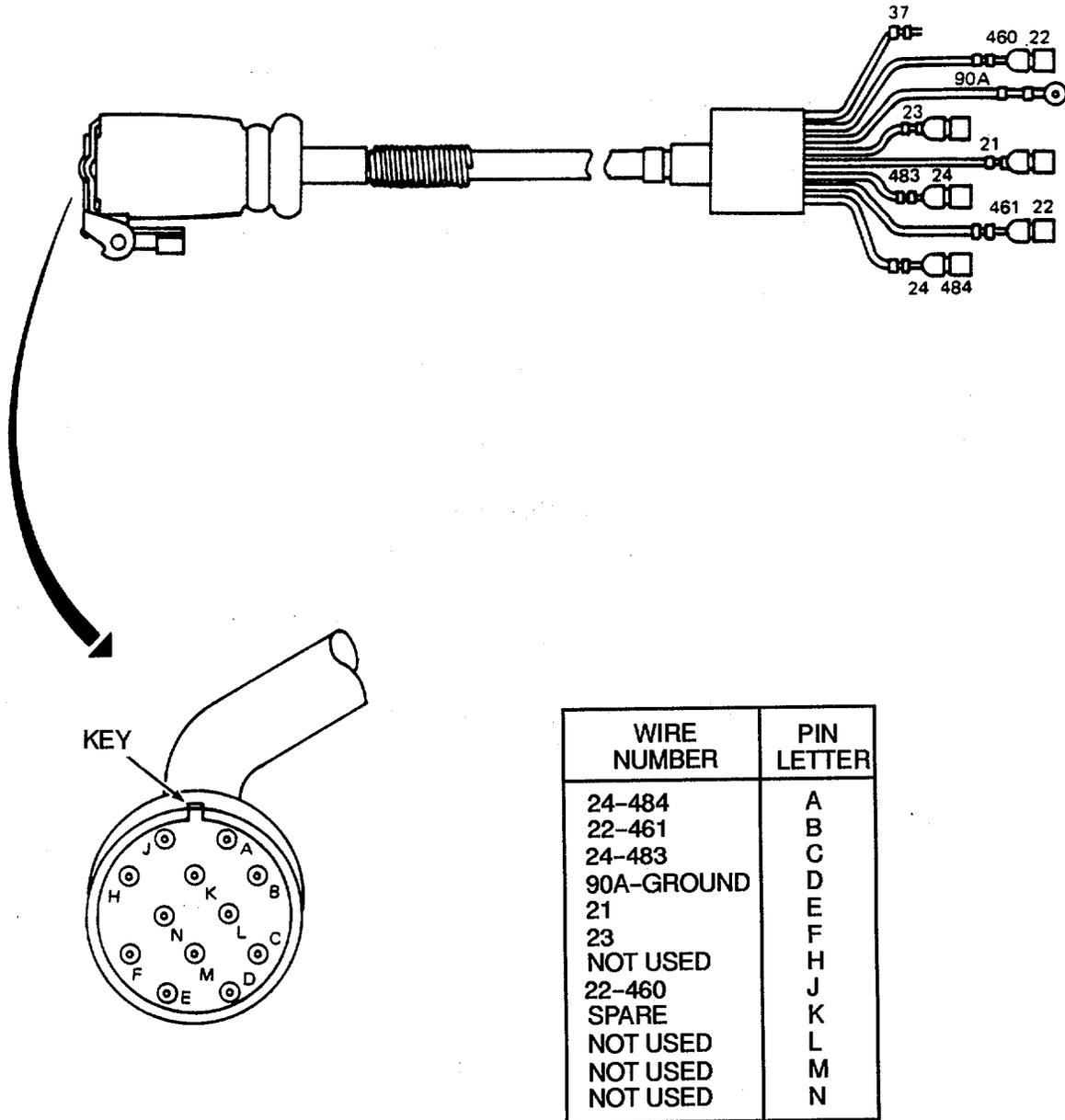


Figure 2-4. Power Cable Assembly Support Diagram

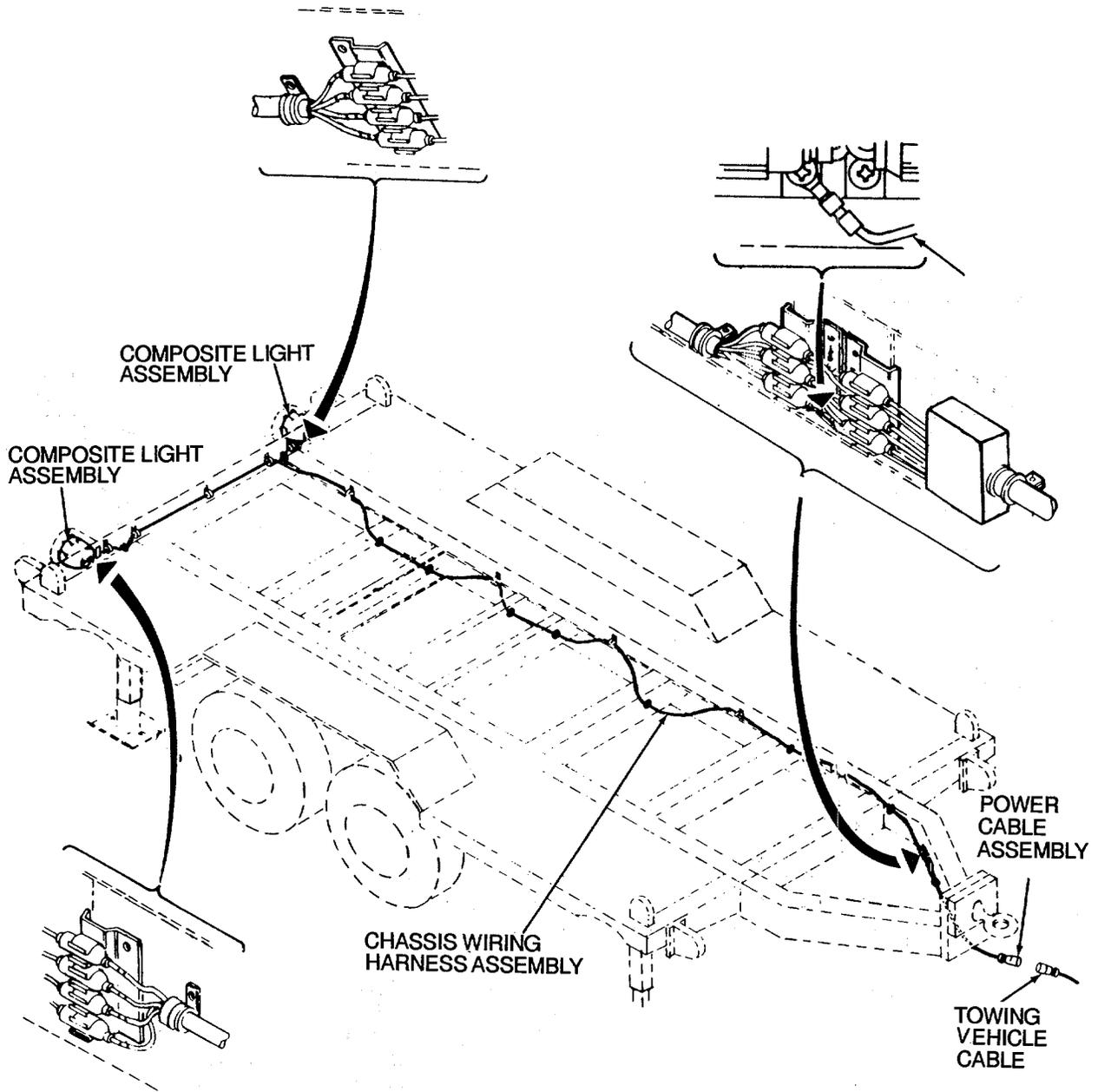
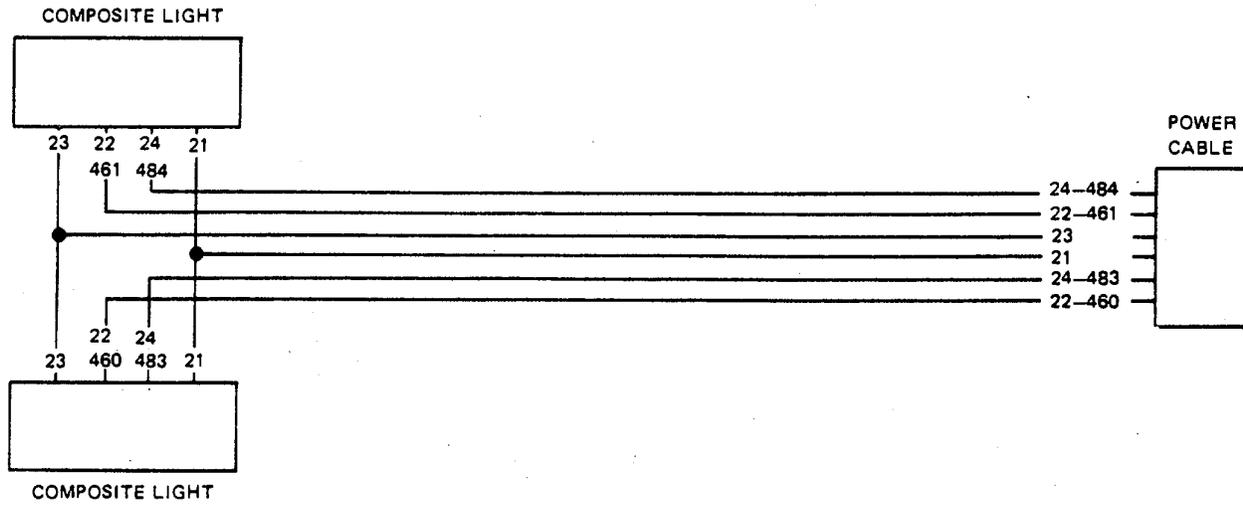


Figure 2-5. Chassis Wiring Harness Support Diagram



BAND MARKER NO.	FUNCTION
21	TAIL LAMPS
22-460	RIGHT SIDE STOP LAMP
22-461	LEFT SIDE STOP LAMP
23	BLACKOUT STOP LAMP
24-483	RIGHT SIDE BLACKOUT MARKER LAMP
24-484	LEFT SODE BLACKOUT MARKER LAMP

Figure 2-6. Chassis Wiring Support Diagram

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**FLATBED CARGO TRAILER ELECTRICAL SYSTEM - Continued**

2. ONE OR MORE LAMPS FAIL TO LIGHT - Continued

- Step 1. Unplug power cable assembly and check for 24 V dc at towing vehicle receptacle.
- If 24 V dc is present, plug power cable assembly into towing vehicle receptacle and go to step 2.
- If 24 V dc is not present, refer to towing vehicle maintenance manual.
- Step 2. Unplug power cable assembly wire from chassis wiring harness and check for 24 V dc at power cable assembly wire.
- If 24 V dc is present, plug power cable assembly wire into chassis wiring harness and go to step 4.
- If 24 V dc is not present, go to step 3.
- Step 3. Check six in-line connectors, one ground lug, and associated wires for damage.
- If connectors and wires are not damaged, go to step 4.
- If connector or wire is damaged, replace power cable assembly. Refer to paragraph 2-63.
- Step 4. Unplug chassis wiring harness wire from left side composite light assembly wire and check for 24 V dc at chassis wiring harness assembly.
- If 24 V dc is present, plug chassis wiring harness wire into left side composite light assembly wire and replace faulty bulb. Refer to TM 10-4610-239-10.
- If 24 V dc is not present, replace power cable assembly. Refer to paragraph 2-63.
- If 24 V dc is still not present, notify Direct Support Maintenance.

3. DIM OR FLICKERING LAMPS

**NOTE**

- Refer to figure 2-4 for power cable assembly support diagram.
- Refer to figure 2-5 for chassis wiring harness support diagram.
- Refer to figure 2-6 for chassis wiring support diagram.

**Table 2-2, Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**FLATBED CARGO TRAILER ELECTRICAL SYSTEM - Continued**

3. DIM OR FLICKERING LAMPS - Continued

- Step 1. Unplug power cable assembly from towing vehicle and check for continuity between towing vehicle receptacle and go to step 2.
- If continuity is present, connect power cable assembly into towing vehicle receptacle and go to step 2
- If continuity is not present, refer to towing vehicle maintenance manual.
- Step 2. Check that chassis ground wire is securely attached to chassis.
- If chassis ground wire is secured, go to step 3.
- If chassis ground wire is loose, clean and secure chassis ground wire to chassis.
- Step 3. Remove chassis ground wire from chassis and power cable assembly from towing vehicle. Check continuity between power cable assembly connector pin D and chassis ground wire terminal. Twist and shake power cable assembly during test.
- If continuity is present, install chassis ground wire and plug power cable assembly into towing vehicle receptacle. Go to step 5.
- If continuity is not present or intermittent, go to step 4.
- Step 4. Check six in-line connectors, one ground lug, and associated wires for damage.
- If connectors and wires are not damaged, go to step 5.
- If connectors or wires are damaged, replace power cable assembly. Refer to paragraph 2-63.
- Step 5. Check that all connector plugs between power cable assembly, chassis wiring harness, and light assemblies are clean and secure.
- Remove corrosion and contaminants and plug in all connectors.
- Step 6. Check light assemblies for loose or damaged lamps.
- Repair composite lights. Refer to paragraph 2-61.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**FLATBED CARGO TRAILER ELECTRICAL SYSTEM - Continued**

3. DIM OR FLICKERING LAMPS - Continued

Step 7. Check light assemblies for loose or damaged wires and sockets. If wires or sockets are damaged, replace composite lights. Refer to paragraph 2-59.

If wires and sockets are not damaged, notify Direct Support Maintenance.

**SUSPENSION ASSEMBLY**

1. WHEELS WOBBLE OR SHIMMY

Step 1. Jack up trailer on all four leveling jacks and spin each tire to check for bent wheels and out of round or damaged tires. Refer to figure 2-7 for tire wear chart.

If wheels and tires are good, go to step 2.

If any wheel is bent or any tire is out of round or damaged, replace defective wheel or tire. Refer to paragraph 2-67.

Step 2. Check wheel bearing adjustment on each wheel. Refer to paragraph 2-65.

If wheel bearing adjustments are good, go to step 3.

If wheel bearings are out of adjustment, adjust wheel bearings. Refer to paragraph 2-65.

2. WHEELS ARE NOISY

Step 1. Jack up trailer on all four leveling jacks and spin each tire to check for bent wheels and out of round or damaged tires. Refer to figure 2-7 for tire wear chart.

If wheels and tires are good, go to step 2.

If any wheel is bent or any tire is out of round or damaged, replace defective wheel or tire. Refer to paragraph 2-67.

Step 2. Check wheel bearing adjustments on each wheel. Refer to paragraph 2-65.

If wheel bearing adjustments are good, go to step 3.

### HOW TO READ TIRE WEAR

THE WAY TIRES WEAR IS A GOOD INDICATOR OF OTHER PARTS OF THE SUSPENSION. ABNORMAL WEAR PATTERNS ARE OFTEN CAUSED BY THE NEED FOR SIMPLE TIRE MAINTENANCE.

EXCESSIVE WEAR AT THE CENTER OF THE TREAD INDICATES THAT THE AIR PRESSURE IN THE TIRE IS TOO HIGH. THE TIRE IS RIDING ON THE CENTER OF THE TREAD AND WEARING IT PREMATURELY

THIS TYPE OF WEAR RESULTS FROM UNDER-INFLATION. WHEN A TIRE IS UNDER-INFLATED, THERE TOO MUCH CONTACT WITH THE ROAD BY THE OUTER TREADS, WHICH WEAR PREMATURELY WHEN THIS TYPE OF WEAR OCCURS, AND THE TIRE PRESSURE IS KNOWN TO BE CORRECT, A BENT AXLE OR OUT OF ADJUSTMENT WHEEL BEARINGS COULD BE INDICATED.

FEATHERING IS A CONDITION WHEN THE EDGE OF EACH TREAD RIB DEVELOPS A SLIGHTLY ROUNDED EDGE ON ONE SIDE AND A SHARP EDGE ON THE OTHER. BY RUNNING YOUR HAND OVER THE TIRE, YOU CAN USUALLY FEEL THE SHARPER EDGES BEFORE YOU'LL BE ABLE TO SEE THEM. THE MOST COMMON CAUSE OF ZFEAING IS A BENT AXLE.

WHEN AN INNER OR OUTER RIB WEARS FASTER THAN THE REST OF THE TIRE, THE NEED FOR WHEEL BEARING ADJUSTMENT IS INDICATED. THERE IS EXCESSIVE WEIGHT ON ONE SIDE OF TRAILER, CAUSING THE WHEEL TO LEAN TOO MUCH, PUTTING EXCESSIVE LOAD ON ONE SIDE OF THE TIRE. MISALIGNMENT COULD ALSO BE DUE TO SAGGING SPRINGS. BE SURE THE VEHICLE IS LOADED EVENLY.

CUPS OR SCALLOPED DIPS APPEARING AROUND THE EDGE OF THE TREAD ALMOST ALWAYS INDICATE WORN (SOMETIMES BENT) SUSPENSION PARTS. ANY WORN COMPONENT THAT CONNECTS THE WHEEL TO THE SUSPENSION CAN CAUSE THIS TYPE OF WEAR. OCCASIONALLY, WHEELS THAT ARE OUT OF BALANCE WILL WEAR LIKE THIS, BUT WHEEL IMBALANCE USUALLY SHOWS UP AS BALD SPOTS BETWEEN THE OUTSIDE EDGES AND CENTER OF THE TREAD.

SECOND-RIB WEAR CAN BEKEPT TO A MINIMUM BY PAYING CAREFUL ATTENTION TO TIRE PRESSURE AND FREQUENTLY ROTATING THE TIRES. THIS IS OFTEN CONSIDERED NORMAL WEAR.

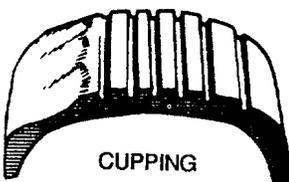
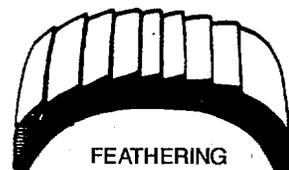
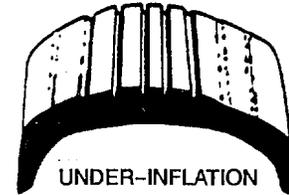
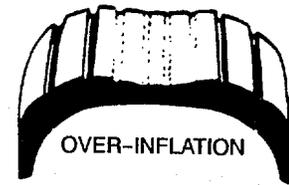


Figure 2-7. Tire Wear Chart

**Table 2-2. Unit Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**SUSPENSION ASSEMBLY - Continued**

2. WHEELS ARE NOISY - Continued

If wheel bearings are out of adjustment, adjust wheel bearings. Refer to paragraph 2-65.

Step 3. Inspect wheel bearings for overheating or damage. Refer to paragraph 2-65.

Replace damaged wheel bearings. Refer to paragraph 2-65.

3. TRAILER VIBRATES WHEN BEING TOWED

Step 1. Jack up trailer on all four leveling jacks and spin each tire to check for bent wheels and out of round or damaged tires. Refer to figure 2-7 for tire wear chart.

If wheels and tires are good, go to step 2.

If any wheel is bent or any tire is out of round or damaged, replace defective wheel or tire. Refer to paragraph 2-67.

Step 2. Check for bent axles.

If axles are not bent, go to step 3.

If any axle is bent, replace defective axle. Refer to paragraph 2-68.

Step 3. Check wheel bearing adjustment on each wheel. Refer to paragraph 2-65.

If wheel bearing adjustments are good, notify Direct Support Maintenance.

If wheel bearings are out of adjustment, adjust wheel bearings. Refer to paragraph 2-65.

4. TIRES WEAR UNEVENLY

**NOTE**

Refer to figure 2-7 for tire wear chart.

Step 1. Check for bent axles.

If axles are not bent, go to step 2.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**SUSPENSION ASSEMBLY - Continued**

4. TIRES WEAR UNEVENLY - Continued

If any axle is bent, replace defective axle. Refer to paragraph 2-65.

Step 2. Check wheel bearing adjustment on each wheel. Refer to paragraph 2-65.

If wheel bearing adjustments are good, go to step 3.

If wheel bearings are out of adjustment, adjust wheel bearings. Refer to paragraph 2-65.

Step 3. Check trailer for proper loading.

If loading is improper, correct trailer loading.

If trailer is properly loaded, notify Direct Support Maintenance.

**ROWPU ASSEMBLY**

1. ROWPU LEAKS WATER

**WARNING**

ROWPU piping and assemblies may contain extremely high pressure during and after operation. If this pressure is not relieved before working on pipes or assemblies, serious injury or death may occur. Be sure to open all drains and vents before working on ROWPU.

Isolate water leak.

If any pipe is leaking, replace damaged pipe. Refer to paragraph 2-93.

If any gage is leaking, replace leaking gage. Refer to paragraphs 2-104 and 2-105.

If backwash valve is leaking, replace backwash valve. Refer to paragraph 2-101.

If multimedia filter is leaking, notify Direct Support Maintenance.

If multimedia filter control valve is leaking, replace multimedia filter control valve. Refer to paragraph 2-86.

If diaphragm valve assembly is leaking, repair diaphragm valve assembly. Refer to paragraph 2-88 or paragraph 2-89.

**Table 2-2. Unit Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
-------------	--------------------	-------------------

**ROWPU ASSEMBLY - Continued**

1. ROWPU LEAKS WATER - Continued

If rupture disk assembly is leaking, replace rupture disk. Refer to TM 10-4610-239-10.

If high-pressure relief valve is leaking, replace high-pressure relief valve. Refer to paragraph 2-110.

If cartridge filter is leaking, repair cartridge filter. Refer to paragraph 2-80 or paragraph 2-81.

If pulse dampener is leaking, replace pulse dampener. Refer to paragraph 2-74.

If product flow needle valve is leaking, replace product flow needle valve. Refer to paragraph 2-109.

If vent vessels gate valve is leaking, repair vent vessels gate valve. Refer to paragraph 2-97.

If ball valve is leaking, replace ball valve. Refer to paragraph 2-113.

If booster pump is leaking, replace booster pump assembly. Refer to paragraph 2-82.

If R.O. pump is leaking, replace R.O. pump assembly. Refer to paragraph 2-129.

If distribution pump is leaking, replace distribution pump assembly. Refer to paragraph 2-132.

If raw water pump is leaking, replace raw water pump assembly. Refer to paragraph 2-134.

If backwash pump is leaking, replace backwash pump assembly. Refer to paragraph 2-137.

2. ROWPU LEAKS CHEMICALS

Isolate chemical leak

If any flexible tubing is leaking, replace leaking flexible tubing and clamps. Refer to paragraph 2-94.

If any chemical container is leaking, replace chemical container. Refer to TM 10-4610-239-10.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**ROWPU ASSEMBLY - Continued**

2. ROWPU LEAKS CHEMICALS - Continued

If chemical feed metering pump metering and drive assembly is leaking, replace chemical feed metering pump metering and drive assembly. Refer to paragraph 2-114.

If any three-way ball valve is leaking, replace three-way ball valve. Refer to paragraph 2-116.

3. ALL PUMPS FAIL TO START

Check for 208 V ac at generator output voltmeters.

If voltage is not present at one or more meters, repair generator. Refer to generator maintenance manual.

If voltage is present at all output meters, notify Direct Support Maintenance.

4. EXCESSIVE NOISE OR VIBRATION DURING OPERATION

Locate the source of the noise or vibration by momentarily shutting down each motor and pump.

If noise or vibration is isolated to the generator, repair generator. Refer to generator maintenance manual.

If noise is isolated to a pump or motor, refer to the troubleshooting table for the defective assembly.

If noise or vibration cannot be isolated, notify Direct Support Maintenance.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**INSTALLATION PIPING**

**WARNING**

ROWPU piping and components can contain extremely high pressure during and after operation. If this pressure is not relieved before working on pipes or equipment, serious injury or death may occur. Be sure to open all drains and vents before beginning any work.

**1. HIGH-PRESSURE RELIEF VALVE OPENS REPEATEDLY**

Step 1. Check R.O. PRESSURE gage.

If gage indicates 1100 psi when valve opens, go to step 2.

If gage indicates less than 1100 psi, replace high-pressure relief valve. Refer to paragraph 2-109.

Step 2. Inspect R.O. elements. Refer to TM 10-4610-239-10.

If R.O. elements are clogged but not damaged, flush R.O. vessels. Refer to TM 10-4610-239-10.

If R.O. elements are damaged, replace R.O. elements. Refer to TM 10-4610-239-10.

**2. RUPTURE DISK RUPTURES**

Step 1. Replace rupture disk (refer to TM 10-4610-239-10) and relief valve (refer to paragraph 2-109).

**NOTE**

Refer to figure 2-8 for high-pressure switch support diagram.

Step 2. Check for continuity between red (NO) and purple (COMMON) wires at terminal board inside high-pressure switch.

If multimeter indicates continuity, go to step 3.

If multimeter does not indicate continuity, replace high-pressure switch. Refer to paragraph 2-85.

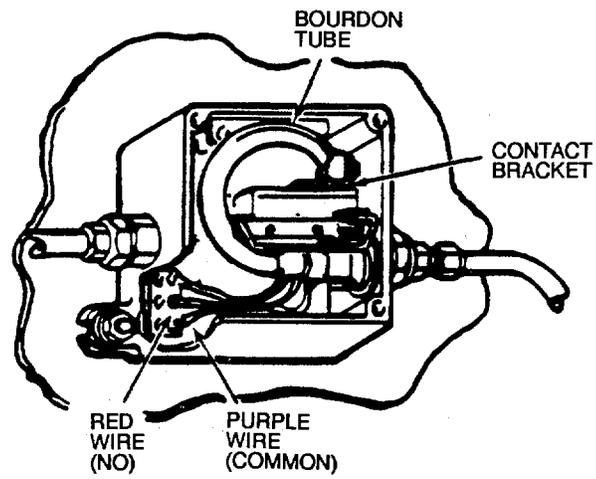


Figure 2-8. High - Pressure Switch Support Diagram

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**INSTALLING PIPING - Continued**

2. RUPTURE DISK RUPTURES - Continued

Step 3. Hold contact bracket against Bourdon tube while checking for continuity between red (NO) and purple (COMMON) wires at terminal board inside high-pressure switch.

If multimeter does not indicate continuity, notify Direct Support Maintenance.

If multimeter indicates continuity, replace high-pressure switch. Refer to paragraph 2-85.

**BOOSTER PUMP ASSEMBLY**

PUMP ASSEMBLY IS NOISY DURING OPERATION

Check that booster pump assembly is secured to ROWPU frame.

If booster pump assembly is not secure, secure booster pump assembly. Refer to paragraph 2-82.

If booster pump assembly is secure, replace booster pump assembly. Refer to paragraph 2-82.

**CHEMICAL FEED METERING PUMP ASSEMBLY**

1. PUMP FAILS TO PRIME

Step 1. Check chemical container for chemical level.

If chemical level is adequate, go to step 2.

If chemical level is low, fill chemical container. Refer to TM 10-4610-239-10.

Step 2. Check two hoses connecting chemical container to three-way ball valve for holes or loose connections.

If connections are tight and there are no holes in flexible tubing, go to step 3.

If connections are loose, tighten connections.

If flexible tubing has hole, replace flexible tubing.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**CHEMICAL FEED METERING PUMP ASSEMBLY - Continued**

1. PUMP FAILS TO PRIME - Continued

Step 3. Remove three-way ball valve. Refer to paragraph 2-114. Set valve to PRIME position and pour water into flexible tubing fitting that was connected from the prime valve fitting to the chemical container.

If water comes out of other hose fitting that was connected to chemical container, replace chemical feed metering pump. Refer to paragraph 2-114. Install three-way ball valve. Refer to paragraph 2-116.

If water does not come out of other hose fitting that was connected to chemical feed metering pump, replace three-way ball valve. Refer to paragraph 2-116.

2. INADEQUATE FLOW OF ONE OR MORE CHEMICALS

Step 1. Check chemical containers for chemical levels.

If chemical levels are adequate, go to step 2.

If any chemical level is inadequate, fill chemical containers.

Step 2. Check for leaks at hoses and three-way valves.

If there are no leaks, replace chemical feed metering pump. Refer to paragraph 2-114.

If hose leaks, replace faulty hose. Refer to paragraph 2-116.

If valve leaks, repair faulty valve. Refer to paragraph 2-116.

3. PUMP ASSEMBLY IS NOISY DURING OPERATION

Step 1. Check that chemical feed metering pump assembly is secured to ROWPU frame.

If pump assembly is secure, go to step 2.

If pump assembly is not secure, secure pump assembly.

Step 2. Check that motor is secured to metering and drive assembly.

If motor is not secure, secure motor.

If motor is secure, replace chemical feed metering pump metering and drive assembly. Refer to paragraph 2-114.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**R.O. PUMP ASSEMBLY**

**1. PUMP DRIVE BELTS FRAY AFTER SHORT USE OR BREAK FREQUENTLY**

**CAUTION**

R.O. pump drive belts must be replaced as a set. Replacement of a single belt will overstress new belt and result in shortened life.

Step 1. Check R.O. pump and pump motor (sheaves) for cracks, chips, burrs, or bent grooves which may damage belts. File burrs and sharp edges, and smooth with emery cloth.

If sheaves are good, go to step 2.

If damage cannot be repaired, replace damaged sheave. Refer to paragraph 2-122.

Step 2. Run R.O. pump and check if sheaves wobble.

If sheaves do not wobble, go to step 3.

If motor sheave wobbles, replace motor. Refer to paragraph 2-124.

If pump sheave wobbles, replace pump. Refer to paragraph 2-128.

Step 3. Check sheave alignment.

If sheave alignment is good, go to step 4.

If sheaves are out of alignment, align sheaves. Refer to paragraph 2-130.

Step 4. Adjust belt tension. Refer to paragraph 2-121.

**2. PUMP ASSEMBLY IS NOISY DURING OPERATION**

Step 1. Check that motor is secured to mounting plate.

If motor is secure, go to step 2.

If motor is not secure, secure motor.

Step 2. Check that pump and mounting plate are secure to stand assembly.

If pump and mounting plate are secure, go to step 3.

If pump is not secure, secure pump.

**Table 2-2. Unit Troubleshooting - Continued**

---

Malfunction
Test or Inspection
Corrective Action

---

**R.O. PUMP ASSEMBLY - Continued**

**2. PUMP ASSEMBLY IS NOISY DURING OPERATION - Continued**

If mounting plate is not secure, secure mounting plate.

Step 3. Check that stand assembly is secured to ROWPU frame.

If stand assembly is secure, go to step 4.

If stand assembly is not secure, secure stand assembly.

Step 4. Place hand on pump and pump motor to locate source of noise.

If pump is noisy, replace pump assembly. Refer to paragraph 2-130.

If pump motor is noisy, replace R.O. pump electric motor. Refer to paragraph 2-124.

**3. R.O. PUMP SHUTS DOWN OR FAILS TO START - LOW PRESSURE INDICATOR LIGHTS**

Step 1. Check RAW WATER PUMPS NO. 1 and NO. 2 indicators and BOOSTER PUMP indicator.

If lit, go to step 2.

If any are not lit, troubleshoot pump(s) as required.

Step 2. Push R.O. Pump RESET switch to RESET, then release. Push R.O. PUMP switch to START while watching CARTRIDGE FILTER gage. Then let R.O. PUMP switch return to RUN position.

If gage indicates less than 20 psi, go to step 3.

If gage indicates more than 20 psi, change cartridge filter tube elements. Refer to TM 10-4610-239-10.

Step 3. Push R.O. PUMP RESET switch to RESET, then release. Push R.O. PUMP switch to START while watching MULTIMEDIA FILTER gage. Then let R.O. PUMP switch return to RUN position.

If gage indicates less than 15 psi, go to step 4.

If gage indicates more than 15 psi, backwash multimedia filter Refer to TM 10-4610-239-10.

**Table 2-2. Unit Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**R.O. PUMP ASSEMBLY - Continued**

3. R.O. PUMP SHUTS DOWN OR FAILS TO START - LOW PRESSURE INDICATOR LIGHTS - Continued

Step 4. Check that raw water strainer is not blocked by dirt or trash.

If strainer is blocked, remove dirt or trash.

If strainer is not blocked, disassemble all raw water hoses from strainer to ROWPU control panel and remove all blockages.

4. R.O. PUMP SHUTS DOWN OR FAILS TO START - HIGH PRESSURE INDICATOR LIGHTS

Step 1. Push R.O. PUMP RESET switch to RESET and release. Push R.O. PUMP switch to START and release. Watch R.O. PRESSURE P.S.I. gage.

If shutdown occurs at less than 1100 psi, replace high-pressure switch. Refer to paragraph 2-85.

If shutdown occurs when gage reaches 1250 psi, replace high-pressure relief valve. Refer to paragraph 2-110.

5. R.O. PUMP KNOCKS EXCESSIVELY.

Check to see if the following symptoms occur simultaneously (may indicate unseated valves):

- a. Loud knocking noise.
- b. Wildly fluctuating gages.
- c. Pulsating and vibration of the entire ROWPU.
- d. Decrease in water pressure flow.

Notify Direct Support Maintenance

**Table 2-2. Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**DISTRIBUTION PUMP ASSEMBLY**

1. DISTRIBUTION PUMP RUNS HOT.

Step 1. Hold distribution nozzle operating lever in the fully open position and allow water to flow.

If water does not flow steadily, go to step 2.

If water flows steadily for 30 seconds and pump motor stays hot, replace distribution pump assembly. Refer to paragraph 2-131.

If water flow steadily for 30 seconds or less and pump motor cools off, set DISTRIBUTION PUMP switch to STOP position and turn distribution pump on only when water is to be released through distribution nozzle.

Step 2. Check suction hose for blockage.

If suction hose is blocked, clean out suction hose.

If suction hose is not blocked, replace distribution pump assembly. Refer to paragraph 2-131.

2. PUMP ASSEMBLY IS NOISY DURING OPERATION

Check that pump assembly is secured to frame.

If pump assembly is secure, replace distribution pump assembly. Refer to paragraph 2-131.

If pump assembly is not secure, secure pump assembly.

**RAW WATER PUMP NO. 1 ASSEMBLY**

PUMP ASSEMBLY IS NOISY DURING OPERATION

Check that pump assembly is secured to frame.

If pump assembly is secure, replace raw water pump assembly. Refer to paragraph 2-133.

If pump assembly is not secure, secure pump assembly.

**Table 2-2. Troubleshooting - Continued**

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Malfunction
Test or Inspection
Corrective Action

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**RAW WATER PUMP NO. 2 ASSEMBLY**

**PUMP ASSEMBLY IS NOISY DURING OPERATION**

Check that pump assembly is secured to frame.

If pump assembly is secure, replace raw water pump assembly. Refer to paragraph 2-133.

If pump assembly is not secure, secure pump assembly.

**BACKWASH PUMP ASSEMBLY**

**PUMP ASSEMBLY IS NOISY DURING OPERATION**

Check that pump assembly is secured to frame.

If pump assembly is secure, replace backwash pump assembly. Refer to paragraph 2-136.

If pump assembly is not secure, secure pump assembly.

**CONTROL BOX ASSEMBLY**

**1. A PUMP INDICATOR LIGHT DOES NOT LIGHT**

Push PANEL LIGHT switch to TEST LIGHTS position.

If failed indicator light lights, notify Direct Support Maintenance.

If failed indicator light does not light, replace lamp. Refer to TM 10-4610-239-10.

**2. LOW-PRESSURE OR HIGH-PRESSURE INDICATOR LIGHT DOES NOT LIGHT**

Push PANEL LIGHT switch to TEST LIGHTS position.

If failed indicator light lights, notify Direct Support Maintenance.

If failed indicator light does not light, replace lamp. Refer to TM 10-4610-239-10.

**Table 2-2. Troubleshooting - Continued**

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Malfunction
Test or Inspection
Corrective Action

---

**CONTROL BOX ASSEMBLY - Continued**

3. UTIL OUT CIRCUIT BREAKER FAILS TO RESET

Disconnect any device connected to utility receptacle J7. Reset UTIL OUT circuit breaker.

If UTIL OUT circuit breaker trips, notify Direct Support Maintenance.

If UTIL OUT circuit breaker does not trip, repair connected device.

## Section VI. GENERAL REPAIR PROCEDURES

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**2-13. GENERAL.** This section contains information on preparation for maintenance, cleaning recommendations, inspection and repair recommendations, and repair procedures. These are to be followed when performing maintenance procedures described in Chapters 2, 3, and 4.

**2-14. PERSONNEL SAFETY.** To ensure safety of personnel, proper care should be exercised when handling assemblies and parts. Many assemblies are heavy. Assistance of another person, lifting device, or other support equipment is needed to manipulate them. Personnel should not try to handle heavy parts by hand. Ensure that all lifting devices are in good working order. Personnel should remove wrist watches, rings, identification bracelets, etc.

**2-15. PROPER EQUIPMENT.** Obtain proper equipment before beginning disassembly. This equipment includes: proper hand tools and special tools, receptacles for small parts, work blocks, oil-soluble grease, and wiping rags. Refer to Appendix B for tools and equipment and TM 10-4610-239-24P for repair parts.

**2-16. WHAT TO DISCARD.** Parts to be discarded are identified in the maintenance tasks.

**2-17. HANDLING TECHNIQUES.** Avoid damage to parts and assemblies during disassembly, cleaning, inspection, repair, and assembly procedures. Nicks, scratches, and dents caused by careless handling can cause oil leakage or improper functioning. This could result in early failure. Replace or repair all defective parts.

**2-18. TORQUING.** Where required, torque requirements are indicated in maintenance procedures for applicable parts. Torque limits are given in Appendix E.

**2-19. IDENTIFICATION.** During disassembly, identify and tag parts to ensure proper assembly.

**2-20. CLEANING RECOMMENDATIONS.** Cleanliness is very important. All parts and assemblies must be thoroughly cleaned and kept clean throughout the repair process. Foreign matter can cause malfunction and possible failure.

**2-21. PARTS TO BE CLEANED.** Thoroughly clean every part and assembly after disassembly. Cleaning ensures effective inspection for wear, damage, and serviceability of parts and assemblies.

**2-22. HOW TO HANDLE EQUIPMENT.** Use utmost care when handling parts and assemblies during cleaning and repair operations. Nicks, scratches, dents, or burns can prevent proper assembly or cause malfunction after assembly.

**2-23. THINGS TO AVOID.** Except where specifically recommended; never use abrasives, files, scrapers, wire brushes, or sharp tools on surfaces where finish is important to operation or sealing of parts.

#### **WARNING**

Dry-cleaning solvent AA711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

**2-24. REMOVAL AGENTS.** Remove gum or varnish deposits by soaking parts in dry-cleaning solvent and scrubbing with soft-bristled brush. Use crocus cloth to remove minor surface irregularities. Clean thoroughly to remove any dirt and residue.

**2-25. CLEANING OIL PASSAGES.** use soft wire (brass or copper) to clean oil passages. Always flush passages thoroughly after cleaning.

**WARNING**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi (207 kPa) air pressure.

**2-26. STEAM CLEANING.** If steam cleaning is used, dry cleaned parts immediately with compressed air and apply thin film of clean oil to prevent rusting. Never use lye or caustic solutions that will corrode or etch metal surfaces.

**2-27. LUBRICANT IN NEW BEARINGS.** Refer to TM 9-214 and LO 10-4610-239-12/ LI08580B-12 for detailed lubrication and cleaning procedures. Bearings that have been in service should be relubricated.

**2-28. CASTINGS, FORGINGS, AND MACHINED SURFACES.**

- a. Inspect all castings and forgings for breaks, cracks, and wear or scoring that would impair operation. Remove nicks and small surface irregularities with crocus cloth or soft honing stone. Pay particular attention to gasket surfaces. Cracked items should be replaced.
- b. Inspect all oil passages for obstructions and dirt. Reclean passages if necessary.
- c. Inspect mounting faces of machined surfaces for nicks, scratches, and scores. Remove minor defects with crocus cloth or soft honing stone. Replace any part with defects that cannot be corrected or which will impair operations.
- d. Inspect all threaded parts for damaged threads. Chase damaged threads with used tap or die of correct size. Do not chase inserts. See insert replacement procedures in this chapter. If possible, worn tap or die should be used because new tap may cut oversize and new die may cut undersize.
- e. Replace housings and parts that are cracked or broken.

**2-29. ROLLER AND BALL BEARINGS.** Inspect bearing races for wear and discoloration due to heat. Refer to TM 9-214 for proper cleaning and inspection procedures.

**2-30. NEEDLE ROLLER BEARINGS.** Inspect bearings for free and smooth rotation, broken or missing rollers, and tightness of fit within bearing bores. Inspect bearing races for wear and discoloration due to heat. If defects are found, replace bearing.

**2-31. BUSHINGS, BUSHING-TYPE BEARINGS, AND THRUST WASHERS.**

- a. Inspect bushings and bushing-type bearings for size, scoring, out-of-roundness, burrs, sharp edges, and evidence of seizing. Minor scores, sharp edges, and scratches can be removed with crocus cloth. Out-of-round, deeply scored, or worn parts should be replaced.

### CAUTION

- Do not remove bushings and bushing-type bearings unless replacement is necessary and authorized. Removal usually damages these parts.
  - If necessary to cut bushing, use care not to damage housing bore.
- b. Remove bushings and bushing-type bearings using puller or press when possible. Bushings in blind holes may require removal by sawing or by using narrow cape chisel.
- c. Inspect thrust washers for wear, distortion, scores, and burrs. Minor defects may be corrected with crocus cloth or soft honing stone. Parts that are worn, scored, or deformed must be replaced.

### 2-32. OIL SEALS, PREFORMED PACKINGS, AND GASKETS.

- a. Inspect hook-type metallic seals rings for wear, distortion, cracks, and broken hooks. Ensure that edges of hook rings are square.
- b. Inspect composition-type seals, rings, and packings for wear, brittleness, cracks, cuts, deformation, and deterioration. Replace defective seals.

### CAUTION

Removing seal will usually damage it. If removal is necessary, inspect seal thoroughly before using.

- c. Inspect lip seals for cracks, wear, cuts, and brittleness. Inspect springs and seal shells for deformation and cracks. Replace defective seals.
- d. All Preformed packings and gaskets should be replaced, if removed, and not reused.

### 2-33. SPLINED PARTS.

- a. Inspect splined parts for burrs, wear, and twisted, cracked, or broken splines.
- b. Remove burrs using soft honing stone. Replace parts that are excessively worn or have twisted, cracked, or broken splines.

### 2-34. THREADED PARTS.

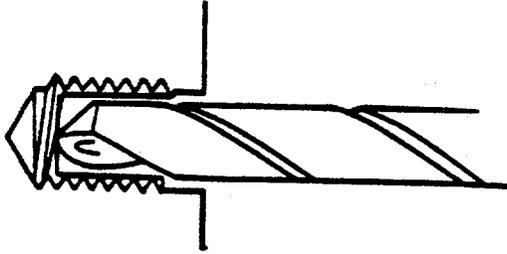
- a. Inspect all threaded parts for burrs and stripped or damaged threads.

### NOTE

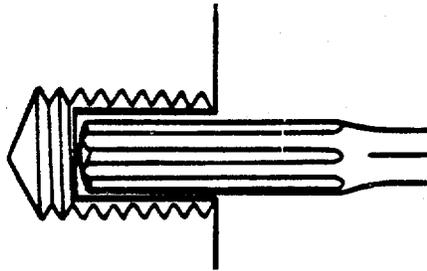
If possible, chase threads with used tap or die. New tap may cut oversize, while new die may cut undersize.

- b. Replace all parts that have stripped threads. Replace parts that cannot be repaired by chasing threads with used tap or die. Replace parts that cannot be repaired by installing helical coil inserts.

c. Remove tight broken studs or screws as follows:

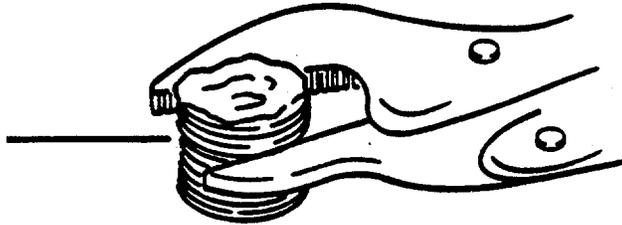


- (1) Center punch broken stud or screw.
- (2) Drill three quarters way deep into broken stud or screw using a drill 'bit 1/16 inch less the diameter of the broken stud or screw.



- (3) Using a screw extractor, remove broken stud or screw.

d. Remove studs or screws that have not broken flush to surface as follows:



- (1) Clamp broken stud or screw using vise grip pliers.
- (2) Back out broken stud or screw.

- e. Repair threads that are damaged and cannot be restored by installing a helical coil insert. The following gives standard procedures for installation of a helical coil insert and removal of a previous installed damaged one. The following tools are required:
- f. Tool Kit (Appx B, Sect III, Item 10)  
Helicoil repair kit (Appx B, Sect III, Item 7)  
Machinist scriber (Appx B, Sect III, Items 6 and 9)  
Tap handle (Appx B, Sect II, Items 6 and 9)  
Depth micrometer (Appx B, Sect III, Items 6 and 9)  
Vernier caliper (Appx B, Sect III, Items 6 and 9)

(1) Installing helical coil insert.

- (a) Using portable electric drill, vernier caliper, and step drill (1); bore out damaged threads (2) to original depth.

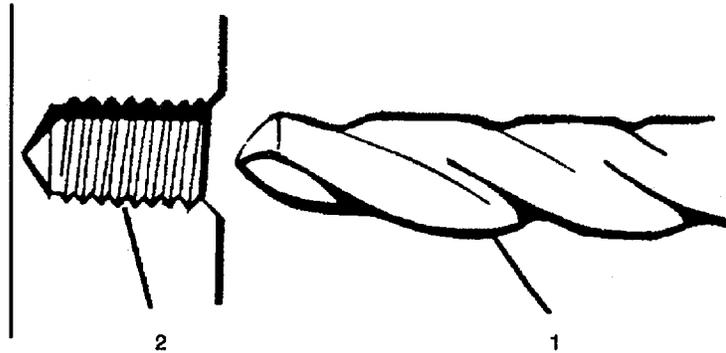
**WARNING**

Compressed air can blow into the eyes. Wear eye protection.  
Do not exceed 30 psi (207 kPa) air pressure.

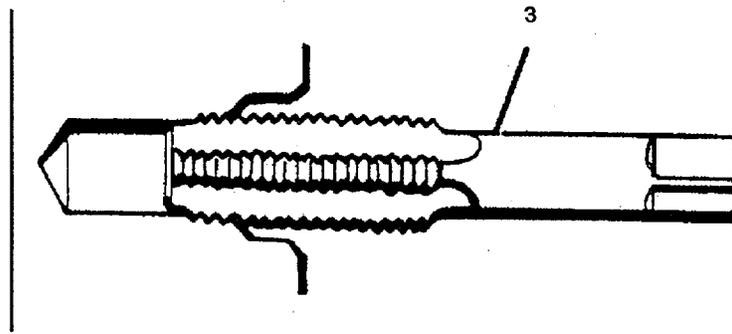
**NOTE**

All sizes for tools and helicoils depend on original bolt size.  
Refer to repair kit.

- (b) Clean newly bored hole using compressed air.



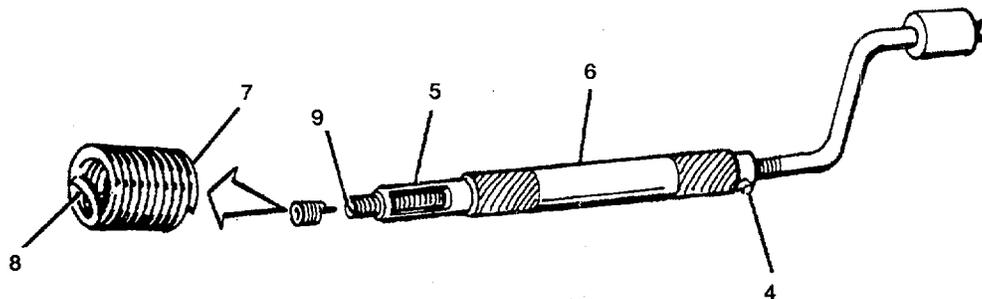
- (c) Coat thread cutting tap (3) with transmission oil.
- (d) Using tap wrench and tap, cut threads until tap bottoms.



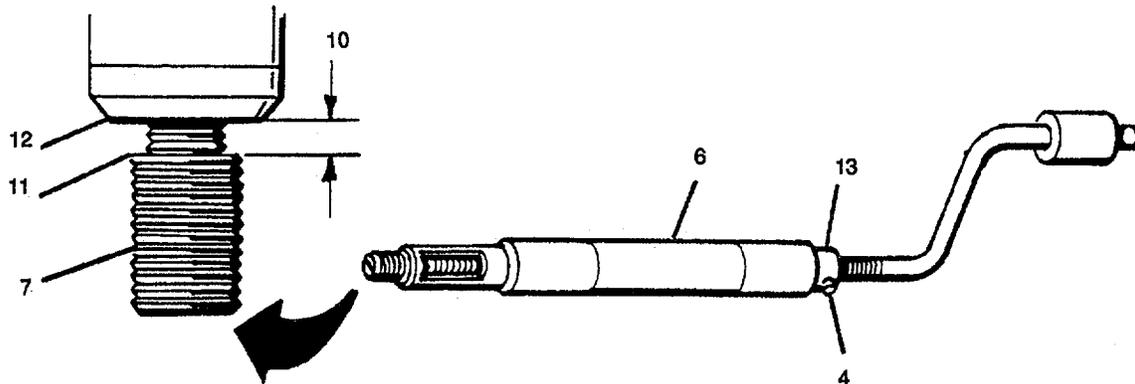
**WARNING**

- Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi(207 kPa) air pressure.
- Dry-cleaning solvent AAF 11 TYPE I & II is highly toxic and can, ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

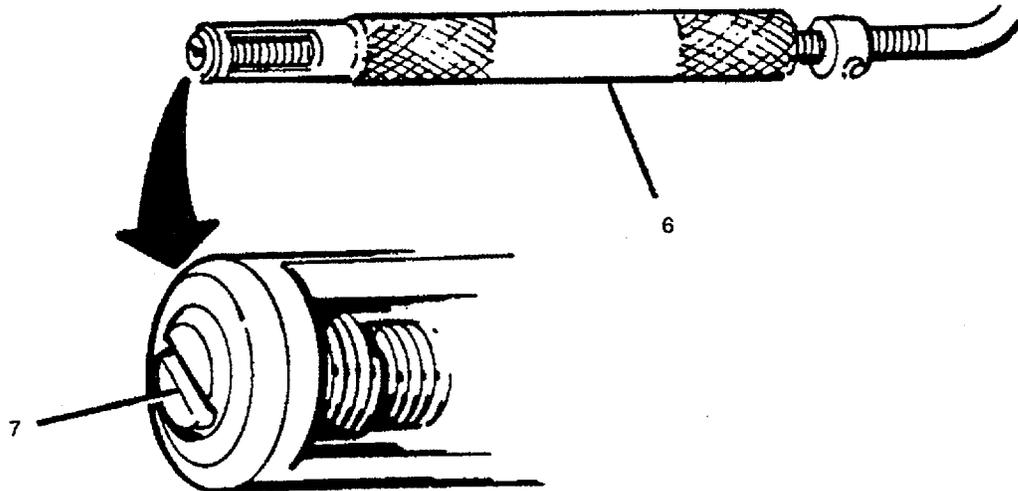
- (e) Using compressed air, blow out dirt and any loose metal chips in threads.
- (f) Using wiping rag dampened with cleaning solvent, clean hole.
- (g) Loosen setscrew (4).
- (h) Turn handle until shaft (5) extends past tip of insertion tool (6) slightly longer than length of insert (7).
- (i) Screw new insert (7) on shaft until tang (8) of insert goes into shaft notch (9).



- (j) Using insertion tool (6) and vernier caliper, adjust distance (10) between end (11) of insert (7) and tip (12). Turn handle until distance is equal to installing depth below surface of tapped hole.
- (k) Push down stop collar (13) until it contacts body of insertion tool (6).
- (l) Tighten setscrew (4).



(m) Turn handle until tang of insert (7) is even with tip of insertion tool (6).

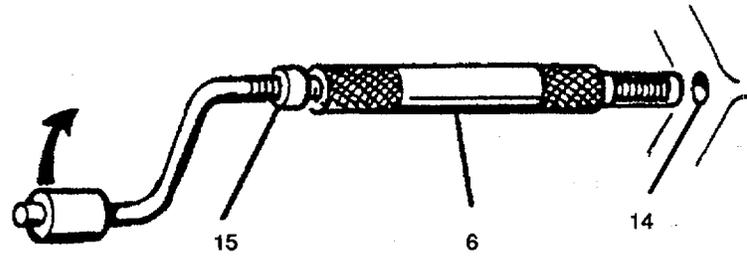


**CAUTION**

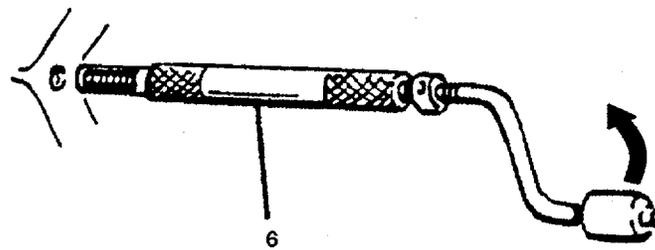
- Insertion tool must be straight and not allowed to wobble when installing insert. Equipment can be damaged.
- Do not force insert into tapped hole. Threads will be damaged.

(n) Put tip of insertion tool (6) against tapped hole (14) being sure that insertion tool is straight.

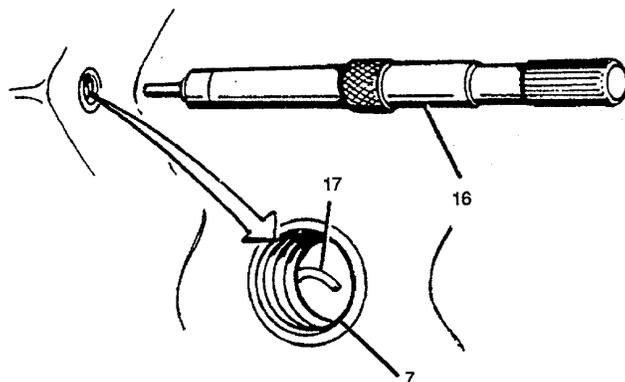
- (o) Slowly turn handle of insertion tool (6) right until stop collar (15) contacts body of insertion tool.



- (p) Turn handle of insertion tool (6) to the left until insertion tool can be removed.



- (q) Place tang breakoff tool (16) in tapped hole with installed insert.  
(r) Push down end of breakoff tool (16) until tang (17) breaks off of insert (7).



(2) Removing damaged helical coil insert.

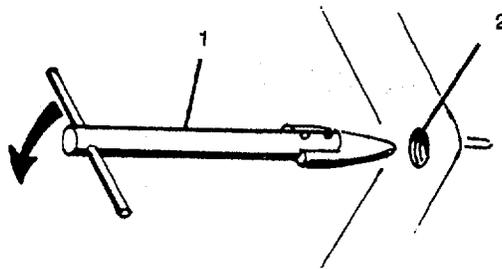
**NOTE**

All sizes for tools and helicoils depend on original helicoil size.

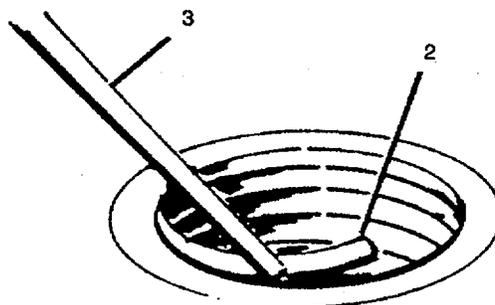
**CAUTION**

- Do not damage threads of tapped hole when using extraction tool.
- Remove inserts from end of tapped hole that the insert is closest to. Threads in tapped hole can be damaged.

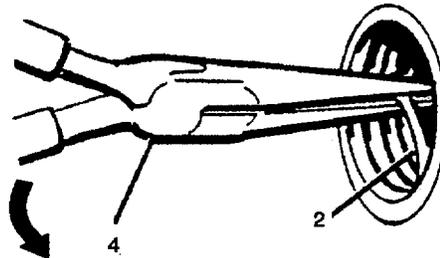
- Place extraction tool (1) in insert (2). Tap top of extraction tool.
- Maintaining steady downward pressure, turn tool (1) to the left. Remove insert (2).
- If insert (2) does not come out of tapped hole, go to step (d). If insert does come out of tapped hole, go to step (h).



- Insert scribe (3) between end of insert (2) and tapped hole.
- Work end of insert (2) away from tapped hole and form a tang equal in length to diameter of insert.

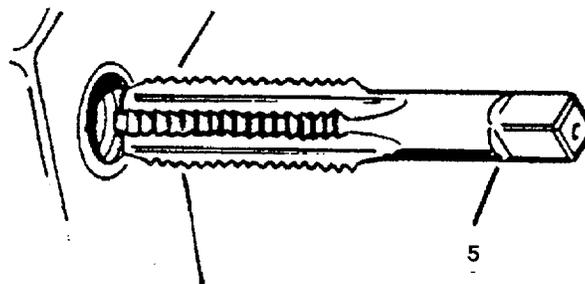


- (f) Using needle nose pliers (4), grasp tang.
- (g) Turn insert (2) to the left until insert is out of tapped hole. Discard insert.



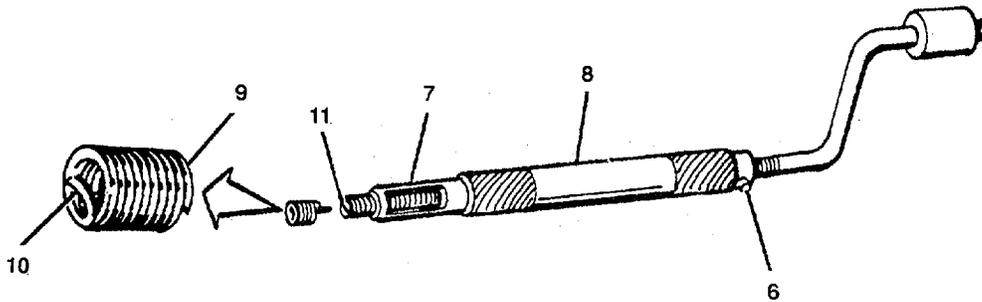
**WARNING**

- Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi (207 kPa) air pressure.
  - Drycleaning solvent AAF11 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.
- (h) Lubricate finishing tap (5) with transmission oil.
  - (i) Using finishing tap and tap handle, slowly thread tap in and out of tapped hole.
  - (j) Using compressed air, blow dirt and any loose metal chips in tapped hole.
  - (k) Use wiping rag dampened with cleaning solvent to clean tapped hole.

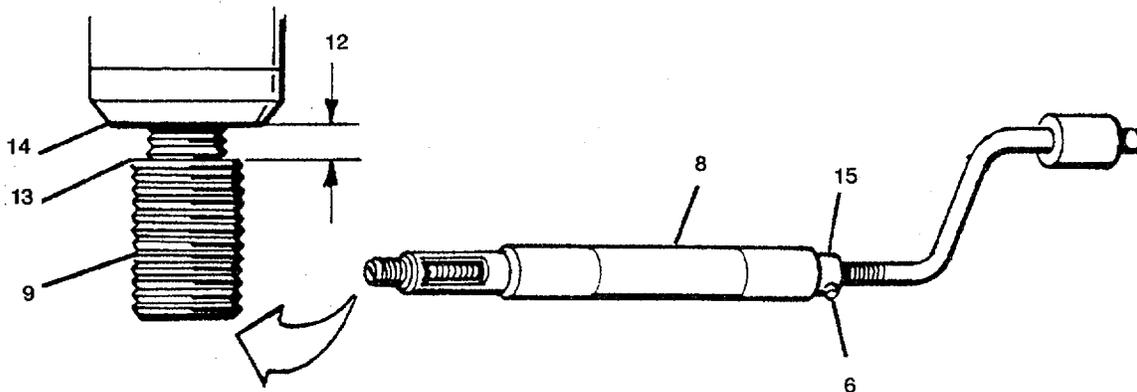


- (l) Loosen setscrew (6).
- (m) Turn handle until shaft (7) extends past tip of insertion tool (8) slightly longer than length of new insert (9).

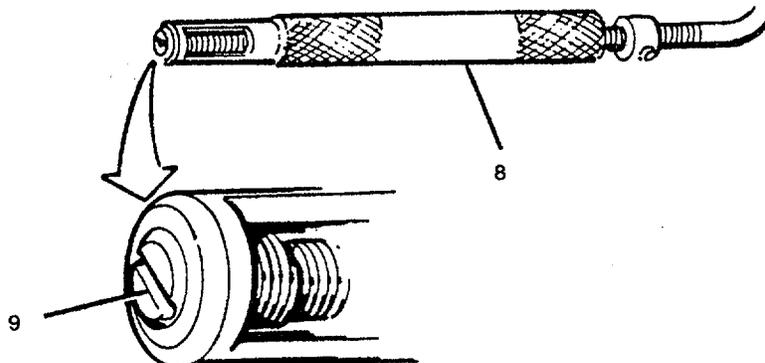
- (n) Screw insert (9) on shaft until tang (10) of insert goes into shaft notch (11).



- (o) Using insertion tool (8) and vernier caliper, adjust distance (12) between end (13) of insert (9) and tip (14). Turn handle until distance is equal to installation depth below surface of tapped hole.
- (p) Push down stop collar (15) until it contacts body of insertion tool (8).
- (q) Tighten setscrew (6).

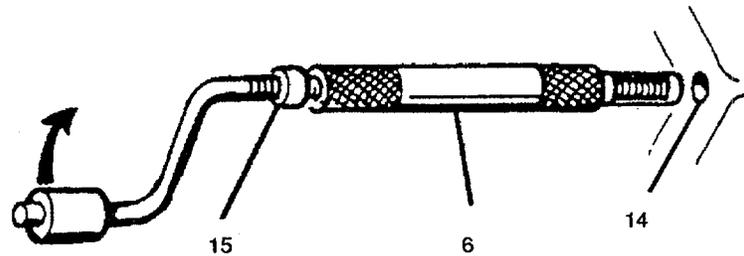


- (r) Turn handle until tang of insert (9) is even with tip of insertion tool (8).

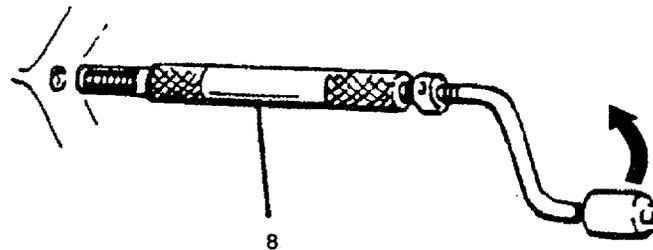


**CAUTION**

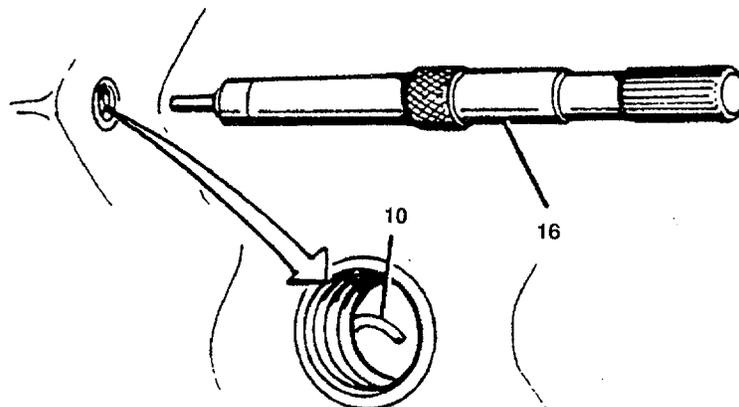
- Insertion tool must be straight and not allowed to wobble when installing insert. Equipment can be damaged.
  - Do not force insert into tapped hole. Threads will be damaged.
- (s) Put tip of insertion tool (8) against tapped hole being sure that insertion tool is straight.
- (t) Slowly turn handle of insertion tool right until stop collar (15) contacts body of insertion tool.



- (u) Turn handle of insertion tool (8) to the left until insertion tool can be removed.



- (v) Place tang breakoff tool (16) in tapped hole with installed insert.
- (w) Push down end of breakoff tool (16) until tang (10) breaks off of insert.



**2-35. SNAP RINGS.** Inspect snap rings for nicks, burns, distortion, loss of tension, and wear. Replace defective snap rings.

**2-36. SPRINGS.** Inspect springs for wear, distortion, breaks, evidence of overheating, and loss of tension or compression. Discard defective springs. Inspect springs using spring tester. Load and height inspection data, where required, are contained in maintenance procedures.

**2-37. SHAFTS AND SPINDLES.**

A Inspect shafts and spindles for excessive wear, binding, scores, cracks, burrs, and obstructed oil passages.

**WARNING**

Using compressed air can be dangerous. See general warning page.

b. Remove burrs and minor surface irregularities with crocus cloth or soft honing stone. Remove obstructions with compressed air or by probing with soft wire. Replace parts with other defects.

**Section VII. FLATBED CARGO TRAILER MAINTENANCE PROCEDURES**

	Para	Page
Replace Reflectors .....	2-38	2-65
Replace Lunette .....	2-39	2-66
Replace Leveling Jack Assembly .....	2-40	2-68
Replace Spare Tire and Wheel Assembly .....	2-41	2-70
Repair Spare Tire Carrier .....	2-42	2-73
Replace Data/Lubrication Plate .....	2-43	2-76
Replace Manual Container .....	2-44	2-77
Replace Chain Assembly .....	2-45	2-78
Repair Chain Assembly.....	2-46	2-79

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## 2-38. REPLACE REFLECTORS.

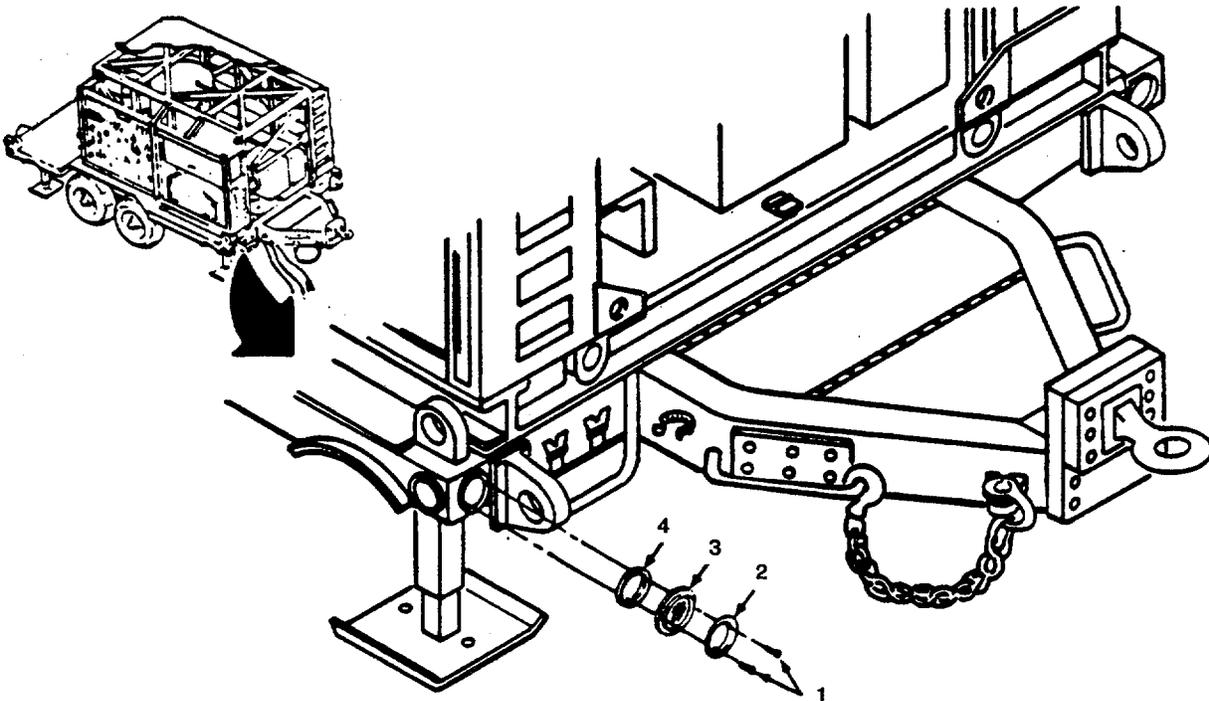
This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

Tools. Tool Kit (Appx B, Sect III, Item 10).

---



### NOTE

There are eight reflectors on the flatbed cargo trailer. Four front reflectors are amber. Four rear reflectors are red. All are removed and installed the same. One is shown.

#### REMOVAL.

Remove two screws (1), ring (2), reflector (3), and gasket (4).

#### INSTALLATION.

Position gasket (4), reflector (3), and ring (2) and install two screws (1).

---

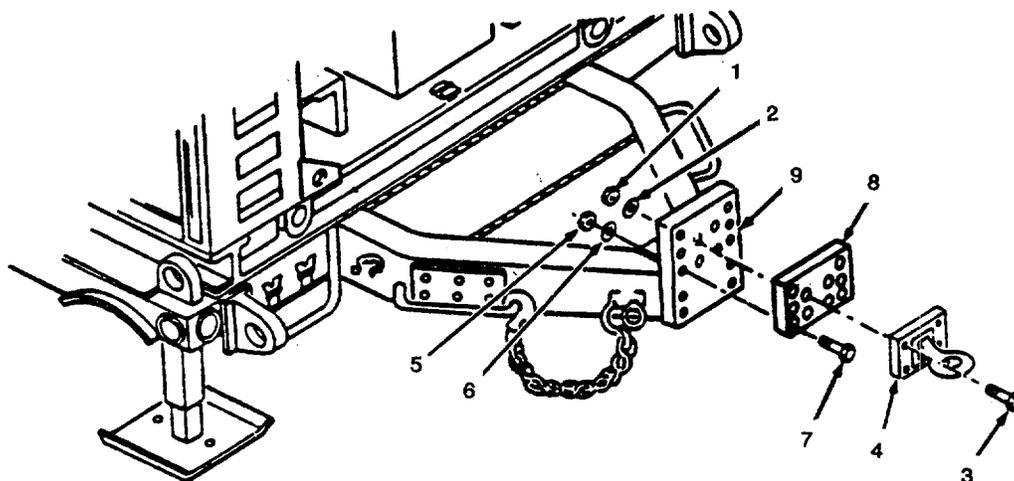
## 2-39. REPLACE LUNETTE.

This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Equipment Condition. Trailer disconnected from towing vehicle (TM 10-4610-239-10).
- 



### REMOVAL.

- a. Remove four nuts (1), four lockwashers (2), four screws (3), and lunette (4).
- b. Remove six nuts (5), six lockwashers (6), six screws (7), and plate (8).

**INSTALLATION.**

**NOTE**

- To install lunette 35 inches (88.9 cm) from ground, install plate using top six holes of mounting plate.
  - To install lunette 29 inches (73.7 cm) from ground, install plate using bottom six holes of mounting plate.
- a. Position plate (8) on mounting plate (9) and install six screws (7), six lockwashers (6), and six nuts (5).
  - b. Position lunette (4) on plate (8) and install six screws (3), six lockwashers (2), and six nuts (1).

---

## 2-40. REPLACE LEVELING JACK ASSEMBLY.

This task covers: a. Removal. b. Installation.

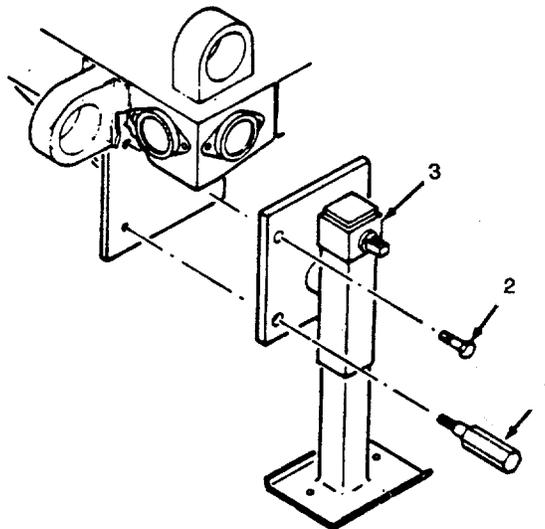
---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Personnel Required. 2
- c. Equipment Condition. Power shut down (power source manual).
- d. General Safety Requirements.

### WARNING

- Lifting heavy equipment incorrectly can cause serious injury. Do not lift or move more than 50 pounds yourself.
  - Removing jack assemblies from flatbed cargo trailer incorrectly can cause serious injury.
- 



### NOTE

There are four jack assemblies on the flatbed cargo trailer. All are removed and installed the same. One is shown.

### REMOVAL.

### WARNING

- Flatbed cargo trailer is unstable when jacks are not down. Make sure that trailer wheels are chocked, trailer is level, and front of trailer is supported before removing jack assembly.
- The jack assembly is heavy. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- a. Supporting jack assembly, remove stud (1) and three bolts (2).
- b. Remove jack assembly (3).

### INSTALLATION

- a. Position jack assembly (3) so that mounting holes on jack mounting plate align with holes on flatbed cargo trailer mounting plate.
- b. Install three bolts (2) and stud (1).

---

## 2-41. REPLACE SPARE TIRE AND WHEEL ASSEMBLY.

This task covers: a. Removal. b. Installation.

---

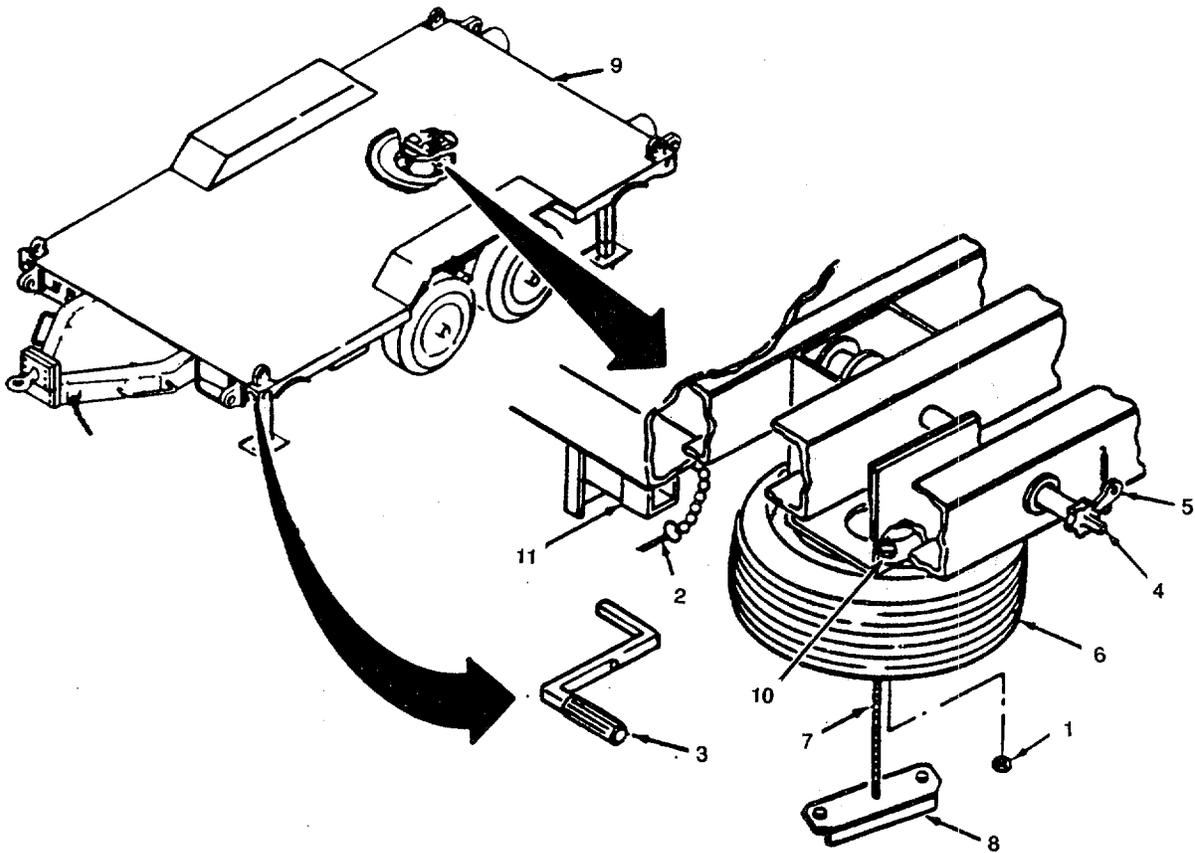
### INITIAL SETUP.

- a. Tools. Lug Nut Wrench and Handle.
- b. General Safety Requirements.

### WARNING

Lifting heavy equipment can cause serious injury. Do not lift or move more than 50 pounds yourself.

---



**REMOVAL.**

- a. Using lug nut wrench and handle, remove two nuts (1).
- b. Remove safety pin (2) and leveling jack handle (3).
- c. Install leveling jack handle (3) on ratchet shaft (4).

**WARNING**

Tire and wheel assembly weighs 122 pounds (55.34 kg). Use care in moving tire and wheel assembly to prevent personal injury.

- d. Push pawl (5) down and, using leveling jack handle (3), turn ratchet shaft (4) to lower spare tire and wheel assembly (6).
- e. Unwind cable (7) until spare tire and wheel assembly (6) are on ground and tire carrier support (8) can be pulled through spare tire and, wheel assembly.

**WARNING**

Tire and wheel assembly weighs 122 pounds (55.34 kg). Use care in lifting tire and wheel assembly to prevent personal injury.

- f. Slide spare tire and wheel assembly (6) from under flatbed cargo trailer (9) and lift to upright position.

**INSTALLATION.**

**WARNING**

Tire and wheel assembly weighs 122 pounds (55.34 kg). Use care in moving tire and wheel assembly to prevent personal injury.

- a. Position spare tire and wheel assembly (6) under tire carrier support (8) and insert tire carrier support through spare tire and wheel assembly.

**WARNING**

Tire and wheel assembly weighs 122 pounds (55.34 kg). Check that pawl holds ratchet shaft when lifting tire and wheel assembly to prevent personal injury.

- b. Using leveling jack handle (3), turn ratchet shaft (4) to raise spare tire and wheel assembly (6).
- c. Align holes on spare tire and wheel assembly (6) with two screws (10).
- d. Install two nuts (1).

**INSTALLATION. (Cont)**

- e. Remove leveling jack handle (3) from ratchet shaft (4).
- f. Position leveling jack handle (3) at rear of leveling jack (11) and install safety pin (2).

---

## 2-42. REPAIR SPARE TIRE CARRIER.

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

---

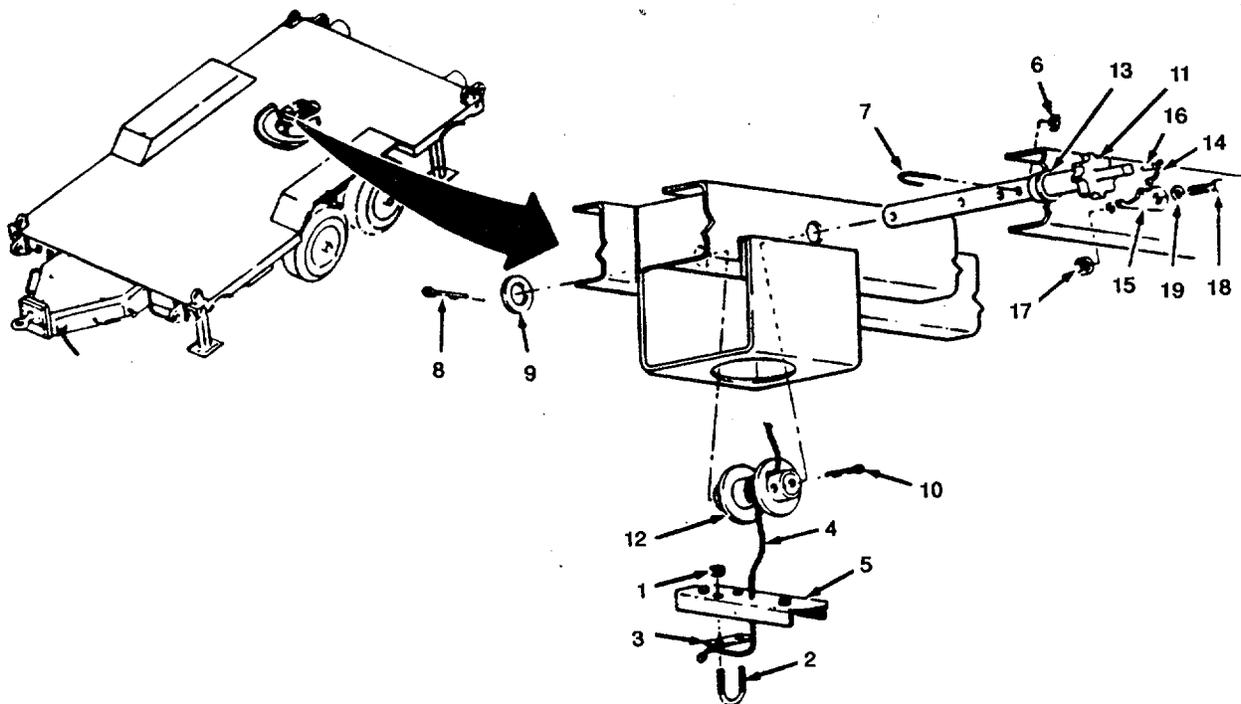
### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Stiff-Bristled Brush (Appx B, Sect III, Item 1).
- b. Materials/Parts. Drycleaning Solvent (Appx C, Sect II, Item 16).
- c. Equipment Condition. Spare tire removed (paragraph 2-41).
- d. General Safety Requirements.

### WARNING

Drycleaning solvent AAF11 Types I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

---



**DISASSEMBLY.**

- a. Remove two nuts (1), U-bolt (2), U-bolt plate (3), cable (4), and tire carrier support (5).
- b. Remove two nuts (6), U-bolt (7), and cable (4).
- c. Remove cotter pin (8), flat washer (9), and cotter pin (10).
- d. Remove ratchet shaft (11), spool (12), and flat washer (13).
- e. Disconnect extension spring (14) from pawl (15) and eyepad (16).
- f. Remove jamnut (17).
- g. Remove screw (18), flat washer (19), and pawl (15).

**CLEANING.**

**WARNING**

Drycleaning solvent AA F11 I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

Using drycleaning solvent and a stiff-bristled brush, scrub dirt and grease from all parts. Let air dry.

**INSPECTION.**

- a. Inspect cable for fraying and cuts or loose or missing end pieces. Replace as required.
- b. Inspect ratchet and pawl for rounded teeth. Replace as required.
- c. Inspect all threaded parts for worn or deformed threads. Replace as required.
- d. Inspect all parts for excessive wear or deformity. Replace as required.

**ASSEMBLY.**

- a. Position spool (12).
- b. Install flat washer (13) on ratchet shaft (11) and install ratchet shaft.
- c. Install cotter pin (10) in spool (12).
- d. Install flat washer (9) and cotter pin (8).

**ASSEMBLY. (Cont.)**

- e. Thread cable (4) through spool (12) and install U-bolt (7) and two nuts (6) to hold end of cable.
- f. Position U-bolt plate (3) and cable (4) on tire carrier support (5) and install U-bolt (2) and two nuts (1).
- g. Position pawl (15) and install screw (18), flat washer (19), and jamnut (17).
- h. Attach extension spring (14) to pawl (15) and eyepad (16).

---

## 2-43. REPLACE DATA/LUBRICATION PLATE.

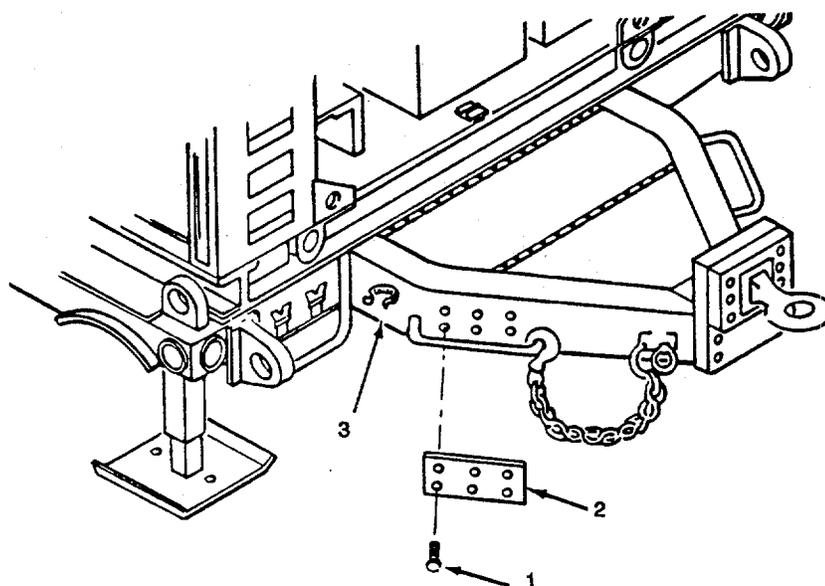
This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

Tools. Tool Kit (Appx B, Sect III, Item 10).

---



### NOTE

There is one data plate and one lubrication plate on the flatbed cargo trailer. Both are removed and installed the same. The lubrication plate is shown.

#### REMOVAL.

Remove six rivets (1) and data/lubrication plate (2) from flatbed cargo trailer (3).

#### INSTALLATION.

Position data/lubrication plate (2) on flatbed cargo trailer (3) and install six rivets (1).

---

## 2-44. REPLACE MANUAL CONTAINER.

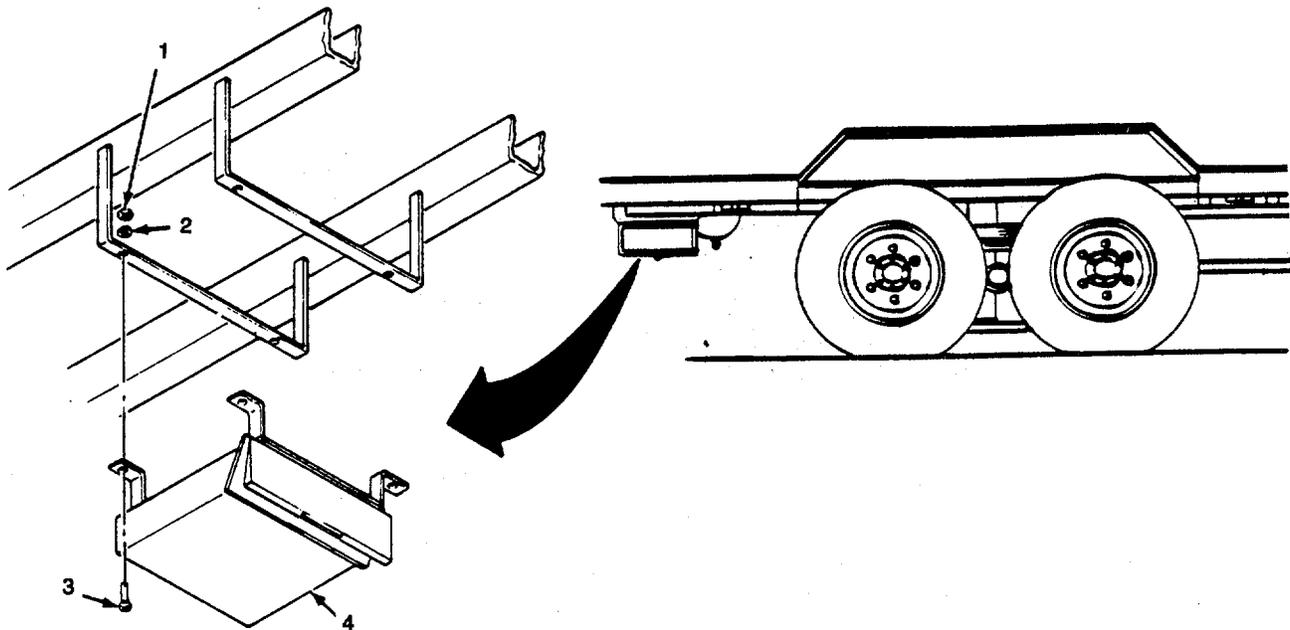
This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

Tools. Tool Kit (Appx B, Sect III, Item 10).

---



### REMOVAL.

### NOTE

Support manual container to prevent falling when last mounting bolt is removed.

- a. Remove four nuts (1), lockwashers (2), and bolts (3).
- b. Remove manual container (4).

### INSTALLATION.

- a. Position manual container (4) and align mounting holes.
- b. Install four bolts (3), lockwashers (2), and nuts (1).

---

## 2-45. REPLACE CHAIN ASSEMBLY.

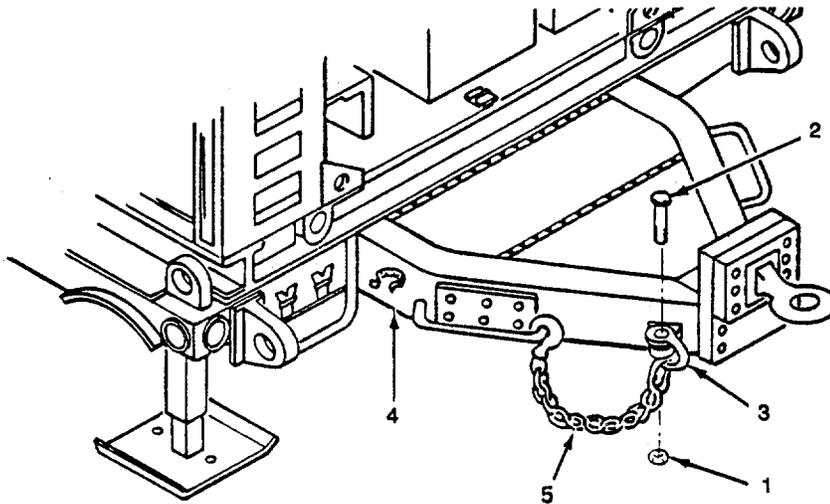
This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

Tools. Tool Kit (Appx B, Sect III, Item 10).

---



### NOTE

There are two chain assemblies on the flatbed cargo trailer. Both are removed and installed the same. One is shown.

#### REMOVAL.

- a. Remove nut (1), screw (2), and chain and latch (3) from flatbed cargo trailer (4).
- b. Remove chain assembly (5).

#### INSTALLATION.

- a. Install chain assembly (5) on chain and latch (3).
- b. Position chain and latch (3) on flatbed cargo trailer (4) and install screw (2) and nut (1).

---

## 2-46. REPAIR CHAIN ASSEMBLY.

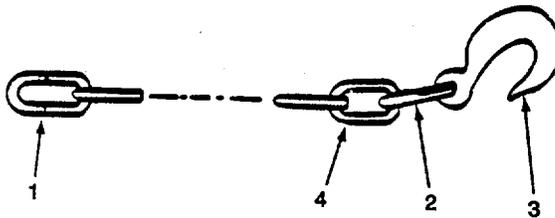
This task covers: a. Inspection. b. Disassembly. c. Assembly.

---

### INITIAL SETUP.

Tools. Tool Kit (Appx B, Sect III, Item 10).

---



### INSPECTION.

- a. Inspect chain for broken or damaged links. Replace chain as required.
- b. Inspect hook for cracks or deformity. Replace as required.
- c. Inspect connecting links for deformity, cracks, or damaged parts. Replace as required.

### DISASSEMBLY.

Remove two connecting links (1) and (2) and hook (3).

### ASSEMBLY.

- a. Install connecting link (1) on chain (4).
- b. Install connecting link (2) on chain (4) and hook (3).

**Section VIII. AIRBRAKE SYSTEM MAINTENANCE PROCEDURES**

	Para	Page
Secure Air Chamber Compression Spring .....	2-47	2-81
Replace Airbrake Hose Assembly .....	2-48	2-83
Repair Airbrake Hose Assembly .....	2-49	2-85
Replace Reservoir.....	2-50	2-86
Replace Reservoir Drain Cock .....	2-51	2-89
Replace Hose Assembly Pipe Coupling.....	2-52	2-91
Replace Airbrake System Tubing .....	2-53	2-94
Replace Airbrake System Anchor Tee.....	2-54	2-101
Replace Brake Line Air Filter.....	2-55	2-104
Repair Brake Line Air Filter .....	2-56	2-106
Replace Airbrake Relay Valve and Adapter.....	2-57	2-108
Repair Airbrake Relay Valve .....	2-58	2-111

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## 2-47. SECURE AIR CHAMBER COMPRESSION SPRING.

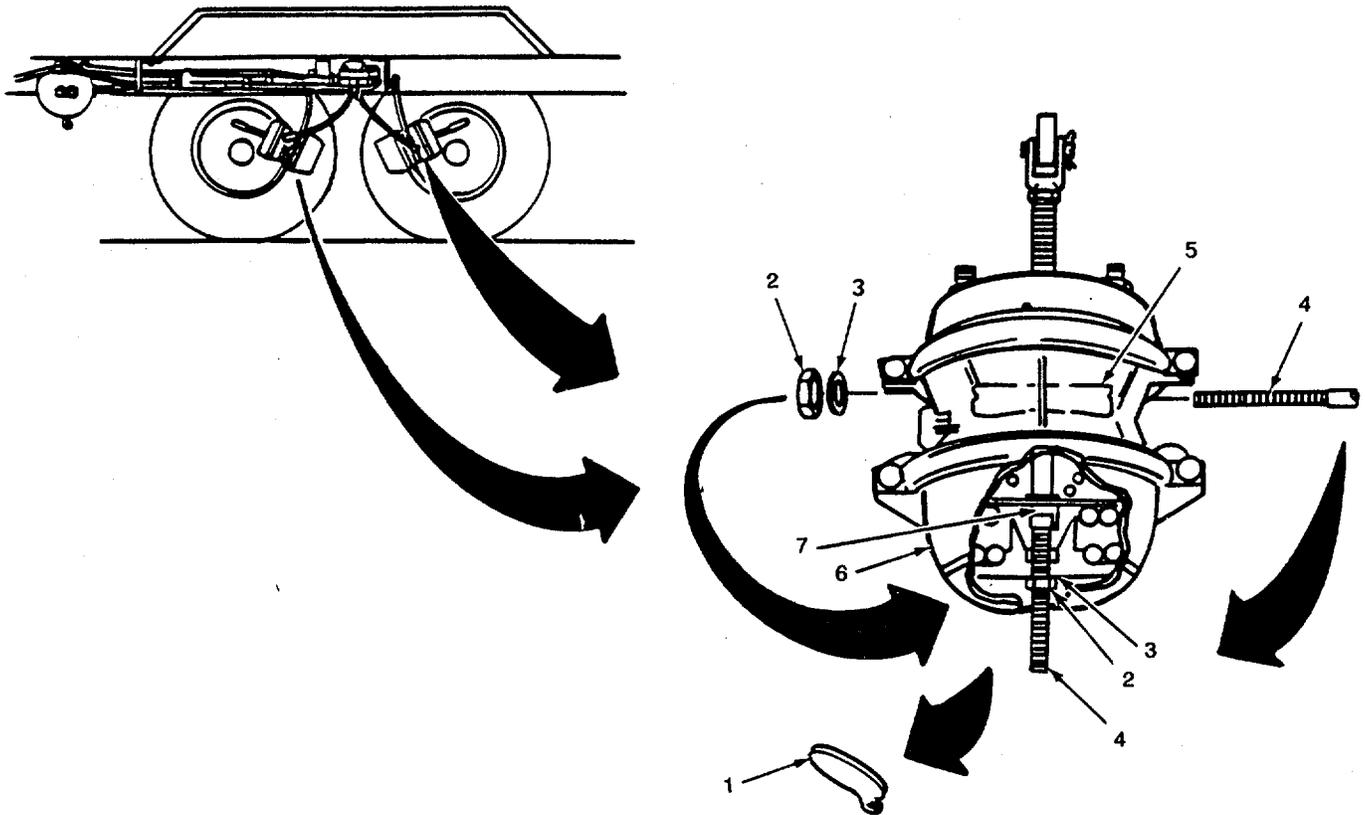
This task covers: a. Cage. b. Uncage.

---

### INITIAL SETUP.

Tools. Tool Kit (Appx B, Sect III, Item 10).

---



### CAGE.

### NOTE

This procedure must be done to all four air chambers before reservoir air pressure is released.

- a. Remove dust cap (1).
- b. Remove nut (2), flat washer (3), and release stud (4) from side sleeve (5).
- c. Insert release stud (4) through hole at end of chamber (6) to engage notches on spring seat (7).

**CAGE. (Cont)**

- d. Rotate release stud (4) 1/4-turn clockwise to lock crosspins into spring seat (7).
- e. Install flat washer (3) and nut (2) on release stud (4) and tighten until fingertight.

**UNCAGE.**

- a. Remove nut (2) and flat washer (3).
- b. Rotate release stud (4) 1/4-turn counterclockwise to release crosspins from spring seat (7).
- c. Install release stud (4) in side sleeve (5) with crosspins in notches and secure with flat washer (3) and nut (2).
- d. Install dust cap (1).

---

## 2-48. REPLACE AIRBRAKE HOSE ASSEMBLY.

This task covers: a. Removal. b. Installation.

---

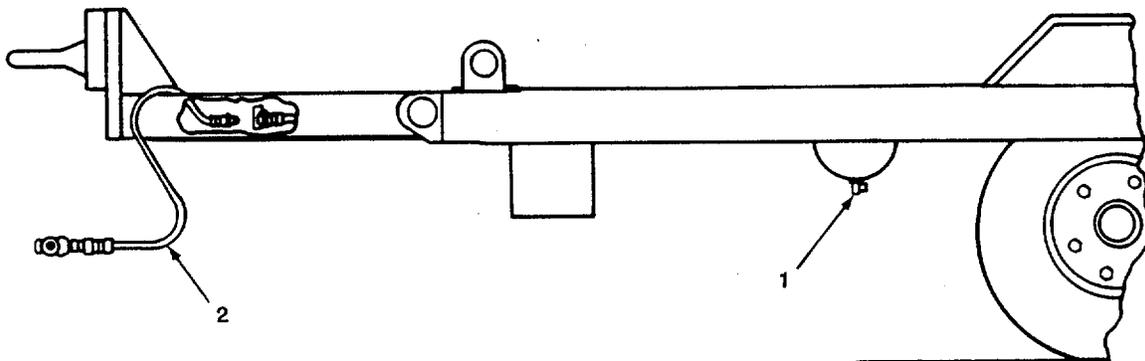
### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Materials/Parts. Towing Vehicle Equipped With Airbrakes.
- c. Equipment Condition. Leveling jacks set (TM 10-4610-239-10).  
Airbrake hoses disconnected from towing vehicle (TM 10-4610-239-10).  
All four air chamber compression springs caged (paragraph 2-47).
- d. General Safety Requirements.

### WARNING

Compressed air in airbrake system can be dangerous. Wear eye protection.  
Do not exceed 30 psig (207 kPag) air pressure.

---



### REMOVAL.

### WARNING

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to bleed air pressure from reservoir.

**REMOVAL. (Cont)**

**NOTE**

Ensure that airflow from reservoir has stopped before closing drain cock.

- b. Turn drain cock T-handle (1) clockwise to close drain cock.

**NOTE**

There are two airbrake hose assemblies on the flatbed cargo trailer. Both are removed the same. One is shown.

- c. Remove airbrake hose assembly (2).

**INSTALLATION.**

**NOTE**

There are two airbrake hose assemblies on the flatbed cargo trailer. Both are installed the same. One is shown.

- a. Install airbrake hose assembly (2).
- b. Check that drain cock T-handle (1) is turned fully clockwise.
- c. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- d. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- e. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.

---

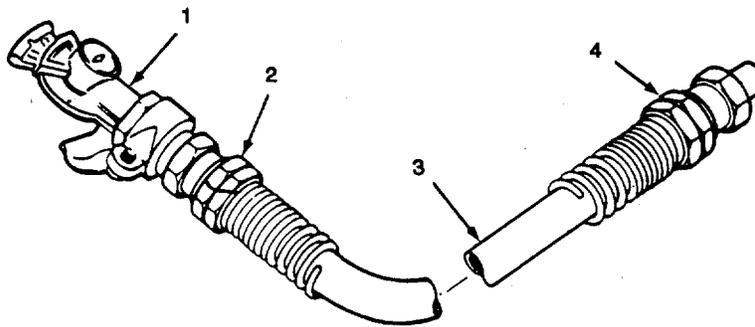
## 2-49. REPAIR AIRBRAKE HOSE ASSEMBLY.

This task covers: a. Disassembly. b. Inspection. c. Assembly.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Equipment Condition. Airbrake hose assembly removed from flatbed cargo trailer (paragraph 2-48).
- 



### DISASSEMBLY.

- a. Remove coupling half (1) from adapter (2).
- b. Remove adapters (2) and (3) from hose (4).

### INSPECTION.

- a. Inspect coupling half and adapters for cracks, deformity, or damaged threads or mating surfaces. Replace as required.
- b. Inspect hose for brittleness, cracks, holes, damaged threads, or deformed springs. Replace as required.

### ASSEMBLY.

- a. Install adapters (2) and (3) on hose (4).
- b. Install coupling half (1) on adapter (2).

---

## 2-50. REPLACE RESERVOIR.

This task covers: a. Removal. b. Installation.

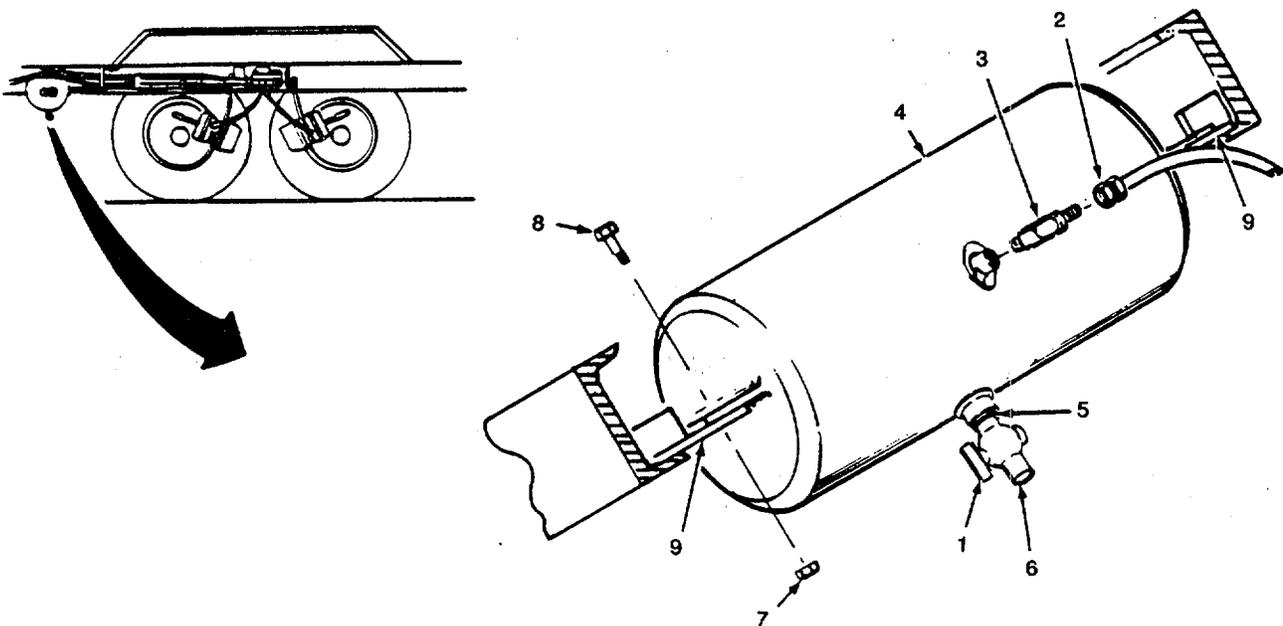
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### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Materials/Parts. Towing Vehicle Equipped With Airbrakes.  
Antiseize Tape (Appx C, Sect II, Item 17).
- c. Personnel Required. 2
- d. Equipment Condition. Leveling jacks set (TM 10-4610-239-10).  
Airbrake hoses disconnected from towing vehicle (TM 10-4610-239-10).  
All four air chamber compression springs caged (paragraph 2-47).
- e. General Safety Requirements.

### WARNING

- Compressed air in airbrake system can be dangerous. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.
  - Lifting heavy equipment incorrectly can cause serious injury. Do not lift or move more than 50 pounds yourself.
- 



**REMOVAL.**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.
- b. Remove tube fitting (2) from hydraulic tube fitting (3).
- c. Remove hydraulic tube fitting (3) and associated parts from reservoir (4).

**CAUTION**

Use wrench only on wrenching portion (5) of drain cock (6). Using wrench on any other part of drain cock can damage drain cock.

- d. Remove drain cock (6).
- e. Remove four locknuts (7) and cap screws (8).

**WARNING**

The reservoir is heavy. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- f. Slide reservoir (4) off two beams (9) and lower it to ground.

**INSTALLATION.**

**WARNING**

The reservoir is heavy. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- a. Position reservoir (4) on two beams (9) and install four cap screws (8) and new locknuts (7).

**CAUTION**

Use wrench only on wrenching portion (5) of drain cock (6). Using wrench on any other part of drain cock can damage drain cock.

- b. Apply antiseize tape to threads of drain cock (6) and install drain cock.
- c. Apply antiseize tape to threads of hydraulic tube fitting (3) and install hydraulic tube fitting and associated parts on reservoir (4).

**INSTALLATION. (Cont)**

- d. Apply antiseize tape to threads of tube fitting (2) and install tube fitting on hydraulic tube fitting (3).
- e. Check that drain cock T-handle (1) is turned fully clockwise.
- g. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- h. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- i. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.

---

## 2-51. REPLACE RESERVOIR DRAIN COCK.

This task covers: a. Removal. b. Installation.

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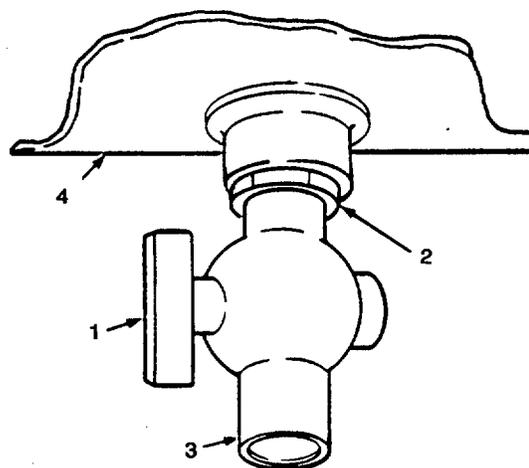
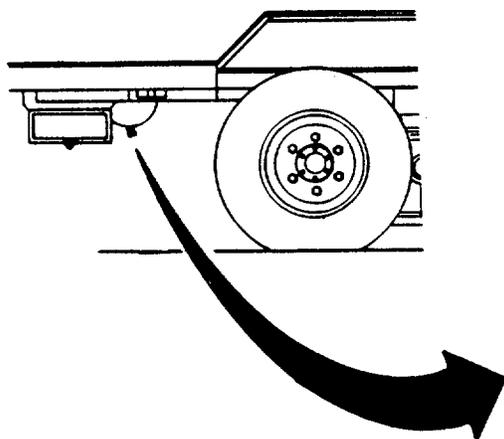
### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Materials/Parts. Towing Vehicle Equipped With Airbrakes.
- c. Equipment Condition. Leveling jacks set (TM 10-4610-239-10).  
Airbrake hoses disconnected from towing vehicle (TM 10-4610-239-10).  
All four air chamber compression springs caged (paragraph 2-47).
- d. General Safety Requirements.

### WARNING

Compressed air in airbrake system can be dangerous. Wear eye protection.  
Do not exceed 30 psig (207 kPag) air pressure.

---



**REMOVAL.**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

**CAUTION**

Use wrench only on wrenching portion (2) of drain cock (3). Using wrench on any other part of drain cock can damage drain cock.

- b. Remove drain cock (3) from reservoir (4).

**INSTALLATION.**

**CAUTION**

Use wrench only on wrenching portion (2) of drain cock (3). Using wrench on any other part of drain cock can damage drain cock.

- a. Install drain cock (3) on reservoir (4).
- b. Check that drain cock T-handle (1) is turned fully clockwise.
- c. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- d. Start engine of towing vehicle and wait for towing vehicle air compressor to, fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- e. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.

---

## 2-52. REPLACE HOSE ASSEMBLY PIPE COUPLING.

This task covers: a. Removal. b. Installation.

---

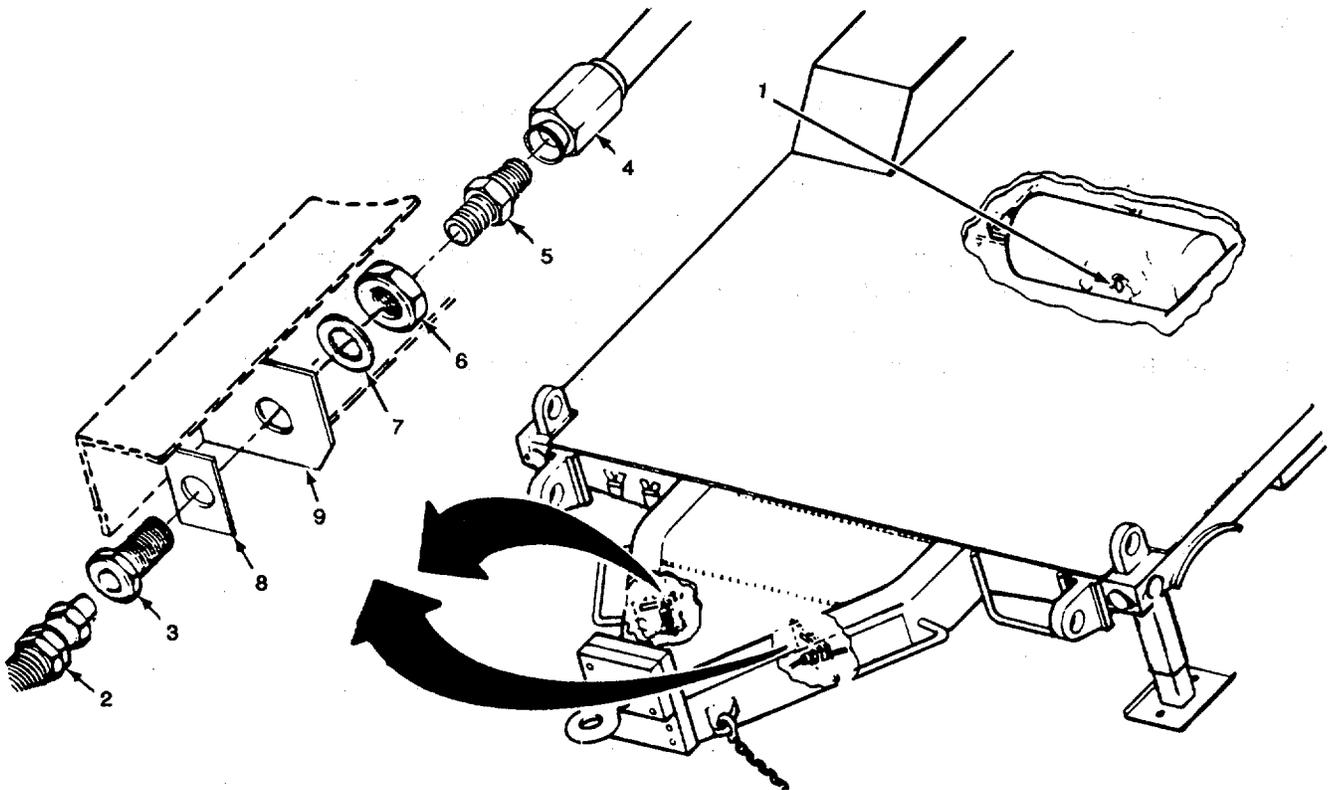
### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Materials/Parts. Towing Vehicle Equipped With Airbrakes.
- c. Equipment Condition. Leveling jacks set (TM 10-4610-239-10).  
Airbrake hoses disconnected from towing vehicle (TM 10-4610-239-10).  
All four air chamber compression springs caged (paragraph 2-47).
- d. General Safety Requirements.

### WARNING

Compressed air in airbrake system can be dangerous. Wear eye protection.  
Do not exceed 30 psig (207 kPag) air pressure.

---



**REMOVAL.**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

**NOTE**

There are two hose assembly pipe couplings with different color identification plates on the flatbed cargo trailer. Both are removed the same. One is shown.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

**NOTE**

Ensure that airflow from reservoir has stopped before closing drain cock.

- b. Turn drain cock T-handle (1) clockwise to close drain cock.

**NOTE**

Hose assembly must be free to rotate with coupling nut.

- c. Remove hose assembly (2) from pipe coupling body (3).
- d. Remove tubing (4) from adapter (5).
- e. Remove adapter (5) from pipe coupling body (3).
- f. Remove nut (6), lockwasher (7), identification plate (8), and pipe coupling body (3).

**INSTALLATION.**

**NOTE**

- There are two hose assembly pipe couplings with different color identification plates on the flatbed cargo trailer. Both are installed the same. One is shown.
  - Identification plate for roadside hose assembly pipe coupling is red.
  - Identification plate for curbside hose assembly pipe coupling is blue.
- a. Position identification plate (8) on pipe coupling body (3), position pipe coupling body through hole in frame (9), and install lockwasher (7) and nut (6).
  - b. Apply antiseize tape to threads of adapter (5) and install adapter on pipe coupling body (3).

**INSTALLATION. (Cont)**

- c. Install tubing (4) on adapter (5).
- d. Install hose assembly (2) in pipe coupling body (3).
- e. Check that drain cock T-handle (1) is turned fully clockwise.
- f. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- g. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- h. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.

---

## 2-53. REPLACE AIRBRAKE SYSTEM TUBING.

This task covers: a. Removal. b. Installation.

---

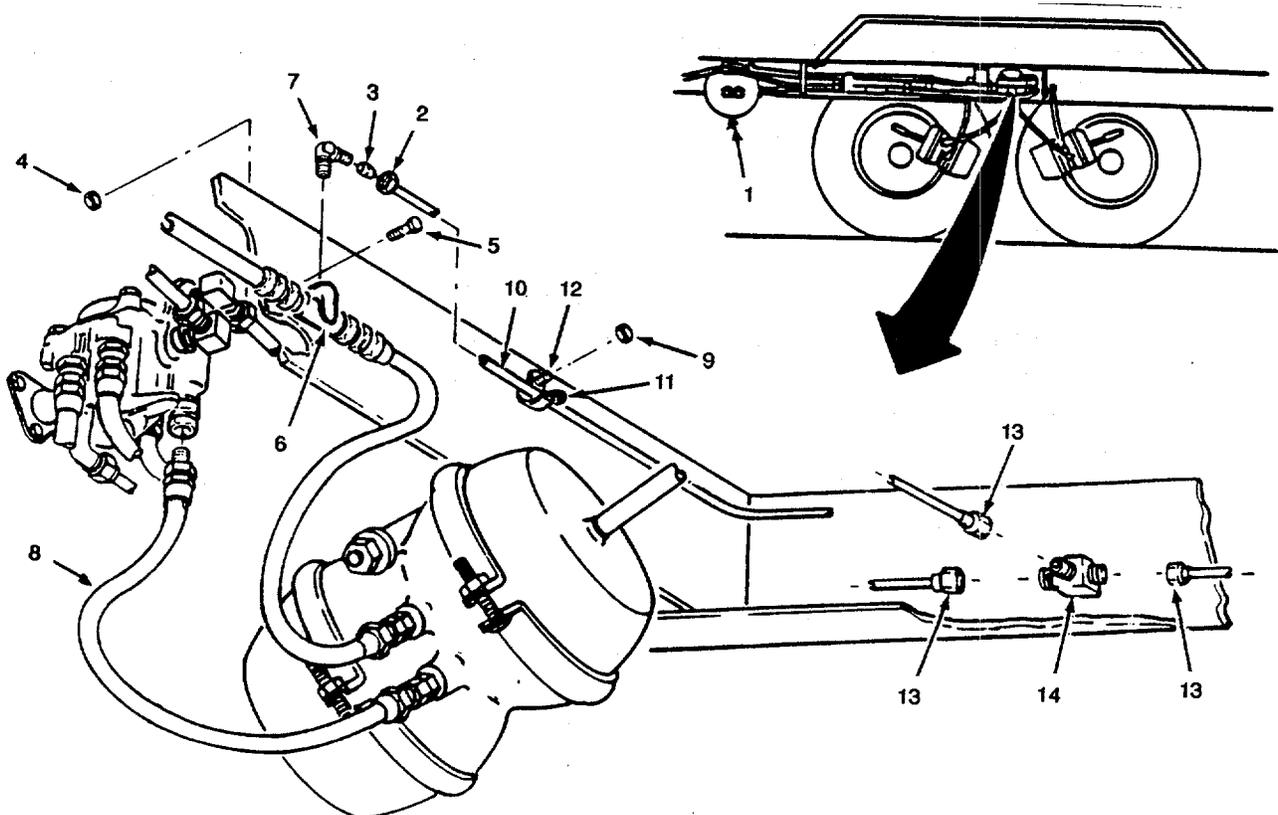
### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Materials/Parts. Towing Vehicle Equipped With Airbrakes.
- c. Equipment Condition. Leveling jacks set (TM 10-4610-239-10).  
Airbrake hoses disconnected from towing vehicle (TM 10-4610-239-10).  
All four air chamber compression springs caged (paragraph 2-47).
- d. General Safety Requirements.

### WARNING

Compressed air in airbrake system can be dangerous. Wear eye protection.  
Do not exceed 30 psig (207 kPag) compressed air.

---



**NOTE**

This procedure is typical for all the different parts found in the airbrake system.

**REMOVAL.**

**ELBOW**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

**NOTE**

Ensure that airflow from reservoir has stopped before closing drain cock.

- b. Turn drain cock T-handle (1) clockwise to close drain cock.
- c. Remove sleeve nut (3) and tubing (10).
- d. Remove two nuts (4) and screws (5) and pull anchor tee (6) away from chassis crossmember.
- e. Remove elbow (7).

**HOSE**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

**NOTE**

Ensure that airflow from reservoir has stopped before closing drain cock.

- b. Turn drain cock T-handle (1) clockwise to close drain cock.

**REMOVAL. (Cont)**

**NOTE**

There are eight hoses in the airbrake system. All are removed the same. One is shown.

- c. Remove hose (8).

**LOOP CLAMP**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

**NOTE**

Ensure that airflow from reservoir has stopped before closing drain cock.

- b. Turn drain cock T-handle (1) clockwise to close drain cock.

**NOTE**

There are 22 loop clamps in the airbrake system. All are removed the same. One is shown.

- c. Remove nut (9).
- d. Pull tubing (10) away from chassis until loop clamp (11) is off of stud (12).
- e. Spread loop clamp and (1) remove it.

**TEE**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

**NOTE**

Ensure that airflow from reservoir has stopped before closing drain cock.

**REMOVAL. (Cont)**

- b. Turn drain cock T-handle (1) clockwise to close drain cock.

**NOTE**

There are two tees in the airbrake system. Both are removed the same. One is shown.

- c. Remove three sleeve nuts (13) and tee (14).

**TUBING**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

**NOTE**

Ensure that airflow from reservoir has stopped before closing drain cock.

- b. Turn drain cock T-handle (1) clockwise to close drain cock.

**NOTE**

The airbrake system tubing is in sections connecting the hose assembly pipe couplings, air chamber assemblies, relay valve, and air reservoir. All are removed in a similar manner. One is shown.

- c. Remove sleeve (2) and sleeve nut (3).
- d. Remove nut (9).
- e. Pull tubing (10) away from chassis until loop clamp (11) is off of stud (12).
- f. Spread loop clamp (11) and remove it.
- g. Working at other end of tubing section, remove sleeve nut (13).
- h. Remove tubing (10).

**NOTE**

This procedure is typical for all the different parts found in the airbrake system.

**INSTALLATION.**

**ELBOW**

- a. Pull anchor tee (6) away from chassis crossmember and install elbow (7).
- b. Install sleeve nut (3) and sleeve (2).
- c. Install two screws (5) and nuts (4).
- d. Check that drain cock T-handle (1) is turned fully clockwise.
- e. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- f. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- g. Uncage compression springs on all four air chambers. Refer to paragraphs 2-47.

**HOSE**

**NOTE**

There are eight hoses in the airbrake system. All are removed the same. One is shown.

- a. Install hose (8).
- b. Check that drain cock T-handle (1) is turned fully clockwise.
- c. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- d. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- e. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.

**LOOP CLAMP**

**NOTE**

There are 22 loop clamps in the airbrake system. All are installed the same. One is shown.

- a. Pull tubing (10) away from chassis until flat section of loop clamp (11) fits between tubing and stud (12). Install loop clamp on stud.

**INSTALLATION. (Cont)**

- b. Install nut (9).
- c. Check that drain cock T-handle (1) is turned fully clockwise.
- d. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- e. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- f. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.

**TEE**

**NOTE**

There are two tees in the airbrake system. Both are installed the same. One is shown.

- a. Position tee (14) and install three sleeve nuts (13).
- b. Check that drain cock T-handle (1) is turned fully clockwise.
- c. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- d. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- e. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.

**TUBING**

**NOTE**

The airbrake system tubing is in sections connecting the hose assembly pipe couplings, air chamber assemblies, relay valve, and air reservoir. All are installed in a similar manner. One is shown.

- a. Position loop clamp (11) on stud (12) and install nut (9).
- b. Position tubing (10) on loop clamp (11).
- c. Install sleeve nut (13).
- d. Working at other end of tubing section, install sleeve nut (3) and sleeve (2).

**INSTALLATION. (Cont)**

- e. Check that drain cock T-handle (1) is turned fully clockwise.
- f. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- g. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- h. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.



**REMOVAL.**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

**NOTE**

Ensure that airflow from reservoir has stopped before closing drain cock.

- b. Turn drain cock T-handle (1) clockwise to close drain cock.
- c. Disconnect tubing (2) from elbow (3).
- d. Disconnect two hoses (4) from two adapter fittings (5).
- e. Remove two nuts (6), two cap screws (7), and anchor tee (8) with elbow (3) and two adapter fittings (5) attached.
- f. Remove elbow (3) and two adapter fittings (5).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to all male fittings before installation.

- a. Install two adapter fittings (5) on anchor tee (8).
- b. Install elbow (3) on anchor tee (8).
- c. Position anchor tee (8) with elbow (3) and two adapter fittings (5) attached and install two cap screws (7) and nuts (6).
- d. Connect two hoses (4) to two adapter fittings (5).
- e. Connect tubing (2) to elbow (3).
- f. Check that drain cock T-handle (1) is turned fully clockwise.
- g. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.

**INSTALLATION. (Cont)**

**NOTE**

Check for air leaks at airbrake system anchor tee after brake system is charged.

- h. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- i. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.



### NOTE

There are two brake line air filters, one on each side of the flatbed cargo trailer. Both are removed and installed the same. One is shown.

### REMOVAL.

### WARNING

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

### NOTE

Ensure that airflow from reservoir has stopped before closing drain cock.

- b. Turn drain cock T-handle (1) clockwise to close drain cock.
- c. Remove two tube assemblies (2).
- d. Support air filter (3) and remove two nuts (4) and one U-bolt clamp (5).
- e. Remove air filter (3).
- f. Remove two tube fittings (6) from air filter (3).

### INSTALLATION.

- a. Apply antiseize tape to two tube fittings (6) and install two tube fittings on air filter (3).
- b. Position air filter (3) and install U-bolt clamp (5) and two nuts (4).
- c. Install two tube assemblies (2).
- d. Check that drain cock T-handle (1) is turned fully clockwise.
- e. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- f. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- g. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.

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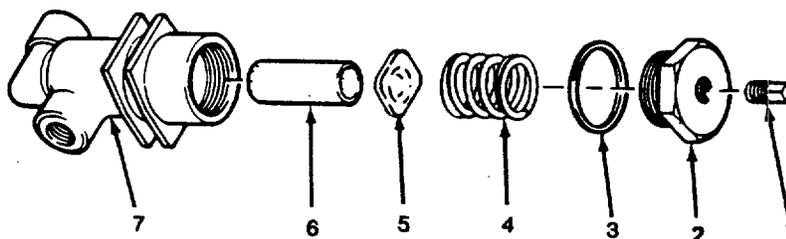
## 2-56. REPAIR BRAKE LINE AIR FILTER.

This task covers:      a. Disassembly.      b. Cleaning.      c. Inspection.      d. Assembly.

---

### INITIAL SETUP.

- a. Tools    Tool Kit (Appx B, Sect III, Item 10).  
             Socket Wrench (Appx B, Sect III, Item 7).
  - b. Materials/Parts.                      Detergent (Appx C, Sect II, Item 3).  
                                                     Rags (Appx C, Sect II, Item 13).
  - c. Equipment Condition.                Brake line air filter removed (paragraph 2-55).
- 



### DISASSEMBLY

- a. Remove pipe plug (1).

#### NOTE

Bushing adapter is under spring tension. Hold bushing adapter and housing while releasing pressure.

- b. Remove bushing adapter (2), gasket (3), compression spring (4), spring tension washer (5), and filter element (6). Discard gasket.

### CLEANING.

- a. Using mild soap solution and soft-bristled brush, wash dirt and grease from all parts.
- b. Using clean water, rinse all parts. Dry with clean, soft cloth.

**INSPECTION.**

- a. Inspect filter for imbedded dirt or torn or deformed filter screen. Replace as required.
- b. Inspect spring and spring tension washer for cracks or deformity. Replace as required.
- c. Inspect pipe plug, bushing adapter, and housing for cracks, deformity, or damaged threads. Replace as required.

**ASSEMBLY.**

- a. Install filter element (6), spring tension washer (5), and compression spring (4).

**CAUTION**

Compression spring causes resistance to installation of bushing adapter. Lack of attention while installing bushing adapter can cause thread damage. Install bushing adapter carefully.

- b. Install new gasket (3), bushing adapter (2), and pipe plug (1).

---

**2-57. REPLACE AIRBRAKE RELAY VALVE AND ADAPTER.**

This task covers:      a. Removal.                      b. Installation.

---

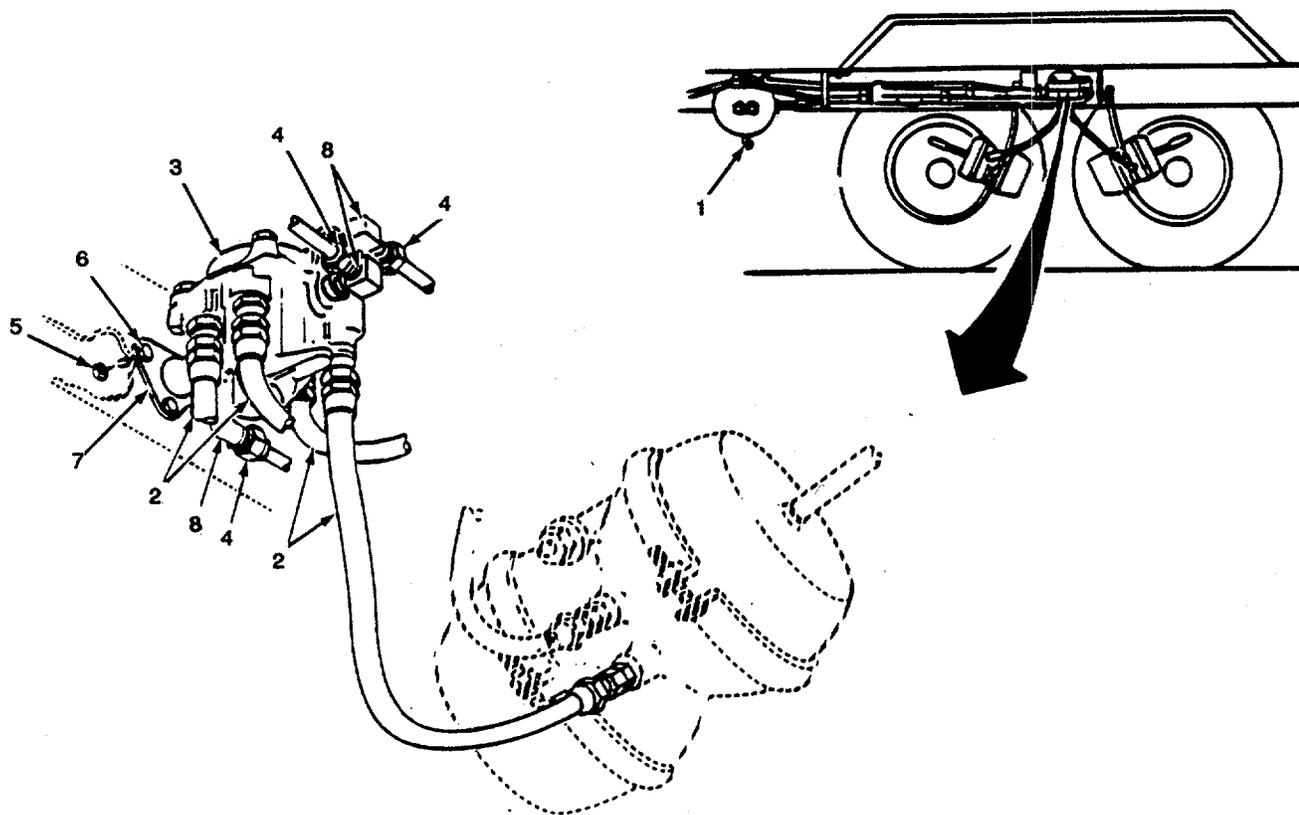
**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Materials/Parts.                      Towing Vehicle Equipped With Airbrakes.
- c. Equipment Condition.              Leveling jacks set (TM 10-4610-239-10).  
                                                 Airbrake hoses disconnected from towing vehicle  
                                                 (TM 10-4610-239-10).  
                                                 All four air chamber compression springs caged (¶paragraphs 2-47).
- d. General Safety Requirements.

**WARNING**

Compressed air in airbrake system can be dangerous. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.

---



**REMOVAL.**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

**NOTE**

Ensure that airflow from reservoir has stopped before closing drain cock.

- b. Turn drain cock T-handle (1) clockwise to close drain cock.

**NOTE**

Disconnect hoses from air chambers before disconnecting from airbrake relay valve.

- c. Tag and remove four hoses (2) and label airbrake relay valve (3) and air chambers with matching identification.
- d. Disconnect three tubes (4).

**NOTE**

Bottom bolt is captive between airbrake relay valve and adapter when loose.

- e. Remove three locknuts (5) and bolts (6) and lower airbrake relay valve (3) and adapter (7). Discard locknuts.
- f. Unscrew adapter (7) from airbrake relay valve (3).

**CAUTION**

Using wrench in tube fitting threads will cause damage to threads. Use wrench only on wrenching surfaces.

- g. Remove three tube fittings (8).

**INSTALLATION.**

- a. Install three tube fittings (8) on airbrake relay valve (3).

**CAUTION**

Using wrench on tube fitting threads will cause damage to threads. Use wrench only on wrenching surfaces.

**INSTALLATION. (Cont)**

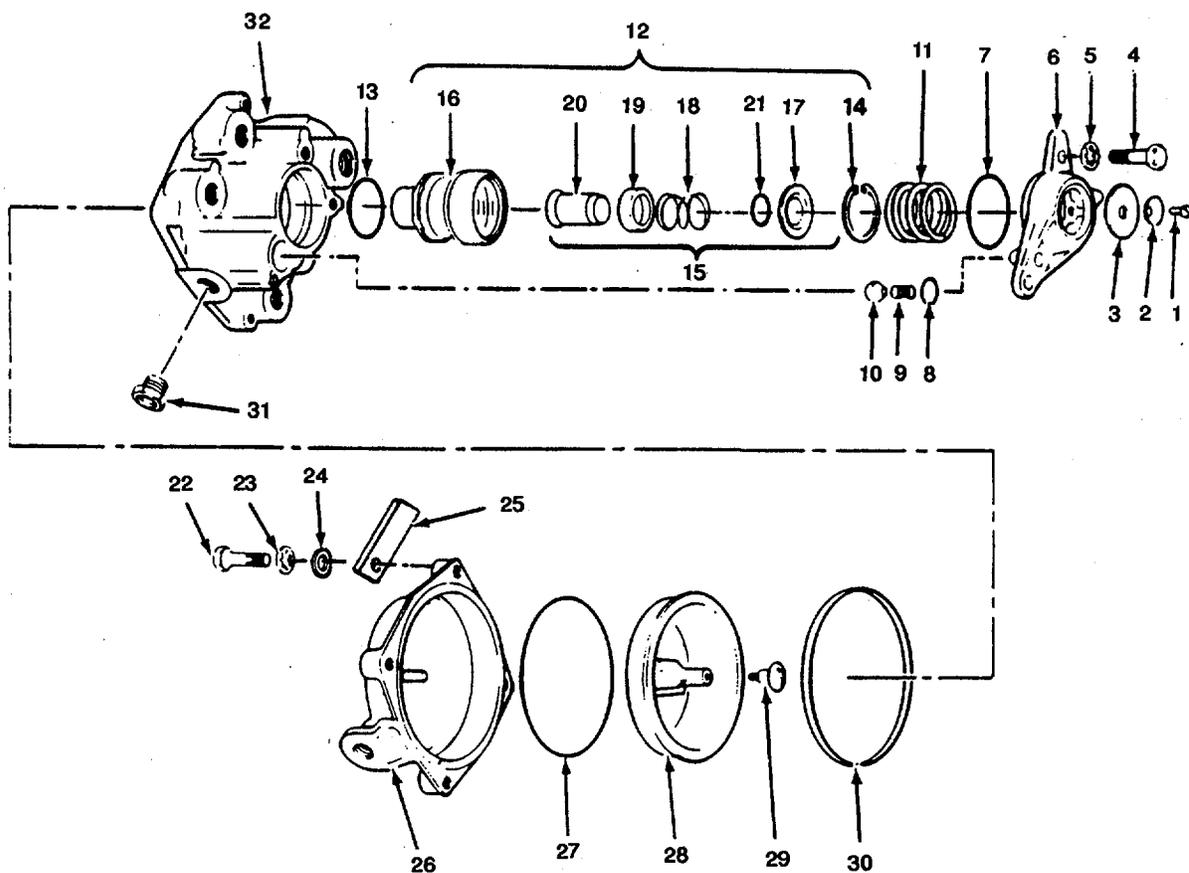
- b. Screw adapter (7) into airbrake relay valve (3).
- c. Install airbrake relay valve (3), adapter (7), three bolts (6), and three new locknuts (5).
- d. Connect three tubes (4).
- e. Connect four hoses (2) as tagged.
- f. Check that drain cock T-handle (1) is turned fully clockwise.
- g. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- h. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- i. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.

**2-58. REPAIR AIRBRAKE RELAY VALVE.**

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Snap Ring Pliers (Appx B, Sect m, Item 7).
- b. Material/Parts Detergent (Appx C, Sect II, Item 3).  
Rags (Appx C, Sect II, Item 13).
- c. Equipment Condition. Airbrake relay valve and adapter removed (paragraph 2-57).



**DISASSEMBLY.**

- a. Remove screw (1), diaphragm washer (2), and exhaust diaphragm (3).

**CAUTION**

Exhaust cover is installed under spring tension. Failure to release pressure slowly can cause loss of parts. Keep pressure on exhaust cover during removal.

- b. Remove three cap screws (4), lockwashers (5), and exhaust cover (6). Discard lockwashers.
- c. Remove O-ring (7) and preformed packing (8) from exhaust cover (6). Discard O-ring and preformed packing.
- d. Remove compression spring (9) and check valve ball (10).
- e. Remove emergency spring (11), piston and valve assembly (12), and O-ring (13). Discard O-ring.
- f. Remove retaining ring (14) and inlet and exhaust valve assembly (15) from emergency piston (16).
- g. Remove valve guide (17), preformed packing (8), valve spring (18), and valve retainer (19) from inlet and exhaust valve (20). Discard O-ring.
- h. Remove preformed packing (21) from valve guide (17). Discard preformed packing.
- i. Remove four cap screws (22) and lockwashers (23), flat washer (24), part number plate (25), cover (26), and sealing ring (27). Discard sealing ring.
- j. Remove piston assembly (28).
- k. Remove exhaust valve seat (29) and preformed packing (30). Discard preformed packing.
- l. Remove adapter (31) from body (32).

**CLEANING.**

- a. Using mild soapy water, wash all parts.
- b. Using clean, lint-free rags, wipe all parts dry.

**INSPECTION.**

- a. Inspect springs for deformity. Replace as required.
- b. Inspect exhaust diaphragm, relay piston, exhaust cover, body, cover, adapter, and inlet and exhaust valve for corrosion, cracks, excessive wear, or damaged threads. Replace as required.

**ASSEMBLY.**

- a. Install adapter (31) in body (32).
- b. Install new preformed packing (30) on piston assembly (28).
- c. Install exhaust valve seat (29) in piston assembly (28).
- d. Install piston assembly (28) in body (32).
- e. Install new sealing ring (27) in body (32) and install cover (26), part number plate (25), flat washer (24), four new lockwashers (23), and cap screws (22) on body (32).
- f. Install new preformed packing (21) in valve guide (17).
- g. Install new O-ring (7) in emergency piston (16).
- h. Install valve retainer (19), valve spring (18), and valve guide (17) on inlet and exhaust valve (20).
- i. Position inlet and exhaust valve assembly (15) in emergency piston (16) and install retaining ring (14).
- j. Position new O-ring (13), piston and valve assembly (12), and emergency spring (11) in body (32).
- k. Position check valve ball (10) and compression spring (9) in body (32).
- l. Install new preformed packing (8) on exhaust cover (60).
- m. Position exhaust cover (6) on emergency spring (11) and compression spring (9).
- n. Push exhaust cover (6) down and install three new lockwashers (5) and cap screws (4).
- o. Position exhaust diaphragm (3) and diaphragm washer (2) in exhaust cover (6) and install screw (1).

**Section IX. FLATBED CARGO TRAILER ELECTRICAL  
MAINTENANCE PROCEDURES**

	Para	Page
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Replace Wiring Harness Connector Clips.....	2-61	2-119
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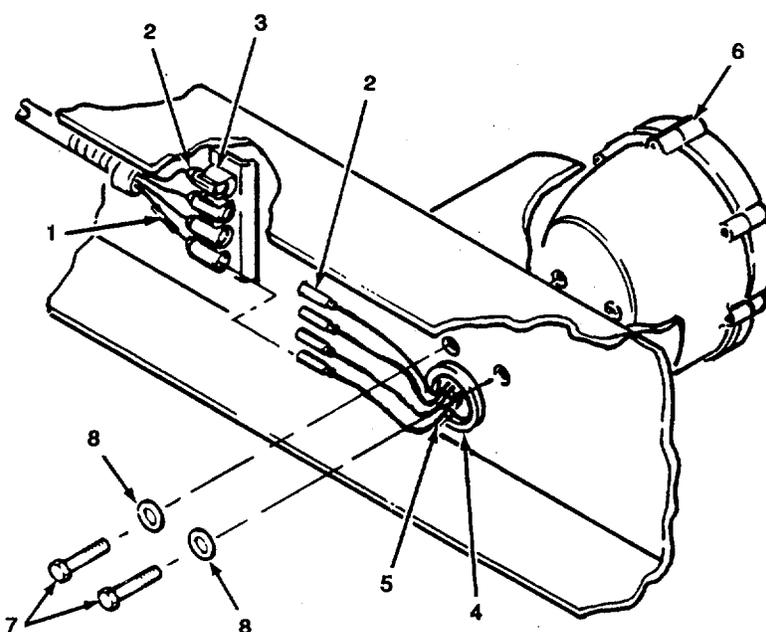
## 2-59. REPLACE COMPOSITE LIGHT.

This task covers:      a. Removal.                      b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Equipment Condition. Flatbed cargo trailer disconnected from towing vehicle (TM 10-4610-239-10).
- 



### REMOVAL.

#### NOTE

There are two composite lights on the flatbed cargo trailer. Both are removed the same. One is shown.

- a. Check all wires for readable wire labels (1).
- b. If wire labels (1) are missing or cannot be read, tag wires.
- c. Pull four connectors (2) from spring clips (3).
- d. Separate two halves of four connectors (2).

**REMOVAL. (Cont)**

- e. Work grommet (4) out of hole in chassis.
- f. Pull cable (5) out of grommet and through hole in chassis.
- g. Support composite light (6). Remove two cap screws (7), two washers (8), and composite light.

**INSTALLATION.**

**NOTE**

There are two composite lights on the flatbed cargo trailer. Both are installed the same. One is shown.

- a. Position composite light (6) and install two washers (8) and cap screws (7).
- b. Pull cable (5) through hole in chassis and grommet (4).
- c. Work grommet (4) into hole in chassis.

**CAUTION**

Failure to match wires as marked will cause malfunctions. Be sure to connect wires as labeled.

- d. Use wire labels (1) to match halves of four connectors (2). Push matching halves together until they lock.
- e. Push four connectors (2) into spring clips (3).

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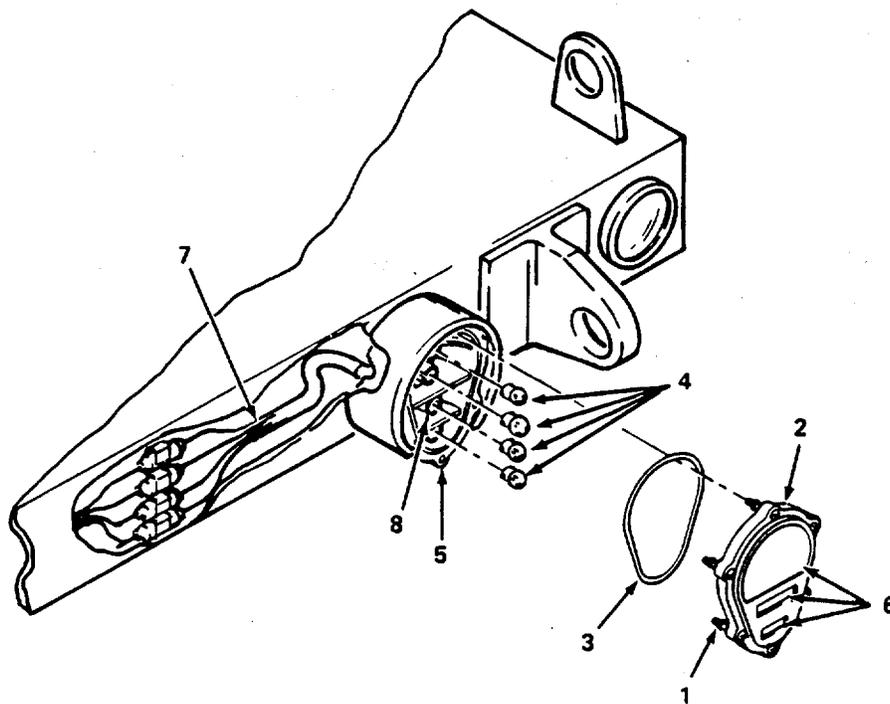
## 2-60. REPAIR COMPOSITE LIGHT.

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Detergent (Appx C, Sect II, Item 3).  
Sandpaper (Appx C, Sect II, Item 15).  
Rags (Appx C, Sect II, Item 13).
  - c. Equipment Condition. Flatbed cargo trailer disconnected from towing vehicle (TM 10-4610-239-10).
- 



### DISASSEMBLY.

#### NOTE

There are two composite lights on the flatbed cargo trailer. Both are disassembled the same. One is shown.

**DISASSEMBLY. (Cont)**

- a. Loosen six captive screws (1) and remove door (2) and preformed packing (3).

**NOTE**

There are two types of bulbs in composite light. Note bulb type as you remove bulb from each socket.

- b. Remove four bulbs (4).

**CLEANING.**

- a. Using soap solution, clean door (2), body (5), and three lenses (6). Dry with clean, soft rags.
- b. Using soap solution, remove dirt from door (2) and body (5).
- c. Touch up paint. Refer to TM 43-0139.

**INSPECTION.**

- a. Inspect door for cracked, broken, or leaking lenses; cracked or bent door; damaged heads or threads on screws. Replace as required.
- b. Inspect body for cracks or broken lamp sockets or burnt, brittle, or cut wiring (7). Replace body as required.
- c. Inspect bulbs for cracks or loose or deformed basis. Replace as required.
- d. Inspect preformed packing for nicks, cuts, or brittleness. Replace as required.
- e. Inspect lamp sockets for corrosion. Using sandpaper, remove corrosion as required.

**ASSEMBLY.**

**NOTE**

There are two composite lights on the flatbed cargo trailer. Both are assembled the same. One is shown.

- a. Install four bulbs (4) in lamp sockets (8) as noted during disassembly.
- b. Position preformed packing (3) and door (2) and tighten six captive screws (1).

---

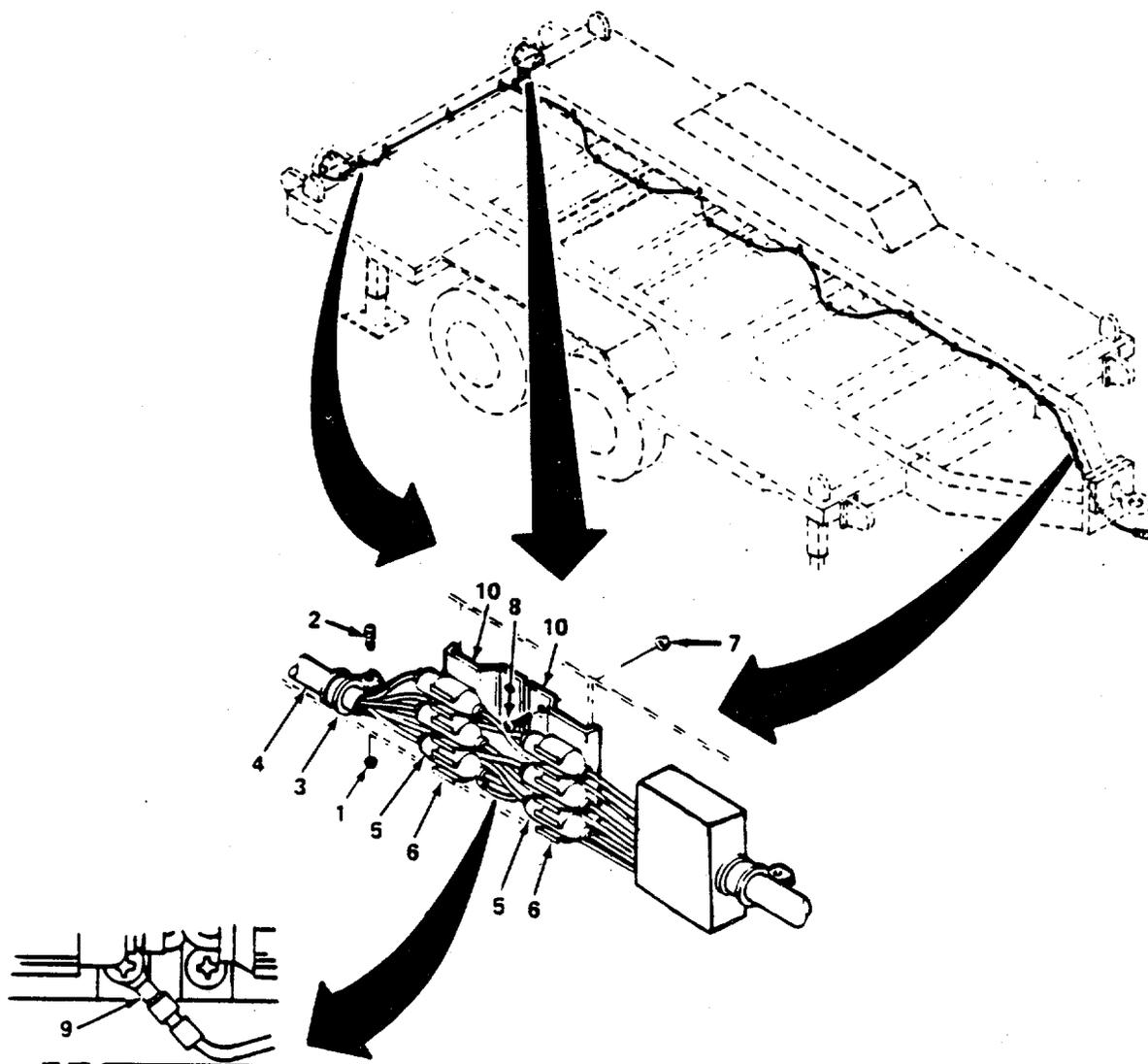
**2-61. REPLACE WIRING HARNESS CONNECTOR CLIPS.**

This task covers:      a. Removal.                      b. Installation.

---

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Equipment Condition. Flatbed cargo trailer disconnected from towing vehicle (TM 10-4610-239-10).
- 



**NOTE**

There are four connector clips on the flatbed cargo trailer. All are removed and installed the same.

**REMOVAL.**

- a. Remove nut (1) and screw (2).
- b. Spread loop clamp (3) so cable (4) can be moved.
- c. Pull electrical connector plugs (5) out of spring clips (6).

**NOTE**

Ground wire is installed only at front connector clip.

- d. Remove two nuts (7), screws (8), ground wire lug (9), and connector clip (10).

**INSTALLATION.**

**NOTE**

Ground wire is installed only at front connector clip.

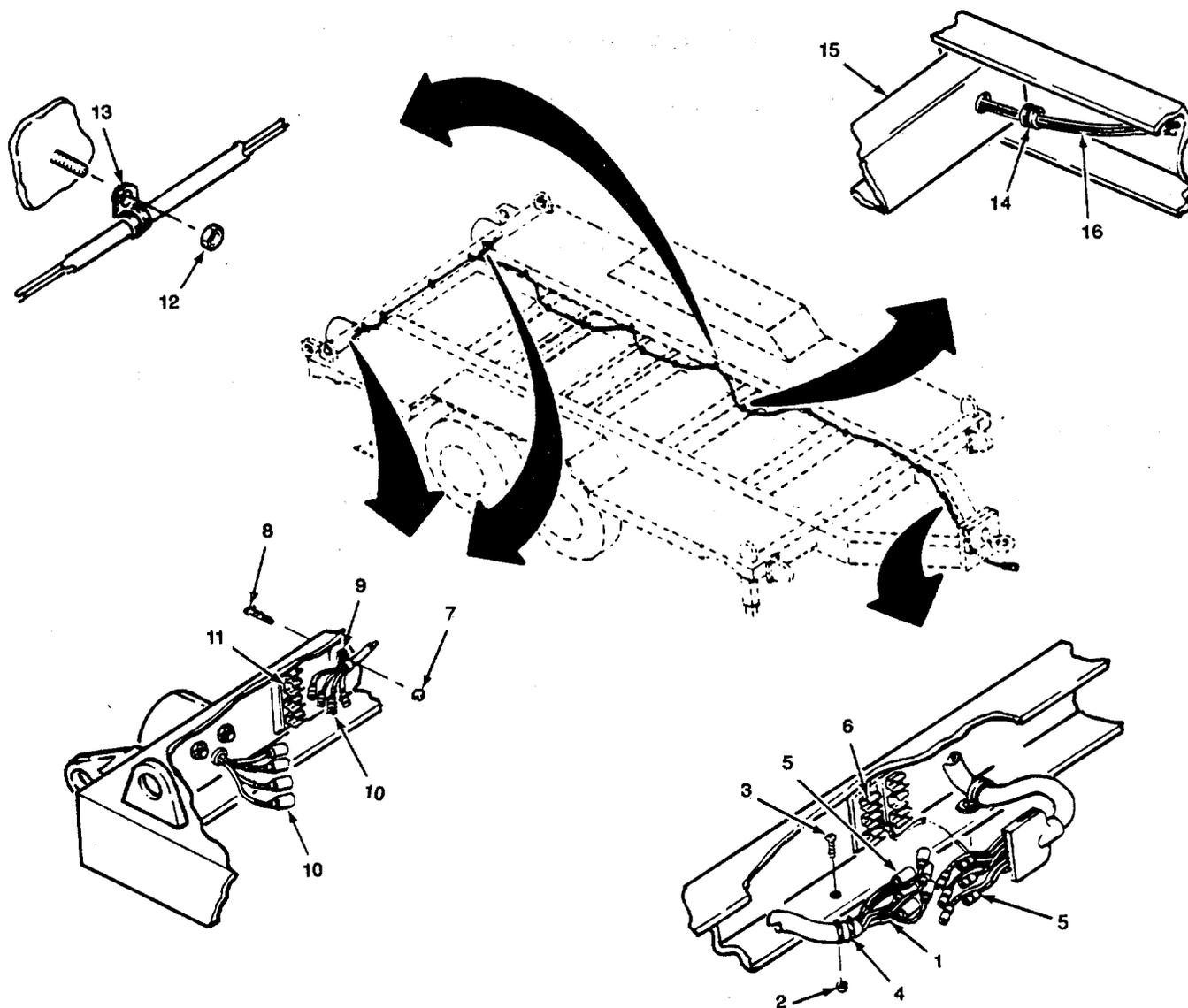
- a. Position connector clip (10) and ground wire lug (9) and install two screws (8) and nuts (7).
- b. Press electrical connector plugs (5) and into spring clips (6).
- c. Position cable (4) in loop clamp (3) and install screw (2) and nut (1).

**2-62. REPLACE CHASSIS WIRING HARNESS.**

This task covers:      a. Removal.                      b. Installation.

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment Condition. Flatbed cargo trailer disconnected from towing vehicle (TM 10-4610-239-10).



**REMOVAL.**

- a. Check all wires for readable wire labels (1).
- b. If wire labels (1) are missing or cannot be read, tag wires.
- c. Remove nut (2), bolt (3), and clamp (4).
- d. Pull six connectors (5) from spring clips (6).
- e. Separate two halves of six connectors (5).
- f. Remove nut (7), bolt (8), and clamp (9).
- g. Pull six connectors (10) from spring clips (11).
- h. Separate two halves of six connectors (10).

**NOTE**

There are eight clamps holding wiring harness to flatbed cargo trailer frame. All are removed the same. One is shown.

- i. Remove nut (12) and clamp (13).

**NOTE**

There are 11 grommets on the wiring harness. All are removed the same. One is shown.

- j. Work grommet (14) out of hole in chassis (15) and remove grommet from wiring harness (16).

**CAUTION**

Connectors can be damaged if wiring harness is not pulled through holes in chassis carefully.

- k. Working from front of flatbed cargo trailer to rear, pull wiring harness through holes in chassis and remove wiring harness from flatbed cargo trailer.

**INSTALLATION.**

**CAUTION**

Connectors can be damaged if wiring harness is not pulled through holes in chassis carefully.

- a. Working from rear of flatbed cargo trailer to front, pull wiring harness through 11 holes in chassis.

**NOTE**

There are 11 grommets on the wiring harness. All are installed the same. One is shown.

- b. Install grommet (14) on wiring harness (16) and work grommet into hole in chassis (15).

**NOTE**

There are eight clamps holding wiring harness to flatbed cargo trailer frame. All are installed the same. One is shown.

- c. Position clamp (13) and install nut (12) on bolt.
- d. Use wire labels (1) to match halves of four connectors (10). Push matching halves together until they lock.
- e. Push four connectors (10) into spring clips (11).
- f. Position clamp (9) and install bolt (8) and nut (7).
- g. Use wire labels (1) to match halves of six connectors (5). Push matching halves together until they lock.
- h. Push six connectors (5) into spring clips (6).
- i. Position clamp (4) and install bolt (3) and nut (2).

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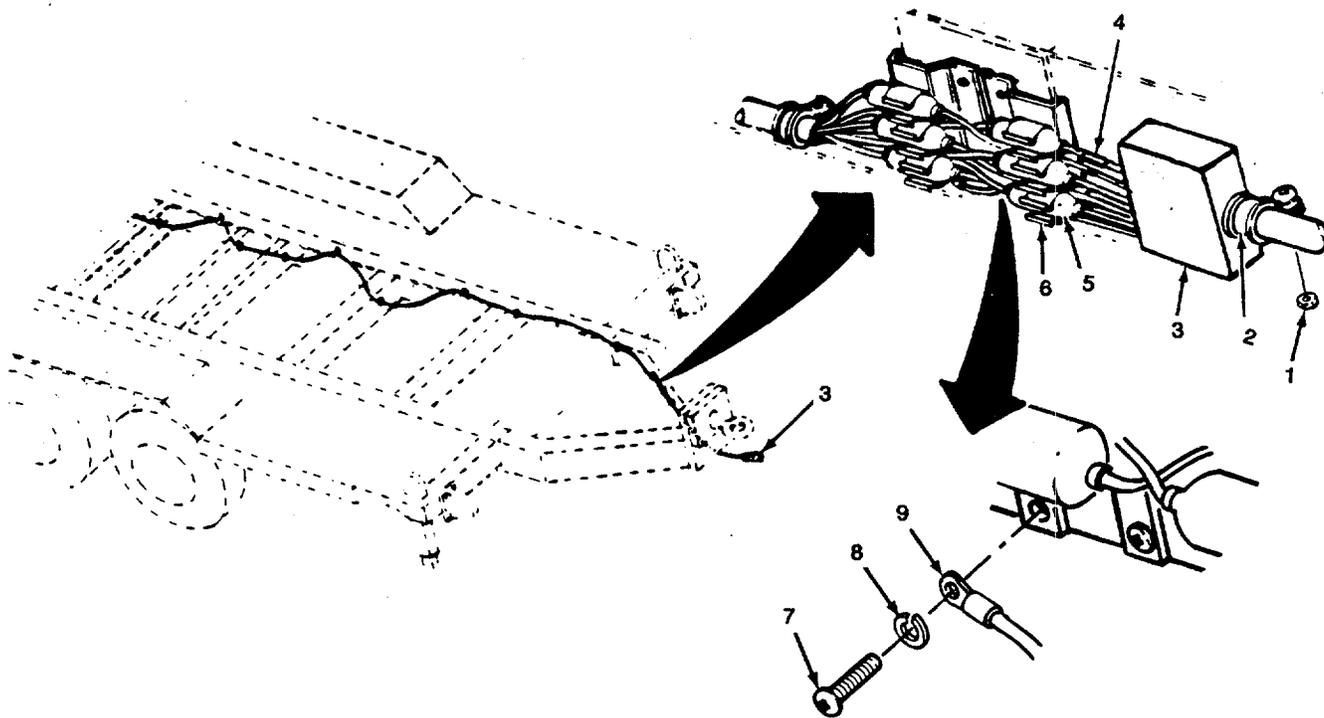
**2-63. REPLACE POWER CABLE ASSEMBLY.**

This task covers:      a. Removal.                      b. Installation.

---

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Equipment Condition.                      Power cable disconnected from towing vehicle (TM 10-4610-239-10).
- 



**REMOVAL.**

- a. On drawbar, remove nut (1) and cable clamp (2) and release power cable assembly (3) from drawbar.
- b. Check all wires for readable wire labels (4).
- c. If wire labels (4) are missing or cannot be read, tag wires.
- d. Remove six connectors (5) from spring clips (6).

**REMOVAL. (Cont.)**

- e. Separate two halves of six connectors (5).
- f. Remove screw (7) and lockwasher (8) and disconnect ground wire (9).
- g. Remove power cable assembly (3) from flatbed cargo trailer.

**INSTALLATION.**

- a. Position power cable assembly (3) in place on flatbed cargo trailer frame.
- b. Install ground wire (9), lockwasher (8), and screw (7).
- c. Use wire labels (4) to match halves of six connectors (5). Push halves together until they lock.
- d. Push six connectors (5) into spring clips (6).
- e. Install power cable assembly (3) on drawbar using cable clamp (2) and nut (1).

**Section X. SUSPENSION ASSEMBLY MAINTENANCE PROCEDURES**

	Para	Page
Replace Lubrication Fitting.....	2-64	2-127
Service Wheel Bearings.....	2-65	2-128
Replace Tire and Wheel Assembly and Hub and Drum Assembly .....	2-66	2-131
Replace Tire and Wheel Assembly.....	2-67	2-138
Repair Tire and Wheel Assembly. (For procedures to repair the tire and wheel assembly, refer to TM 9-2610-200-20).		
Replace Axle Assembly.....	2-68	2-141
Repair Hub and Drum Assembly .....	2-69	2-143
Replace Air Chamber.....	2-70	2-145
Replace Service Brake Assembly.....	2-71	2-147
Repair Service Brake Assembly .....	2-72	2-149
Adjust Service Brakes .....	2-73	2-153

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**2-64. REPLACE LUBRICATION FITTING.**

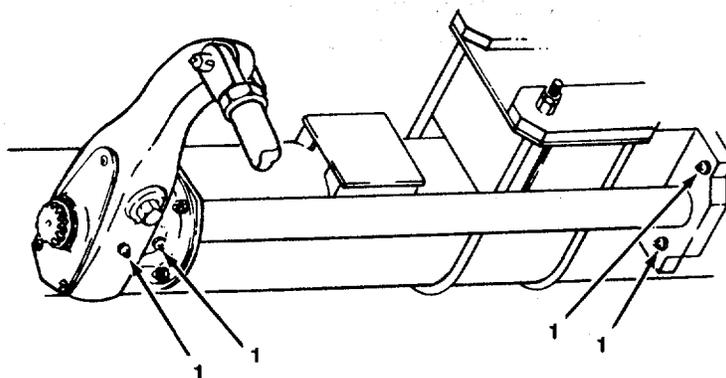
This task covers:     a. Removal.             b. Installation.

---

**INITIAL SETUP.**

Tools. Tool Kit (Appx B, Sect HI, Item 10).

---



**REMOVAL.**

Unscrew lubrication fitting (1).

**INSTALLATION.**

Screw in new lubrication fitting (1).

---

**2-65. SERVICE WHEEL BEARINGS.**

This task covers:      a. Cleaning.                      b. Inspection.                      c. Lubrication.

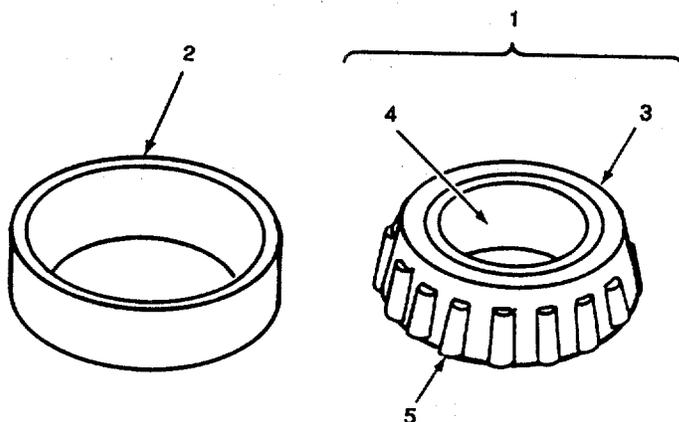
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**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Lubrication Kit (Appx B, Sect III, Item 6).
- b. Materials/Parts                      Dry-cleaning Solvent (Appx C, Sect II, Item 16).  
Grease (Appx C, Sect II, Item 9).
- c. Equipment Condition.              Wheel bearings removed (paragraph 2-66).
- d. General Safety Requirements.

**WARNING**

- Using dry-cleaning solvent incorrectly can cause serious injury. Wear eye, skin, and respiratory protection. Use in a well ventilated area.
- Bearings spinning at high speed can explode, causing injury to personnel. Do not use compressed air to dry or spin bearings.



**CLEANING.**

**WARNING**

- Dry-cleaning solvent AAF11 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.
- Do not spin bearings. spinning at high speed can cause an explosion and injury to personnel. Do not use compressed air to dry or spin bearings.

**NOTE**

- This task is for both inner and outer bearing cones and rollers and bearing cups.
  - All old lubricant must be removed during cleaning. Repeat steps a and b as needed to remove old lubricant.
- a. Using dry-cleaning solvent, clean bearing cone and rollers (1) by wiping, scrubbing, and agitation.
  - b. If old grease in bearing cone and rollers is gummed or caked, soak bearing in dry-cleaning solvent for a few hours. Repeat step a.

**WARNING**

Do not dry bearing cone and rollers with compressed air. Spinning bearings may explode and cause serious injury to personnel.

**CAUTION**

After cleaning, keep bearings clean and dry. Dirt and moisture can damage bearings.

- c. Rinse bearing cone and rollers and bearing cup (2) in clean dry-cleaning solvent. Let air dry.

**INSPECTION.**

- a. Position light behind bearing cone and rollers (1).
- b. Hold bearing cone (3) and slowly turn inner race (4).

**INSPECTION. (Cont)**

**NOTE**

Bearing cup and bearing cones and rollers are a matched set. If either part of set is faulty, replace both parts.

- c. Check that rollers (5) and bearing cone (3) have no cracks, flaking, pitting, or long or deep scratches. Replace as required.
- d. Check that bearing cone has not overheated. Bearing cone turns blue where overheated. Replace as required.
- e. Check that bearing cup and rollers are not splintered or chipped. Replace as required.

**LUBRICATION.**

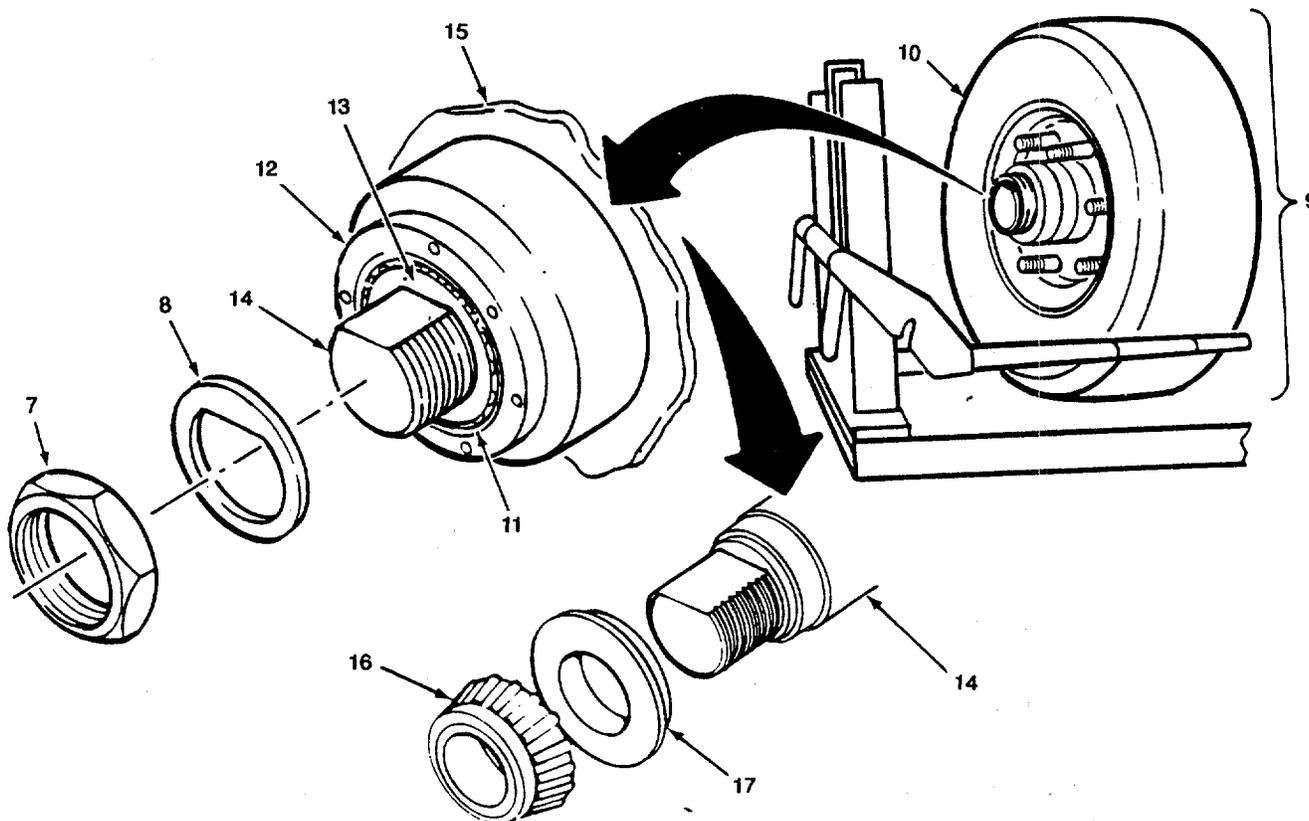
For bearing lubrication instructions, refer to LO 10-4610-239-12/LI 08580B-12.



**REMOVAL.**

**NOTE**

- If task is being performed to work on hub, go to step a.
  - If task is being performed for other reasons, go to step b.
- Remove tire and wheel assembly. Refer to paragraph 2-67.
  - Remove six bolts (1), lockwashers (2), hubcap (3), and gasket (4). Discard gasket.
  - Bend lockwasher (5) off of outer spindle nut (6).
  - Using wheel bearing nut wrench, remove outer spindle nut (6).
  - Remove lockwasher (5).



**REMOVAL. (Cont)**

- f. Using wheel bearing nut wrench, remove inner spindle nut (7).
- g. Remove tongue washer (8).

**NOTE**

- If tire and wheel assembly has been removed, go to step m.
- If tire and wheel assembly has not been removed, go to step h.

- h. Position wheel lift truck under tire and wheel and hub and drum assembly (9).
- i. Jack up lift arms of wheel lift truck until lift arms just touch tire (10).

**NOTE**

Outer bearing cup (11) will remain in hub (12) when outer bearing cone and rollers (13) is removed.

- j. Shake top of tire and wheel and hub and drum assembly (9) until outer bearing cone and rollers (13) moves out of hub (12). Remove outer bearing cone and rollers.
- k. Jack up lift arms of wheel light truck until tire and wheel and hub and drum assembly (9) can be pulled straight off spindle (14) without binding.

**WARNING**

Hold assembly firmly to wheel lift truck during movement. Tire and wheel and hub and drum assembly can cause injury to personnel by falling from wheel lift truck.

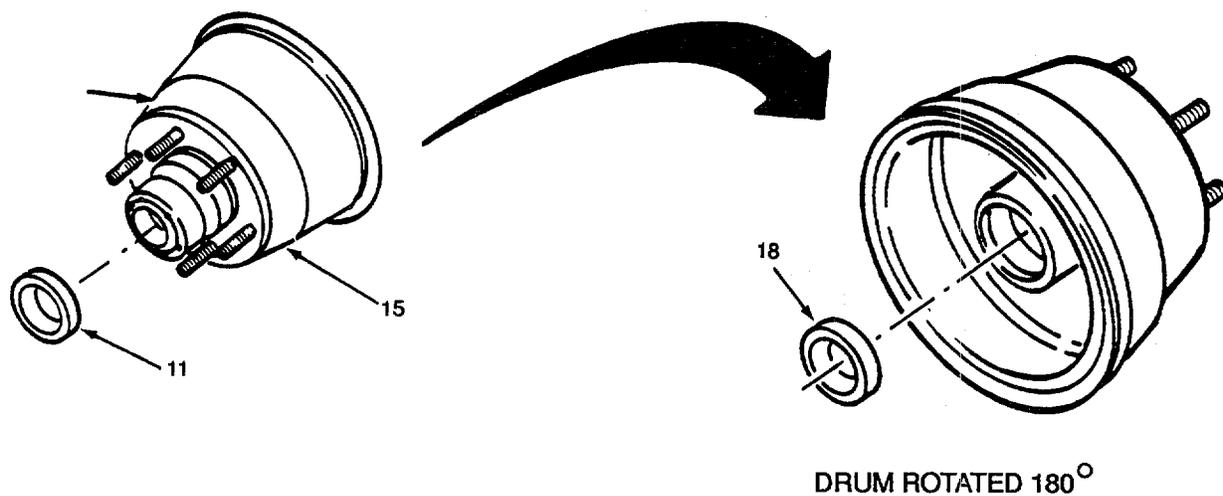
- l. Pull wheel lift truck with tire and wheel and hub and drum assembly (9) away from trailer. Go to step o.

**NOTE**

Outer bearing cup (11) will remain in hub (12) when outer bearing cone and rollers (13) is removed.

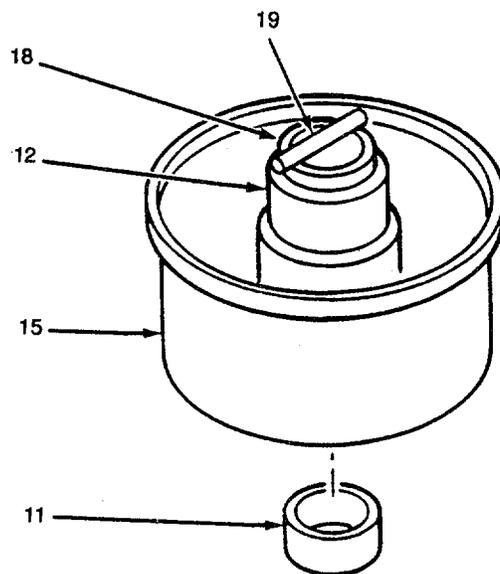
- m. Shake hub and drum assembly (15) until outer bearing cone and rollers (13) moves out of hub (12). Remove outer bearing cone and rollers.
- n. Remove hub and drum assembly (15).
- o. Remove inner wheel bearing (16) and seal (17) from spindle (14). Discard seal.

**REMOVAL. (Cont)**



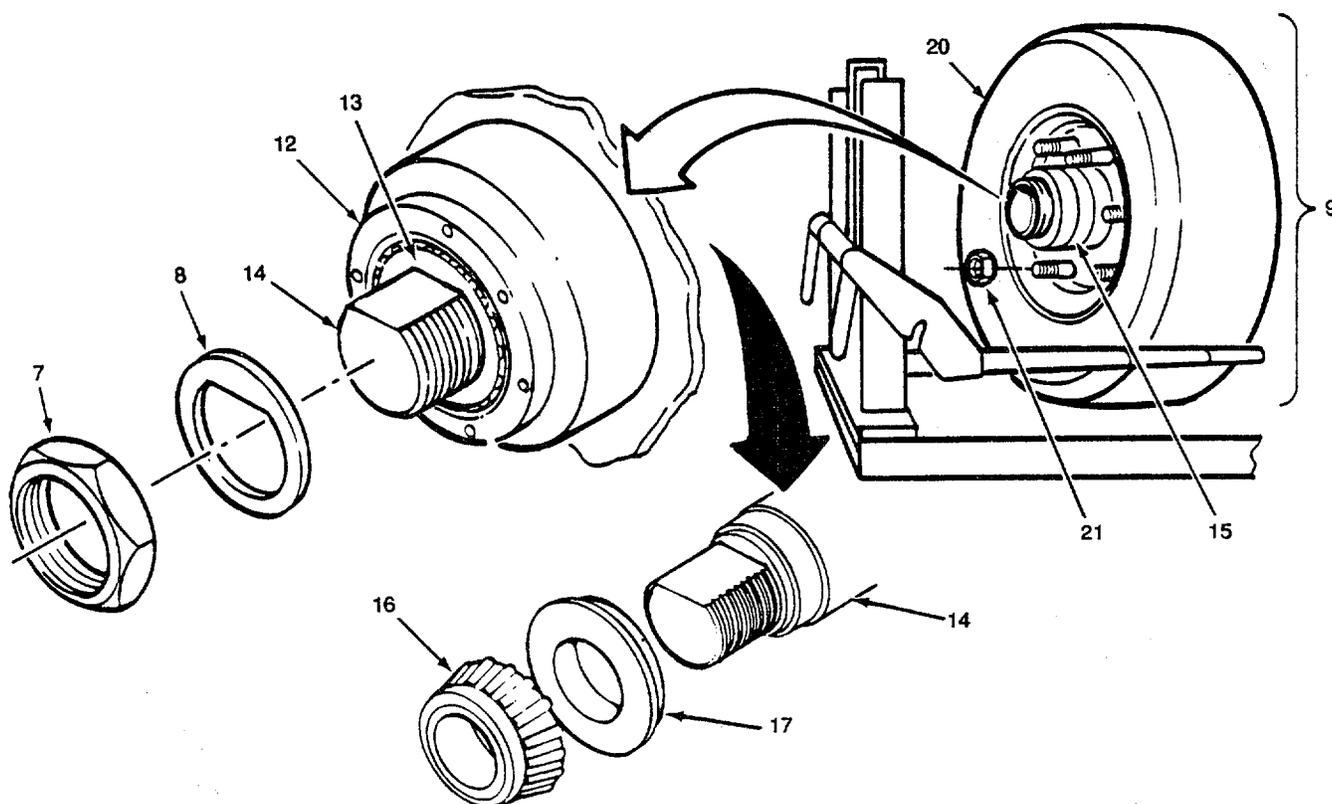
- p. Using bearing cup puller, remove outer bearing cup (11).
- q. Turn over hub and drum assembly (15).
- r. Using bearing cup puller, remove inner bearing cup (18).
- s. Service wheel bearings. Refer to paragraph 2-65.

**INSTALLATION.**



**INSTALLATION. (Cont)**

- a. Position inner bearing cup (18) in hub (12).
- b. Lay brass drift pin (19) across top of inner bearing cup (18).
- c. Using hammer, tap brass drift pin (19), move brass drift pin to another position on inner bearing cup (18), then tap again. Repeat until inner bearing cup is seated completely inside hub (12).
- d. Turn over hub and drum assembly (15) and repeat steps a thru c for outer bearing cup (11).



- e. Install new seal (17) and inner wheel bearing (16) on spindle (14).

**INSTALLATION. (Cont)**

**NOTE**

- If tire and wheel assembly was removed from hub and drum assembly, go to step f.
- If tire and wheel assembly was not removed from hub and drum assembly, go to step i.

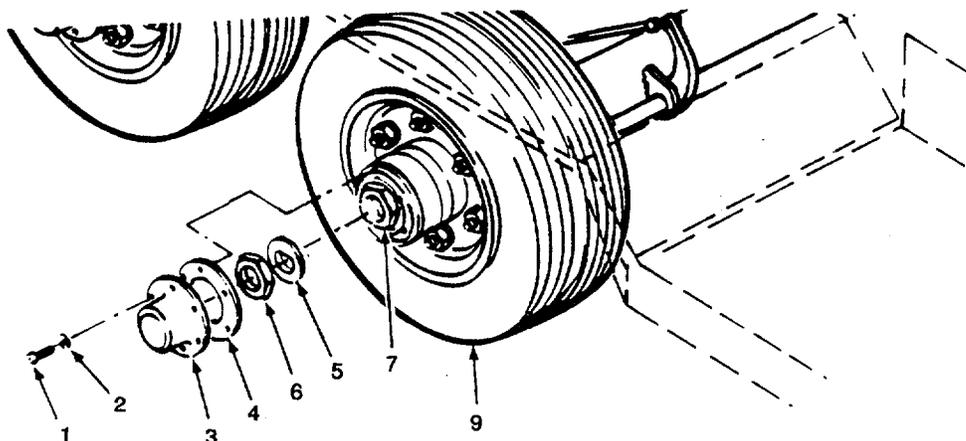
- f. Position tire and wheel assembly (20) on wheel lift truck.
- g. Position hub and drum assembly (15) in tire and wheel assembly (20).
- h. Install six lug nuts (21) and torque lug nuts to 250 pound-feet (339 N.m.)
- i. Push wheel lift truck with tire and wheel and hub and drum assembly (9) toward trailer so that hub (12) goes on spindle (14) without being forced.

**NOTE**

To ease installation of outer bearing cone and rollers, rock top and bottom of tire and wheel and hub and drum assembly on spindle while pushing in on bearing cone and rollers.

- j. Install outer bearing cone and rollers(13) in hub (12).
- k. Install tongue washer (8) and inner spindle nut (7). Tighten inner spindle nut fingertight.
- l. Lower lift arms of wheel lift truck clear of tire and wheel and hub and drum assembly (9) and move wheel lift truck away from trailer.

**ADJUST BEARINGS.**



**ADJUST BEARINGS. (Cont)**

- a. Rotate tire and wheel and hub and drum assembly (9). Using wheel bearing nut wrench, tighten inner spindle nut (7) until tire and wheel and hub and drum assembly binds.
- b. Loosen inner spindle nut (7) one-sixth turn, or until tire and wheel and hub and drum assembly (9) doesn't bind.
- c. Put one hand on bottom and one hand on top of tire and wheel and hub and drum assembly (9). Push with one hand and pull with the other hand. Tire and wheel and hub and drum assembly should not move.
- d. If tire and wheel and hub and drum assembly (9) moves, repeat steps a thru c.
- e. Install lockwasher (5). Bend one side of lockwasher over one flat of inner spindle nut (7).
- f. Using wheel bearing nut wrench, install outer spindle nut (6). Bend one side of lockwasher (5) over one flat of outer spindle nut.
- g. Install new gasket (4), hubcap (3), six lockwashers (2), and bolts (1).
- h. Raise leveling jacks until tire is firmly on ground. Refer to TM 10-4610-239-10.
- i. Stow leveling jacks in horizontal position.

---

**2-67. REPLACE TIRE AND WHEEL ASSEMBLY.**

This task covers: a. Removal. b. Installation.

---

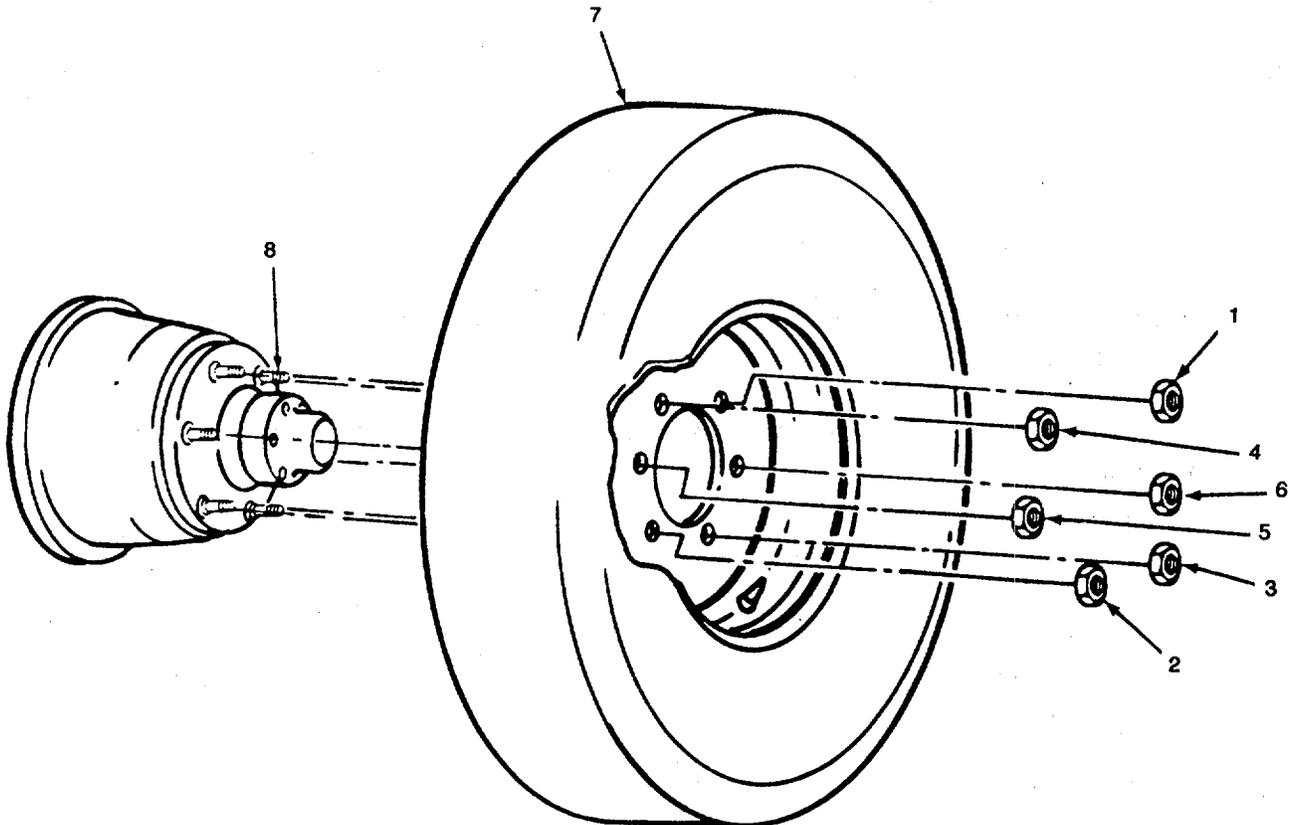
**INITIAL SETUP.**

- A Tools. Tool Kit (Appx B, Sect III, Item 10).  
Tool Kit (Appx B, Sect III, Item 7).
- b. Personnel Required. 2
- c. Equipment Condition. Trailer on flat and solid ground or floor.  
Trailer disconnected from towing vehicle.
- d. General Safety Requirements.

**WARNING**

Lifting heavy equipment incorrectly can cause serious injury. Do not lift more than 50 pounds yourself.

---



**REMOVAL.**

**WARNINGS**

- To avoid injury to personnel, tire removal should ONLY be done on solid ground, i.e., concrete or asphalt surfaces or hard ground or floors or similar hard surfaces.
  - To prevent the trailer from rolling or sliding, use blocks under the tires.
- a. If the front (trailer hitch) tire is being changed, block both rear (generator end) tires. If the rear (generator end) tire is being changed, block both front (trailer hitch end) tires.

**NOTE**

Do not remove lug nuts at this time.

- b. Using a standard lug nut wrench and handle, available from a towing vehicle, loosen lug nuts (1) thru (6).
- c. If the front (trailer hitch end) tire is being changed, rotate both front jack assemblies to the vertical position. If the rear (generator end) tire is being changed, rotate both rear jack assemblies to the vertical position.
- d. For each jack assembly, remove safety pin (1) and crank handle (2) clockwise to lower jack pad (5).

**NOTE**

The jacks should be lowered at the same time at the same speed.

- e. For each jack, install crank handle (2) on jack unit (4) and turn crank handle (2) clockwise to lower jack pad (5).
- f. Continue to lower both jack pads until the pads are firmly on the ground and the wheels are clear of the floor or ground.

**WARNING**

The tire and wheel assembly weight is 122 pounds (55.34 kg). Injury can occur if caution is not used when removing from hub. Place block or lug wrench under tire before removing wheel and tire to prevent injury to personnel.

- g. Carefully remove tire and wheel assembly (7) from studs (8).

**INSTALLATION.**

**WARNING**

The tire and wheel assembly is heavy. Two people are needed to lift it to prevent personal injury or damage to the equipment.

**CAUTION**

Be careful not to drag wheel across threads of studs. Studs could be damaged.

- a. Position tire and wheel assembly (7) on studs (8).
- b. Install six lug nuts (1) thru (6) fingertight.

**NOTE**

Do not fully tighten lug nuts at this time.

- c. Using lug nut wrench and handle, tighten lug nuts (1) thru (6) until snug.
- d. Raise leveling jacks until tires are firmly on ground. Refer to TM 10-4610--239-10.
- e. Using lug nut wrench and handle, tighten lug nuts in sequence (1) thru (6). Torque lug nuts to 250 pound-feet (339 N.m).
- f. Rotate leveling jacks to horizontal position and stow them. Refer to TM 10-4610-239-10.

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## 2-68. REPLACE AXLE ASSEMBLY.

This task covers: a. Removal. b. Installation.

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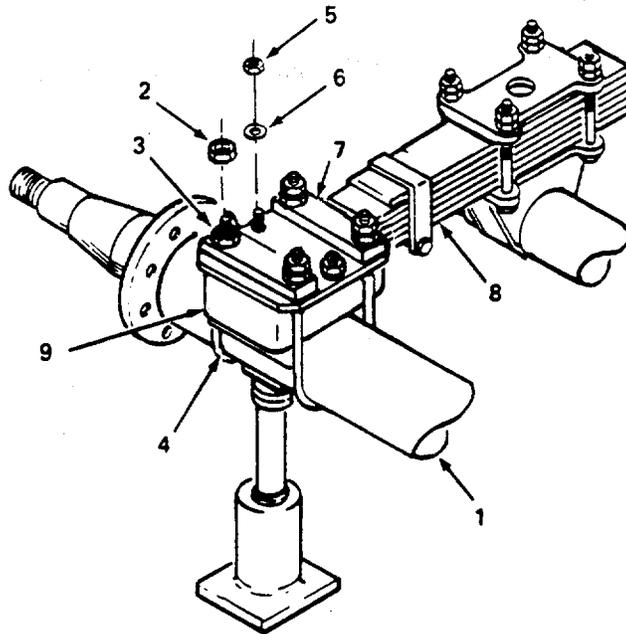
### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Tool Kit (Appx B, Sect III, Item 7).  
Two Hydraulic or Screw-Type Jacks (Appx B, Sect III, Item 7).
- b. Personnel Required: 2
- c. Equipment Condition Both hub and drum assemblies removed (paragraph 2-66).  
Both air chambers removed (paragraph 2-70).
- d. General Safety Requirements.

### WARNING

Lifting heavy equipment incorrectly can cause serious injury. Do not lift or move more than 50 pounds by yourself.

---



### REMOVAL.

- a. Using two hydraulic or screw-type jacks, support axle (1) to be removed at both ends.

**REMOVAL. (Cont)**

**WARNING**

The axle is heavy. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- b. Remove eight backing nuts (2), eight retaining nuts (3), and four U-bolts (4.).
- c. Remove four nuts (5), four washers (6), and two covers (7).
- d. Lower and remove axle.

**INSTALLATION.**

**WARNING**

The axle is heavy. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- a. Place axle (1) in position underneath flatbed cargo trailer with a hydraulic or screw-type jack supporting each end of axle.
- b. Raise axle (1) into position with springs (8) aligned with spring box (9).
- c. Install two covers (7), four washers (6), and four nuts (5).
- d. Install four U-bolts (4) around axle (1) and through cover (7).
- e. Install eight retaining nuts (3) and eight backing nuts (2).
- f. Torque retaining nuts (3) to 85-105 pound-feet (115.26-143.38 N.m) and install eight backing nuts (2) against them.
- g. Install two air chambers. Refer to paragraph 2-70.
- h. Install two hub and drum assemblies. Refer to paragraph 2-66.

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## 2-69. REPAIR HUB AND DRUM ASSEMBLY.

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

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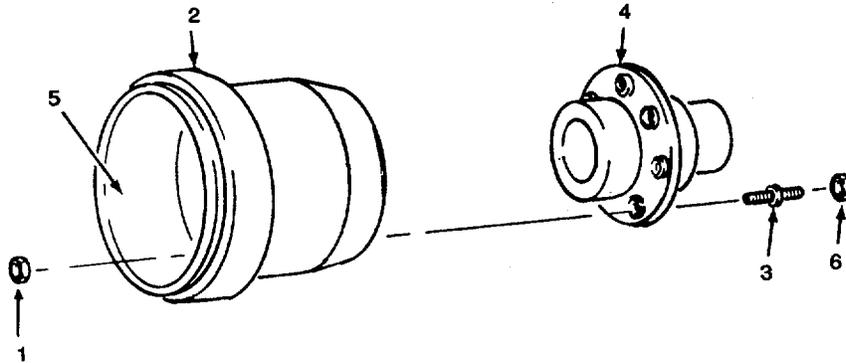
### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Materials/Parts. Drycleaning Solvent (Appx C, Sect II, Item 16).
- c. Equipment Condition. Hub and drum assembly removed (paragraph 2-66).
- d. General Safety Requirements.

### WARNING

Drycleaning solvent AAF11 Types I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

---



### DISASSEMBLY.

- a. Remove six nuts (1) and drum (2).
- b. Remove six studs (3) from hub (4).

**CLEANING.**

**WARNING**

Drycleaning solvent AAF11 Type I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Using drycleaning solvent, clean braking surface (5) of drum (2) and let air dry.
- b. Using drycleaning solvent, clean hub (4) and let air dry.

**INSPECTION.**

- a. Check that drum has no cracks. Replace as required.
- b. Check that braking surface (5) of drum is not scored. If braking surface is scored, send drum to Direct Support maintenance.
- c. Check that hub has no cracks. Replace as required.

**ASSEMBLY.**

**CAUTION**

- Stud threads can be damaged if hammer is used on end of studs. Use lug nuts to protect threads when installing studs.
  - Thread rotation on studs is different on each side of trailer. Install studs marked with L in hub and drum assemblies for roadside wheels. Install studs marked with R in hub and drum assemblies for curbside wheels.
- a. Install six lug nuts (6) on six studs (3) and install studs in hub (4).
  - b. Position hub (4) in drum (2) and install six nuts (1).

---

## 2-70. REPLACE AIR CHAMBER.

This task covers: a. Removal. b. Installation.

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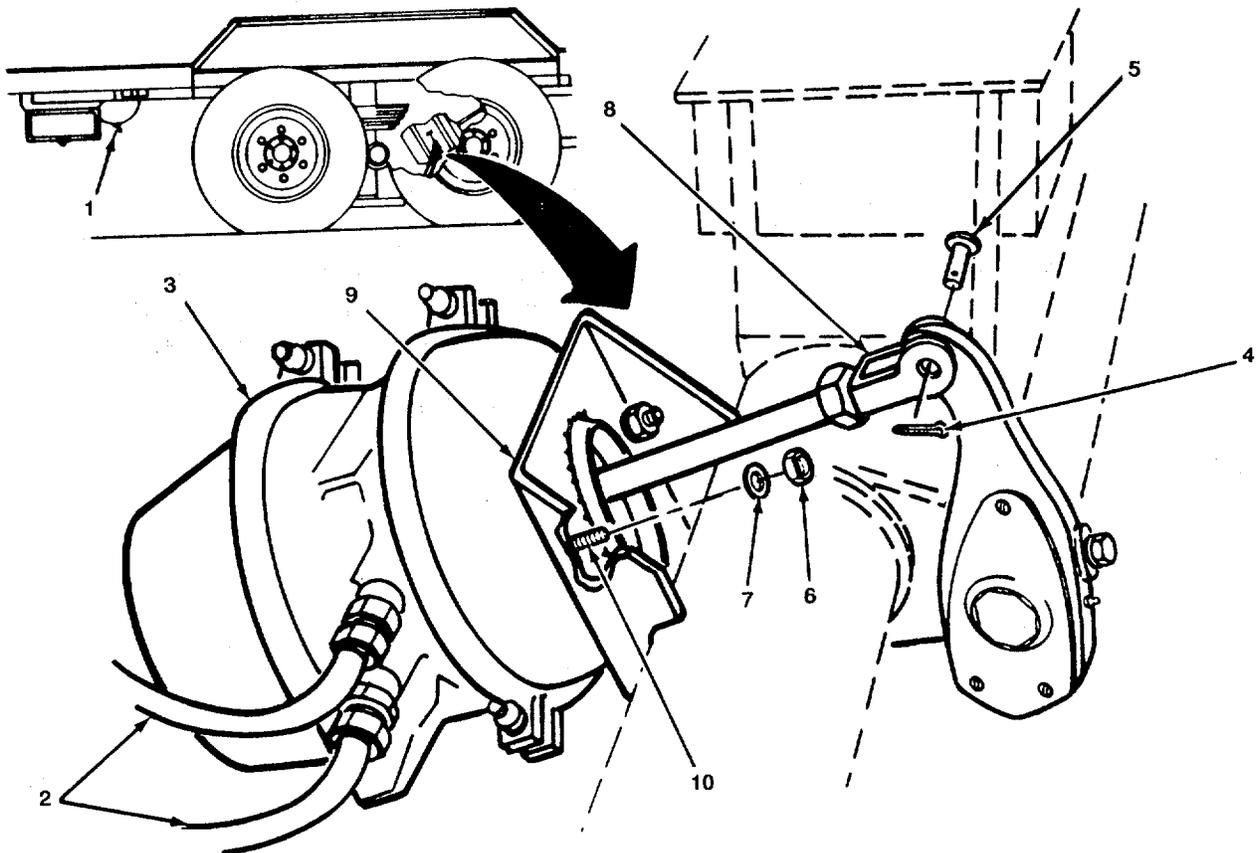
### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Towing Vehicle Equipped With Airbrakes.
- b. Equipment Condition. Airbrakes disconnected from towing vehicle  
(TM 10-4610-239-10)  
All four chamber compression springs caged (paragraph 2-47).
- c. General Safety Requirements.

### WARNING

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.

---



**REMOVAL.**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn relief valve T-handle slowly to avoid a sudden rush of air when releasing reservoir air pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

**NOTE**

Insure that airflow from reservoir has stopped before closing drain cock.

- b. Turn drain cock T-handle (1) clockwise to close drain cock.
- c. Tag and disconnect two hoses (2) from air chamber (3).
- d. Remove cotter pin (4) and clevis pin (5).
- e. While supporting air chamber (3), remove two nuts (6), and washers (7).
- f. Lower air chamber (3), guiding pushrod (8) through bracket (9).

**INSTALLATION.**

- a. Guide pushrod (8) and two mounting studs (10) through bracket (9) while positioning air chamber (3) against bracket.
- b. Install two washers (7) and nuts (6).

**WARNING**

Air chamber will lock brake if hoses are reversed when installed. A locked brake can result in injury to personnel and damage to equipment. Install hoses as tagged.

- c. Install clevis pin (5) and cotter pin (4).
- d. Install two hoses (2) as tagged.
- e. Connect flatbed cargo trailer air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- f. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- g. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.
- h. Adjust service brakes. Refer to paragraph 2-73.

---

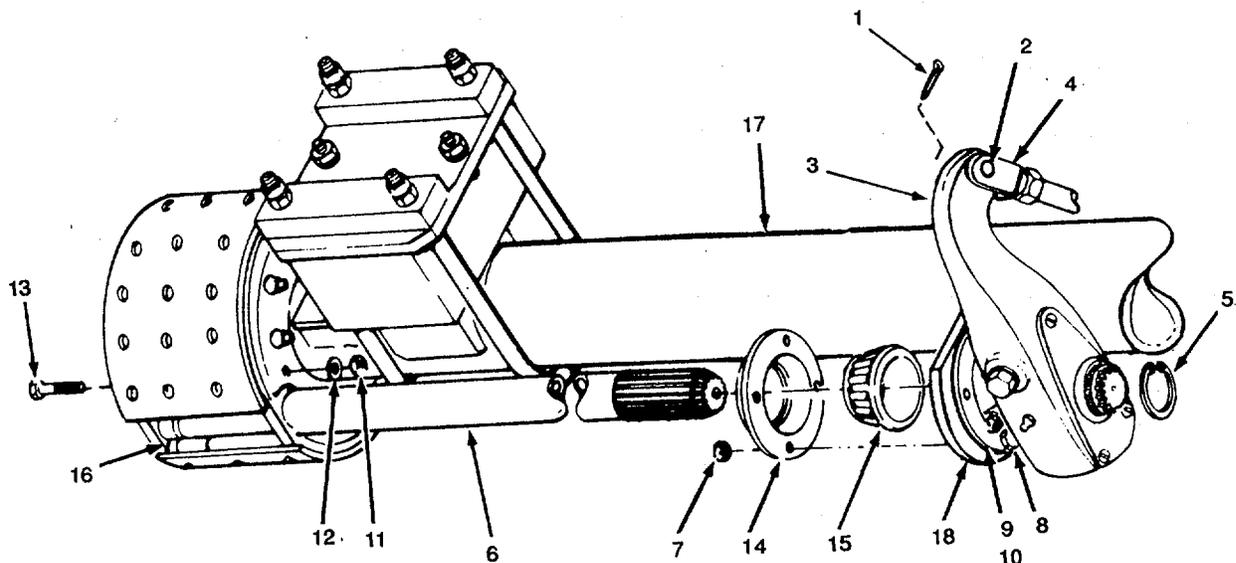
## 2-71. REPLACE SERVICE BRAKE ASSEMBLY.

This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Equipment Condition. Tire and wheel assembly and hub and drum assembly removed (paragraph 2-66).  
Trailer disconnected from towing vehicle (TM 10-4610-239-10).
- 



### REMOVAL.

- a. Remove cotter pin (1) and clevis pin (2). Separate slack adjuster (3) from air chamber pushrod clevis (4).
- b. Remove locking ring (5) and slack adjuster (3) from camshaft (6).
- c. Remove four nuts (7), four bolts (8), cover plate (9), and tapered bushing (10).

**REMOVAL. (Cont)**

- d. Remove eight nuts (11), washers (12), and bolts (13).

**CAUTION**

Pull brake assembly straight out from trailer. Any vertical or side-to-side movement can cause damage to splined end of camshaft.

**NOTE**

Cover plate (14) and tapered bushing (15) might slide off camshaft when camshaft is pulled through camshaft bracket.

- e. Remove brake assembly (16), tapered bushing (15), and cover plate (14) from axle (17) and camshaft bracket (18).

**INSTALLATION.**

- a. Position cover plate (14) and tapered bushing (15) on camshaft (6).

**CAUTION**

Guide camshaft into camshaft bracket. If camshaft does not enter straight, splined end can be damaged.

- b. Position brake assembly (16) on axle (17), guiding camshaft (6) through camshaft bracket (18).
- c. Install eight bolts (13), washers (12), and nuts (11).
- d. Position two tapered bushings (10) and (15) and two cover plates (9) and (14) on camshaft against camshaft bracket (18). Align four holes in cover plates with four holes in camshaft bracket.
- e. Install four bolts (8) and nuts (7).

**NOTE**

If hole in slack adjuster arm does not align with holes in clevis, adjust brake. Refer to paragraph 2-73.

- f. Position slack adjuster (3) on camshaft (6) with hole in slack adjuster arm aligned with holes in clevis (4).
- g. Install lockring (5).
- h. Install clevis pin (2) and cotter pin (1).
- i. Adjust service brakes. Refer to paragraph 2-73.

---

## 2-72. REPAIR SERVICE BRAKE ASSEMBLY.

This task covers: a. Disassembly. b. Cleaning c. Inspection. d. Assembly.

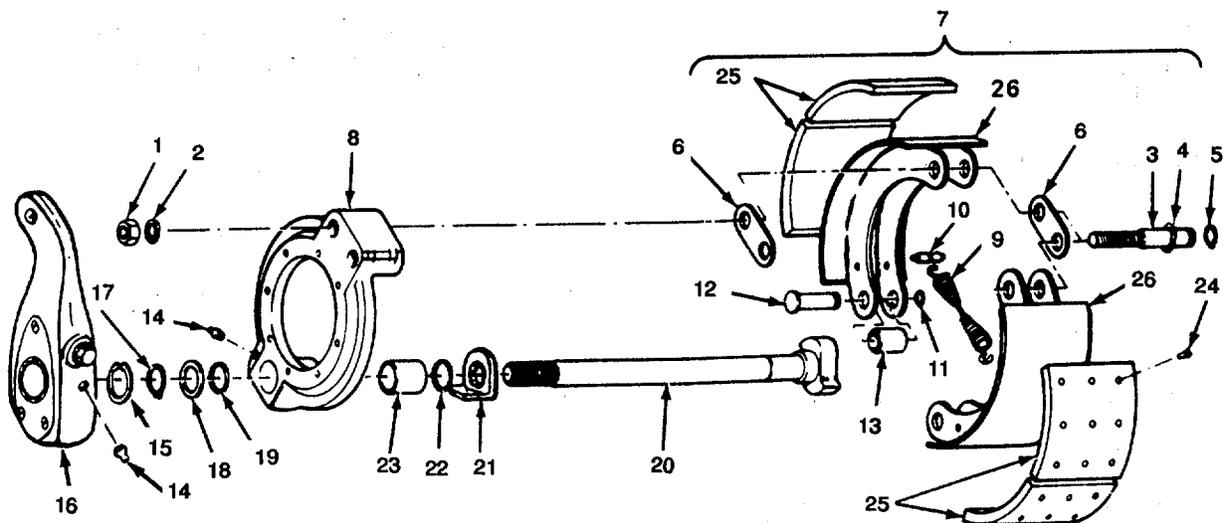
---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Stiff-Bristled Brush (Appx B, Sect III, Item 1).  
Soft-Bristled Brush (Appx B, Sect III, Item 2).  
Brake Spring Tool (Appx B, Sect III, Item 6).  
Hand Grease Gun (Appx B, Sect III, Item 6).
- b. Materials/Parts. Drycleaning Solvent (Appx C, Sect II, Item 16).  
Grease (Appx C, Sect II, Item 8).  
Rags (Appx C, Sect II, Item 13).
- c. Equipment Condition. Service brake assembly removed (paragraph 2-71).
- d. General Safety Requirements.

### WARNING

- Drycleaning solvent P-D-680 is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.
  - Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.
- 



**DISASSEMBLY.**

- a. Remove two anchor pin nuts (1), anchor pin lockwashers (2), anchor pins (:3), flat washers (4), retaining rings (5), and anchor pin links (6).
- b. Remove two flat washers (4) and retaining rings (5) from anchor pins (3).
- c. Remove brakeshoe assembly (7) from spider (8).
- d. Remove retract spring (9) and two retract spring pins (10).
- e. Remove two roller retaining rings (11), brake roller pins (12), and brake rollers (13).
- f. Remove two lubrication fittings (14).
- g. Remove cam lockring (17), camshaft spacer washer (18), and seal (19). Discard seal.
- h. Remove camshaft (20), camshaft retaining water (21), and seal (22). Discard seal.
- i. Using brass drift pin, tap spider bushing (23) out of spider (8).

**NOTE**

Do not perform step j unless brakeshoe linings are faulty.

- j. Remove rivets (24) and remove brakeshoe linings (25).

**CLEANING.**

- a. Using rags, wipe grease that is not solidified off all parts.

**WARNING**

Drycleaning solvent AAF11 Type I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

**NOTE**

Repeat steps b through d until all grease is removed.

- b. Soak spider, slack adjuster, and other parts, except brakeshoes, with solidified grease in drycleaning solvent for 1 hour.
- c. Using stiff-bristled brush, scrub grease off all parts except brakeshoes.
- d. Using clean, lint-free rags, wipe all parts dry.

**CLEANING. (Cont)**

**WARNING**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi (207 kPa) air pressure.

- e. Hold rags loosely over both ends of tube through spider to catch dirt and solvent. Blow low-pressure compressed air into lubrication fitting hole on spider.
- f. Move rags so that clean material is over ends of tube and blow air into lubrication fitting hole. Repeat until rags stay clean and dry.
- g. Hold rags loosely over both ends of splined tube through slack adjuster to catch dirt and solvent. Blow low-pressure compressed air into lubrication fitting hole on slack adjuster.
- h. Move rags so that clean material is over ends of tube and blow air into lubrication fitting hole. Repeat until rags stay clean and dry.
- i. Using soft-bristled brush, sweep dirt and metal filings off brakeshoes and brakeshoe linings.

**INSPECTION.**

**NOTE**

Replace all four brakeshoe linings as a set.

- a. Inspect brakeshoe linings for excessive or uneven wear. Remove faulty linings and send brakeshoes to Direct Support Maintenance.
- b. Inspect brakeshoe linings for oil or grease. Remove damaged linings and send brakeshoes to Direct Support Maintenance.
- c. Inspect splines of camshaft and slack adjuster for chipping, cracking, or excessive wear. Replace as required.
- d. Inspect washers, bushing, anchor pin links, anchor pins, brake roller pins, and bearing surfaces of camshaft and spider for excessive wear or deformity. Replace as required.
- e. Inspect spring for cracks or deformity. Replace as required.
- f. Inspect retract spring pins for stuck or missing end pins, excessive wear, or deformity. Replace as required.

**ASSEMBLY.**

- a. Using brass drift pin, tap spider bushing (23) into spider (8).
- b. Install new seal (22), camshaft retaining washer (21), and camshaft (20).
- c. Install new seal (19), camshaft spacer washer (18), and cam lockring (17).
- d. Install two lubrication fittings (14).
- e. Using hand grease gun, force grease into spider lubrication fitting (14) until grease comes out along camshaft (20). Wipe off grease.
- f. Using hand grease gun, force grease into spider lubrication fitting (14) until grease comes out along camshaft (20). Wipe off grease.
- g. Install two brake rollers (13), brake roller pins (12), and roller retaining rings (11).
- h. Install one retract spring pin (10) in each brakeshoe (26).
- i. Install one end of retract spring (9) on one retract spring pin (10).
- j. Install free end of retract spring (9) on other retract spring pin (10).
- k. Install tow retaining rings (5) and flat washers (4) on two anchor pins (3).
- l. Position two anchor pin links (6) on opposite sides of brakeshoes (26).
- m. Push free ends of brakeshoes together while inserting two anchor pins (3) through brakeshoes (26) and anchor pin links (6).
- n. Install two anchor pin lockwashers (2) and anchor pin nuts (1).
- o. Adjust service brakes. Refer to paragraph 2-73.



**ADJUST. (Cont)**

- c. Back off slack adjuster arm (4) until drag just stops. Note position of slack adjuster arm with respect to clevis (5).

**NOTE**

- If hole in slack adjuster arm aligns with hole in clevis, go to step k.
- If slack adjuster arm is completely clear of clevis, go to step d.
- If slack adjuster arm is within clevis, but holes don't line up, go to step g.

- d. Remove lockring (6) and slack adjuster (7).

- e. Rotate slack adjuster (7) to align hole in arm (4) with hole in clevis (5) and install slack adjuster and lockring (6).

- f. Rotate hub and drum assembly (3) by hand rotating slack adjuster arm (4). Check alignment with holes in clevis (5) at point where drag begins.

**NOTE**

- If hole in slack adjuster arm aligns with hole in clevis, go to step k.
- If not, go to step g.

- g. Loosen jamnut (8) to allow clevis (5) to rotate.

- h. Rotate slack adjuster arm (4) out of clevis (5).

**NOTE**

Adjust clevis one or two turns at a time, rotating slack adjuster arm back into position to check alignment before adjusting clevis more.

- i. Rotate clevis (5) on pushrod (9) until in clevis aligns with hole in slack adjuster arm (4).

- j. Tighten jamnut (8) against clevis (5).

- k. Install clevis pin (2) and cotter pin (1).

**Section XI. ROWPU ASSEMBLY MAINTENANCE PROCEDURES**

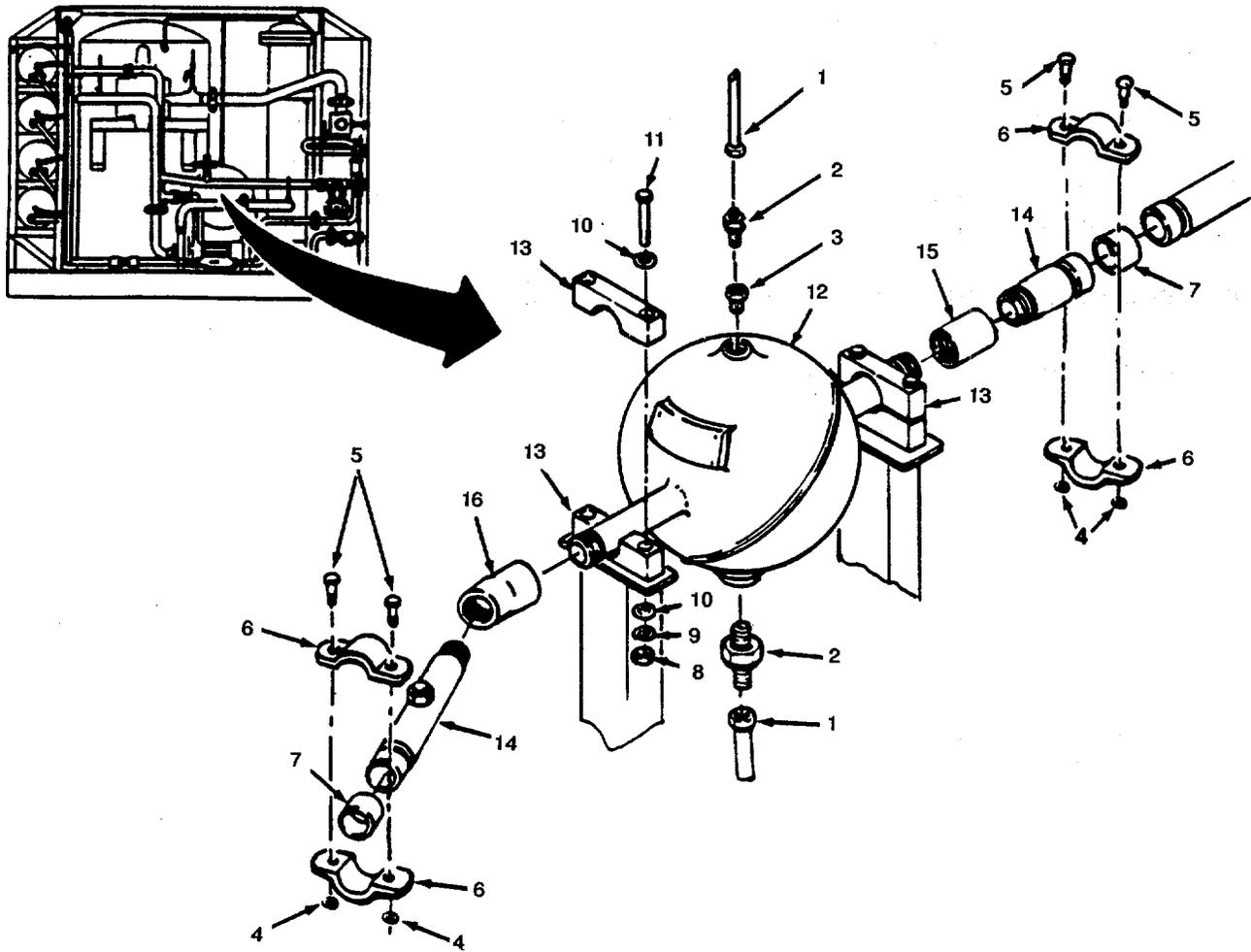
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**2-74. REPLACE PULSE DAMPENER.**

This task covers: a. Removal. b. Installation.

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Materials/Parts. Antiseize Tape (Appx C, Sect II, Item 17).
- c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).



**REMOVAL.**

- a. Support pulse dampener (12) and remove two supports (13).
- b. Remove four nuts (4) and screws (5) and two clamps (6) and gaskets (7).
- c. Remove two tubes (1) and two adapters (2) and bushing (3).
- d. Remove four nuts (8) and lockwashers (9), eight flat washers (10), and four screws (11). Discard lockwashers.
- e. Remove two pipe sections (14), pipe coupling (15), and elbow (16).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to pipe threads before installation.

- a. Install elbow (16), pipe coupling (15), and two pipe sections (14).
- b. Position pulse dampener (12) on two supports (13) and install four screws (11), eight flat washers (10), and four new lockwashers (9) and nuts (8).
- c. Install two gaskets (7) and clamps (6) and four screws (5) and nuts (4).
- d. Install bushing (3) and two adapters (2) and two tubes (1).

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## 2-75. REPLACE STORAGE BOX.

This task covers: a. Removal. b. Installation.

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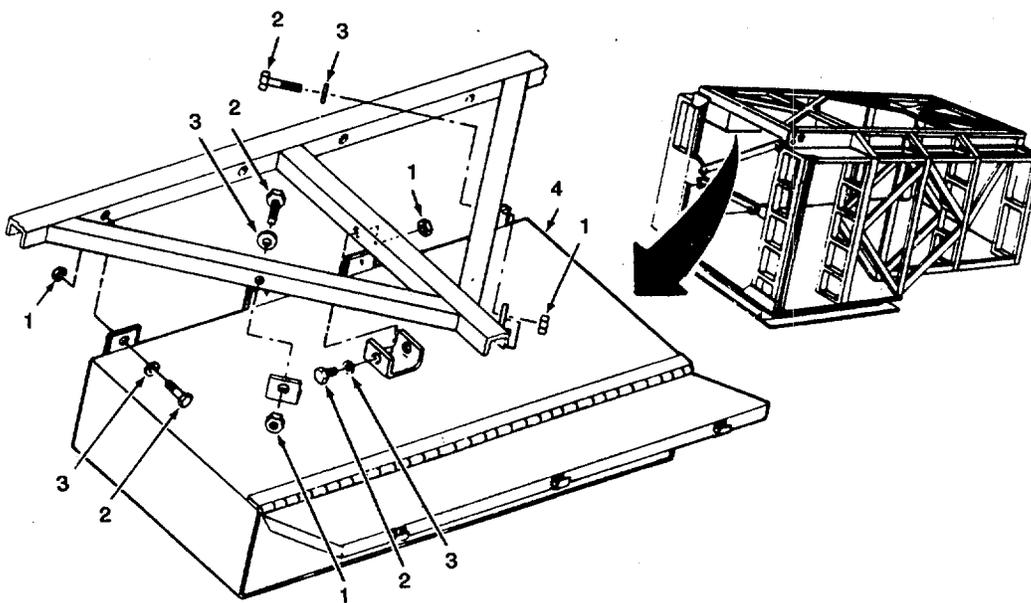
### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Personnel Required. 2
- c. General Safety Requirements.

### WARNING

Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.

---



### REMOVAL.

### WARNING

The storage box is heavy/difficult to handle. Two people are needed to lift it to prevent personal injury or damage to the equipment.

**REMOVAL. (Cont)**

**NOTE**

Support storage box to prevent falling when last mounting bolt is removed.

- a. Remove seven nuts (1), bolts (2), and lockwashers (3). Discard lockwashers.
- b. Lower storage box (4) and remove.

**INSTALLATION.**

- a. Lift storage box (4) in place and align mounting holes.
- b. Install seven bolts (2), new lockwashers (3), and nuts (1).

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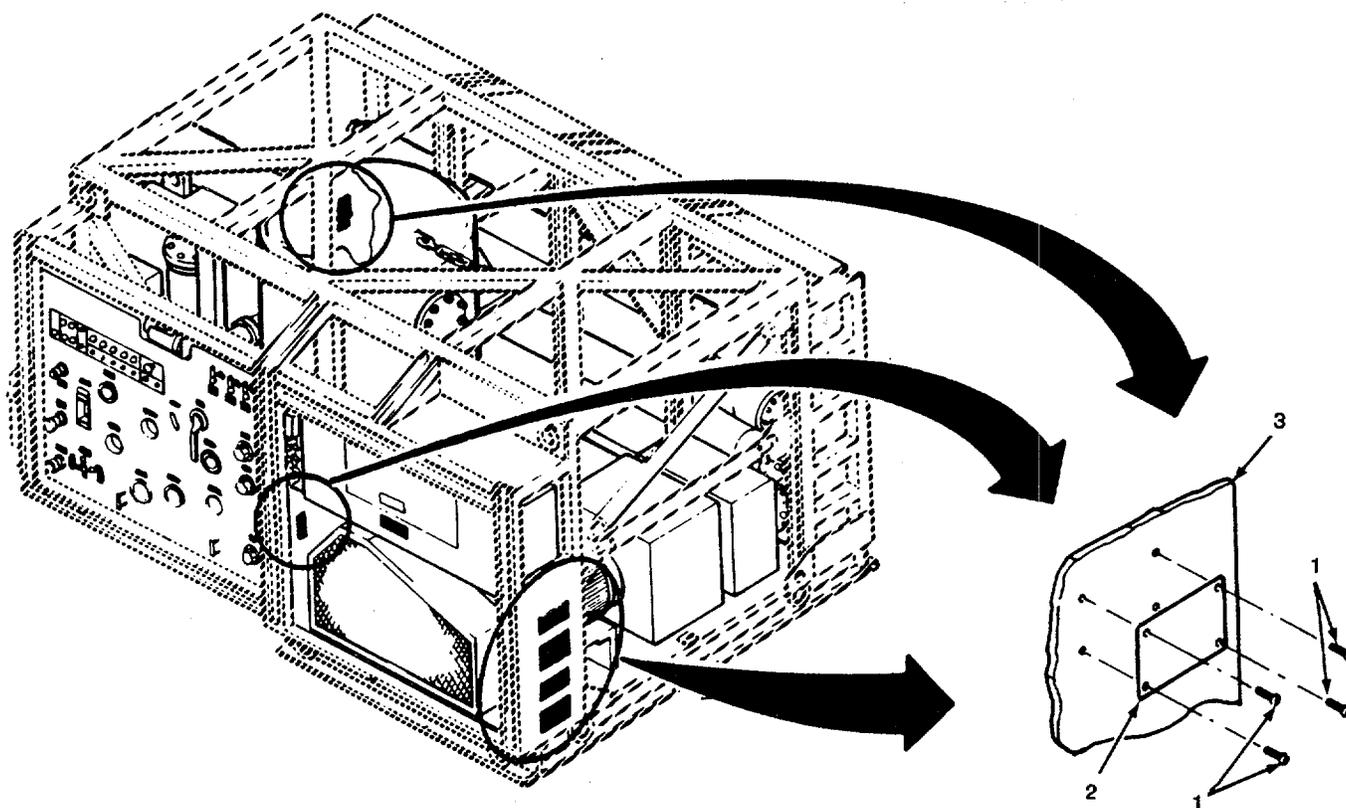
## 2-76. REPLACE DATA AND INSTRUCTION PLATES.

This task covers: a. Removal. b. Cleaning. c. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Sandpaper (Appx C, Sect II, Item 15).
- 



### REMOVAL.

#### NOTE

Data and instruction plates are installed on the ROWPU with screws or rivets.

- a. Remove screws or rivets (1).
- b. Remove data or instruction plate (2).

**CLEANING.**

- a. Using sandpaper, clean dirt and corrosion from surface of ROWPU.
- b. Wipe surface with a clean cloth.

**INSTALLATION.**

- a. Touch up paint on surface of ROWPU. Refer to TM 9-213, TM 43-019, and TM 740-90-1.
- b. Position data or instruction plate (2) on ROWPU frame (3).
- c. Install screws or rivets (1).

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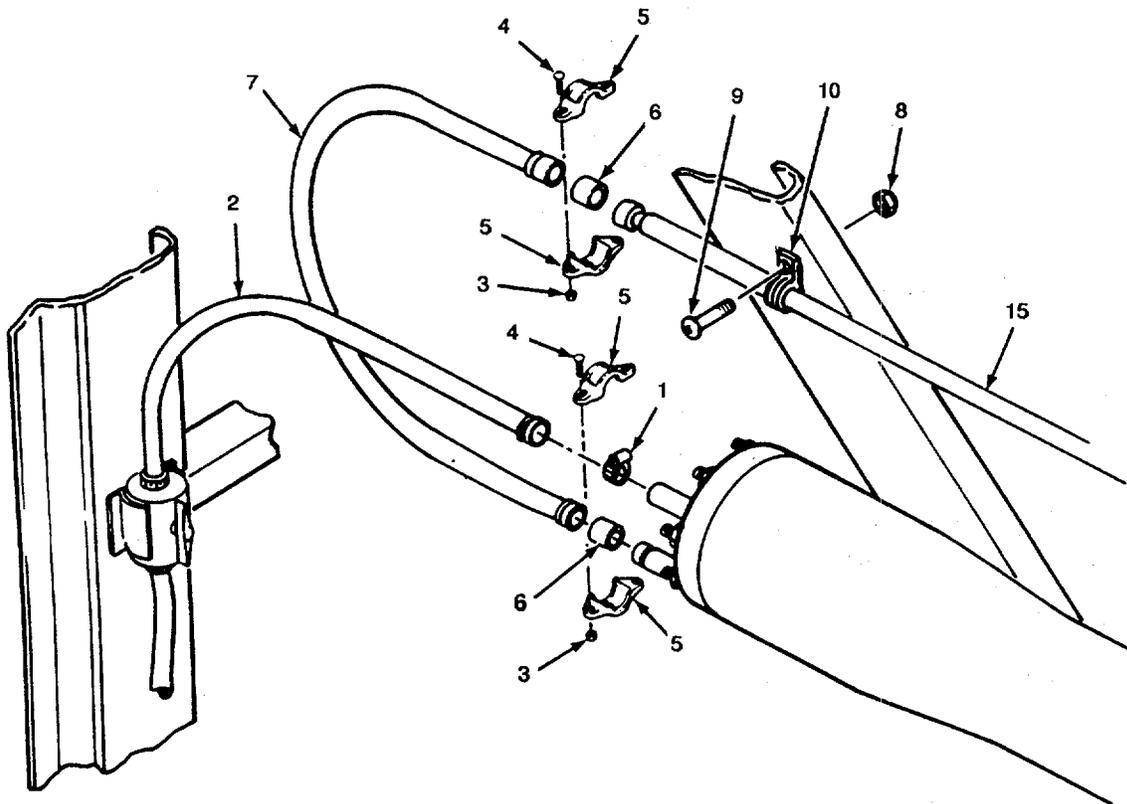
**2-77. REPLACE R.O. PRESSURE TUBE PIPING. (MODEL NO. 0996109001) (ARMY)**

This task covers: a. Removal. b. Installation.

---

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Nomex Tape (Appx C, Sect II, Item 19).
  - c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- 

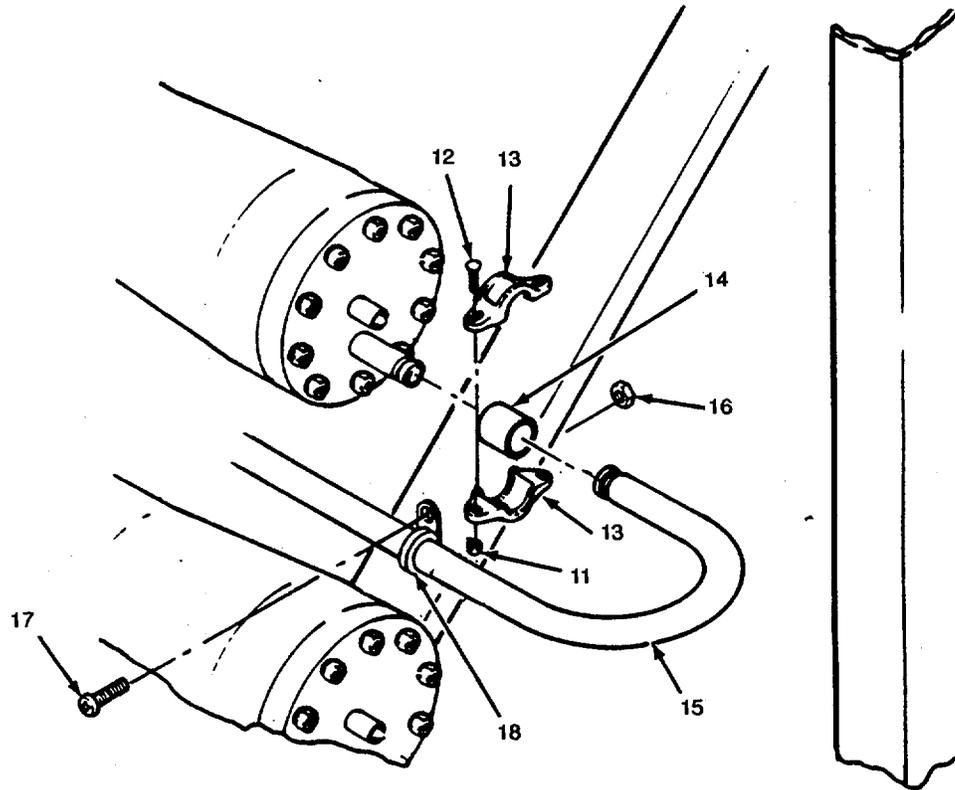


**REMOVAL.**

- a. At each end of all four R.O. pressure tubes, loosen hose clamp (1) and remove flexible tubing (2).
- b. At input end of all four R.O. pressure tubes, remove four nuts (3) and bolts, (4), two clamps (5) and gaskets (6), and pipe section (7).

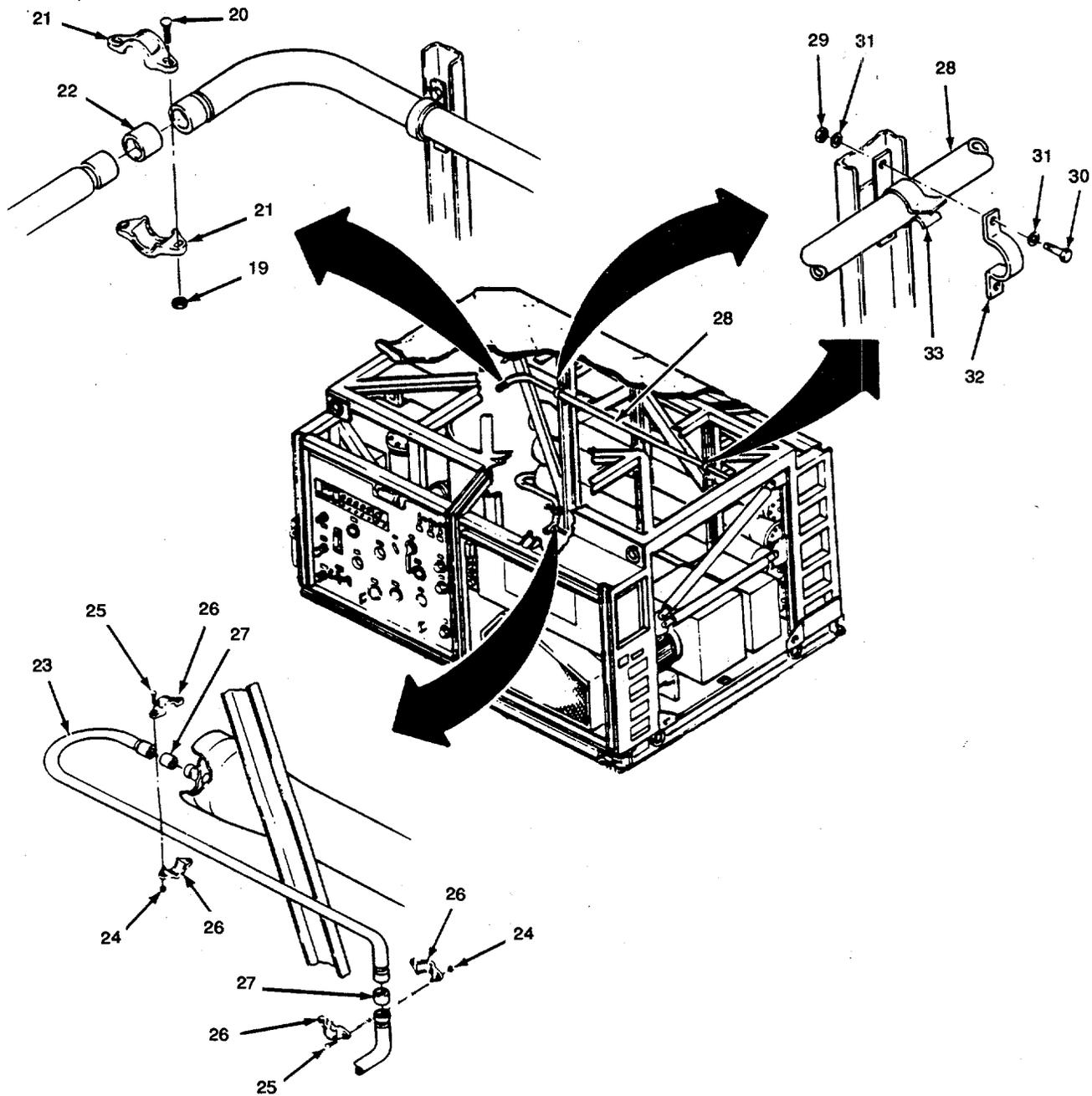
**REMOVAL. (Cont)**

- c. At input end of each of the bottom three R.O. pressure tubes, remove nut (8), screw (9), and clamp (10).



- d. At output end of each of the top three R.O. pressure tubes, remove two nuts (11) and bolts (12), clamp (13), and gasket (14).
- e. While supporting pipe section (15), remove nut (16), bolt (17), and clamp (18). Remove pipe section.

REMOVAL. (Cont)



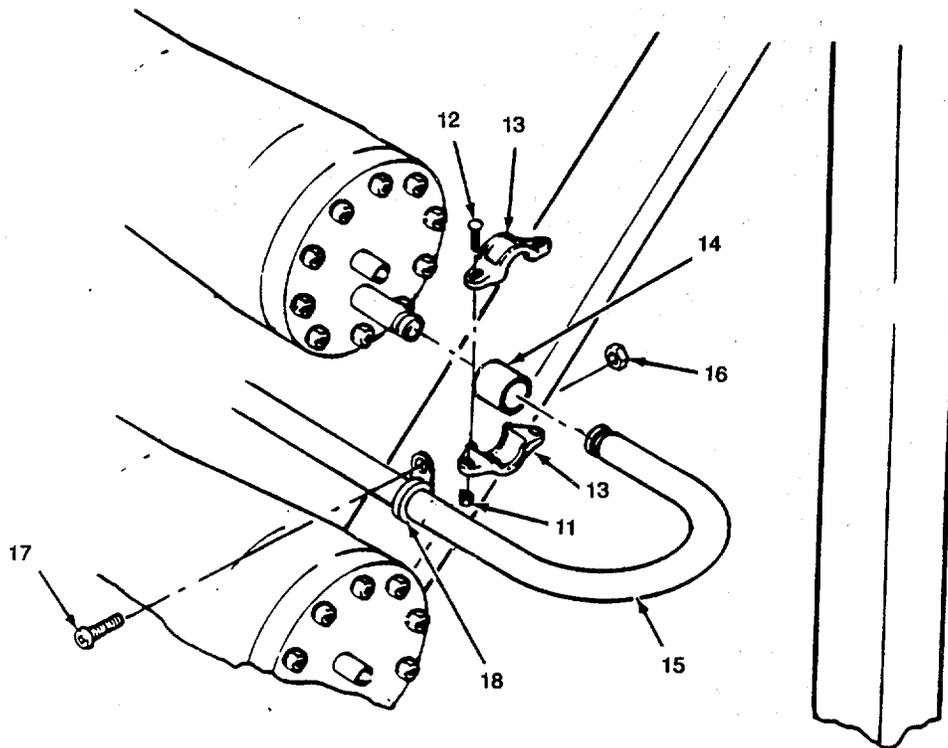
- f. Remove two nuts (19) and bolts (20), clamp (21), and gasket (22).
- g. While supporting pipe section (23), remove four nuts (24) and bolts (25) and two clamps (26) and gaskets (27). Remove pipe section.
- h. While supporting pipe section (28), remove four nuts (29) and screws (30), eight washers (31), and two clamps (32) and tapes (33). Remove pipe section.

**INSTALLATION.**

**CAUTION**

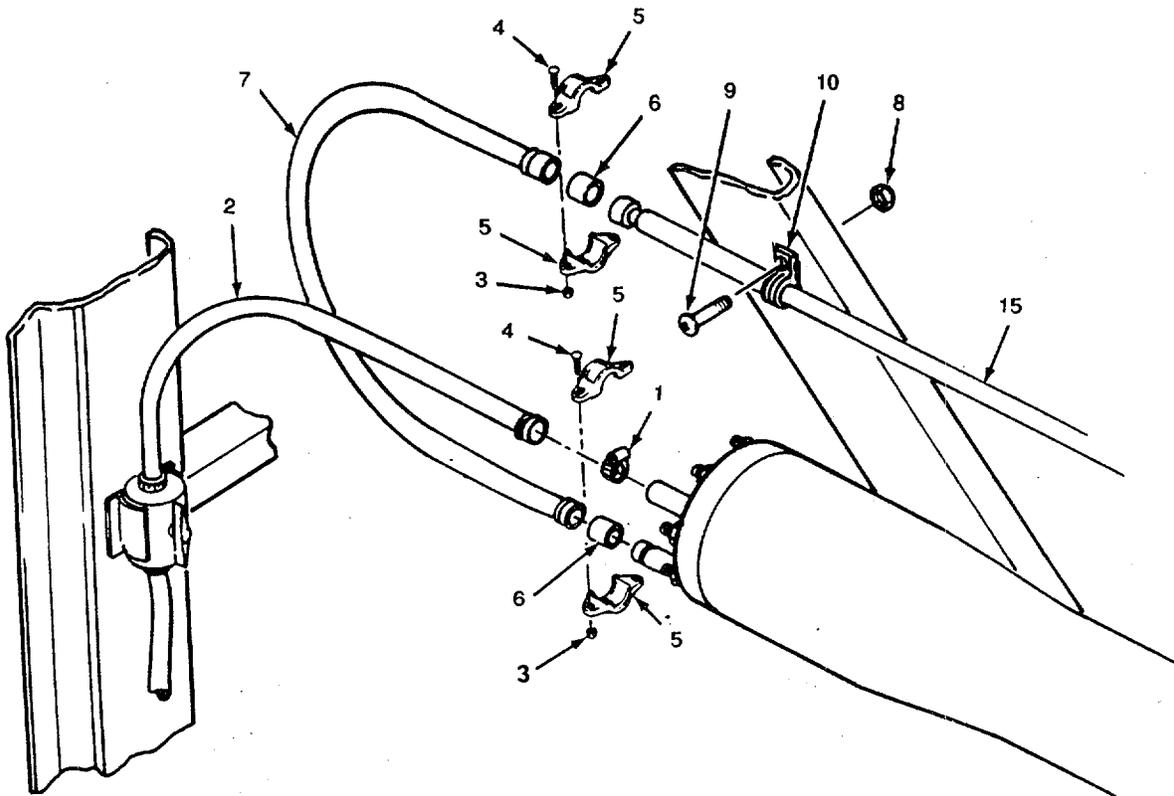
Pipe section (28) can be badly damaged by corrosion if it is installed in contact with frame or clamps. Ensure Nomex tape separates pipe section from frame and clamp.

- a. Position pipe section (28) and install two tapes (33) and clamps (32), four screws (30), eight washers (31), and four nuts (29).
- b. Position pipe section (23) and install two gaskets (27) and clamps (26) and four bolts (25) and nuts (24).
- c. Install gasket (22) and clamp (21) and two bolts (20) and nuts (19).



- d. At output end of each of the top three R.O. pressure tubes, position pipe section (15) and install clamp (18), bolt (17), and nut (16).
- e. Install gasket (14), clamp (13), and two bolts (12) and nuts (11).

INSTALLATION. (Cont)



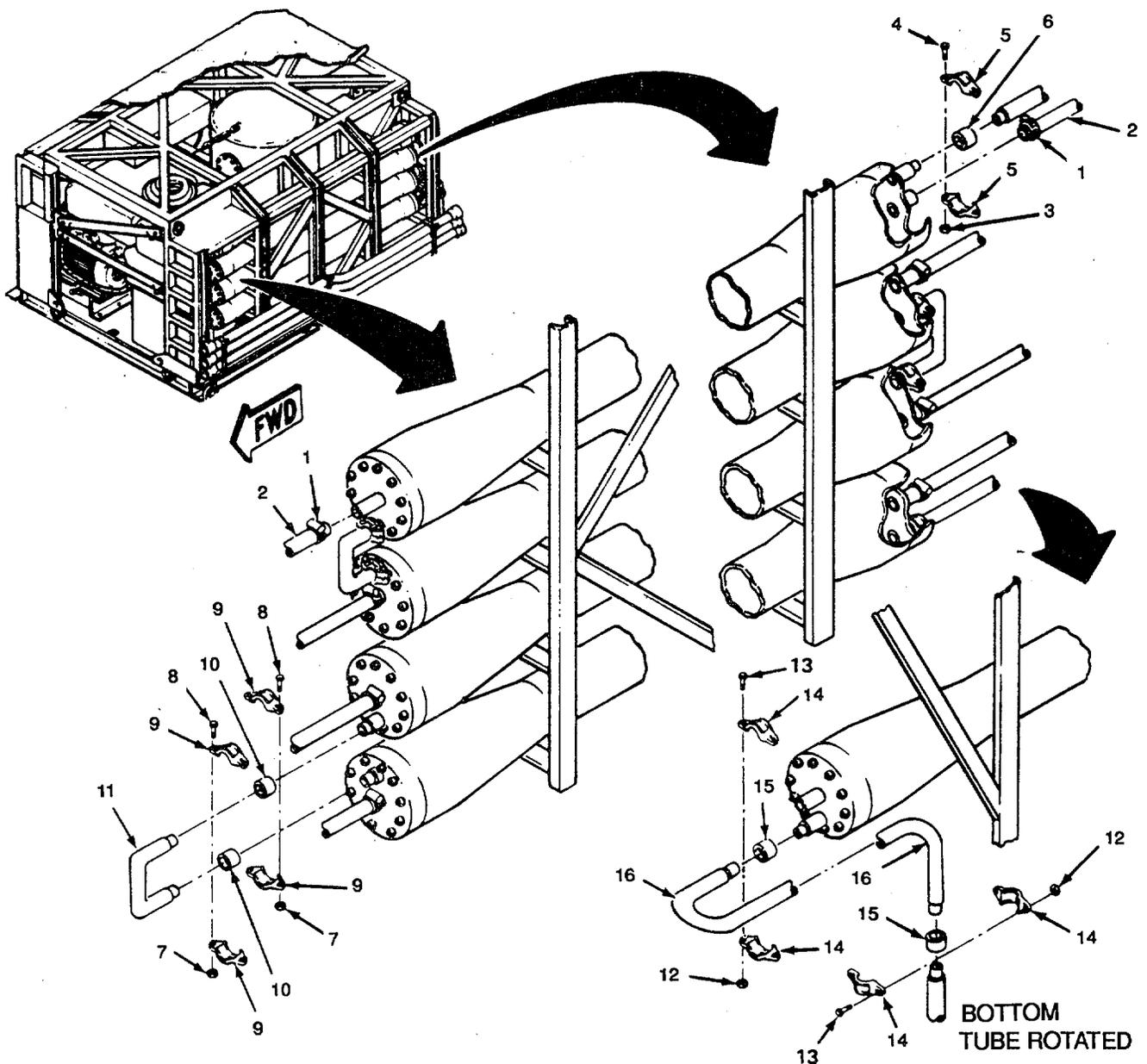
- f. At input end of each of the bottom three R.O. pressure tubes, position pipe section (15) and install clamp (10), screw (9), and nut (8).
- g. At input end of all four R.O. pressure tubes, position pipe section (7) and install two gaskets (6) and clamps (5) and four bolts (4) and nuts (3).
- h. At each end of all four R.O. pressure tubes, install flexible tubing (2) and tighten hose clamp (1).

**2-78. REPLACE R.O. PRESSURE TUBE PIPING. (MODEL NO. 0996108001) (MARINE CORPS)**

This task covers: a. Removal. b. Installation.

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).



**REMOVAL.**

- a. At both ends of all four R.O. pressure tubes, loosen eight hose clamps (1) and remove eight flexible tubes (2).
- b. At aft end of top R.O. pressure tube, remove two nuts (3) and screws (4), clamp (5), and gasket (6).
- c. At aft end of middle 2 R.O. pressure tubes and at forward end of all 4 tubes, remove 12 nuts (7) and screws (8), 6 clamps (9) and gaskets (10), and 3 pipe sections (11).
- d. At aft end of bottom R.O. pressure tube, remove four nuts (12) and screws (13), two clamps (14) and gaskets (15), and pipe section (16).

**INSTALLATION.**

- a. At aft end of bottom R.O. pressure tube, position pipe section (16) and install two gaskets (15) and clamps (14) and four screws (13) and nuts (12).
- b. At aft end of middle 2 R.O. pressure tubes and at forward end of all 4 tubes, position 3 pipe sections (11) and install 6 gaskets (10) and clamps (9) and 12 screws (8) and nuts (7).
- c. At aft end of top R.O. pressure tube, install gasket (6), clamp (5), and two screws (4) and nuts (3).
- d. At both ends of all four R.O. pressure tubes, install eight flexible tubes (2) and tighten eight hose clamps (1).

## **2-79. REPLACE CARTRIDGE FILTER.**

This task covers: a. Removal. b. Installation.

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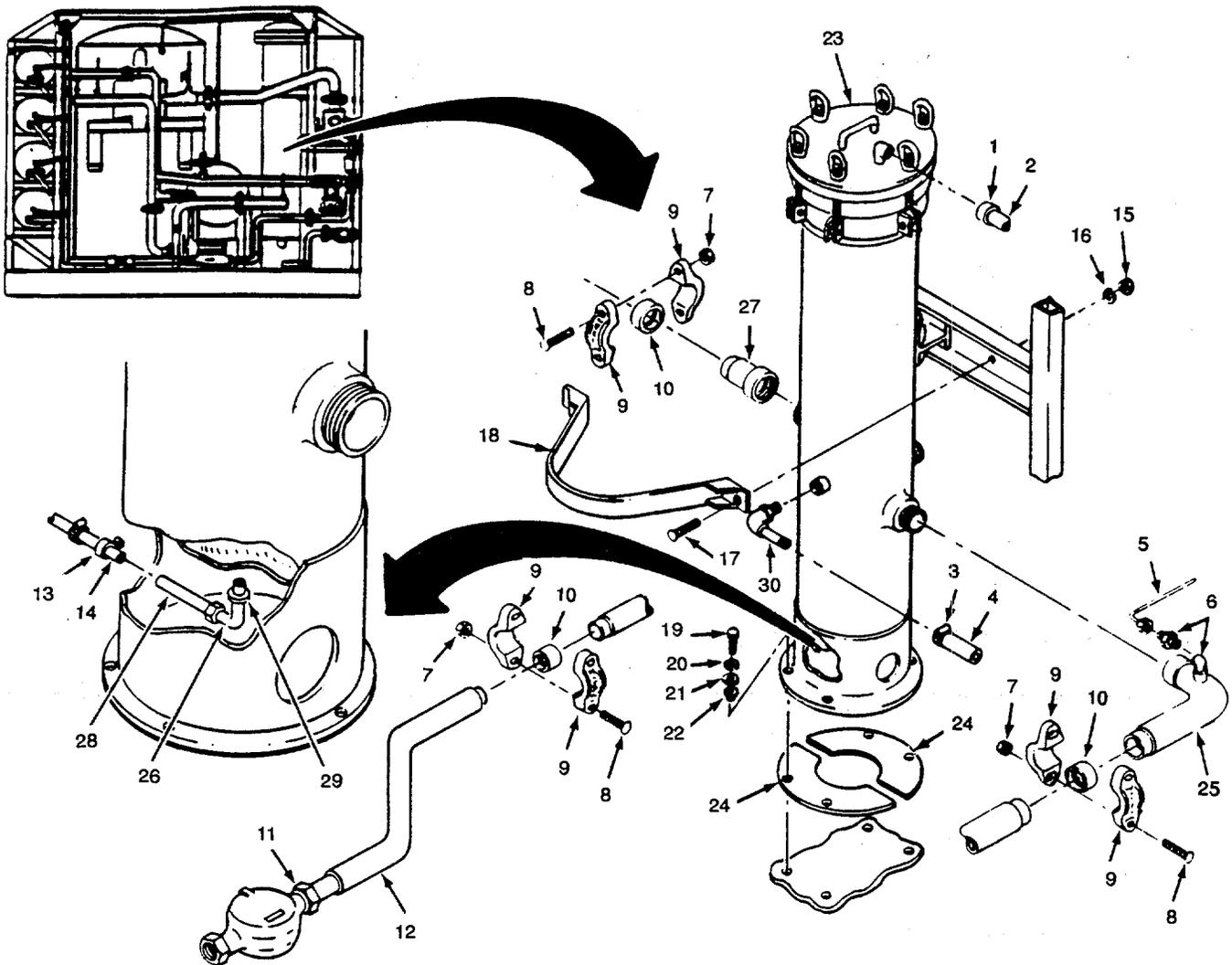
### **INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect HIII, Item 10).
- b. Materials/Parts. Antiseize Tape (Appx C, Sect II, Item 17).
- c. Personnel Required. 3
- d. Equipment Condition. ROWPU shut down (TM 10-4610-239-10).
- e. General Safety Requirements.

### **WARNING**

Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.

---



**REMOVAL.**

- a. Release quick-disconnect (1) and remove.
- b. Loosen hose clamp (3) and remove flexible tubing (4) from nipple (30).
- c. Remove tubing (5) from elbow and adapter (6).
- d. Remove six nuts (7), six screws (8), three clamps (9), and three gaskets (10).
- e. Loosen nut (11) and remove pipe section with nipple (12).
- f. Loosen hose clamp (13) and remove flexible tubing (14).
- g. Remove two nuts (15), lockwashers (16), screws (17), and bracket (18). Discard lockwashers.
- h. Remove elbow (25) and adapter (27).

**REMOVAL. (Cont)**

- i. Remove four screws (19), lockwashers (20), flat washers (21), and bushings (22).

**CAUTION**

Removal of cartridge filter requires the use of a crane rated at 1 ton (0.91 tonne) or greater in order to prevent damage to equipment.

- j. Using lifting equipment and two assistants, tilt cartridge filter (23) and remove it from ROWPU.
- k. Remove two gasket halves (24) from ROWPU deck.
1. Remove elbow (26), nipple (28), and adapter (29).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to pipe threads before installation.

- a. Install adapter (29), elbow (26), and nipple (28).
- b. Position two gasket halves (24) on ROWPU deck. Align holes with threaded inserts on ROWPU frame.

**CAUTION**

Installation of cartridge filter requires the use of a crane rated at 1 ton (0.91 tonne) or greater in order to prevent damage to equipment.

- c. Using lifting equipment and two assistants, lift cartridge filter (23) and position on ROWPU. Align mounting holes with holes in gasket halves (24).
- d. Install four bushings (22), four flat washers (21), four lockwashers (20), and four screws (19).
- e. Position bracket (18) and install two screws (17), two lockwashers (16), and two nuts (15).
- f. Install elbow (25) and adapter (27).
- g. Install flexible tubing (14) on nipple (28) and tighten hose clamp (13).
- h. Position pipe section with nipple (12) and tighten nut (11).
- i. Install three gaskets (10), three clamps (9), six screws (8), and six nuts (7).
- j. Install tubing (5) on elbow and adapter (6).
- k. Install flexible tubing (4) on nipple (30) and tighten hose clamp (3).
- l. Install flexible tubing (2) and tighten quick-disconnect (1).

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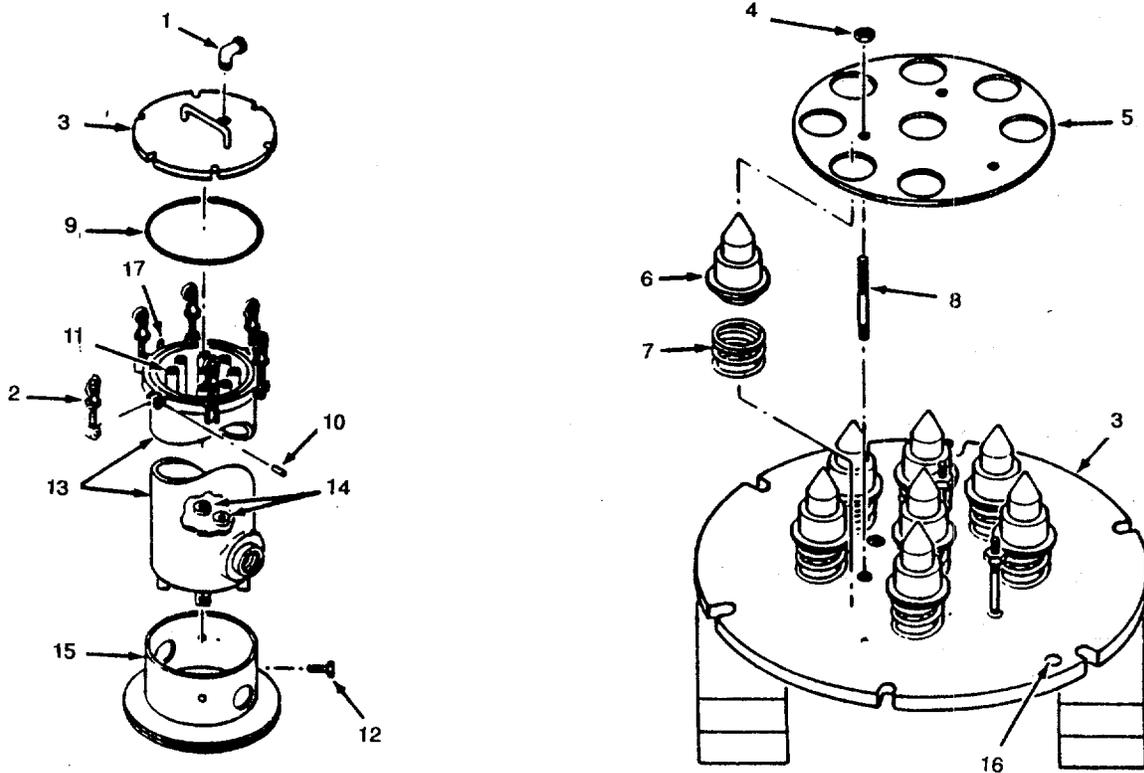
## 2-80. REPAIR CARTRIDGE FILTER. (FILTRITE AND PECO)

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

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### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sec III, Item 10).
  - b. Materials/Parts. Four 15-inch Long 2 x 4 Lumber.  
Cloth (Appx C Sect II, Item 2).  
Detergent (Appx C Sect II, Item 3).
  - c. Equipment Condition. Cartridge filter removed (paragraph 2-79).
- 



**DISASSEMBLY.**

- a. Remove street elbow (1).

**NOTE**

Cover is installed under tension. Relieve tension by loosening eyebolts a few turns at a time in an alternating pattern.

- b. Loosen six eyebolt assemblies (2) and rotate them out of notches in cover (3). Remove cover with attached parts.
- c. Position cover (3), handle down, on two stacks of 2 x 4' s.

**NOTE**

- Retainer plate is attached to cover under tension. Hold retainer plate down to make removal of nuts easier. Then slowly release tension.
- Lift retainer plate straight up to prevent scattering top seat cups and springs.

- d. Remove three nuts (4) and retainer plate (5).
- e. Remove eight top seat cups (6) and springs (7).
- f. Install two nuts (4) on stud (8). Using wrench on inner nut, remove stud.
- g. Repeat for remaining studs. Remove six nuts from three studs.
- h. Remove and discard O-ring (9).
- i. Using drift pin, tap out six spiral pins (10) and remove six eyebolt assemblies (2).
- j. Remove and discard eight filter tubes (11).
- k. Remove four bolts (12) and shell (13).

**CLEANING.**

Using soft cloth and mild soap solution, wash all parts. Rinse thoroughly with clean water. Dry with clean, soft cloth.

**INSPECTION.**

**NOTE**

Threads of eyebolt assembly are damaged on purpose inside the eye to prevent removal of eye from bolt.

- a. Inspect eyebolts for cracks, damaged threads, bent shafts, or deformed eyes. Replace as required.
- b. Inspect studs and bolts for cracks, damaged threads, or bent shafts. Replace as required.
- c. Inspect nuts and street elbow for deformity, cracks, or damaged threads. Replace as required.
- d. Inspect skirt assembly cover and shell for cracks, chips, holes, or damaged threads. Replace as required.
- e. Inspect bottom seat cups (14) for deformity or looseness. Replace shell if bottom seat cups are loose or damaged.
- f. Inspect top seat cups and springs for deformity or cracks. Replace as required.

**ASSEMBLY.**

- a. Position shell (13) with input and output openings in line with two large openings in skirt assembly (15) and install four bolts (12).
- b. Position six eyebolt assemblies (2) and tap in six spiral pins (10).
- c. Position cover (3), handle down, on two stacks of 2 x 4's.
- d. Install two nuts (4) on stud (8). Using wrench on outer nut, install stud in cover (3) and remove nuts (4). Repeat for two remaining studs.
- e. Position eight springs (7) and top seat cups (6) on inside of cover.
- f. Position retainer plate (5) on top seat cups (6) and studs (8).
- g. Push retainer plate (5) down on studs (8) and install three nuts (4). Tighten nuts until retainer plate is 2-1/4 inches (5.7 cm) from cover (3).
- h. Install eight filter tubes (11).
- i. Install new O-ring (9).
- j. Position cover (3) on cartridge filter with hole (16) in cover aligned with pin (17) on rim of shell (13).
- k. Rotate six eyebolt assemblies (2) up into notches in cover (3) and tighten eyebolts.
- l. Install street elbow (1).

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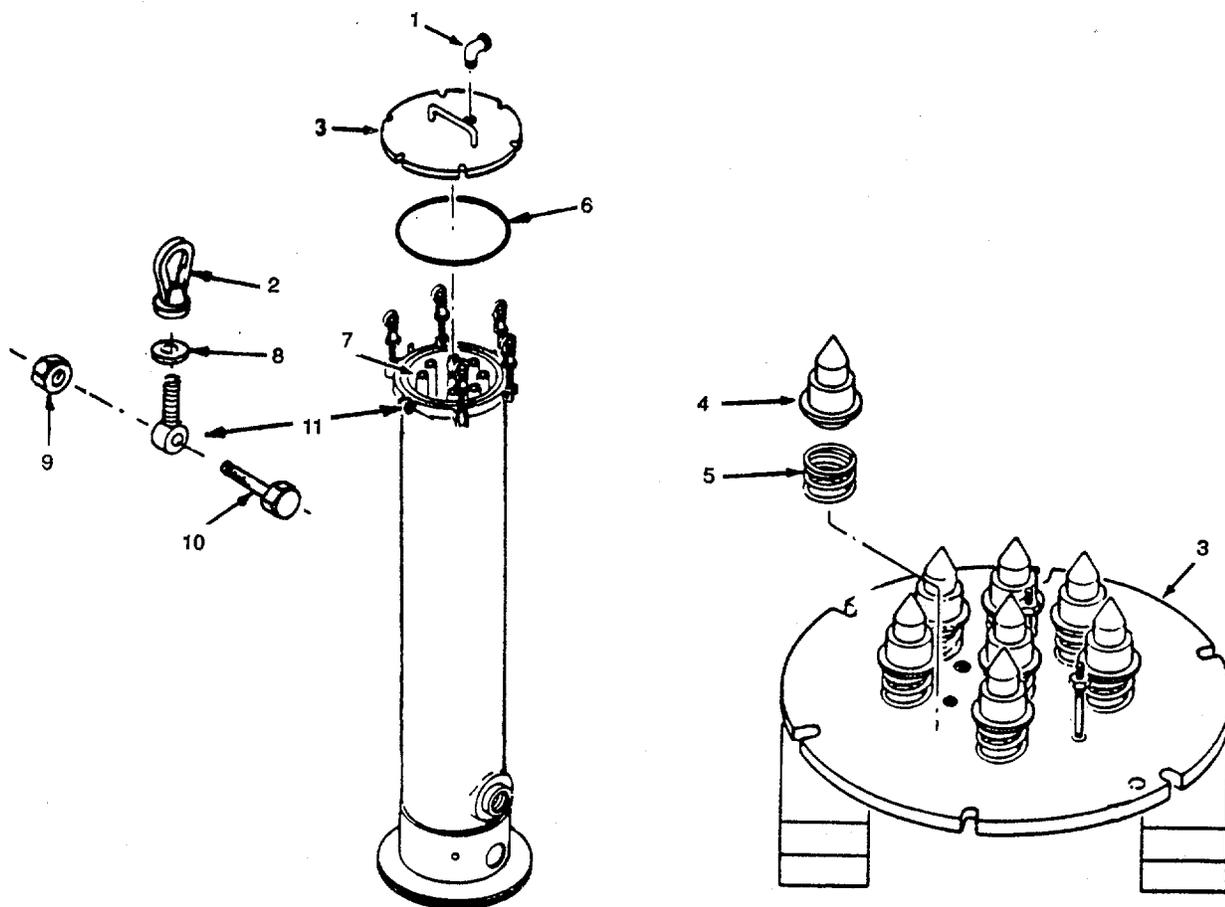
## 2-81. REPAIR CARTRIDGE FILTER. (SERFILCO AND MECO)

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sec III, Item 10).
  - b. Materials/Parts. Four 15-inch Long 2 x 4 Lumber.  
Cloth (Appx C, Sect II, Item 2).  
Detergent (Appx C, Sect II, Item 3).
  - c. Equipment Condition. Cartridge filter removed (paragraph 2-79).
- 



**DISASSEMBLY.**

- a. Remove street elbow (1).

**NOTE**

Cover is installed under tension by loosening eyenuts in a few turns at a time in an alternating pattern.

- b. Loosen six eyenuts (2) and rotate assembly out of notches in cover (3). Remove cover with attached part.
- c. Position cover (3), handle down, on two stacks of 2 x 4's.
- d. Remove eight top seat cups (4) and springs (5).
- e. Remove and discard O-ring (6).
- f. Remove locknut (9) from bolt (10).
- g. Remove eyenut (2), washer (8), and eyebolt (11).
- h. Remove and discard eight filter tubes (7).

**CLEANING.**

Using soft cloth and mild soap solution, wash all parts. Rinse thoroughly with clean water. Dry with clean, soft cloth.

**INSPECTION.**

- a. Inspect eyebolts for cracks, damaged threads, bent shafts, or deformed eyes. Replace as required.
- b. Inspect bolts for cracks, damaged threads, or bent shafts. Replace as required.
- c. Inspect nuts and street elbow for deformity, cracks, or damaged threads. Replace as required.
- d. Inspect skirt assembly cover and shell for cracks, chips, holes, or damaged threads. Replace as required.
- e. Inspect bottom seat cups (4) for deformity or looseness. Replace shell if bottom seat cups are loose or damaged.
- f. Inspect top seat cups and springs for deformity or cracks. Replace as required.

**ASSEMBLY.**

- a. Replace eight filter tubes (7).
- b. Install eyebolt (11), washer (8), and eyenut (2).
- c. Install bolt (10) and locknut (9).
- d. Replace O-ring (6).
- e. Install eight seat cups (4) and springs (5).
- f. Install cover with attached parts and tighten six eyenuts (2).
- g. Install street elbow (1).

**2-82. REPLACE BOOSTER PUMP ASSEMBLY. (AMPCO AND SCOT)**

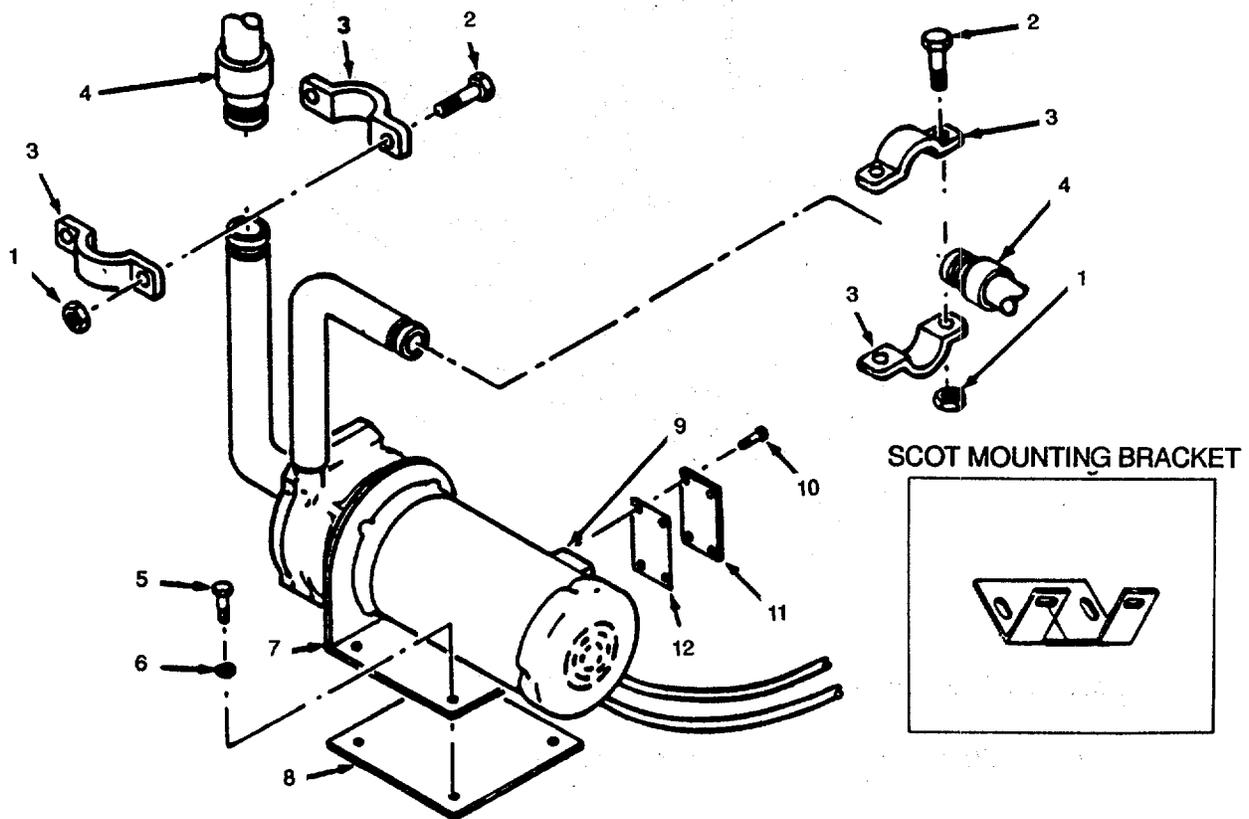
This task covers: a. Removal. b. Installation.

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sec IHI, Item 10).
- b. Materials/Parts. Twine (Appx C, Sect II, Item 20).  
Tape, Electrical (Appx C, Sect I, Item 18).
- c. Personnel Required. 2
- d. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- e. General Safety Requirements.

**WARNING**

Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.



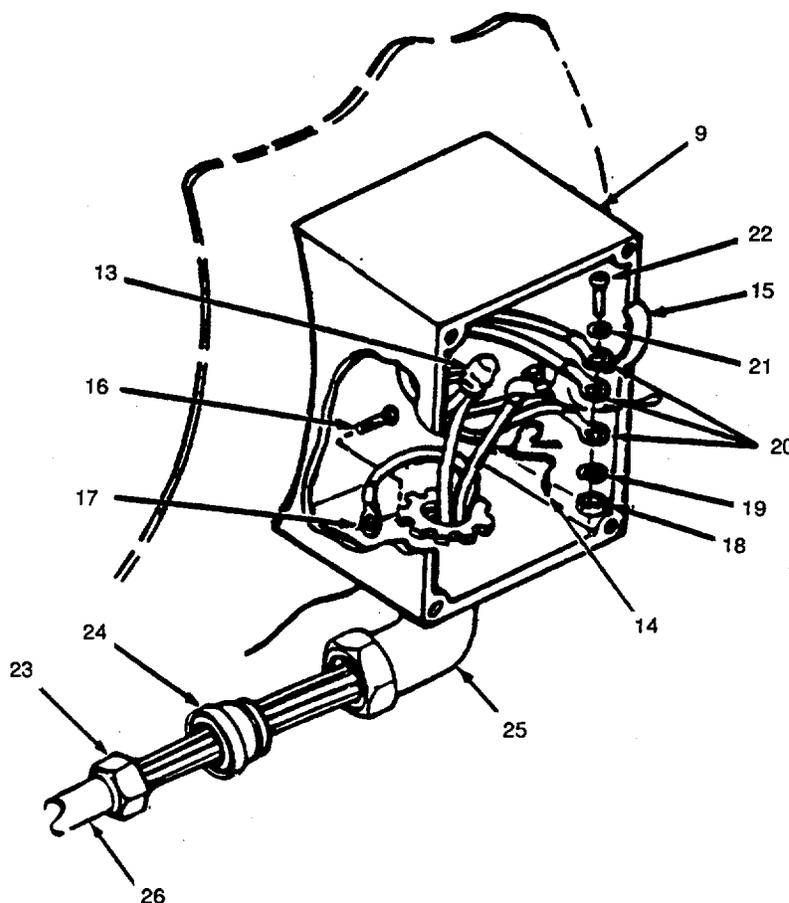
**REMOVAL.**

- a. Remove four nuts (1) and bolts (2), two clamps (3), and two gaskets (4).
- b. Remove bolts (5) and lockwashers (6) securing booster pump assembly (7) and spacer plate (8).

**WARNING**

The booster pump assembly is heavy/difficult to handle. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- c. Position booster pump assembly (7) to access conduit box (9).
- d. Remove four screws (10), cover (11), and gasket (12).



- e. Pull bundle of four wires sets (13) from conduit box (9).
- f. Set aside bundle of wires with three cream-colored wires.
- g. Tag three other bundles with color of wires from power source.

**REMOVAL. (Cont)**

- h. Remove twine (14) and tape (15) from three tagged wire sets.
- i. Remove screw (16) securing grounding wire lug (17).

**NOTE**

There are three sets of motor wires to disconnect from power source. Each set is removed the same. One is shown.

- j. Remove nut (18), lockwasher (19), three terminal lugs (20), and flat washer (21) from screw (22) on each set of wires (13) that have been untaped.
- k. Install flat washer (21), terminal lugs (20), lockwasher (19), and nut (18) on screw (22).

**CAUTION**

Wire insulation can be damaged when wires are pulled through elbow. Be careful when pulling wires.

- l. Remove sealing grip (23) and gasket (24) with wires at elbow (25).
- m. Remove booster pump assembly (7) from ROWPU.

**INSTALLATION.**

**CAUTION**

Wire insulation can be damaged when wires are pulled through elbow. Be careful when pulling wires.

- a. Position gasket (24) and sealing grip nut (23) on cable assembly (26) and pull four wires through elbow (25) into conduit box (9).

**NOTE**

There are three sets of motor wires to connect to power source. Each wire from the power source is added to a motor wire set in the same way. One is shown.

- b. Remove nut (18) and lockwasher (19) from screw (22).
- c. Install three terminal lugs (20) from power source as tagged, lockwasher (19), and nut (18) on screw (22).
- d. Position grounding wire terminal lug (17) in conduit box (9) and secure with screw (16).

**INSTALLATION. (Cont.)**

- e. Using electrical tape (15), wrap each wire set (13).
- f. Secure tape on each wire set (13) with twine (14).
- g. Position four wire sets (13) in conduit box (9).
- h. Position gasket (12) and conduit box cover (11) on conduit box (9). Install four screws (10).

**WARNING**

The booster pump assembly is heavy/difficult to handle. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- i. Position booster pump assembly (7) on spacer plate (8) with mounting holes aligned.
- j. Install bolts (5) and lockwashers (6).
- k. Position two gaskets (4) and clamps (3) on piping and install four bolts (2) and nuts (1).

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## 2-83. REPLACE LOW-PRESSURE SWITCH.

This task covers:            a. Removal.            b. Inspection.            c. Installation.

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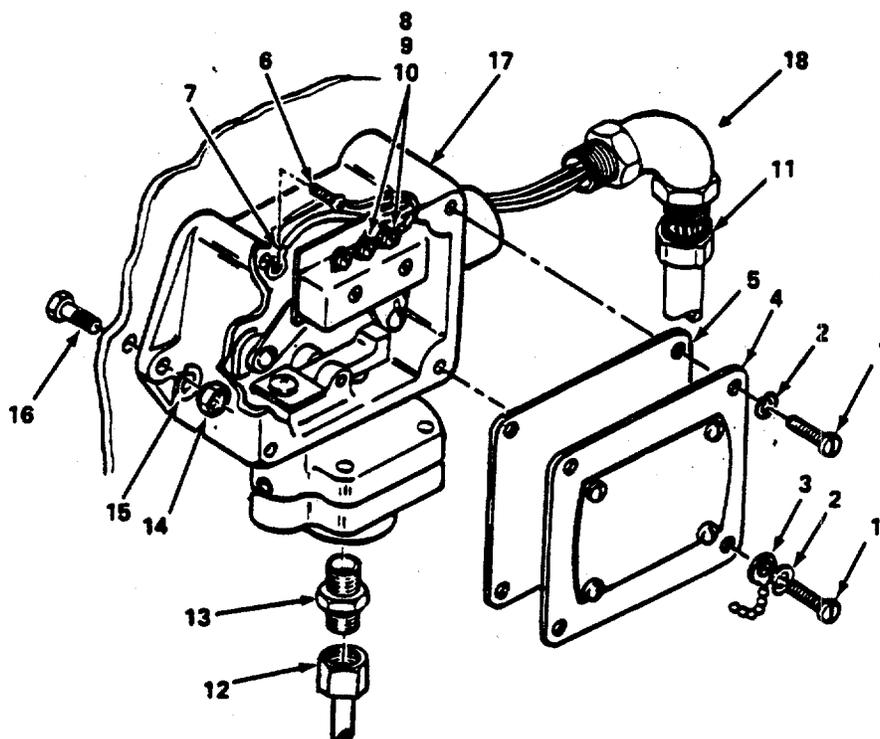
### INITIAL SETUP.

a. Tools. Tool Kit (Appx B, Sect III, Item 10).

b. Equipment Condition.

Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).

---



### REMOVAL.

- a. Remove four screws (1), lockwashers (2), chain lug (3), cover (4), and gasket (5). Discard lockwashers.
- b. Remove screw (6) and terminal lug (7).
- c. Remove two screws (8), washers (9), and terminal lugs (10).

**REMOVAL. (Cont)**

- d. Remove sealing grip (11) with cable.
- e. Disconnect pressure tube (12) from adapter (13).
- f. Remove two nuts (14), lockwashers (15), screws (16), and low-pressure switch (17). Discard lockwashers.
- g. Remove elbow connector (18) and adapter (13).

**INSPECTION.**

- a. Inspect switch for broken case, damaged threads, or components. Send damaged switch to Direct Support Maintenance.
- b. Inspect electric power cable for cracked insulation, bare wires, damaged terminal lugs, and sealinggrip. Replace as required.
- c. Inspect pressure tube coupling nut and mounting hardware for stripped heads, threads, and bent or broken shanks. Replace as required.

**INSTALLATION.**

- a. Install elbow connector (18) and adapter (13) on low-pressure switch (17).
- b. Position low-pressure switch (17) on control panel and install two screws (16), new lockwashers (15), and nuts (14).
- c. Install pressure tube (12) on adapter (13).
- d. Position sealing grip nut (11) on cable and pull wires (19) through sealinggrip elbow (18) into low-pressure switch (17) and tighten sealing grip nut (11).

**NOTE**

White wire terminal lug connects to COM position. Black wire terminal lug connects to NC position on the switch.

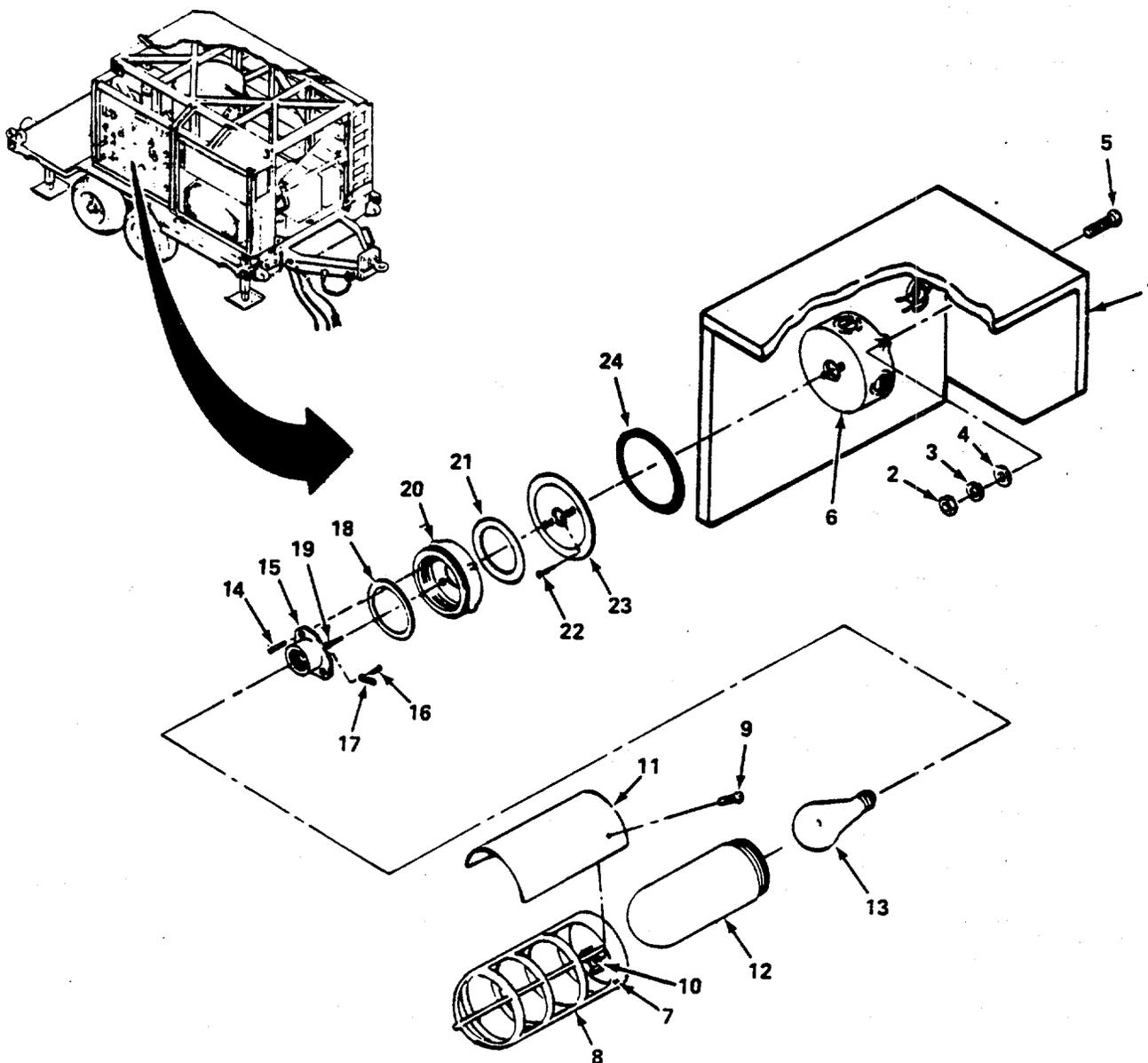
- e. Position two terminal lugs (10) and install two screws (8) and washers (9).
- f. Position terminal lug (7) of green wire and install screw (6).
- g. Position gasket (5) and cover (4). Install chain lug (3) and four new lockwashers (2) and screws (1).

**2-84. REPAIR PANEL LIGHT ASSEMBLY.**

This task covers:           a. Disassembly.           b. Inspection.           c. Assembly

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect HI, Item 10).
- b. Materials/Parts. Sandpaper (Appx C, Sect II, Item 15).
- c. Equipment Condition. ROWPU shut down (TM 10-4610-239-10).  
Power shut down (power source manual).



**DISASSEMBLY.**

- a. Pull out panel light bracket (1) for access to panel light assembly.
- b. Remove two nuts (2), lockwashers (3), flat washers (4), screws (5), and splice box (6).
- c. Loosen setscrews (7).
- d. Remove guard (8).
- e. Remove two screws (9), two brackets (10), and reflector (11).
- f. Remove globe (12) and light bulb (13).
- g. Remove two screws (14) and remove socket (15).

**NOTE**

Tag all wires before removal.

- h. Remove two screws (16), terminal lugs (17), and gasket (18).
- i. Remove two screws (19), fixture body (20), and gasket (21).
- j. Remove two screws (22), adapter ring (23), and gasket (24).

**INSPECTION.**

- a. Inspect splice box, adapter ring, and fixture body for damage. Replace as required.
- b. Inspect socket for cracks in ceramic and corrosion on contacts. Replace socket if damaged. Clean contacts with sandpaper if corroded.
- c. Inspect globe and bulb for cracks. Replace as required.
- d. Inspect brackets and reflector for damage. Replace as required.
- e. Inspect gaskets for cracks or tears. Replace as required.
- f. Inspect mounting hardware for stripped heads, threads, and other damage. Replace as required.

**ASSEMBLY.**

- a. Position gasket (24) and adapter ring (23) and install two screws (22).
- b. Position gasket (21) and fixture body (20) and install two screws (19).

**ASSEMBLY. (Cont)**

- c. Install gasket (18) in fixture body (20).
- d. Install two terminal lugs (17) as tagged with screws (16) on socket (15).
- e. Position socket (15) in fixture body (20) and install two screws (14).
- f. Install light bulb (13) in socket (15).
- g. Install globe (12) on fixture body (20).
- h. Position reflector (11) and two brackets (10) and install two screws (9).
- i. Install guard (8) on fixture body (20) and tighten setscrew (7).
- j. Position splice box (6) and install two screws (5), flat washers (4), lockwashers (3), and nuts (2).
- k. Place light bracket (1) in normal position.



**REMOVAL.**

- a. Remove four screws (1), washers (2), cover (3), and gasket (4).

**NOTE**

Tag wires before removal.

- b. Remove three screws (5) and terminal lugs (6).
- c. Remove sealing grip (7) from high-pressure switch (8).
- d. Disconnect pressure tube nut (9) from adapter (10).
- e. Remove two nuts (11), lockwashers (12), flat washers (13), screws (14), and high-pressure switch (8). Discard lockwashers.
- f. Remove two adapters (10) and (15).

**INSPECTION.**

- a. Inspect switch for broken case and damaged threads or components. Send damaged switch to Direct Support Maintenance.
- b. Inspect electric power cable for cracked or burned insulation, bare wires, damaged sealing grip and wire lugs. Replace as required.
- c. Inspect mounting hardware for stripped threads and heads. Replace as required.
- d. Inspect cover gasket for breaks and serviceability. Replace as required.

**INSTALLATION.**

- a. Position high-pressure switch (8) and install two screws (14), flat washers (13), lockwashers (12), and nuts (11).

**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- b. Install adapter (10) and high-pressure tube (9).
- c. Install adapter (15).
- d. Position sealing grip nut (7) on power cable and thread wires through adapter (15) into high-pressure switch housing (8) and tighten sealing grip nut (7) on adapter (15).

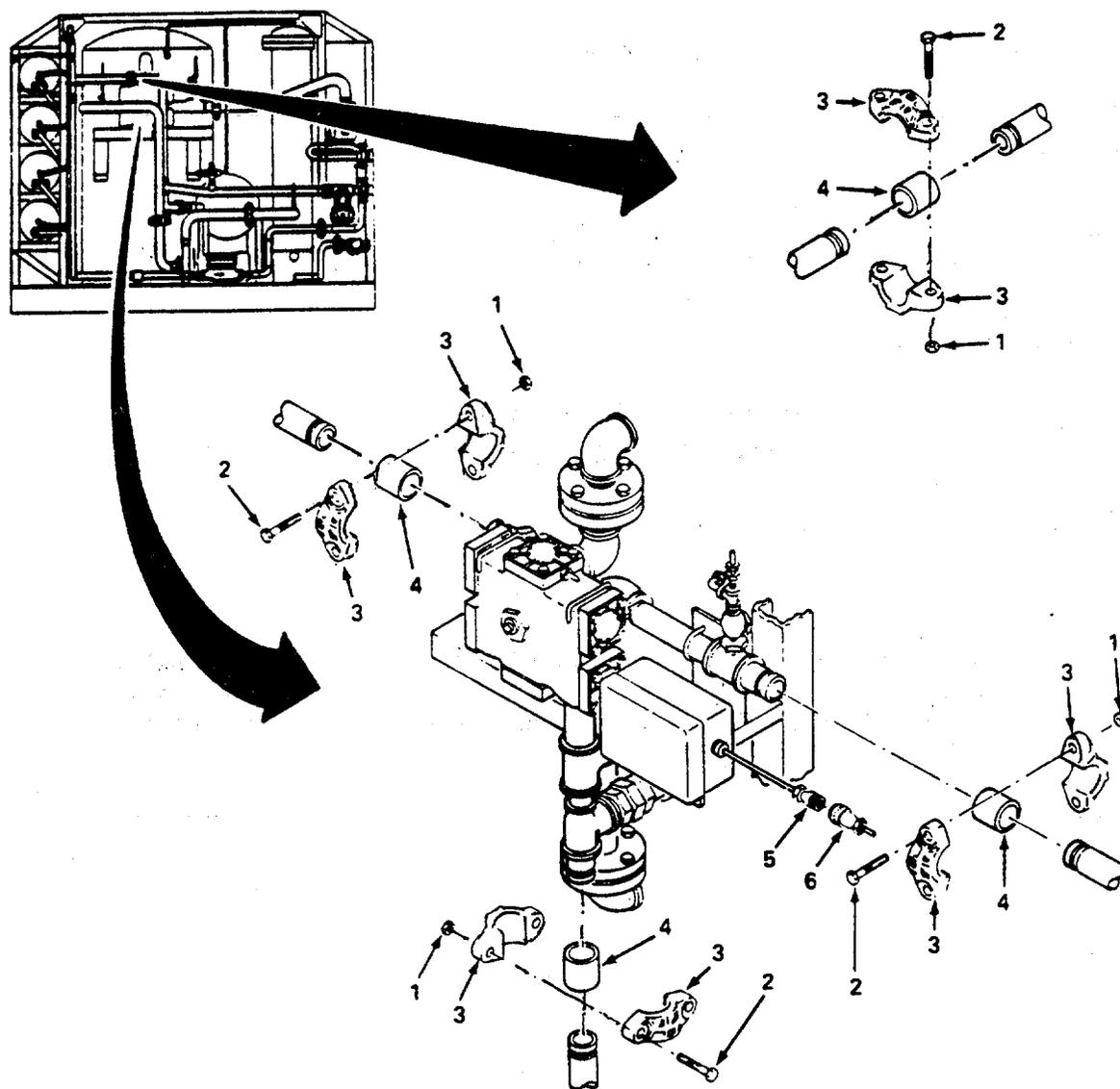
**INSTALLATION. (Cont)**

**NOTE**

White wire terminal lugs connects to C position. Blue wire terminal lug connects to NC position on terminal board.

- e. Position two terminal lugs (6) as tagged and install two screws (5).
- f. Position gasket (4) and cover (3). Install four screws (1) and flat washers (2).

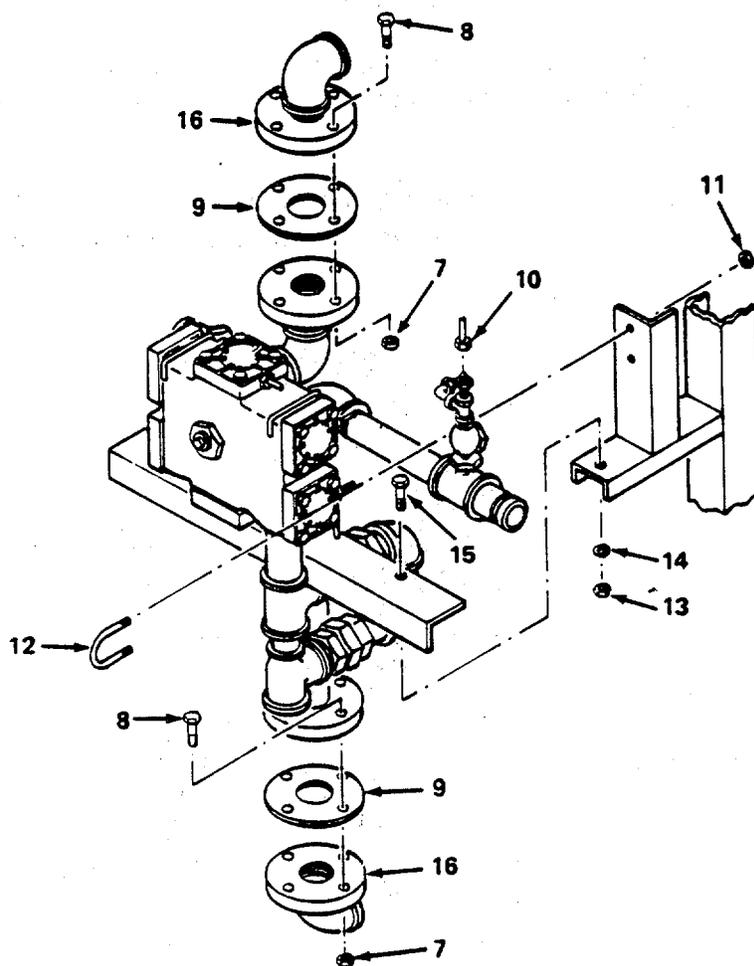




**REMOVAL.**

- a. Remove eight nuts (1) and bolts (2) and four clamps (3) and four gaskets (4).

REMOVAL. (Cont)



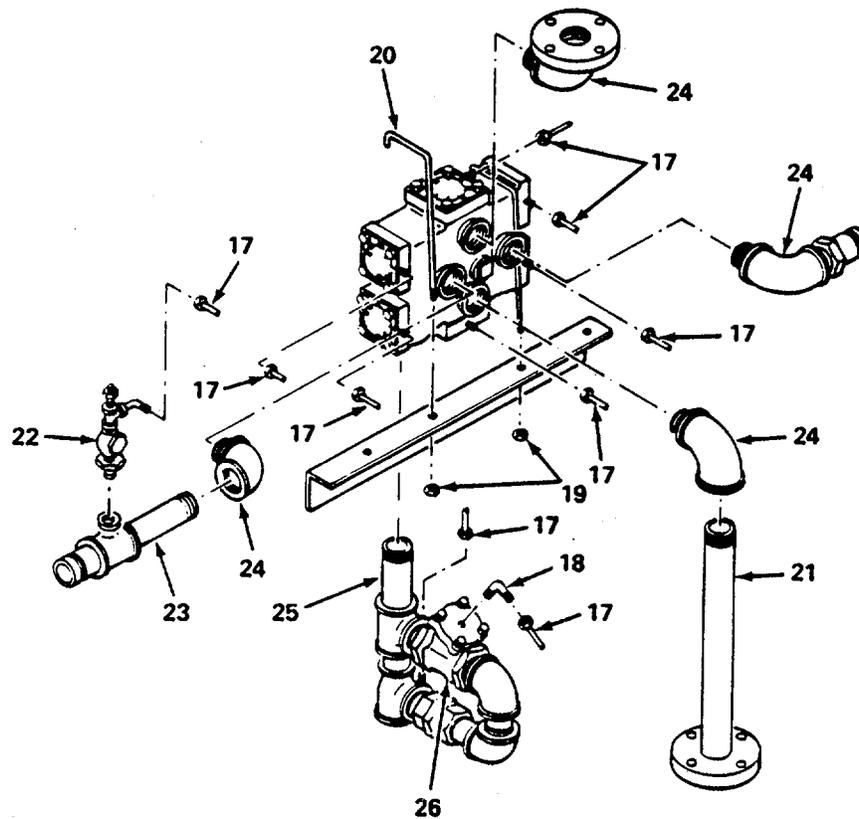
- b. Remove eight nuts (7) and bolts (8) and two gaskets (9).
- c. Disconnect tube (10).
- d. Remove two nuts (11) and clamp (12).
- e. Remove two nuts (13), lockwashers (14), and bolts (15).

**REMOVAL. (Cont)**

**WARNING**

Multimedia filter control valve with attached plumbing weighs over 75 pounds (34 kg).  
Two people are needed to lift it to prevent personal injury or damage to the equipment.

- f. Slide multimedia filter control valve with attached plumbing from between two pipes (16) and remove assembly from ROWPU. Set assembly on workbench with piping on top.



- g. Tag and disconnect nine pressure lines (17).  
h. Remove elbow (18).  
i. Remove two nuts (19) and clamps (20).  
j. Remove pipe (21).  
k. Remove reducer (22) and attached fittings.  
l. Remove pipe (23) and attached fittings.

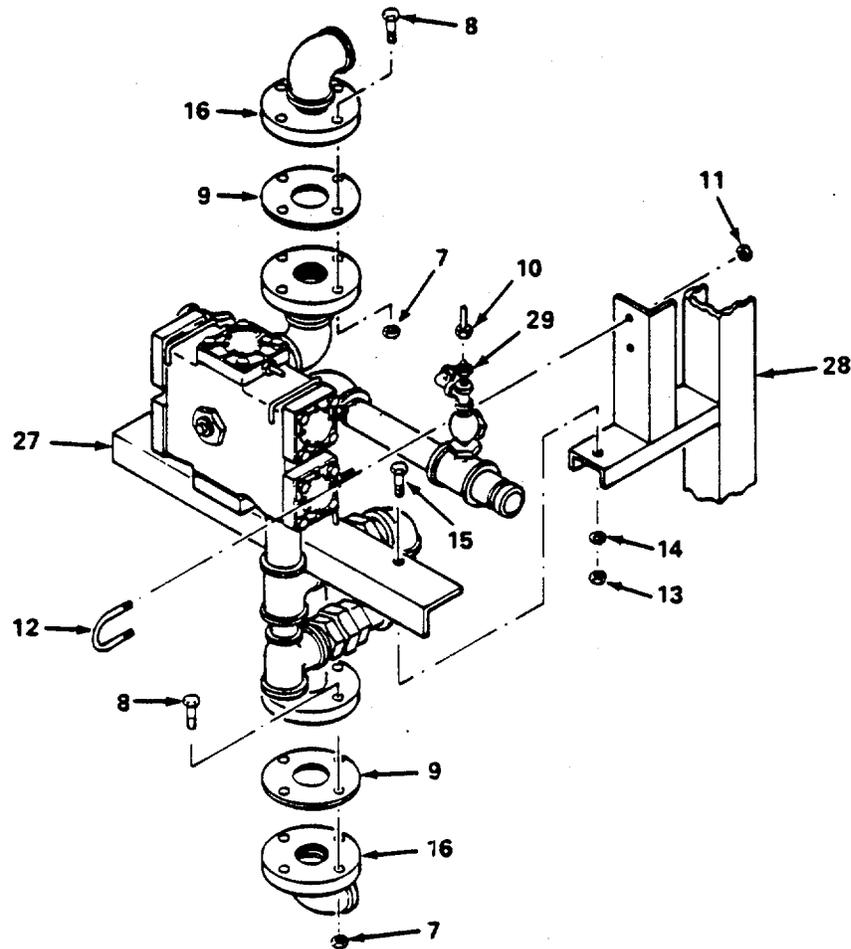
**REMOVAL. (Cont)**

- m. Remove four elbows (24) and attached fittings.
- n. Remove pipe (25) with attached fittings and diaphragm valve (26).

**INSTALLATION.**

- a. Install pipe (25) with attached fittings and diaphragm valve (26).
- b. Install four elbows (24) and attached fittings.
- c. Install pipe (23) and attached fittings.
- d. Install reducer (22) and attached fittings.
- e. Install pipe (21).
- f. Install two clamps (20) and two nuts (19).
- g. Install elbow (18).
- h. Install nine pressure lines (17) as tagged.

INSTALLATION. (Cont)

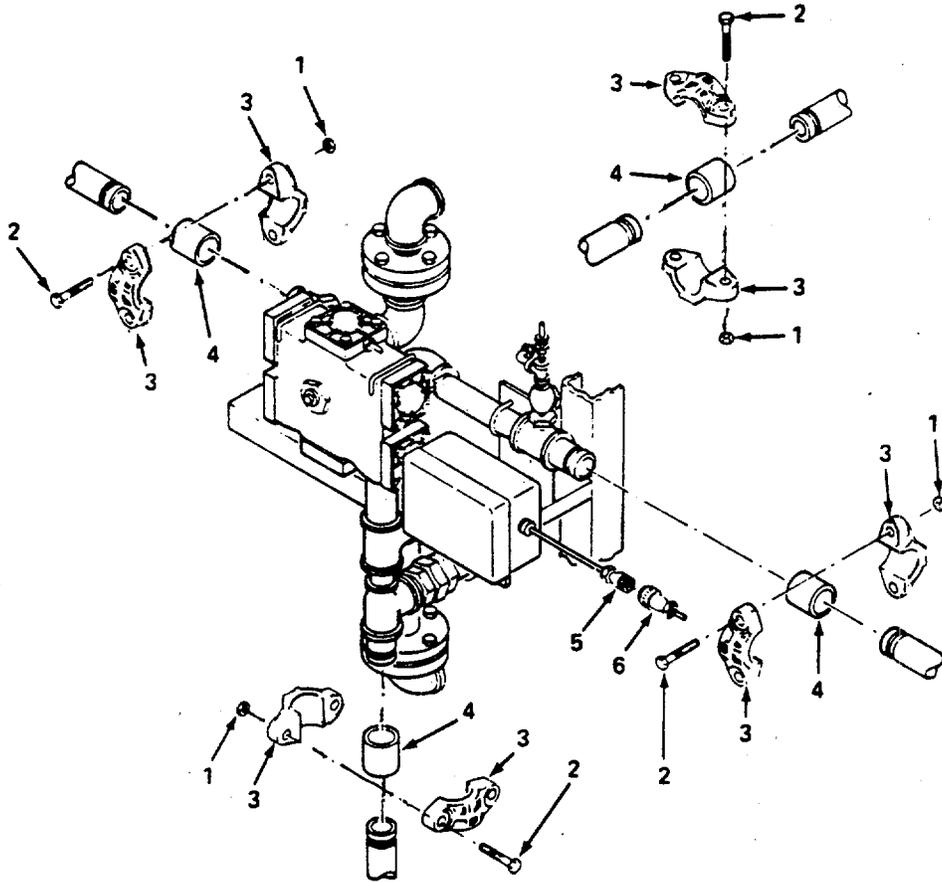


**WARNING**

Multimedia filter control valve and attached plumbing weighs over 75 pounds (34 kg). Two people are needed to lift it to prevent personal injury or damage to the equipment.

- i. Slide multimedia filter control valve with attached plumbing between two pipes (16).
- j. Align holes in assembly crossmember (27) with holes in multimedia filter struts (28) and install two bolts (15), lockwashers (14), and nuts (13).
- k. Position clamp (12) and install two nuts (11).
- l. Install tube (10) on adapter (29).
- m. Position two gaskets (9) and install eight bolts (8) and nuts (7).

INSTALLATION. (Cont)



n. Install four gaskets (4) and clamps (3) and eight bolts (2) and nuts (1).

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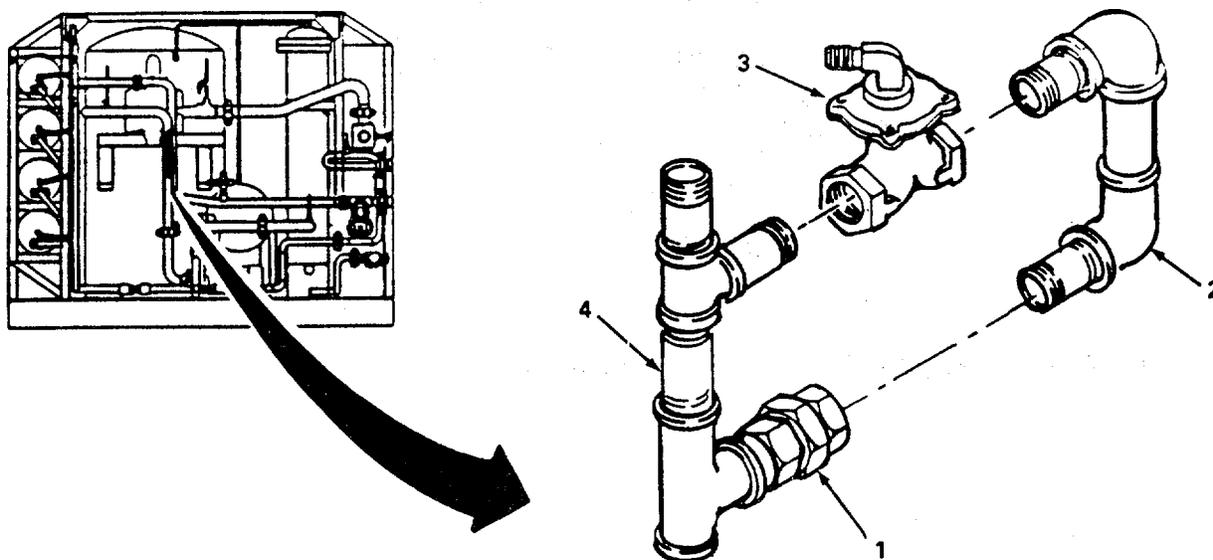
**2-87. REPLACE DIAPHRAGM VALVE ASSEMBLY. (CULLIGAN)**

This task covers:           a. Removal.           b. Installation.

---

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Tool Kit (Appx B, Sect III, Item 7).
  - b. Equipment Condition. ROWPU shut down (TM 10-4610-239-10).  
Multimedia filter control valve removed (paragraph 2-86).
- 



**REMOVAL.**

- a. Disconnect union (1) and remove piping assembly (2).
- b. Remove diaphragm valve (3) from pipe assembly (4).
- c. Remove valve assembly (2) from piping valve (3).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to male pipe threads before installation.

- a. Install diaphragm valve assembly (3) on piping assembly (4).
- b. Install piping assembly (2) and diaphragm valve assembly (3). Connect and tighten union (1).

**2-88. REPAIR DIAPHRAGM VALVE ASSEMBLY. (CULLIGAN)**

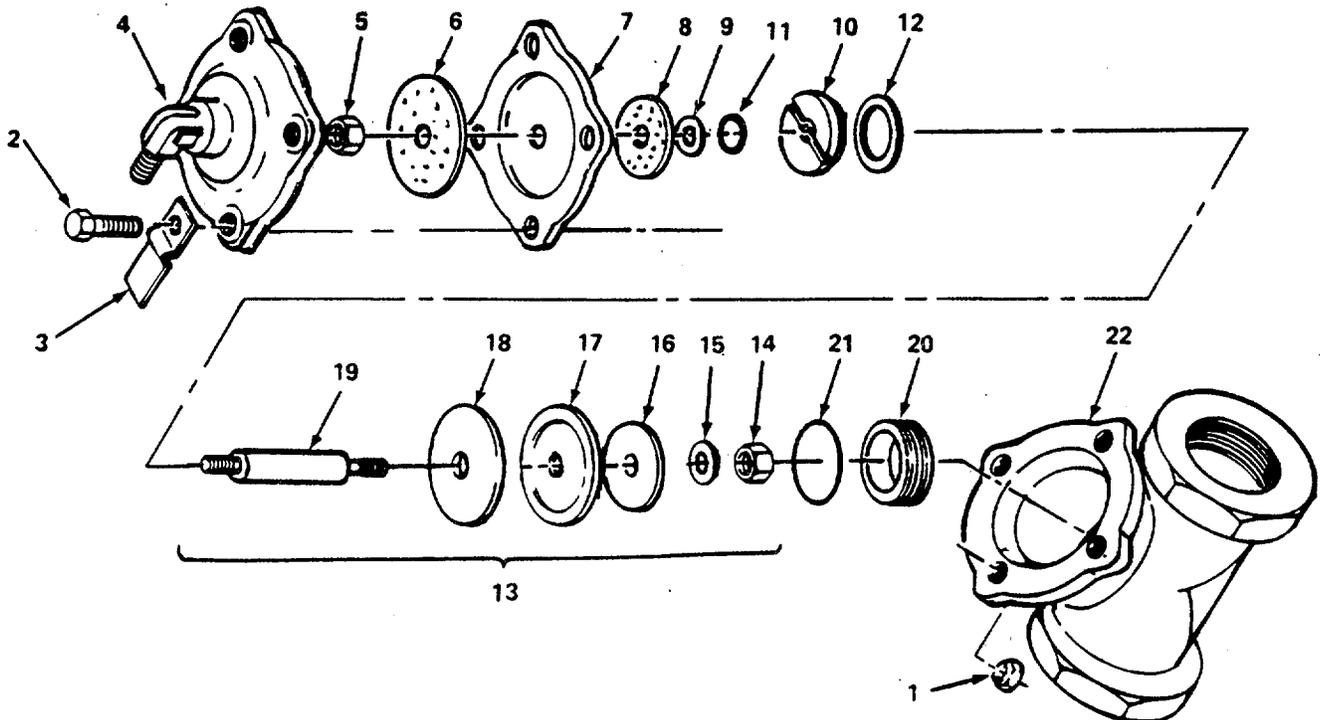
This task covers:           a. Disassembly.           b. Cleaning.           c. Inspection.           d. Assembly.

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Materials/Parts. Drycleaning Solvent (Appx C, Sect II, Item 16).
- c. Equipment Condition. Multimedia filter control valve removed (paragraph 2-86).
- d. General Safety Requirements.

**WARNING**

Drycleaning solvent AA 711 Type I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.



**DISASSEMBLY.**

**NOTE**

Scribe cap and valve body for orientation of tube protruding from cap.

- a. Remove four nuts (1), bolts (2), tag (3), and cap (4).
- b. Remove nut (5), upper diaphragm plate (6), diaphragm (7), lower diaphragm plate (8), and beveled washer (9).
- c. Remove O-ring retainer (10).
- d. Remove preformed packing (11) and O-ring gasket (12) from O-ring retainer (10).
- e. Remove shaft assembly (13).
- f. Remove nut (14), flat washer (15), disk plate (16), disk (17), and disk retainer (18) from shaft (19).
- g. Remove lower O-ring retainer (20).
- h. Remove O-ring (21) from lower O-ring retainer (20).
- i. Discard all old gaskets and preformed packing.

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 Type I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Using drycleaning solvent, thoroughly clean all parts.
- b. Allow parts to air dry.

**INSPECTION.**

Inspect all parts, threaded areas, and attaching parts for damage and corrosion.

**ASSEMBLY.**

- a. Install new O-ring (21) on lower O-ring retainer (20).
- b. Install lower O-ring retainer (20) in valve body (22).
- c. Install disk retainer (18), disk (17), disk plate (16), flat washer (15), and nut (14) on shaft (19).
- d. Install shaft assembly (13) in valve body (22).
- e. Install new O-ring gasket (12) on O-ring retainer (10).
- f. Install new preformed packing (11) in O-ring retainer (10).
- g. Install O-ring retainer (10) on shaft assembly (13).
- h. Install beveled washer (9), lower diaphragm plate (8), diaphragm (7), upper diaphragm plate (6), and nut (5) on shaft assembly (13).
- i. Position cap (4) on valve body (22) and install tag (3) and four bolts (2) and nuts (1).

**2-89. REPAIR DIAPHRAGM VALVE ASSEMBLY. (MECO)**

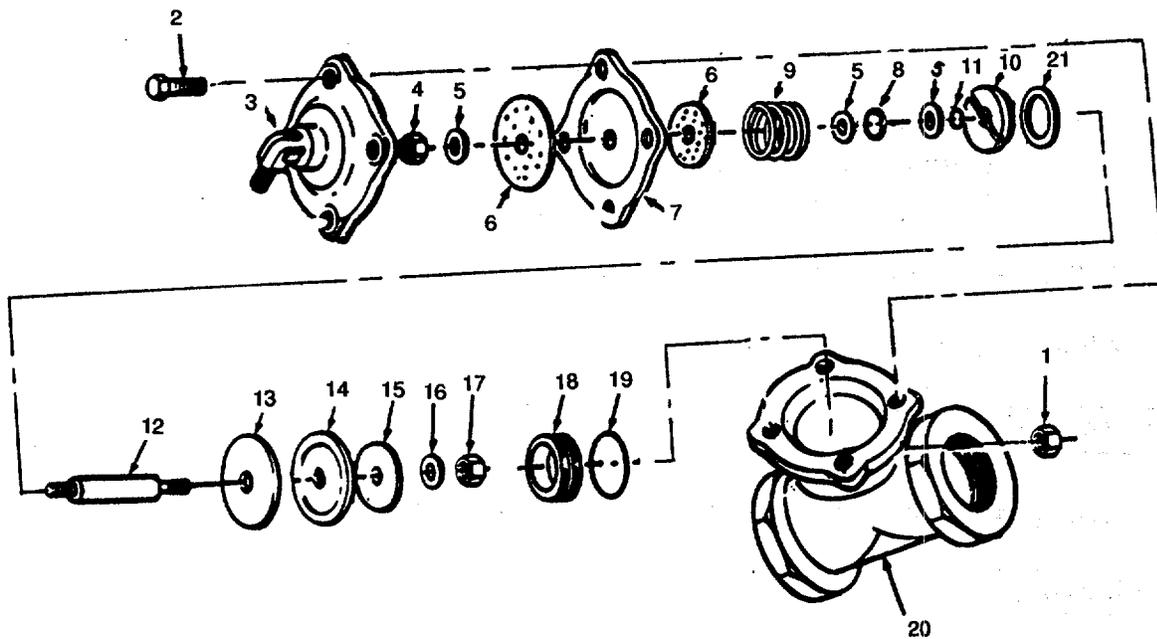
This task covers:           a. Disassembly.           b. Cleaning.           c. Inspection.           d. Assembly.

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Materials/Parts. Drycleaning Solvent (Appx C, Sect II, Item 16).
- c. Equipment Condition. Multimedia filter control valve (Meco Model) removed (paragraph 3-23).
- d. General Safety Requirements.

**WARNING**

Drycleaning solvent AA 711 Type I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.



**DISASSEMBLY.**

**NOTE**

Scribe cap and valve body for orientation of tube protruding from cap.

- a. Remove four nuts (1), bolts (2), and cap (3).
- b. Remove nut (4), washer (5), upper diaphragm plate (6), diaphragm (7), lower diaphragm plate (6), and spring (9).
- c. Remove washer (5), washer (8), and washer (5).
- d. Unscrew plug (10) and remove with shaft assembly (12).
- e. Remove O-ring (11) and O-ring (21) from plug (10).
- f. Remove nut (17), flat washer (16), disk plate (15), gasket (14), and disk retainer (13), from shaft (12).
- g. Remove seat (18) from valve body (20).
- h. Remove O-ring (19) from seat (18).

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 Type I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Using drycleaning solvent, thoroughly clean all parts.
- b. Allow parts to air dry.

**INSPECTION.**

Inspect all parts, threaded areas and attaching parts for damage and corrosion.

**ASSEMBLY.**

- a. Install new O-ring (19) on seat (18).
- b. Install seat (18) in valve body (20).

**ASSEMBLY. (Cont)**

- c. Install disk retainer (13), gasket (14), disk plate (15), flat washer (16), and nut (17) on shaft (12).
- d. Install new O-ring gasket (21) and O-ring (11) on plug (10).
- e. Install shaft assembly (12) in plug (10) and screw in plug (10) into valve body (20).
- f. Install spring (9).
- g. Install washer (5), washer (8), and washer (5) on end of shaft (12).
- h. Install lower diaphragm plate (6), and diaphragm (7) and upper diaphragm plate (6) onto shaft (12).
- i. Install washer (5) and nut (4) on shaft (12).

**NOTE**

Locate cap on valve body and align scribe marks.

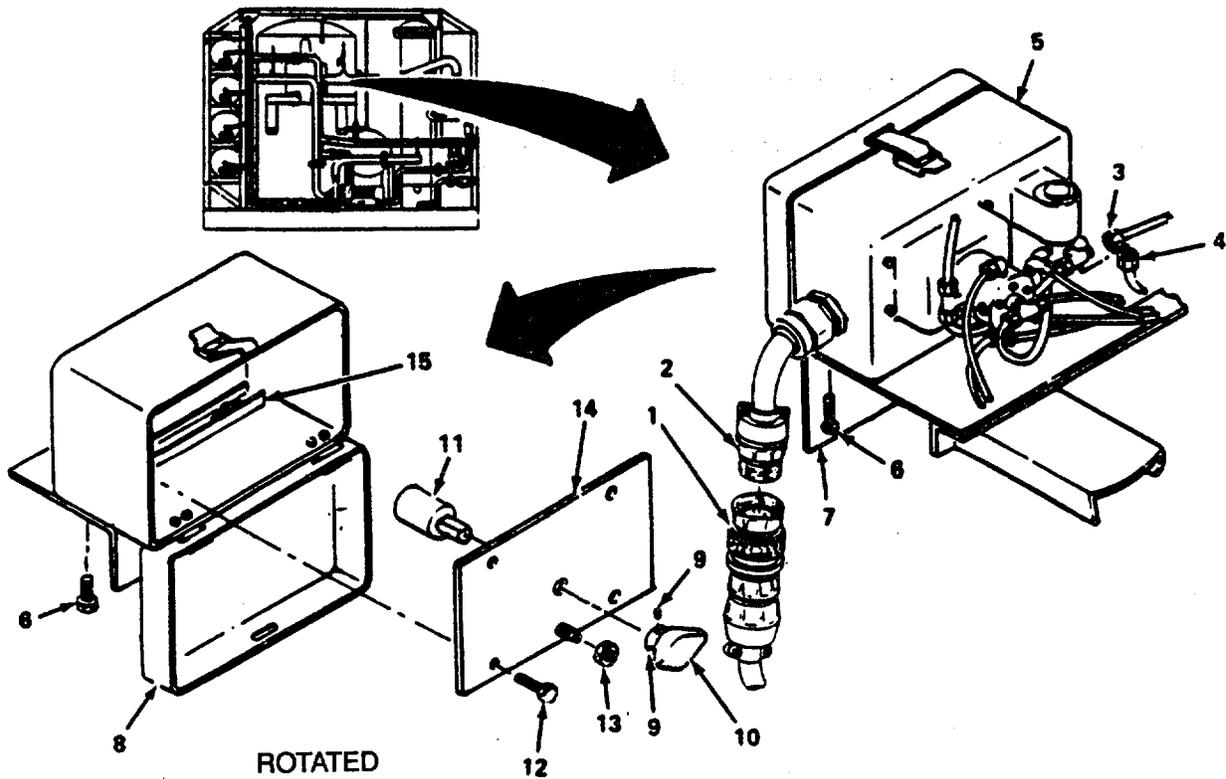
- j. Attach cap (3) to valve body (20) and tighten four bolts (2) and nuts (1).

**2-90. REPLACE BACKWASH TIMER ASSEMBLY. (CULLIGAN)**

This task covers:           a. Removal.           b. Installation.

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sec m, Item 10).
- b. Equipment Condition.           Power shut down (Power source manual.)  
                                          ROWPU shut down (TM 10-4610-239-10).



**REMOVAL.**

- a. Disconnect control box power cable (1) from backwash timer electrical connector (2).

**REMOVAL. (Cont)**

**CAUTION**

Improper connection of pressure tubes to backwash timer will damage the timer. Label all tubes before disconnecting.

- b. Unscrew 13 coupling nuts (3) and disconnect 11 tubes (4) from backwash timer (5).
- c. Remove two screws (6) from nutplate (15) and remove backwash timer (5).
- d. Loosen two setscrews (9) and remove indicator knob (10) from extension adapter (11).
- e. Remove four screws (12), locknut (13), and plate (14).

**INSTALLATION.**

- a. Position backwash timer (5) on mounting bracket (7) and open cover (8).
- b. Position nutplate (15) and align holes with holes in backwash timer (5) and mounting bracket (7).
- c. Install two screws (6).
- d. Position plate (14) and install four screws (12) and locknut (13) on the reset switch.
- e. Position indicator knob (10) on extension adapter(11) with setscrews (9) opposite pointer in line with flat surface of extension adapter. Tighten two setscrews.

**CAUTION**

Improper connection of pressure tubes to backwash timer will damage timer. Check attached tags before connecting tubes.

- f. Connect 11 tubes (4) with coupling nuts (3).
- g. Connect control box power cable (1) to backwash timer electrical connector (2).

## 2-91. REPLACE BACKWASH TIMER ASSEMBLY. (MECO)

This task covers:            a. Removal.            b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sec III, Item 10).
- b. Materials/Parts.            Drycleaning Solvent (Appx C, Sect II, Item 16).
- c. Equipment Condition.        Power shut down (Power source manual.)  
ROWPU shut down (TM 10-4610-239-10).
- d. General Safety Requirements

### WARNING

Drycleaning solvent AA 711 Type I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

### REMOVAL.

#### CABLE

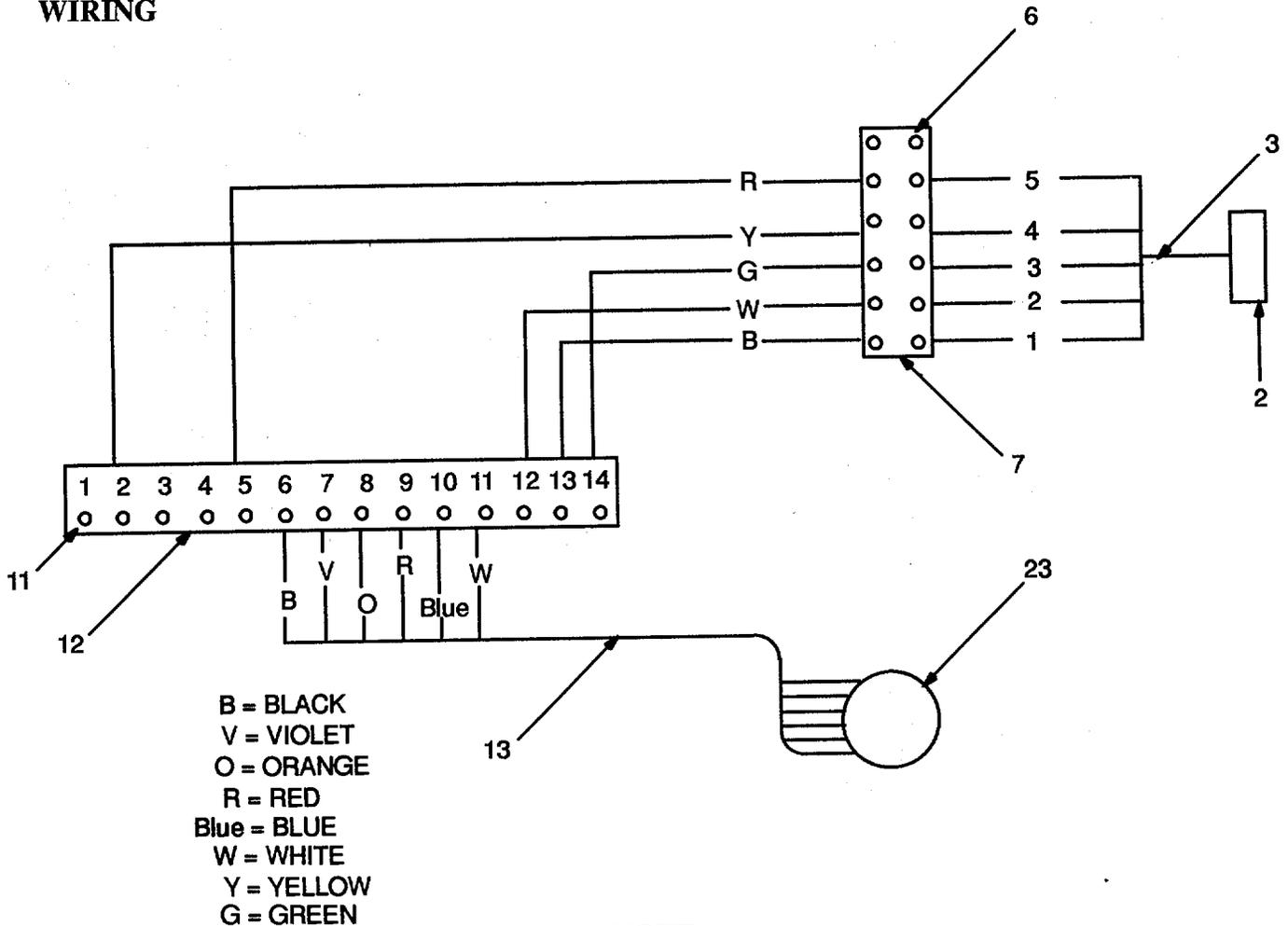
### NOTE

- Tag all wires before removal.
  - Setscrew (6) at position 6 on terminal block (7) is not used.
- a. Disconnect control box power cable (1) from backwash timer electrical connector (2).
  - b. Unlatch six latches (4) and open backwash timer door (5).
  - c. Loosen five set screws (6) from right side of terminal block (7) marked 1 through 5 and disconnect five wire leads from terminal block (7).
  - d. Remove compression nut (8) and pull cable (3) through connector body (9).
  - e. Remove gland (10), gland retainer (25), and compression nut (8) from cable (3).



**REMOVAL. (Cont)**

**WIRING**



NOTE

**NOTE**

Tag all wires before removal.

- On terminal board (12) loosen setscrew at position 5, and on terminal board ( ) loosen setscrew at position 5 and remove red wire.
- On terminal board (12) loosen setscrew at position 2, and on terminal board ( ) loosen setscrew at position 4 and remove yellow wire.
- On terminal board (12) loosen setscrew at position 14, and on terminal board ( ) loosen setscrew at position 3 and remove green wire.
- On terminal board (12) loosen setscrew at position 12, and on terminal board ( ) loosen setscrew at position 2 and remove white wire.
- On terminal board (12) loosen setscrew at position 13, and on terminal board ( ) loosen setscrew at position 1 and remove black wire.

**REMOVAL. (Cont)**

**BACKWASH TIMER ASSEMBLY**

**NOTE**

Tag all wires before removal

- a. On terminal board (12) loosen setscrews (11) at positions 6, 7, 8, 9, 10, and 11 and remove black, violet, orange, red, blue, and white wires of cable (13).
- b. Tag and disconnect eight pressure lines (13) by removing plastic compression nut (14).
- c. Remove two pipe plugs (15).
- d. Remove five elbows (16).
- e. Remove three adapters (17).
- f. Remove one strainer (18).
- g. Remove four screws (19).
- h. Lift and remove stagger (23) through hole in bottom of control box (24).

**LATCH ASSEMBLY**

**NOTE**

There are six latches (4) externally attached to the control box (24). All are identical and removed in the same manner. One latch is shown.

Remove two locknuts (21) and discard. Remove two screws (20). Remove latch (4).

**GASKET**

- a. Remove gasket (22) from door (5). Discard old gasket.

**WARNING**

Drycleaning solvent AA 711 Type I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- b. Using drycleaning solvent, thoroughly clean all surfaces of door (5).

**INSTALLATION.**

**CABLE**

**CAUTION**

Improper connection of wiring will damage timer. Check tags before installation.

- a. Slide compression nut (8) on cable (3). Slide gland retainer (25) and gland (10) on cable. (3).
- b. Push leads from cable (3) through connector body (9) and tighten compression nut (8) to connector body (9).
- c. Insert red wire at position 5, yellow wire at position 4, green wire at position 3, white wire at position 2, and black wire at position 1 on terminal board (7). Tighten setscrews (6).

**WIRING**

**CAUTION**

Improper connection of wiring will damage timer. Check tags before installation.

**NOTE**

Terminal board (12) requires that each marked position be manually opened with a small instrument such as a small screwdriver so that the wire lead can be reinserted into the terminal board.

- a. Insert one end of red wire into position 5 on terminal board (12). Tighten setscrew (11). Insert other end of red wire into position 5 on terminal board (7). Tighten setscrew (6).
- b. Insert one end of yellow wire into position 2 on terminal board (12). Tighten setscrew (11). Insert other end of yellow wire into position 4 on terminal board (7). Tighten setscrew (6).
- c. Insert one end of green wire into position 14 on terminal board (12). Tighten setscrew (11). Insert other end of green wire into position 3 on terminal board (7). Tighten setscrew (6).
- d. Insert one end of white wire into position 12 on terminal board (12). Tighten setscrew (11). Insert other end of white wire into position 2 on terminal board (7). Tighten setscrew (6).
- e. Insert one end of black wire into position 13 on terminal board (12). Tighten setscrew (11). Insert other end of black wire into position 1 on terminal board (7). Tighten setscrew (6).

**INSTALLATION. (Cont)**

**BACKWASH TIMER ASSEMBLY**

- a. Position stagger and gasket assembly (23) inside control box (24) and install four screws (19).

**CAUTION**

Improper connection of pressure tubes to backwash timer will result in damage to timer. Check attached tags before connecting tubes.

**NOTE**

Apply antiseize tape to male pipe threads before installation.

- b. Install two pipe plugs (15).
- c. Install five elbows (16).
- d. Install strainer (18).
- e. Install three adapters (17)
- f. Connect eight pressure tubes (13) by attaching plastic compression nut (14.).

**CAUTION**

Installation of contacts in wrong connector sockets will result in malfunctions or damage to equipment. Be sure contacts are installed as tagged.

- g. Insert color coded tagged leads (black violet, orange, red, blue, and white) of cable (13) in positions 6, 7, 8, 9, 10, and 11 of terminal board (12) and tighten setscrews.

**LATCH ASSEMBLY**

**NOTE**

There are six latch assemblies. All are identical and all are attached in the same manner. One is shown.

Position latch assembly (4) on control box (24) and install two new lock nuts (21) with two screws (20).

**GASKET**

Position gasket (22) on door (5) and glue in place.

---

## 2-92. REPLACE R.O. PRESSURE TUBES.

This task covers:           a. Removal.           b. Installation.

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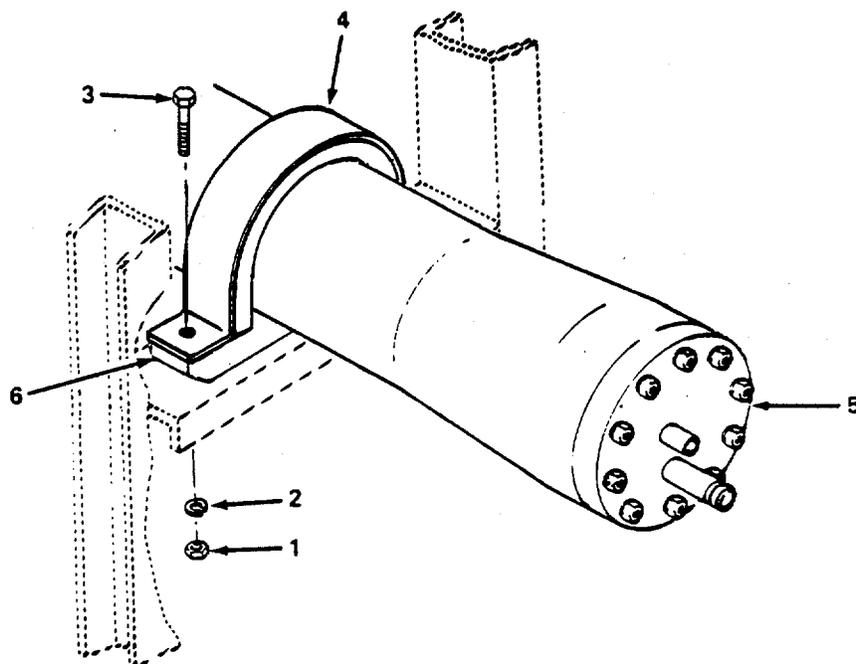
### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Personnel Required.           2
- c. Equipment Condition.       Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).  
R.O. pressure tube piping removed:  
Model No. 0966109001 (Army) (paragraph 2-77).  
Model No. 0996108001 (Marine Corps) (paragraph 2-78).
- d. General Safety Requirements.

### WARNING

Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.

---



**NOTE**

There are four R.O. pressure tubes. All are removed and installed the same. One is shown.

**REMOVAL.**

- a. Remove four nuts (1), lockwashers (2), and screws (3).
- b. Remove two clamps (4) from each end of R.O. pressure tube (5).

**WARNING**

The R.O. pressure tube is heavy. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- c. Remove R.O. pressure tube (5) from base of pressure tube (6).

**INSTALLATION.**

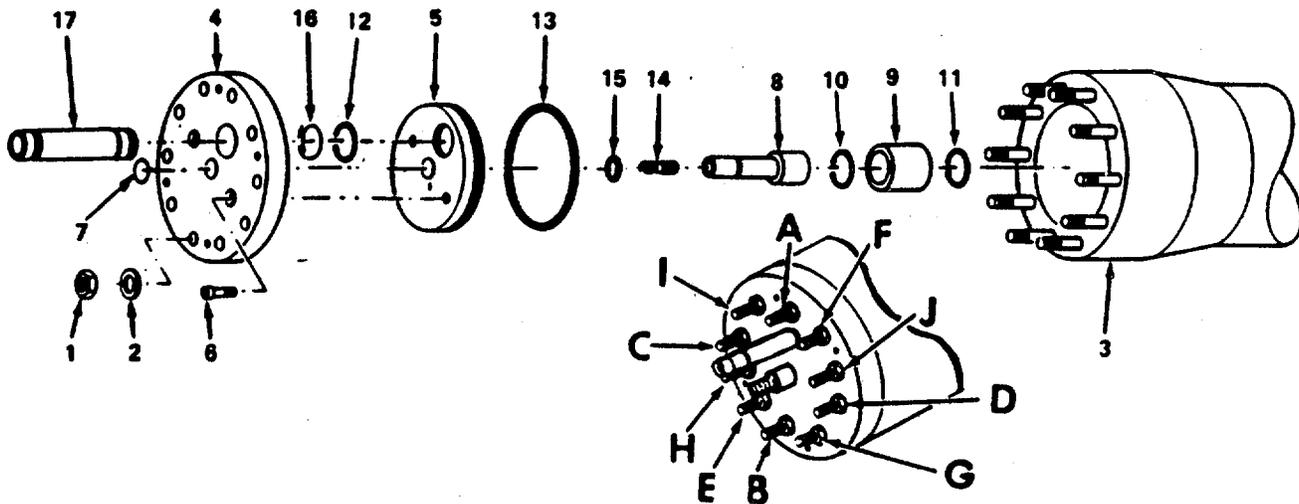
- a. Position R.O. pressure tube (5) on base of pressure tube (6).
- b. Install piping and fittings. For Model No. 0996109001 (Army), refer to paragraph 2-77. For Model No. 0996108001 (Marine Corps), refer to paragraph 2-78.
- c. Position two clamps (4), one at each end of R.O. pressure tube (5), and install four screws, lockwashers (2), and nuts (1).

**2-93. REPAIR R.O. PRESSURE TUBES (FLUID SYSTEMS AND ADVANCED STRUCTURES)**

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

**INITIAL SETUP.**

- a. Tools Tool Kit (Appx B, Sect III, Item 10).  
Torque Wrench (Appx B, Sect III, Item 7)
- b. Materials/Parts. Silicon Grease (Appx C, Sect II, Item 22).  
Detergent (Appx C, Sect II, Item 3).
- c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).  
R.O. Pressure tube piping removed:  
Model No. 0996109001 (Army) (paragraph 2-77).  
Model No. 0996108001 (Marine Corps) (Paragraph 2-78).



**DISASSEMBLY.**

**NOTE**

- There are two end plate assemblies on each of four R.O. pressure tubes. Procedure for both end plates and all tubes is the same.
- Mark end plates and pressure tube to help in alignment during assembly.

**DISASSEMBLY. (Cont)**

- a. Remove 10 nuts (1) and flat washers (2) from studs on pressure tube (3).
- b. Remove two end cap puller bolts (6) from both end cap assemblies (4).
- c. Screw four end cap puller bolts (6) into threaded holes in end cap (4) until end cap assembly is separated from the pressure tube (3) and remove end cap assembly (4).
- d. Remove retaining ring (7) and discard.
- e. Remove permeate port (8) and end connector (9). Separate end connector (9) from permeate port (8).
- f. Remove two O-rings (10) and (11) from end connector (9) and separate end plate (4) from sealing plate (5)
- g. Remove two O-rings (12) and (13) from sealing plate (5).
- h. Remove adapter (14) and O-ring (15) from permeate port (8).
- i. Remove retaining ring (16) from concentrate port (17). Discard retaining ring. Remove concentrate port (17).
- j. Remove filter elements. Refer to TM 10-4610-239-10.

**CLEANING.**

- a. Using strong soap solution, clean end plate and end plug.
- b. Clean permeate port, concentrate port, nuts, lockwashers, and studs.

**INSPECTION.**

- a. Inspect end connector and O-rings for damage or deformity. Replace as required.
- b. Inspect end plate for damage, excessive wear, and serviceability. Replace as required.
- c. Inspect end plug, permeate port, and concentrate port for wear, proper fit, and serviceability. Replace as required.
- d. Inspect R.O. pressure tube and studs for damage. Replace as required.

**ASSEMBLY.**

**NOTE**

- There are two end plate assemblies on each of four R.O. pressure tubes. Procedure for both end plates and all tubes are the same.
  - Coat O-rings and O-ring path with a thin layer of silicone grease to reduce friction during installation.
- a. Install filter elements. (Refer to TM 10-4610-239-10).
  - b. Install concentrate port (17) into end plate (4).
  - c. Install new retaining ring (16) on concentrate port (17).
  - d. Install O-ring (15) and adapter (14) on permeate port (8).
  - e. Install O-rings (12) and (13) on sealing plate (5).
  - f. Insert permeate port (8) through sealing plate (5) and end plate (4) and install new retaining ring (7) on permeate port (8).

**NOTE**

The two O-rings in the end connector have different outside diameters. Feel inside end connector find the large and small inside-diameter ends. Install large O-ring in large end of end connector. Install small O-ring in small end of end connector.

- g. Install all O-rings (10) and (11) in connector(9).
- h. Install end connector (9) on permeate port (8).

**NOTE**

Small inside diameter end of end connector goes in permeate port.

- j. Install capscrews (6) into end plate (4) and sealing plate (5).
- k. Install end plate assembly (4) onto pressure tube (3).

**CAUTION**

Unequal torque on any end cap nut can result in damage to equipment.

1. Install flatwashers (2) and nuts (1) onto studs on pressure tubes (3). Torque nuts to 65 inch-pound (73.5N.m) in sequence A through J as shown.

**ASSEMBLY. (Cont)**

**CAUTION**

Unequal torque on any end cap nut can result in damage to the pressure tube.

- m. Install filter elements. (Refer to TM 10-4610-239-10).
- n. Install concentrate port (17) into end plate (4).
- o. Install new retaining ring (16) on concentrate port (17).
- p. Install O-ring (15) and adapter (14) on permeate port (8).
- q. Install O-rings (12) and (13) on end plug (5).

**NOTE**

The two O-rings in the end connector have different outside diameters. Feel inside connector to find the large and small inside diameter ends. Install large O-ring in large end of end connector. Install small O-ring in small end of end connector.

- r. Install O-rings (10) and (11) in connector (9).
- s. Install end connector (9) on permeate port (8).
- t. Insert permeate port (8) through end plug (5), end plate (4) and install new retaining ring (7) on permeate port (8).
- u. Install end connector (9) on permeate port (8).

**NOTE**

Small inside diameter end of end connector goes in permeate port.

- v. Install capscrews (6) into end plate (4) and end plug (5).
- w. Install end plate (4) and end plug (5) onto pressure tubes (3).

**Section XII. PIPING INSTALLATION MAINTENANCE PROCEDURES**

	Para	Page
Replace Piping.....	2-94	2-220
Replace Vent Vessels Gate Valve.....	2-95	2-230
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Replace Brine Water Flowmeter.....	2-98	2-236
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Replace Product Water Flowmeter.....	2-101	2-243
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Replace Differential Pressure Gages: Cartridge Filter, Multimedia Filter, and R.O. Vessels.....	2-103	2-249
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Replace Elliptic Valve.....	2-111	2-267
Replace Ball Valve .....	2-112	2-269
Replace Vent Valves: Cartridge Filter, Pulse Dampener, and Multimedia Filter.....	2-113	2-271

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## 2-94. REPLACE PIPING.

This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect HI, Item 10).
- b. Materials/Parts. Antiseize Tape (Appx C, Sect II, Item 17).  
Nomex Tape (Appx C, Sect II, Item 19).
- c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- d. General Safety Requirements.

### WARNING

ROWPU piping and equipment can contain extremely high pressure during and after operation. If this pressure is not relieved before working on these pipes or equipment, serious injury or death may occur. Be sure to open all drains and vents before beginning any disassembly.

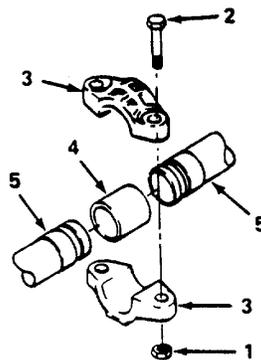
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### NOTE

Pipe sections in the ROWPU are designed to interconnect within the unit to provide for continuous flow of water being processed. This task gives typical procedures for all piping and installation hardware found in the ROWPU.

### REMOVAL.

#### PIPE TO PIPE

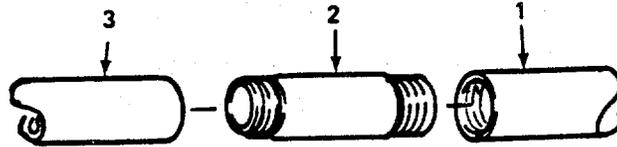


**REMOVAL. (Cont)**

**PIPE TO PIPE (Cont)**

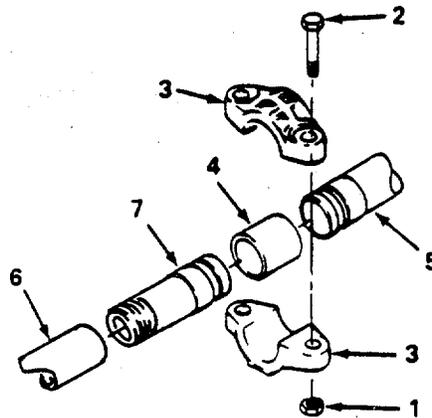
Remove two nuts (1), screws (2), clamp (3), and gasket (4) from pipe sections (5).

**PIPE TO NIPPLE**



Remove pipe section (1) and nipple (2).

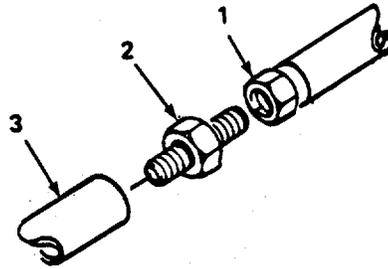
**PIPE TO ADAPTER**



- a. Remove two nuts (1), screws (2), clamp (3), and gasket (4).
- b. Separate pipes (5) and (6) and adapter (7).

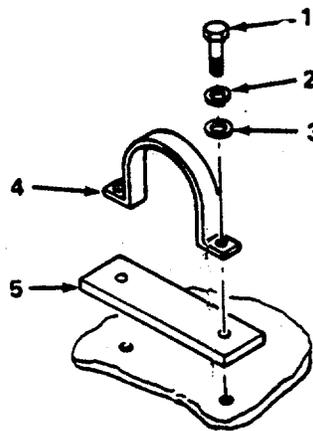
**REMOVAL. (Cont)**

**PIPE TO ADAPTER AND TUBE**



Remove tube connector (1) and adapter (2) from pipe (3).

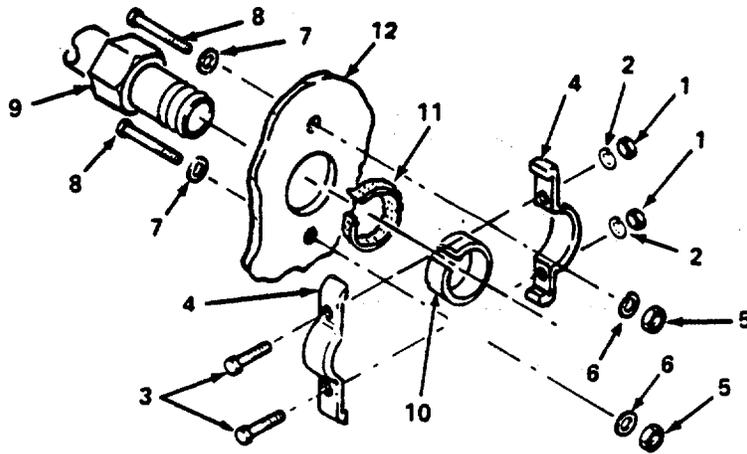
**RETAINING STRAP AND SUPPORT**



Remove two screws (1), lockwashers (2), flat washers (3), retaining strap (4), and pipe support (5). Discard lockwashers.

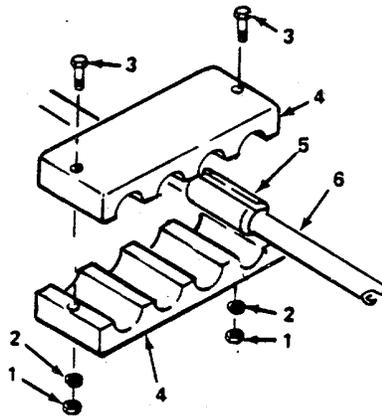
**REMOVAL. (Cont)**

**STRAP AND NIPPLE**



- a. Remove two nuts (1), flat washers (2), and screws (3).
- b. Support clamp (4) and remove two nuts (5), lockwashers (6), flat washers (7), and screws (8). Discard lockwashers.
- c. Separate and remove two-piece clamp (4).
- d. Remove ring filler (10), Nomex tape (11), and nipple (9).

**TUBE SUPPORT**

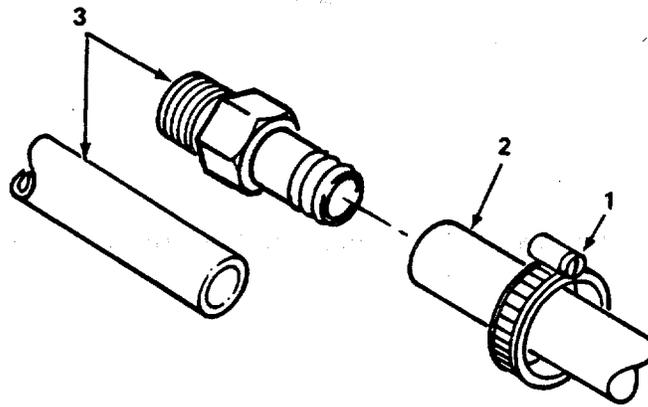


**REMOVAL. (Cont)**

**TUBE SUPPORT (Cont)**

- a. Remove two nuts (1), lockwashers (2), and screws (3). Discard lockwashers.
- b. Separate and remove two pieces of tube support (4).
- c. Remove Nomex tape (5).

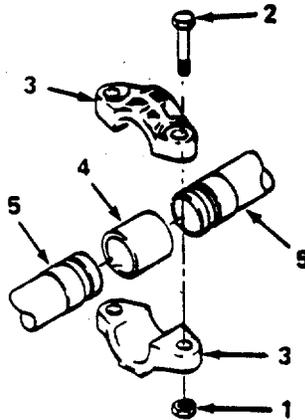
**FLEXIBLE TUBING**



Loosen clamp screw (1) and remove tubing (2) from adapter/copper tubing (3).

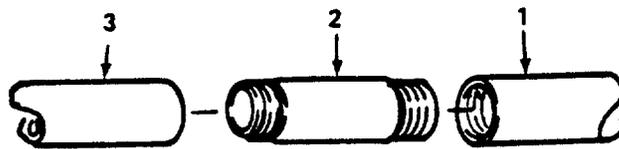
**INSTALLATION.**

**PIPE TO PIPE**



Position pipe sections (5) and install gasket (4), clamp (3), and two screws (2) and nuts (1).

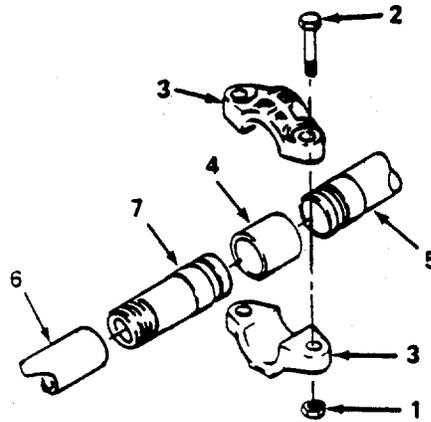
**PIPE TO NIPPLE**



- a. Apply antiseize tape to pipe threads before installation.
- b. Install nipple (2) on pipe (3).
- c. Install pipe section (1) on nipple (2).

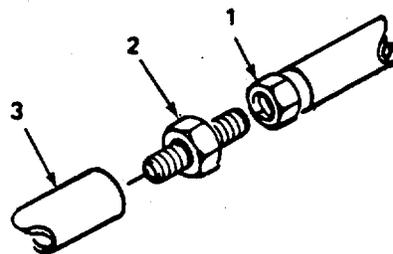
**INSTALLATION. (Cont)**

**PIPE TO ADAPTER**



- a. Apply antiseize tape to pipe threads prior to installation.
- b. Install adapter (7) on pipe (6).
- c. Position pipe (5) and adapter (7), and install gasket (4), clamp (3), and two screws (2) and nuts (1).

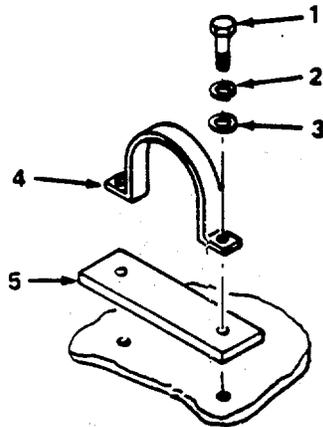
**PIPE TO ADAPTER AND TUBE**



- a. Apply antiseize tape to pipe threads before installation.
- b. Install adapter (2) on pipe (3).
- c. Install tube connector (1).

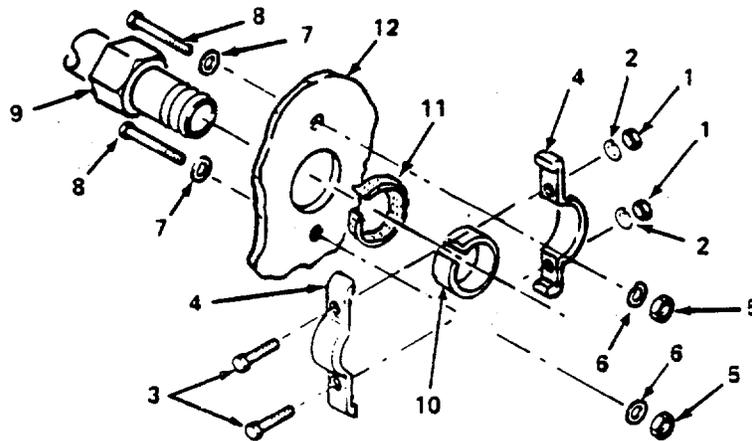
**INSTALLATION. (Cont)**

**RETAINING STRAP AND SUPPORT**



- a. Position pipe support (5) and retaining strap (4).
- b. Install two flat washers (3), new lockwashers (2), and two screws (1).

**STRAP AND NIPPLE**



**CAUTION**

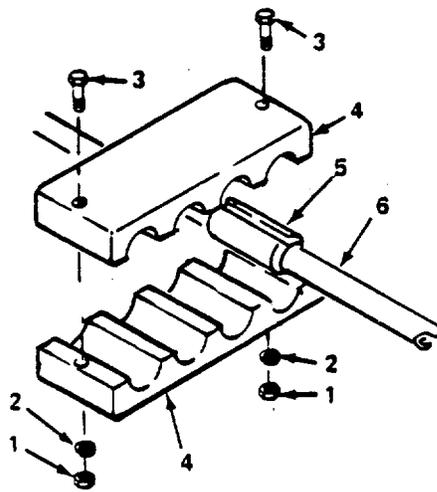
Piping can be badly damaged by corrosion if nipple and ring filler are in contact. Be sure that Nomex tape separates nipple and ring filler.

**INSTALLATION. (Cont)**

**STRAP AND NIPPLE (Cont)**

- a. Apply antiseize tape to nipple threads and install ring filler (10), Nomex tape (11), and nipple (9).
- b. Position two-piece clamp (4) in back of control panel (12) on ring filler (10).
- c. Install two screws (3), flat washers (2), and nuts (1). Do not tighten screws.
- d. Install two screws (8), flat washers (7), new lockwashers (6), and nuts (5).
- e. Tighten all screws.

**TUBE SUPPORT**



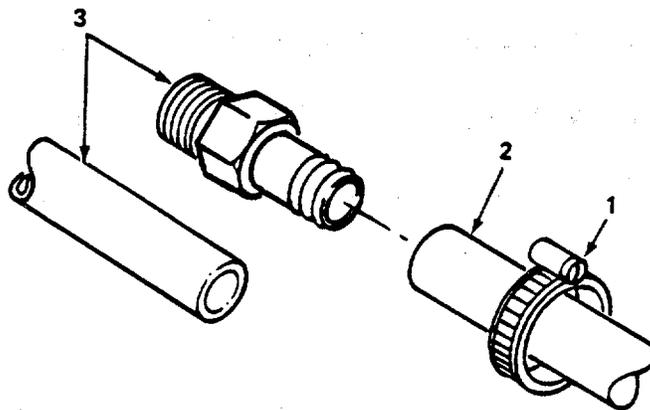
**CAUTION**

Piping can be badly damaged by corrosion if it contacts tube support. Be sure that Nomex tape separates piping and tube support.

- a. Wrap tubes (6) with Nomex tape (5).
- b. Position two pieces of tube support (4) on tubes (6) (with Nomex tape separating tube support and tubes) and install two screws (3), new lockwashers (2), and nuts (1).

**INSTALLATION. (Cont)**

**FLEXIBLE TUBING**



Position tubing (2) and clamp on adapter/copper tubing (3) and tighten clamp screw (1).

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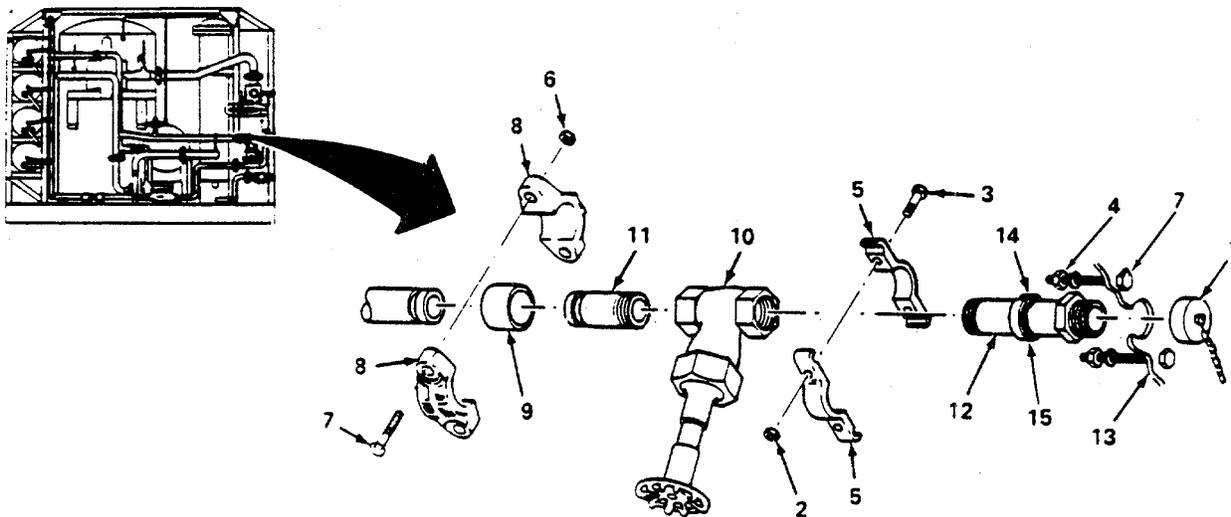
## 2-95. REPLACE VENT VESSELS GATE VALVE.

This task covers: a. Removal. b. Installation.

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### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Antiseize Tape (Appx C, Sect II, Item 17).  
Nomex Tape (Appx C, Sect II, Item 19).
  - c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- 



### REMOVAL.

- a. Remove cap (1).
- b. Remove two nuts (2) and screws (3).
- c. Loosen two nuts (4) and remove two-piece strap (5).
- d. Remove two nuts (6), screws (7), clamp (8), and gasket (9).

**REMOVAL. (Cont)**

- e. Remove vent vessels gate valve (10) with adapter (11) and pipe section (12) from control panel (13).
- f. Remove adapter (11) and pipe section (12) from vent vessels gate valve (10).
- g. Remove ring filler (14) and Nomex tape (15) from pipe section (12).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Wrap pipe section (12) with Nomex tape (15) where two-piece strap (5) will be positioned.
- b. Install ring filler (14).
- c. Install adapter (11) and pipe section (12) on vent vessels gate valve (10).
- d. Position pipe section (12) through cutout on control panel (13).
- e. Install gasket (9), clamp (8), two screws (7), and nuts (6).

**CAUTION**

Pipe section can be badly damaged by corrosion if it contacts strap. Be sure to separate pipe section from strap with Nomex tape.

- f. Position two-piece strap (5) on ring filler (14) and nuts (4).
- g. Install two screws (3) and nuts (2).
- h. Tighten two nuts (4) and (2) and install cap (1).

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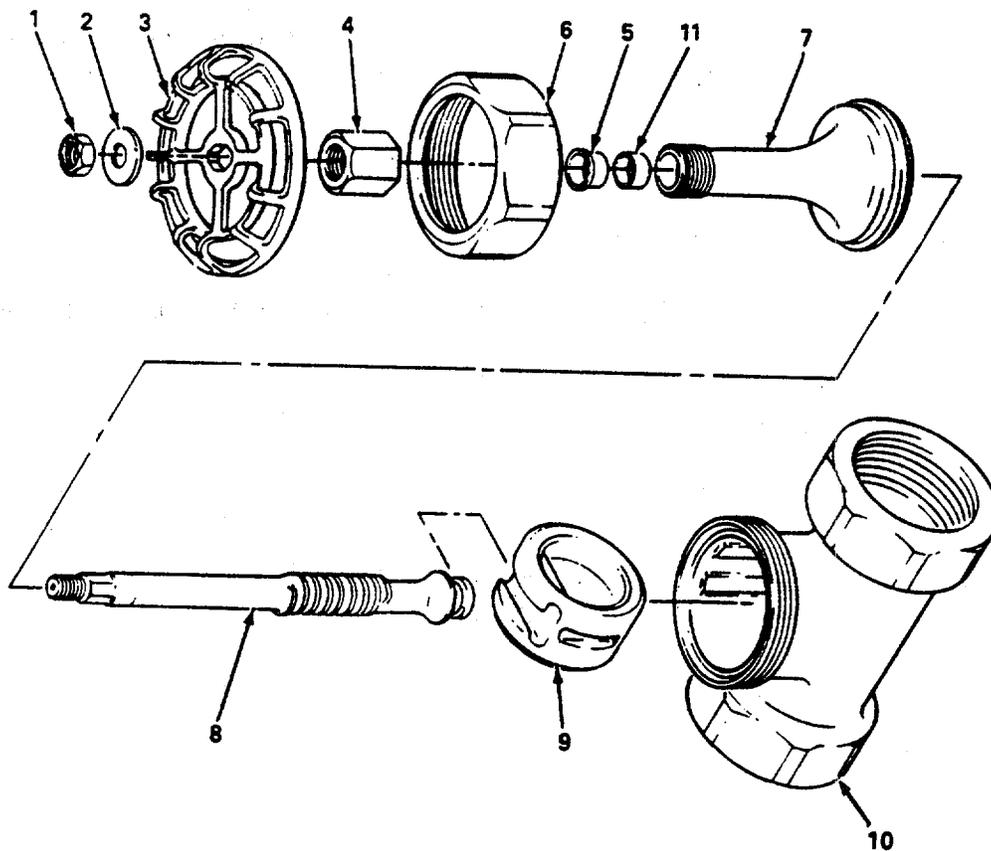
## 2-96. REPAIR VENT VESSELS GATE VALVE.

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

---

### INITIAL SETUP.

- a. Tools.      Tool Kit (Appx B, Sect III, Item 10).  
                  Tool Kit (Appx B, Sect III, Item 7).  
                  Soft-Bristled Brush (Appx B, Sect III, Item 2).
  - b. Materials/Parts.      Detergent (Appx C, Sect II, Item 3).
  - c. Equipment Condition.      Vent vessels gate valve removed (paragraph 2-95).
- 



### DISASSEMBLY.

- a. Place vent vessels gate valve in vice to disassemble.
- b. Remove handwheel nut (1), nameplate (2), handwheel (3), packing nut (4), and gland (5).

**DISASSEMBLY. (Cont)**

- c. Remove union bonnet ring (6) and bonnet (7) with stem (8) and disc (9) from body (10).
- d. Remove disc (9) and unscrew stem (8) from bonnet (7).
- e. Remove packing (11) from bonnet (7). Discard packing.

**CLEANING.**

Using soap solution and soft-bristled brush, clean all parts of vent vessels gate valve assembly.

**INSPECTION.**

- a. Inspect disc for cracks and scarring, stem for damaged threads, gland and packing nut for damage. Replace valve if parts are damaged.
- b. Inspect handwheel nut, handwheel, union bonnet ring, bonnet, and body for damage. Replace valve if parts are damaged.

**ASSEMBLY.**

- a. Place new packing (11) in bonnet (7).
- b. Screw stem (8) into bonnet (7), slide disc (9) on stem, and position disc guides into slots in body (10).
- c. Seat bonnet (7) on body (10).
- d. bonnet (7), gland (5), and packing nut (4).
- e. Install handwheel (3), nameplate (2), and handwheel nut (1).

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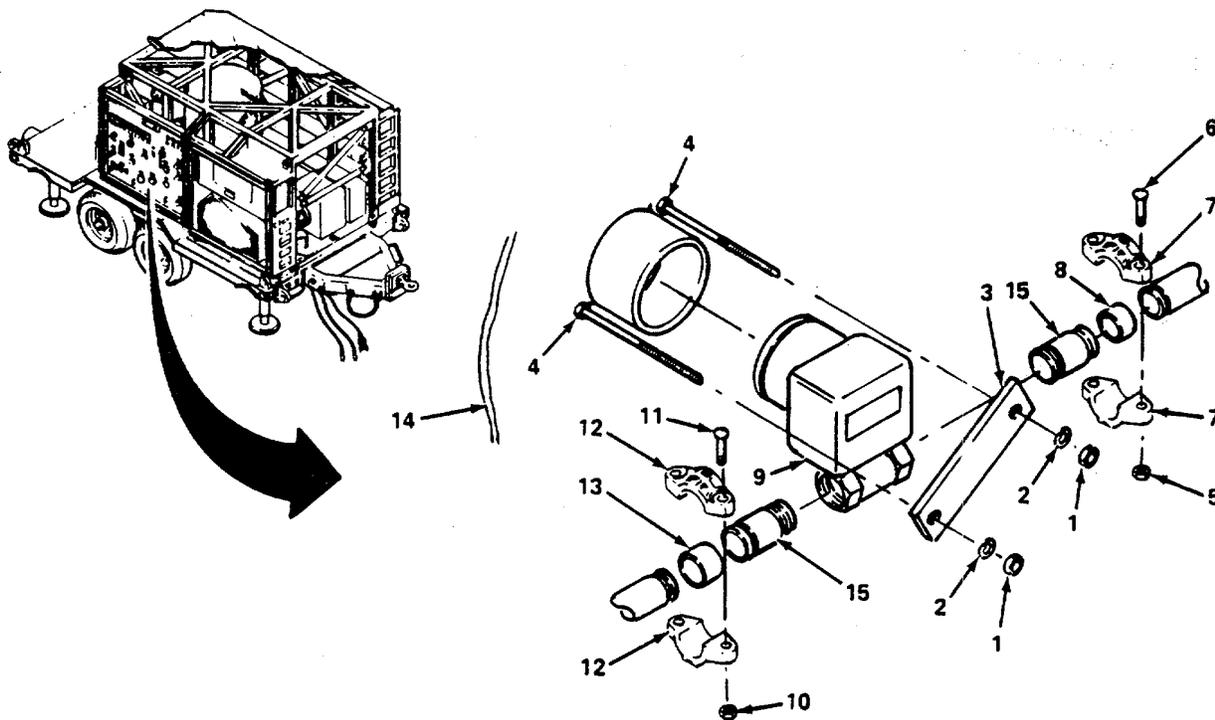
## 2-97. REPLACE RAW WATER FLOWMETER.

This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Antiseize Tape (Appx C, Sect II, Item 17).
  - c. Equipment Condition. Power shut down (power source manual). ROWPU shut down (TM 10-4610-239-10).
- 



### REMOVAL.

- a. Remove two nuts (5), bolts (6), clamp (7), and gasket (8).
- b. Remove two nuts (10), bolts (11), clamp (12), and gasket (13).

**REMOVAL. (Cont)**

- c. Remove two nuts (1), lockwashers (2), bracket (3) and flowmeter (9) from panel (14). Discard lockwashers.
- d. Remove two adapters (15) from flowmeter (9).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to threads on all male pipe fittings before installation.

- a. Install two adapters (15) on flowmeter (9).
- b. Position flowmeter (9) in cutout on control panel (14).
- c. Install gasket (13), clamp (12), two bolts (11), and nuts (10).
- d. Install gasket (8), clamp (7), two bolts (6), and nuts (5).
- e. Position bracket (3) on two studs (4) and install two new lockwashers (2) and nuts (1).

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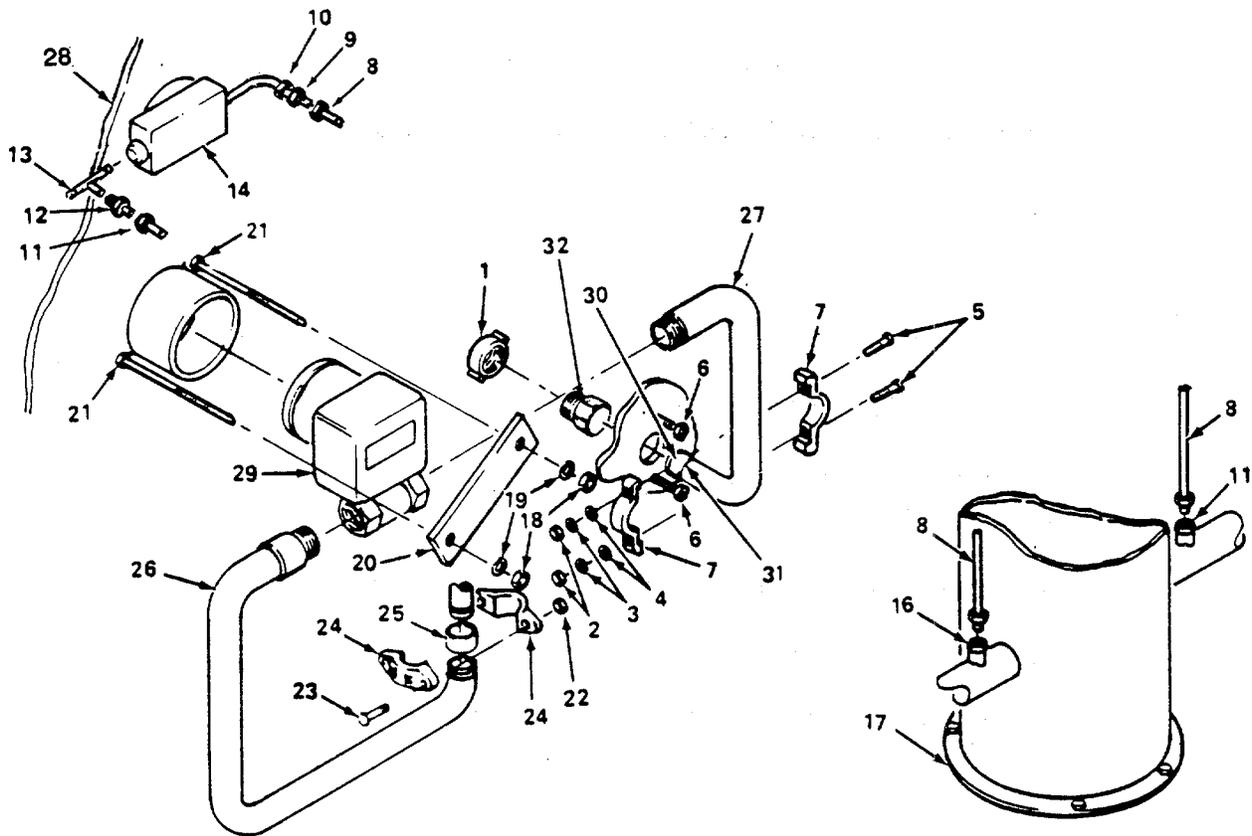
## 2-98. REPLACE BRINE WATER FLOWMETER.

This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect HIII, Item 10).
  - b. Materials/Parts. Antiseize Tape (Appx C, Sect II, Item 17).  
Nomex Tape (Appx C, Sect II, Item 19).
  - c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- 



### REMOVAL.

- a. Remove cap (1) from adapter (32).

**REMOVAL. (Cont)**

- b. Remove two nuts (2), lockwashers (3), flat washers (4), and screw (5). Discard lockwashers.
- c. Loosen two nuts (6) and remove two-piece strap (7).

**NOTE**

Tag ends of pressure tubes before removal.

- d. Disconnect two pressure tubes (8) from adapters (9) and (12) at filter gage (14).
- e. Remove two nuts (18), lockwashers (19), and bracket (20) from studs (21). Discard lockwashers.
- f. Remove two nuts (22), screws (23), clamp (24), and gasket (25).
- g. Tilt pipe section (26) and pipe assembly (27) and remove from control panel (28) with flowmeter (29).
- h. Remove pipe section (26) and pipe assembly (27) from flowmeter (29).
- i. Remove ring filler (30) and Nomex tape (31) from pipe assembly (27).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Install pipe section (26) and pipe assembly (27) on flowmeter (29).
- b. Position flowmeter (29) face in cutout on control panel (28). End of pipe assembly (27) must protrude through control panel cutout.
- c. Position bracket (20) on two studs (21) and install two new lockwashers (19) and nuts (18).
- d. Install gasket (25), clamp (24), two screws (23), and nuts (22).
- e. Install pressure tubes (8) on adapters (9) and (12) at tee connection (13) and elbow (10).

**INSTALLATION. (Cont)**

**CAUTION**

Piping can be badly damaged by corrosion if pipe section and ring filler are in contact. Be sure that Nomex tape separates pipe section and ring filler.

- f. Install Nomex tape (31) and ring filler (30) on pipe assembly (27) where two-piece strap (7) will clamp and install adapter (32) on pipe assembly (27).
- g. Position two-piece strap (7) and tighten two nuts (6).
- h. Install two screws (5), flat washers (4), new lockwashers (3), and nuts (2).
- i. Install cap (1) on adapter (32).

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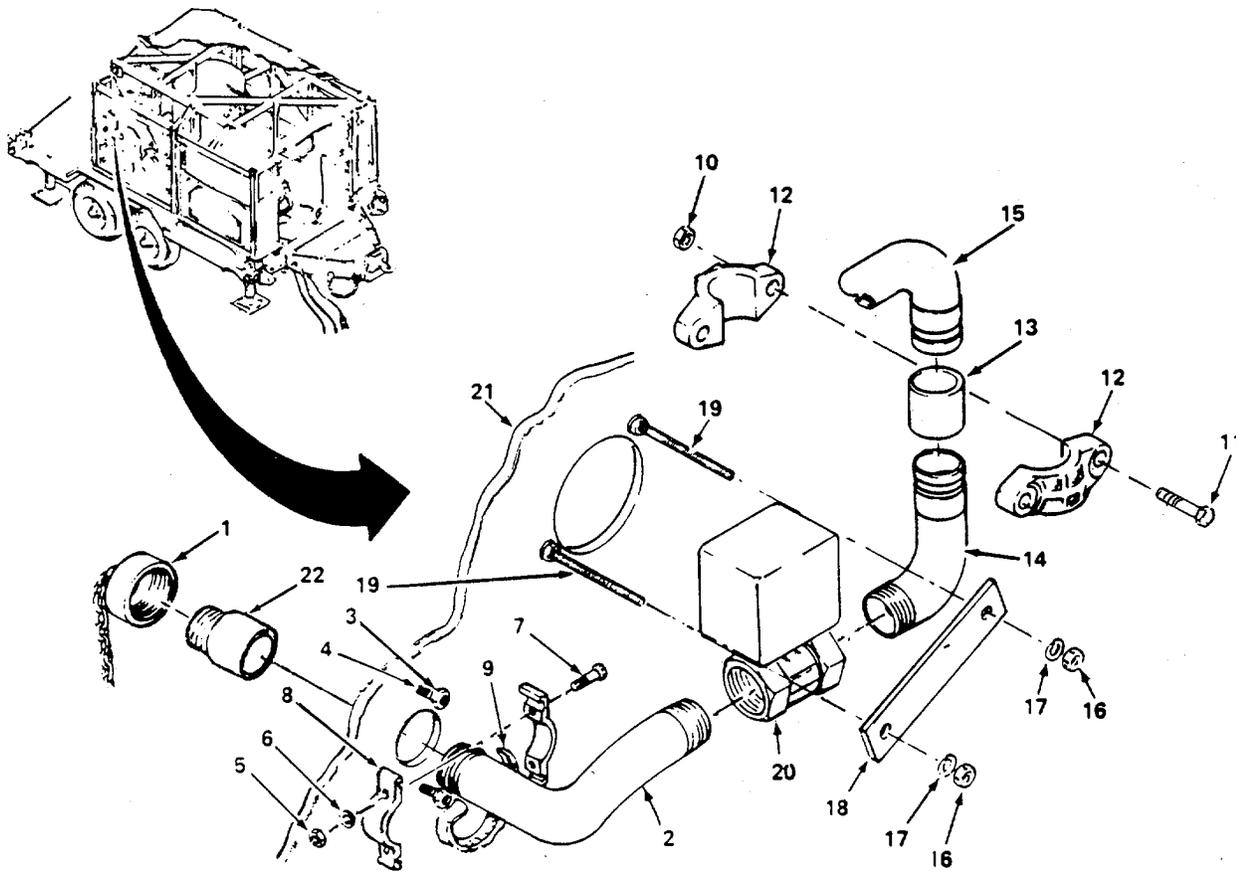
## 2-99. REPLACE BACKWASH WATER FLOWMETER.

This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Antiseize Tape (Appx C, Sect II, Item 17).  
Nomex Tape (Appx C, Sect II, Item 19).
  - c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM-10-4610-239-10).
- 



**REMOVAL.**

- a. Remove cap (1) from pipe adapter (22) and remove adapter (22).
- b. Loosen two nuts (3) on studs (4) and remove two nuts (5), lockwashers (6), and screws (7). Discard lockwashers.
- c. Remove two-piece strap (8) and Nomex tape (9). Discard Nomex tape.
- d. Remove two nuts (10), screws (11), clamp (12), and gasket (13) from pipe sections (14) and (15).
- e. Remove two nuts (16), lockwashers (17), and gage clamp (18) from two studs (19). Discard lockwashers.
- f. Remove flowmeter (20) with pipe sections (2) and (14) from control panel (21).
- g. Remove pipe sections (2) and (14).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to male pipe fittings before installation.

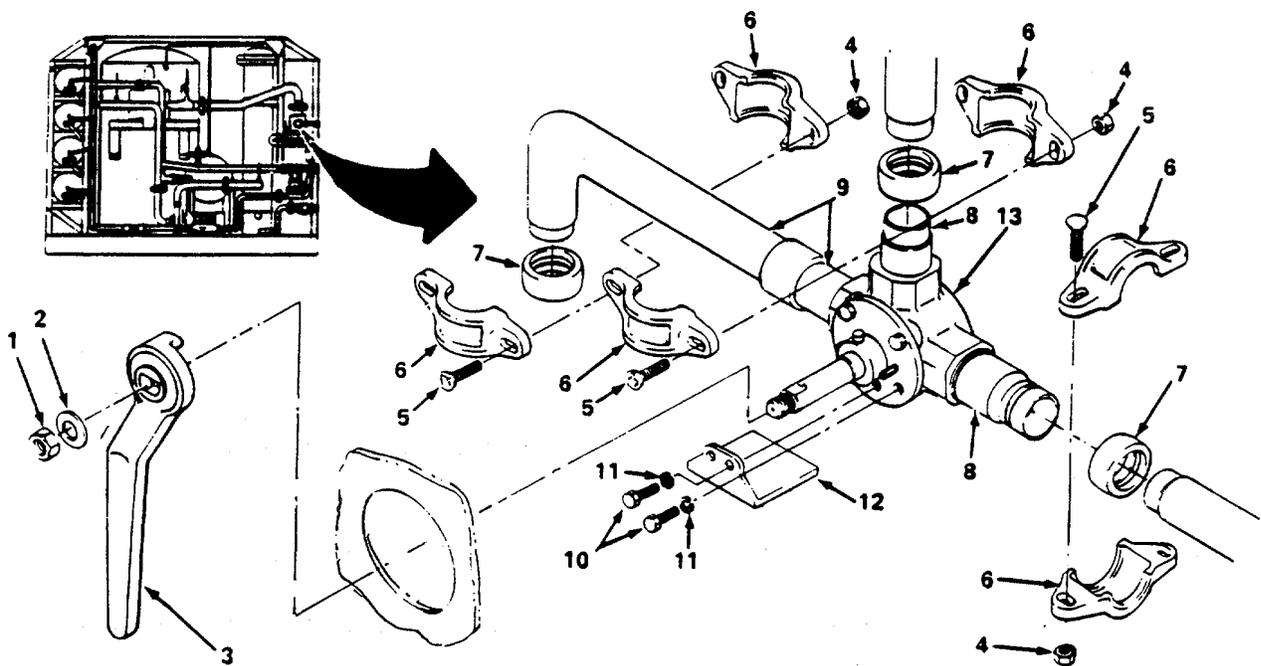
- a. Install pipe sections (2) and (14) on flowmeter (20).
- b. Position flowmeter (20) in cutout on control panel (21) and install gasket (13), clamp (12), two screws (11), and nuts (10) on pipe sections (14) and (15).
- c. Wrap pipe section (2) with Nomex tape (9) and position two-piece strap (8) with Nomex tape (9) between two studs (4) and nuts (3).
- d. Install two screws (7), new lockwashers (6), and nuts(5). Tighten two nuts (3).
- e. Position gage clamp (18) on two studs (19) and install two new lockwashers (17) and nuts (16).
- f. Install adapter (22) and cap (1) on pipe section (2).

## 2-100. REPLACE BACKWASH VALVE.

This task covers: a. Removal. b. Installation.

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Materials/Parts. Antiseize Tape (Appx C, Sect II, Item 17).
- c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).



### REMOVAL.

- a. Remove nut (1), flat washer (2), and handle (3).
- b. Remove six nuts (4) and screws (5), three clamps (6), and three gaskets (7).
- c. Remove two adapters (8) and check valve with pipe section (9).

**REMOVAL (Cont)**

- d. Remove two bolts (10) and lockwashers (11) and remove mounting plate (12). Discard lockwashers.

**INSTALLATION.**

- a. Position mounting plate (12) on backwash valve (13) and install two lockwashers (11) and bolts (10).

**NOTE**

Apply antiseize tape to male pipe threads before installation.

- b. Install two adapters (8) and pipe section with check valve (9) on backwash valve (13).
- c. Position backwash valve (13) on back of control panel with valve stem through cutout.
- d. Install three gaskets (7) and clamps (6) and six screws (5) and nuts (4).
- e. Install handle (3), flat washer (2), and nut (1).

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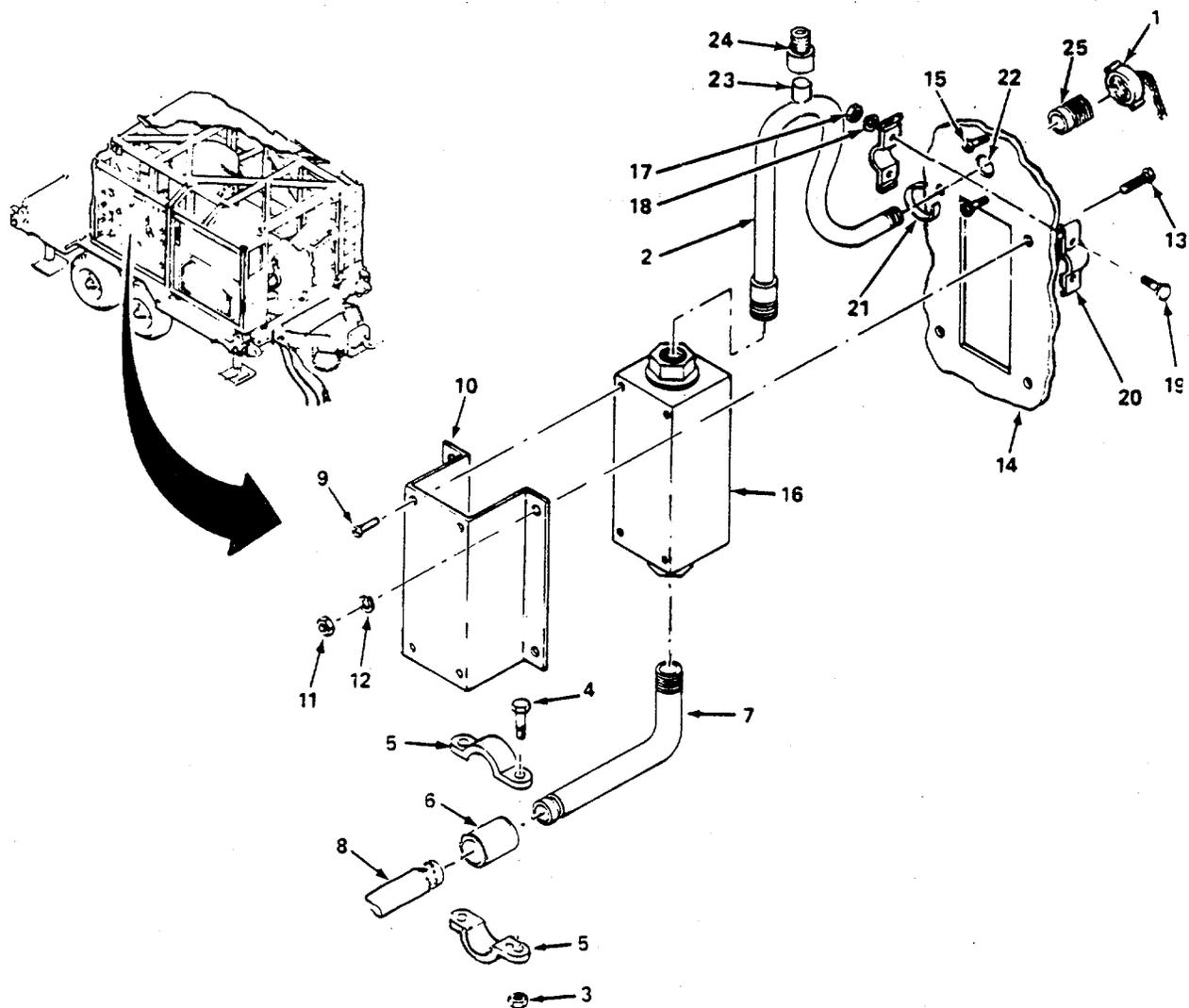
## 2-101. REPLACE PRODUCT WATER FLOWMETER.

This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Antiseize Tape (Appx C, Sect II, Item 17).  
Nomex Tape (Appx C, Sect II, Item 19).
  - c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- 



**REMOVAL.**

- a. Remove cap (1) from adapter (25) and remove adapter (25) from pipe section (2).
- b. Remove two nuts (3), screws (4), clamp (5), and gasket (6) from pipe sections (7) and (8).
- c. Remove four screws (9) from bracket (10).
- d. Remove four nuts (11), lockwashers (12), screws (13), and bracket (10) from control panel (14). Discard lockwashers.
- e. Loosen two nuts (15).
- f. While supporting flowmeter (16), remove two nuts (17), lockwashers (18), screws (19), and two-piece strap (20). Discard lockwashers.
- g. Remove pipe sections (2) and (7) with flowmeter (16) from control panel (14).
- h. Remove two pipe sections (2) and (7) from flowmeter (16).
- i. Disconnect dissolved solids sensor cable connector (24) from adapter (23) on pipe section (2).
- j. Remove Nomex tape (21) from pipe section (2).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Install pipe sections (2) and (7) on flowmeter (16).

**CAUTION**

Pipe section can be badly damaged by corrosion if it contacts strap. Be sure to separate pipe section from strap with Nomex tape.

- b. Install Nomex tape (21) on pipe section (2) where two-piece strap (20) will clamp.
- c. Position flowmeter (16) in cutout on control panel (14) and position end of pipe section (2) through hole (22) in control panel.
- d. While supporting flowmeter (16), install two-piece strap (20), two screws (19), new lockwashers (18), and nuts (17).
- e. Tighten two nuts (15).

**INSTALLATION. (Cont)**

- f. Position bracket (10) and install four screws (9).
- g. Install four screws (13), new lockwashers (12), and nuts (11).
- h. Position pipe section (7) and install gasket (6) and clamp (5), and two screws (4) and nuts (3).
- i. Connect dissolved solids sensor cable connector (24) to adapter (23) on pipe section (2).

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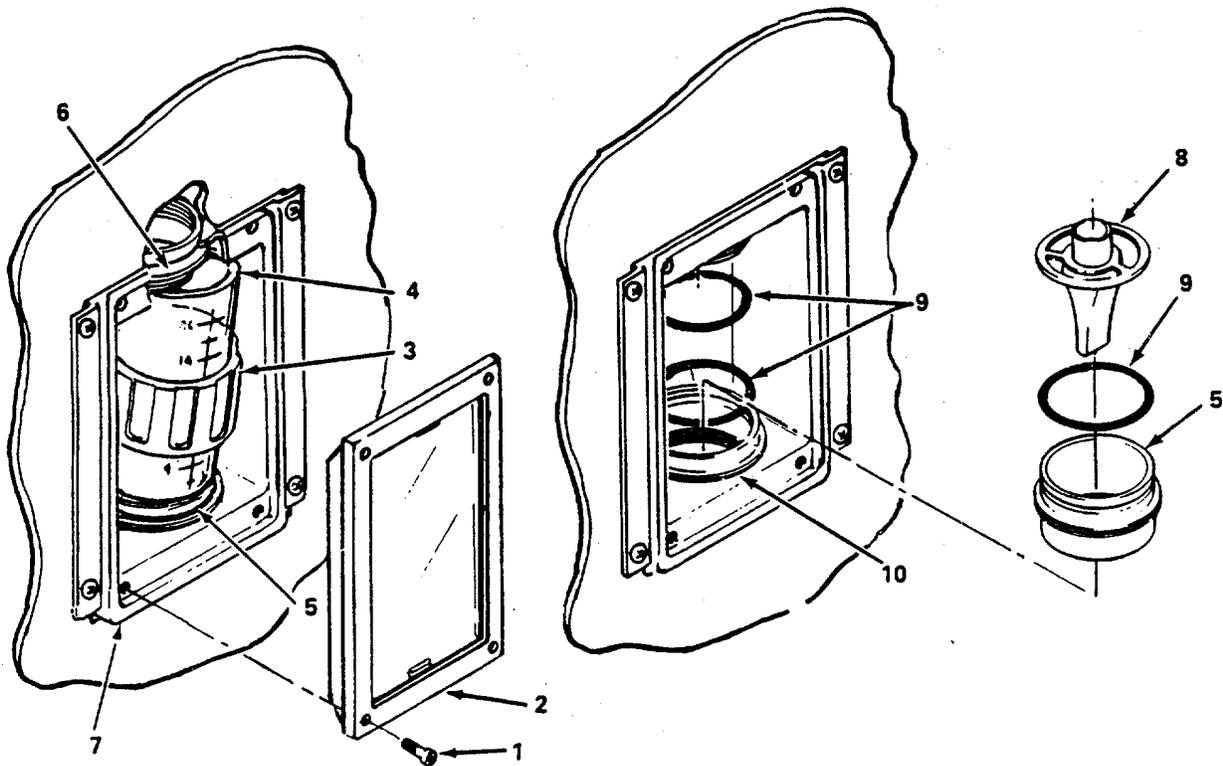
## 2-102. REPAIR PRODUCT WATER FLOWMETER.

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Detergent (Appx C, Sect II, Item 3).  
Sandpaper (Appx C, Sect II, Item 15).  
Rags (Appx C, Sect II, Item 13).
  - c. Equipment Condition. Power shut down (power-source manual).  
ROWPU shut down (TM 10-4610-239-10).
- 



**DISASSEMBLY.**

**WARNING**

Do not disassemble flowmeter while ROWPU is operating.  
Pressurized water can cause serious personnel injury.

- a. Remove four screws (1) and faceplate (2).
- b. Unscrew ring (3) and slide it up tube (4).
- c. Press down on socket (5), lift tube (4) off socket, then work tube and ring (3) off of top fitting (6) and out of shell (7).
- d. Remove plumb bob float (8), socket (5), and three O-rings (9). Discard O-rings.

**CLEANING.**

- a. Using mild soap solution, wash all parts.
- b. Rinse parts with clean water and wipe dry with clean rags.

**INSPECTION.**

- a. Inspect screws and shell for damaged threads. Replace screws as required. If shell threads are damaged, replace product water flowmeter. Refer to paragraph 2-102.
- b. Inspect tube and faceplate lenses for scratches or cracks. Inspect tube lettering for legibility. Replace tube or faceplate as required.
- c. Inspect ring for cracks, chips, or damaged threads. Replace as required.
- d. Inspect faceplate and shell for rust and deformity. Remove rust with sandpaper and prime and touch up paint as required. Replace deformed faceplate as required. If shell is deformed, replace product water flowmeter. Refer to paragraph 2-102.
- e. Inspect plumb bob float and socket for deformity or cracks. Replace as required.
- f. Inspect top and bottom (10) fittings for deformity or cracks. Inspect bottom fitting for damaged threads. If either fitting is damaged, replace product water flowmeter. Refer to paragraph 2-102.

**ASSEMBLY.**

- a. Install three new O-rings (9) on top fitting (6), bottom fitting (10), and socket (5).
- b. Position socket (5) and plumb bob float (8) in bottom fitting (10).
- c. Position ring (3) on tube (4).

**NOTE**

Be sure G.P.M. WATER scale faces out when installing tube on socket.

- d. While pressing down on socket (5), work tube (4) with ring (3) between socket and top fitting (6).
- e. Slide tube (4) onto socket (5) and push socket and tube up onto top fitting (6).
- f. Screw ring (3) on socket (5). Be sure G.P.M. WATER scale stays at front.
- g. Position faceplate (2) and install four screws (1).

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**2-103. REPLACE DIFFERENTIAL PRESSURE GAGES: CARTRIDGE FILTER, MULTIMEDIA FILTER, AND R.O. VESSELS.**

This task covers: a. Removal. b. Installation.

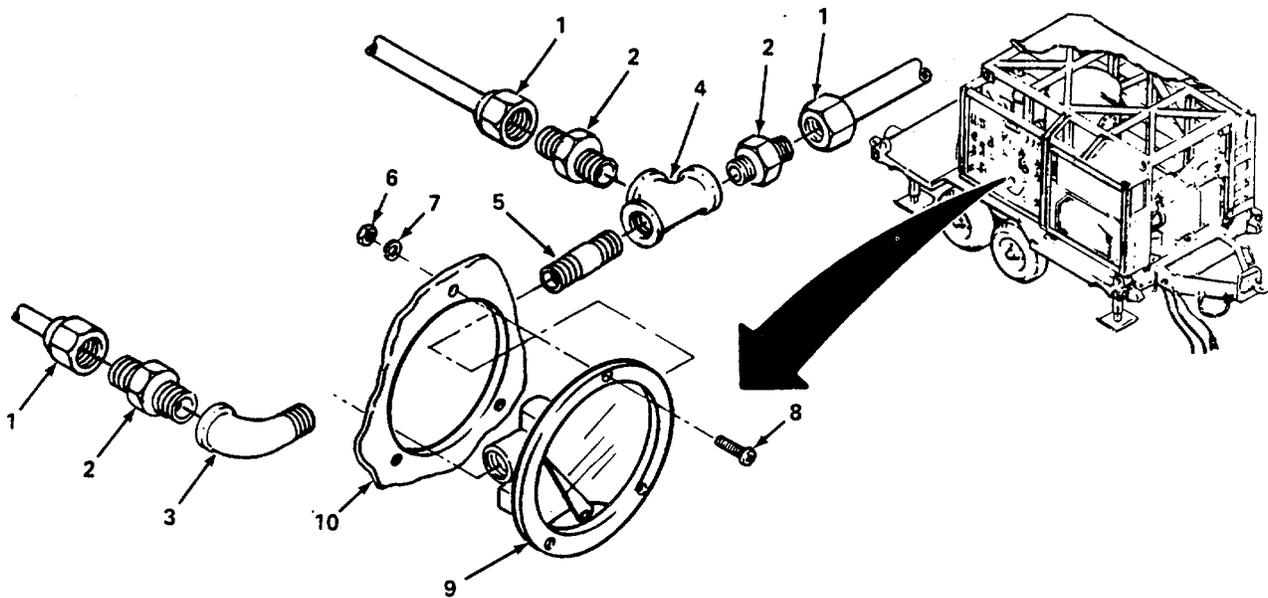
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**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Detergent (Appx C, Sect II, Item 3).  
Antiseize Tape (Appx C, Sect II, Item 17).
  - c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- 

**REMOVAL.**

**CARTRIDGE FILTER GAGE**

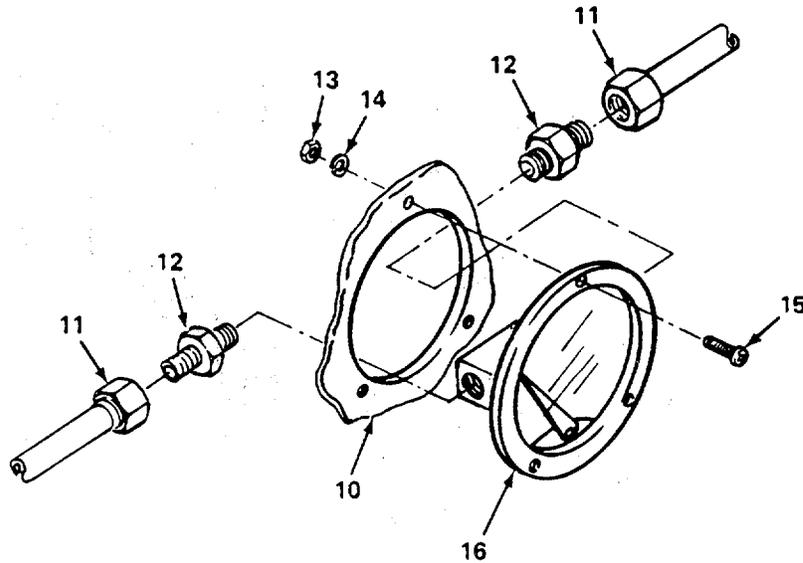


- a. Remove three connectors (1), adapters (2), and elbow (3).
- b. Remove pipe tee (4) and nipple (5).

**REMOVAL. (Cont)**

- c. Remove three nuts (6), lockwashers (7), and screws (8). Discard lockwashers.
- d. Remove cartridge filter gage (9) from control panel (10).

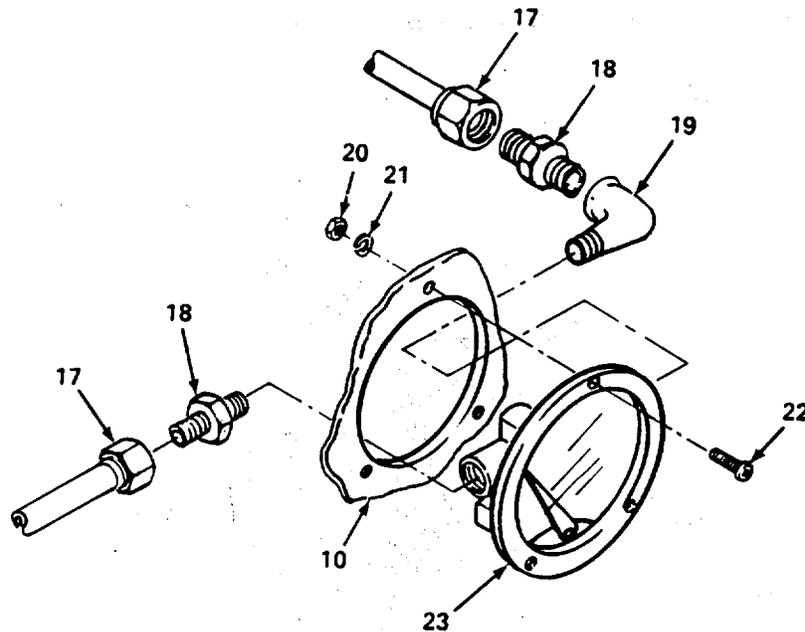
**MULTIMEDIA FILTER GAGE**



- a. Remove two connectors (11) and adapters (12).
- b. Remove three nuts (13), lockwashers (14), and screws (15).
- c. Remove multimedia filter gage (16) from control panel (10).

**REMOVAL. (Cont)**

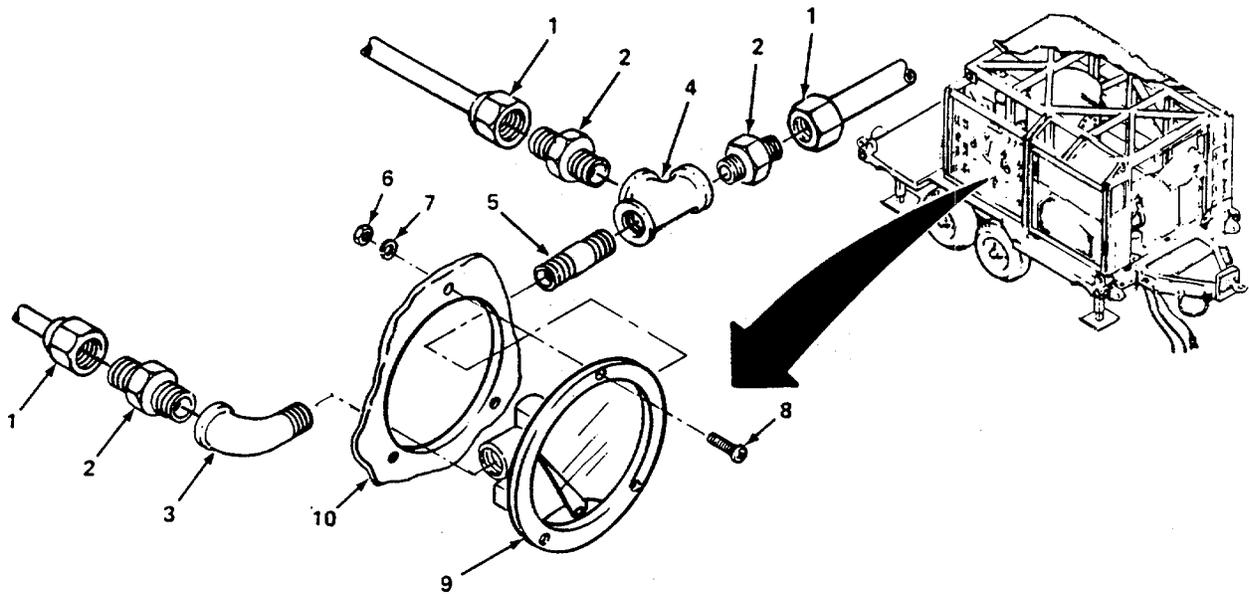
**R.O. VESSELS GAGE**



- a. Remove two connectors (17) and adapters (18).
- b. Remove elbow (19).
- c. Remove three nuts (20), lockwashers (21), and screws (22). Discard lockwashers.
- d. Remove R.O. vessels gage (23) from control panel (10).

**INSTALLATION.**

**CARTRIDGE FILTER GAGE**



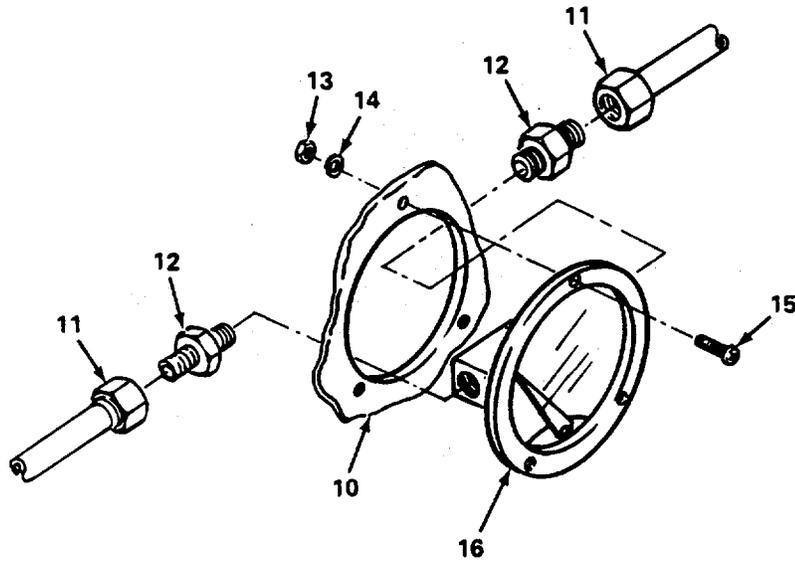
**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Position cartridge filter gage (9) in cutout on control panel (10) and install three screws (8), new lockwashers (7), and nuts (6).
- b. Install nipple (5), pipe tee (4), and elbow (3).
- c. Install three adapters (2) and connectors (1).

**INSTALLATION. (Cont)**

**MULTIMEDIA FILTER GAGE**



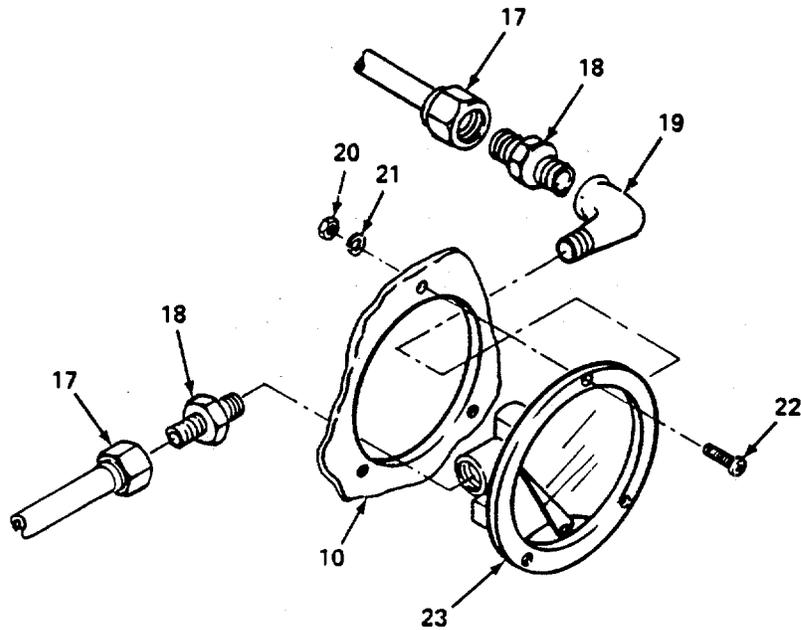
**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Position multimedia filter gage (16) in cutout on control panel (10) and install three screws (15), new lockwashers (14), and nuts (13).
- b. Install two adapters (12) and connectors (11).

**INSTALLATION. (Cont)**

**R.O. VESSELS GAGE**



**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Position R.O. vessels gage (23) in cutout on control panel (10) and install three screws (22), new lockwashers (21), and nuts (20).
- b. Install elbow (19).
- c. Install two adapters (18) and connectors (17).

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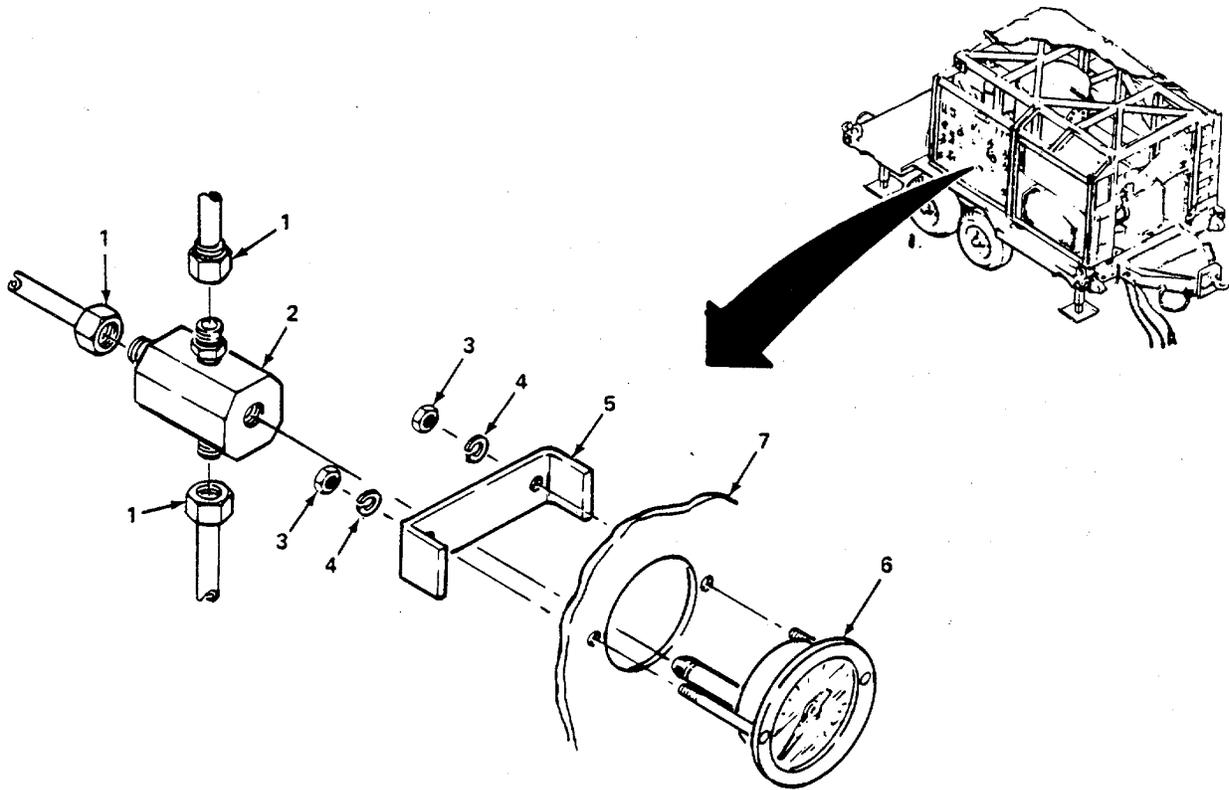
## 2-104. REPLACE R.O. PRESSURE GAGE.

This task covers: a. Removal. b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Part. Antiseize Tape (Appx C, Sect II, Item 17).
  - c. Equipment Condition Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- 



**REMOVAL.**

- a. Unscrew three connectors (1) and remove four-way distribution block (2).
- b. Remove two nuts (3), lockwashers (4), and bracket (5). Discard lockwashers.
- c. Remove R.O. pressure gage (6) from front of control panel (7).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Position R.O. pressure gage (6) in cutout on control panel (7).
- b. Position mounting bracket (5) on rear of control panel (7) and install two new lockwashers (4) and nuts (3).
- c. Install four-way distribution block (2) and three connectors (1).



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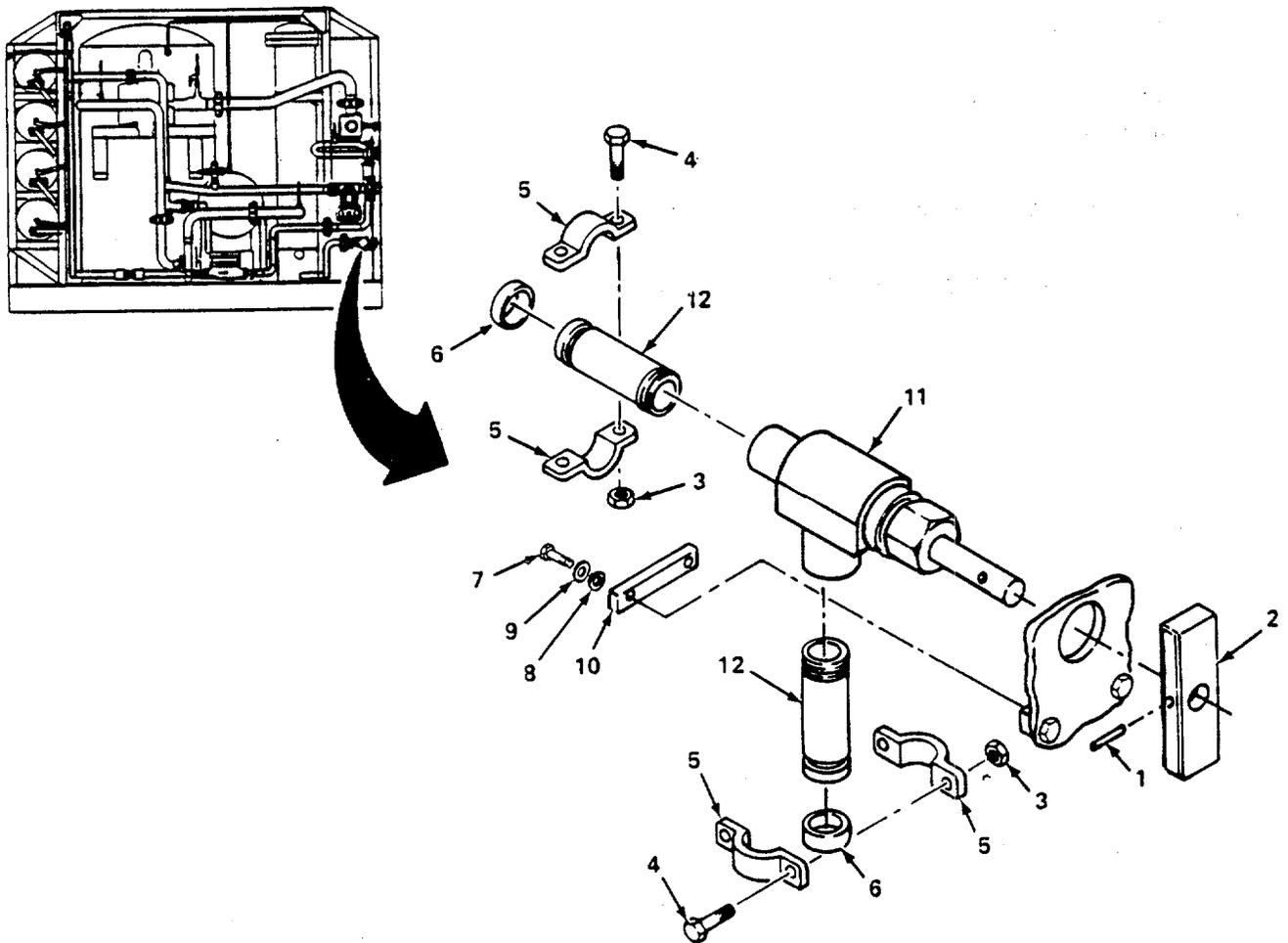
**2-106. REPLACE NEEDLE VALVE.**

This task covers:      a.    Removal.                      b.    Installation.

---

**INITIAL SETUP.**

- a. Tools.            Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts.                      Antiseize Tape (Appx C, Sect II, Item 17).
  - c. Equipment Condition.                      Power shut down (power source manual).  
                                                            ROWPU shut down (TM 10-4610-239-10).
- 



**REMOVAL.**

- a. Punch out roll pin (1) and remove valve handle (2).
- b. Remove four nuts (3) and screws (4) and two clamps (5) and gaskets (6).
- c. Remove two screws (7), lockwashers (8), flat washers (9), bar (10), and needle valve (11) with two adapters (12).
- d. Remove two adapters (12).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to pipe threads before installation.

- a. Install two adapters (12).
- b. Position needle valve (11) and bar (10) and install two screws (7), flat washers (9), and lockwashers (8).
- c. Install two gaskets (6), two clamps (5), four screws (4), and four nuts (3).
- d. Position handle (2) and install roll pin (1).

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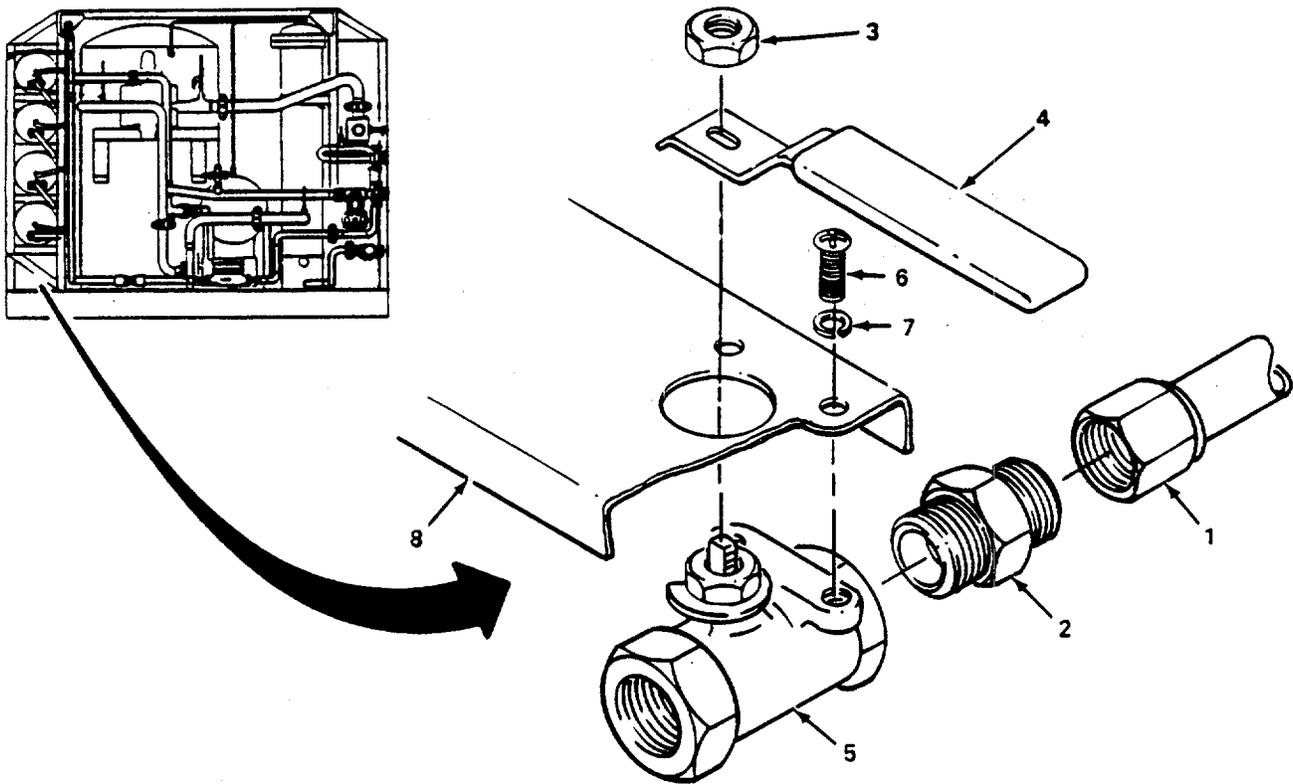
## 2-107. REPLACE DRAIN BALL VALVE.

This task covers:                    a. Removal.                                            b. Installation.

---

### INITIAL SETUP.

- a. Tools.                    Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts.                    Antiseize Tape (Appx C, Sect II, Item 17).
  - c. Equipment Condition.                    Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- 



### REMOVAL.

#### NOTE

There are seven drain ball valves. All are removed the same. One is shown.

- a. Remove tube (1) from adapter (2).

**REMOVAL. (Cont)**

- b. Remove nut (3) and handle (4).

**NOTE**

Label drain ball valve before removal. Valves must be installed in same location from which removed.

- c. Support drain ball valve (5) and remove two screws (6) and lockwashers (7). Discard lockwashers.
- d. Lower drain ball valve (5) and tilt to remove from hole in bracket (8).
- e. Remove adapter (2) from drain ball valve (5).

**INSTALLATION.**

**NOTE**

- There are seven drain ball valves. All are installed the same. One is shown.
- Install drain ball valve in position labeled.
- Apply antiseize tape to male pipe threads before installation.

- a. Install adapter (2) on drain ball valve (5).
- b. Position drain ball valve (5) on bracket (8) and install two new lockwashers (7) and screws (6) fingertight.
- c. Install handle (4) and nut (3).
- d. Install tube (1) on adapter (2).
- e. Tighten two screws (6).



**REMOVAL.. (Cont)**

- b. Remove tube (3) and adapter (4).
- c. Loosen clamp (5) and remove tubing (6) and adapter (7).
- d. Remove two bolts (8), two lockwashers (9), two flat washers (10), clamp (11), Nomex tape (12), and plate (13). Discard lockwashers.
- e. Remove pipe section (2) and check valve (14) from pipe section (15).
- f. Remove check valve (14) from pipe section (2).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Install check valve (14) on end of pipe section (2) nearest threaded adapter (4). Ensure arrow on check valve points toward pipe section (2).
- b. Wrap pipe section (2) with Nomex tape (12).
- c. Install pipe section (2) and check valve (14) on pipe section (15). Ensure threaded adapter (4) points toward multimedia filter and hose adapter (7) points upward.
- d. Position plate (13).

**CAUTION**

Pipe section can be badly damaged by corrosion if it is installed in contact with plate or clamp. Be sure to separate pipe section from plate and clamp with Nomex tape.

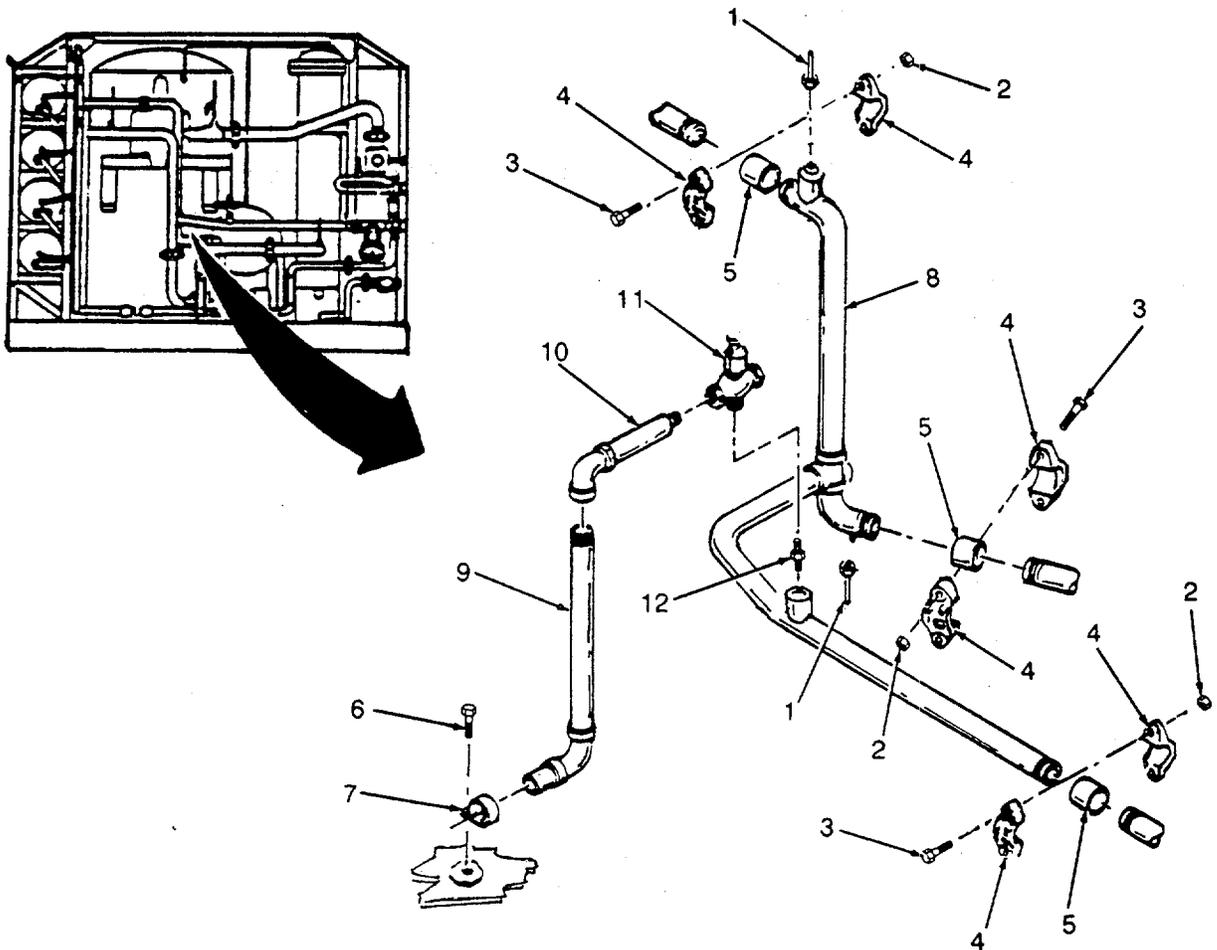
- e. Install clamp (11), two flat washers (10), two lockwashers (9), and two bolts (8).
- f. Install adapter (7) and tubing (6) and tighten clamp (5).
- g. Install adapter (4) and tube (3).
- h. Install nipple (1) in pipe section (2).

**2-109. REPLACE RELIEF VALVE.**

This task covers:                    a. Removal.                    b. Installation.

**INITIAL SETUP.**

- a. Tools.                    Tool Kit (Appx B, Sect III, Item 10).  
                                Tool Kit (Appx B, Sect III, Item 7).
- b. Materials/Parts.                    Antiseize Tape (Appx C, Sect II, Item 17).
- c. Equipment Condition.                    Power shut down (power source manual).  
                                ROWPU shut down (TM 10-4610-239-10).



**REMOVAL..**

- a. Disconnect two connectors (1).
- b. Remove six nuts (2) and screws (3) and three clamps (4) and gaskets (5).

**REMOVAL. (Cont)**

- c. Remove screw (6) and loop clamp (7).
- d. Remove pipe sections (8) and (9).
- e. Remove pipe section (10) and relief valve (11) from adapter (12).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Install relief valve (11) on adapter (12).
- b. Install pipe section (10) on relief valve (11).
- c. Install pipe section (9).
- d. Position pipe section (8) and install three gaskets (5) and clamps (4) and six screws (3) and nuts (2).
- e. Connect two connectors (1).

---

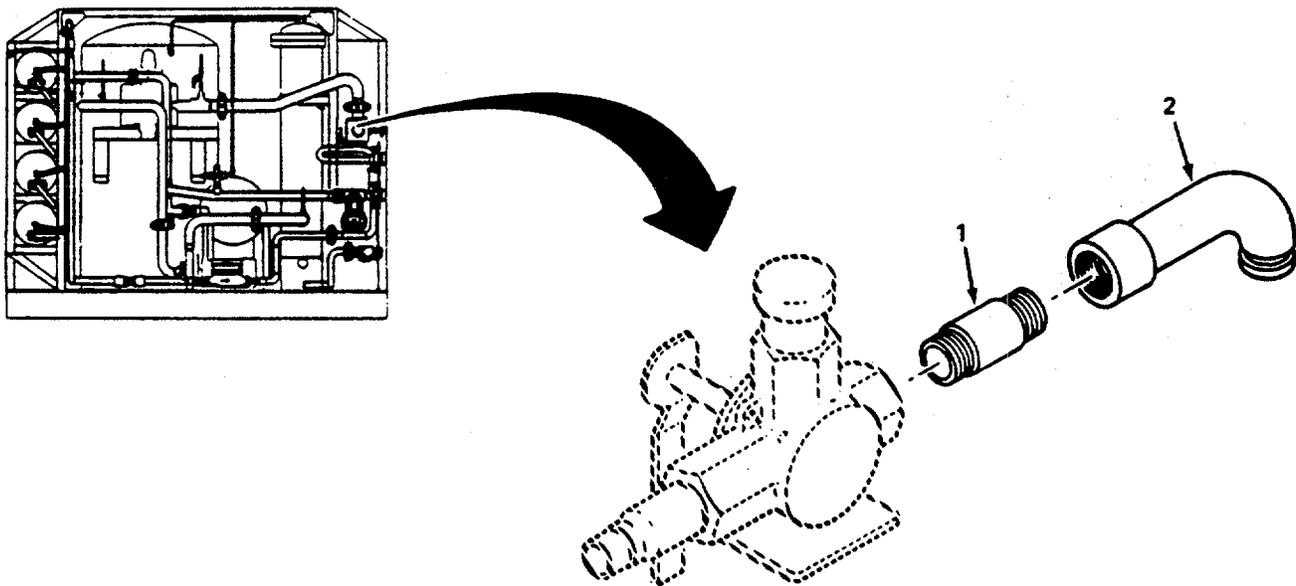
**2-110. REPLACE BACKWASH CHECK VALVE.**

This task covers:                    a. Removal.                                    b. Installation.

---

**INITIAL SETUP.**

- a. Tools.                                    Tool Kit (Appx B, Sect m, Item 10).  
                                                  Tool Kit (Appx B, Sect m, Item 7).
  
  - b. Materials/Parts.                                    Antiseize Tape (Appx C, Sect II, Item 17).
  
  - c. Equipment Condition.                                    Power shut down (power source manual).  
                                                  ROWPU shut down (TM 10-4610-239-10).  
                                                  Backwash valve removed (paragraph 2-100).
- 



**REMOVAL**

Remove check valve (1) from pipe section (2).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to all male pipe threads before installation.

Install check valve (1) on pipe section (2).



**REMOVAL.**

- a. Loosen two clamps (1) and remove flexible tubing (2) from two adapters (3).
- b. Remove two adapters (3) from elliptic valve (4).
- c. Remove elliptic valve (4) from nipple (5).

**INSTALLATION.**

- a. Apply antiseize tape to male pipe threads on nipple (5) and two adapters (3).
- b. Install elliptic valve (4) on nipple (5).
- c. Install two adapters (3) and flexible tubes (2) with clamps (1). Tighten clamps.

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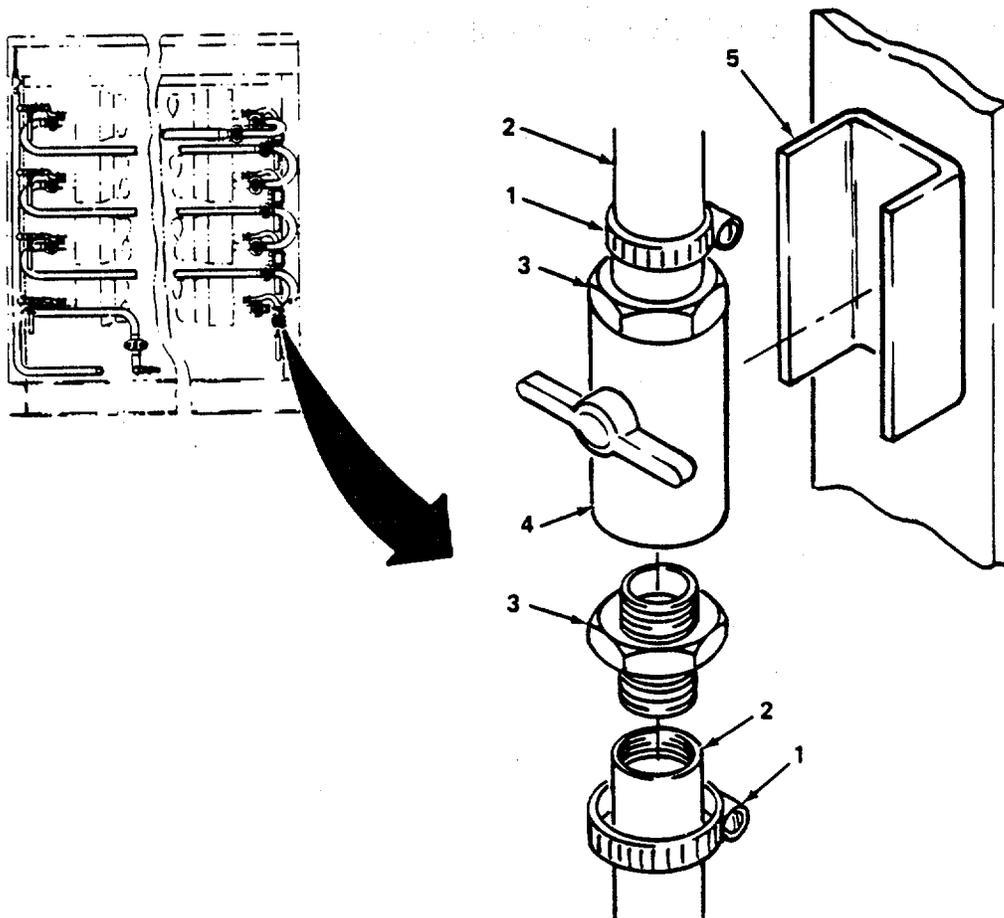
**2-112. REPLACE BALL VALVE.**

This task covers:                    a. Removal.                                            b. Installation.

---

**INITIAL SETUP.**

- a. Tools.                                    Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts.                                            Antiseize Tape (Appx C, Sect II, Item 17).
  - c. Equipment Condition.                                            Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- 



**NOTE**

There are four ball valves mounted on the ROWPU frame. All are removed and installed the same. One is shown.

**REMOVAL.**

- a. Loosen two clamps (1) and remove flexible tubing (2) from two adapters (3).
- b. Remove two adapters (3) from ball valve (4).
- c. Remove ball valve (4) from clip (5).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Install two adapters (3) on ball valve (4).
- b. Hold ball valve (4) in clip (5) and install flexible tubing (2) with clamps (1). Tighten clamps.

---

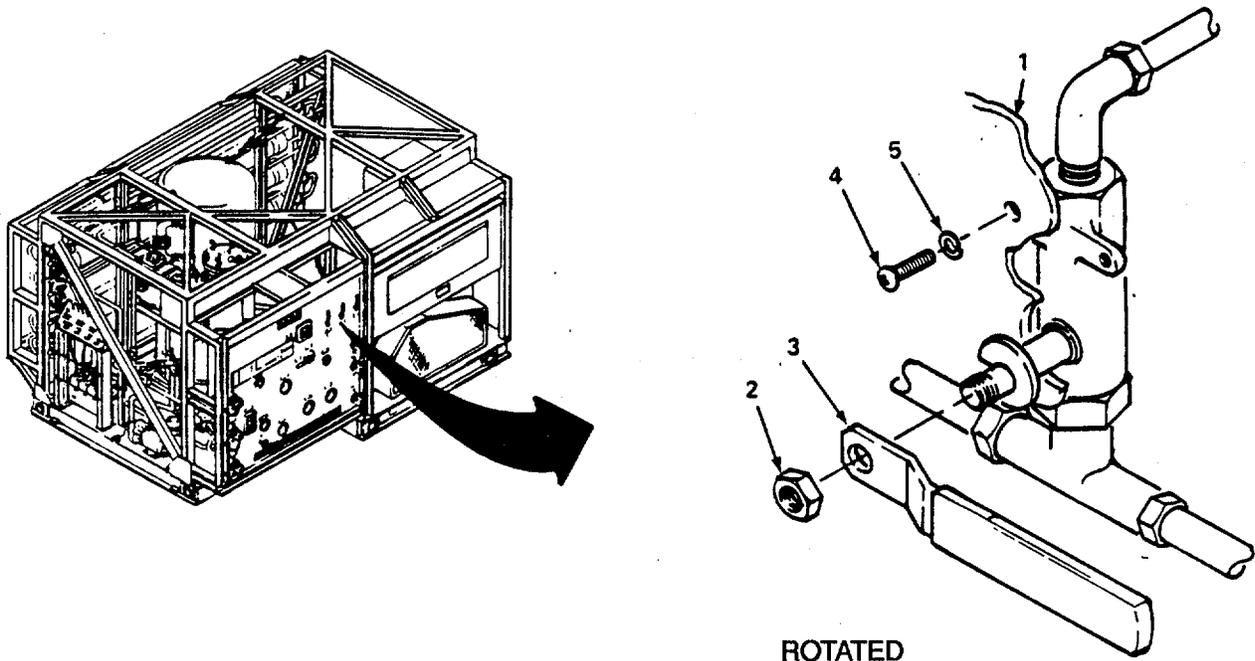
**2-113. REPLACE VENT VALVES: CARTRIDGE FILTER, PULSE DAMPENER, AND MULTIMEDIA FILTER.**

This task covers:                    a. Removal.                                            b. Installation.

---

**INITIAL SETUP.**

- a. Tools.                                            Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts.                                            Antiseize Tape (Appx C, Sect II, Item 17).
  - c. Equipment Condition.                                            ROWPU shut down (TM 10-4610-239-10).
- 



**REMOVAL.**

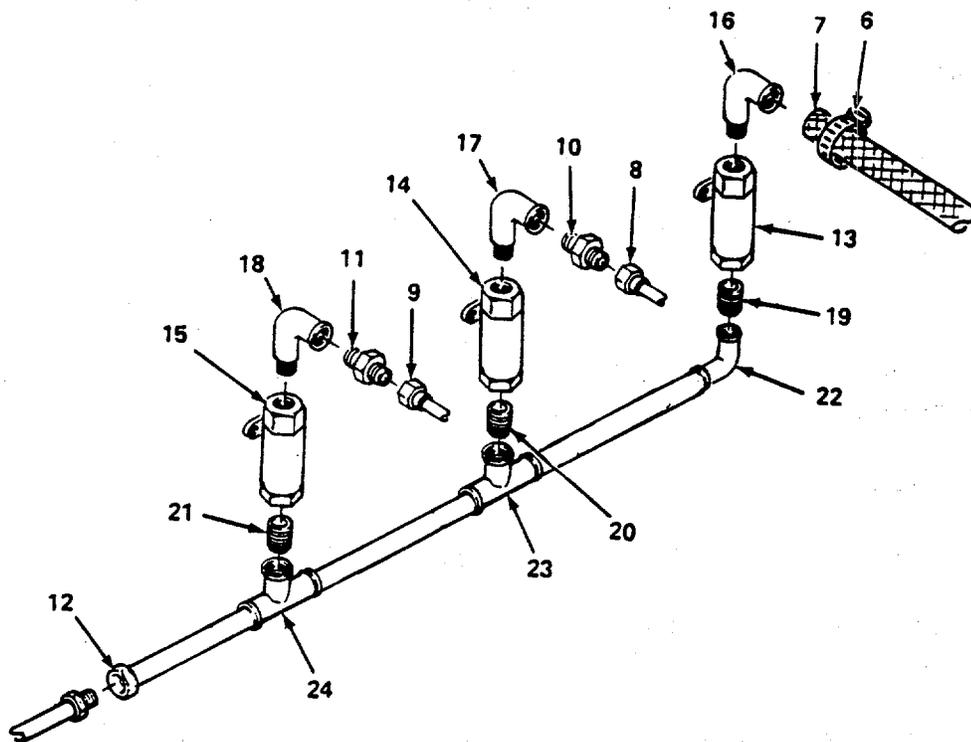
**NOTE**

- The cartridge filter, pulse dampener, and multimedia filter vent valve handles are removed the same. One is shown.
- Tag handles before removal.

- a. Working at front of control panel (1), remove nut (2) and handle (3).

**REMOVAL. (Cont)**

- b. Remove two screws (4) and lockwashes (5). Discard lockwashes.



- c. Working at rear of control panel (1), loosen hose clamp (6) and remove flexible tubing (7).  
d. Remove two connectors (8) and (9) and adapters (10) and (11).  
e. Remove connector (12).

**NOTE**

Tag valves before removal.

- f. Remove three valves (13), (14), and (15) and attaching hardware as a unit.  
g. Remove three elbows (16), (17), and (18) from three valves (13), (14), and (15).  
h. Remove three valves (13), (14), and (15).  
i. Remove three nipples (19), (20), and (21).  
j. Remove elbow (22) and two pipe tees (23) and (24).

**INSTALLATION**

**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Install two pipe tees (23) and (24) and elbow (22).
- b. Install three nipples (19), (20), and (21) on three valves (13), (14), and (15).
- c. Install three elbows (16, (17), and (18) on three valves (13), (14), and (15).
- d. Install three valves (13), (14), and (15) on three nipples (19), (20), and (21) as tagged.
- e. Working at rear of control panel (1), position three valves (13), (14), and (15) as a unit with valves aligned with cutouts and screw holes in control panel (1).
- f. Install connector (12).
- g. Install two adapters (10) and (11) and connectors (8) and (9).
- h. Install flexible tubing (7) on adapter (10). Slide hose clamp (6) on flexible tubing and tighten hose clamp.
- i. Working at front of control panel (1), install six screws (4) and new lockwashers (5).

**NOTE**

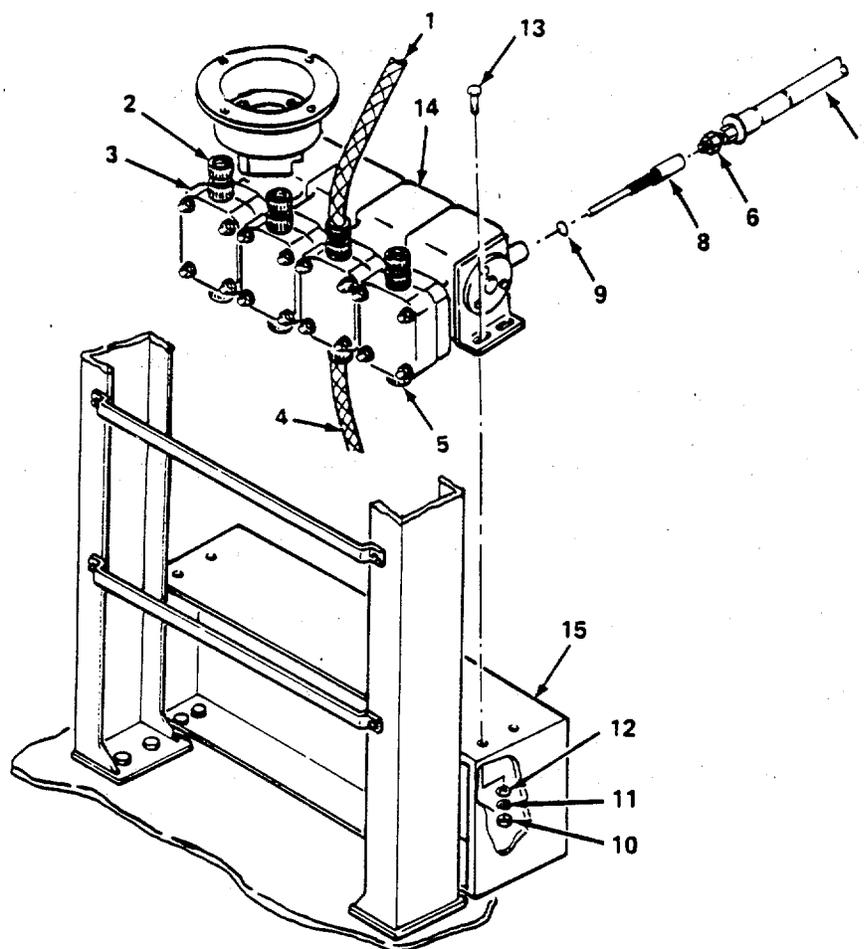
The cartridge filter, pulse dampener, and multimedia filter vent valve handles are installed the same. One is shown.

- j. Install handle (3) as tagged and nut (2).

**Section XIII. CHEMICAL FEED METERING PUMP ASSEMBLY  
MAINTENANCE PROCEDURES**

	Para	Page
Replace Chemical Feed metering Pump Metering and Drive Assembly .....	2-114	2-275
Replace Chemical Feed Metering Pump Manual Stroke Adjustment Assemblies .....	2-115	2-278
Replace Chemical Feed Metering Pump Three-Way Ball Valve .....	2-116	2-282
Replace Chemical Feed Metering Pump Stand, Brackets, and Mounting Plate .....	2-117	2-284





**REMOVAL**

- a. Tag and remove flexible tubing connectors (1) and (4) from chemical feed pump heads (3).
- b. Disconnect four hoses (4) from caps (5) on discharge side of feed pump heads (3).
- c. Loosen four nuts (6) and remove four flexible shafts (7) from adjusting spindles (8).
- d. Remove four adjusting spindles (8) and O-rings (9). Discard O-rings.
- e. Remove four nuts (10), lockwashers (11), flat washers (12), and screws (13). Discard lockwashers.

**REMOVAL. (Cont)**

**WARNING**

The chemical feed metering pump metering and drive assembly is heavy/difficult to handle. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- f. Remove chemical feed metering pump metering and drive assembly (14) from pump stand (15).

**INSTALLATION.**

- a. Position chemical feed pump (14) on pump stand (15) and install four screws (13), flat washers (12), lockwashers (11), and nuts (10).
- b. Install four new O-rings (9) and four adjusting spindles (8) in metering and drive assembly (14).
- c. Install four flexible shafts (7) on adjusting spindles (8) and tighten four nuts (6).
- d. Connect four flexible tube connectors (1) and (4) as tagged to four chemical feed heads (3).
- e. Add oil to pump drive unit. Refer to LO 10-4610-239-12.
- f. Adjust chemical feed pump manual stroke adjustment assemblies. Refer to paragraph 2-115.

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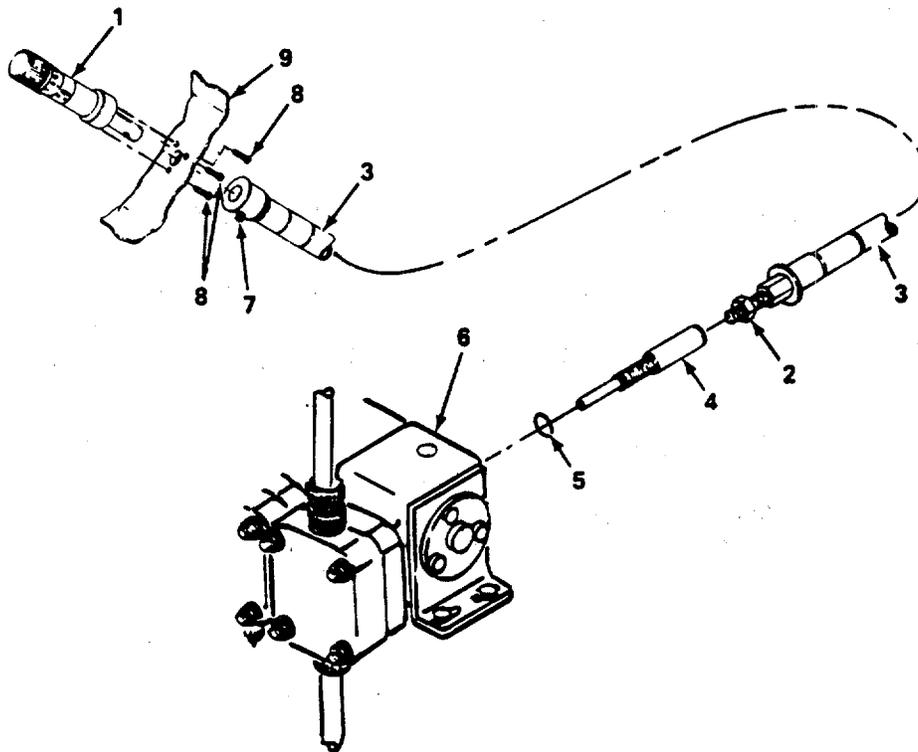
**2-115. REPLACE CHEMICAL FEED PUMP MANUAL STROKE ADJUSTMENT ASSEMBLIES.**

This task covers:                    a. Removal.                                    b. Installation.                                    c. Adjustment

---

**INITIAL SETUP.**

- a. Tools.                                    Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment Condition.                                    ROWPU shut down (TM 10-4610-239-10).
- 



**REMOVAL**

**NOTE**

- There are four manual stroke adjustment assemblies. All are removed the same. One is shown.
- Tag manual stroke adjustment head and flexible shaft before removal.

- a. Turn stroke adjustment head (1) clockwise to zero setting.

**REMOVAL. (Cont)**

- b. Loosen nut (2) and remove flexible shaft (3) from adjusting spindle (4).
- c. Remove adjusting spindle (4) and O-ring (5) from metering and drive assembly (6). Discard O-ring.
- d. Loosen grub screw (7) and remove flexible shaft (3).
- e. Remove three screws (8) and remove stroke adjustment head (1) from mounting plate (9).

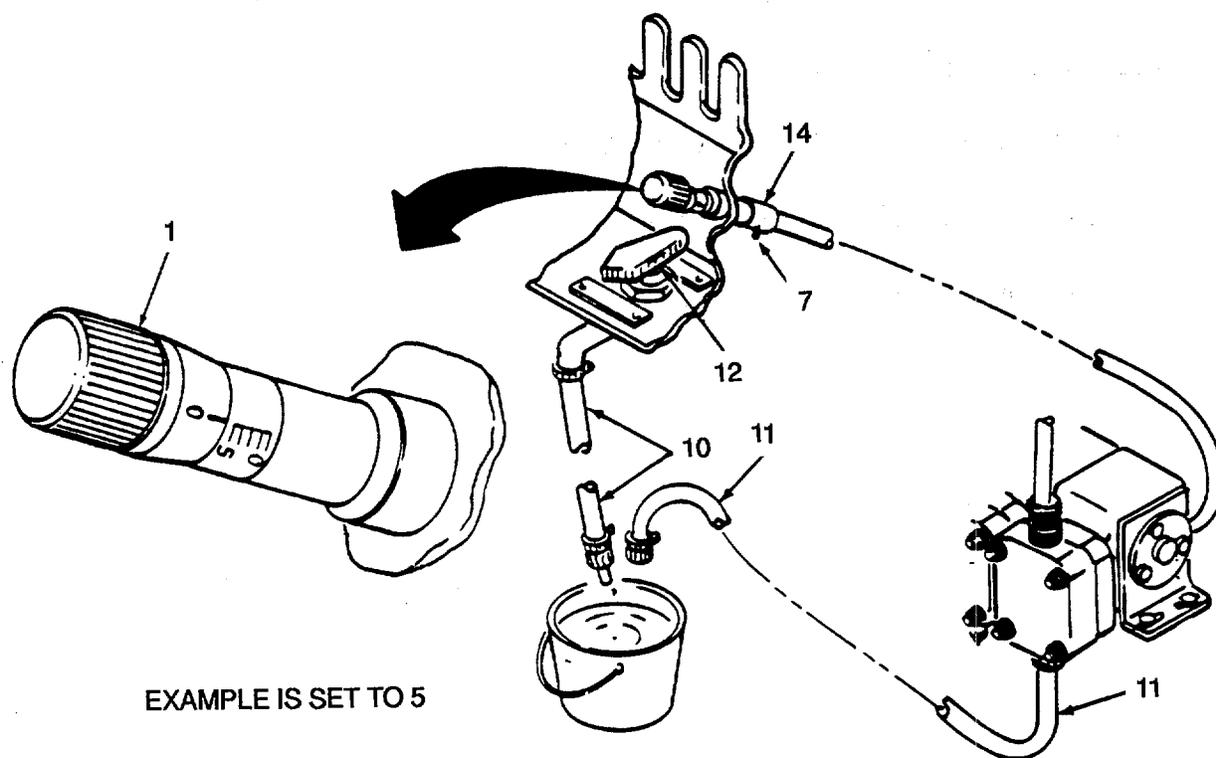
**INSTALLATION.**

**NOTE**

There are four manual stroke adjustment assemblies. All are installed the same. One is shown.

- a. Position stroke adjustment head (1) on mounting plate (9) and install three screws (8).
- b. Position flexible shaft (3) on stroke adjustment head (1) and tighten grub screw (7).
- c. Install new O-ring (5) and adjusting spindle (4) in metering and drive assembly (6).
- d. Install flexible shaft (3) in adjusting spindle (4) and tighten nut (2).

**ADJUSTMENT.**



**NOTE**

- There are four manual stroke adjustment assemblies. All are adjusted the same. One is shown.
  - Tag flexible tubes before disconnecting.
- a. Disconnect flexible tubing connectors (10) and (11) from four chemical feed cans.
  - b. Place flexible tubing connectors (10) and (11) associated with manual stroke adjustment assembly being adjusted into bucket of water.
  - c. Apply power to ROWPU. Refer to power source manual.
  - d. Set ball valve control handle (12) to PRIME position.
  - e. At control box, momentarily set CHEMICAL FEED PUMP switch to STUART position then let it return to RUN position.
  - f. Loosen grub screw (7) and set adjustment head (1) to zero setting.

**ADJUSTMENT. (Cont)**

- g. Turn flexible shaft collar (14) counterclockwise until a steady flow of water comes out of flexible tubing connector (10). Then turn flexible shaft collar slowly clockwise until flow just stops.
- h. Ensure adjustment is still at zero and tighten grub screw (7).
- i. At control box, set CHEMICAL FEED PUMP switch to STOP position.
- j. Shut down power to ROWPU. Refer to TM 10-4610-239-10.
- k. Install flexible tubing connectors (10) and (11) as tagged.

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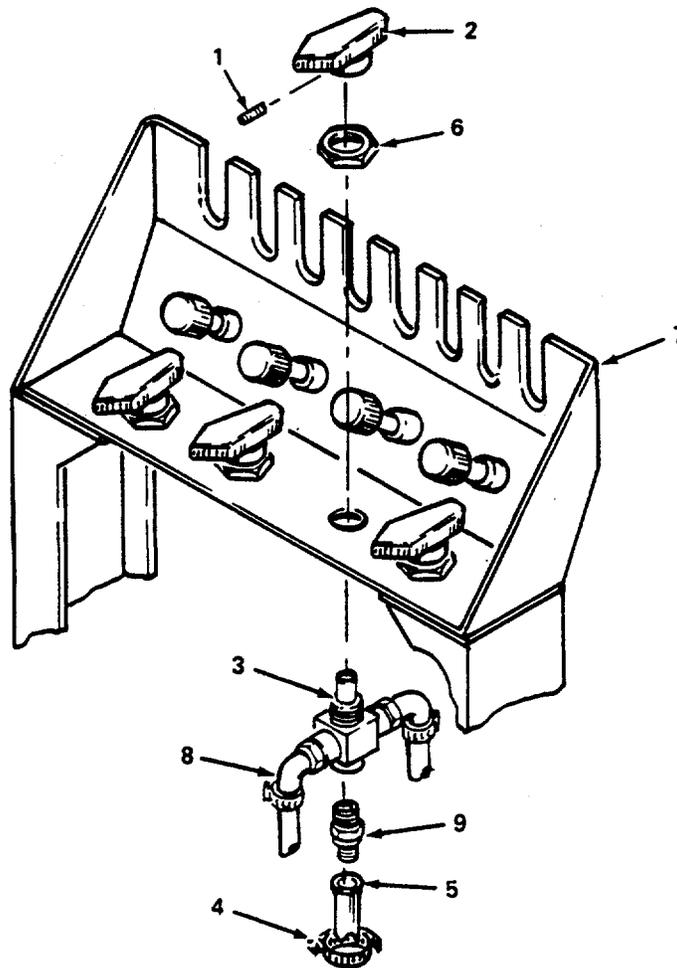
**2-116. REPLACE CHEMICAL FEED METERING PUMP THREE-WAY BALL VALVE.**

This task covers:                    a. Removal.                                            b. Installation.

---

**INITIAL SETUP.**

- a. Tools.                                    Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts.                                    Antiseize Tape (Appx C, Sect II, Item 17).
  - c. Equipment Condition.                                    ROWPU shut down (TM 10-4610-239-10).
- 



**NOTE**

There are four three-way ball valves mounted on the chemical feed pump mounting plate. All are removed and installed the same. One is shown.

**REMOVAL.**

- a. Loosen setscrew (1) and remove handle (2) from three-way ball valve (3).

**NOTE**

Tag flexible tubing before disconnecting.

- b. Disconnect three clamps (4) and remove flexible tubing (5).
- c. Remove locknut (6) and three-way ball valve from mounting plate (7).
- d. Remove two elbows (8) and adapter (9) and retain for reinstallation.

**INSTALLATION**

**NOTE**

Apply antiseize tape to pipe fittings before installation.

- a. Install two elbows (8) and adapter (9).
- b. Position three-way ball valve (3) on mounting plate (7) and install locknut (6), handle (2), and tighten setscrew (1).
- c. Place three clamps (4) on flexible tubing (5) and install on two elbows (8) and adapter (9). Tighten clamps.

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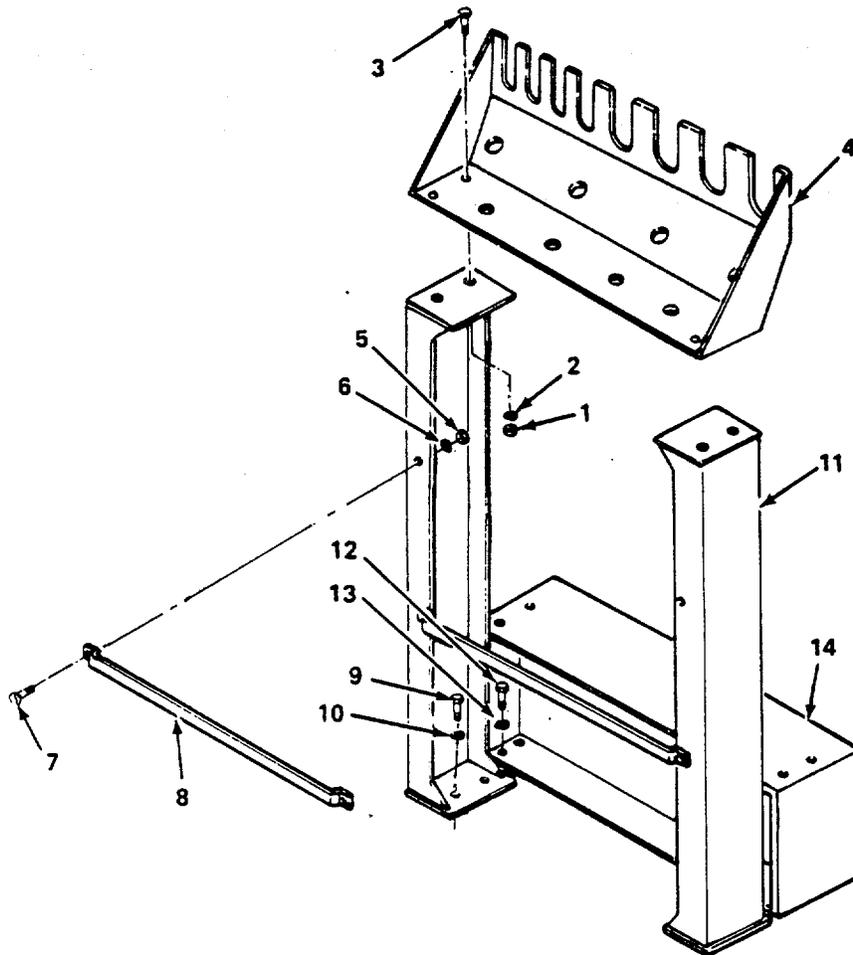
**2-117. REPLACE CHEMICAL FEED METERING PUMP STAND, BRACKETS, AND MOUNTING PLATE.**

This task covers:                    a. Removal.                                            b. Installation.

---

**INITIAL SETUP.**

- a. Tools.                    Tool Kit (Appx B, Sect III, Item 10).
  - b. Equipment Condition.                    ROWPU shut down (TM 10-4610-239-10).  
Chemical feed metering pump metering and drive assembly removed (paragraph 2-114).  
Chemical feed metering pump manual stroke adjustment assemblies removed (paragraph 2-115).  
Chemical feed metering pump three-way ball valves removed (paragraph 2-116).
- 



**REMOVAL.**

- a. Remove four nuts (1), lockwashers (2), screws (3), and mounting plate (4).
- b. Remove four nuts (5), lockwashers (6), screws (7), and two crossbars (8).
- c. Remove four screws (9) and lockwashers (10).
- d. Remove two brackets (11).
- e. Remove four screws (12), lockwashers (13), and chemicalfeed metering pump stand (14).

**INSTALLATION.**

- a. Position chemical feed metering pump stand (14) and install four screws (12) and lockwashers (13).
- b. Position two brackets (11) and install four screws (9) and lockwashers (10).
- c. Position two crossbars (8) and install four screws (7), lockwashers (6), and nuts (5).
- d. Position mounting plate (4) on brackets (11) and align mounting holes.
- e. Install four screws (3), lockwashers (2), and nuts (1).

**Section XIV. JUNCTION BOX ASSEMBLY MAINTENANCE PROCEDURES**

	Para	Page
Replace Electrical Junction Box Assembly Cover .....	2-118	2-287
Repair Electrical Junction Box Assembly Cover .....	2-119	2-289

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**2-118. REPLACE ELECTRICAL JUNCTION BOX ASSEMBLY COVER.**

This task covers:                    a. Removal.                                    b. Installation.

---

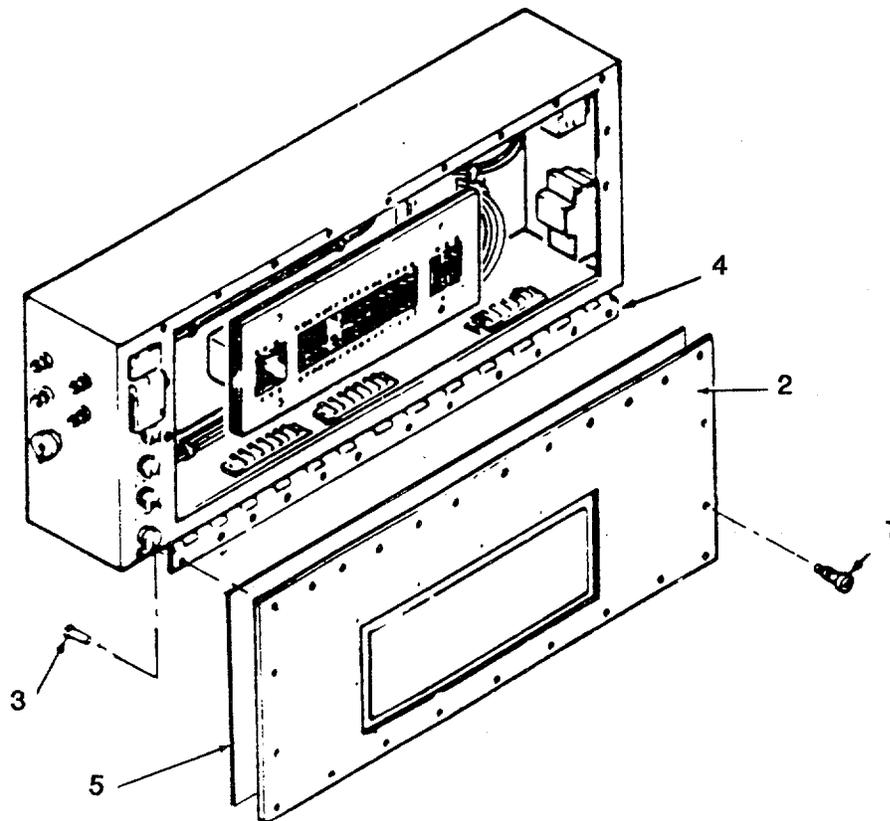
**INITIAL SETUP.**

- a. Tools.                    Tool Kit (Appx B, Sect III, Item 10).  
                                Rivet Tool (Appx B, Sect III, Item 7).
- b. Personnel Required.                    2
- c. Equipment Condition.                    Power shut down (power source manual).
- d. General Safety Requirements.

**WARNING**

Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.

---



**REMOVAL..**

- a. Unlock 13 rotary fasteners (1) and open junction box cover (2).

**WARNING**

Junction box cover is difficult to handle. Two people are needed to lift it to prevent injury or damage to equipment.

- b. Support junction box cover (2) and drill out 12 rivets (3) from hinge (4) and cover (2).

**CAUTION**

Be careful not to damage cover gasket during removal.

- c. Remove junction box cover (2) and gasket (5).

**INSTALLATION.**

- a. Position and support junction box cover (2) and gasket (5).
- b. Using rivet tool, install 12 rivets (3) in hinge (4) and junction box cover (2).
- c. Close junction box cover (2) and lock 13 rotary fasteners (1) to secure.

---

**2-119. REPAIR ELECTRICAL JUNCTION BOX ASSEMBLY COVER.**

This task covers:                    a. Inspection.                    b. Disassembly.                    c. Assembly.

---

**INITIAL SETUP.**

- a. Tools.                    Tool Kit (Appx B, Sect III, Item 10).
  - b. Material/Parts.                    Adhesive (Appx C, Sect II, Item 21).
  - c. Equipment Condition.                    Power shut down (power source manual).
- 

**NOTE**

Repair of junction box cover is the same with cover installed on electrical junction box or with cover on workbench after removal.

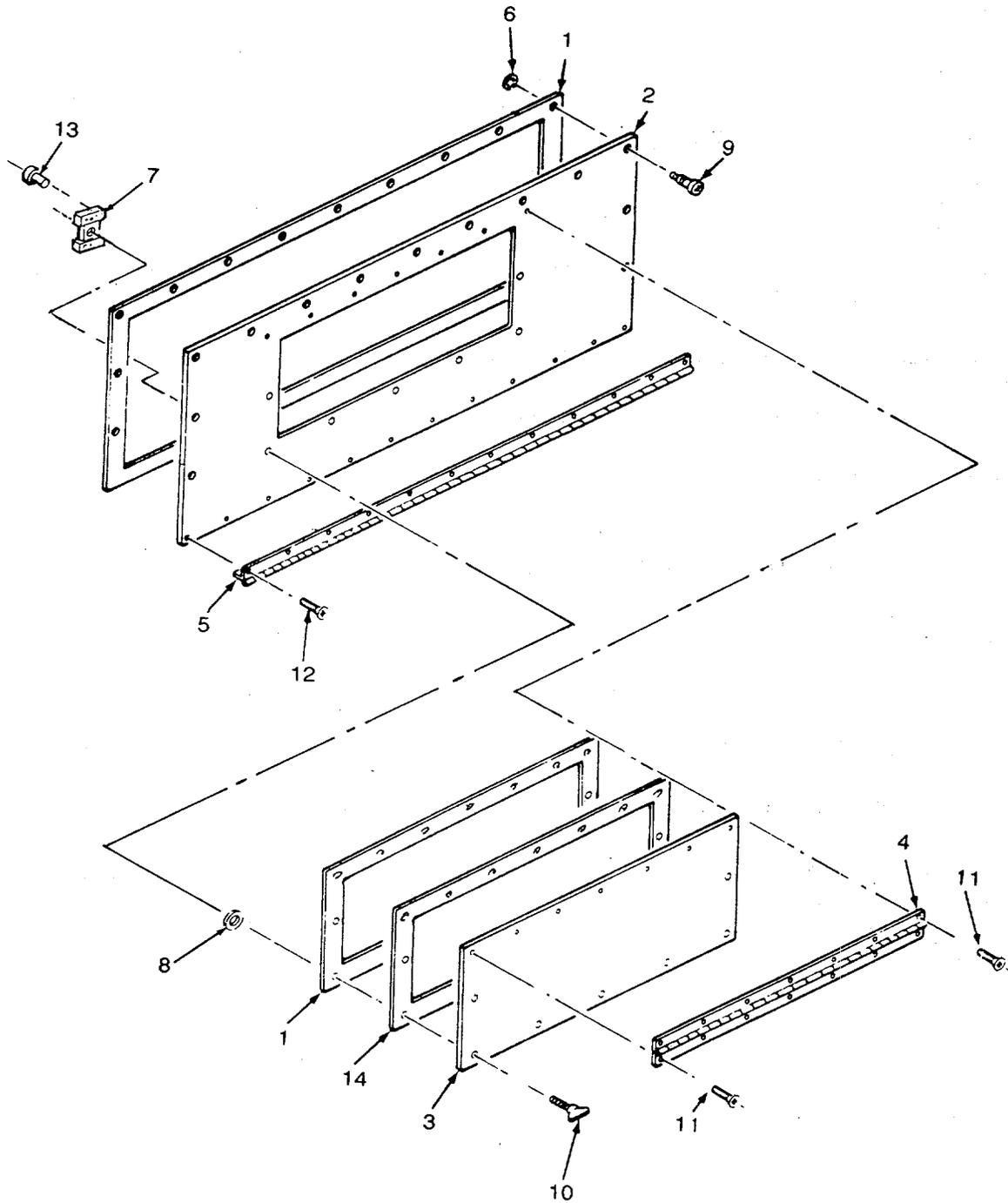
**INSPECTION.**

- a. Check gasket material (1) on junction box cover (2) and door (3) for tears, cracks, brittleness, and separation from metal. Replace as required.
- b. Check metal of junction box cover (2) and door (3) for cracks and deformity. Replace cover or doors as required.
- c. Check two hinges (4) and (5) for cracks, deformity, and loose or missing rivets. Replace damaged hinge as required. Replace rivets as required.
- d. Check 13 retaining rings (6) and 7 speed nuts (7) and retainer washers (8) for deformity. Replace as required.
- e. Check 13 rotary fasteners (9) and 7 wing screws (10) for deformity and damaged threads. Replace as required.
- f. Check wiring diagram plate (14) for damage and readability. Replace as required.

**DISASSEMBLY.**

- a. Loosen wing nuts (10) and open door (3). Remove retaining washers (8) and wing nuts (10).
- b. Remove rivets (11), hinge (4), and door (3).
- c. Peel gasket (1) and information/wiring diagram (14) from door (3).

DISASSEMBLY. (Cont)



**DISASSEMBLY. (Cont)**

- d. Loosen rotary fasteners (9) and open junction box cover (2). Remove retainer washers (6) and rotary fasteners (9).
- e. Remove rivets (12), hinge (5), junction box cover (2), and gasket (1).
- f. Drill out rivets (13) and remove speed nuts (7) from junction box cover (2).

**ASSEMBLY.**

- a. Cut gasket material (1) and, using adhesive, glue gasket material (1) and information/wiring diagram (14) on door (3).
- b. Punch seven holes through gasket material (1) for wing screws (10).
- c. Position hinge (4) on door (3) and install rivets (11).
- d. Position seven wing screws (10) on door (3) and install retaining washers (8) on wing screws (10).
- e. Cut gasket material (1) and, using adhesive, glue gasket material (1) on junction box cover (2).
- f. Punch 13 holes through gasket material (1) at for rotary fasteners (9).
- g. Position 7 speed nuts (7) and install 14 rivets (13) on junction box cover (2).
- h. Position hinge (5) on junction box cover (2) and install rivets (12).
- i. Position 13 rotary fasteners (9) and install retaining washers (6).
- j. Position door (3) and hinge (4) on junction box cover (2) and install rivets (11) on hinge (4) and junction box cover (2).

**Section XV. REVERSE OSMOSIS (R.O.) PUMP ASSEMBLY  
MAINTENANCE PROCEDURES**

	Para	Page
Replace R.O. Pump Assembly Belt Guard and Shroud .....	2-120	2-293
Replace R.O. Pump Assembly Belt.....	2-121	2-295
Replace R.O. Pump Electric Motor Sheave Assembly .....	2-122	2-297
Replace R.O. Pump Motor Cable Assembly .....	2-123	2-299
Replace R.O. Pump Electric Motor .....	2-124	2-302
Replace R.O. Pump Assembly Sheave .....	2-125	2-304
Replace R.O. Pump Oil Drain Valve and Air Breather .....	2-126	2-306
Replace R.O. Pump Assembly Oil Gage .....	2-127	2-308
Replace R.O. Pump Assembly .....	2-128	2-310
Replace R.O. Pump and Motor Stand.....	2-129	2-312
Align R.O. Pump Sheaves .....	2-130	2-315

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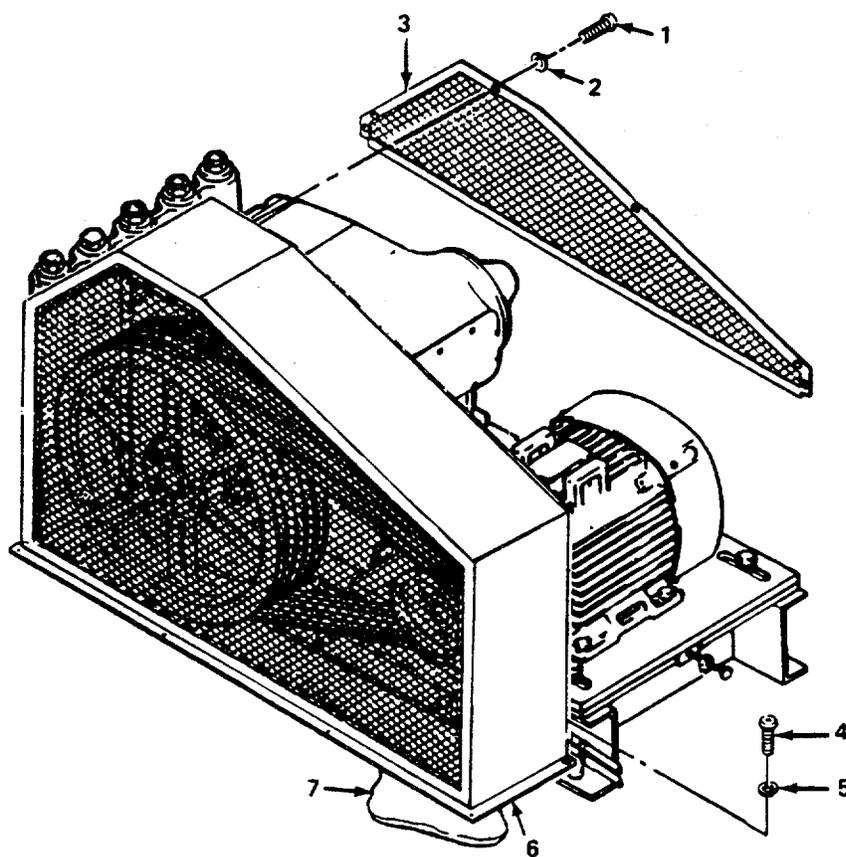
**2-120. REPLACE R.O. PUMP ASSEMBLY BELT GUARD AND SHROUD.**

This task covers:                    a. Removal.                    b. Installation.

---

**INITIAL SETUP.**

- a. Tools.                    Tool Kit (Appx B, Sect III, Item 10).
  - b. Equipment Condition.                    Power shut down (power source manual).
- 



**REMOVAL.**

- a. Remove four screws (1) and lockwashers (2).

**REMOVAL. (Cont)**

- b. Remove belt guard (3).
- c. Remove six screws (4) and lockwashers (5).
- d. Remove belt shroud (6).

**INSTALLATION.**

- a. Position belt shroud (6) on ROWPU frame (7) and install six screws (4) and lockwashers (5).
- b. Position belt guard (3) on shroud (6) and install four screws (1) and lockwashers (2).

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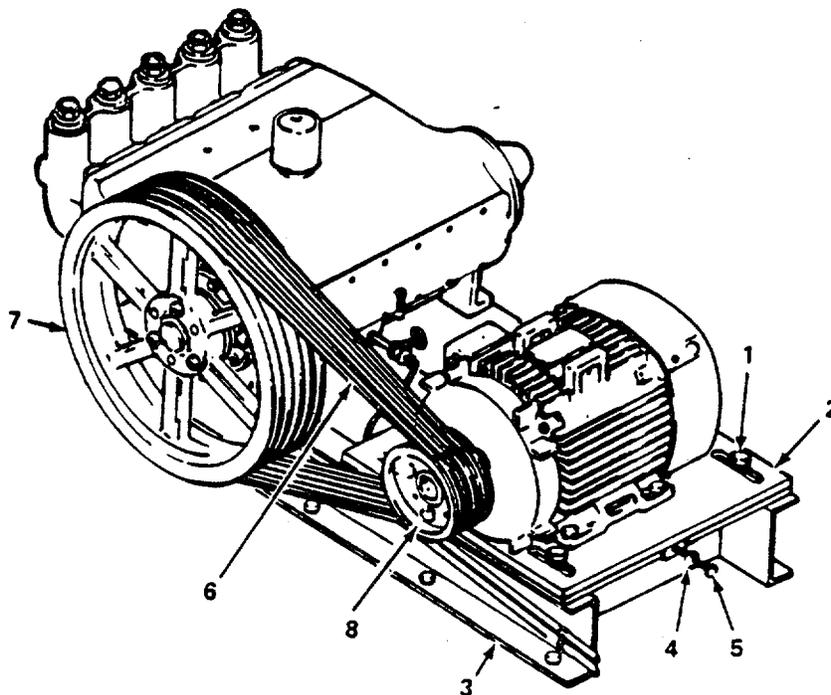
## 2-121. REPLACE R.O. PUMP ASSEMBLY BELTS.

This task covers:                    a. Removal.                    b. Inspection.                    c. Installation.

---

### INITIAL SETUP.

- a. Tools.                    Tool Kit (Appx B, Sect III, Item 10).
  - b. Equipment Condition.                    Power shut down (power source manual).  
R.O. pump assembly belt guard and shroud removed (paragraph 2-120).
- 

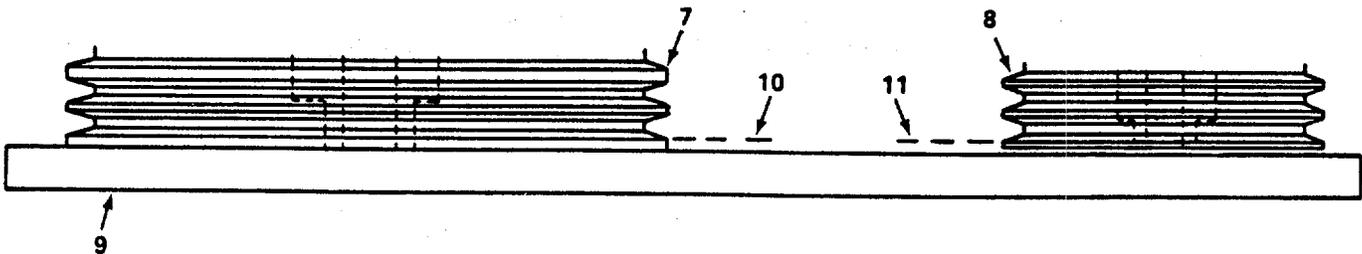


### REMOVAL.

- a. Loosen four bolts (1) securing motor mounting plate (2) to stand (3).
- b. Loosen locknut (4) on adjusting screw (5)
- c. Turn adjusting bolt (5) counterclockwise until belts (6) are loose on two sheaves (7) and (8).
- d. Remove five belts (6) from two sheaves (7) and (8).

**INSPECTION.**

- a. Inspect belts for cracks, dry rot, and excessive wear. Replace belts as a set if required.
- b. Position straightedge (9) across front of pump assembly sheave (7) and electric motor sheave (8).
- c. Measure distance from straightedge to outer belt groove (10) of pump assembly sheave.
- d. Measure distance from straightedge to outer belt groove (11) of electric motor sheave. If distances measured in steps c and d are not the same, align R.O. pump sheaves. Refer to paragraph 2-130.



**INSTALLATION.**

**NOTE**

If any belt is damaged, replace all five belts with new ones. Do not replace one belt or use a mismatched set.

- a. Install five belts (6) on two sheaves (7) and (8).
- b. Turn adjusting bolt (5) clockwise until belt deflection is 0.5 inch (1.3cm) midway between two sheaves.
- c. Tighten locknut (4) on adjusting screw.
- d. Tighten four bolts (1) securing mounting plate (2) on stand (3).
- e. Install R.O. pump assembly belt guard and shroud. Refer to paragraph 2-120.

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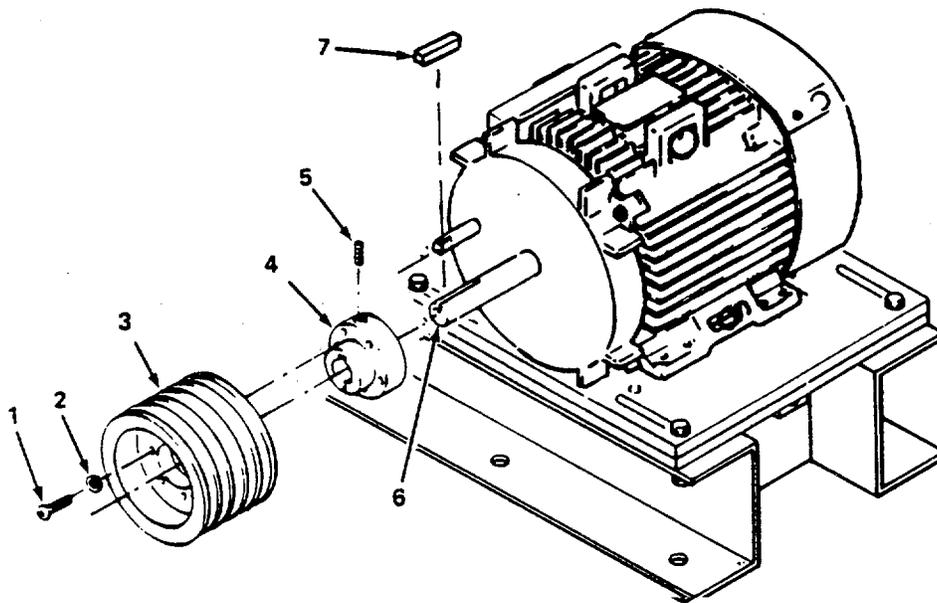
## 2-122. REPLACE R.O. PUMP ELECTRIC MOTOR SHEAVE ASSEMBLY.

This task covers: a. Removal. b. Inspection. c. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Wheel Puller (Appx B, Sect III, Item 7).
  - b. Materials/Parts. Oil, Lubricating (Appx C, Sect II, Item 11).
  - c. Equipment Condition. Power shut down (power source manual).  
R.O. pump assembly belts removed (paragraph 2-121).
- 



### REMOVAL.

- a. Remove three bolts (1) and lockwashers (2). Discard lockwashers.
- b. Install three bolts (1) in threaded holes in sheave (3) and screw in alternately until sheave is off hub (4). Remove three bolts from threaded holes.
- c. Loosen setscrew (5) and, using wheel puller, remove hub (4) from electric motor shaft (6).
- d. Remove key (7).

**INSPECTION.**

- a. Inspect sheave and hub for cracks, excessive wear, or other damage. Replace as required.
- b. Inspect all mounting hardware for stripped threads or other damage. Replace as required.

**INSTALLATION.**

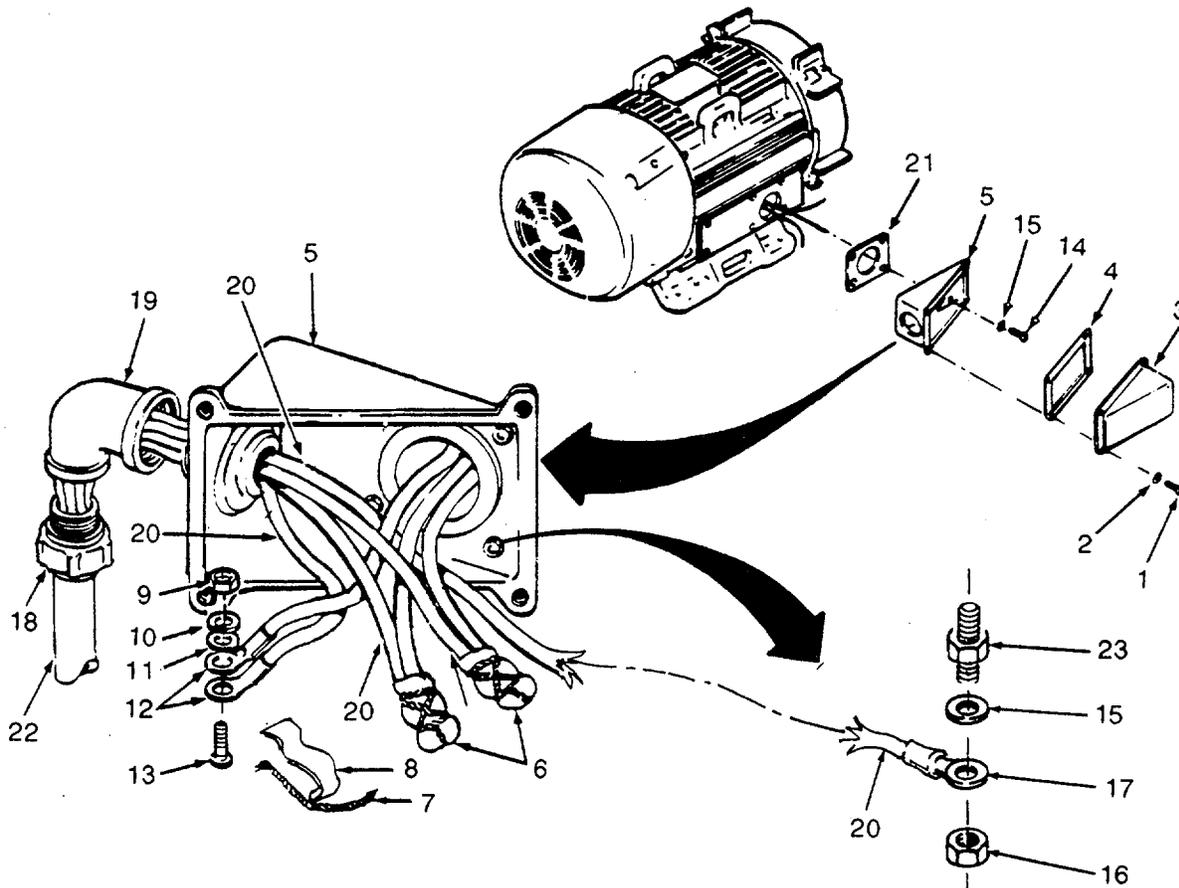
- a. Apply light engine lubricating oil to electric motor shaft (6).
- b. Align key slots, position key (7) in slots, and press hub (4) onto electric motor shaft (6).
- c. Tighten setscrew (5) until snug.
- d. Align R.O. pump sheaves. Refer to paragraph 2-131.

**2-123. REPLACE R.O. PUMP MOTOR CABLE ASSEMBLY.**

This task covers:      a. Removal.    b. Installation.

**INITIAL SETUP.**

- a.      Tools.    Tool Kit (Appx B, Sect III, Item 10).
- b.      Materials/Parts.      Tape, Electrical (Appx C, Sect II, Item 18).  
                                    Twine (Appx C, Sect II, Item 20).
- Antiseize Tape (Appx C, Sect II, Item 17).
- c.      Equipment Condition.      Power shut down (power source manual).



**REMOVAL.**

- a. Remove four screws (1), star washers (2), cover (3), and gasket (4) from conduit box (5).
- b. Pull slack in three wire bundles (6) from conduit box (5). Remove twine (7) and electrical tape (8) from each bundle.

**NOTE**

- There are three wire bundles in conduit box. All are disassembled the same. One is shown.
- Tag wires by set before removal.

- c. Remove nut (9), lockwasher (10), flat washer (11), two wire lugs (12), and screw (13).
- d. Remove three screws (14), star washers (15), nut (16), terminal lug (17), and stud (23) from terminal box (5).
- e. Disconnect connector (18) from elbow (19).
- f. Carefully pull four wires (20) from conduit box (5) and elbow (19).
- g. Remove connector (18) from cable (22).
- h. Remove elbow (19) from conduit box (5).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to all male pipe threads before installation.

- a. Install elbow (19) on conduit box (5).
- b. Install three screws (14), star washers (15), and stud (23) and position connector (18) on cable (22).
- c. Carefully pull four wires (20) through elbow (19) into conduit box (5).
- d. Install cable connector (18) on elbow (19).
- e. Install terminal lug (17) and nut (16) on stud (23).

**INSTALLATION. (Cont)**

**NOTE**

There are three wire bundles in conduit box. All are assembled the same. One is shown.

- f. Install two wire lugs (12), flat washer (11), lockwasher (10), nut (9), and screw (13).
- g. Using electrical tape (8), wrap bare metal parts on each wire bundle (6).
- h. Using twine (7), secure electrical tape (8) on each wire bundle (6) and position three bundles in conduit box (5) by feeding slack into cable (22).
- i. Position gasket (4) and conduit box cover (3) on conduit box (5). Install four screws (1) and star washers (2).

---

**2-124. REPLACE R.O. PUMP ELECTRIC MOTOR.**

This task covers:      a. Removal.    b. Installation.

---

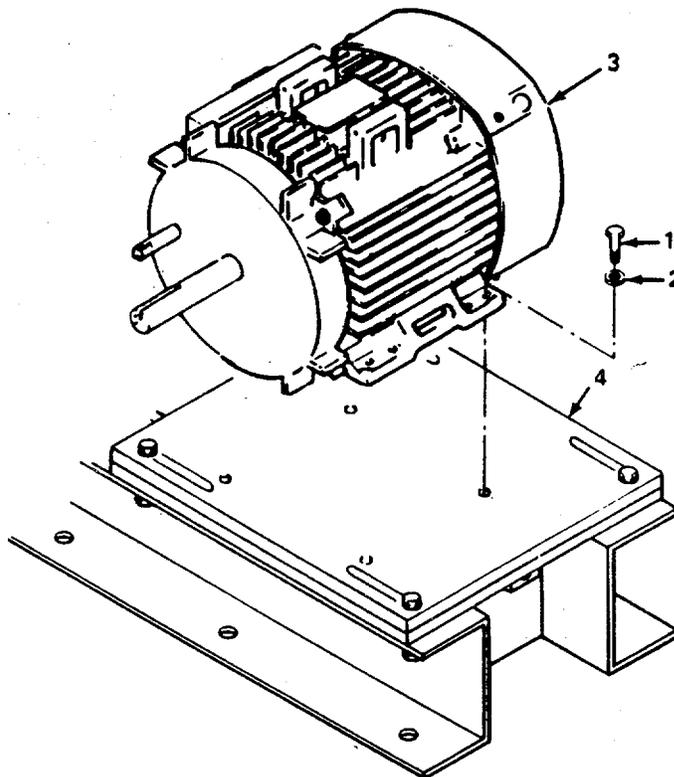
**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10)
- b. Equipment Condition. Power shut down (power source manual).  
R.O. pump electric motor sheave assembly removed (paragraph 2-122).  
R.O. pump motor cable assembly removed (paragraph 2-123).
- c. General Safety Requirements.

**WARNING**

Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.

---



**REMOVAL.**

- a. Remove four bolts (1) and lockwashers (2).

**WARNING**

Weight of R.O. pump motor is approximately 250 pounds (113 kg). Attempting to move it without proper equipment could cause serious injury. Hoist motor with equipment rated at 1 ton or greater.

- b. Remove motor (3) from pump stand (4).

**INSTALLATION.**

- a. Position motor (3) on stand (4).
- b. Install four screws (1) and lockwashers (2).
- c. Install R.O. pump electric motor sheave assembly. Refer to paragraph 2-122.
- d. Install R.O. pump assembly belts. Refer to paragraph 2-121.
- e. Install R.O. pump motor cable assembly. Refer to paragraph 2-123.

---

**2-125. REPLACE R.O. PUMP ASSEMBLY SHEAVE.**

This task covers:      a. Removal.    b. Inspection.    c. Installation.

---

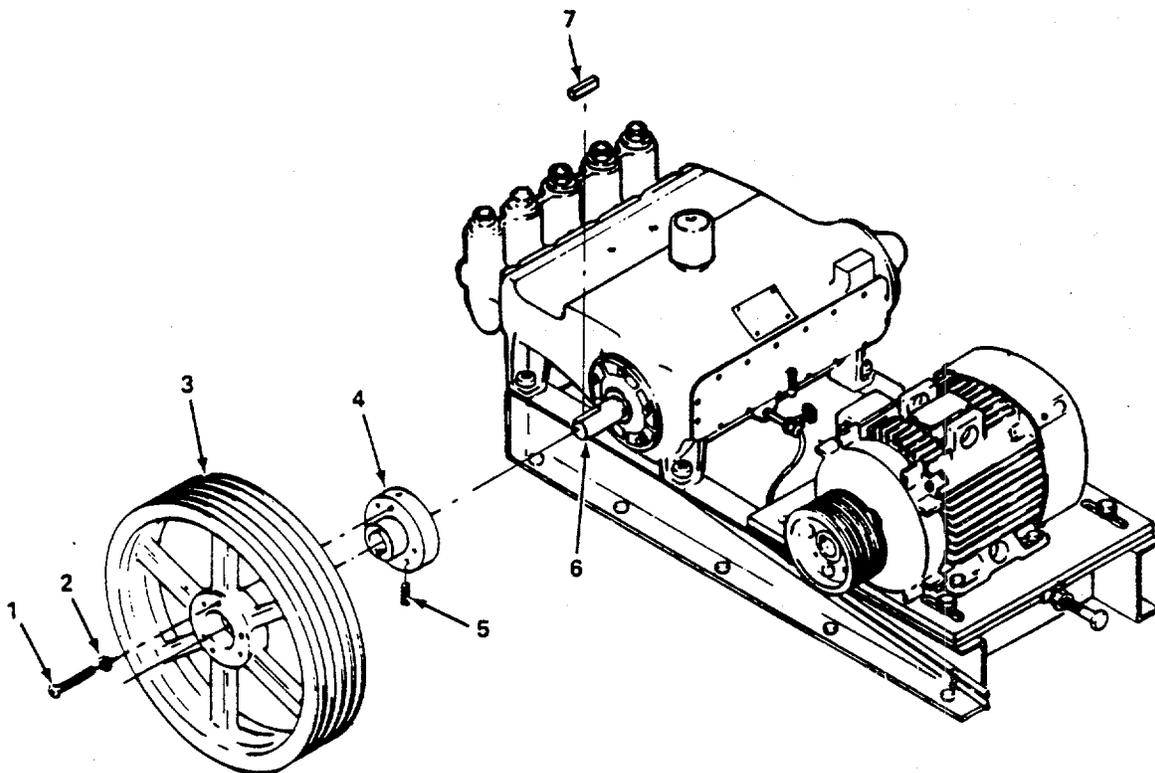
**INITIAL SETUP.**

- a.      Tools.    Tool Kit (Appx B, Sect III, Item 10).
- b.      Materials/Parts.      Oil, Lubricating (Appx C, Sect II, Item 11).
- c.      Personnel Required.    2
- d.      Equipment Condition.    Power shut down (power source manual).  
                                         R.O. pump assembly belts removed (paragraph 2-121).
- e.      General Safety Requirements.

**WARNING**

Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.

---



**REMOVAL.**

- a. Remove three bolts (1) and lockwashers (2). Discard lockwashers.

**WARNING**

The R.O. pump assembly sheave is heavy. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- b. Install three bolts (1) in threaded holes in sheave (3) and screw in alternately until sheave is off hub (4). Remove three bolts from threaded holes.
- c. Loosen setscrew (5) and, using wheel puller, remove hub (4) from pump shaft (6).
- d. Remove key (7).

**INSPECTION.**

- a. Inspect sheave and hub for cracks or other damage. Replace as required.
- b. Inspect loose hardware for damage. Replace as required.

**INSTALLATION.**

- a. Apply light engine lubricating oil to pump shaft (6).
- b. Align key slots, position key (7) in slots, and press hub (4) onto pump shaft (6).
- c. Tighten setscrew (5) until snug.
- d. Align R.O. pump sheaves. Refer to paragraph 2-130.

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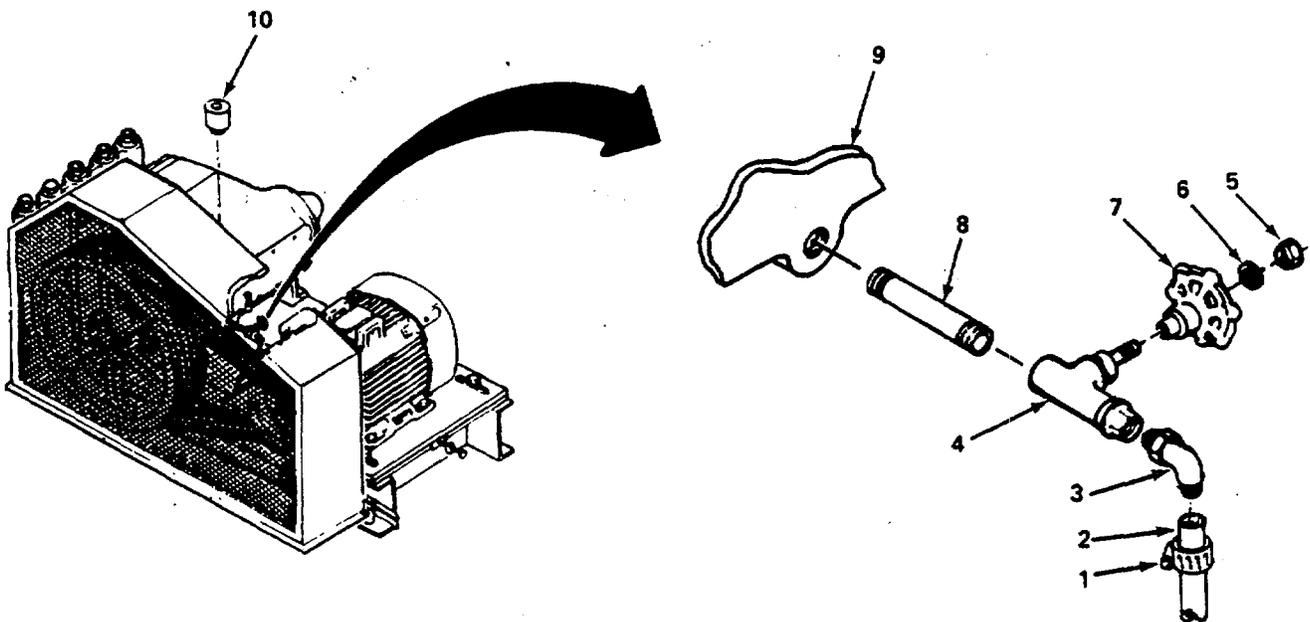
## 2-126. REPLACE R.O. PUMP OIL VALVE AND AIR BREATHER.

This task covers:      a. Removal.      b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Oil, Lubricating (Appx C, Sect II, Item 11).  
Antiseize Tape (Appx C, Sect II, Item 17).
  - c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM10-4610-239-10).  
Oil drained from R.O. pump assembly (LO 10-4610-239-12).  
R.O. pump assembly oil gage removed (paragraph 2-127).
- 



### REMOVAL.

- a. Loosen clamp (1) and remove drain hose (2) from adapter elbow (3).
- b. Remove adapter elbow (3) from oil drain valve (4).
- c. Remove nut (5), washer (6), and handle (7).

**REMOVAL. (Cont)**

- d. Remove oil drain valve (4) from pipe nipple (8).
- e. Remove pipe nipple (8) from R.O. pump (9).
- f. Remove air breather (10).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to male pipe fittings before installation.

- a. Install pipe nipple (8) on R.O. pump (9).
- b. Install oil drain valve (4) on pipe nipple (8).
- c. Install handle (7), washer (6), and nut (5).
- d. Install adapter elbow (3) on oil drain valve (4).
- e. Install drain hose (2) and tighten clamp (1).
- f. Refill R.O. pump assembly with oil. Refer to LO 10-4610-239-12/LI 08580B-12.
- g. Install air breather (10).

---

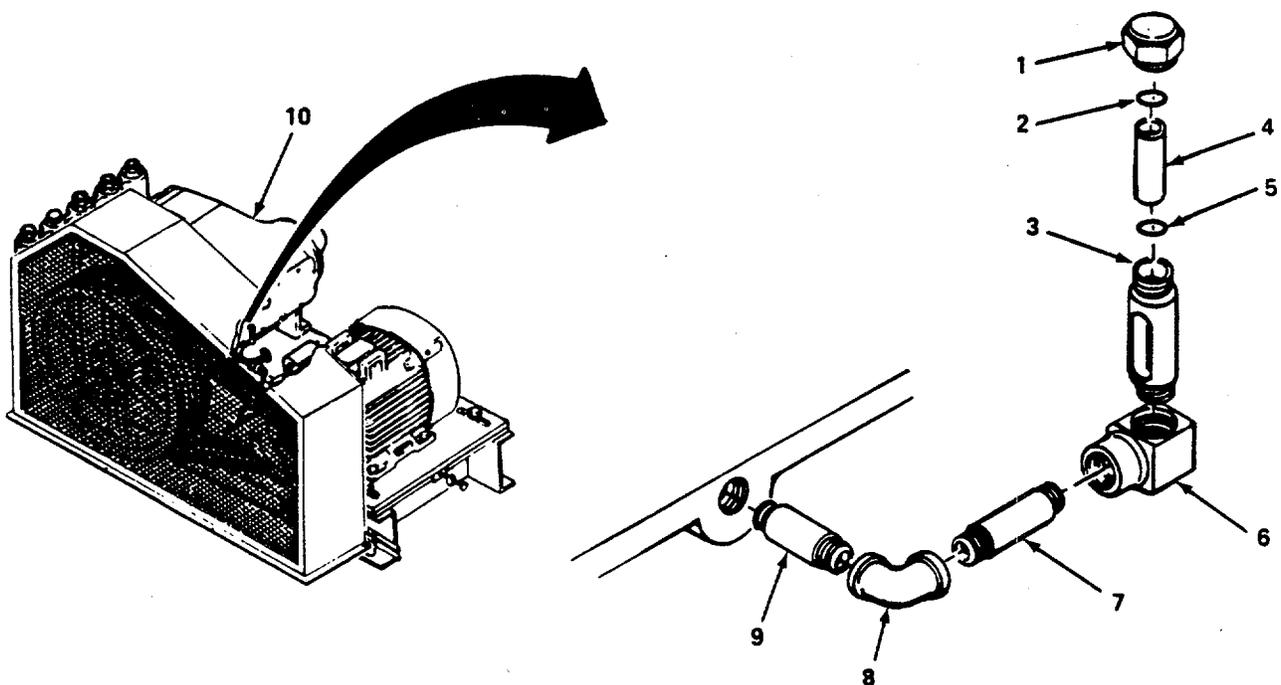
## 2-127. REPLACE R.O. PUMP ASSEMBLY OIL GAGE.

This task covers:      a. Removal.    b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Oil, Lubricating (Appx C, Sect II, Item 11).  
Antiseize Tape (Appx C, Sect II, Item 17).
  - c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).  
Oil drained from R.O. pump assembly (LO 10-4610-239-12).
- 



### REMOVAL.

- a. Remove vent cap (1) and rubber washer (2) from oil gage (3).
- b. Remove sight glass (4) and rubber washer (5) from sight tube (3).
- c. Remove sight tube (3) from elbow adapter (6).
- d. Remove elbow adapter (6), nipple (7), pipe elbow (8), and nipple (9) from R.O. pump assembly (10).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to male pipe threads before installation.

- a. Install nipple (9) on R.O. pump assembly (10).
- b. Install pipe elbow (8), nipple (7), and elbow adapter (6).
- c. Install sight tube (3).
- d. Position rubber washer (5), sight glass (4), and rubber washer (2) in oil gage (3).
- e. Install vent cap (1).
- f. Refill R.O. pump assembly with oil. Refer to LO 10-4610-239-12/LI 08580B-12.

---

**2-128. REPLACE R.O. PUMP ASSEMBLY.**

This task covers:      a. Removal.    b. Installation.

---

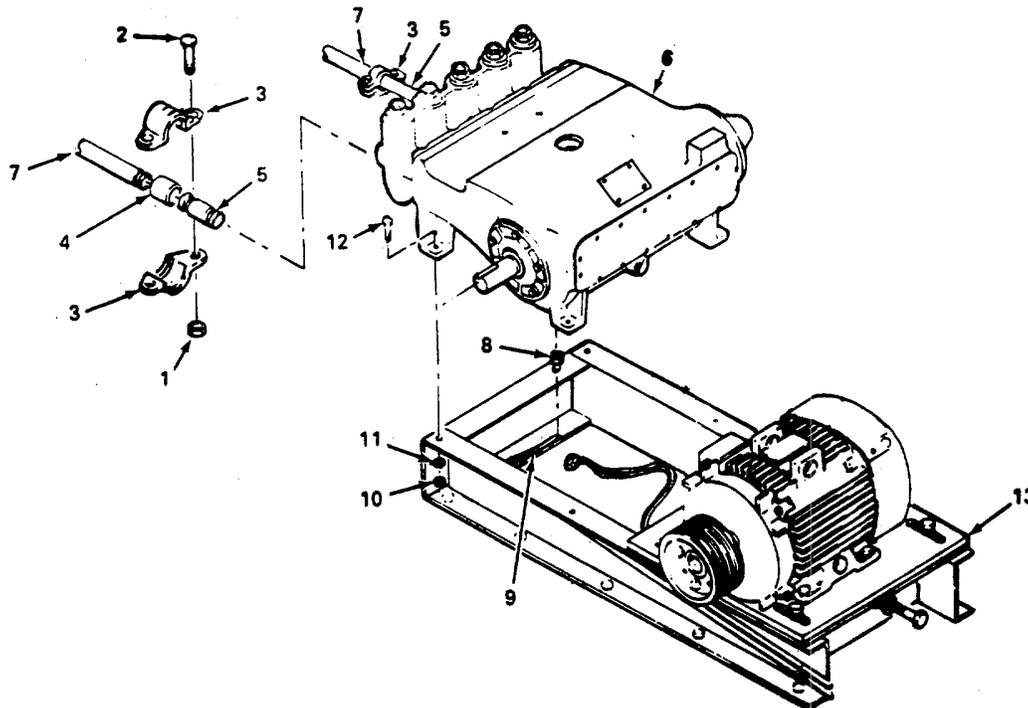
**INITIAL SETUP.**

- a.    Tools.    Tool Kit (Appx B, Sect III, Item 10).  
              Tool Kit (Appx B, Sect III, Item 7).
  
- b.    Materials/Parts.      Oil, Lubricating (Appx C, Sect II, Item 11).  
                              Antiseize Tape (Appx C, Sect II, Item 17).
  
- c.    Equipment Condition.    Power shut down (power source manual).  
                              Oil drained from R.O. pump assembly (LO 10-4610-239-12).  
                              R.O. pump assembly sheave removed (paragraph 2-125).  
                              R.O. pump oil drain valve and air breather removed (paragraph 2-126).  
                              R.O. pump oil gage removed (paragraph 2-127).
  
- d.    General Safety Requirements.

**WARNING**

Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.

---



**REMOVAL.**

- a. Remove four nuts (1), four screws (2), damp halves (3), two gaskets (4), and adapters (5) from R.O. pump (6) and two pipe sections (7).
- b. Loosen hose clamp (8) and remove water hose (9).
- c. Remove four nuts (10), lockwashers (11), and screws (12) from pump stand (13) and R.O. pump (6). Discard lockwashers.

**WARNING**

Weight of R.O. pump is 658 pounds (298 kg). Attempting to move it without proper equipment could cause serious injury. Hoist pump with equipment rated at 1 ton or greater.

- d. Using lifting equipment, remove R.O. pump (6).

**INSTALLATION.**

- a. Position R.O. pump (6) on pump stand (13), align mounting holes, and install four screws (12), new lockwashers (11), and nuts (10).
- b. Install water hose (9) and tighten clamp (8).

**NOTE**

Apply antiseize tape to male pipe threads before installation.

- c. Install two adapters (5) on R.O. pump (6).
- d. Install two gaskets (4) on adapters (5) and pipe sections (7).
- e. Position two clamps (3) over gaskets (4) and install four screws (2) and nuts (1).
- f. Install R.O. pump oil drain valve and air breather. Refer to paragraph 2-126.
- g. Install R.O. pump oil gage. Refer to paragraph 2-127.
- h. Install R.O. pump assembly sheave. Refer to paragraph 2-125.
- i. Refill R.O. pump assembly with oil. Refer to LO 10-4610-239-12/LI 08580B-12.

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**2-129. REPLACE R.O. PUMP AND MOTOR STAND.**

This task covers:      a. Removal.    b. Installation.

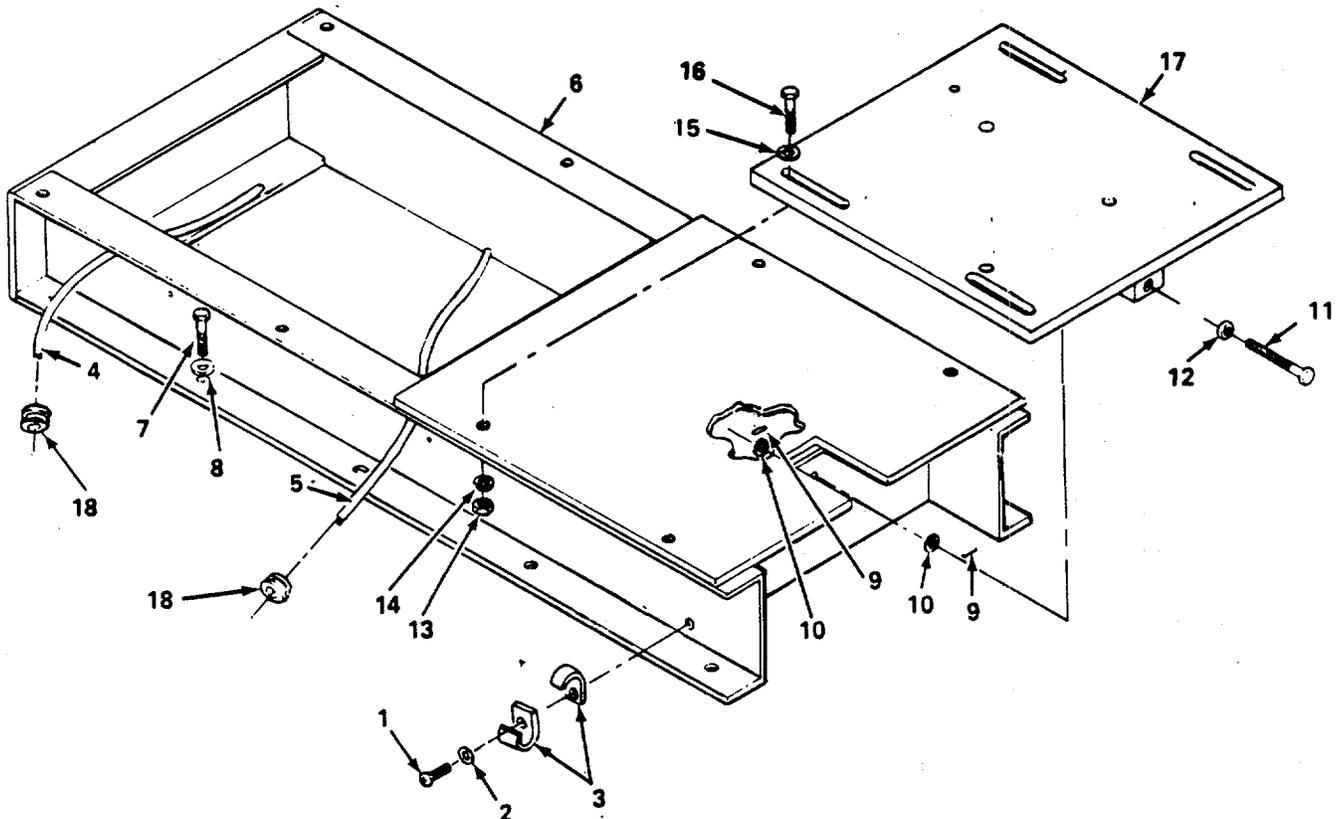
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**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Personnel Required    2
- c. Equipment Condition. R.O. pump electric motor removed (paragraph 2-124).  
R.O. pump assembly removed (paragraph 2-128).
- d. General Safety Requirements.

**WARNING**

Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.



**REMOVAL.**

- a. Remove five screws (1), lockwashers (2), and clamps (3) securing water hose (4) and oil hose (5) to pump and motor stand (6). Discard lockwashers.
- b. Remove water hose (4) and oil hose (5) from pump and motor stand (6).
- c. Remove 10 screws (7) and lockwashers (8) securing pump and motor stand (6) to ROWPU frame. Discard lockwashers.

**WARNING**

The R.O. pump, motor stand, and mounting plate are heavy. Two people are needed to lift them to prevent personal injury or damage to the equipment.

- d. Remove pump and motor stand (6) from ROWPU.
- e. Remove two grooved pins (9) and flat washers (10) from adjusting bolt (11).
- f. Remove adjusting bolt (11) and stop nut (12).
- g. Remove four nuts (13), lockwashers (14), flat washers (15), and screws (16) from mounting plate (17). Discard lockwashers.
- h. Remove R.O. pump electric motor mounting plate (17).
- i. Remove two rubber grommets (18) from R.O. pump and motor stand (6).

**INSTALLATION.**

**WARNING**

The R.O. pump, motor stand, and mounting plate are heavy. Two people are needed to lift them to prevent personal injury or damage to the equipment.

- a. Position R.O. pump electric motor mounting plate (17) on pump and motor stand (6) and install four screws (16), flat washers (15), new lockwashers (14), and nuts (13).
- b. Install stop nut (12), adjusting bolt (11), washer (10), and pins (9).
- c. Install two flat washers (10) and grooved pins (9) on adjusting screw (11).
- d. Position pump and motor stand (6) on ROWPU and align mounting holes.
- e. Install 10 screws (7) and new lockwashers (8).

**INSTALLATION. (Cont)**

- f. Install two grommets (18) and two hoses (4) and (5) on R.O. pump and motor stand (6).
- g. Position three clamps (3) on water drain hose and two clamps on oil drain hose. Install two screws (1) and new lockwashers (2).
- h. Install R.O. pump electric motor. Refer to paragraph 2-124.
- i. Install R.O. pump assembly. Refer to paragraph 2-128.

---

## 2-130. ALIGN R.O. PUMP SHEAVES.

This task covers: alignment.

---

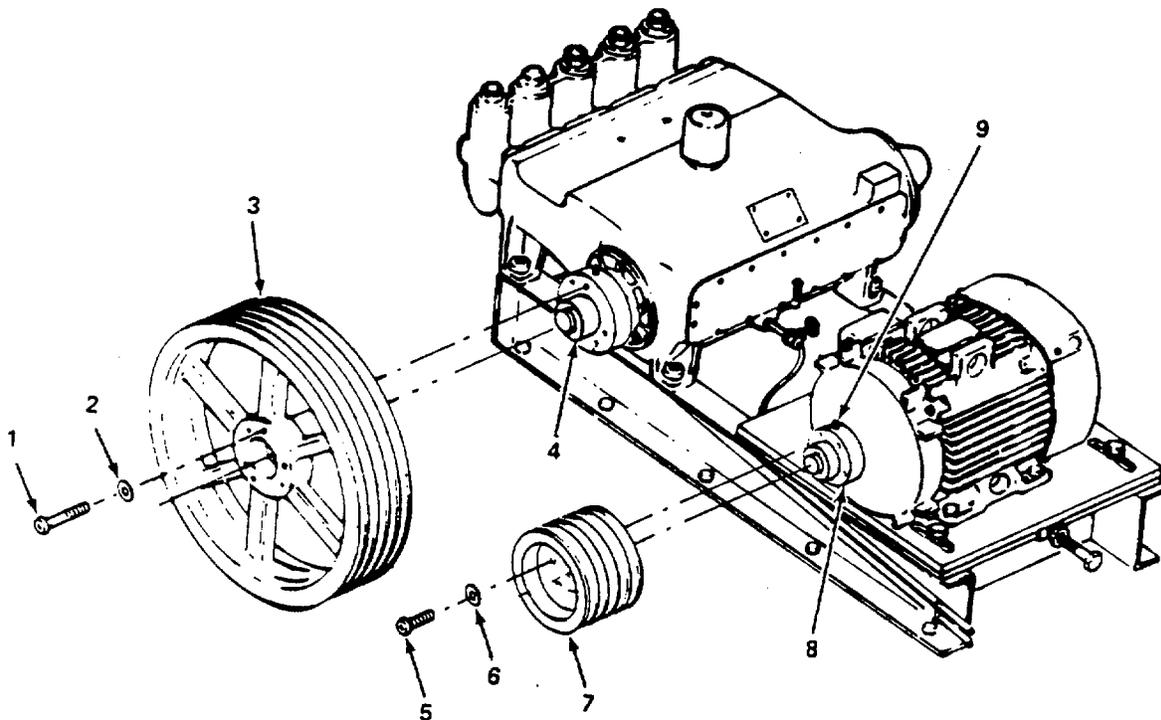
### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment Condition. Power shut down (power source manual).  
R.O. pump assembly belts removed (paragraph 2-121).
- c. General Safety Requirements.

### WARNING

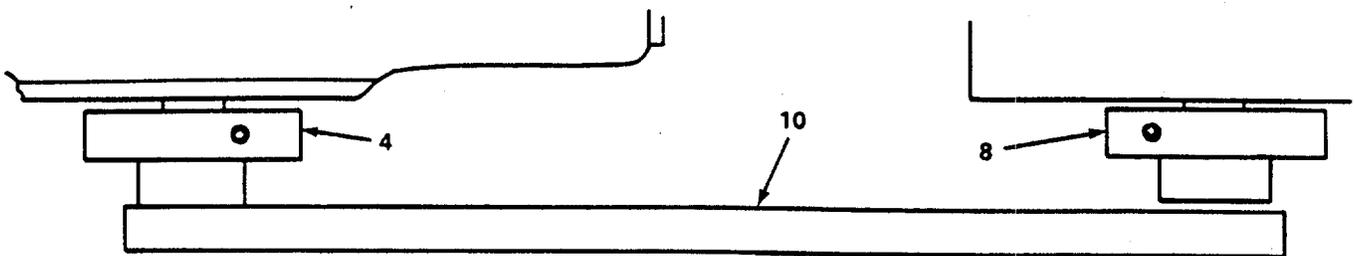
Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.

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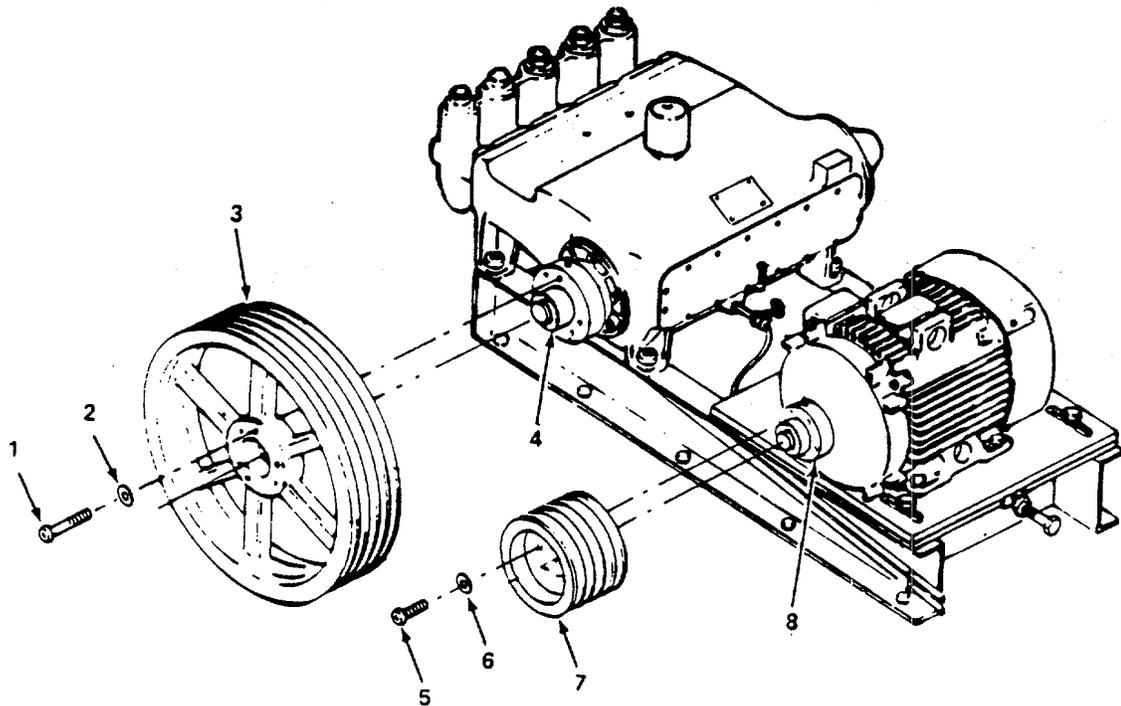


**ALIGNMENT.**

- a. Remove three screws (1) and lockwashers (2). Discard lockwashers.
- b. Install three screws (1) in threaded holes in pump sheave (3) and screw in alternately until pump sheave is off pump hub (4).
- c. Remove three bolts (5) and lockwashers (6). Discard lockwashers.
- d. Install three bolts (5) in threaded holes in motor sheave (7) and screw in alternately until motor sheave is off motor hub (8).
- e. Loosen setscrew (9) until motor hub (8) is just snug on motor shaft.

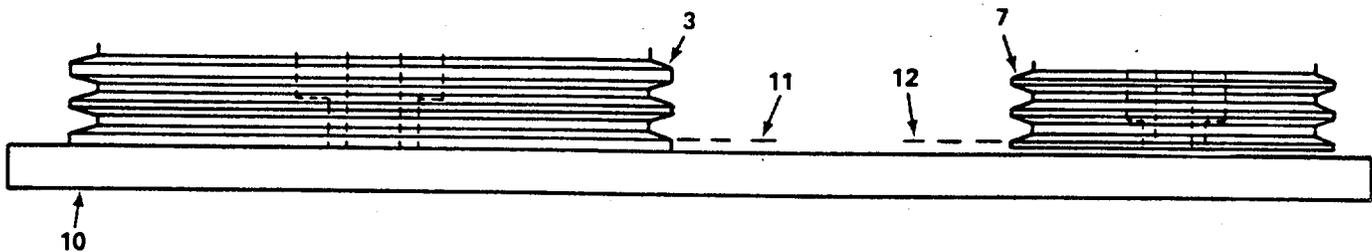


- f. Position straightedge (10) across front of pump hub (4) and motor hub (8). Hold straightedge flush with front of pump hub (4).
- g. Slide motor hub (8) on shaft to align it with pump hub (4). Leave motor hub snug on shaft.



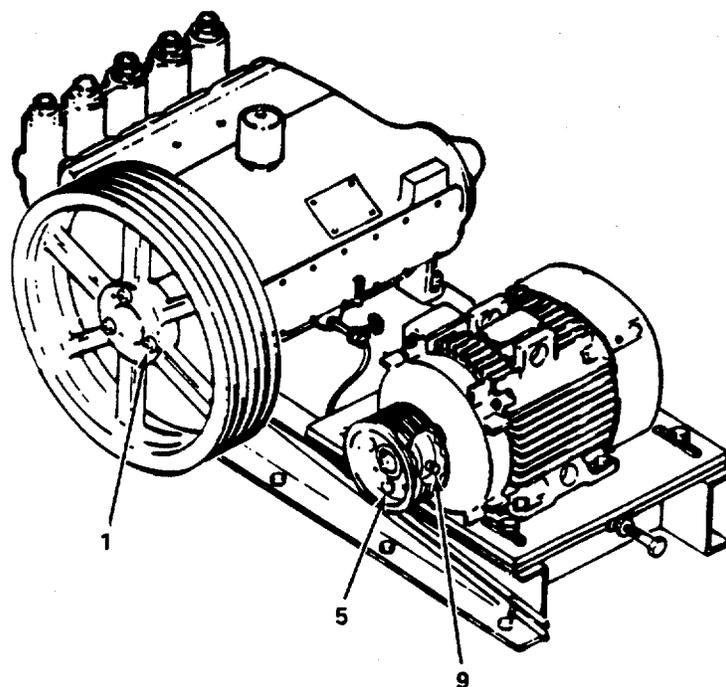
**ALIGNMENT. (Cont)**

- h. Remove three screws (1) from pump sheave (3).
- i. Position pump sheave (3) on pump hub (4) with unthreaded holes in pump sheave aligned with threaded holes in pump hub.
- j. Install three screws (1) and lockwashers (2) snug. Do not tighten screws at this time.
- k. Remove three bolts (5) from motor sheave (7).
- l. Position motor sheave (7) on motor hub (8) with unthreaded holes in motorsheave aligned with threaded holes in motor hub.
- m. Install three bolts (5) and lockwashers (6) snug. Do not tighten bolts at this time.



- n. Position straightedge (10) across front of pump sheave (3) and motor sheave (7).
- o. Measure distance from straightedge to outer belt groove (11) of pump sheave (3).
- p. Measure distance from straightedge to outer belt groove (12) of motor sheave (7).
- q. If distances measured in steps o and p are not the same, slide motor hub (8) and motor sheave (7) on shaft until distances are the same.

ALIGNMENT. (Cont)



- r. Tighten three screws (1) and three bolts (5).
- s. Repeat steps n through q. When distances are the same, tighten setscrew (9).
- t. Repeat steps n through p. If distances are not the same, loosen setscrew (9), slide motor hub (8) and motor sheave (7) on shaft until distances are the same, then tighten setscrew.
- u. Install R.O. pump assembly belts. (Refer to paragraph 2-121).

**Section XVI. DISTRIBUTION PUMP ASSEMBLY MAINTENANCE PROCEDURES**

	Para	Page
Replace Distribution Pump Assembly.....	2-131	2-320
Replace Distribution Pump Cable Assembly.....	2-132	2-322

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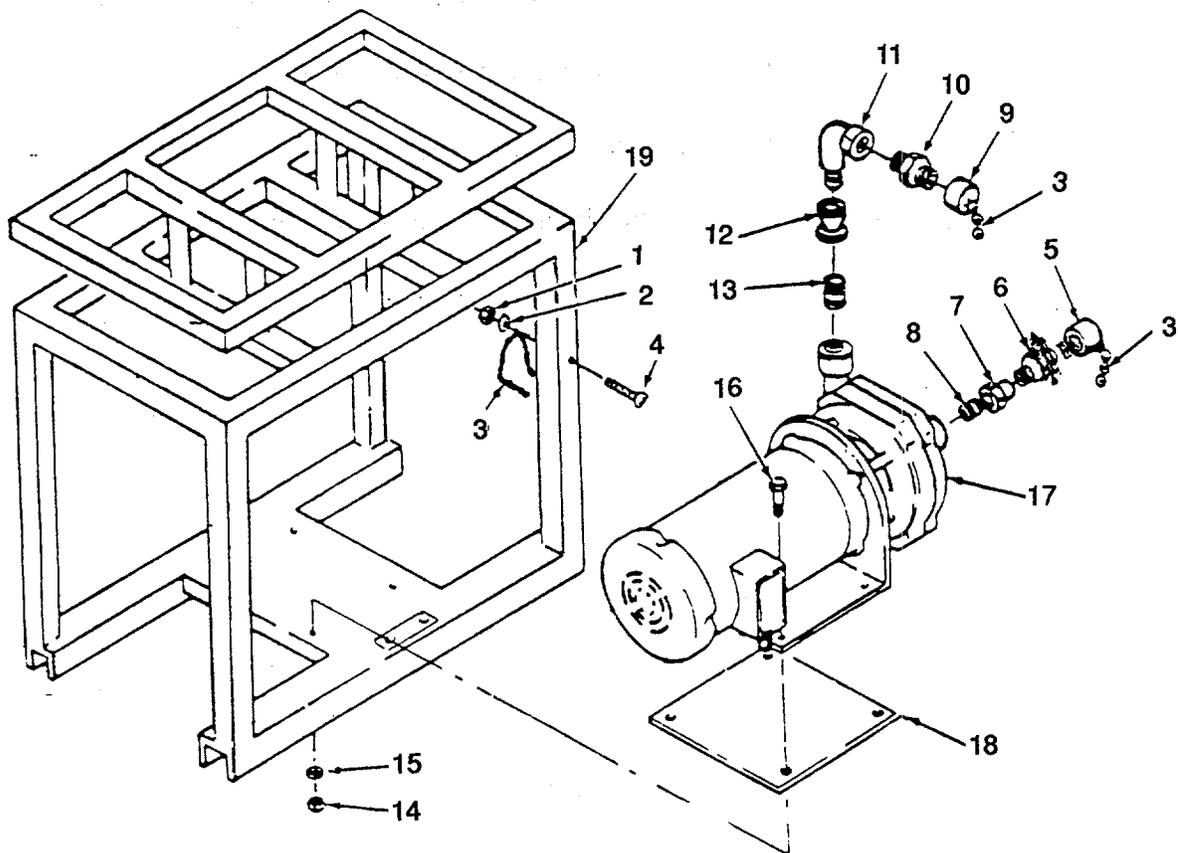
**2-131. REPLACE DISTRIBUTION PUMP ASSEMBLY.**

This task covers:      a. Removal.    b. Installation.

---

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
          Tool Kit (Appx B, Sect III, Item 7).
  
  - b. Equipment Condition. Power shut down (power source manual).  
                                  Frame cover removed (TM-10-4610-239-10).  
                                  External hoses disconnected (TM-10-4610-239-10).  
                                  Distribution pump cable assembly removed (paragraph 2-132).
- 



**REMOVAL.**

- a. Remove nut (1), flat washer (2), two cap chain lugs (3), and screw (4).
- b. Remove hose plug (5), swivel adapter (6), reducer (7), and nipple (8).
- c. Remove hose cap (9), straight adapter (10), elbow (11), reducer (12), and nipple (13).
- d. Remove two nuts (14), lockwashers (15), and screws (16).
- e. Remove distribution pump assembly (17) and spacer plate (18).

**INSTALLATION.**

- a. Position spacer plate (18) and distribution pump assembly (17) on frame (19).
- b. Install two screws (16), lockwashers (15), and nuts (14).
- c. Install nipple (13), reducer (12), elbow (11), straight adapter (10), and hose cap (9).
- d. Install nipple (8), reducer (7), swivel adapter (6), and hose plug (5).
- e. Install screw (4), two cap chain lugs (3), flat washer (2), and nut (1).
- f. Install distribution pump cable assembly. Refer to paragraph 2-132.

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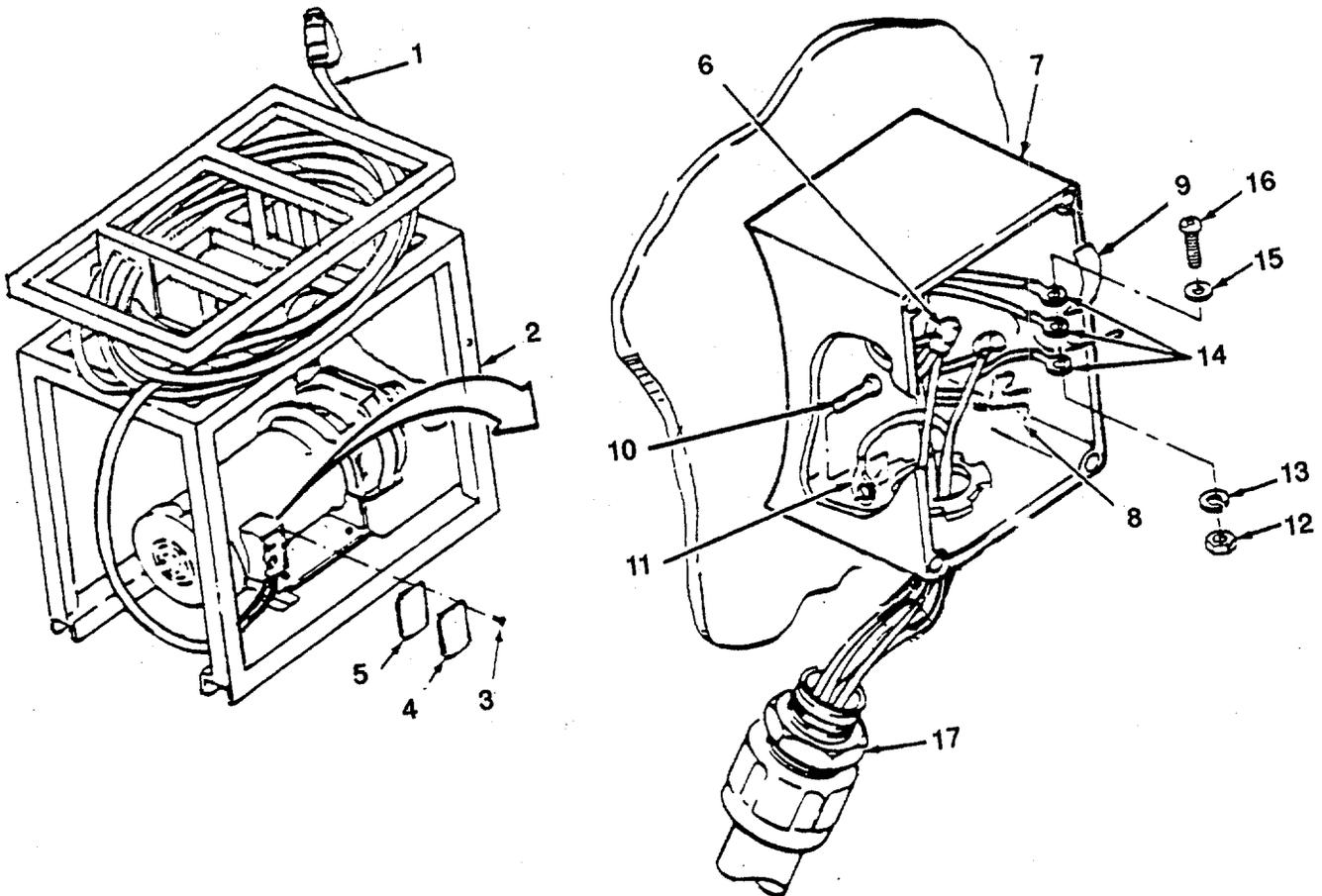
**2-132. REPLACE DISTRIBUTION PUMP CABLE ASSEMBLY.**

This task covers:      a. Removal.    b. Installation.

---

**INITIAL SETUP.**

- a.    Tools.    Tool Kit (Appx B, Sect III, Item 10).
  - b.    Materials/Parts.      Twine (Appx C, Sect II, Item 20).  
                                  Tape, Electrical (Appx C, Sect II, Item 18).
  - c.    Equipment Condition.    Power shut down (power source manual).  
                                  Frame cover removed (TM 10-4610-239-10).
- 



**REMOVAL.**

- a. Unwrap cable assembly (1) from distribution pump assembly frame (2).
- b. Remove four screws (3), cover (4), and gasket (5).

**NOTE**

Tag wires by set before removal.

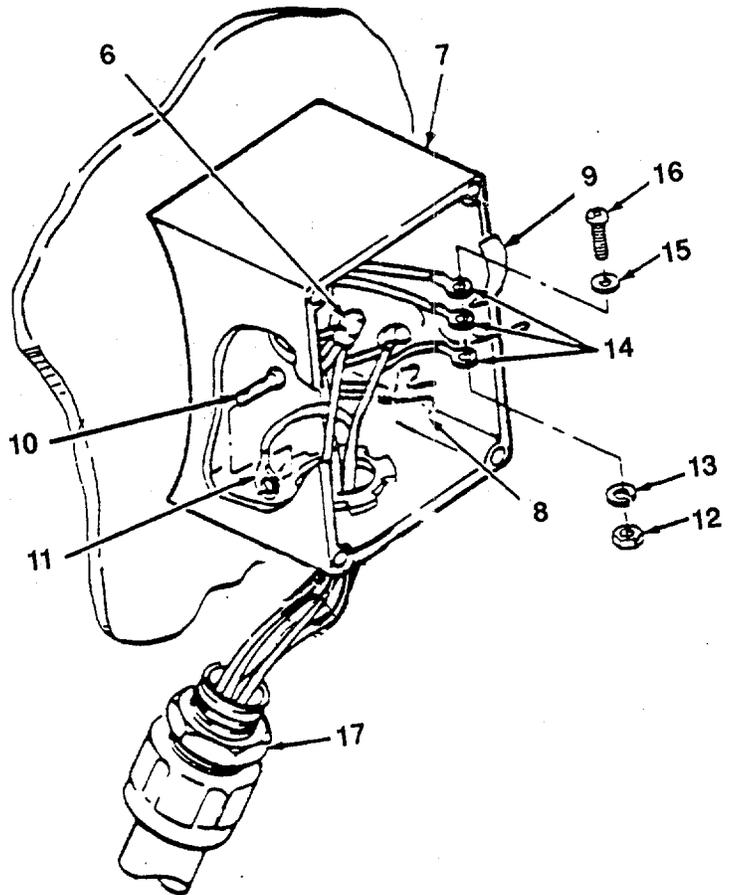
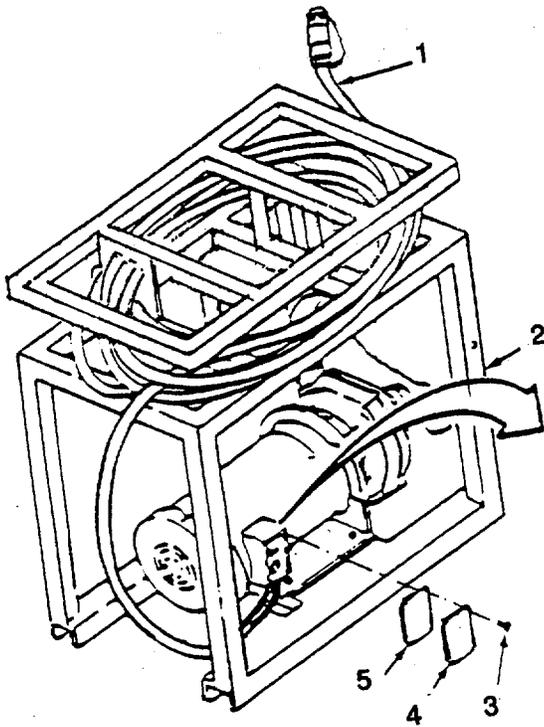
- c. Pull bundle of four wire sets (6) from conduit box (7).
- d. Set aside bundle of wires with three cream-colored wires.
- e. Tag three other bundles with color of wires from power source.
- f. Remove twine (8) and electrical tape (9) from three tagged wire sets.
- g. Remove screw (10) securing ground terminal lug (11).
- h. Remove nut (12), lockwasher (13), three wire lugs (14), and flat washer (15) from screw (16) on each set of wires (6) that have been untaped.
- i. Install flat washer (15), lugs of two cream-colored wires (14), lockwasher (13), and nut (12) on screw (16).

**CAUTION**

Wire insulation can be damaged when wires are pulled through elbow. Be careful when pulling wires.

- j. From conduit box (7), remove sealing grip locknut (18) and wires (6).
- k. Remove sealing grip (17) from cable assembly.

INSTALLATION



**INSTALLATION. (Cont)**

**CAUTION**

Wire insulation can be damaged when wires are pulled through elbow. Be careful when pulling wires.

- a. Position sealing grip (17) on cable assembly and feed wires (6) through conduit box (7) opening and sealing grip locknut (18). Secure sealing grip locknut (18) on sealing grip (17).

**NOTE**

There are three sets of motor wires to connect to power source. Each wire from the power source. Each wire from the power source is added to a motor wire set in the same way. One is shown.

- b. Remove nut (12) and lockwasher (13) from screw (16).
- c. Install colored wire (14) from power source as tagged, lockwasher (13), and nut (12) on screw (16).
- d. Position ground terminal lug (11) on screw (10) and secure
- e. Using electrical tape (9), wrap each wire set (6).
- f. Secure electrical tape (9) on wire set (6) with twine (8).
- g. Position bundle of three wire sets (6) in conduit box (7).
- h. Position gasket (5) and conduit box cover (4) on conduit box (7). Install four screws (3).
- i. Wrap cable assembly (1) on distribution pump assembly frame (2).

**Section XVII. RAW WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES**

	Para	Page
Replace Raw Water Pump Assembly.....	2-133	2-327
Replace Raw Water Pump Cable Assembly.....	2-134	2-329

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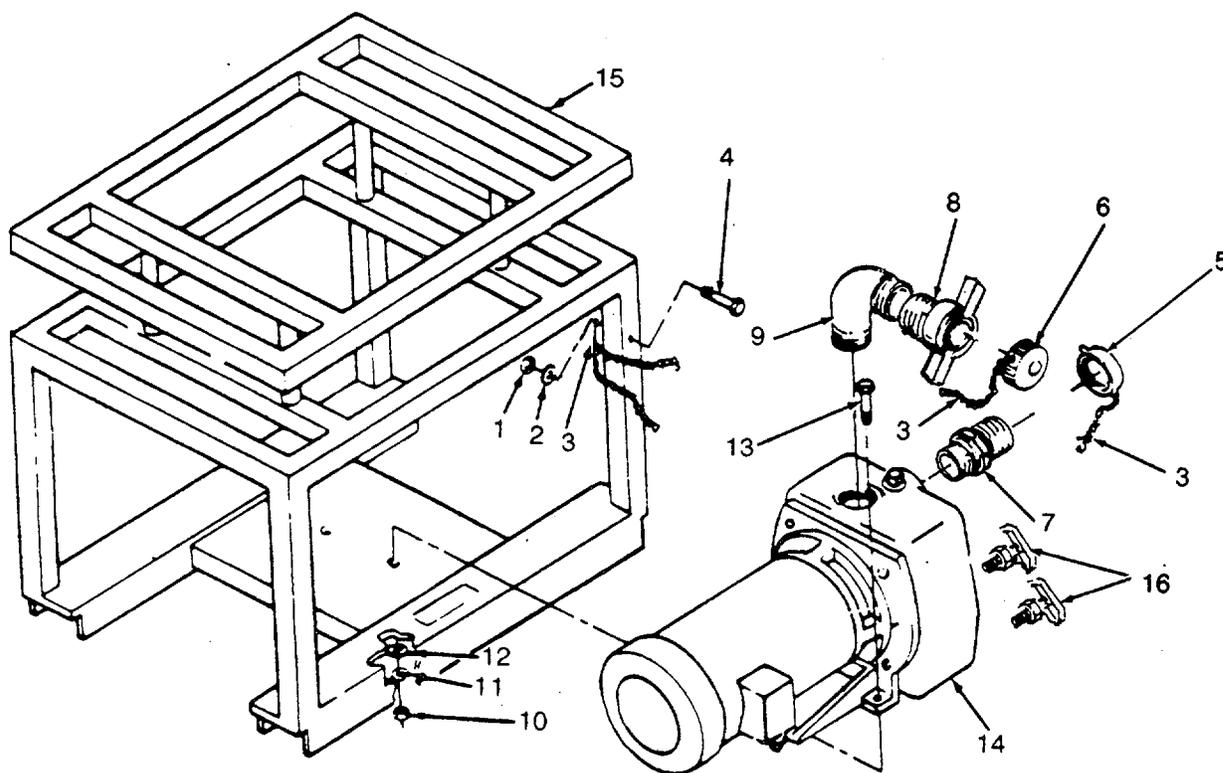
### 2-133. REPLACE RAW WATER PUMP ASSEMBLY.

This task covers:      a. Removal.      b. Installation.

---

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Tool Kit (Appx B, Sect III, Item 7).
  - b. Equipment Condition. Power shut down (power source manual).  
Frame cover removed (TM 10-4610-239-10).  
Raw water pump cable assembly removed (paragraph 2-134).
- 



#### REMOVAL.

- a. Remove locknut (1), flat washer (2), two chain lugs (3), and screw (4).

**REMOVAL. (Cont)**

- b. Remove hose caps (5), hose plug (6), straight adapter (7), swivel adapter (8), and pipe elbow (9).
- c. Remove two nuts (10), lockwashers (11), flat washers (12), and screws (13).
- d. Remove raw water pump assembly (14) from frame (15).
- e. Remove drain cocks (16) from raw water pump assembly (14) and retain for reinstallation.

**INSTALLATION.**

- a. Position raw water pump assembly (14) on frame (15).
- b. Install two screws (13), flat washers (12), lockwashers (11), and nuts (10).
- c. Install pipe elbow (9), swivel adapter (8), straight adapter (7), hose plug (6), and hose cap (5).
- d. Install screw (4), two chain lugs (3), flat washer (2), and locknut (1).
- e. Install raw water pump cable assembly. Refer to paragraph 2-134.
- f. Install drain cocks (16).

---

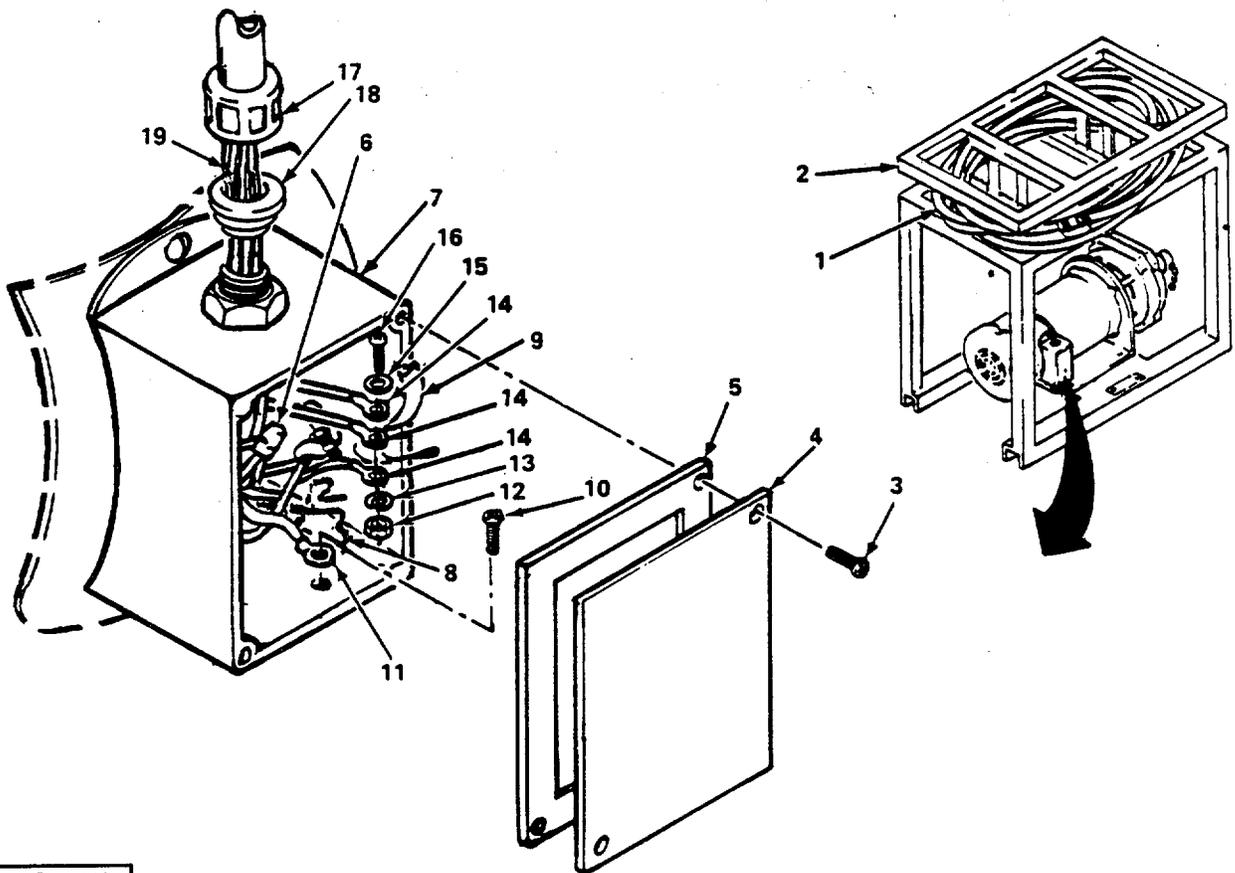
**2-134. REPLACE RAW WATER PUMP CABLE ASSEMBLY.**

This task covers:      a. Removal.    b. Installation.

---

**INITIAL SETUP.**

- a.    Tools.    Tool Kit (Appx B, Sect III, Item 10).
  - b.    Materials/Parts.      Twine (Appx C, Sect II, Item 20).  
                                  Tape, Electrical (Appx C, Sect II, Item 18).
  - c.    Equipment Condition.    Power shut down (power source manual).  
                                  Frame cover removed (TM 10-4610-239-10).
- 



**REMOVAL.**

- a.    Unwrap cable assembly (1) from raw water pump assembly frame (2).
- b.    Remove two screws (3), cover (4), and gasket (5).

**REMOVAL. (Cont)**

**NOTE**

Tag wires by set before removal.

- c. Pull three wire sets (6) from conduit box (7) and remove twine (8) and electrical tape (9).
- d. Remove screw (10) securing ground terminal lug (11).

**NOTE**

There are four sets of wires in conduit box. One motor wire is removed from each bundle the same way. One bundle is shown.

- e. Remove nut (12), lockwasher (13), three terminal lugs (14), and flat washers (15) from screw (16) on each set of wires (6).
- f. Install flat washer (15), terminal lugs (14), lockwasher (13), and nut (12) on screw (16).

**CAUTION**

Wire insulation can be damaged when wires are pulled through conduit box. Be careful when pulling wires.

- g. Remove sealing grip (17) and gasket (18) with wires (19).

**INSTALLATION.**

- a. Position sealing grip (17) and gasket (18) on cable (1).

**CAUTION**

Wire insulation can be damaged when wires are pulled through conduit box. Be careful when pulling wires.

- b. Pull four wires (19) from cable (1) into conduit box (7) and secure sealing grip nut (17).

**NOTE**

There are four sets of motor wires to connect to cable wires. Each wire from cable is added to a motor wire the same way. One is shown.

- c. Remove nut (12) and lockwasher (13) from screw (16).
- d. Install terminal lugs (14) from colored wire cable (1), lockwasher (13), and nut (12) on screw (16).

**INSTALLATION. (Cont)**

- e. Position ground terminal lug (11) in conduit box (7) and secure with screw (10).
- f. Using electrical tape (9), wrap each wire set (6).
- g. Tie three wire sets (6) into bundle with twine (8).
- h. Secure electrical tape (9) on each wire set (6) with twine (8).
- i. Position three wire sets (6) in conduit box (7).
- j. Position gasket (5) and cover (4) on conduit box (7). Install two screws (3).
- k. Wrap cable assembly (1) on raw water pump assembly frame (2).

**Section XVIII. BACKWASH PUMP ASSEMBLY MAINTENANCE PROCEDURES**

	Para	Page
Replace Backwash Pump Strainer Assembly.....	2-135	2-333
Replace Backwash Pump Assembly (Ampco and Scot).....	2-136	2-334
Replace Backwash Pump Cable Assembly.....	2-137	2-337
Replace Power Cable (W40).....	2-138	2-339

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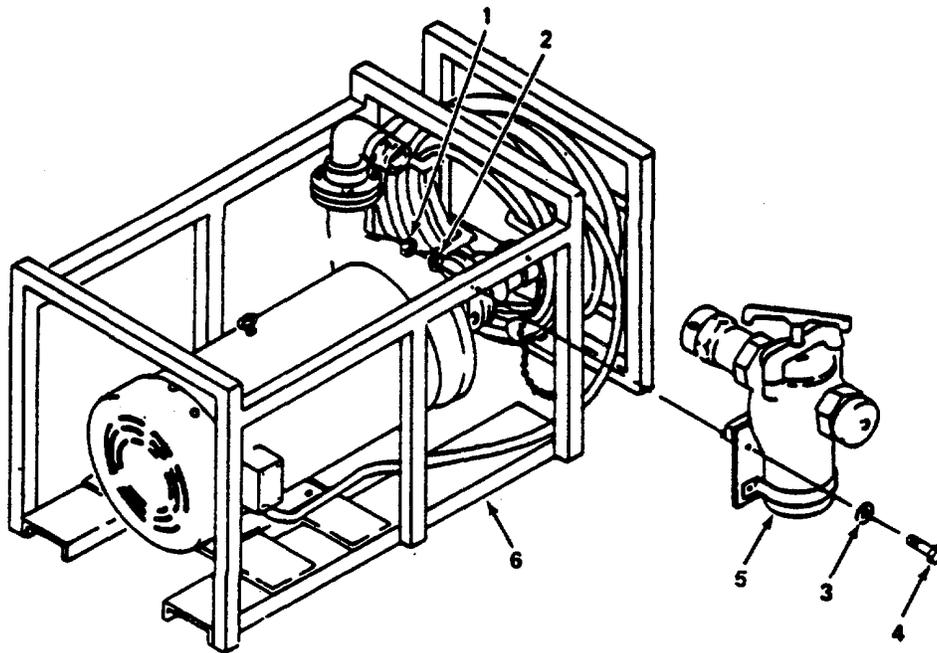
## 2-135. REPLACE BACKWASH PUMP STRAINER ASSEMBLY.

This task covers:      a. Removal.      b. Installation.

---

### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Equipment Condition. Generator shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- 



### REMOVAL.

- a. Remove two nuts (1), lockwashers (2), flat washers (3), and bolts (4).
- b. Remove backwash pump strainer assembly (5).

### INSTALLATION.

- a. Position backwash pump strainer assembly (5) on frame (6) and align mounting holes.
- b. Install two bolts (4), flat washers (3), lockwashers (2), and nuts (1).





**REMOVAL. (Cont)**

- f. Remove four nuts (14), flat washers (15), lockwashers (16), screws (18), flat washers (17), suction flange assembly (19), and gasket (20). Discard lockwashers and gasket.
- g. Remove four nuts (21), flat washers (22), lockwashers (23), flat washers (24), screws (25), discharge flange assembly (26), and gasket (27). Discard lockwashers and gasket.

**INSTALLATION.**

**WARNING**

Backwash pump assembly is heavy/difficult to handle. Two people are needed to lift it to prevent personal injury or damage to the equipment.

**NOTE**

Apply antiseize tape to male pipe threads before installation.

- a. Position new gasket (27) and flange (26) on backwash pump assembly (10), align holes, and install four screws (25), flat washers (24), new lockwashers (23), flat washers (22), and nuts (21).
- b. Position new gasket (20) and flange (19) on backwash pump assembly and install four screws (18), flat washers (17), new lockwashers (16), flat washers (15), and nuts (14).
- c. Install elbow (12) and two swivel adapters (11).
- d. Position backwash pump assembly (10) on frame (6) and install four screws (9), new lockwashers (8), and new locknuts (7).
- e. Position two chains (5) and install two screws (4), flat washers (3), and nuts (2).
- f. Install two plugs (1).
- g. Install backwash pump strainer assembly. Refer to paragraph 2-135.
- h. Install backwash pump cable assembly. Refer to paragraph 2-137.

---

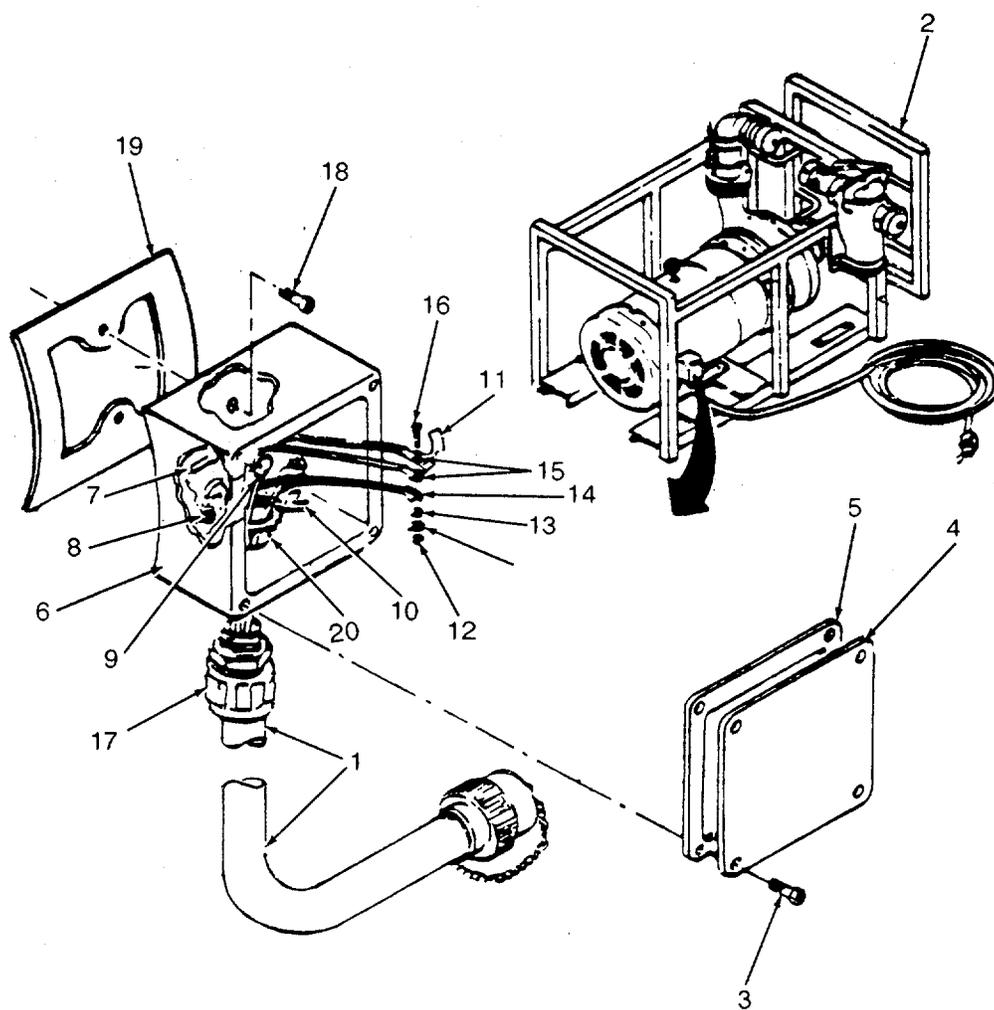
**2-137. REPLACE BACKWASH PUMP CABLE ASSEMBLY.**

This task covers: a. Removal. b. Installation.

---

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Tape, Electrical (Appx C, Sect II, Item 18).  
Twine (Appx C, Sect II, Item 20).
  - c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).
- 



## REMOVAL

- a. Unwind and place bulk of backwash pump cable assembly (1) clear of frame (2).
- b. Remove four screws (3), conduit box cover (4), and gasket (5) from conduit box (6). Discard gasket.
- c. Remove screw (7) securing ground terminal lug (8).
- d. Pull bundle of four wire sets (9) from conduit box (6). Remove twine (10) and tape (11).

### NOTE

Tag wires by set before removal.

- e. Remove nut (12), lockwasher (13), flat washer (14), three wire lugs (15) and screw (16). Repeat this step for each wire set (9).
- f. Remove sealing grip locknut (20) and pull wires of backwash pump cable assembly (1) from conduit box (6).
- g. Remove two bolts (18), conduit box (6), and gasket (19).

## INSTALLATION

- a. Position gasket (19) and conduit box (6) and install bolts (18).
- b. Position cable grip (17) on cable assembly (1) and insert wires of cable assembly (1) through hole in conduit box (6) and sealing grip locknut (20). Secure sealing grip locknut (20).
- c. Pull wires from conduit box (6).
- d. On each set of three wire lugs (15), install screw (16), flat washer (14), lockwasher (13), and nut (12).
- e. Using electrical tape (11), wrap each wire set (9).
- f. Secure electrical tape (11) on each wire set (9) with twine (10).
- g. Position bundle of three wire sets (9) in conduit box (6).
- h. Install ground terminal lug (8) on screw (7) and secure.
- i. Install gasket (5), conduit box cover (4), and two screws (3).
- j. Position backwash pump cable assembly (1) on backwash pump assembly frame (2).

**2-138. REPLACE POWER CABLE. (W40) (ARMY ONLY)**

This task covers: a. Removal      b. Installation

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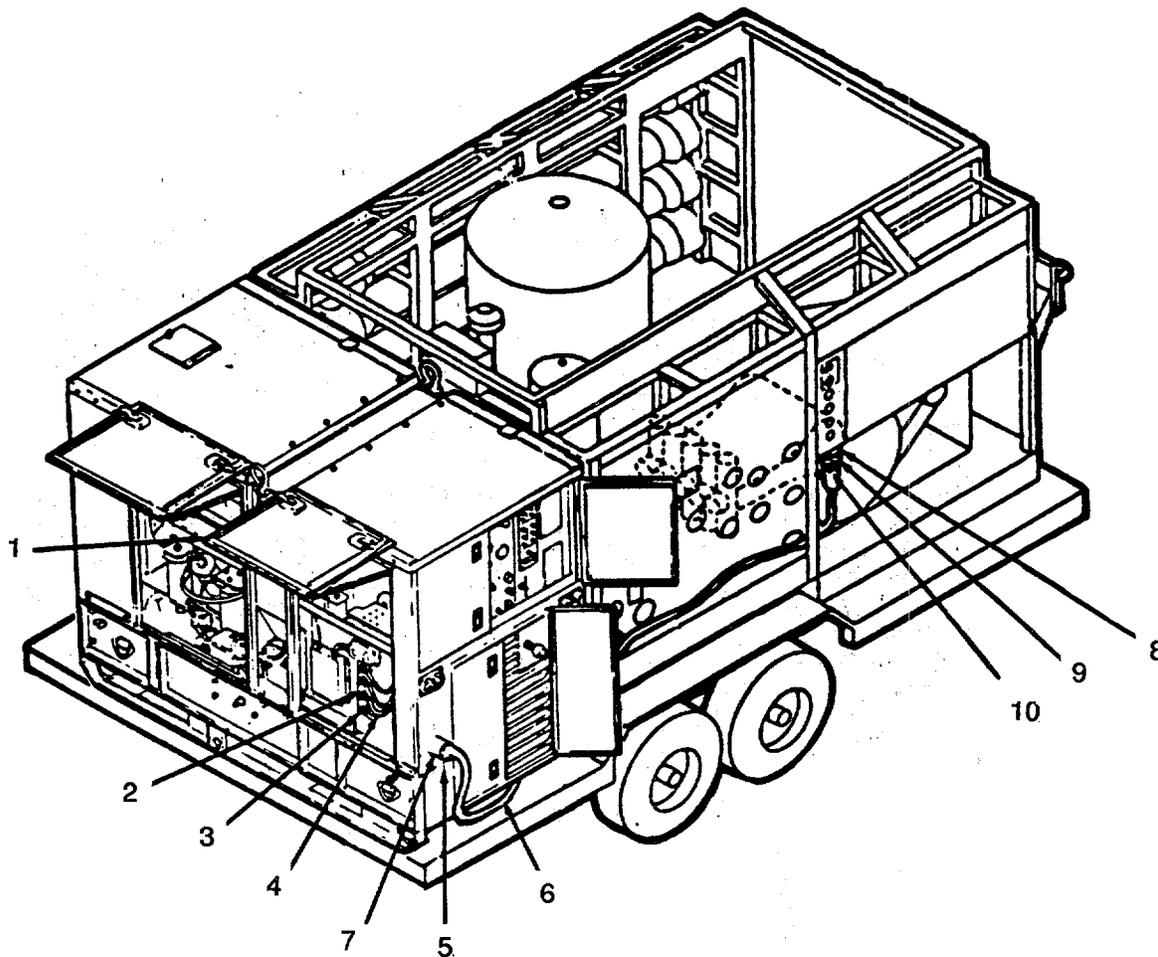
**INITIAL SETUP.**

- a. Tools.      Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment Condition.      ROWPU Shutdown, TM 10-4610-239-10.  
                                         Generator Shutdown, TM 5-6115-465-12
- c. General Safety Requirements.

**WARNINGS**

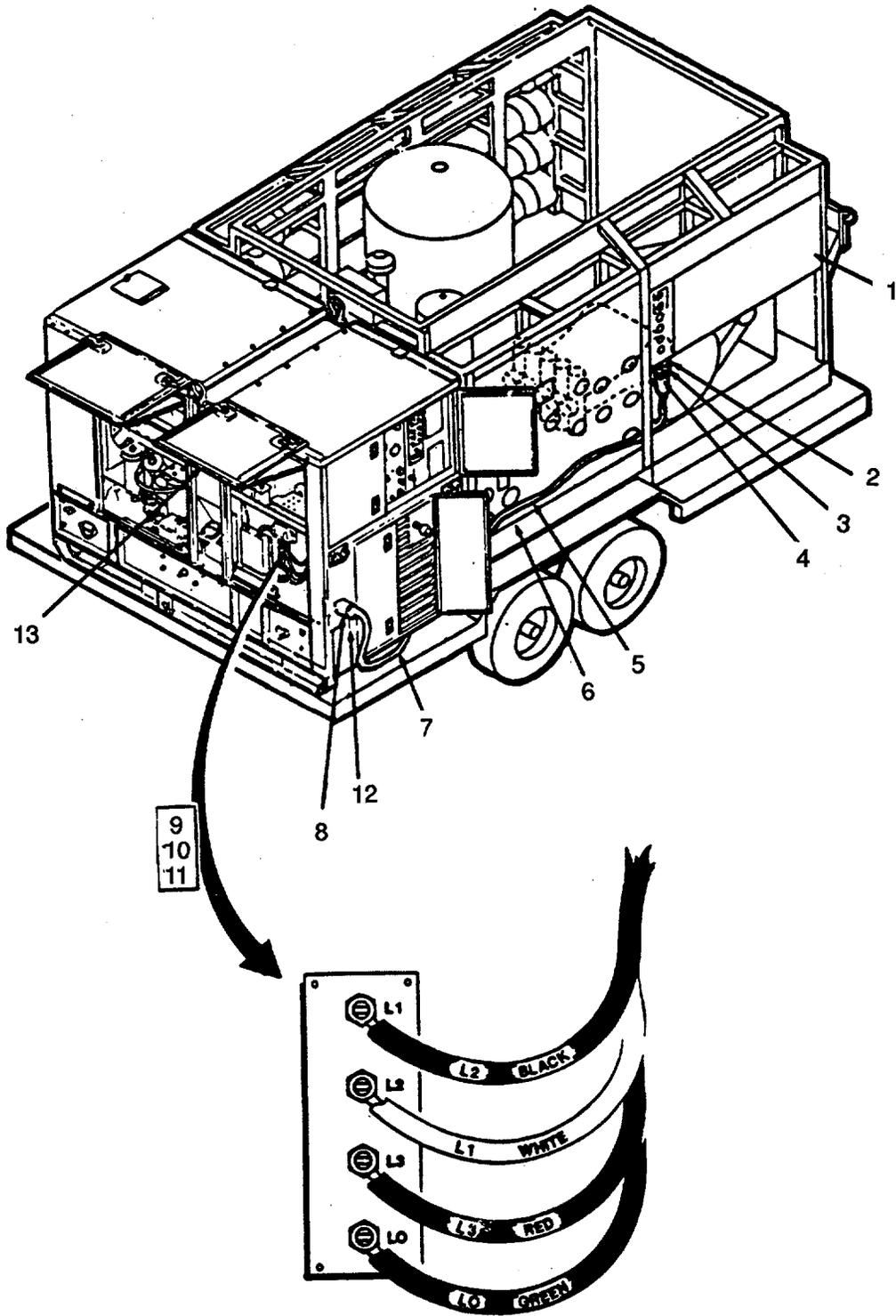
- High voltage can cause burns and electrical shock. All electrical power must be off before performing these procedures.
  - Lethal voltages are present at load connection board of the ROGEN during operation. Do not attempt to connect or disconnect load leads while either the ROGEN or the ROWPU are powered up or while the ROGEN is parallel to another unit which is in operation.
-

REMOVAL



- a. Open access cover (1) to access ROGEN terminal board (2).
- b. Loosen four terminal bolts (3), and disconnect four wires (4) from ROGEIN terminal board (2).
- c. Loosen dust boot draw string (5), and pull power cable (6) through dust boot (7).
- d. At ROWPU junction box (8), loosen locking connector (9), and disconnect power cable (10) from ROWPU junction box (8).

INSTALLATION.



**INSTALLATION. (Cont)**

- a. At ROWPU junction box (1), insert female end of cable connector (2) into male connector (3) and tighten locking connector (4).
- b. Push taped end of power cable (5) along floor inside ROWPU flatbed trailer (6) toward and then under ROGEN skid (7).
- c. Insert and pull taped end of power cable (5) through dust boot (8).
- d. Untape power cable ends (9) and strip approximately 12 inches of outside insulation (10) from around five terminal wires (11).
- e. Strip approximately 1 1/2 inch insulation from each terminal wire (11).
- f. Connect all green wires (five each) to terminal marked LO, connect wire marked L3 (red) to terminal L3, connect wire marked L1 (white) to terminal L2, and connect wire marked L2 (black) to terminal L1, and tighten five terminal bolts.
- g. Pull excess power cable (5) through dust boot (8) until cable lies smoothly on platform of ROWPU flatbed trailer (6) and just under ROGEN skid (7).
- h. Tighten draw string (12) to draw dust boot (8) snugly around power cable (5).
- i. Close ROGEN terminal board access cover (13).

## Section XIX. PREPARATION FOR STORAGE OR SHIPMENT

**2-139. SECURITY PROCEDURES.** Refer to AR 190-11 or 190-13.

**2-140. PREPARATION FOR MOVEMENT.** Refer to TM 10-4610-239-10 to prepare the ROWPU for movement.

**2-141. SHORT-TERM (ADMINISTRATIVE) STORAGE.** Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period, appropriate maintenance records will be kept.

- a. Before placing equipment in administrative storage, current maintenance services and equipment serviceable criteria (ESC) evaluations should be completed, shortcomings and deficiencies should be corrected, and all modification work orders (MWO's) should be applied.
- b. Remove R.O. elements and end cap O-rings, calcium hypochlorite (chlorine), spare parts, and consumables from the ROWPU.
- c. Attach tag to pressure vessels that reads "R.O. elements and end cap O-rings have been removed. Reinstall before operating unit."
- d. Cover the ROWPU with the tarpaulin furnished.
- e. Storage site selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans, cone containers and other containers may be used.

**CHAPTER 3  
DIRECT SUPPORT MAINTENANCE INSTRUCTIONS**

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Backwash Pump Assembly Maintenance Procedures.....	IX

**Section I. DIRECT SUPPORT TROUBLESHOOTING**

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**3-1. GENERAL.**

a. Troubleshooting at the direct support level requires location of any trouble as quickly as possible. Once the trouble is located, repair or replace the item if authorized by the Maintenance Allocation Chart. This section is designed to aid in quick, accurate diagnosis of problems associated with the ROWPU. In its simplest state, troubleshooting the ROWPU is an exercise in logic.

b. It is most important to understand that the ROWPU is really made up of a series of systems with each system having a number of assemblies. Some of these systems are interrelated; others are not. The ROWPU operates within a framework of logical rules and physical laws and the key to troubleshooting is a good understanding of all the systems and their assemblies.

**NOTE**

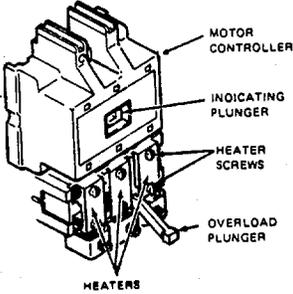
Before using the troubleshooting table, check your work order and talk to unit maintenance, if possible, for a description of the symptoms and the steps that have been taken to correct them.

c. This section breaks the ROWPU down into its systems and assemblies, allowing the problem to be isolated. The troubleshooting table lists the most common problems and the most probable causes of trouble. It would be impossible to list every possible problem that could happen along with every possible cause, but it will locate most problems and eliminate a lot of unnecessary guesswork. The systematic format will locate problems within a given assembly but, because many of the ROWPU assemblies are interrelated, the solution to a particular problem may be found in more than one assembly.

3-2. USING THE TROUBLESHOOTING TABLE . The following columns are used in the troubleshooting table:

TM 5-4610-215-24/2  
TM 08580B-24/3

Table 3-1. Intermediate Direct Support Troubleshooting - Continued

Malfunction	Test or Inspection	Corrective Action
DISTRIBUTION PUMP ASSEMBLY		
<b>WARNING</b>		
Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.		
<b>NOTE</b>		
Ensure that all circuit breakers are set. Refer to figure F0-3 for schematic diagram and figure F0-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-5 for distribution pump assembly support diagram.		
①	PUMP ELECTRIC MOTOR FAILS TO START WHEN DISTRIBUTION PUMP SWITCH IS SET TO START	
②	Step 1. Push overload plunger on K5. Set DISTRIBUTION PUMP switch to START and release. Check position of overload plunger.	
③	If plunger stays in, go to step 2. If plunger does not stay in, go to step 7.	
④		

3-28

- Malfunction (1). Malfunctions given are those that cause symptoms seen or heard at the equipment without using test equipment.
- Test or Inspection (2). Test or inspections are procedure steps that isolate the damaged part.
- Corrective Action (3). Corrective actions tell the technician what needs to be done to correct the problem.
- Illustration (4). Illustrations show what the text is talking about.

**3-3. TROUBLESHOOTING TABLE.** Table 3-1 lists common malfunctions which may be found during operation or maintenance of the ROWPU group or its assemblies. Perform the tests/inspections and corrective actions in the order listed.

**NOTE**

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

**Table 3-1. Direct Support Troubleshooting**

Malfunction	Test or Inspection	Corrective Action
-------------	--------------------	-------------------

**SUSPENSION ASSEMBLY**

1. **FLATBED CARGO TRAILER SIDETRACKS WHEN BEING TOWED**
  - Step 1. Check for worn or broken spring leaves.
    - If spring leaves are good, go to step 2.
    - If spring leaves are worn or broken, replace both spring assemblies. Refer to paragraph 3-8.
  - Step 2. Check for worn or broken trunnion brackets.
    - If trunnion brackets are good, go to step 3.
    - If trunnion brackets are worn or broken, replace trunnion axle. Refer to paragraph 3-4.
  - Step 3. Check for bent trunnion axle.
    - If trunnion axle is bent, replace trunnion axle. Refer to paragraph 3-4.
    - If trunnion axle is not bent, notify General Support Maintenance.

**Table 3-1. Direct Support Troubleshooting - Continued**

---

Malfunction	Test or Inspection	Corrective Action
-------------	--------------------	-------------------

---

**SUSPENSION ASSEMBLY - Continued**

**2. FLATBED CARGO TRAILER LEANS TO ONE SIDE**

- Step 1. Check for worn or broken spring leaves.
  - If spring leaves are good, go to step 2.
  - If spring leaves are worn or broken, replace both spring assemblies. Refer to paragraph 3-8.
- Step 2. Check for worn or broken trunnion brackets.
  - If trunnion brackets are good, go to step 3.
  - If trunnion brackets are worn or broken, replace trunnion axle. Refer to paragraph 3-4.
- Step 3. Check for bent axles.
  - If axles are bent, replace bent axles. Refer to paragraph 2-68.
  - If axles are not bent, replace suspension assembly. Refer to paragraph 3-7.

**3. FLATBED CARGO TRAILER SAGS**

- Step 1. Check for worn or broken spring leaves.
  - If spring leaves are good, go to step 2.
  - If spring leaves are worn or broken, replace both spring assemblies. Refer to paragraph 3-8.
- Step 2. Check for worn or broken trunnion brackets.
  - If trunnion brackets are good, go to step 3.
  - If trunnion brackets are worn or broken, replace trunnion axle. Refer to paragraph 3-4.
- Step 3. Check for bent trunnion axle.
  - If trunnion axle is bent, replace trunnion axle. Refer to paragraph 3-4.
  - If trunnion axle is not bent, notify General Support Maintenance.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
<b>SUSPENSION ASSEMBLY - Continued</b>		
4. FLATBED CARGO TRAILER VIBRATES WHEN BEING TOWED		
Step 1.	Check for worn or broken spring leaves. If spring leaves are good, go to step 2. If spring leaves are worn or broken, replace both spring assemblies. Refer to paragraph 3-8.	
Step 2.	Check for worn or broken trunnion brackets. If trunnion brackets are good, go to step 3. If trunnion brackets are worn or broken, replace trunnion axle. Refer to paragraph 3-4.	
Step 3.	Check for bent trunnion axle. If trunnion axle is bent, replace trunnion axle. Refer to paragraph 3-4. If trunnion axle is not bent, go to step 4.	
Step 4.	Check for bent axles. If axles are bent, replace bent or worn axles. Refer to paragraph 2-68. If axles are not bent or worn, notify General Support Maintenance.	
5. TIRES WEAR UNEVENLY		
Step 1.	Check for worn or broken spring leaves. If spring leaves are good, go to step 2. If spring leaves are worn or broken, replace both spring assemblies. Refer to paragraph 3-8.	
Step 2.	Check for worn or broken trunnion brackets. If trunnion brackets are good, go to step 3. If trunnion brackets are worn or broken, replace trunnion axle. Refer to paragraph 3-4.	

**Table 3-1. Direct Support Troubleshooting - Continued**

---

Malfunction	Test or Inspection	Corrective Action
-------------	--------------------	-------------------

---

**SUSPENSION ASSEMBLY - Continued**

5. TIRES WEAR UNEVENLY - Continued

- Step 3. Check for bent trunnion axle.  
If trunnion axle is bent, replace trunnion axle. Refer to paragraph 34.  
If trunnion axle is not bent, go to step 4.
- Step 4. Check for bent axles.  
If axles are bent, replace bent or worn axles. Refer to paragraph 2-68.  
If axles are not bent or worn, notify General Support Maintenance.

**ROWPU ASSEMBLY**

1. ALL PUMPS FAIL TO START

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-3 for ROWPU support diagram.

- Step 1. Refer to ROWPU support diagram figure 3-3. Perform continuity check between test points A and B. If check indicates continuity, go to step 2.  
If check does not indicate continuity, go to step 4.
- Step 2. Check wire lead connecting test point B to ground stake.  
If connection is good, go to step 3.  
If connection is faulty, tighten connection or repair wire lead. Refer to paragraph 3-39.

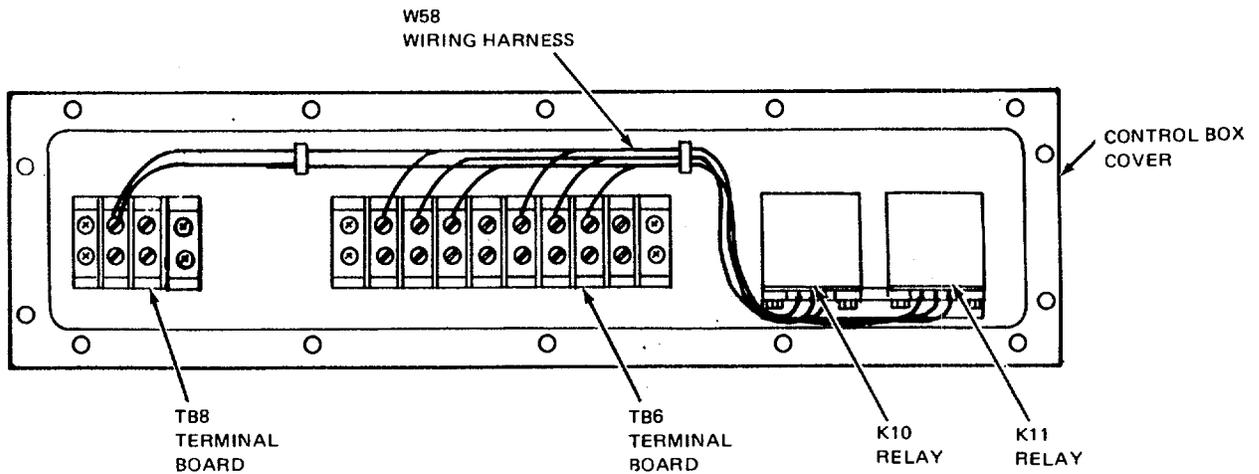
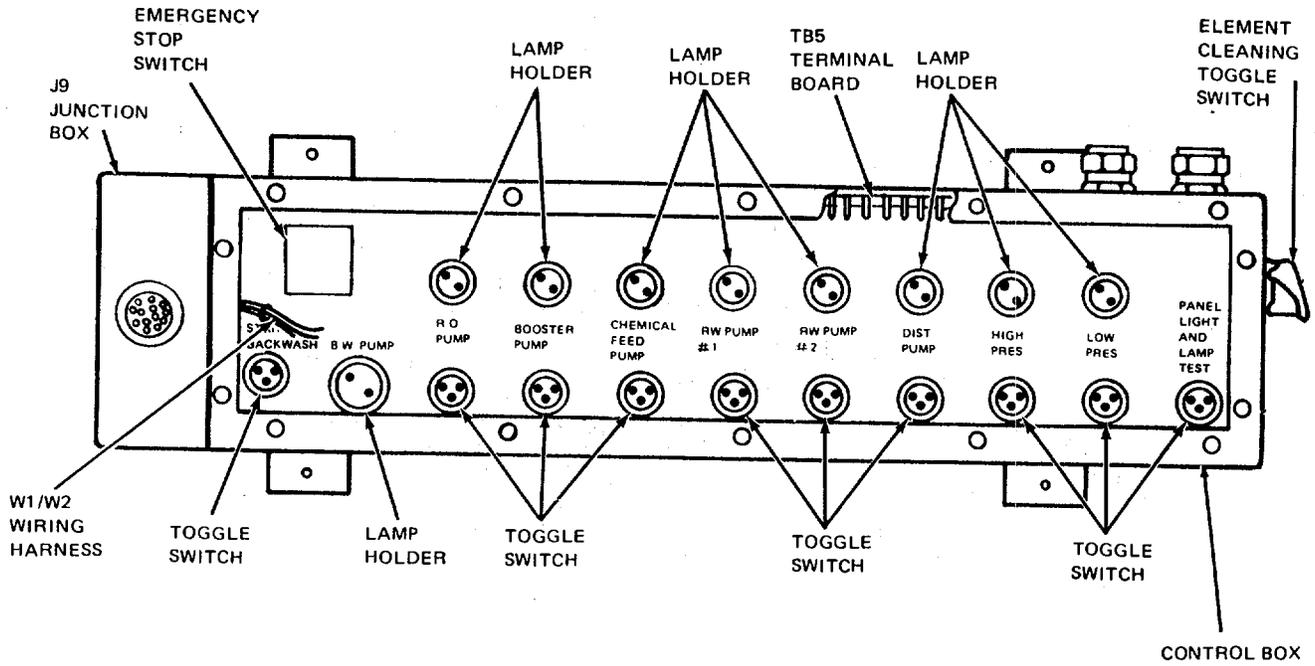


Figure 3-1. Control Box Support Diagram

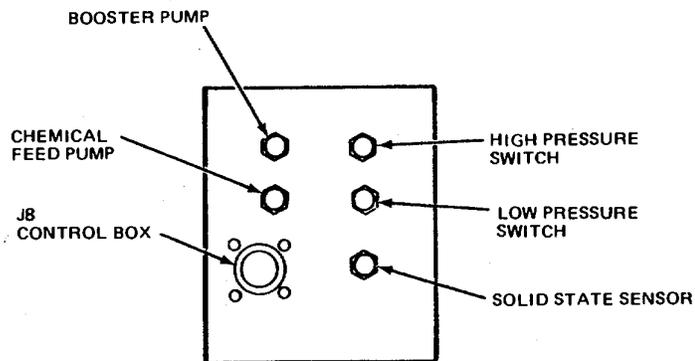
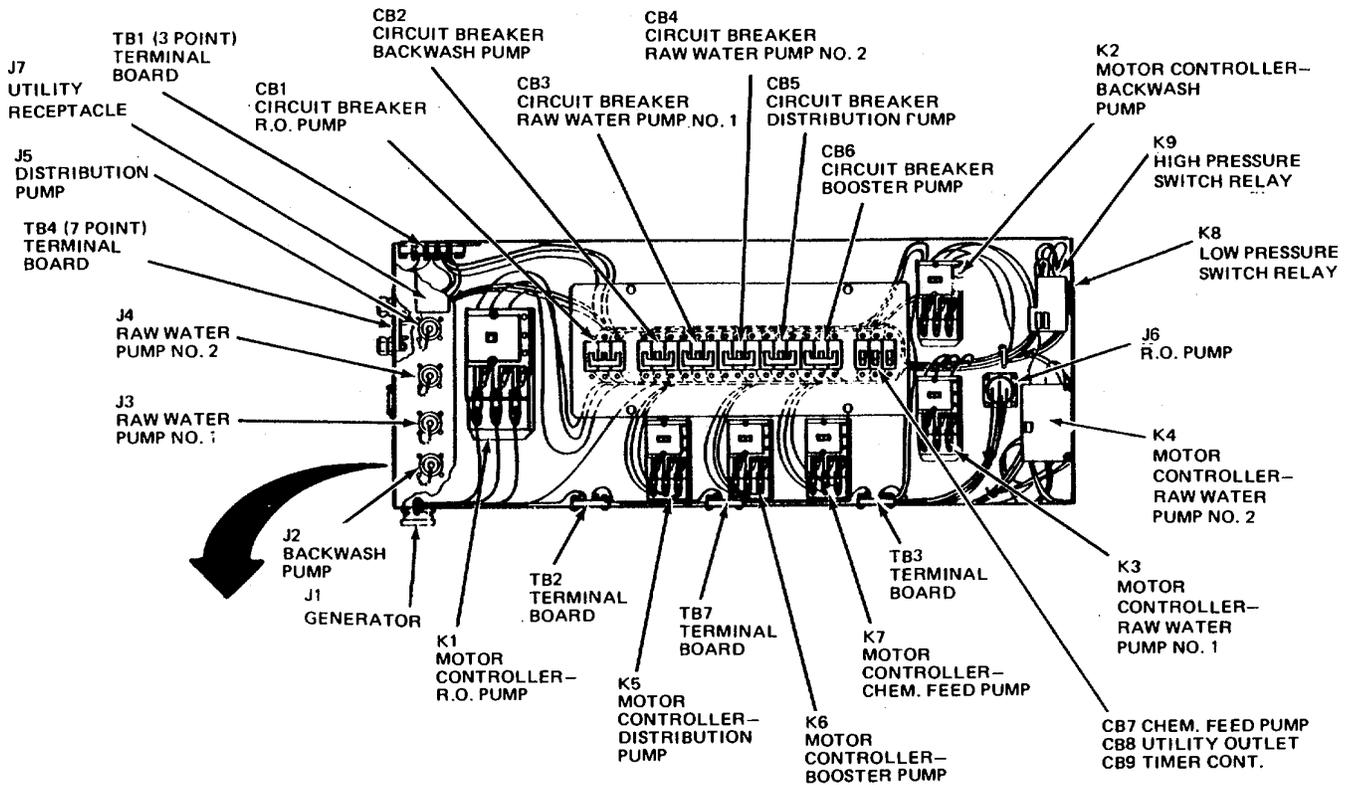


Figure 3-2. Junction Box Support Diagram



**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**ROWPU ASSEMBLY - Continued**

1. ALL PUMPS FAIL TO START - Continued

Step 3. Perform continuity check point-to-point between test points C and D.  
 If all checks indicate continuity, replace CB 1. Refer to paragraph 3-43.  
 If wiring harness does not indicate continuity, repair wiring harness.  
 Refer to paragraph 3-39.  
 If wire lead does not indicate continuity, repair wire lead. Refer to  
 paragraph 3-39.

Step 4. Perform continuity checks point-to-point between test points A and B.  
 If a wiring harness does not indicate continuity, repair wiring harness.  
 Refer to paragraph 3-39.  
 If a wire lead does not indicate continuity, repair wire lead. Refer to  
 paragraph 3-39.

2. ITEM PLUGGED INTO UTILITY RECEPTACLE DOES NOT OPERATE

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

- Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram and figure 3-2 for junction box support diagram.
- Ensure that all circuit breakers in junction box are set to ON.

Step 1. Disconnect item plugged into utility receptacle J7. Check position of RESET button on J7.  
 If RESET button is in, go to step 2.  
 If RESET button is out, press button in.

Step 2. Press in TEST button on J7. Check position of RESET button.  
 If RESET button pops out, go to step 3.  
 If RESET button does not pop out, go to step 4.

**Table 3-1 Direct Support Troubleshooting - (Continued)**

Malfunction	Test or Inspection	Corrective Action
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**ROWPU ASSEMBLY - Continued**

2. ITEM PLUGGED INTO UTILITY RECEPTACLE DOES NOT OPERATE – Continued
- Step 3. Check for 110 V ac between two rectangular pins of J7.  
 If 110 V ac is present, troubleshoot item that was plugged into J7.  
 If 110 V ac is not present, replace J7. Refer to paragraph 3-45.
- Step 4. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Perform continuity check of black wire lead connecting J7 to terminal board TB4-1.  
 If check indicates continuity, replace J7. Refer to paragraph 3-45.  
 If check does not indicate continuity, repair black wire lead. Refer to paragraph 3-39.

3. PANEL LAMP FAILS TO LIGHT

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-3 for ROWPU support diagram.

- Step 1. Set PANEL LIGHT switch to OFF. Remove guard, globe, and socket from panel light assembly. Refer to paragraph 2-84. Set PANEL LIGHT switch to TEST INDICATOR LIGHTS. Check for 110 V ac between two terminals of socket.  
 If 110 V ac is not present, go to step 2.  
 If 110 V ac is present, repair panel light assembly. Refer to paragraph 2-84.
- Step 2. Refer to ROWPU support diagram figure 3-3. Perform continuity check between test points E and F.  
 If check indicates continuity, go to step 3.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**ROWPU ASSEMBLY - Continued**

3. PANEL LAMP FAILS TO LIGHT - Continued  
If check does not indicate continuity, replace S 11. Refer to paragraph 3-34.
- Step 3. Perform continuity checks point-to-point between test points G and E.  
If all checks indicate continuity, go to step 4.  
If all checks do not indicate continuity, repair W1. Refer to paragraph 3-39.
- Step 4. Perform continuity checks point-to-point between test points F and H.  
If all checks indicate continuity, replace panel light assembly. Refer to paragraph 2-84.  
If a wiring harness has no continuity, repair wiring harness. Refer to paragraph 3-39.  
If a cable has no continuity, repair cable. Refer to paragraph 3-17.
4. UTIL OUT CIRCUIT BREAKER FAILS TO RESET

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

Remove power from unit by disconnecting power cable at MAIN POWER IN jack J1 before connecting, disconnecting, or replacing any lead or parts. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-3 for ROWPU support diagram.

- Step 1. Disconnect any external device connected to utility receptacle J7. Reset UTIL OUT circuit breaker.
- If UTIL OUT circuit breaker trips, go to step 2.  
If UTIL OUT circuit breaker does not trip, repair connected device.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**ROWPU ASSEMBLY - Continued**

4. UTIL OUT CIRCUIT BREAKER FAILS TO RESET - Continued
- Step 2. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Disconnect wire lead from UTIL OUT circuit breaker terminal T. Reset UTIL OUT circuit breaker. Start ROWPU. Refer to TM 10-4610-239-10.  
 If UTIL OUT circuit breaker does not trip, go to step 3.  
 If UTIL OUT circuit breaker trips, replace circuit breaker. Refer to paragraph 3-43.
- Step 3. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Disconnect P12 from J12. Check continuity between test point I and TB2-3.  
 If check indicates continuity, go to step 4.  
 If check does not indicate continuity, go to step 6.
- Step 4. Remove three wire leads from TB4-1. Check continuity between TB2-3 and test points J, K, and L.  
 If check indicates continuity to test point L, go to step 5.  
 If check indicates continuity to test point J, repair W39. Refer to paragraph 3-39.  
 If check indicates continuity to test point K, repair W56. Refer to paragraph 3-17.
- Step 5. Remove black wire from J7. Check continuity between end of wire and TB2-3.  
 If check indicated continuity, repair black wire between J7 and TB4 terminal 1. Refer to paragraph 3-39.  
 If check does not indicate continuity, replace J7. Refer to paragraph 3-45.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**ROWPU ASSEMBLY - Continued**

4. UTIL OUT CIRCUIT BREAKER FAILS TO RESET - Continued
- Step 6. Remove wire leads from dissolved solids meter terminal board TB 1-1. Check continuity between test points N and O.  
If check indicates continuity, replace dissolved solids meter. Refer to TM 10-4610-239-10.  
If check does not indicate continuity, repair W55. Refer to paragraph 3-17.
5. TIMER CONT CIRCUIT BREAKER FAILS TO RESET

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

Remove power from unit by disconnecting power cable at MAIN POWER IN jack J1 before connecting, disconnecting, or replacing any lead or part. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-3 for ROWPU support diagram.

- Step 1. Set PANEL LIGHT switch to OFF. Reset TIMER CONT circuit breaker.  
If circuit breaker trips, go to step 2.  
If circuit breaker does not trip, go to step 6.
- Step 2. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove P9 from J9 on control box. Reset TIMER CONT circuit breaker. Start ROWPU. Refer to TM 10-4610-239-10.  
If circuit breaker trips, go to step 3.  
If circuit breaker does not trip, go to step 7.

**Table 3-1. Direct Support Troubleshooting - (Continued)**

Malfunction	Test or Inspection	Corrective Action
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**ROWPU ASSEMBLY - Continued**

5. TIMER CONT CIRCUIT BREAKER FAILS TO RESET - Continued
- Step 3. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove W4 from CB9 terminal T. Check continuity between test point P and TB2-3.  
 If check indicates continuity, go to step 4.  
 If check does not indicate continuity, replace CB9. Refer to paragraph 3-43.
- Step 4. Remove P8 from J8 on junction box. Check continuity between test point Q and TB2-3.  
 If check indicates continuity, go to step 5.  
 If check does not indicate continuity, repair W52. Refer to paragraph 3-17.
- Step 5. Remove lead W4 from J8 pin P. Check continuity between test point P and TB2-3.  
 If check indicates continuity, repair W4. Refer to paragraph 3-39.  
 If check does not indicate continuity, replace J8. Refer to paragraph 3-37.
- Step 6. Remove wiring harness W1 lead from S11 pin 2. Check continuity between test point R and TB2-3.  
 If check does not indicate continuity, go to step 9.  
 If check indicates continuity, go to step 10.
- Step 7. Remove W1 lead that connects S11 pin 5 and S13 pin 2 from S13 pin 2. Check continuity between test point S and TB2-3.  
 If check indicates continuity, go to step 8.  
 If check does not indicate continuity, repair W1 lead between S11 and S 13. Refer to paragraph 3-38.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
<b>ROWPU ASSEMBLY - Continued</b>		
5. TIMER CONT CIRCUIT BREAKER FAILS TO RESET - Continued		
	Step 8. Remove W1 lead from J9 pin P and from S13 pin 2. Check continuity between TB2-3 and test points S and T.	<p>If check indicates continuity to test point T, replace J9. Refer to paragraph 3-37.</p> <p>If check indicates continuity to test point S, replace S 13. Refer to paragraph 3-34.</p> <p>If neither check indicates continuity, repair W1. Refer to paragraph 3-39.</p>
	Step 9. Remove both W1 leads from S11 to pin 5. Check continuity between TB2-3 and S11 pins 2 and 5.	<p>If check indicates continuity at either pin 2 or pin 5, replace S11. Refer to paragraph 3-34.</p> <p>If check does not indicate continuity at either pin 2 or pin 5, repair W1. Refer to paragraph 3-39.</p>
	Step 10. Remove both W58 leads from TB6-20. Check continuity between test point U and TB2-3.	<p>If check indicates continuity, go to step 11.</p> <p>If check does not indicate continuity, go to step 12.</p>
	Step 11. Remove W1 lead from TB6 terminal 20. Check continuity between test point U and TB2-3.	<p>If check indicates continuity, replace TB6. Refer to paragraph 3-36.</p> <p>If check does not indicate continuity, repair W1. Refer to paragraph 3-39.</p>
	Step 12. Check continuity between TB2-3 and test points V and W.	<p>If check indicates continuity at test point V, go to step 13.</p> <p>If check indicates continuity at test point W, go to step 14.</p>

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**ROWPU ASSEMBLY - Continued**

5. **TIMER CONT CIRCUIT BREAKER FAILS TO RESET - Continued**

- Step 13. Remove W58 from K10 pin A1. Check continuity between test point V and TB2-3.  
If check indicates continuity, repair W58. Refer to paragraph 3-39.  
If check does not indicate continuity, replace K10. Refer to paragraph 3-40.
- Step 14. Remove W58 from K11 pin A1. Check continuity between test point W and TB2-3.  
If check indicates continuity, repair W58. Refer to paragraph 3-39.  
If check does not indicate continuity, replace K11. Refer to paragraph 3-40.

**BOOSTER PUMP ASSEMBLY**

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

Ensure that all circuit breakers are set. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-4 for booster pump assembly support diagram.

**PUMP ELECTRIC MOTOR FAILS TO START WHEN BOOSTER PUMP SWITCH IS SET TO START**

- Step 1. Push overload plunger on K6. Set BOOSTER PUMP switch to START and release. Check position of overload plunger.  
If plunger stays in, go to step 2.  
If plunger does not stay in, go to step 8.

Table 3-1. Direct Support Troubleshooting - Continued

Malfunction

Test or Inspection

Corrective Action

**BOOSTER PUMP ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN BOOSTER PUMP SWITCH IS SET TO START - Continued

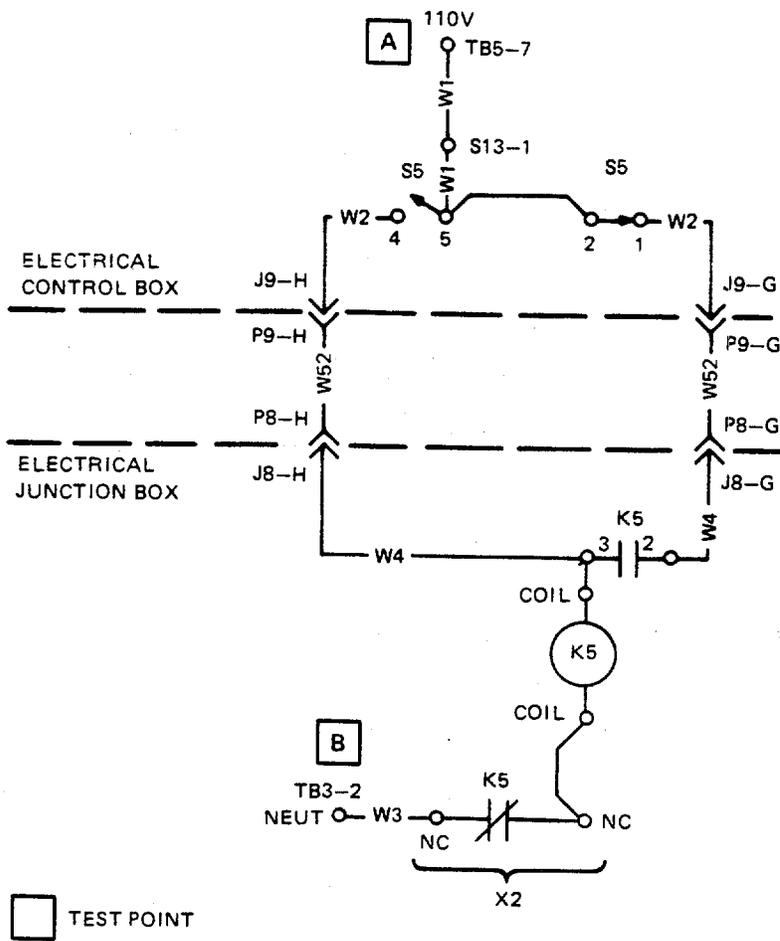


Figure 3-4. Booster Pump Assembly Support Diagram

**Table 3-1. Direct Support Troubleshooting - Continued**

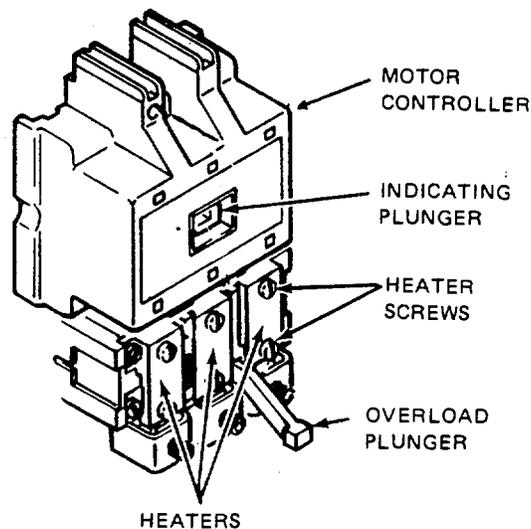
Malfunction

Test or Inspection

Corrective Action

**BOOSTER PUMP ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN BOOSTER PUMP SWITCH IS SET TO START - Continued



- Step 2. Set BOOSTER PUMP switch to START and release. Check position of indicating plunger.  
 If indicating plunger stays out, go to step 3.  
 If indicating plunger goes in but comes out when switch is released, go to step 4.  
 If indicating plunger goes in and stays in, go to step 5.
- Step 3. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to booster pump support diagram figure 3-4. Hold BOOSTER PUMP switch in START position. Check continuity point-to-point between test points A and B through S6-5 and S6-4.  
 If check indicates no continuity through K6, repair K6. Refer to paragraph 3-49.  
 If check indicates no continuity through S6, replace S6. Refer to paragraph 3-34.  
 If any check through a wiring harness does not indicate continuity, repair wiring harness. Refer to paragraph 3-39.  
 If any check through a cable does not indicate continuity, repair cable assembly. Refer to paragraph 3-17.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**BOOSTER PUMP ASSEMBLY - Continued**

**PUMP ELECTRIC MOTOR FAILS TO START WHEN BOOSTER PUMP SWITCH IS SET TO START - Continued**

- Step 4. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Set BOOSTER PUMP switch to RUN position. Refer to booster pump assembly support diagram figure 3-4. Check continuity point-to-point between test points A and B through S6-2 and S6-7.  
 If all checks indicate continuity except across terminals 2 and 3 of K6, repair K6. Refer to paragraph 3-49.  
 If there is no continuity through other sections of K6, repair K6. Refer to paragraph 3-49.  
 If there is no continuity through S6, replace S6. Refer to paragraph 3-34.  
 If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.  
 If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.
- Step 5. Refer to schematic diagram figure FO-3. Check for 208 V ac at K6 between terminal pairs T1 and T2, T2 and T3, and T1 and T3.  
 If 208 V ac is not present on all terminal pairs, go to step 6.  
 If 208 V ac is present on all terminal pairs, go to step 9.
- Step 6. Refer to schematic diagram figure FO-3. Check for 208 V ac at K6 between terminal pairs on the top screw of each heater; left to center, center to right, and left to right.  
 If 208 V ac is not present on all terminal pairs, go to step 10.  
 If 208 V ac is present on all terminal pairs, shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove screws and three heaters. Replace heaters that have damaged elements. Start ROWPU. Refer to TM 10-4610-239-10. Repeat step 5.  
 If 208 V ac is not present on all terminal pairs after repeating step 5, go to step 7.  
 If 208 V ac is present on all terminal pairs after repeating step 5, malfunction caused by faulty heater elements has been corrected.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
<b>BOOSTER PUMP ASSEMBLY - Continued</b>		
PUMP ELECTRIC MOTOR FAILS TO START WHEN BOOSTER PUMP SWITCH IS SET TO START - Continued		
Step 7.	Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to schematic diagram figure FO-3. Check for short circuits between junction box ground terminal EI and K6 terminals T1, T2, and T3.	<p>If any terminal is shorted to ground terminal E1, go to step 8.</p> <p>If no terminal is shorted to ground terminal E1 replace K2. Refer to paragraph 3-46.</p>
Step 8.	Remove booster pump cable assembly. Refer to paragraph 3-31. Refer to schematic diagram figure FO-3. Check for short circuits between wire lugs on motor cable.	<p>If any lugs are shorted, repair booster pump cable assembly. Refer to paragraph 3-17.</p> <p>If no lugs are shorted, repair booster pump electric motor. Refer to paragraph 3-29 or 3-30.</p>
Step 9.	Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove booster pump cable assembly from motor. Refer to paragraph 3-31. Leave cable connected to K6. Refer to schematic diagram figure FO-3. Check continuity between K6 terminals T1, T2, and 13 and wire lugs on end of cable.	<p>If any measurement does not indicate continuity, repair booster pump cable assembly. Refer to paragraph 3-17.</p> <p>If all three measurements indicate continuity, repair booster pump electric motor. Refer to paragraph 3-29 or 3-30.</p>
Step 10.	Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to interconnect diagram figure FO-4. Check for continuity between K6 terminals L1, L2, and L3 and J1 pins A, B, and C respectively.	<p>If all three measurements do not indicate continuity,, go to step 11.</p> <p>If all three measurements indicate continuity, repair K6. Refer to paragraph 3-49.</p>

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**BOOSTER PUMP ASSEMBLY - Continued**

**PUMP ELECTRIC MOTOR FAILS TO START WHEN BOOSTER PUMP SWITCH IS SET TO START - Continued**

- Step 11. Check continuity between CB6 terminals L1, L2, and L3 and J1 pins A, B, and C respectively.  
If all three measurements indicate continuity, go to step 12.  
If all three measurements do not indicate continuity, repair wire leads W26, W27, and W28. Refer to paragraph 3-39.
- Step 12. Check continuity between CB6 terminals L1, L2, and L3 and terminals T1, T2, and T3 respectively.  
If all three measurements indicate continuity, repair wiring harness W39. Refer to paragraph 3-39.  
If all three measurements do not indicate continuity, replace CB6. Refer to paragraph 3-43.

**DISTRIBUTION PUMP ASSEMBLY**

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

Ensure that all circuit breakers are set. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-5 for distribution pump assembly support diagram.

**PUMP ELECTRIC MOTOR FAILS TO START WHEN DISTRIBUTION PUMP SWITCH IS SET TO START**

- Step 1. Push overload plunger on K5. Set DISTRIBUTION PUMP switch to START and release. Check position of overload plunger.  
If plunger stays in, go to step 2.  
If plunger does not stay in, go to step 7.

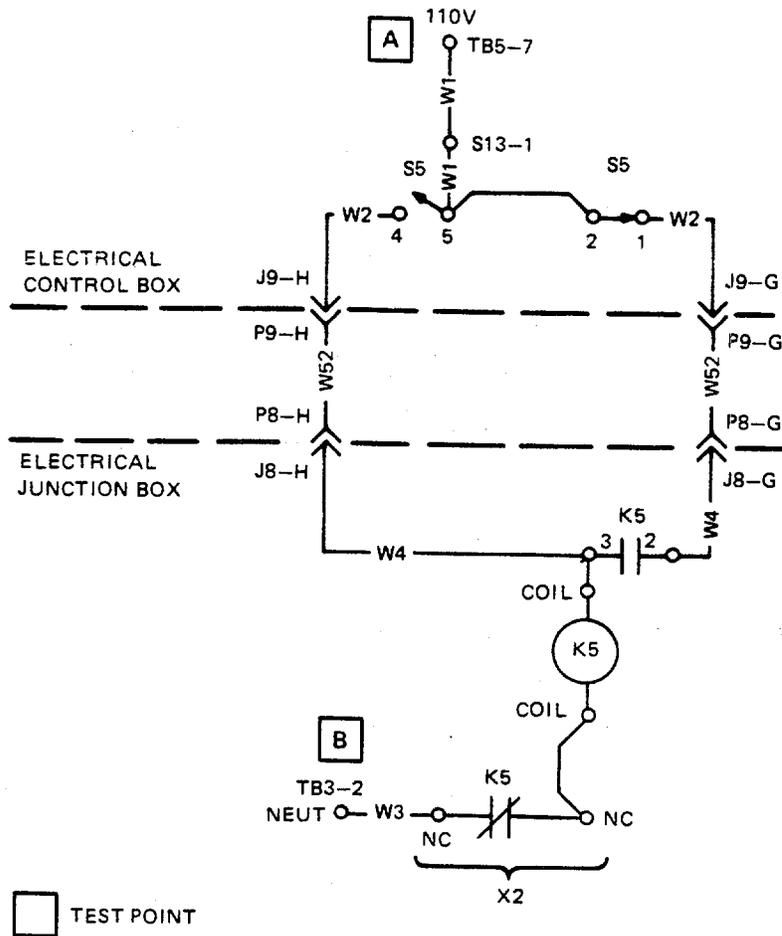


Figure 3-5. Distribution Pump Assembly Support Diagram

Table 3-1. Direct Support Troubleshooting - Continued

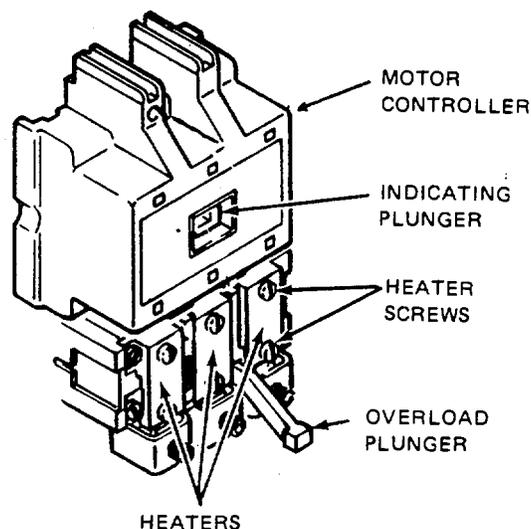
Malfunction

Test or Inspection

Corrective Action

**DISTRIBUTION PUMP ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN DISTRIBUTION PUMP SWITCH IS SET TO START - Continued



- Step 2. Set DISTRIBUTION PUMP switch to START and release. Check position of indicating plunger.  
 If indicating plunger is out, go to step 3.  
 If indicating plunger goes in but comes out when switch is release, go to step 4.  
 If indicating plunger goes in and stays in, go to step 5.
- Step 3. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to distribution pump assembly support diagram figure 3-5. Hold DISTRIBUTION PUMP switch in START position. Check continuity point-to-point between test points A and B through S5-5 and S5-4.  
 If there is no continuity through K5, repair K5. Refer to paragraph 3-49.  
 If there is continuity through S5, replace S5. Refer to paragraph 3-34.  
 If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.  
 If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**DISTRIBUTION PUMP ASSEMBLY - Continued**

**PUMP ELECTRIC MOTOR FAILS TO START WHEN DISTRIBUTION PUMP SWITCH IS SET TO START - Continued**

- Step 4. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to distribution pump assembly support diagram figure 3-5. Set DISTRIBUTION PUMP switch to RUN position. Check continuity point-to-point between test points A and B through S5-2 and S5-1.  
 If all checks indicate continuity except across terminals 2 and 3 of K5, repair K5. Refer to paragraph 3-49.  
 If there is no continuity through other sections of K5, repair K5. Refer to paragraph 3-49.  
 If there is no continuity through S5, replace S5. Refer to paragraph 3-34.  
 If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.  
 If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.
- Step 5. Refer to schematic diagram figure FO-3. Check for 208 V ac at K5 between terminal pairs T1 and T2 and T3, and T1 and T3.  
 If 208 V ac is not present on all terminal pairs, go to step 6.  
 If 208 V ac is present on all terminal pairs, go to step 12.
- Step 6. Refer to schematic diagram figure FO-3. Check for 208 V ac at K5 between terminal pairs on the top screw of heater; left to center, center to right, and left to right.  
 If 208 V ac is not present on all terminal pairs, go to step 11.  
 If 208 V ac is present on all terminal pairs, shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove six screws and three heaters. Replace heaters that have damaged elements. Start ROWPU. Refer to TM 10-4610-239-10. Repeat step 5.  
 If 208 V ac is not present on all terminal pairs after repeating step 5, go to step 7.  
 If 208 V ac is present on all terminal pairs after repeating step 5, the malfunction caused by faulty heater elements has been corrected.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**DISTRIBUTION PUMP ASSEMBLY - Continued**

**PUMP ELECTRIC MOTOR FAILS TO START WHEN DISTRIBUTION PUMP SWITCH IS SET TO START - Continued**

- Step 7. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to schematic diagram figure FO-3. Check for short circuits between junction box ground terminal EI and K5 terminals T1, T2, and T3.

  - If any K5 terminal is shorted to ground terminal EI, go to step 8.
  - If no K5 terminal is shorted to ground terminal EI, replace K5. Refer to paragraph 3-48.
- Step 8. Disconnect distribution pump cable connector P5 from ROWPU. Refer to schematic diagram figure FO-3. Check for short circuits between P5-D and P5-A, P5-B, and P5-C.

  - If no pin is shorted to P5-D, go to step 9.
  - If any pin is shorted to P5-D, go to step 10.
- Step 9. Remove receptacle connector J5 from electrical junction box. Refer to paragraph 3-30. Refer to schematic diagram figure FO-3. Check for a short circuit between J5-D and K5 terminals T1, T2, and T3.

  - If any terminal is shorted to J5-D, repair cable W9. Refer to paragraph 3-17.
  - If no terminal is shorted to J5-D, replace receptacle connector J5. Refer to paragraph 3-37.
- Step 10. Remove distribution pump cable assembly. Refer to paragraph 3-25. Refer to schematic diagram figure FO-3. Check for short circuits between P5-D and P5-A, P5-B, and P5-C.

  - If any pin is shorted to P5-D, repair distribution pump cable assembly. Refer to paragraph 3-17.
  - If no pin is shorted to P5-D, repair distribution pump electric motor. Refer to paragraph 3-29 or 3-30.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**DISTRIBUTION PUMP ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN DISTRIBUTION PUMP SWITCH .IS SET TO START - Continued

- Step 11. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to interconnect diagram figure FO-4. Check continuity between K5 terminals L1, L2, and L3 and J1 pins A, B, and C respectively.
  - If all three measurements do not indicate continuity, go to step 17.
  - If all three measurements indicate continuity, repair K5. Refer to paragraph 3-49.
- Step 12. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove distribution pump cable assembly from motor. Refer to paragraph 2-133. Leave cable connected to J5. Refer to schematic diagram figure FO-3. Check continuity between motor controller K5 terminals T1, T2, and T3 and wire lugs on end of cable.
  - If all three measurements do not indicate continuity, go to step 13.
  - If all three measurements indicate continuity, go to step 14.
- Step 13. Disconnect distribution pump cable connector P5 from ROWPU. Refer to schematic diagram figure FO-3. Check continuity between wire lugs on end of cable and P5-A, P5-B, P5-C, and P5-D.
  - If all four measurements indicate continuity, replace receptacle connector J5. Refer to paragraph 3-37.
  - If all four measurements do not indicate continuity, repair distribution pump cable assembly. Refer to paragraph 3-17.
- Step 14. Refer to schematic diagram figure FO-3. Check continuity between wirelugs on end of cable and junction box ground terminal EI.
  - If there is no continuity between any wire lug and. EI, go to step 15.
  - If there is continuity between a wire lug and EI, repair distribution pump electric motor. Refer to paragraph 3-29 or 3-30.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**DISTRIBUTION PUMP ASSEMBLY - Continued****PUMP ELECTRIC MOTOR FAILS TO START WHEN DISTRIBUTION PUMP SWITCH IS SET TO START - Continued**

- Step 15. Disconnect distribution pump cable connector P5 from ROWPU. Refer to interconnect diagram figure FO-4. Check continuity between wire lugs on end of cable and P5-D.  
 If there is continuity between a wire lug and P5-D, go to step 16.  
 If there is no continuity between any wire lug and P5-D, repair distribution pump cable assembly. Refer to paragraph 3-17.
- Step 16. Refer to interconnect diagram figure FO-4. Check continuity between terminal board TB 3-3 and junction box ground terminal EI.  
 If there is continuity, repair cable W9. Refer to paragraph 3-17.  
 If there is no continuity, repair wiring harness W39. Refer to paragraph 3-39.
- Step 17. Check continuity between CB5 terminals L1, L2, and L3 and J1 pins A, B, and C respectively.  
 If all three measurements indicate continuity, go to step 18.  
 If all three measurements do not indicate continuity, repair wire leads W23, W24, and W25. Refer to paragraph 3-39.
- Step 18. Check continuity between CB5 terminals L1, L2, and L3 and terminals T1, T2, and T3 respectively.  
 If all three measurements indicate continuity, repair wiring harness W39. Refer to paragraph 3-39.  
 If all three measurements do not indicate continuity, replace CB5. Refer to paragraph 3-43.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**CONTROL BOX ASSEMBLY**

1. A PUMP INDICATOR DOES NOT LIGHT

**NOTE**

Refer to figure 3-6 for pump indicator circuit support diagram.

- Step 1. Push PANEL LIGHT switch to TEST INDICATOR LIGHTS.  
If failed indicator lights, go to step 2.  
If failed indicator does not light, go to step 3.
- Step 2. Refer to appropriate detail of support diagram figure 3-6. Check continuity point-to-point between test points A and B.  
If all points have continuity, replace relay listed at test point A. Refer to paragraph 3-40.  
If any point-to-point check indicates no continuity, repair cable or wiring harness. For cable, refer to paragraph 3-17. For wiring harness, refer to paragraph 3-39.
- Step 3. Refer to appropriate detail of support diagram figure 3-6. Check continuity point-to-point between test points A and C.  
If all points have continuity, go to step 4.  
If any point-to-point-check indicates no continuity, replace indicator lampholder or repair wiring harness. For indicator lampholder, refer to paragraph 3-35. For wiring harness, refer to paragraph 3-39.
- Step 4. Push PANEL LIGHT switch to TEST INDICATOR LIGHTS. Check continuity point-to-point between test points D and E.  
If all points have continuity, replace control relay listed at test point A. Refer to paragraph 3-40.

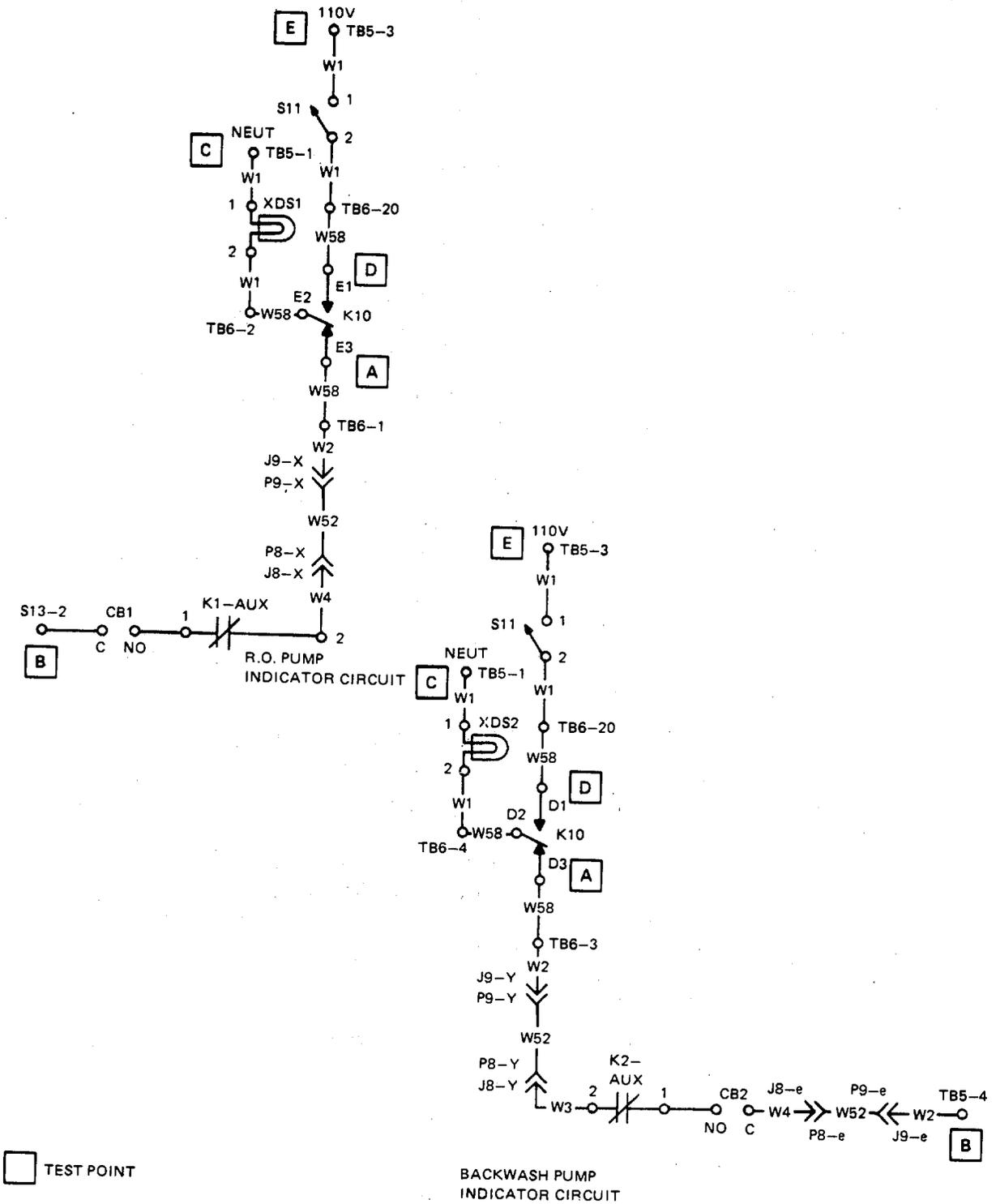


Figure 3-6. Pump Indicator Circuit Support Diagram (Sheet 1 of 2)



**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**CONTROL BOX ASSEMBLY**

1. A PUMP INDICATOR DOES NOT LIGHT - Continued

If any point-to-point check indicates no continuity, replace PANEL LIGHT switch S11 or repair wiring harness. For switch, refer to paragraph 3-34. For wiring harness, refer to paragraph 3-39.

2. LOW PRESSURE OR HIGH PRESSURE INDICATOR DOES NOT LIGHT

**NOTE**

Refer to figure 3-7 for pressure indicator circuit support diagram.

Step 1. Push PANEL LIGHT switch to TEST INDICATOR LIGHTS.

If failed indicator lights, go to step 2.

If failed indicator does not light, go to step 3.

Step 2. Refer to appropriate detail of support diagram figure 3-7. Check continuity point-to-point between test points A and B.

If all points have continuity, replace control relay listed at test point B.

Refer to paragraph 3-40.

If any point-to-point check indicates no continuity, repair cable or wiring harness. For cable, refer to paragraph 3-17. For wiring harness, refer to paragraph 3-39.

Step 3. Refer to appropriate detail of support diagram figure 3-7. Check continuity point-to-point between test points B and C.

If all points have continuity, go to step 4.

If any point-to-point check indicates no continuity, replace indicator lampholder or repair wiring harness. For indicator lampholder, refer to paragraph 3-35. For wiring harness, refer to paragraph 3-39.

Step 4. Check continuity point-to-point between test points D and E.

If all points have continuity, replace control relay listed at test point A.

Refer to paragraph 3-40.

If any point-to-point check indicates no continuity, replace PANEL

LIGHT switch S 11 or repair wiring harness. For switch, refer to paragraph 3-34. For wiring harness, refer to paragraph 3-39.

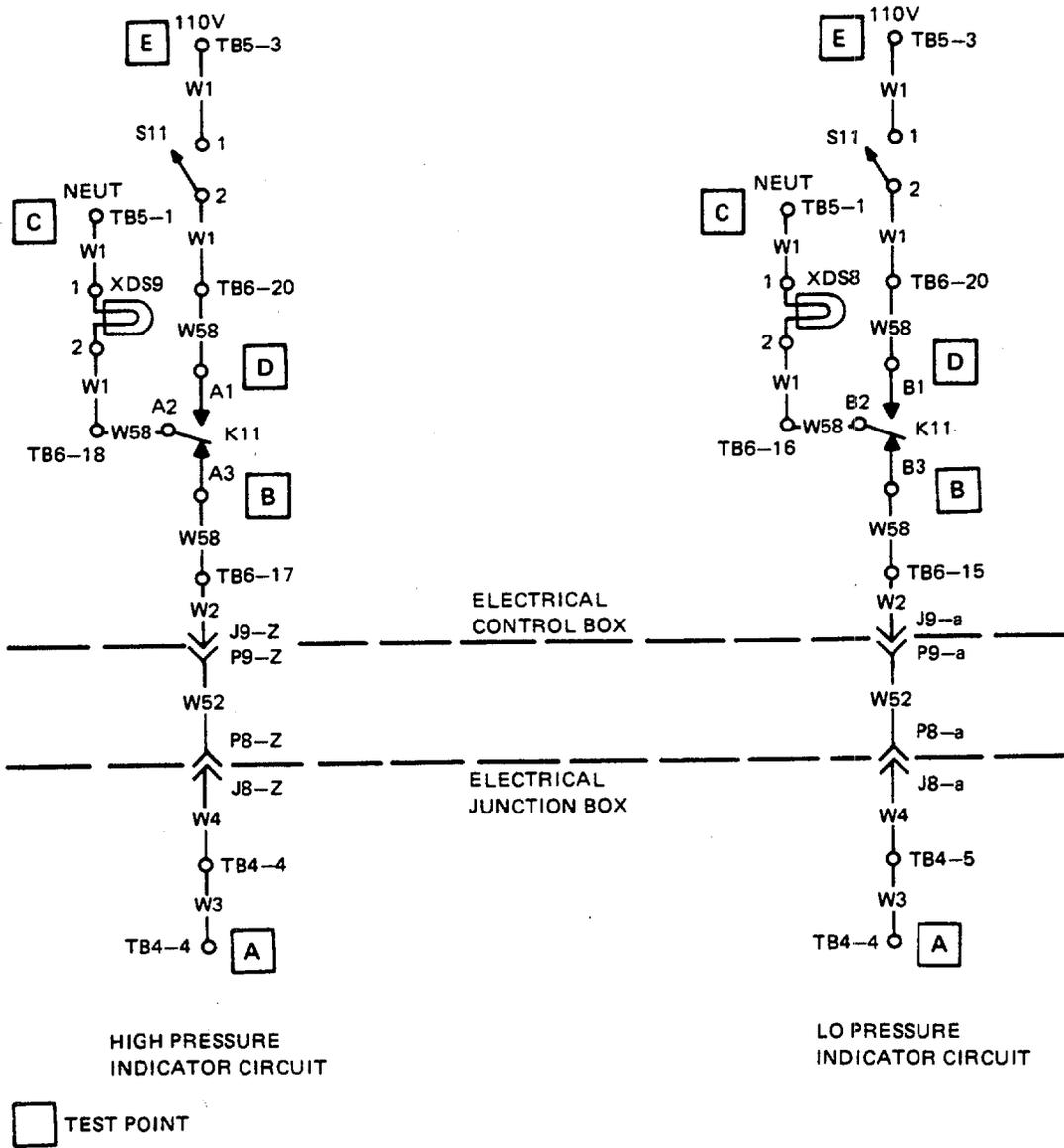


Figure 3-7. Pressure Indicator Circuit Support Diagram

Table 3-1. Direct Support Troubleshooting - Continued

Malfunction	Test or Inspection	Corrective Action
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**CHEMICAL FEED METERING PUMP ASSEMBLY**

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

Ensure that all circuit breakers are set. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-8 for chemical feed metering pump support diagram.

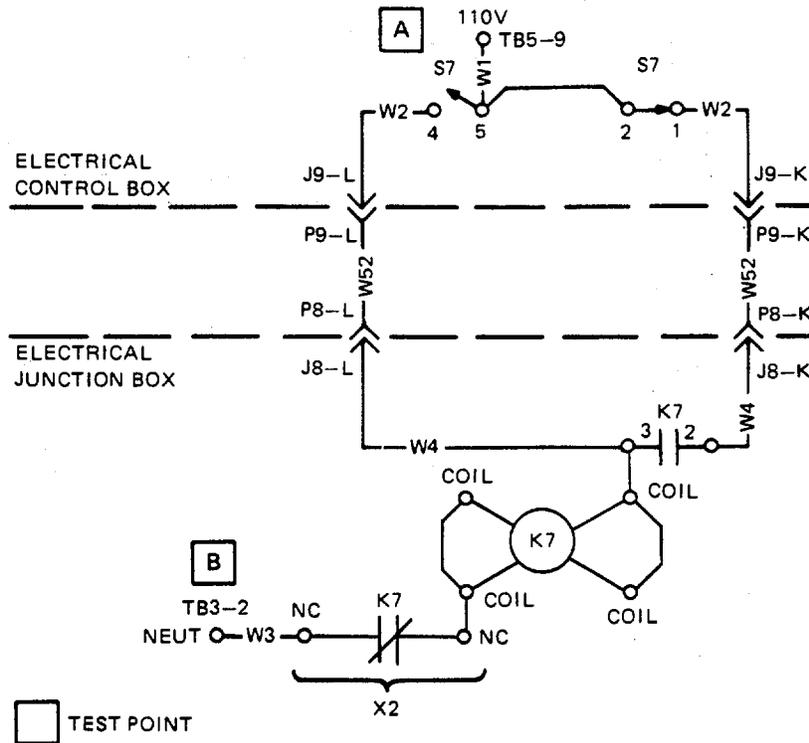


Figure 3-8. Chemical Feed Metering Pump Assembly Support Diagram

Table 3-1. Direct Support Troubleshooting - Continued

Malfunction	Test or Inspection	Corrective Action
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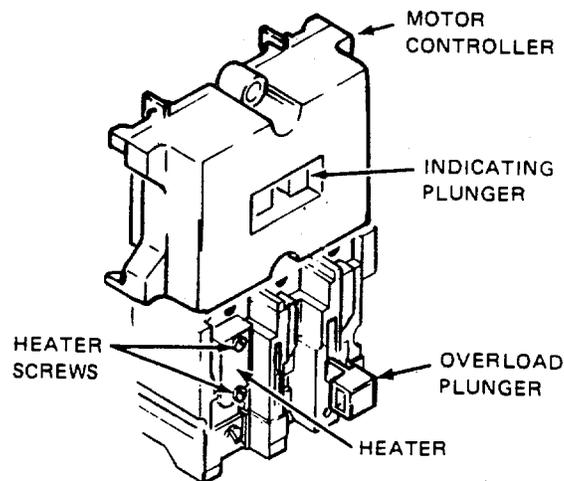
**CHEMICAL FEED METERING PUMP ASSEMBLY - Continued**

**PUMP ELECTRIC MOTOR FAILS TO START WHEN CHEMICAL FEED PUMP SWITCH IS SET TO START**

Step 1. Push overload plunger on K7. Set CHEMICAL FEED PUMP switch to START and release. Check position of overload plunger.

If plunger stays in, go to step 2.

If plunger does not stay in, go to step 8.



Step 2. Set CHEMICAL FEED PUMP switch to START and release. Check position of indicating plunger.

If indication plunger stays out, go to step 3.

If indicating plunger goes in but comes out when switch is released, go to step 4.

If indicating plunger goes in and stays in, go to step 5.

Step 3. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to chemical feed metering pump assembly support diagram figure 3-8. Hold CHEMICAL FEED PUMP switch in START position. Check continuity point-to-point between test points A and B through S7-5 and S7-4.

If check indicates no continuity through K7, repair K7. Refer to paragraph 3-49.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**CHEMICAL FEED METERING PUMP ASSEMBLY - Continued**

**PUMP ELECTRIC MOTOR FAILS TO START WHEN CHEMICAL FEED PUMP SWITCH IS SET TO START - Continued**

If check indicates no continuity through S7, replace S7. Refer to paragraph 3-34.

If any check through a wiring harness does not indicate continuity, repair wiring harness. Refer to paragraph 3-39.

If any check through a cable does not indicate continuity, repair cable assembly. Refer to paragraph 3-17.

- Step 4. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Set CHEMICAL FEED PUMP switch to RUN position. Refer to chemical feed metering pump assembly support diagram figure 3-8. Check continuity point-to-point between test points A and B through S7-2 and S7-1.

If all checks indicate continuity except across terminals 2 and 3 of K7, repair K7. Refer to paragraph 3-49.

If there is no continuity through other sections of K7, repair K7. Refer to paragraph 3-49.

If there is no continuity through S7, replace S7. Refer to paragraph 3-34.

If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.

If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.

- Step 5. Refer to schematic diagram figure FO-3. Check for 115 V ac between K7 terminal T and ground terminal EI.

If 115 V ac is not present, go to step 6.

If 115 V ac is present, go to step 9.

- Step 6. Refer to schematic diagram figure FO-3. Check for 115 V ac at K7 between terminal on the top screw of the heater and TB2-3.

If 115 V ac is not present, go to step 10.

If 115 V ac is present, shut down ROWPU. Refer to TM 5-4610-215-10. Shut down power. Refer to generator manual. Remove two screws and heater. Replace heater. Start ROWPU. Refer to TM 10-4610-239-10. Repeat step 5.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**CHEMICAL FEED METERING PUMP ASSEMBLY - Continued**

**PUMP ELECTRIC MOTOR FAILS TO START WHEN CHEMICAL FEED PUMP SWITCH IS SET TO START - Continued**

- |          |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I        | <p>f 115 V ac is not present after repeating step 5, go to step 7.</p> <p>If 115 V ac is present after repeating step 5, malfunction caused by faulty heater element has been corrected.</p>                                                                                                                                                                                                                                     |
| Step 7.  | <p>Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to schematic diagram figure FO-3. Check for short circuit between junction box ground terminal EI and K7 terminal T. If K7 terminal is shorted to ground terminal EI, go to step 8. If K7 terminal is not shorted to ground terminal EI, replace K7. Refer to paragraph 3-48.</p>                                              |
| Step 8.  | <p>Remove chemical feed metering pump cable. Refer to paragraph 3-50. Refer to schematic diagram figure FO-3. Check for short circuits between wire lugs on motor cable.</p> <p>If any lugs are shorted, repair chemical feed metering pump cable assembly. Refer to paragraph 3-17.</p> <p>If no lugs are shorted, repair chemical feed metering pump electric motor. Refer to paragraph 3-52.</p>                              |
| Step 9.  | <p>Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove chemical feed metering pump cable assembly from motor. Refer to paragraph 3-50. Leave cable connected to K7. Refer to schematic diagram figure FO-3. Check continuity between K7 terminal T and wire lugs on end of cable.</p> <p>If no measurement indicates continuity, repair cable assembly. Refer to paragraph 3-17.</p> |
| Step 10. | <p>Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to interconnect diagram figure FO-4. Check continuity between K7 terminal L and J1 pin A.</p> <p>If check indicates continuity, repair K7. Refer to paragraph 3-49.</p> <p>If check does not indicate continuity, go to step 11.</p>                                                                                           |
| Step 11. | <p>Check continuity between CB7 terminal L and J1 pin A.</p> <p>If measurement indicates continuity, go to step 12.</p>                                                                                                                                                                                                                                                                                                          |

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**CHEMICAL FEED METERING PUMP ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN CHEMICAL FEED PUMP SWITCH IS SET TO START - Continued

If measurement does not indicate continuity, repair wire lead W29. Refer to paragraph 3-39.

Step 12. Check continuity between CB7 and terminals L and T.

If measurement indicates continuity, repair wiring harness W39. Refer to paragraph 3-39.

If measurement does not indicate continuity, replace CB7. Refer to paragraph 3-43.

**REVERSE OSMOSIS ASSEMBLY**

1. PUMP ELECTRIC MOTOR FAILS TO START WHEN R.O. PUMP SWITCH IS SET TO START

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

Ensure that all circuit breakers are set. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-9 for R.O. pump assembly support diagram.

Step 1. Push overload plunger on K1. Set R.O. PUMP switch to START and release. Check position of overload plunger.

If plunger stays in, go to step 2.

If plunger does not stay in, go to step 10.

Table 3-1. Direct Support Troubleshooting - Continued

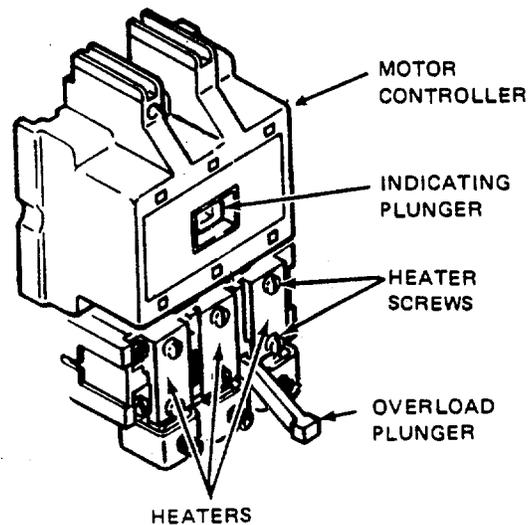
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Malfunction	Test or Inspection	Corrective Action
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**REVERSE OSMOSIS ASSEMBLY - Continued**

1. PUMP ELECTRIC MOTOR FAILS TO START WHEN R.O. PUMP SWITCH IS SET TO START  
- Continued



- Step 2. Set R.O. PUMP switch to START and release. Check position of indicating plunger.  
If indicating plunger is out, go to step 3.  
If indicating plunger goes in but comes out when switch is released, go to step 7.  
If indicating plunger goes in and stays in, go to step 8.
- Step 3. Set JOG switch to JOG position for 3 seconds. Check position of K1 indicating plunger.  
If plunger stays out, go to step 4.  
If plunger pulls in while switch is held in JOG position, go to step 5.
- Step 4. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to R.O. pump assembly support diagram figure 3-9. Check continuity point-to-point between test points A and B.  
  
If there is no continuity through K1, repair K1. Refer to paragraph 3-47.  
If there is no continuity through a wire lead, repair wire lead. Refer to paragraph 3-39.



**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**REVERSE OSMOSIS ASSEMBLY - Continued**

**1. PUMP ELECTRIC MOTOR FAILS TO START WHEN R.O. PUMP SWITCH IS SET TO START  
- Continued**

Step 5. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to R.O. pump assembly support diagram figure 3-9. Check continuity point-to-point between test points A and C.

If there is continuity between test point A and test point C, go to step 6.

If there is no continuity through control relay K8, replace K8. Refer to paragraph 3-44.

If there is no continuity through a wire lead, repair wire lead. Refer to paragraph 3-39.

Step 6. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to R.O. pump assembly support diagram figure 3-9. Hold R.O. PUMP switch in START position. Check continuity point-to-point between test points C and D through S1-4 and S1-5. If there is no continuity through S 1, replace S 1. Refer to paragraph 3-34.

If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.

If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.

Step 7. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to R.O. pump assembly support diagram figure 3-9. Set R.O. PUMP switch to RUN position. Check continuity point-to-point between test points C and D through S1-1 and S 1-2.

If there is no continuity through control relay K9, replace K9. Refer to paragraph 3-44.

If there is no continuity through S 1, replace S 1. Refer to paragraph 3-34.

If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.

If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**REVERSE OSMOSIS ASSEMBLY - Continued**

1. PUMP ELECTRIC MOTOR FAILS TO START WHEN R.O. PUMP SWITCH IS SET TO START  
 - Continued

- |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step 8   | <p>Refer to schematic diagram figure FO-3. Check for 208 V ac at K1 between terminal pairs T1 and T2, T2 and T3, and T1 and T3.</p> <p style="padding-left: 40px;">If 208 V ac is not present on all terminal pairs, go to step 9.</p> <p style="padding-left: 40px;">If 208 V ac is present on all terminal pairs, go to step 15.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Step 9.  | <p>Refer to schematic diagram figure FO-3. Check for 208 V ac at K1 between terminals pairs on the top screw of each heater; left to center, center to right, and left to right.</p> <p style="padding-left: 40px;">If 208 V ac is not present on all terminal pairs, go to step 14.</p> <p style="padding-left: 40px;">If 208 V ac is present on all terminal pairs, shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove six screws and three heaters. Replace heaters that have damaged elements. Start ROWPU. Refer to TM 10-4610-239-10. Repeat step 8.</p> <p style="padding-left: 40px;">If 208 V ac is not present on all terminal pairs after repeating step 8, go to step 10.</p> <p style="padding-left: 40px;">If 208 V ac is present on all terminal pairs after repeating step 8, the malfunction caused by faulty heater elements has be corrected.</p> |
| Step 10. | <p>Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to schematic diagram figure FO-3. Check for short circuits between junction box ground terminal EI and K1 terminals T1, T2, and T3.</p> <p style="padding-left: 40px;">If any K1 terminal is shorted to ground terminal EI, go to step 11. If no K1 terminal is shorted to ground terminal EI, replace K1. Refer to paragraph 3-46.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Step 11. | <p>Disconnect R.O. pump cable connector P6 from ROWPU. Refer to schematic diagram figure FO-3. Check for short circuits between P6-D and P6-A, P6-B, and P6-C.</p> <p style="padding-left: 40px;">If no pin is shorted to P6-D, go to step 12.</p> <p style="padding-left: 40px;">If any pin is shorted to P6-D, go to step 13.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**REVERSE OSMOSIS ASSEMBLY - Continued**

**1. PUMP ELECTRIC MOTOR FAILS TO START WHEN R.O. PUMP SWITCH IS SET TO START - Continued**

Step 12. Remove receptacle connector J6 from electrical junction box. Refer to paragraph 3-36. Refer to schematic diagram figure FO-3. Check for a short circuit between J6-D and K1 terminals T1, T2, and T3.

If any terminal is shorted to J6-D, repair cable W:10. Refer to paragraph 3-17.

If no terminal is shorted to J6-D, replace J6. Refer to paragraph 3-37.

Step 13. Remove R.O. pump motor cable assembly. Refer to paragraph 2-121. Refer to schematic diagram figure FO-3. Check for short circuits between P6-D and P6-A, P6-B, and P6-C.

If any pin is shorted to P6-D, repair R.O. pump motor cable assembly. Refer to paragraph 3-17.

If no pin is shorted to P6-D, repair R.O. pump electric motor. Refer to paragraph 3-53.

Step 14. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to interconnect diagram figure FO-4. Check continuity between K1 terminals L1, L2, and L3 and J1 pins A, B, and C respectively.

If all three measurements do not indicate continuity, go to step 20.

If all three measurements indicate continuity, repair K1. Refer to paragraph 3-47.

Step 15. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove R.O. pump cable assembly from motor. Refer to paragraph 2-124. Leave cable connected to J6. Refer to schematic diagram figure FO-3. Check continuity between K1 terminals T1, T2, and T3 and wire lugs on end of cable.

If all three measurements do not indicate continuity, go to step 16.

If all three measurements indicate continuity, go to step 17.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**REVERSE OSMOSIS ASSEMBLY - Continued**

1. PUMP ELECTRIC MOTOR FAILS TO START WHEN R.O. PUMP SWITCH IS SET TO START - Continued

Step 16. Disconnect R.O. pump connector P6 from ROWPU. Refer to schematic diagram figure FO-3. Check continuity between wire lugs on end of cable and P6-A, P6-B, P6-C, and P6-D.

If all four measurements indicate continuity, replace J6. Refer to paragraph 3-37.

If all four measurements do not indicate continuity, repair R.O. pump cable assembly. Refer to paragraph 3-17.

Step 17. Refer to schematic diagram figure FO-3. Check continuity between wire lugs on end of cable and junction box ground terminal EI.

If there is no continuity between any wire lug and EI, go to step 18.

If there is continuity between a wire lug and EI, repair R.O. pump electric motor. Refer to paragraph 3-53.

Step 18. Disconnect R.O. pump cable connector P6 from ROWPU. Refer to interconnect diagram figure FO-4. Check continuity between wire lugs on end of cable and P6-D.

If there is continuity between a wire lug and P6-D, go to step 19.

If there is no continuity between any wire lug and P6-D, repair R.O. pump cable assembly. Refer to paragraph 3-17.

Step 19. Refer to interconnect diagram figure FO-4. Check continuity between TB3-3 and junction box ground terminal EI.

If there is continuity, repair cable W10. Refer to paragraph 3-17.

If there is no continuity, repair wiring harness W39. Refer to paragraph 3-39.

Step 20. Check continuity between CB 1 terminals L1, L2, and L3 and J1 pins A, B, and C respectively.

If all three measurements indicate continuity, go to step 21.

If all three measurements do not indicate continuity, go to step 22.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**REVERSE OSMOSIS ASSEMBLY - Continued**

**1. PUMP ELECTRIC MOTOR FAILS TO START WHEN R.O. PUMP SWITCH IS SET TO START - Continued**

- Step 21. Check continuity between CB1 terminals, L1, L2, and L3 and terminals T1, T2, and T3 respectively.
- If all three measurements indicate continuity, repair wiring harness W39. Refer to paragraph 3-39.
- If all three measurements do not indicate continuity, replace CB 1. Refer to paragraph 3-43.
- Step 22. Check continuity between J1 pins A, B, and C and TB 1 terminals 1, 2, and 3 respectively.
- If all three measurements indicate continuity, repair wire leads W11, W12, and W13. Refer to paragraph 3-39.
- If all three measurements do not indicate continuity, repair wiring harness W5. Refer to paragraph 3-39.

**2. PUMP ELECTRIC MOTOR FAILS TO START WHEN JOG SWITCH IS SET TO JOG.**

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

Ensure that all circuit breakers are set. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-9 for R.O. pump assembly support diagram.

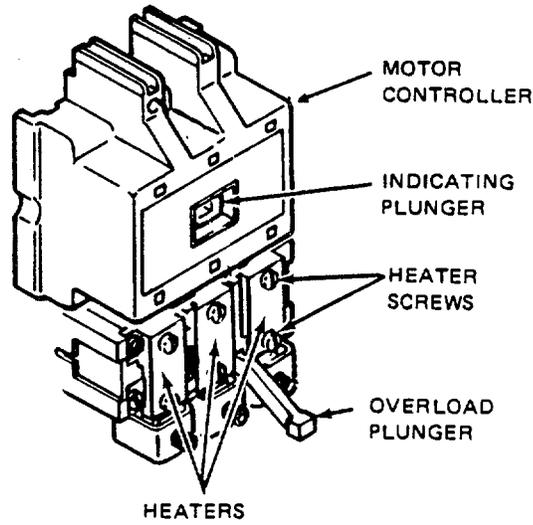
- Step 1. Push overload plunger on k1. Set R.O. PUMP switch to START and release. Check position of overload plunger.
- If plunger stays in, go to step 2.
- If plunger does not stay in, refer to malfunction 1, PUMP ELECTRIC MOTOR FAILS TO START WHEN R.O. PUMP SWITCH IS SET TO START.

Table 3-1. Direct Support Troubleshooting - Continued

Malfunction	Test or Inspection	Corrective Action
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**REVERSE OSMOSIS ASSEMBLY - Continued**

2. PUMP ELECTRIC MOTOR FAILS TO START WHEN JOG SWITCH IS SET TO JOG. - Continued



Step 2. Set R.O. PUMP switch to START and release. Check position of indicating plunger.

If plunger goes in and stays in, go to step 3.

If plunger does not go in or does not stay in, refer to malfunction 1, PUMP ELECTRIC MOTOR FAILS TO START WHEN R.O. PUMP SWITCH IS SET TO START.

Step 3. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to R.O. pump assembly support diagram figure 3-9. Check continuity point-to-point between test points A and E.

If there is no continuity through S 12, replace S 12. Refer to paragraph 3-34.

If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.

If there is no continuity through a cable, repair cable. Refer to paragraph 3-17.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**REVERSE OSMOSIS ASSEMBLY - Continued**

**3. R.O. PUMP KNOCKS EXCESSIVELY.**

Check to see if the following symptoms occur simultaneously (may indicate unseated valves):

- a. Loud knocking noise.
- b. Wildly fluctuating gages.
- c. Pulsating and vibration of the entire ROWPU.
- d. Decrease in water pressure flow.

If valves are unseated, refer to paragraph 3-54 to replace R.O. Pump Fluid end assembly and paragraph 3-55 to repair R.O. Pump Fluid end assembly.

**RAW WATER PUMP NO. 1 ASSEMBLY**

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

Ensure that all circuit breakers are set. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-10 for raw water pump no. 1 support diagram.

**PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMP'S NO. 1 SWITCH IS SET TO START**

- Step 1      Push overload plunger on K3. Set RAW WATER PUMPS NO. 1 switch to START and release. Check position of overload plunger.

    If plunger stays in, go to step 2.

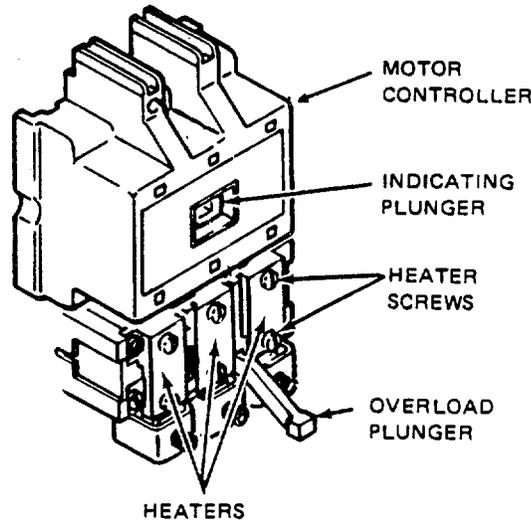
    If plunger does not stay in, go to step 7.

Table 3-1. Direct Support Troubleshooting - Continued

Malfunction	Test or Inspection	Corrective Action
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**RAW WATER PUMP NO. 1 ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 1 SWITCH IS SET TO START - Continued



- Step 2. Set RAW WATER PUMPS NO. 1 switch to START and release. Check position of indicating plunger.
- If indicating plunger is out, go to step 3.
  - If indicating plunger goes in but comes out when switch is released, go to step 4.
  - If indicating plunger goes in and stays in, go to step 5.
- Step 3. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to raw water pump no. 1 assembly support diagram figure 3-10. Hold RAW WATER PUMPS NO. 1 switch in START position. Check continuity point-to-point between test points A and B through S3-5 and S3-4.
- If there is no continuity through K3, repair K3. Refer to paragraph 3-49.
  - If there is no continuity through S3, replace S3. Refer to paragraph 3-34.
  - If there is no continuity through a wiring harness, repair wiringharness. Refer to paragraph 3-39.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**RAW WATER PUMP NO. 1 ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 1 SWITCH IS SET TO START - Continued

If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.

Step 4. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to raw water pump no. 1 assembly support diagram figure 3-10. Set RAW WATER PUMPS NO. 1 switch to RUN position. Check continuity point-to-point between test points A and B through S3-2 and S3-1.

If all checks indicate continuity except across terminals 2 and 3 of K3, repair K3. Refer to paragraph 3-49.

If there is no continuity through K3, repair K3. Refer to paragraph 3-49.

If there is no continuity through S3, replace S3. Refer to paragraph 3-34.

If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.

If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.

Step 5. Refer to schematic diagram figure FO-3. Check for 208 V ac at K3 between terminal pairs T1 and T2, T2 and T3, and T1 and T3.

If 208 V ac is not present on all terminal pairs, go to step 6.

If 208 V ac is present on all terminal pairs, go to step 12.

Step 6. Refer to schematic diagram Figure FO-3. Check for 208 V ac at K3 between terminal pairs on the top screw of each heater; left to center, center to right, and left to right.

If 208 V ac is not present on all terminal pairs, go to step 11.

If 208 V ac is present on all terminal pairs, shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove six screws and three heaters. Replace heaters that have damaged elements. Start ROWPU. Refer to TM 10-4610-239-10. Repeat step 5.

If 208 V ac is not present on all terminals pairs after repeating step 5, go step 7.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**RAW WATER PUMP NO. 1 ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 1 SWITCH IS SET TO START - Continued

- Step 7. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to schematic diagram figure FO-3. Check for short circuits between junction box ground terminal EI and K3 terminals T1, T2, and T3.
- If any K3 terminal is shorted to ground terminal EI, go to step 8.
- If no K3 terminal is shorted to ground terminal EI, replace K3. Refer to paragraph 3-48.
- Step 8. Disconnect raw water pump no. 1 cable connector P3 from ROWPU. Refer to schematic diagram figure FO:-3. Check for short circuits between P3-D and P3-A, P3-B, and P3-C.
- If no pin is shorted to P3-D, go to step 9.
- If any pin is shorted to P3-D, go to step 10.
- Step 9. Remove receptacle connector J3 from electrical junction box. Refer to paragraph 3-37. Refer to schematic diagram figure FO-3. Check for a short circuit between J3-D and K3 terminals T1, T2, and T3.
- If any terminal is shorted to J3-D, repair cable W7. Refer to paragraph 3-17.
- If no terminal is shorted to J3-D, replace J3. Refer to paragraph 3-37.
- Step 10. Remove raw water pump no. 1 cable assembly. Refer to paragraph 2-135. Refer to schematic diagram figure FO-3. Check for short circuits between P3-D and P3-A, P3-B, and P3-C.
- If any pin is shorted to P3-D, repair raw water pump no. 1 cable assembly. Refer to paragraph 3-17.
- If no pin is shorted to P3-D, repair raw water pump no. 1 electric motor. Refer to paragraph 3-57.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**RAW WATER PUMP NO. 1 ASSEMBLY - Continued**

**PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 1 SWITCH IS SET TO START - Continued**

If 208 V ac is present on all terminal pairs after repeating step 5, the malfunction caused by faulty heater elements has been corrected.

- Step 11. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to interconnect diagram figure FO-4. Check continuity between K3 terminals L1, L2, and L3 and J1 pins A, B, and C respectively.

If all three measurements do not indicate continuity, go to step 17.

If all three measurements indicate continuity, repair K3. Refer to paragraph 3-49.

- Step 12. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove raw water pump no. 1 cable assembly from motor. Refer to paragraph 2-135. Leave cable connected to J3. Refer to schematic diagram figure FO-3. Check continuity between motor controller K3 terminals T1, T2, and T3 and wire lugs on end of cable.

If all three measurements do not indicate continuity, go to step 13.

If all three measurements indicate continuity, go to step 14.

- Step 13. Disconnect raw water pump no. 1 cable connector P3 from ROWPU. Refer to schematic diagram figure FO-3. Check continuity between lugs on end of cable and P3-A, P3-B, P3-C, and P3-D.

If all four measurements indicate continuity, replace J3. Refer to paragraph 3-37.

If all four measurements do not indicate continuity, repair raw water pump no. 1 cable assembly. Refer to paragraph 3-17.

- Step 14. Refer to schematic diagram figure FO-3. Check continuity between wire lugs on end of cable and junction box ground terminal E1.

If there is continuity between any wire lug and E1, go to step 15.

If there is no continuity between a wire lug and E1, repair raw water pump no. 1 electric motor. Refer to paragraph 3-57.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**RAW WATER PUMP NO. 1 ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 1 SWITCH IS SET TO START - Continued

- Step 15. Disconnect raw water pump no. 1 cable connector P3 from ROWPU. Refer to interconnect diagram figure FO-4. Check continuity between wire lugs on end of cable and P3-D.
- If there is continuity between a wire lug and P3-D, go to step 16.
- If there is no continuity between any wire lug and P3-D, repair raw water pumpno. 1 cable assembly. Refer to paragraph 3-17.
- Step 16. Refer to interconnect diagram figure FO-4. Check continuity between terminal boardTB3-3 and junction box ground terminal EI. If there is continuity, repair cable W7. Refer to paragraph 3-17. If there is no continuity, repair wiring harness W39. Refer to paragraph 3-39.
- Step 17. Check continuity between CB3 terminals L1, L2, and L3 and J1 pins A, B, and C, respectively.
- If all three measurements indicate continuity, go to step 18.
- If all three measurements do not indicate continuity, repair wire leads W17, W18, and W19. Refer to paragraph 3-39.
- Step 18. Check continuity between CB3 terminals L1, L2, and L3 and terminals T1, T2, and T3, respectively.
- If all three measurements indicate continuity, repair wire harness W39. Refer to paragraph 3-39.
- If all three measurements do not indicate continuity, replace CB3. Refer to paragraph 3-43.

Table 3-1. Direct Support Troubleshooting - Continued

Malfunction	Test or Inspection	Corrective Action
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RAW WATER PUMP NO. 1 ASSEMBLY - Continued

PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 1 SWITCH IS SET TO START - Continued

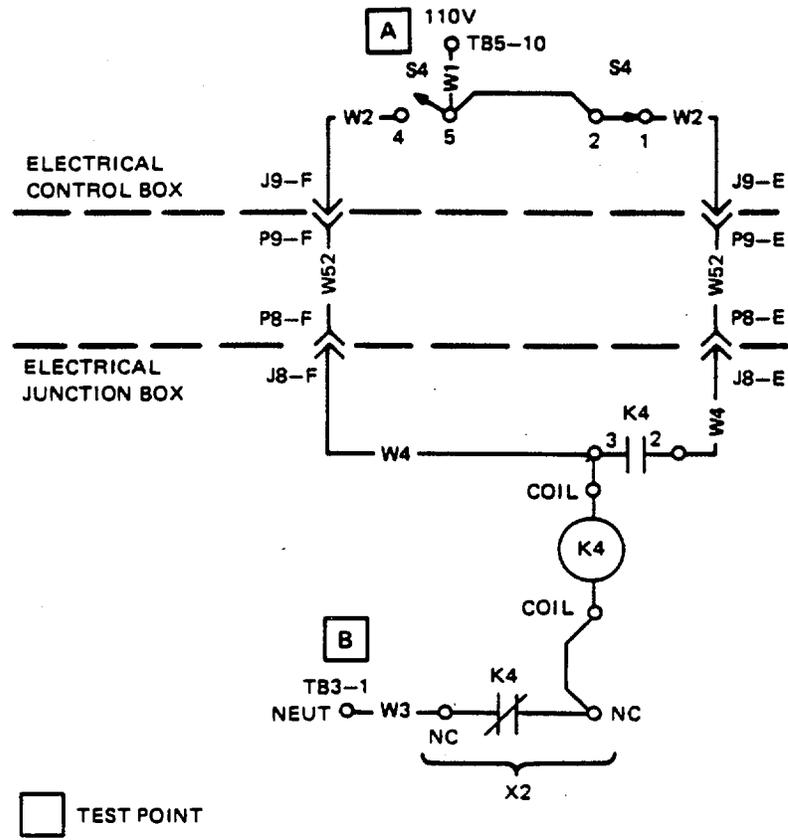


Figure 3-10. Raw Water Pump No. 1 Assembly Support Diagram

Table 3-1. Direct Support Troubleshooting - Continued

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Malfunction	Test or Inspection	Corrective Action
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**RAW WATER PUMP NO. 2 ASSEMBLY**

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

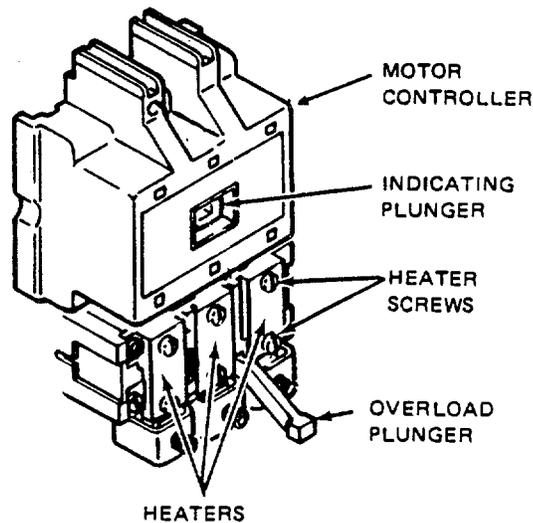
Ensure that all circuit breakers are set. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-11 for raw water pump no. 2 support diagram.

**PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 2 SWITCH IS SET TO START**

Step 1. Push overload plunger on K4. Set RAW WATER PUMPS NO. 2 switch to START and release. Check position of overload plunger.

If plunger stays in, go to step 2.

If plunger does not stay in, go to step 7.



**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**RAW WATER PUMP NO. 2 ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 2 SWITCH IS SET TO START - Continued

- Step 2. Set RAW WATER PUMPS NO. 2 switch to START and release. Check position of indicating plunger.
- If indicating plunger is out, go to step 3.
  - If indicating plunger goes in but comes out when switch is released, go to step 4.
  - If indicating plunger goes in and stays in, go to step 5.
- Step 3. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to raw water pump no. 2 assembly support diagram figure 3-11. Hold RAW WATER PUMPS NO. 2 switch in START position. Check continuity point-to-point between test points A and B through S4-5 and S4-4.
- If there is no continuity through K4, repair K4. Refer to paragraph 3-49.
  - If there is no continuity through S4, replace S4. Refer to paragraph 3-34.
  - If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.
  - If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.
- Step 4. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to raw water pump no. 2 assembly support diagram figure 3-11. Hold RAW WATER PUMPS NO. 2 switch in START position. Check continuity point-to-point between test points A and B through S4-2 and S4-1.
- If all checks indicate continuity except across terminals 2 and 3 of K4, repair K4. Refer to paragraph 3-49.
  - If there is no continuity through K4, repair K4. Refer to paragraph 3-49.
  - If there is no continuity through S4, replace S4. Refer to paragraph 3-34.
  - If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.

Table 3-1. Direct Support Troubleshooting - Continued

Malfunction	Test or Inspection	Corrective Action
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RAW WATER PUMP NO. 2 ASSEMBLY - Continued

PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 2 SWITCH IS SET TO START - Continued

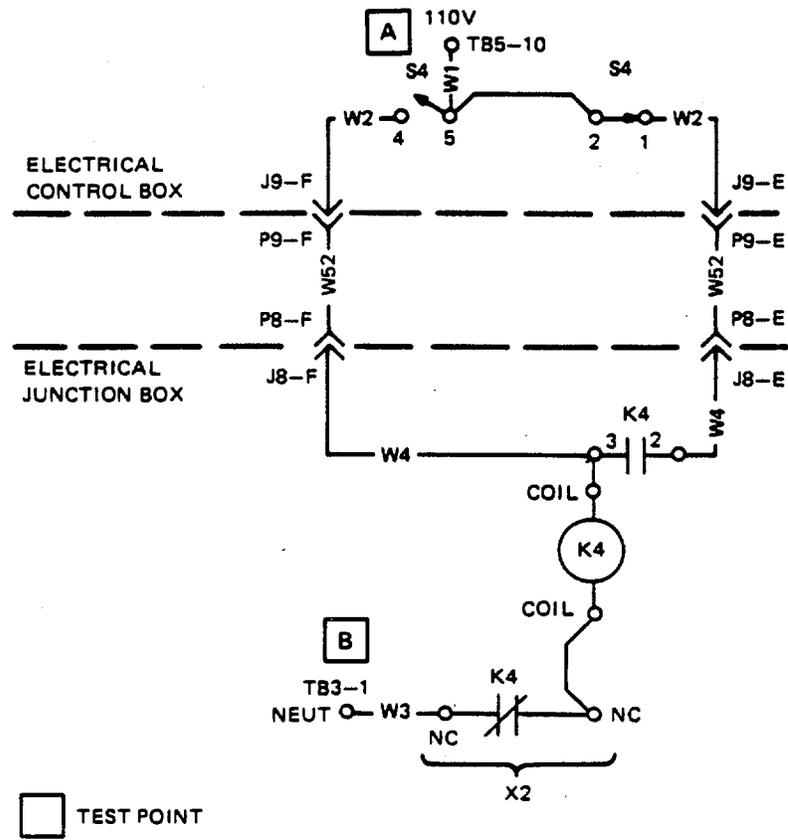


Figure 3-11. Raw Water Pump No. 2 Assembly Support Diagram

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**RAW WATER PUMP NO. 2 ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 2 SWITCH IS SET TO START - Continued

If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.

Step 5. Refer to schematic diagram figure FO-3. Check for 208 V ac at K4 between terminal pairs T1 and T2, T2 and T3, and T1 and T3.

If 208 V ac is not present on all terminal pairs, go to step 6.

If 208 V ac is present on all terminal pairs, go to step 12.

Step 6. Refer to schematic diagram figure FO-3. Check for 208 V ac at K4 between terminal pairs on the top screw of each heater; left to center, center to right, and left to right.

If 208 V ac is not present on all terminal pairs, go to step 11.

If 208 V ac is present on all terminal pairs, shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove six screws and three heaters. Replace heaters that have damaged elements. Start ROWPU. Refer to TM 10-4610-239-10. Repeat step 5.

If 208 V ac is not present on all terminal pairs after repeating step 5, go to step 7.

If 208 V ac is present on all terminal pairs after repeating step 5, the malfunction caused by faulty heater elements has been corrected.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**RAW WATER PUMP NO. 2 ASSEMBLY - Continued**

**PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 2 SWITCH IS SET TO START - Continued**

- Step 7. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to schematic diagram figure FO-3. Check for short circuits between junction box ground terminal EI and K4 terminals T1, T2, and T3.
- If any K4 terminal is shorted to ground terminal EI, go to step 8.
  - If no K4 terminal is shorted to ground terminal EI, replace K4. Refer to paragraph 3-48.
- Step 8. Disconnect raw water pump no. 2 cable connector P4 from ROWPU. Refer to schematic diagram figure FO-3. Check for short circuits between P4-D and P4-A, P4-B, and P4-C.
- If no pin is shorted to P4-D, go to step 9.
  - If any pin is shorted to P4-D, go to step 10.
- Step 9. Remove receptacle connector J4 from electrical junction box. Refer to paragraph 3-37. Refer to schematic diagram figure FO-3. Check for a short circuit between J4-D and K4 terminals T1, T2, and T3.
- If any terminal is shorted to J4-D, repair cable W8. Refer to paragraph 3-17.
  - If no terminal is shorted to J4-D, replace J4. Refer to paragraph 3-37.
- Step 10. Remove raw water pump no. 2 cable assembly. Refer to paragraph 2-134. Refer to schematic diagram figure FO-3. Check for short circuits between P4-D and P4-A, P4-B, and P4-C.
- If any pin is shorted to P4-D, repair raw water pump no. 2 cable assembly. Refer to paragraph 3-17.
  - If no pin is shorted P4-D, repair raw water pump no. 2 electric motor. Refer to paragraph 3-57.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**RAW WATER PUMP NO. 2 ASSEMBLY - Continued**

**PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 2 SWITCH IS SET TO START - Continued**

- Step 11. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to interconnect diagram figure FO-4. Check continuity between K4 terminals L1, L2, and L3 and J1 pins A, B, and C respectively.
- If all three measurements do not indicate continuity, go to step 17.
- If all three measurements indicate continuity, repair K4. Refer to paragraph 3-49.
- Step 12. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove raw water pump no. 2 cable assembly from motor. Refer to paragraph 2-134. Leave cable connected to J4. Refer to schematic diagram figure FO-3. Check continuity between motor controller K4 terminals T1, T2 and T3 and wire lugs on end of cable.
- If all three measurements do not indicate continuity, go to step 13.
- If all three measures indicate continuity, go to step 14.
- Step 13. Disconnect raw water pump no. 2 cable connector P4 from ROWPU. Refer to schematic diagram figure FO-3. Check continuity between lugs on end of cable and P4-A, P4-B, P4-C, and P4-D.
- If all four measurements indicate continuity, replace J4. Refer to paragraph 3-37.
- If all four measurements do not indicate continuity, repair raw water pump no. 2 cable assembly. Refer to paragraph 3-17.
- Step 14. Refer to schematic diagram figure FO-3. Check continuity between wire lugs on end of cable and junction box ground terminal EI.
- If there is no continuity between any wire lug and EI, go to step 15.
- If there is continuity between a wire lug and EI, repair raw water pump no. 2 electric motor. Refer to paragraph 3-57.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**RAW WATER PUMP NO. 2 ASSEMBLY - Continued**

PUMP ELECTRIC MOTOR FAILS TO START WHEN RAW WATER PUMPS NO. 2 SWITCH IS SET TO START - Continued

Step 15. Disconnect raw water pump no. 2 cable connector P4 from ROWPU. Refer to interconnect diagram figure FO-4. Check continuity between wire lugs on end of cable and P4-D.

If there is continuity between a wire lug and P4-D, go to step 16.

If there is no continuity between any wire lug and P4-D, repair raw water pump no. 2 cable assembly. Refer to paragraph 3-17.

Step 16. Refer to interconnect diagram figure FO-4. Check continuity between terminal board TB3-3 and junction box ground terminal EI.

If there is continuity, repair cable WS. Refer to paragraph 3-17.

If there is no continuity, repair wiring harness W39. Refer to paragraph 3-39.

Step 17. Check continuity between CB4 terminals L1, L2, and L3 and J1 pins A, B, and C respectively.

If all three measurements indicate continuity, go to step 18.

If all three measurements do not indicate continuity, repair wire leads W20, W21, and W22. Refer to paragraph 3-39.

Step 18. Check continuity between CB4 terminals L1, L2, and L3 and terminals T1, T2, and T3 respectively.

If all three measurements indicate continuity, repair wiring harness W39. Refer to paragraph 3-39.

If all three measurements do not indicate continuity, replace CB4. Refer to paragraph 3-43.

Table 3-1. Direct Support Troubleshooting - Continued

Malfunction	Test or Inspection	Corrective Action
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**BACKWASH PUMP ASSEMBLY**

1. PUMP ELECTRIC MOTOR FAILS TO START WHEN BACKWASH SWITCH IS SET TO START

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

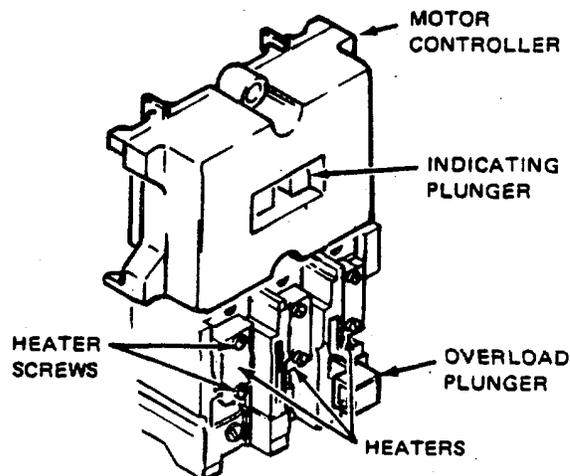
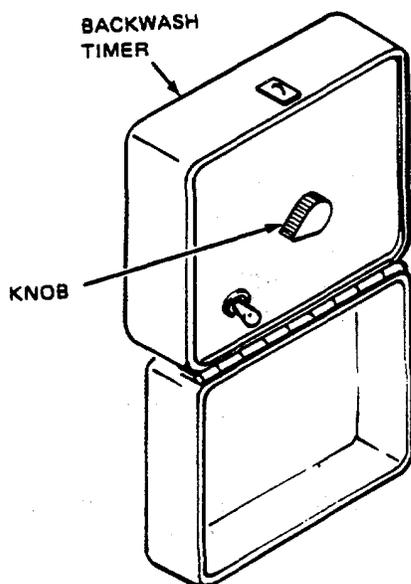
**NOTE**

Ensure that all circuit breakers are set. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-12 for backwash pump assembly support diagram.

Step 1. Set ELEMENT CLEANING switch to START and release.

If motor starts, set ELEMENT CLEANING switch to OFF and go to step 2.

If motor does not start, set ELEMENT CLEANING switch to OFF and go to step 5.



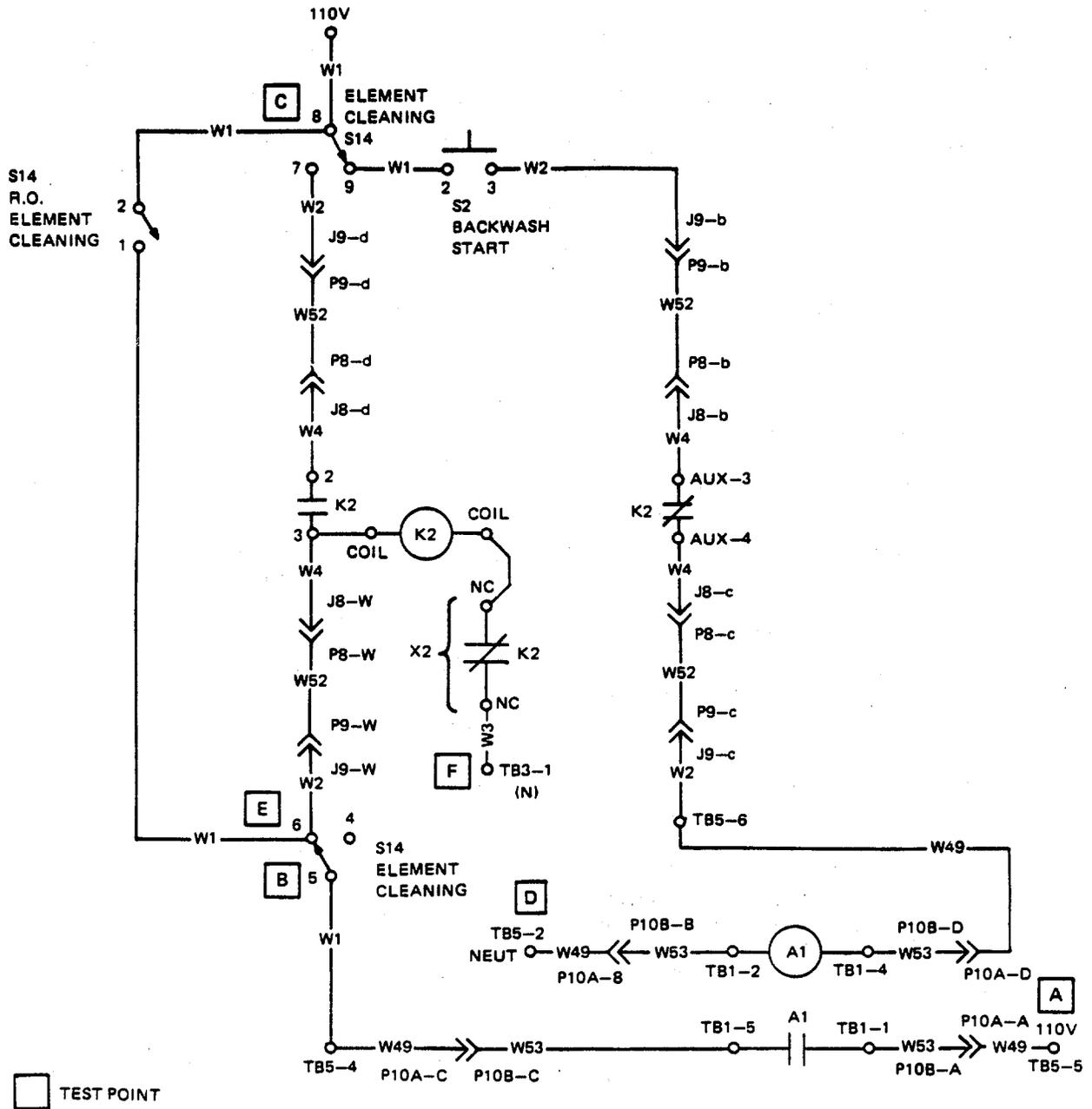


Figure 3-12. Backwash Pump Assembly Support Diagram

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**BACKWASH PUMP ASSEMBLY - Continued**

1. PUMP ELECTRIC MOTOR FAILS TO START WHEN BACKWASH SWITCH IS SET TO START - Continued

- Step 2. Open timer cover. Set BACKWASH switch to START and release. Watch knob in timer.
- If knob rotates, go to step 3.
  - If knob does not rotate, go to step 4.
- Step 3. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to backwash pump assembly support diagram figure 3-12. Check continuity point-to-point between test points A and B. If all checks indicate continuity except across A1, repair backwash timer assembly. Refer to paragraph 3-24.
- If any check through a wiring harness does not indicate continuity, repair wiring harness. Refer to paragraph 3-39.
  - If any check through a cable does not indicate continuity, repair cable assembly. Refer to paragraph 3-17.
- Step 4. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Hold BACKWASH switch in START position. Refer to backwash pump assembly support diagram figure 3-12. Check continuity point-to-point between test points C and D.
- If there is no continuity through S2 or S 14, replace switch. Refer to paragraph 3-34.
  - If there is no continuity through K2, repair motor controller. Refer to paragraph 3-47.
  - If there is no continuity through A1, repair backwash timer. Refer to paragraph 3-24.
  - If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.
  - If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
<b>BACKWASH PUMP ASSEMBLY - Continued</b>		
1. PUMP ELECTRIC MOTOR FAILS TO START WHEN BACKWASH SWITCH IS SET TO START - Continued		
Step 5.	Push overload plunger on K2. Set ELEMENT CLEANING switch to START and release. Check position of overload plunger.	<p>If plunger stays in, go to step 6.</p> <p>If plunger does not stay in, go to step 10.</p>
Step 6.	Set ELEMENT CLEANING switch to START and release. Check position of indicating plunger.	<p>If indicating plunger is out, go to step 7.</p> <p>If indicating plunger is in, go to step 8.</p>
Step 7.	Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to backwash pump assembly support diagram figure 3-12. Check continuity point-to-point between test points E and F.	<p>If there is no continuity through a wiring harness, repair harness. Refer to paragraph 3-39.</p> <p>If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.</p> <p>If there is no continuity through motor controller K2, repair motor controller. Refer to paragraph 3-47.</p>
Step 8.	Refer to schematic diagram figure FO-3. Check for 208 V ac at motor controller K2 between terminal pairs T1 and T2, and T3, and T1 and T3.	<p>If 208 V ac is not present on all terminal pairs, go to step 9.</p> <p>If 208 V ac is present on all terminal pairs, go to step 15.</p>
Step 9.	Refer to schematic diagram figure FO-3. Check for 208 V ac at motor controller K2 between terminal pairs on the top screw of each heater; left to center, center to right, and left to right.	<p>If 208 V ac is not present on all terminal pairs, go to step 14.</p> <p>If 208 V ac is present on all terminal pairs, shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove six screws and three heaters. Replace heaters that have damaged elements. Start ROWPU. Refer to TM 10-4610-239-10. Repeat step 8.</p> <p>If 208 V ac is not present on all terminal pairs after repeating step 8, go to step 10.</p>

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
<b>BACKWASH PUMP ASSEMBLY - Continued</b>		
1. PUMP ELECTRIC MOTOR FAILS TO START WHEN BACKWASH SWITCH IS SET TO START - Continued		<p>If 208 V ac is present on all terminal pairs after repeating step 8, malfunction caused by faulty heater elements has been corrected.</p> <p>Step 10. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to schematic diagram FO-3. Check for short circuits between junction box ground terminal EI and motor controller K2 terminals T1, T2, and T3.</p> <p>If any motor controller terminal is shorted to ground terminal EI, go to step 11.</p> <p>If no motor controller terminal is shorted to ground terminal EI, replace motor controller K2. Refer to paragraph 3-46.</p> <p>Step 11. Disconnect backwash pump cable connector P2 from ROWPU. Refer to schematic diagram figure FO-3. Check for short circuits between P2-D and P2-A, P2-B, and P2-C.</p> <p>If no pin is shorted to P2-D, go to step 12.</p> <p>If any pin is shorted to P2-D, go to step 13.</p> <p>Step 12. Remove receptacle connector J2 from electrical junction box. Refer to paragraph 3-37. Refer to schematic diagram figure FO-3. Check for a short circuit between J2-D and motor controller K2 terminals T1, T2, and T3.</p> <p>If any terminal is shorted J2-D, repair cable W6. Refer to paragraph 3-17.</p> <p>If no terminal is shorted to J2-D, replace receptacle: connector J2. Refer to paragraph 3-37.</p> <p>Step 13. Remove backwash pump cable assembly. Refer to paragraph 2-138. Refer to schematic diagram figure FO-3. Check for short circuits between P2-D and P2-A, P2-B, and P2-C.</p> <p>If any pin is shorted to P2-D, repair backwash pump cable assembly. Refer to paragraph 3-17.</p> <p>If no pin is shorted to P2-D, repair backwash pump electric motor. Refer to paragraph 3-61.</p>

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
<b>BACKWASH PUMP ASSEMBLY - Continued</b>		
1. PUMP ELECTRIC MOTOR FAILS TO START WHEN BACKWASH SWITCH IS SET TO START - Continued		
Step 14.	Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to schematic diagram figure FO-3. Check continuity between motor controller K2 terminals L1, L2, and L3 and receptacle connector J1 pins A, B, and C respectively.	<p>If all three measurements indicate continuity, repair motor controller K2. Refer to paragraph 3-47.</p> <p>If all three measurements do not indicate continuity, repair wiring harness W5. Refer to paragraph 3-39.</p>
Step 15.	Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove backwash pump cable assembly from motor. Refer to paragraph 2-138. Leave cable connected to receptacle connector J2. Refer to schematic diagram figure FO-3. Check continuity between motor controller K2 terminals T1, T2, and T3 wire lugs on end of cable.	<p>If all three measurements do not indicate continuity, go to step 16.</p> <p>If all three measurements indicate continuity, go to step 17.</p>
Step 16.	Disconnect backwash pump cable connector P2 from ROWPU. Refer to schematic diagram figure FO-3. Check continuity between wire lugs on end of cable and P2-A, P2-B, P2-C, and P2-D.	<p>If all four measurements indicate continuity, replace receptacle connector J2. Refer to paragraph 3-37.</p> <p>If all four measurements do not indicate continuity, repair backwash pump cable assembly. Refer to paragraph 3-17.</p>
Step 17.	Refer to interconnect diagram figure FO-3. Check continuity between wire lugs on end of cable and junction box ground terminal EI.	<p>If there is no continuity between any wire lug and EI, go to step 18.</p> <p>If there is continuity between a wire lug and EI, repair backwash pump electric motor. Refer to paragraph 3-52.</p>

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**BACKWASH PUMP ASSEMBLY - Continued**

**1. PUMP ELECTRIC MOTOR FAILS TO START WHEN BACKWASH SWITCH IS SET TO START - Continued**

Step 18. Disconnect backwash pump cable connector P2 from RENVPU. Refer to interconnect diagram figure FO-4. Check continuity between wire lugs on end of cable and P2-D.

If there is continuity between a wire lug and P2-D, go to step 19.

If there is no continuity between any wire lug and P2-D, repair backwash pump cable assembly. Refer to paragraph 3-17.

Step 19. Refer to interconnect diagram figure FO-4. Check continuity between terminal board TB3-3 and junction box ground terminal E1.

If there is continuity, repair cable W6. Refer to paragraph 3-17.

If there is no continuity, repair wiring harness W3S9. Refer to paragraph 3-39.

**2. PUMP ELECTRIC MOTOR FAILS TO START WHEN ELEMENT CLEANING SWITCH IS SET TO START**

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power to be connected. Always take proper measures to ensure personal safety.

**NOTE**

Ensure that all circuit breakers are set. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure FO-3 for schematic diagram and figure FO-4 for interconnection diagram. Refer to figure 3-1 for control box support diagram, figure 3-2 for junction box support diagram, and figure 3-12 for backwash pump assembly support diagram.

Step 1. Set ELEMENT CLEANING SWITCH to OFF. Set BACKWASH switch to START and release. Check if motor started.

If motor started, push PUSH EMERG STOP switch. Open door of backwash timer and manually set timer knob to SERVICE position. Pull PUSH EMERG STOP switch out. Go to step 2.

If motor did not start, go to step 3.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**BACKWASH PUMP ASSEMBLY - Continued**

**2. PUMP ELECTRIC MOTOR FAILS TO START WHEN ELEMENT CLEANING SWITCH IS SET TO START - Continued**

- Step 2. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Set ELEMENT CLEANING switch to RUN position. Refer to backwash pump assembly support diagram figure 3-12. Check continuity point-to-point between test points C and F.
- If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.
- If there is no continuity through S 14, replace switch. Refer to paragraph 3-34.
- If there is no continuity through K2, repair motor controller. Refer to paragraph 3-47.
- Step 3. Push overload plunger on K2. Set ELEMENT CLEANING switch to START and release. Check position of overload plunger.
- If plunger stays in, go to step 4.
- If plunger does not stay in, go to step 8.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction	Test or Inspection	Corrective Action
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**BACKWASH PUMP ASSEMBLY - Continued**

**2. PUMP ELECTRIC MOTOR FAILS TO START WHEN ELEMENT CLEANING SWITCH IS SET TO START - Continued**

- Step 4. Set ELEMENT CLEANING switch to START and release. Check position of indicating plunger.
- If indicating plunger is out, go to step 5.
- If indicating plunger is in, go to step 6.
- Step 5. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to backwash pump assembly support diagram figure 3-12. Check continuity point-to-point between test points E and F.
- If there is no continuity through a wiring harness, repair wiring harness. Refer to paragraph 3-39.
- If there is no continuity through a cable, repair cable assembly. Refer to paragraph 3-17.
- If there is no continuity through motor controller :K2, repair motor controller. Refer to paragraph 3-47.
- Step 6. Refer to schematic diagram figure FO-3. Check for 208 V ac at motor controller K2 between terminal pairs T1 and T2, T2 and T'3, and T1 and T3.
- If 208 V ac is not present on all terminal pairs, go to step 7.
- If 208 V ac is present on all terminal pairs, go to step 13.
- Step 7. Refer to schematic diagram figure FO-3. Check for 208 V ac at motor controller K2 between terminal pairs on the top screw of each heater; left to center, center to right, and left to right.
- If 208 V ac is not present on all terminals pairs, go to step 12.
- If 208 V ac is present on all terminals pairs, shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove six screws and three heaters. Replace heaters that have damaged elements. Start ROWPU. Refer to TM 10-4610-239-10. Repeat step 6.
- If 208 V ac is not present on all terminal pairs after repeating step 6, go to step 8.
- Step 8. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Check for short circuits between junction box ground terminal EI and motor controller K2 terminals T1, T2, and T3.
- If any motor controller terminal is shorted to ground terminal EI, go to step 9.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
<b>BACKWASH PUMP ASSEMBLY - Continued</b>		
2. PUMP ELECTRIC MOTOR FAILS TO START WHEN ELEMENT CLEANING SWITCH IS SET TO START - Continued		
		If no motor controller terminal is shorted to ground terminal EI, replace motor controller K2. Refer to paragraph 3-46.
Step 9.	Disconnect backwash pump cable connector P2 from ROWPU. Refer to schematic diagram figure FO-3. Check for short circuits between P2-D, and P2-A, P2-B, and P2-C.	If no pin is shorted to P2-D, go to step 10. If any pin is shorted to P2-D, go to step 11.
Step 10.	Remove receptacle connector J2 from electrical junction box. Refer to paragraph 3-37. Refer to schematic diagram figure FO-3. Check for a short circuit between J2-D and motor controller K2 terminals T1, T2, and T3.	If any terminal is shorted to J2-D, repair cable W6. Refer to paragraph 3-17. If no terminal is shorted to J2-D, replace receptacle connector J2. Refer to paragraph 3-37.
Step 11.	Remove backwash pump cable assembly. Refer to paragraph 2-138. Refer to schematic diagram figure FO-3. Check for short circuits between P2-D and P2-A, P2-B, and P2-C.	If any pin is shorted to P2-D, repair backwash pump cable assembly. Refer to paragraph 3-17. If no pin is shorted to P2-D, repair backwash pump electric motor. Refer to paragraph 3-61.
Step 12.	Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Refer to schematic diagram figure FO-3. Check continuity between motor controller K2 terminals L1, L2, and L3 and receptacle connector J1 pins A, B, and C respectively.	If all three measurements indicate continuity, repair motor controller K2. Refer to paragraph 3-47. If all three measurements do not indicate continuity, repair wiring harness W5. Refer to paragraph 3-39.

**Table 3-1. Direct Support Troubleshooting - Continued**

Malfunction	Test or Inspection	Corrective Action
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**BACKWASH PUMP ASSEMBLY - Continued**

**2. PUMP ELECTRIC MOTOR FAILS TO START WHEN ELEMENT CLEANING SWITCH IS SET TO START - Continued**

- Step 13. Shut down ROWPU. Refer to TM 10-4610-239-10. Shut down power. Refer to generator manual. Remove backwash pump cable assembly from motor. Refer to paragraph 2-138. Leave cable connected to receptacle connector J2. Refer to schematic diagram figure FO-3. Check continuity between motor controller K2 terminals T1, T2, and T3 and wire lugs on end of cable.
- If all three measurements do not indicate continuity, go to step 14.
- If all three measurements indicate continuity, go to step 15.
- Step 14. Disconnect backwash pump cable connector P2 from ROWPU. Refer to schematic diagram figure FO-3. Check continuity between wire lugs on end of cable and P2-A, P2-B, P2-C, and P2-D.
- If all four measurements indicate continuity, replace receptacle connector J2. Refer to paragraph 3-37.
- If all four measurements do not indicate continuity, repair backwash pump cable assembly. Refer to paragraph 3-17.
- Step 15. Refer to interconnect diagram figure FO-4. Check continuity between wire lugs on end of cable and junction box ground terminal EI.
- If there is no continuity between any wire lug and EI, go to step 18.
- If there is continuity between a wire lug and EI, repair backwash pump electric motor. Refer to paragraph 3-61.
- Step 16. Disconnect backwash pump cable connector P2 and ROWPU. Refer to interconnect diagram figure FO-4. Check continuity between wire lugs on end of cable and P2-D.
- If there is continuity between a wire lug and P2-D, go to step 17.
- If there is no continuity between any wire lug and P2-D, repair backwash pump cable assembly. Refer to paragraph 3-17.

**Table 3-1. Direct Support Troubleshooting - Continued**

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Malfunction

Test or Inspection

Corrective Action

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**BACKWASH PUMP ASSEMBLY - Continued**

2. PUMP ELECTRIC MOTOR FAILS TO START WHEN ELEMENT CLEANING SWITCH IS SET TO START -  
Continued

Step 17. Refer to interconnect diagram figure FO-4. Check continuity between terminal board TB3-3 and junction box ground terminal E1.

If there is continuity, repair cable W6. Refer to paragraph 3-17.

If there is no continuity, repair wiring harness W39. Refer to paragraph

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**Section II. FLATBED CARGO TRAILER MAINTENANCE PROCEDURES**

	Para	Page
Replace Trunnion Axle .....	3-4	3-75
Repair Chassis Wiring Harness.....	3-5	3-77
Repair Power Cable Assembly.....	3-6	3-80
Replace Suspension Assembly.....	3-7	3-82
Replace Spring Assembly.....	3-8	3-85
Repair Spring Assembly .....	3-9	3-87
Repair Brake Drum.....	3-10	3-89
Repair Air Chamber Assembly.....	3-11	3-91
Repair Brakeshoe.....	3-12	3-95

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### 3-4. REPLACE TRUNNION AXLE.

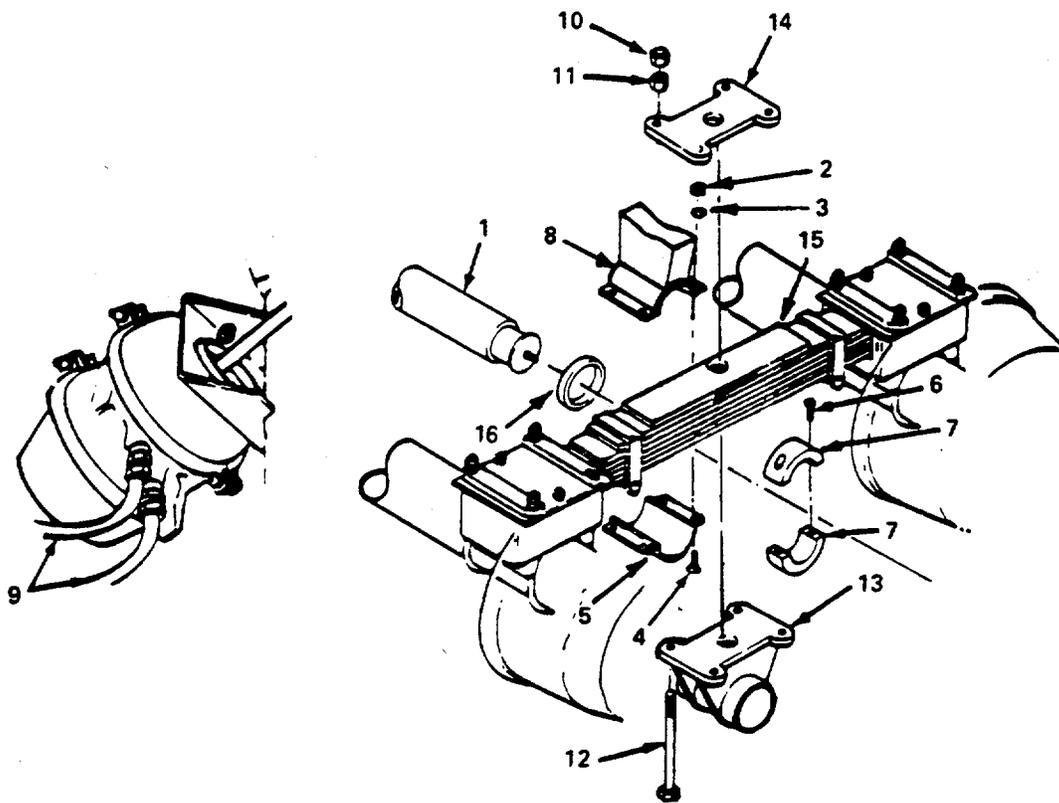
This task covers: a. Removal. b. Installation.

---

#### INITIAL SETUP.

Tools. Tool Kit (Appx B, Sect III, Item 10).  
Tool Kit (Appx B, Sect III, Item 7).  
Hydraulic Floor Jacks (Appx B, Sect III, Item 7).

---



#### REMOVAL.

- Chock flatbed cargo trailer tires to prevent rolling.
- Jack flatbed cargo trailer until weight is almost relieved on tires. Refer to TM 10-4610-239-10.
- Support trunnion axle (1) with jacks at both ends.

#### NOTE

Both ends of the trunnion axle are removed the same. One is shown.

**REMOVAL. (Cont)**

- d. Remove four nuts (2), lockwashers (3), and bolts (4) and remove trunnion clamp (5).
- e. Remove four Allen screws (6) and remove upper and lower ring clamps (7).
- f. Jack flatbed cargo trailer until trunnion mount (8) clears trunnion axle (1) being careful not to pull air chamber lines (9) loose.

**INSTALLATION.**

**NOTE**

Both ends of the trunnion axle are installed the same. One is shown.

- a. Install two upper and two lower ring clamps (7) and four screws (6).
- b. Lower flatbed cargo trailer until trunnion mount (8) rests on trunnion axle (1).
- c. Install two trunnion clamps (5) and eight bolts (4), eight lockwashers (3), and eight nuts (2).
- d. Torque bolts (4) to 80-105 pound-feet (59.04-77.49 N.m).
- e. Lower flatbed cargo trailer to normal operating position. Refer to TM 10-4610-239-10.



**SPLICE WIRE. (Cont)**

- b. Cut off 3-inch (7.62 cm) piece of damaged wire (3) with damage in middle of removed piece.
- c. Measure and cut a piece of new wire (4) to replace damage piece.
- d. Strip both ends of new wire (4) and two free ends of old wire (5).

**NOTE**

When crimping, be sure to make a good electrical and mechanical connection between terminal and wire.

- e. Install and crimp two splices (6) on new wire (4).
- f. Install and crimp two splices (6) on free ends of old wire (5).
- g. Wrap two splices (6) and wire, 1 inch (2.54 cm) each side of splices, with electrical tape.

**NOTE**

Make sure electrical tape overlaps old tape on both ends of repair area.

- h. Using electrical tape, completely wrap all wires together.

**REPLACE CONNECTOR.**

**NOTE**

Procedure is the same for replacement of male and female connectors except as noted.

- a. Pull two connectors (7) and (8) apart.

**NOTE**

- Male connector has a clip installed under shell. Be careful not to lose clip when shell is pulled back.
- Female connector has an insulator bushing covering the terminal.

- b. Pull shell (9) back to expose terminal (10) and end of wire. On male connector, remove clip (11). On female connector, slide insulator bushing (12) back from connector.
- c. Cut off terminal (10).
- d. Using hand wire stripper, strip end of wire (13).

**NOTE**

When crimping, be sure to make a good electrical and mechanical connection between terminal and wire.

**REPLACE CONNECTOR. (Cont)**

e. Using crimping tool, crimp new terminal (14) to wire (13).

**NOTE**

- For female connector, do step f
- For male connector, do step g.

f. Slide insulator bushing (15) over female connector and slide shell (9) over insulator bushing.

g. Position clip (11) on wire behind male connector and slide shell (9) over clip and connector.

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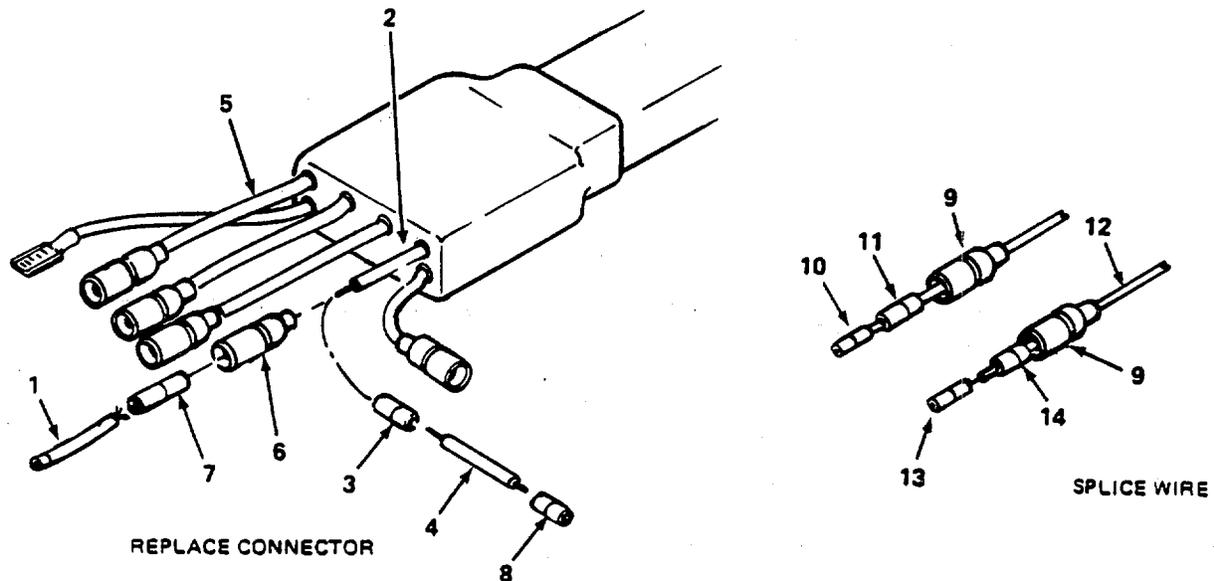
### 3-6. REPAIR POWER CABLE ASSEMBLY.

This task covers: a. Splice Wire. b. Replace Connector.

---

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Wire Stripper (Appx B, Sect III, Item 7).  
Multimeter (Appx B, Sect III, Items 6 and 9).  
Crimping Tool (Appx B, Sect III, Item 7).
  - b. Materials/Parts. Tape, Electrical (Appx C, Sect II, Item 18).
  - c. Equipment Condition. Power cable assembly removed (paragraph 2-63).
- 



#### SPLICE WIRE.

#### NOTE

There are six wires on end of power cable assembly. Procedure is the same to splice all six. One is shown.

- a. Cut off damaged part of wire (1). Do not discard it.
- b. Using hand wire stripper, strip end of wire stub (2).

#### NOTE

When crimping, be sure to make a good electrical and mechanical connection between terminal and wire.

**SPLICE WIRE. (Cont)**

- c. Using crimping tool, crimp splice (3) to wire stub (2).
- d. Cut a piece of new wire (4) long enough to match length of existing wires (5).
- e. Using hand wire stripper, strip one end of new wire (4).
- f. Using crimping tool, crimp splice (3) to new wire (4).
- g. Remove shell (6) and insulator bushing (7) from damaged part of wire (1). Discard damaged part of wire.
- h. Install shell (6) and insulator bushing (7) on new wire (4) and slide them up wire to expose loose end of new wire.
- i. Using hand wire stripper, strip loose end of new wire (4).
- j. Using crimping tool, crimp new connector (8) on new wire (4).
- k. Position insulator bushing (7) and shell (6) over connector (8).

**REPLACE CONNECTOR.**

**NOTE**

There are six connectors. Procedure for replacement is the same for all six. One is shown.

- a. Pull shell (9) back to expose connector end of wire.
- b. Cut off terminal (10) with insulator bushing (11).
- c. Using hand wire stripper, strip end of wire (12).
- d. Insert wire (12) in new terminal (13).

**NOTE**

When crimping, be sure to make a good electrical and mechanical connection between terminal and wire.

- e. Using crimping tool, crimp new terminal (13) to wire (12).
- f. Slide insulator bushing (14) over new terminal (13).
- g. Slide shell (9) over insulator bushing (14) and new terminal (13).

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### 3-7. REPLACE SUSPENSION ASSEMBLY.

This task covers: a. Removal. b. Installation.

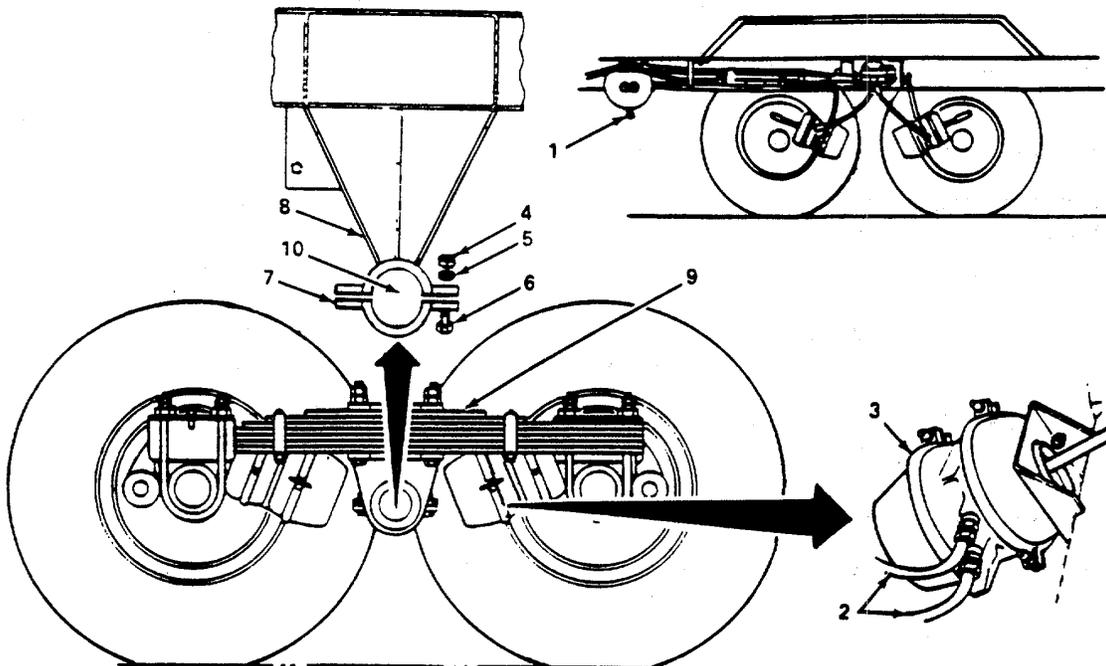
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#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Lifting Device.
- b. Materials/Parts. Towing Vehicle Equipped With Airbrakes.
- c. Personnel Required. 2
- d. Equipment Condition. STET Air hoses disconnected from towing vehicle  
(TM 10-4610-239-10).
- e. General Safety Requirements.

#### WARNINGS

- Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.
  - Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.
- 



**REMOVAL.**

**WARNING**

Compressed air can blow dust into eyes. Wear eye protection and turn drain cock T-handle slowly to avoid a sudden rush of air when releasing reservoir pressure.

- a. Turn drain cock T-handle (1) slowly counterclockwise to release air pressure from reservoir.

**NOTE**

Ensure that airflow from reservoir has stopped before closing drain cock.

- b. Turn drain cock T-handle (1) clockwise to close drain cock.
- c. Tag eight air lines.
- d. Disconnect eight air lines (2) from four air chamber assemblies (3).
- e. Remove four nuts (4), lockwashers (5), and bolts (6).
- f. Remove trunnion clamp (7) from trunnion mount (8).
- g. Repeat steps e and f for trunnion clamp on opposite side.

**WARNING**

The suspension assembly is heavy. Two people are needed to move it to prevent personal injury or damage to the equipment.

- h. Using lifting device, raise flatbed cargo trailer clear of suspension assembly (9). Refer to TM 10-4610-239-10.
- i. Roll suspension assembly (9) from under flatbed cargo trailer.

**INSTALLATION.**

**WARNING**

The suspension assembly is heavy. Two people are needed to move it to prevent personal injury or damage to the equipment.

- a. Using lifting device, raise flatbed cargo trailer clear of suspension assembly (9). Refer to TM 10-4610-239-10.
- b. Roll suspension assembly (9) into position under flatbed cargo trailer.
- c. Lower flatbed cargo trailer until trunnion mount (8) rests on trunnion axle (10).
- d. Place trunnion clamp (7) in position under trunnion mount (8) and around trunnion axle (10) with mounting bolt holes aligned.

**INSTALLATION. (Cont)**

- e. Install four bolts (6), lockwashers (5), and nuts (4).
- f. Repeat steps d and e for trunnion clamp on opposite side.
- g. Connect eight airlines (2) to four air chamber assemblies (3).
- h. Connect air hoses to towing vehicle. Refer to TM 10-4610-239-10.
- i. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.

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### 3-8. REPLACE SPRING ASSEMBLY.

This task covers: a. Removal. b. Installation.

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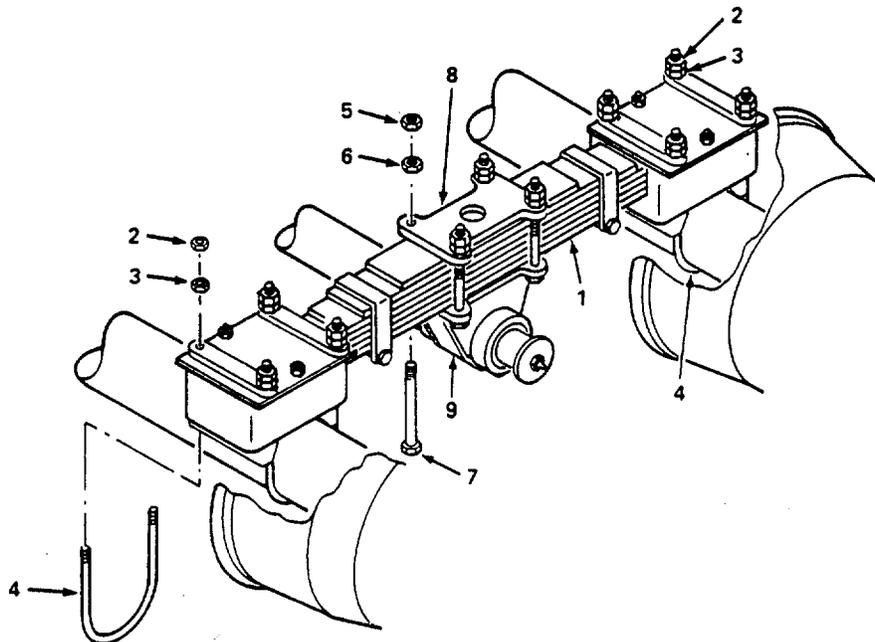
#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Personnel Required. 2
- c. Equipment Condition. Leveling jacks set (TM-10-4610-239-10).  
Tire and wheel assemblies removed (paragraph 2-67).
- d. General Safety Requirements.

#### WARNING

Lifting or moving heavy equipment incorrectly can cause serious injury.  
Do not try to lift or move more than 50 pounds by yourself. Get an assistant.  
Bend legs while lifting. Don't support heavy weight with your back.

---



#### REMOVAL.

- a. Jack up side of flatbed cargo trailer from which spring assembly (1) is to be removed so that weight is just relieved on tires. Refer to TM 10-4610-239-10.

**REMOVAL. (Cont)**

- b. Remove eight backing nuts (2) and eight retaining nuts (3) and four U-bolts (4) holding spring assembly (1) to axle.
- c. Remove four backing nuts (5), retaining nuts (6), and bolts (7) and trunnion bracket plate (8) holding spring assembly (1) to trunnion bracket (9).

**WARNING**

The spring assembly is heavy. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- d. Lift spring assembly (1) off trunnion bracket (9).

**INSTALLATION.**

- a. Jack up side of flatbed cargo trailer to which spring assembly (1) is to be installed. Refer to TM 10-4610-239-10.

**WARNING.**

The spring assembly is heavy. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- b. Lift and position spring assembly (1) on trunnion bracket (9).
- c. Position trunnion bracket plate (8) on spring assembly (1) and align holes with holes in trunnion bracket (9).
- d. Install eight bolts (7), eight retaining nuts (6), and eight backing nuts (5).
- e. Install four U-bolts (4) and eight retaining nuts (3) and eight backing nuts (:2).
- f. Lower flatbed cargo trailer to normal operating position. Refer to TM 10-46510-239-10.

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### 3-9. REPAIR SPRING ASSEMBLY.

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

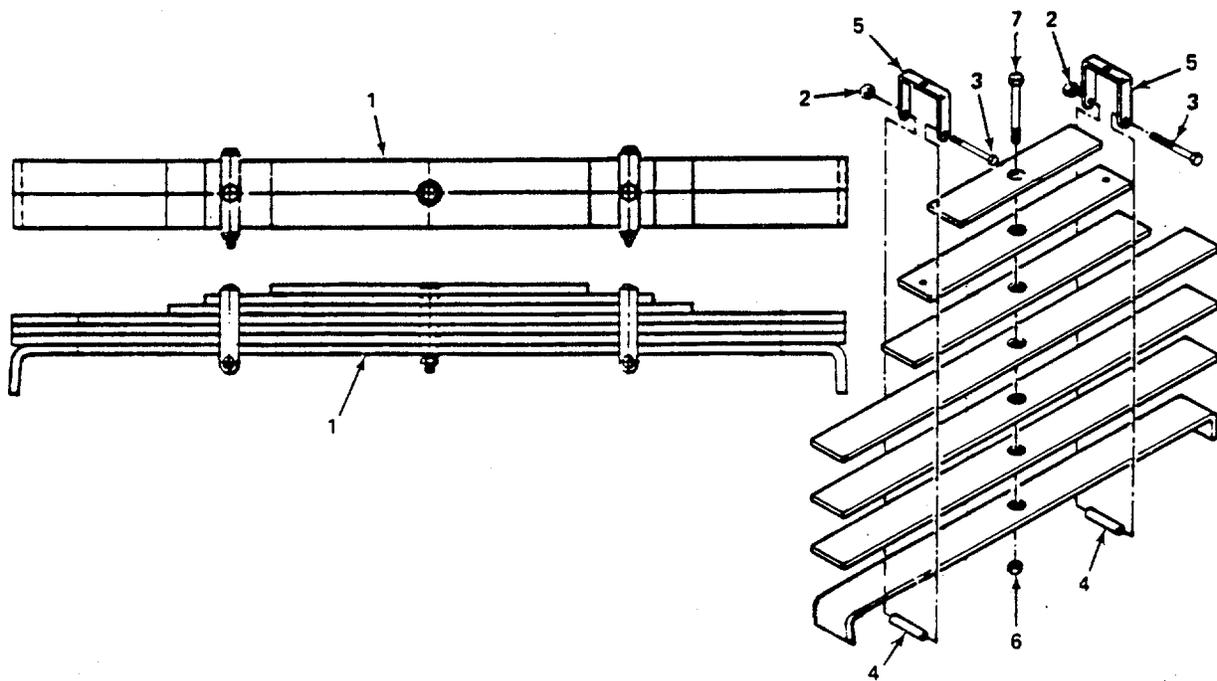
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#### INITIAL SETUP.

- a. Tools. Tool Kit.(Appx B, Sect III, Item 10).
- b. Materials/Parts. Drycleaning Solvent (Appx C, Sect II, Item 16).  
Oil, Lubricating (Appx C, Sect II, Item 11).
- c. Personnel Required. 2
- d. Equipment Condition. Spring assembly removed (paragraph 3-8).
- e. General Safety Requirements.

#### WARNINGS

- Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.
- Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.



**DISASSEMBLY.**

**WARNING**

The spring assembly is heavy. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- a. Place spring assembly (1) on workbench.
- b. Remove two nuts (2), two bolts (3), two spacer tubes (4), and two angle bars (5).
- c. Remove nut (6) and bolt (7).

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Clean all parts with a wire brush.
- b. Soak all parts in drycleaning solvent and let air dry.

**INSPECTION.**

- a. Inspect spring assembly for distortion, damage such as cracks, thread damage (bolts/nuts), excessive rust, and missing parts. Replace as required.
- b. Ensure that all fitting assembly holes are not elongated or oversize. Replace as required.
- c. Inspect for broken spring bars. Replace as required.

**ASSEMBLY.**

**NOTE**

Clean all spring assembly parts thoroughly and coat with light oil.

- a. Position all spring bars in place so that center holes align.
- b. Install bolt (7) and nut (6).
- c. Install two angle bars (5) with rivet pin keyed to hole in second spring bar from top.
- d. Install two spacer tubes (4), two bolts (3), and two nuts (2).

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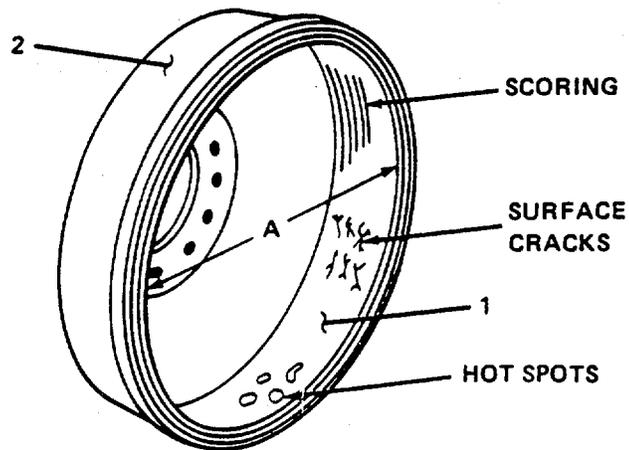
### 3-10. REPAIR BRAKE DRUM.

This task covers: a. Inspection. b. Repair.

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#### INITIAL SETUP.

- a. Tools. Brake Drum Calipers (Appx B, Sect III, Items 6 and 9).  
Floor-Mounted Brake Drum Lathe (Appx B, Sect III, Items 6 and 9).  
Wire Brush (Appx B, Sect III, Item 10).
- b. Equipment Condition. Brake drum on workbench.
- 



#### INSPECTION.

- a. Using brake drum calipers, measure inside diameter (A) of brake drum.
- b. If caliper indicates more than 12.370 inches (31.42 cm), discard drum.
- c. If caliper indicates less than 12.370 inches (31.42 cm), repair drum.
- d. If caliper measurement indicates brake drum is repairable, inspect drum braking surface (1) for scoring, surface cracks, and hot spots.
- e. Use wire brush to remove loose rust and inspect external surface (2) for corrosion and cracks.
- f. If drum is cracked, discard drum.

#### REPAIR.

- a. Use brake drum cutting lathe to cut scoring grooves, surface cracks, and hot spots from braking surface. Refer to TM 9-4910-482-10.

**REPAIR. (Cont)**

- b. Remove a maximum 0.010 inch (0.0254 cm) for each cut. Maximum amount of material which may be removed is 0.060 inch (0.1524 cm).
- c. Using brake drum calipers, measure inside diameter (A) of brake drum.
- d. If caliper indicates more than 12.370 inches (31.42 cm), discard drum.

---

### 3-11. REPAIR AIR CHAMBER ASSEMBLY.

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

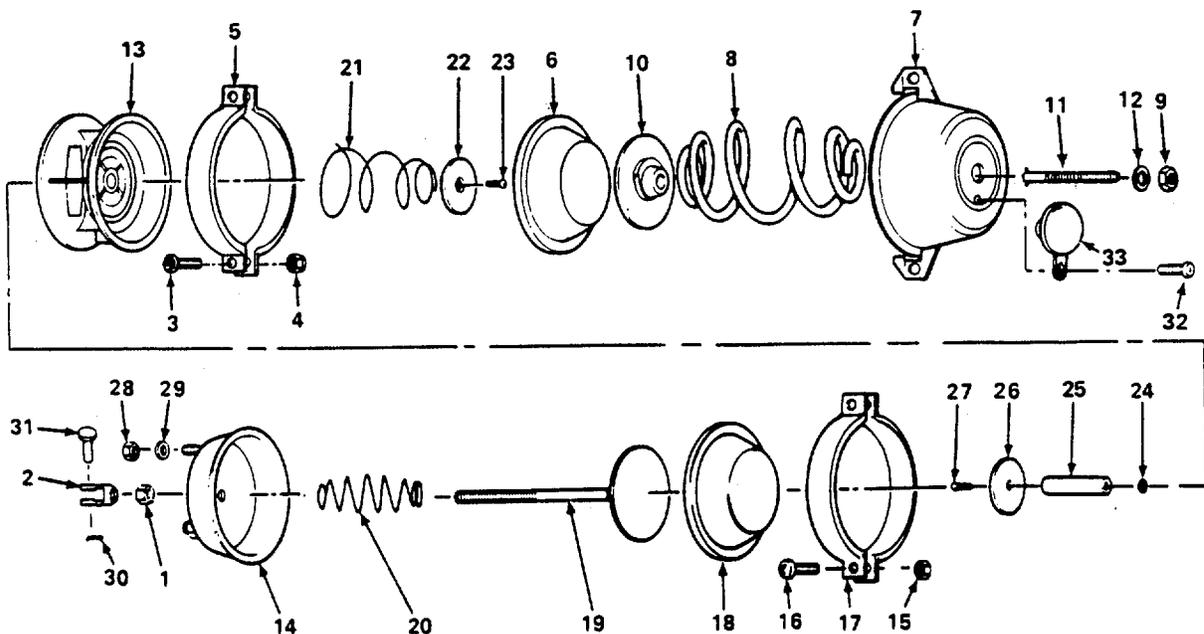
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#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Stiff-Bristled Brush (Appx B, Sect III, Item 1).
- b. Materials/Parts. Detergent (Appx C, Sect II, Item 3).  
Drycleaning Solvent (Appx C, Sect II, Item 16).  
Cloth (Appx C, Sect II, Item 2).
- c. Personnel Required. 2
- d. Equipment Condition. Air chamber compression spring caged (paragraph 2-47).
- e. General Safety Requirements.

#### WARNINGS

- Sudden release of spring tension can cause personal injury and damage due to flying objects. Release spring tension gradually.
  - Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.
- 



**DISASSEMBLY.**

- a. Loosen jamnut (1) away from clevis (2).
- b. Remove clevis (2) and jamnut (1).

**WARNING**

Spring is under tension inside chamber. Sudden release of tension can cause personal injury and damage from flying objects. Release tension slowly.

- c. Remove two bolts (3), nuts (4), and clamp (5).
- d. Use screwdriver to gently separate chamber (7) from adapter (13) as these are stuck together by the diaphragm (6).
- e. Remove diaphragm (6).
- f. While one person secures chamber (7) in vice and spring (8) to prevent sudden release of spring tension, second person slowly turn nut (9) counterclockwise to release all tension on spring.
- g. Slowly turn spring seat (10) on end of stud assembly (11) and remove stud assembly, nut (9), washer (12), spring (8), and chamber (7).

**WARNING**

Spring is under tension inside housing assembly. Sudden release of tension can cause personal injury and damage from flying objects. Release tension slowly.

- h. While holding adapter (13) firmly against housing assembly (14), remove two nuts (15), bolts (16), and clamp (17).
- i. Slowly release spring tension by allowing adapter (13) to separate from housing assembly (14).
- j. Remove diaphragm (18), push rod (19), and return spring (20).

**WARNING**

Spring is under tension between adapter and plate. Sudden release of tension can cause personal injury and damage from flying objects. Hold tension on spring manually while removing screw.

- k. While holding tension on spring (21) by pressing down on plate (22), remove screw (23).
- l. Slowly release tension and remove plate (22), spring (21), and performed packing (24). Discard performed packing.
- m. Turn adapter (13) over and remove push rod adapter (25) and plate (26).
- n. Remove screw (27) and plate (26).

**DISASSEMBLY. (Cont)**

- o. Remove two nuts (28) and washers (29).
- p. Remove cotter pin (30) and clevis pin (31). Discard cotter pin.
- q. Remove screw (32) and cap (33).

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in well-ventilated area.

- a. Using drycleaning solvent and stiff-bristled brush, scrub outside of chamber, adapter, and housing assembly. Allow to air dry.
- b. Using drycleaning solvent and stiff-bristled brush, scrub push rod arm, clevis, and clevis pin. Scrub stud assembly, clamps, and all nuts, bolts, and washers. Allow to air dry.
- c. Using solution of mild soap and water, wash all remaining parts and insides of chamber, adapter, and housing assembly. Wipe dry with clean, lint-free cloth.

**INSPECTION.**

- a. Inspect all threaded items for damaged heads or threads or deformity. Replace as required.
- b. Inspect spring seat, plates, clamps, and washers for bends, cracks, or burrs. Replace as required.
- c. Inspect springs, chamber, adapter, and housing assembly for cracks or deformity. Replace as required.
- d. Inspect diaphragms for tears, worn areas, brittleness, cracking, or deformity. Replace as required.
- e. Inspect screws for presence of nylon inserts in shaft. Inspect nylon inserts for evidence of damage to threads. Replace as required.
- f. Inspect stud assembly for damaged or missing locking pins. Replace as required.
- g. Inspect plug for brittleness, cracking, deformed or missing tab, or loose fit. Replace as required.

**ASSEMBLY.**

- a. Install plate (26) and screw (27) on push rod adapter (25).
- b. Insert push rod adapter (25) through hole in adapter (13) and hold it in place while turning adapter over.

**ASSEMBLY. (Cont)**

- c. Position new preformed packing (24) on end of push rod adapter (25).
- d. Position wide end of spring (21) on floor of adapter (13).

**NOTE**

Do not move preformed packing out of place while compressing spring and installing plate.

- e. Position plate (22) on spring (21) and push plate down until plate touches preformed packing (24).
- f. Install screw (23).
- g. Install spring (20) on push rod (19) and install push rod inhousing assembly (14).
- h. Position diaphragm (18) in adapter (13) and push adapter and diaphragm against push rod (19) until adapter touches housing assembly (14).
- i. Install clamp (17), two bolts (16), and nuts (15). Set assembly aside.
- j. Insert stud assembly (11) into spring seat (10). Rotate stud assembly 1/4 turn to lock pins into spring seat notches.
- k. Position spring (8) over stud assembly (11) to mate with raised boss on spring seat (10).

**WARNING**

Installation of spring in chamber requires placing the spring under tension. Use care not to release spring until secured to prevent personal injury or damage to equipment from flying objects.

- l. While one person positions chamber (7) on spring (8) and presses down until end of stud assembly (11) extends through hole in chamber until chamber rests on work surface, second person install washer (12) and nut (9). Tighten nut until spring seat (10) is inside chamber.
- m. Position diaphragm (6) over open end of adapter (13) and position chamber (7) over diaphragm. Tighten nut (9) until chamber touches adapter.
- n. Install clamp (5), two bolts (3), and nuts (4).
- o. Position cap (33) and install screw (32).
- p. Install jamnut (1), clevis (2), clevis pin (31), and new cotter pin (30).
- q. Install two washers (29) and nuts (28).

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### 3-12. REPAIR BRAKESHOE.

This task covers: a. Installation.

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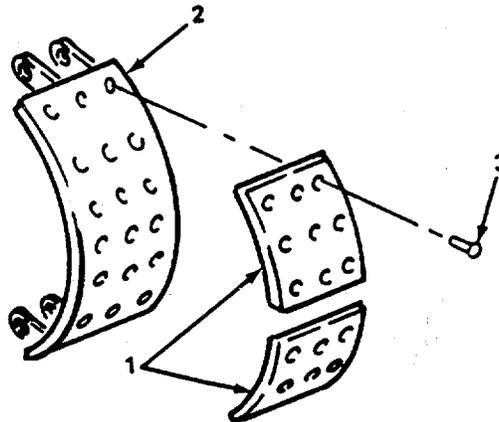
#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment Condition. Brake lining removed (paragraph 2-72).
- c. General Safety Requirements.

#### WARNING

Rivets can shatter during removal or installation and cause serious injury to eyes. Wear eye protection.

---



#### INSTALL BRAKE LININGS.

- a. Position two brake linings (1) on brakeshoe (2). Align rivet holes in brake linings with rivet holes in brakeshoe.
- b. Secure 2 brake linings (1) to brakeshoe (2) with 12 rivets (3).

**Section III. ROWPU ASSEMBLY MAINTENANCE PROCEDURES**

	Para	P
age		
Repair Canvas Covers..... 97	3-13	3-
Repair Backwash Valve..... 99	3-14	3-
Repair Low-Pressure Switch..... 102	3-15	3-
Repair High-Pressure Switch..... 108	3-16	3-
Repair Cable Assemblies..... 113	3-17	3-
Replace Multimedia Filter (CULLIGAN AND MECO) ..... 116	3-18	3-
Repair Multimedia Filter (CULLIGAN) ..... 119	3-19	3-
Repair Multimedia Filter (MECO) ..... 122	3-20	3-
Repair Multimedia Filter Control Valve (CULLIGAN) ..... 125	3-21	3-
Repair Multimedia Filter Control Valve (MECO) ..... 128	3-22	3-
Replace Multimedia Filter Control Valve ..... 131	3-23	3-
Repair Solid-State Backwash Timer (CULLIGAN) ..... 135	3-24	3-
Removal of Timer Assembly (MECO) ..... 140	3-25	3-
Repair Frame ..... 141	3-26	3-

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### 3-13. REPAIR CANVAS COVERS.

This task covers: a. Canvas Cover Cleaning. b. ROWPU Frame Cover Inspection.  
c. ROWPU Frame Cover Repair. d. Pump Cover Inspection  
e. Pump Cover Repair.

---

#### INITIAL SETUP.

- a. Tools. Refer to FM 43-3.  
Stiff-Bristled Brush (Appx B, Sect III, Item 1).
  - b. Materials/Parts. Detergent (Appx C, Sect II, Item 3).
  - c. Equipment Condition. Cover removed from equipment (TM 10-4610-239-10).
- 

<b>CANVAS COVER CLEANING.</b>
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#### NOTE

This procedure is the same for all canvas covers except as noted.

- a. Spread cover on a clean surface with good drainage. Ensure outside of cover is up.

#### CAUTION

Pump cover has felt lining. Use of excessive water during cleaning can cause damage to lining. Use minimum of water necessary to wash and rinse pump cover.

- b. Using mild soapy water and firm-bristled brush, wash outside surface of cover.
- c. Using clean water, rinse cover.

#### NOTE

- For ROWPU cover, go to step d.
  - For pump cover, go to step f.
- d. Turn cover with inside of cover up.
  - e. Repeat steps b and c.
  - f. Hang cover vertically and allow to air dry.

**ROWPU FRAME COVER INSPECTION.**

- a. Spread cover flat on a clean surface. Ensure outside of cover is up.
- b. Check that rim strip around edge of cover is not coming unstitched.
- c. Check webbing straps for end clips.
- d. Check spring buckles.
- e. Check that all straps are securely sewn to cover. Mark loose stitching for repair.
- f. Check cover for tears. Mark for repair.
- g. Turn cover over. Check buckles on underside for serviceability.

**ROWPU FRAME COVER REPAIR.**

- a. Sew patches on tears. Refer to FM 43-3.
- b. Sew loose rim strip or webbing straps. Refer to FM 43-3.
- c. Apply water-repellent solution. Refer to FM 43-3.

**PUMP COVER INSPECTION.**

- a. Spread cover flat on a clean surface with outside of cover up.
- b. Inspect outside cover and inner felt lining for tears, loose stitches, or wear.
- c. Inspect laces for wear.
- d. Check for missing or damaged grommets.

**PUMP COVER REPAIR.**

- a. Replace damaged or missing grommets. Refer to FM 43-3.
- b. Replace worn or frayed laces. Refer to FM 43-3.
- c. Replace or repair inner felt lining. Refer to FM 43-3.
- d. Patch tears in cover. Refer to FM 43-3.
- e. Sew loose stitching. Refer to FM 43-3.

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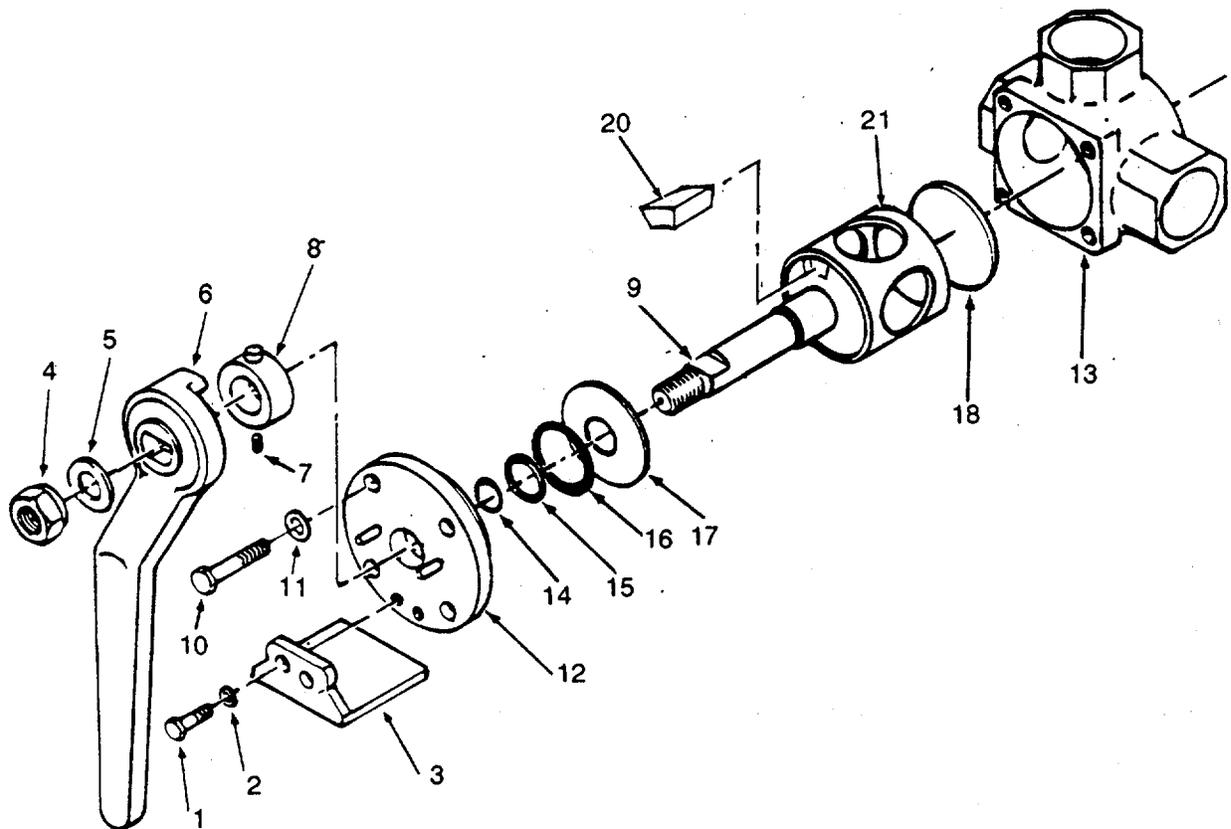
### 3-14. REPAIR BACKWASH VALVE.

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

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#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Detergent (Appx C, Sect II, Item 3).  
Sandpaper (Appx C, Sect II, Item 15).
  - c. Equipment Condition. Backwash valve removed (paragraph 2-101).
- 



#### DISASSEMBLY.

- a. Remove two screws (1), lockwashers (2), and bracket (3). Discard lockwashers.
- b. Remove jamnut (4), washer (5), and handle (6).
- c. Loosen setscrew (7) and remove setscrew collar (8) from gate valve rotor shaft (9).
- d. Remove four screws (10) and washer (11), lift the top cap (12) gate valve rotor (9) from valve body (13).

**DISASSEMBLY. (Cont)**

**NOTE**

Excess paint on valve rotor shaft may cause difficulty in removing top cap.  
Remove paint before forcing top cap from shaft of gate valve rotor.

- e. Remove top cap (12) from shaft of gate valve rotor (9).
- f. Remove stem O-ring (14), cap O-ring (15), body O-ring (16), and top rotor washer (17). Discard O-rings.
- g. Remove rotor port (21), woodruff key (20) and bottom rotor washer (18) from valve (13).

**CLEANING.**

- a. Using soap solution; clean gate valve rotor, valve body, top cap, setscrew collar, handle, and attaching hardware.
- b. Using sandpaper, clean paint from gate valve rotor shaft.

**INSPECTION.**

- a. Inspect gate valve rotor for excessive wear, corrosion, and other damage. Inspect shaft for damaged threads and cracks. Replace rotor assembly as required.
- b. Inspect valve body for cracks, corrosion, and damaged threads. Replace as required.
- c. Inspect top cap for cracks, damaged threads, and broken stop pins. Replace backwash valve assembly as required.
- d. Inspect setscrew collar and setscrew for serviceability. Replace as required.
- e. Inspect handle, bracket, and mounting hardware for breaks, cracks, damaged threads, and general serviceability. Replace items as required.

**ASSEMBLY.**

- a. Position new top rotor washer (17) on gate valve rotor (9) and install new body O-ring (16), new cap O-ring (15), new stem O-ring (14), woodruff key (20) and rotor port (21).
- b. Position bottom rotor washer (18) in valve body (13).
- c. Position gate valve rotor (9) in valve body (13) and align holes with three pipe connectors.
- d. Holding gate valve rotor (9) in place, position top cap (12) and align screw holes.
- e. Install four screws (10) and washers (11).

**ASSEMBLY. (Cont)**

- f. Install setscrew collar (8) and tighten setscrew (7).
- g. Position handle (6) and install washer (5) and jamnut (4).
- h. Position bracket (3) and install two screws (1) and new lockwashers (2).

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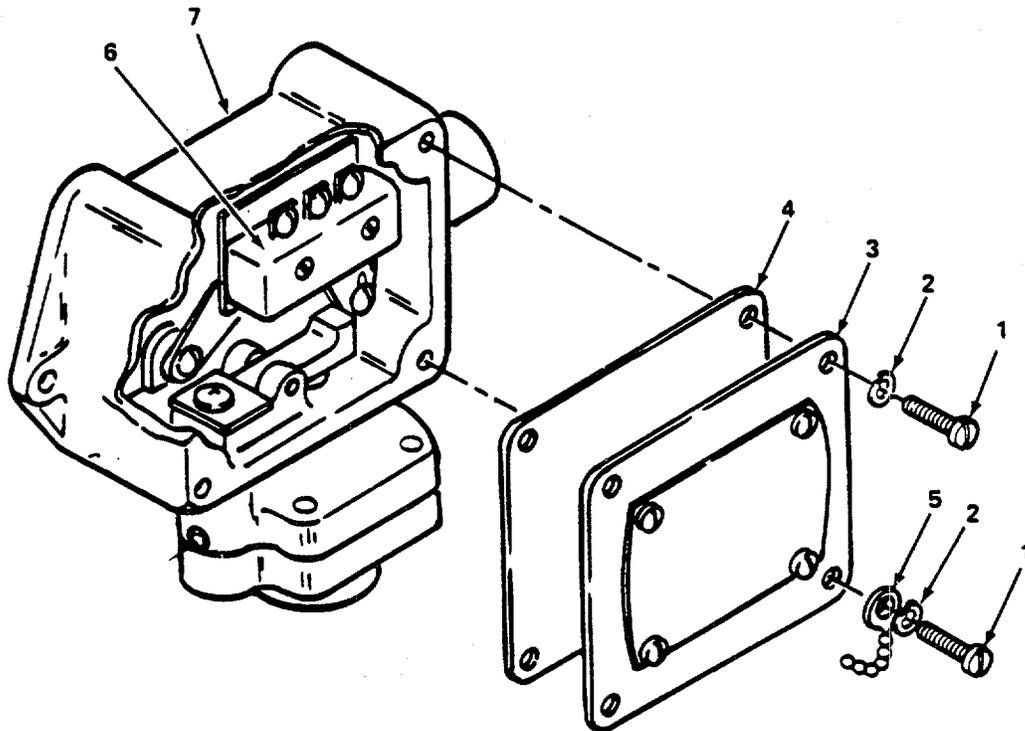
### 3-15. REPAIR LOW-PRESSURE SWITCH.

This task covers: a. Test. b. Disassembly. c. Inspection. d. Assembly. e. Calibration.

---

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Multimeter (Appx B, Sect III, Items 6 and 9).  
Dead Weight Gage Tester (Appx B, Sect III, Items 6 and 9).
- b. Equipment Condition. Low-pressure switch removed (paragraph 2-83).
- 



#### TEST.

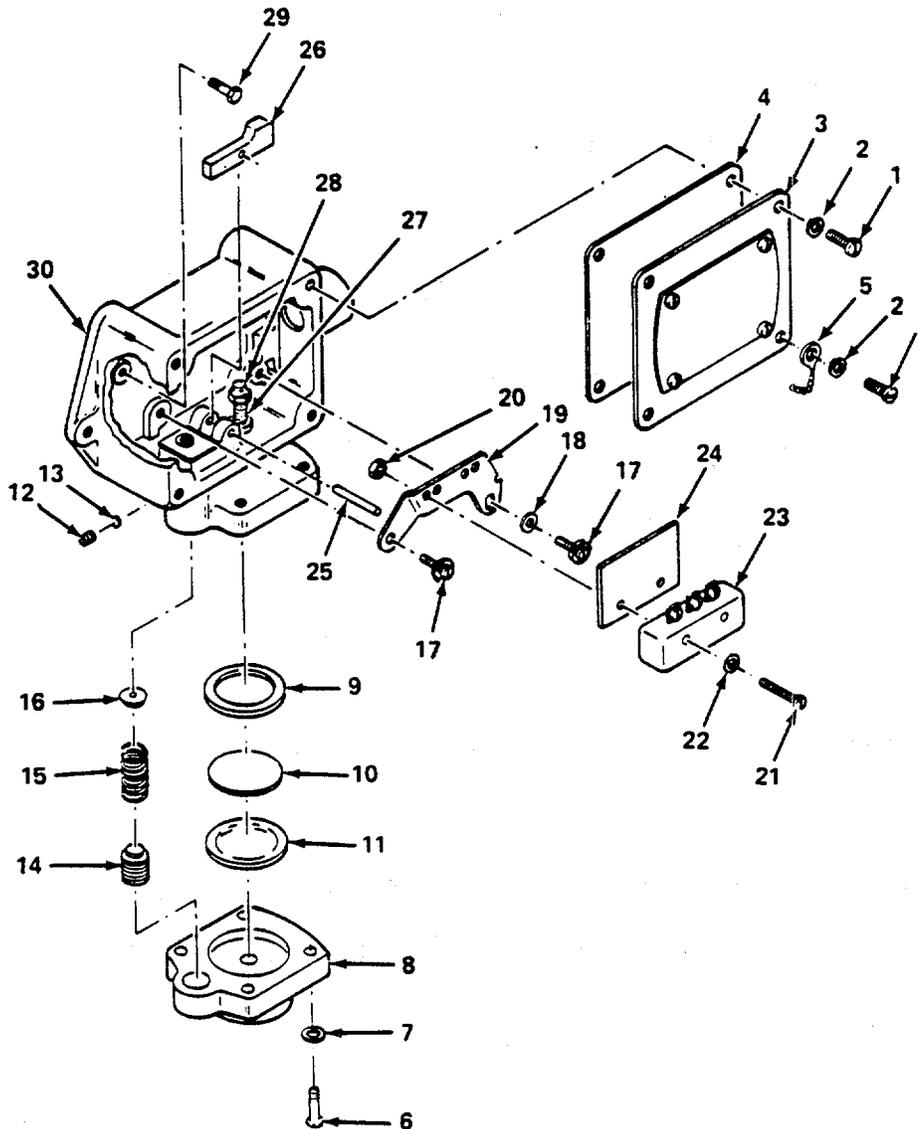
- a. Remove four screws (1) and lockwashers (2) to remove cover (3) and cover gasket (4) and release cover retainer (5).
- b. Set multimeter to OHMS X1. Connect multimeter leads to limit switch (6) terminal marked C and NC.

#### NOTE

Test can be performed using either dead weight gage tester or a calibrated pressure gage with a source of hydraulic or pneumatic pressure.

**TEST. (Cont)**

- c. Connect low-pressure switch to dead weight gage tester or a calibrated pressure gage with a source of hydraulic or pneumatic pressure.
- d. Apply 11 psi (78.85 kPa) to low-pressure switch as indicated by dead weight gage tester or calibrated pressure gage.
  - (1) If multimeter indicates infinite ohms, go to step e.
  - (2) If multimeter indicates 0 ohm, calibrate low-pressure switch.
  - (3) If low-pressure switch cannot be calibrated, disassemble low-pressure switch and replace faulty components.
- e. Apply 10 psi (68.95 kPa) to low-pressure switch as indicated by dead weight gage tester or calibrated pressure gage.
  - (1) If multimeter indicates 0 ohm, test is complete. Disconnect multimeter and position cover gasket (4), cover (3), and free end of retainer (5) on housing (7) and install four lockwashers (2) and screws (1).
  - (2) If multimeter indicates infinite ohms, calibrate low-pressure switch.
  - (3) If low-pressure switch cannot be calibrated, disassemble low-pressure switch and replace faulty components.



**DISASSEMBLY.**

- a. Remove four screws (1) and lockwashers (2) to remove cover (3) and cover gasket (4) and release cover retainer (5). Discard lockwashers.
- b. Remove four screws (6), lockwashers (7), fitting (8), spacer (9), pressure plate (10), and diaphragm (11). Discard lockwashers.
- c. Remove setscrew (12), soft copper slug (13), adjustment plug (14), return spring (15), and retainer (16).
- d. Remove two screws (17), washer (18), and adjustment plate (19) with limit switch assembly attached.
- e. Remove two nuts (20), screws (21), washers (22), limit switch (23), insulator (24), and adjustment plate (19).

**DISASSEMBLY. (Cont)**

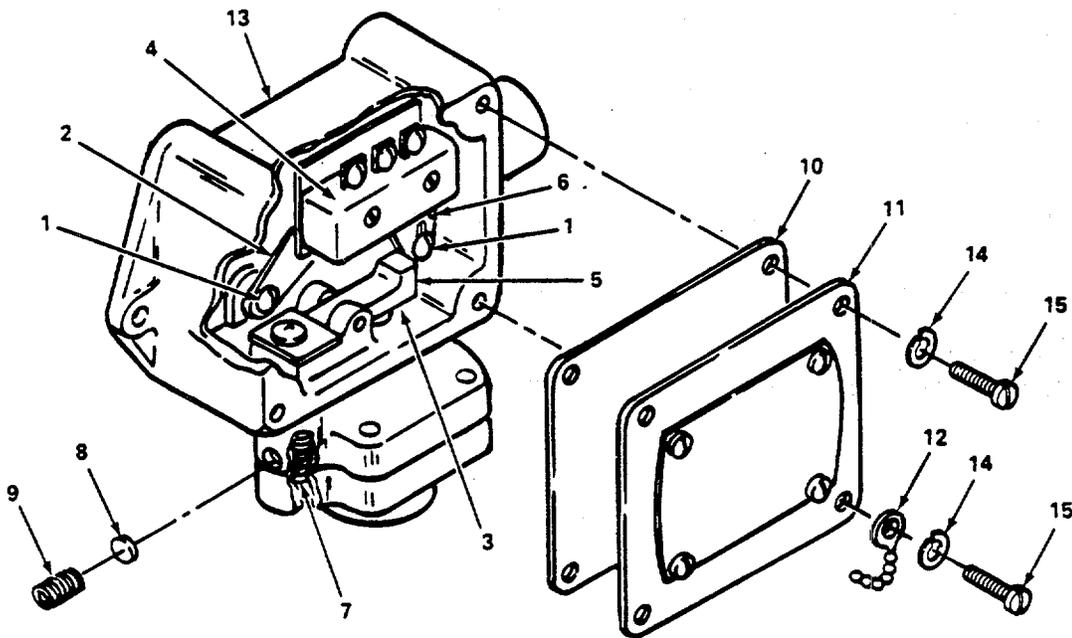
- f. Remove lever pin (25) and lever (26).
- g. Remove piston (27) and piston nut (28).
- h. Remove ground screw (29).

**INSPECTION.**

- a. Inspect all parts for corrosion. Replace as required.
- b. Inspect all threaded items for damaged heads or threads. Replace as required.
- c. Inspect diaphragm and spacer for deformity or breaks. Replace as required.

**ASSEMBLY.**

- a. Install ground screw (29).
- b. Install spring retainer (16), spring (15), and adjustment plug (14).
- c. Install diaphragm (11), pressure plate (10), and spacer (9) in fitting (8).
- d. Position fitting (8) and install four new lockwashers (7) and screws (6).
- e. Install piston nut (28) and piston (27). Turn nut to cover top threads of piston.
- f. Hold housing (30) with fitting (8) down and note clearance between piston nut (28) and bottom of housing. If clearance is zero, go to step h. If clearance is not zero, go to step g.
- g. Lift piston and nut, turn nut clockwise 1/4 turn, and release piston and nut. Note clearance and repeat step as often as needed to bring clearance to zero.
- h. Position lever (26) and install lever pin (25).
- i. Position limit switch (23) and insulator (24) on adjustment plate (19) and install two washers (22), screws (21) and nuts (20).
- j. Position adjustment plate (19) and install washer (18) and two screws (17).



**CALIBRATION.**

- a. Loosen two screws (1), push up movable end of adjustment plate (2), then tighten screws (1) until snug.
- b. Use feeler gage to measure piston-to-lever gap (3).
- c. Set multimeter scale to OHMS X1. Connect multimeter leads to limit switch (4) terminals marked C and NC.
- d. Insert feeler gage that is half of gap width. With one hand, push down lever (5), trapping gage blade in gap.
- e. With other hand, place blade tip of screwdriver in notch (6) and twist to slowly force adjustment plate (2) down. When multimeter indication goes from infinite ohms to 0 ohm, tighten screws (1) to lock adjustment.

**NOTE**

Calibration can be performed using either dead weight gage tester or a calibrated pressure gage with a source of hydraulic or pneumatic pressure.

- f. Connect low-pressure switch to dead weight gage tester or a calibrated pressure gage with a source of hydraulic or pneumatic pressure.

**CALIBRATION. (Cont)**

- g. Apply 10 psi (68.95 kPa) to low-pressure switch as indicated by dead weight gage tester or calibrated pressure gage.
- h. If multimeter indicates 0 OHM, turn adjustment plug (7) counterclockwise one turn more than needed to change indication to infinite OHMS.
- i. Slowly turn adjustment plug (7) until multimeter indicates 0 OHM.
- j. Install soft copper slug (8) and setscrew (9).
- k. Position cover gasket (10), cover (11), and free end of cover retainer (12) on housing (13) and install four new lockwashers (14) and screws (15).

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### 3-16. REPAIR HIGH-PRESSURE SWITCH.

This task covers: a. Disassembly. b. Inspection. c. Assembly. d. Calibration.

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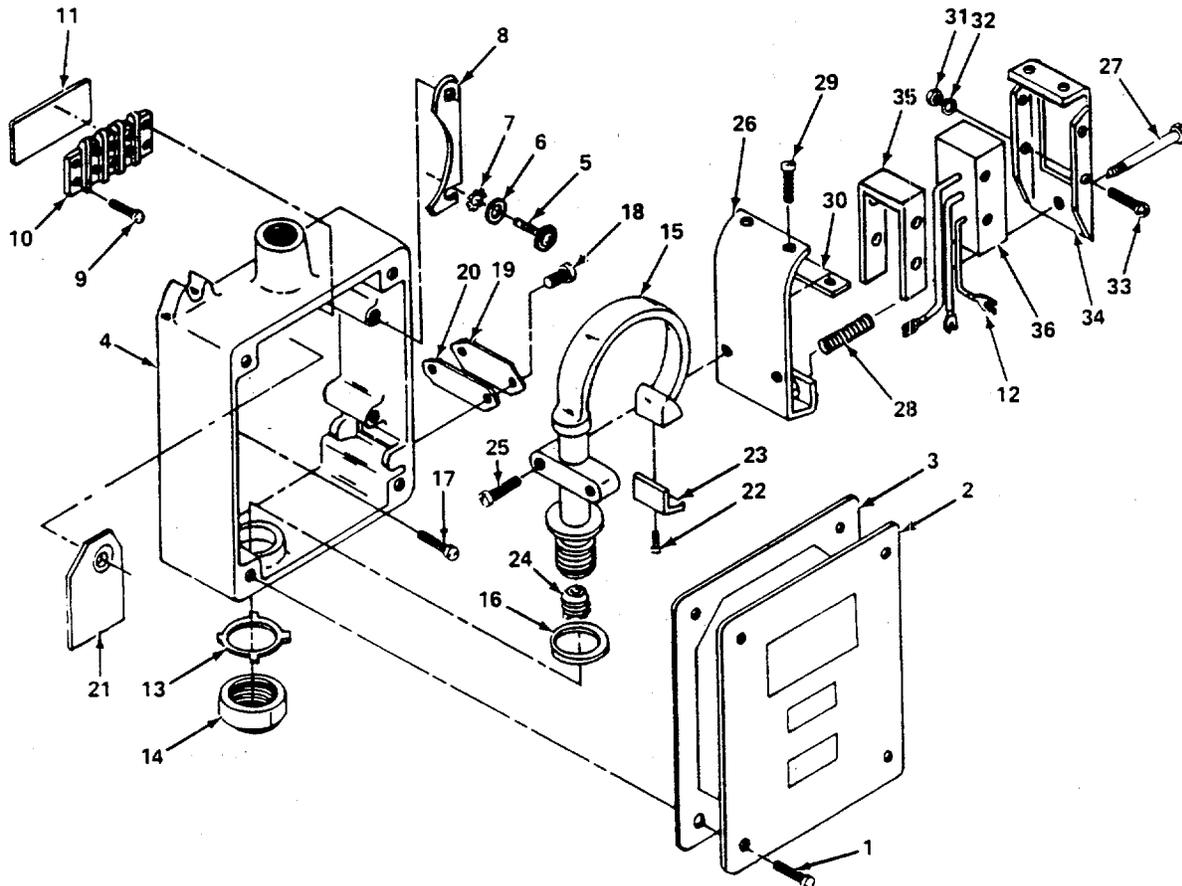
#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Set III, Item 10).  
Multimeter (Appx B, Sect III, Items 6 and 9).  
Calibrated Pressure Gage (Appx B, Sect III, Items 6 and 9).  
Variable Hydraulic/Pneumatic Pressure Source (Appx B, Sect III, Items 6 and 9).
- b. Equipment Condition. High-pressure switch removed (paragraph 2-85).
- c. General Safety Requirements

#### WARNING

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.

---



**DISASSEMBLY.**

- a. Remove four screws (1), housing cover (2), and housing cover gasket (3) from housing (4).
- b. Remove two screws with washers (5), flat washers (6), external-toothed lockwashers(7), and tube stop plate (8).
- c. Tag and remove three limit switch wires (12) from terminal block (10).
- d. Remove two screws with washers (9), lift terminal block (10), and remove terminal strip marker (11).

**NOTE**

Calibration is required after replacement or disassembly of Bourdon tube.

- e. Bend lockwasher (13) tabs clear of socket nut (14).
- f. Remove socket nut (14), lockwasher (13), Bourdon tube (15), and socket gasket (16).
- g. Remove ground screw (17).
- h. Remove two screws with washers (18), adjustment cover (19), and adjustment cover gasket (20).
- i. Remove tag (21) from Bourdon tube (15).
- j. Remove two screws with washers (22) and contact bracket (23).
- k. Remove dampener (24) from within Bourdon tube (15).
- l. Remove two screws with washers (25) and assembly bracket (26).
- m. Remove adjusting screw (27) and overload spring (28).
- n. Remove two screws with washers (29) and bracket clamp (30).
- o. Remove two nuts (31), washers (32), screws (33), limit switch bracket (34), and insulator (35) from limit switch (36).

**INSPECTION.**

- a. Inspect gasket for breaks.
- b. Inspect all parts for evidence of water damage. Replace as required.
- c. Inspect Bourdon tube for cracks, bulges, or twists. Replace as required.
- d. Inspect limit switch and wires for cracked or charred insulation and loose terminals. Replace limit switch if wires are damaged.

**INSPECTION. (Cont)**

- e. Inspect terminal block for damaged or missing screws and broken or charred barriers. Replace as required.

**ASSEMBLY.**

**NOTE**

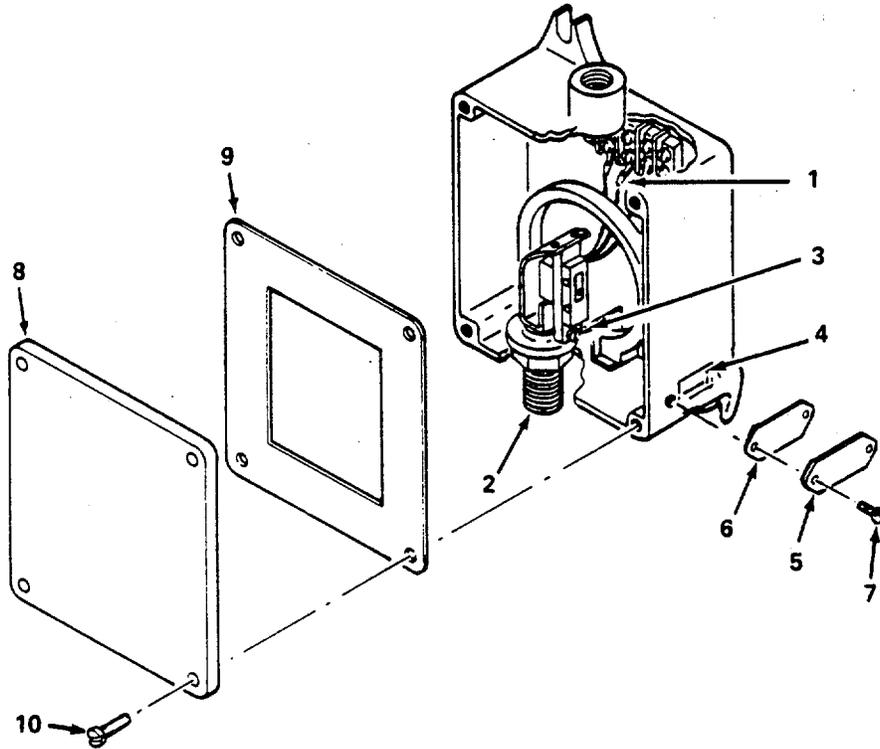
Calibration is required after replacement or disassembly of Bourdon tube.

- a. Position limit switch (36) and insulator (35) in limit switch bracket (34) and install two screws (33), washers (32), and nuts (31).
- b. Position bracket clamp (30) and limit switch bracket (34) on assembly bracket (26) and install two screws with washers (29).
- c. Install overload spring (28) and adjusting screw (27).
- d. Tie tag (21) to Bourdon tube (15).
- e. Install dampener (24) in Bourdon tube (15).
- f. Position contact bracket (23) on Bourdon tube (15) and install two screws with washers (22).
- g. Position assembly bracket (26) inside Bourdon tube (15) loop and install two screws with washers (25).
- h. Install ground screw (17) in housing (4).

**NOTE**

Purple limit switch wire connects to outside terminal (C). Red limit switch wire connects to middle terminal (NO). Blue limit switch wire connects to inside terminal (NC).

- i. Connect three limit switch wires (12) to terminal block (10) as tagged.
- j. Position terminal strip marker (11) and terminal block (10) in housing (4) and install four screws with washers (9).
- k. Position socket gasket (16) and Bourdon tube (15) in housing (4) and install lockwasher (13) and socket nut (14).
- l. Bend tabs of lockwasher (13) up against sides of socket nut (14).
- m. Position tube stop plate (8) on housing (4) and install two external-toothed lockwashers (7), flat washers (6), and screws with washers (5).



**CALIBRATION.**

- a. Set multimeter scale to OHMSX1 and connect leads to terminal board connections marked C and NO. If multimeter indicates 0 OHM, go to step b. If multimeter indicates infinity (open), replace the limit switch.

**NOTE**

Calibration can be performed using either dead weight gage tester or a calibrated pressure gage with a source of hydraulic or pneumatic pressure.

- b. Connect pressure inlet (2) to deadweight gage tester or a calibrated pressure gage with a source of hydraulic/pneumatic pressure.

**WARNING**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.

- c. Raise pressure to 1250 psi (8618.75 kPa) as indicated on dead weight gage tester or calibrated pressure gage.
- d. Use flat screwdriver to reach adjustment screw (3) through adjustment hole (4). If multimeter indicates 0 ohm, turn adjusting screw clockwise until multimeter indicates infinite ohms, then counterclockwise until multimeter again indicates 0 ohm. If multimeter does not indicate 0 ohm, turn adjusting screw counterclockwise until multimeter indicates 0 ohm.

**CALIBRATION. (Cont)**

- e. Lower pressure until multimeter indicates infinite ohms.
- f. Raise pressure until multimeter indicates 0 ohm. If pressure gage or dead weight gage tester indicates between 1237 psi (8529.115 kPa) and 1262 psi (8701.49 kPa), go to step g. If not, repeat steps d thru f.
- g. Release pressure. Disconnect dead weight gage tester or pressure source and pressure gage from high-pressure switch.
- h. Position adjustment cover (5) and adjustment cover gasket (6) over adjustment hole (4) and install two screws with washers (7).
- i. Position housing cover (8) and housing cover gasket (9) and install four screws (10).

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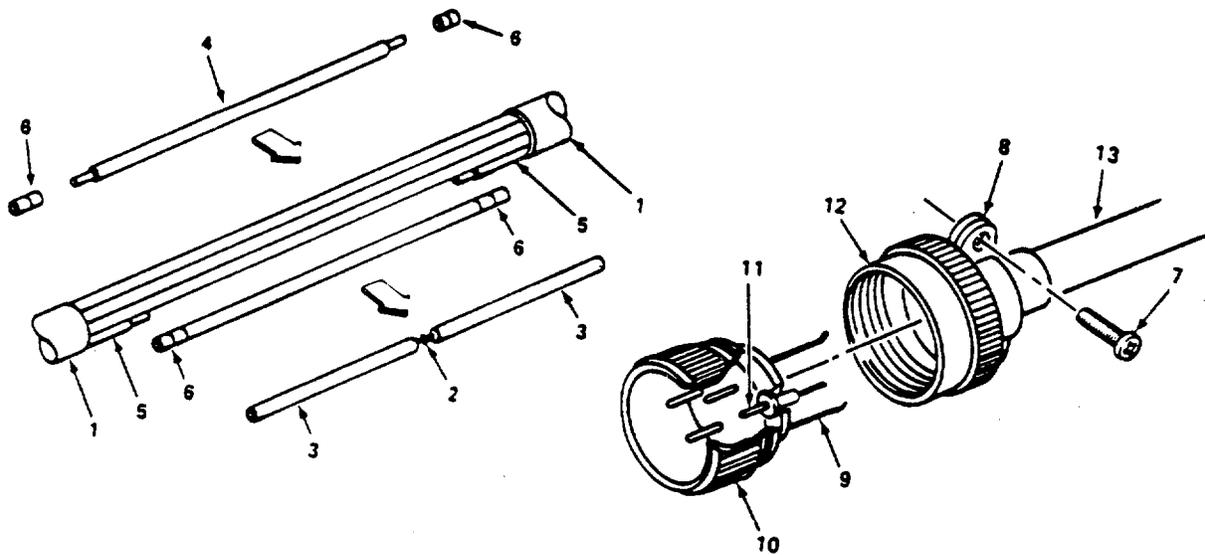
### 3-17. REPAIR CABLE ASSEMBLIES.

This task covers: a. Test cable assembly b. Splice Wire c. Replicate Connector (Multipin)

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#### INITIAL SETUP.

- a. Tools.      Tool Kit (Appx B, Sect III, Item 10).  
                  Multimeter (Appx B, Sect III, Item 6)  
                  Crimping Tool (Appx B, Sect III, Item 6)  
                  Wire Stripper (Appx B, Sect III, Item 6)  
                  Pin Removal Tool (Appx B, Sect III, Items 2 and 9)  
                  Pin Insertion Tool (Appx B, Sect III, Items 2 and 9)  
                  Soldering Kit (Appx B, Sect III, Item 6).  
                  Electrical Repair Kit (Appx B, Sect III, Item 6).
- b. Materials/Parts                      Tape, Electrical (Appx C, Sect II, Item 18). Solder
- c. Equipment Condition.      Cable assembly removed: junction box (paragraph 3-41);  
                                          control box (paragraph 3-32); R.O. pump motor (paragraph 2-124);  
                                          raw water pump motor (paragraph 2-133); backwash pump motor  
                                          (paragraph 2-138); booster pump motor (paragraph 3-31);  
                                          chemical feed pump motor (paragraph 3-50); distribution pump motor  
                                          (paragraph 2-133).
- 



**TEST CABLE ASSEMBLY.**

**CAUTION**

- The following test is performed to detect defective wires. Before testing, be sure cable assembly is disconnected. Failure to disconnect cable can result in false test indicators.
- Make sure wire terminals are not touching each other.

**NOTE**

Refer to appropriate wiring diagram in FP appendix for cable assembly being tested.

- a. Using multimeter, test for continuity.
- b. If continuity does not exist between any two points, replace damaged or faulty wire.

**SPLICE WIRE.**

**NOTE**

There are four wires in the pump cable assembly. All wires are spliced the same. One is shown.

- a. Remove 6 inches (15.24 cm) of insulation (1) from both sides of break in wire (2).
- b. Cut off 3-inch (7.62 cm) piece of damaged wire (3) with damage in middle of removed piece.
- c. Measure and cut a piece of new wire (4) to replace damaged piece.
- d. Strip both ends of new wire (4) and two free ends of wire (5)

**NOTE**

When crimping, be sure to make a good electrical and mechanical connection between terminal and wire.

- e. Install and crimp splice (6) on each end of new wire (4).
- f. Install and crimp and new wire splices onto free ends of cable wire (5).
- g. Wrap two splices and wire 1 inch (2.54 cm) each side of splices with electrical tape.

**NOTE**

Make sure electrical tape overlaps insulation on both ends of repair area.

- h. Using electrical tape, completely wrap all wires together.

**REPLACE CONNECTOR (MULTIPIN).**

- a. Remove two screws (7) to release connector cable clamp (8).
- b. Tag four wires (9) with connector pin numbers.
- c. Using removal tool through front of connector (10), push four contacts (11) with wires (9) out of connector.

**CAUTION**

Installation of contacts in wrong connector sockets will result in malfunctions or damage to equipment. Be sure contacts are installed as tagged.

- d. Using insertion tool, install four contacts (11) in connector (10) as tagged.
- e. Install clamp (8) and two screws (7) on connector backshell (12).
- f. Tighten clamp (8) to grip cable (13) firmly.

### 3-18. REPLACE MULTIMEDIA FILTER. (CULLIGAN AND MECO)

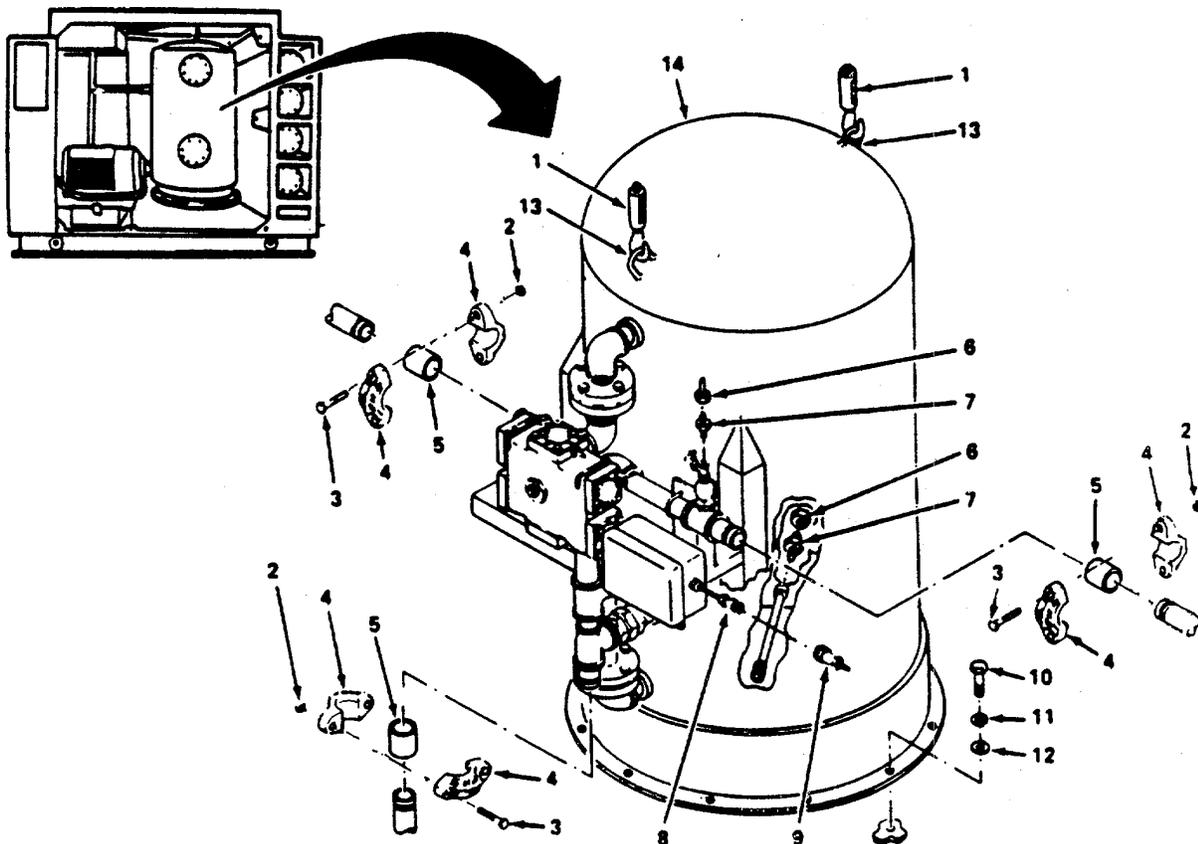
This task covers: a. Removal. b. Installation.

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sec III, Item 10).  
5-Ton Crane.
- b. Personnel Required. 2 and crane operator.
- c. Equipment Condition. ROWPU shut down (TM 10-4610-239-10).
- d. General Safety Requirements.

#### WARNING

Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.



**REMOVAL.**

- a. Loosen and remove two turnbuckles (1).
- b. Remove six nuts (2) and six bolts (3) and three clamps (4) and three gaskets (5).
- c. Remove three connectors (6) from fittings (7).
- d. Remove connector (8) from receptacle (9).
- e. Remove 12 bolts (10), 12 lockwashers (11) and 12 flat washers (12). Discard lockwashers.

**WARNING**

Lack of attention or being in an improper position during lifting operation can result in serious injury or death. Pay close attention to movements of multimedia filter. Do not stand under multimedia filter or in a position where you could be pinned against another object. Watch your footing.

**CAUTION**

Uncontrolled sideways motion of multimedia filter during lifting can cause damage to equipment. Two assistants are needed on ROWPU to control motion of multimedia filter.

- f. Attach two crane hooks to two lifting eyes (13) and carefully lift multimedia filter (14) through opening in top of ROWPU frame.

**INSTALLATION.**

**WARNING**

Lack of attention or being in an improper position during lifting operation can result in serious injury or death. Pay close attention to movements of multimedia filter. Do not stand under multimedia filter or in a position where you could be pinned against another object. Watch your footing.

**CAUTION**

Uncontrolled sideways motion of multimedia filter during lifting can cause damage to equipment. Two people are needed on ROWPU to control of multimedia filter.

- a. Attach two crane hooks to two lifting eyes (13) and carefully lift multimedia filter (14) over opening in top of ROWPU frame.
- b. Slowly lower multimedia filter (14) while two assistants on ROWPU guide it into position.
- c. Install 12 flat washers (12), new lockwashers (11), and bolts (10).
- d. Remove two crane hooks and install two turnbuckles (1).
- e. Install connector (8) on receptacle (9).

**INSTALLATION. (Cont)**

- f. Install three connectors (6) on fittings (7).
- g. Install three gaskets (5) and clamps (4) and six bolts (3) and nuts (2).

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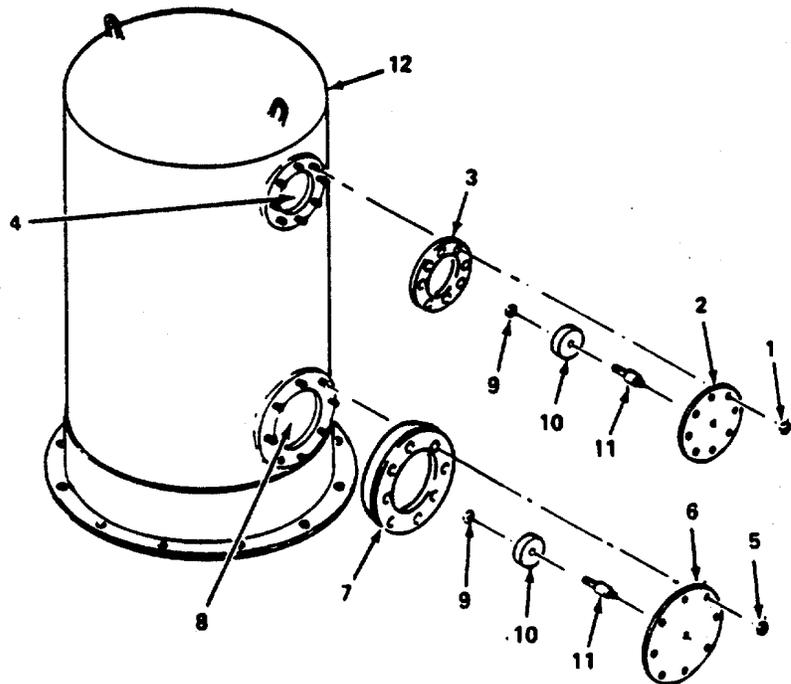
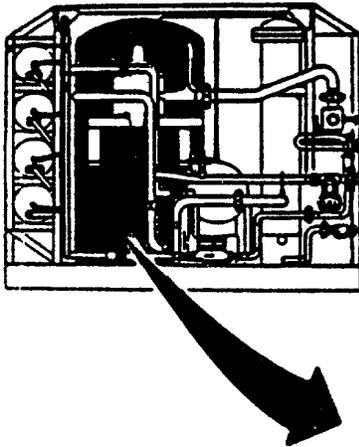
### 3-19. REPAIR MULTIMEDIA FILTER. (CULLIGAN)

This task covers: a. Disassembly. b. Cleaning c. Inspection d. Assembly.

---

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sec III, Item 10).  
Garden Hose (Appx B, Sect III, Item 3).  
Stiff-Bristled Brush (Appx B, Sect III, Item 1).
  
  - b. Materials/Parts. Detergent (Appx C, Sect II, Item 3).  
Gravel (Appx C, Sect II, Item 6).  
Coarse Garnet (Appx C, Sect II, Item 4).  
Fine Garnet (Appx C, Sect II, Item 5).  
Filter Sand (Appx C, Sect II, Item 14).  
Anthracite (Appx C, Sect II, Item 1).  
Plastic Media (Appx C, Sect II, Item 10).
  
  - c. Equipment Condition. ROWPU shut down (TM- 10-4610-239-10).  
Multimedia filter removed (paragraph 3-18).
- 



**DISASSEMBLY.**

**NOTE**

Cover a 6-foot (1.83 m) square area of the floor in front of lower flange cover to catch filtration material.

- a. Remove eight nuts (1), flange cover (2), and gasket (3) from top handhole (4). Discard gasket.

**WARNING**

Weight of media is over 1000 pounds (454 kg). Remove flange cover carefully to avoid personal injury from flange cover movement.

- b. Remove eight nuts (5), flange cover (6), and gasket (7) from bottom handhole (8). Discard gasket.
- c. Remove two nuts (9), anodes (10), and anode mounting studs (11). Discard anodes.

**CAUTION**

Be careful while removing media not to damage laterals with tools.

- d. Using a hand scoop, remove filtration material from multimedia filter (12) and discard.
- e. Turn multimedia filter (12) on side and use garden hose to flush out remaining media.

**CLEANING.**

- a. Using soap solution and stiff-bristled brush, clean anode mounting studs and flange covers.
- b. Clean flange ports, mounting studs, and nuts.

**INSPECTION.**

- a. Inspect inside and outside of multimedia filter for cracks, leaks, damage, or excessive corrosion. Replace damage multimedia filter. Refer to paragraph 3-18.
- b. Inspect anode mounting studs, nuts, and flange covers for excessive corrosion and wear. Replace as required.
- c. Inspect all inside parts for corrosion and wear. Ensure diffuser tube vent lines and screens are not clogged.

**ASSEMBLY**

- a. Install two anode mounting studs (11), new anodes (10), and nuts (9) on flange covers (2) and (6).

**CAUTION**

Pouring coarse gravel through upper handhole opening may damage filter lining.

- b. Place a total of 55 pounds (24.75 kg) of 1/4-inch medium underbed gravel in multimedia filter (12) through lower handhole opening (8).
- c. Use paddle or narrow board to level gravel.
- d. On lower handhole opening (8), install new flange gasket (7), flange cover (6), and eight nuts (5).

**NOTE**

Steps e through i must be performed in sequence.

- e. Using hand scoop, place 350 pounds (157.5 kg) of No. 12 coarse garnet through upper handhole opening (4).
- f. Repeat step e for 225 pounds (101.25 kg) of No. 50 fine garnet.
- g. Repeat step e for 175 pounds (78.75 kg) of filter sand.
- h. Repeat step e for 175 pounds (78.75 kg) of No. 2 anthracite.
- i. Repeat step e for 250 pounds (112.5 kg) of Plastic Media.
- j. On upper handhole opening (4), install new gasket (3), flange cover (2), and eight nuts (1).

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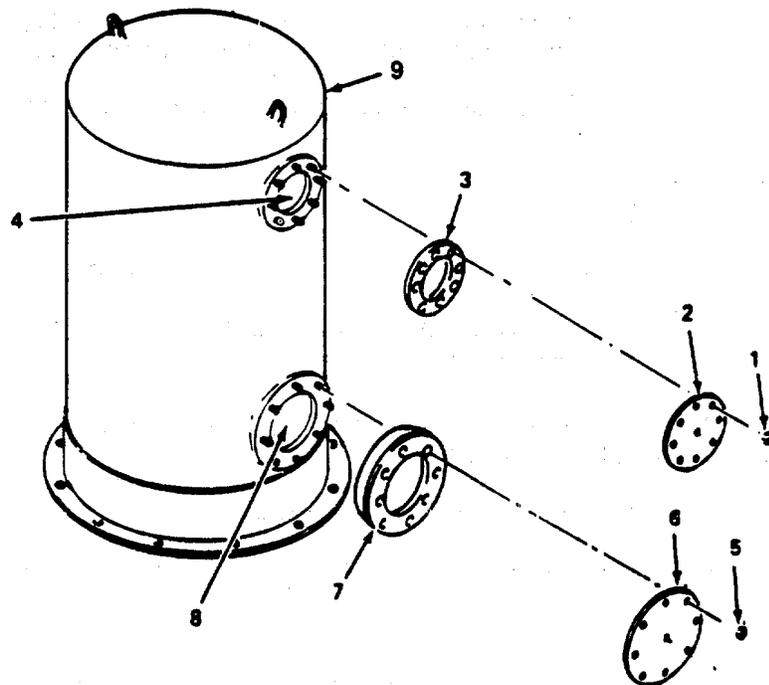
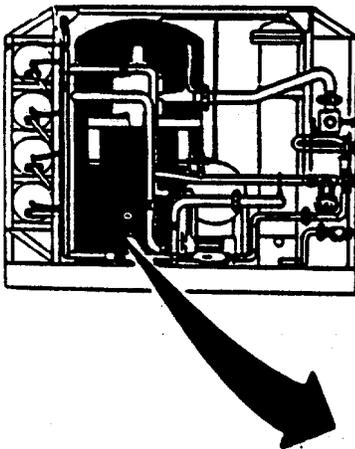
### 3-20. REPAIR MULTIMEDIA FILTER. (MECO)

This task covers: a. Disassembly. b. Cleaning c. Inspection d. Assembly.

---

#### INITIAL SETUP.

- a. Tools.     Tool Kit (Appx B, Sec m, Item 10).  
              Garden Hose (Appx B, Sect III, Item 3).  
              Stiff-Bristled Brush (Appx B, Sect III, Item 1).
  
  - b. Materials/Parts.             Detergent (Appx C, Sect II, Item 3).  
                                  Gravel (Appx C, Sect II, Item 6).  
                                  Coarse Garnet (Appx C, Sect II, Item 4).  
                                  Fine Garnet (Appx C, Sect II, Item 5).  
                                  Filter Sand (Appx C, Sect II, Item 14).  
                                  Anthracite (Appx C, Sect II, Item 1).  
                                  Plastic Media (Appx C, Sect II, Item 10).
  
  - c. Equipment Condition.     ROWPU shut down (TM 10-4610-239-10).  
                                  Multimedia filter removed (paragraph 3-18)
- 



**DISASSEMBLY.**

**NOTE**

Cover a 6-foot (1.83 m) square area of the floor in front of lower flange cover to catch filtration material.

- a. Remove eight nuts (1), flange cover (2), and gasket (3) from top handhole (4). Discard gasket.

**WARNING**

Weight of media is over 1000 pounds (454 kg). Remove flange cover carefully to avoid personal injury from flange cover movement.

- b. Remove 12 nuts (5), flange cover (6) and gasket (7) from bottom handhole (8). Discard gasket.

**CAUTION**

Be careful while removing media not to damage laterals with tools.

- c. Using a hold scoop, remove filtration material from multimedia filter (9) and discard.
- d. Turn multimedia filter (9) on side and use garden hose to flush out remaining media.

**CLEANING.**

- a. Inspect inside and outside of multimedia filter for cracks, leaks, damage or excessive corrosion. Replace damaged multimedia filter. Refer to paragraph 3-18.
- b. Inspect all inside parts for corrosion and wear. Ensure diffuser tube vent lines and screens are not clogged.

**ASSEMBLY**

**CAUTION**

Pouring coarse gravel through upper handhole opening may damage internal laterals.

- a. Place a total 245 pounds (110.25 kg) of 1/4-inch medium underbed gravel in multimedia filter (9) through lower handhole opening (8).
- b. Use paddle or narrow board to level gravel.
- c. On lower handhole opening (8), install new flange gasket (7), flange cover (6), 12 nuts (5).

**NOTE**

Steps a through i must be performed in sequence.

**ASSEMBLY. (Cont)**

- d. Using hand scoop, place 170 pounds (76.5 kg) of No. 12 coarse garnet through upper handhole opening (4).
- e. Repeat step d for 180 pounds (81 kg) of No. 50 fine garnet.
- f. Repeat step d for 230 pounds (103.5 kg) of filter sand.
- g. Repeat step d for 345 pounds (155.25 kg) of No. 2 anthracite.
- h. Repeat step d for 55 pounds (27 kg) of plastic media.
- i. On upper handhole opening (4), install new gasket (3), flange cover (2), eight nuts (1).

---

### 3-21. REPAIR MULTIMEDIA CONTROL VALVE. (CULLIGAN)

This task covers: a. Disassembly. b. Cleaning c. Inspection d. Assembly.

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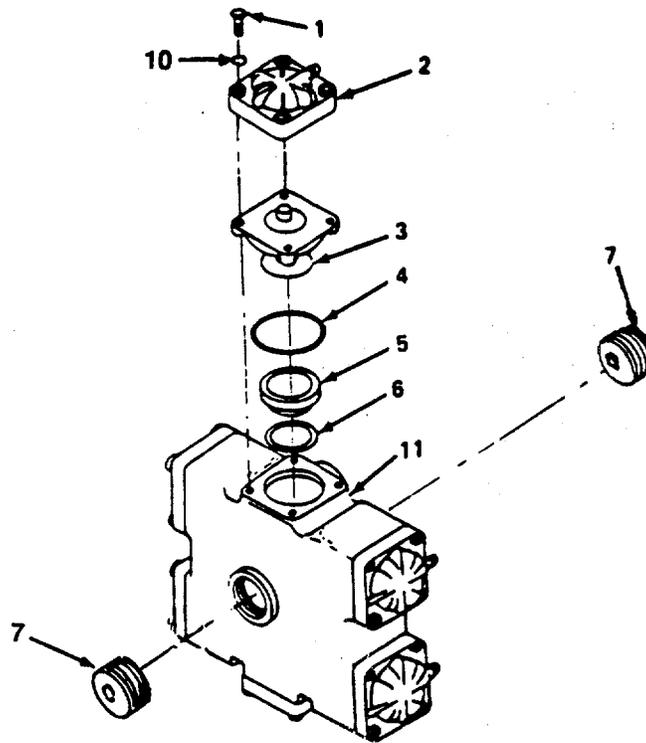
#### INITIAL SETUP.

- a. Tools.     Tool Kit (Appx B, Sec III, Item 10).  
              Torque Wrench (Appx B, Sect III, Item 7).
- b. Materials/Parts.             Drycleaning Solvent (Appx C, Sect II, Item 16).
- c. Equipment Condition.         Multimedia filter control valve removed (paragraph 2-86).
- d. General Safety Requirements.

#### WARNING

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respirator protection. Use in a well-ventilated area.

---



**DISASSEMBLY.**

**NOTE**

There are six cartridges in the multimedia filter control valve. All are disassembled the same. One is shown:

- a. Remove four screws (1) and remove cartridge cap (2).
- b. Remove cartridge assembly (3), cartridge gasket (4), seat (5), and seat gasket (6).
- c. Remove cap (7) and preformed packing (8).
- d. Remove cap assembly (9) and preformed packing (10) from valve body (11 ).
- e. Discard all gaskets and preformed packings.

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in well-ventilated area.

- a. Thoroughly clean multimedia filter control valve metal parts using drycleaning solvent.
- b. Allow parts to air dry.

**INSPECTION.**

Inspect all valve parts, cartridge assembly, cap assembly, all threaded parts, and screws for damage and/or corrosion. Replace damaged items. Clean corroded items.

**ASSEMBLY.**

**NOTE**

There are six cartridges in the multimedia filter control valve. All are assembled the same. One is shown.

- a. Install new preformed packing (10) on cap assembly (9).
- b. Install cap assembly (9) in valve body (11).
- c. Install new preformed packing (8) on cap (7).
- d. Install cap (7) in valve body (11).
- e. Install new seat gasket (6), seat (5), new cartridge gasket (4), and cartridge assembly (3) in valve body (11).

**ASSEMBLY. (Cont)**

**CAUTION**

Cartridge cap can be cracked if screws are overtightened. Do not exceed torque limits.

- f. Install cartridge cap (2) and four screws (1). Torque screws to 65 pound-inches (7.345 N.m)

---

### 3-22. REPAIR MULTIMEDIA FILTER CONTROL VALVE. (MECO)

This task covers: a. Disassembly. b. Cleaning c. Inspection c. Assembly.

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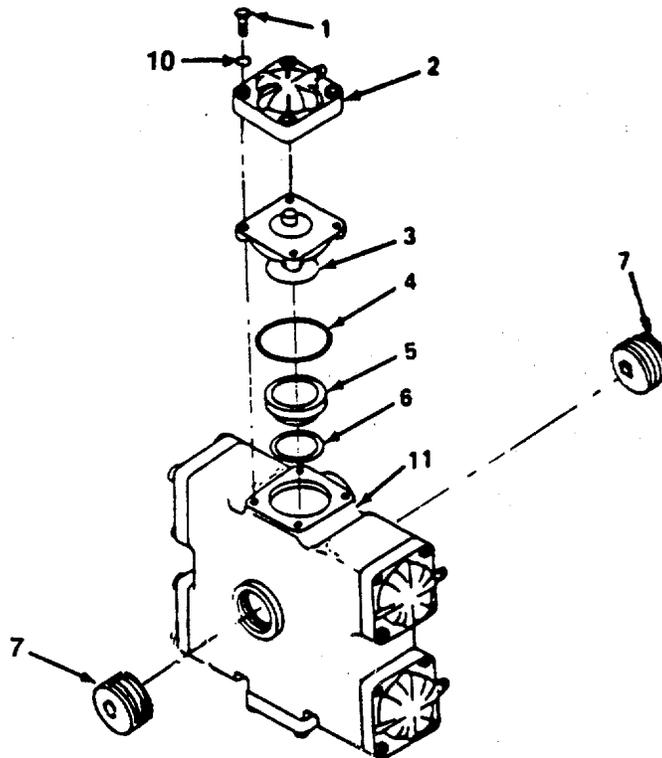
#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sec ]ml, Item 10).  
Torque Wrench (Appx B, Sect III, Item 7).  
MECO Seat Removal Tool (Appx B, Sect III, Item 12).
- b. Materials/Parts. Drycleaning Solvent (Appx C, Sect II, Item 16).
- c. Equipment Condition. Multimedia filter control valve removed (paragraph 3-23).
- d. General Safety Requirements.

#### WARNING

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated areas.

---



**DISASSEMBLY.**

**NOTE**

There are six cartridges in the multimedia filter control valve. All are disassembled the same. One is shown.

- a. Remove four screws (1), washer (10) and remove cartridge cap (2).
- b. Remove cartridge assembly (3), cartridge O-ring (4) from cartridge assembly (3).
- c. Unscrew seat (5) and remove O-ring (6).
- d. Remove two pipe plugs (7) from valve body (11).

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in well-ventilated area.

- a. Thoroughly clean multimedia filter control valve metal parts using drycleaning solvent.
- b. Allow parts to air dry.

**INSPECTION.**

Inspect all valve parts, cartridge assembly, cap assembly, all threaded parts, and screws for damage and/or corrosion. Replace damaged items. Clean corroded items.

**ASSEMBLY.**

**NOTE**

There are six cartridges in the multimedia filter control valve. All are assembled the same. One is shown.

- a. Install seat (5) and O-ring (6).
- b. Install O-ring (4) to cartridge assembly (3).

**ASSEMBLY. (Cont)**

**CAUTION**

Cartridge cap can be cracked if screws are overtightened. Do not exceed torque limits.

**NOTE**

Torque screws to 65 pound-inches (7.345 N.m)

- c. Install cartridge cap (2), washer (10) and screws (1) to valve body (11).
- d. Install two pipe plugs (7) to valve body (11).

---

### 3-23. REPLACE MULTIMEDIA FILTER CONTROL VALVE. (MECO)

This task covers: a. Removal. b. Installation.

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#### INITIAL SETUP.

Tools. Tool Kit (Appx B. Sec III, Item 10).

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#### REMOVAL.

#### CAUTION

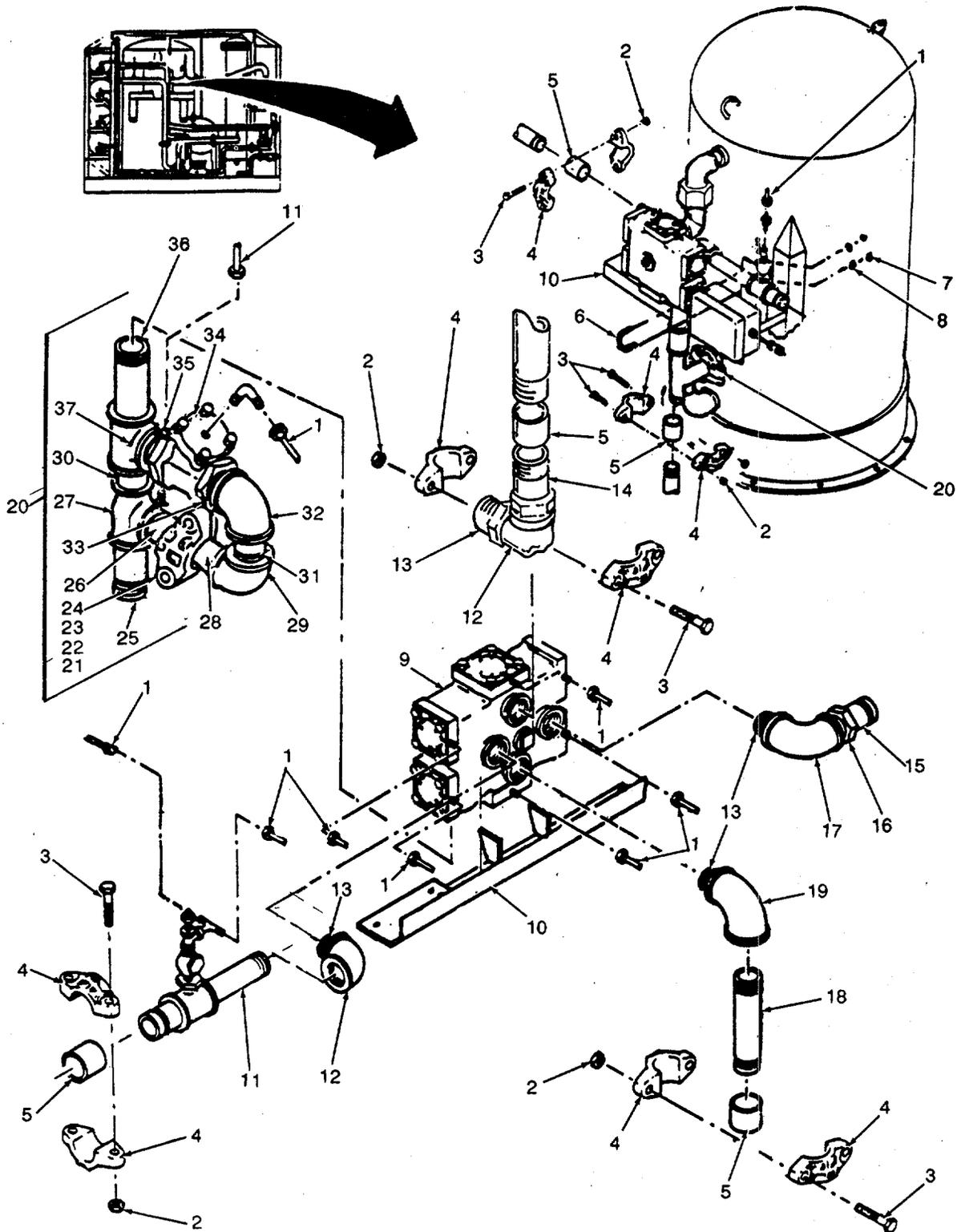
If pressure lines are not reinstalled properly, damage/failure of equipment will occur.

- a. Tag and disconnect 11 pressure lines (1).
- b. Remove 10 nuts (2) and bolts (3).
- c. Remove five clamps (4) gaskets (5).
- d. Remove U-bolt (6), two nuts (7) and lockwashers (8).

#### WARNING

Multimedia filter control valve with attached plumbing weighs over 75 pounds (34 kg). Two people are required to lift it to prevent personal injury or damage to the equipment.

- e. Lift filter control valve (9) with attached plumbing from crossmember (10).
- f. Remove pipe (11) and elbow (12). Remove nipple (13).
- g. Remove pipe (14), elbow (12) and nipple (13).
- h. Remove pipe (15) and bushing (16) from elbow (17). Remove nipple (13).
- i. Remove pipe (18) and elbow (19). Remove nipple (13).
- j. Remove pipe sub-assembly (20).
- k. Remove two nuts (21), bolts (22), clamp (23) and gasket (24).
- l. Remove pipe (25) and pipe (26).
- m. Remove tee (27).
- n. Remove pipe (28) and elbow (29).



**REMOVAL. (Cont)**

**CAUTION**

Pipes (30) and (31) are fitted with an internal orifice. Pipes should be tagged before removal.

- o. Removes pipes (30) and (31).
- p. Remove elbow (32) and nipple (33).
- q. Remove diaphragm valve (34).
- r. Remove nipple (35) and pipe (36) from tee (37).

**INSTALLATION.**

**NOTE**

Apply antiseize tape to male pipe threads before installation.

- a. Install pipe (36) into filter control valve (9). Install tee (37) onto pipe (36). Install nipple (35) into tee (37).
- b. Install diaphragm valve (34) onto nipple (35).
- c. Install nipple (33) into diaphragm valve (34). Install elbow (32) onto nipple (33).

**CAUTION**

Pipes (30) and (31) are fitted with internal orifices. Incorrect installation will result in malfunction of the multimedia filter and possible failure of the system. Check tags before installation.

- d. Install pipe (30) into tee (37).
- e. Install pipe (31) into elbow (32).
- f. Install elbow (29) onto pipe (31) and pipe (28) into elbow (29).
- g. Install tee (27) onto pipe (30) and pipe (26) into tee (27). Install pipe (25) into tee (27).
- h. Install gasket (24), clamp (23), two bolts (22) and nuts (21).
- i. Install nipple (13) onto filter control valve (9) and install elbow (19) onto nipple (13). Install pipe (18) into elbow (19).
- j. Install nipple (13) into filter control valve (9) and install elbow (17). Install bushing (16) into elbow (17) and pipe (15) into bushing (16).
- k. Install nipple (13) on filter control valve (9), elbow (12) on nipple (13) and install pipe (14) on elbow (12).
- 1. Install nipple (13) into filter control valve (9) and install elbow (12) onto nipple (13). Install pipe (11) into elbow (12).

**INSTALLATION. (Cont)**

**WARNING**

Multimedia filter control valve with attached plumbing weighs over 75 pounds (34 kg). Two people are required to lift it to prevent personal injury or damage to the equipment.

- m. Lift and place filter control valve (9) and attached piping onto crossmember (10).
- n. Install U-bolt (6), washer (8) and nut (7).
- o. Install five gaskets (5) and clamps (4). Install and tighten 10 bolts (3) and nuts (2).
- p. Replace 11 pressure lines (1).

---

### 3-24. REPAIR SOLID-STATE BACKWASH TIMER. (CULLIGAN)

This task covers: a. Disassembly b. Cleaning c. Inspection. d. Assembly.

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#### INITIAL SETUP.

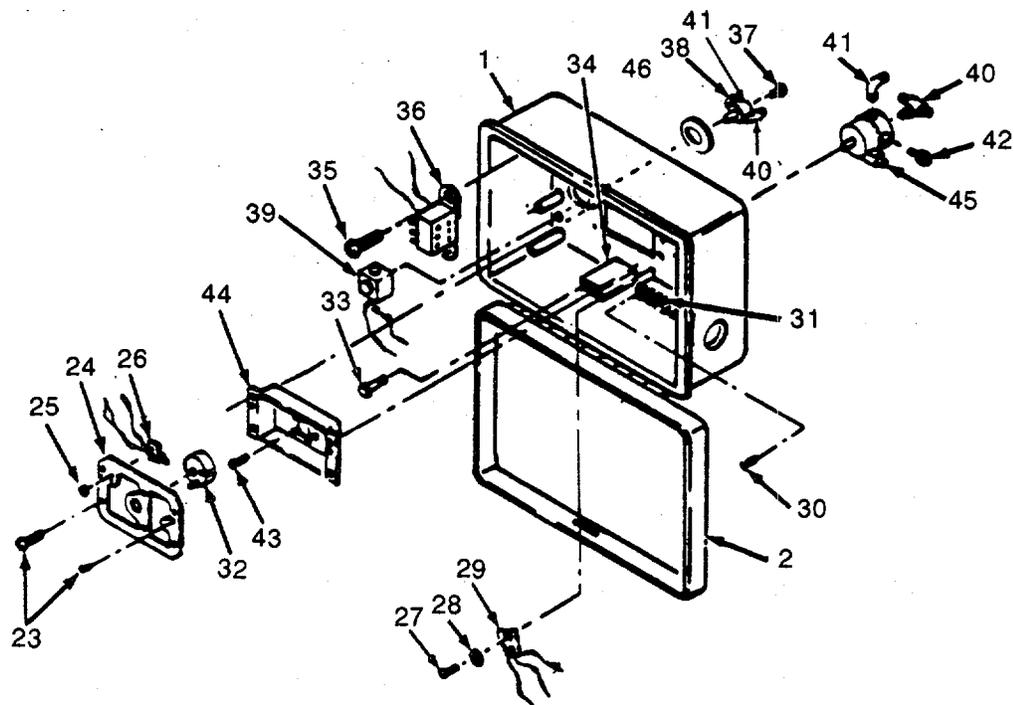
- a. Tools.      Tool Kit (Appx B, Sec III, Item 10).  
                  Multimeter (Appx B, Sect III, Items 6 and 9).  
                  Soft-Bristled Brush (Appx B, Sect III, Item 2).
- b. Materials/Parts.      Drycleaning Solvent (Appx C, Sect II, Item 16).  
                                  Antiseize Tape (Appx C, Sect II, Item 17).  
                                  Rags (Appx C, Sect II, Item 13).
- c. Equipment condition.      Solid-state backwash timer removed. (paragraph 2-90).
- d. General Safety Requirements.

#### WARNINGS

- High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
- Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

**DISASSEMBLY.**

- a. Position backwash timer box (1) on workbench and open cover (2).
- b. Loosen two setscrews (3) and remove indicator knob (4), nut (5), four screws (6), and plate (7).
- c. Remove locknut (8) and reset switch (9).
- d. Remove cable locknut (10) and pull power cable (11) to remove slack from wires (12).
- e. Loosen one screw (13) at a time and remove and tag each wire (12) as it comes free of backwash timer box (1).
- f. Tag and disconnect 13 wires (14) and cut all wire ties.
- g. Loosen setscrews (17) and remove extension adapter (18).
- h. Remove two spring-loaded screws (19), cut wire tie (20), tag and disconnect two wires (21), and remove motor (22).



- i. Remove six screws (23), pull subplate (24) out, remove two nuts (25), microswitch (26), and subplate (24).
- j. Remove two screws (27), washers (28), and microswitch (29).
- k. Remove two screws (30) and pull terminal strip (31) with tagged wires (14) away from back wall of backwash timer box (1).

**NOTE**

Mark location of cam activating pin on box before removal.

1. Remove cam (32).

**DISASSEMBLY. (Cont)**

- m. Remove two screws (33) and relay (34).
- n. Remove two screws (35) and transformer (36).
- o. Remove solenoid valve nut (37), solenoid valve assembly (38), solenoid (39) and gasket (46).
- p. Remove one tee (40) and two elbows (41) from solenoid valve assembly (38).
- q. Remove five screws (43), box (44), and pilot control (45). Remove two pipe tees (40) from pilot control (45).

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Using a soft-bristled brush and drycleaning solvent, clean cam, terminalstrip, subplate, plate, cam tee, elbow, nipple, mounting hardware, and pilot control.
- b. Using dry cloth, clean solenoid, solenoid valve, box gasket, transformer, switches, and motor.

**INSPECTION.**

- a. Inspect terminal strip, motor, transformer, and switches for breaks, overheating, and terminal damage. Replace as required.
- b. Using multimeter, test motor, transformer, and switches for continuity and short. Replace as required.
- c. Inspect printed circuit board for cracks, breaks, overheating, and circuitry damage. Replace as required.
- d. Inspect cam for excessive wear, breaks, and damage. Replace as required.
- e. Inspect plate, subplate, and gasket for cracks, damage, and excessive wear. Replace as required.
- f. Inspect solenoid valve and nut for damage. Replace as required.
- g. Inspect pilot control for cracks and damage. Replace as required.
- h. Inspect all pipe fittings for stripped or damaged threads. Replace as required.
- i. Inspect timer box and cover for damage. Replace as required.

**ASSEMBLY.**

**NOTE**

Apply antiseize tape to male pipe threads before installation.

- a. Position backwash timer box (1) on workbench for assembly.
- b. Install adapter (42), two elbows (41), and two pipe tees (40) on pilot control (45).
- c. Position box (44) and pilot control (45) and install five screws (43).
- d. Install gasket (46) on solenoid valve assembly (38).
- e. Position solenoid valve assembly (38) and solenoid (39) and install solenoid valve nut (37).
- f. Install pipe tee (40) and two elbows (41) on solenoid valve assembly (38).
- g. Position transformer (36) and install two screws (35).
- h. Position relay (34) and install two screws (33).
- i. Position microswitch (29) and install two screws (27) and flat washers (28).
- j. Position terminal strip (31) with tagged wires (14) attached and install two screws (30).
- k. Position microswitch (26) on subplate (24) and install two nuts (25).
- l. Position cam (32) in box (44) and align marks made during disassembly.
- m. Position subplate (24) and install six screws (23).
- n. Position motor (22), connect two wires (21), and install two spring-load screws (19).
- o. Use extension adapter (18) to turn cam (32) counterclockwise until cam lug just clears actuator arm of microswitch (26).
- p. Reposition extension adapter (18) on shaft of cam (32) as required to position flat side of extension adapter toward motor (22). Tighten setscrews (17).
- q. Position printed circuit board (16), install five screws (15), and connect 13 wires (14).
- r. Remove tags from wires (12) one at a time, place wires through hole and locknut (10), and secure wires to terminal strip (31) with screws (13) as tagged.
- s. Tighten cable locknut (10) on cable sealing grip.
- t. Install locknut (8) on reset switch (9).
- u. Position plate (7) on reset switch (9) and extension adapter (18) and install nuts (5).

**ASSEMBLY. (Cont)**

**NOTE**

One setscrews must be installed horizontally and in line with pointer.

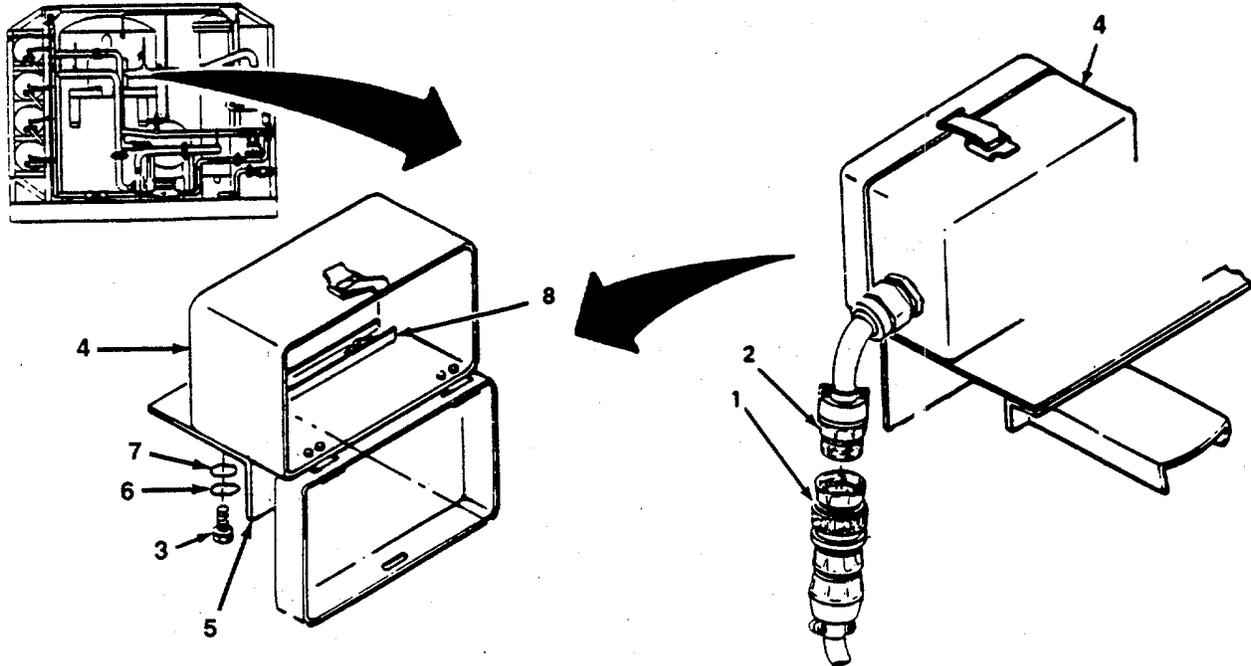
- v. Position plate (7) and install four screws(6), indicator knob (4), and two setscrews (3).
- w. Close cover (2).

### 3-25. REMOVAL OF TIMER ASSEMBLY. (MECO)

This task covers: a. Removal. b. Installation.

#### INITIAL SETUP.

Tools. Tool Kit (Appx B, Sec III, Item 10).



#### REMOVAL.

- Disconnect power cable (1) from connector receptacle (2).
- Refer to paragraph 2-91 and remove pressure lines from timer.
- Remove two screws (3), two lockwashers (6) and two flat washers (7).
- Remove mounting bracket (8).
- Lift timer assembly (4) from crossmember (5) and remove.

#### INSTALLATION.

- Locate timer assembly (4) on crossmember (5) install mounting bracket (8) and install two screws (3), two lockwashers (6) and two flat washers (7).
- Install pressure lines per paragraph 2-91.
- Connect receptacle (2) to power cable (1).

---

### 3-26. REPAIR FRAME.

---

#### INITIAL SETUP.

- a. Tools.      Tool Kit (Appx B, Sect III, Item 10).  
                  Vernier Caliper (Appx B, Sect m, Items 6 and 9).  
                  Tap Wrench (Appx B, Sect III, Item 7).  
                  Portable Electric Drill (Appx B, Sect III, Items 6 and 9).  
                  Standard Insert Repair Kit (Appx B, Sect III, Items 2 and 9).  
                  Oversize Insert Repair Kit (Appx B, Sect III, Items 2 and 9).  
                  Swage Tool Stop (Appx B, Sect III, Items 2 and 9).
- b. Materials/Parts.              Drycleaning Solvent (Appx C, Sect II, Item 16).  
                                          Transmission Oil (LO 5-4610-215-12).  
                                          Rags (Appx C, Sect II, Item 13).
- c. General Safety Requirements.

#### WARNINGS

- Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.
- Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

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For standard procedures for removal, cleaning, inspection, and installation, refer to Chapter 2, Section VI, of this manual.

For welding procedures, refer to TM 9-237.

For repair of metal bodies, refer to TM 9-450.

**Section IV. BOOSTER PUMP AND DISTRIBUTION PUMP ASSEMBLIES  
MAINTENANCE PROCEDURES**

	Para	Page
Repair Booster Pump and Distribution Pump (AMPCO).....	3-27	3-143
Repair Booster Pump and Distribution Pump (SCOT).....	3-28	3-146
Repair Booster Pump and Distribution Pump Electric Motors.....	3-29	3-149
Repair Booster Pump and Distribution Pump Electric Motor (Balder Motor).....	3-30	3-153
Replace Booster Pump Cable Assembly.....	3-31	3-157
Repair Booster Pump and Distribution Pump Cable Assemblies. For procedures to repair booster pump and distribution pump cable assemblies, refer to.....	3-17	3-113

### 3-27. REPAIR BOOSTER PUMP AND DISTRIBUTION PUMP. (AMPCO)

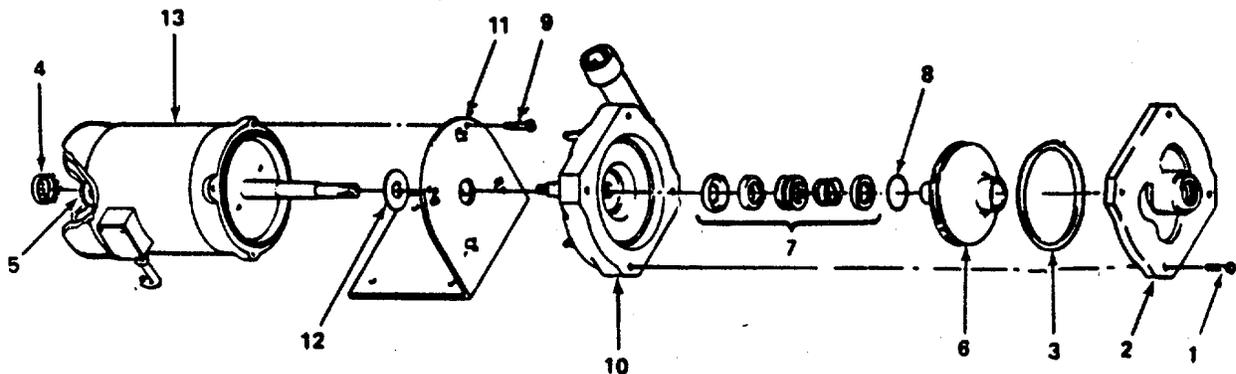
This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sec III, Item 10).
- b. Materials/Parts. Drycleaning Solvent (Appx C, Sect II, Item 16).  
Detergent (Appx C, Sect II, Item 3).
- c. Equipment Condition. Booster pump assembly removed (paragraph 2-82).  
Distribution pump assembly removed (paragraph 2-131).
- d. General Safety Requirements.

#### WARNING

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.



#### DISASSEMBLY.

#### NOTE

Booster pump and distribution pump are disassembled the same. Booster pump is shown.

- a. Remove four screws (1), cover (2), and gasket (3).
- b. Remove cap (4) and insert screwdriver in shaft slot (5).
- c. While holding shaft with screwdriver, remove impeller (6) and mechanical seal (7).

**DISASSEMBLY. (Cont)**

- d. Remove O-ring (8) from impeller (6). Discard O-ring.
- e. Remove four cap screws (9), casing (10), and bracket (11).
- f. Rotate bracket (11) and remove bracket from casing (10).
- g. Remove remaining parts of mechanical seal (7) from casing (10).
- h. Remove slinger (12) from shaft of electric motor (13).

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Using drycleaning solvent, clean casing externally and adapter. Air dry parts.
- b. Using wire brush, clean rust and corrosion from casing and adapter.
- c. Using mild soap solution, wash casing internally and impeller.

**INSPECTION.**

- a. Inspect casing and impeller for cracks and damage. Replace parts as required.
- b. Inspect washer and mounting hardware for excessive wear or other damage. Replace parts as required.
- c. Inspect mechanical seal for deformed metal parts or torn rubber parts. Replace seal as required.

**ASSEMBLY.**

**NOTE**

Booster pump and distribution pump are assembled the same.  
Booster pump is shown.

- a. Install new slinger (12) on shaft of electric motor (13).
- b. Position electric motor (13) on bracket (11) and install four cap screws (9).

**ASSEMBLY. (Cont)**

**CAUTION**

Seal assembly must be installed in casing with raised end first.

- c. Position casing (10) on bracket (11) and install new mechanical seal (7) new O-ring (8).
- d. Insert blade of screwdriver in shaft slot (5) and install impeller (6).
- e. Position gasket (3) in cover and cover (2) on casing (10). Install four screws (1).
- f. Install cap (4).

---

### 3-28. REPAIR BOOSTER PUMP AND DISTRIBUTION PUMP. (SCOT)

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

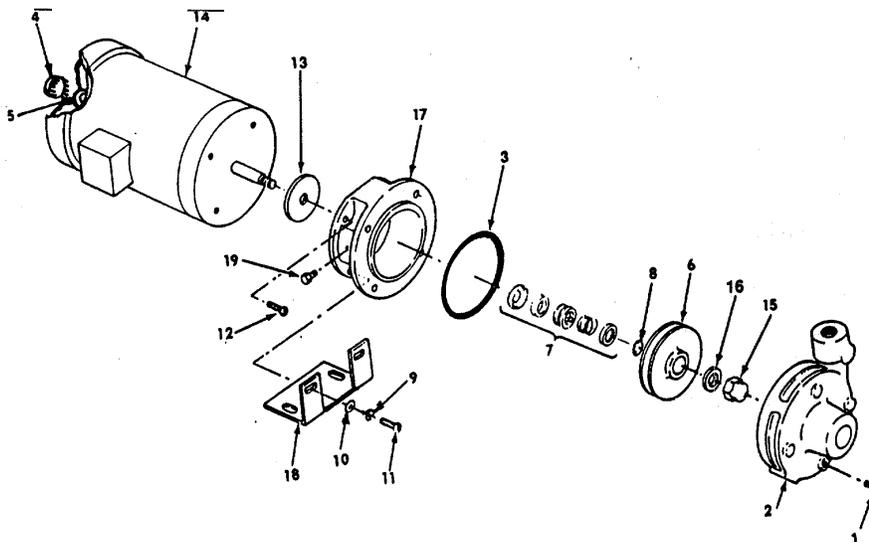
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#### INITIAL SETUP.

- a. Tools.     Tool Kit (Appx B, Sec HI, Item 10).  
              Multimeter (Appx B, Sect III, Item 7).  
              Arbor Press.
- b. Materials/Parts.             Grease (Appx C, Sect II, Item 9).  
                                      Rags (Appx C, Sect II, Item 13).
- c. Equipment Condition.     Electric Motor removed (paragraph 3-27).
- d. General Safety Requirements.

#### WARNINGS

- High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
- Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.
- Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.



**DISASSEMBLY.**

**NOTE**

Booster pump and distribution pump are disassembled the same. Booster pump is shown.

- a. Remove four bolts (1), cover (2), and gasket (3).
- b. Remove cap (4) and insert screwdriver in shaft slot (5).
- c. While holding shaft with screwdriver, unscrew acorn nut (15), washer (16), impeller (6), and mechanical seal (7).
- d. Remove O-ring (8) from impeller (6). Discard O-ring
- e. Remove two bottom lockwashers (9), washer (10), and bolt (11).
- f. Remove two bolts at top (12).
- g. Remove bronze adapter (17) and bracket (18) from motor (14).
- h. Remove plug (19) from bronze adapter (17).
- i. Remove slinger (13) from shaft of electric motor (14).

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Using drycleaning solvent, clean external casing components and adapter. Air dry parts.
- b. Using wire brush, clean rust and corrosion from casing and adapter.
- c. Using mild soap solution, wash casing internally and impeller.

**INSPECTION.**

- a. Inspect casing and impeller for cracks and damage. Replace parts as required.
- b. Inspect washer and mounting hardware for excessive wear or other damage. Replace parts as required.
- c. Inspect mechanical seal for deformed metal parts or torn rubber parts. Replace seal as required.

**ASSEMBLY.**

**NOTE**

Booster pump and distribution pump are assembled the same.  
Booster pump is shown.

- a. Install slinger (13) on shaft of electric motor (14).
- b. Install plug (19) to bronze adapter (17).
- c. Install bracket (18) and bronze adapter (17) to motor (14).
- d. Install two bottom lockwashers (9), washers (10), and bolt (11).
- e. Install two bolts (12) at top.

**CAUTION**

Seal assembly must be installed in casing with raised end first.

- f. Install mechanical seal (7) into bronze adapter (17).
- g. Install O-ring (8) to impeller (6).
- h. Install impeller (6) on shaft of electric motor (14).
- i. Insert blade of screwdriver in shaft slot (5).
- j. Install washer (16) and acorn nut (15).
- k. Position gasket (3) in cover and cover (2) on casing (10). Install four bolts (1).
- l. Install cap (4).

**TEST.**

- a. Secure motor to test bench.

**WARNING**

Electrical high voltages can cause serious injury or death.  
Some tests require power to be connected. Always take proper  
measures to ensure personal safety.

- b. Connect motor wiring to test bench leads.
- c. Connect power and run motor with and without load.
- d. Check motor for excessive vibration and fast temperature rise.
- e. Disconnect motor from test bench leads.

---

### 3-29. REPAIR BOOSTER PUMP AND DISTRIBUTION PUMP ELECTRIC MOTORS.

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly. e. Test.

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#### INITIAL SETUP.

- a. Tools.      Tool Kit (Appx B, Sect m, Item 10).  
                  Multimeter (Appx B, Sect III, Item 7).  
                  Arbor Press.
- b. Materials/Parts.      Grease (Appx C, Sect II, Item 9).  
                                  Rags (Appx C, Sect II, Item 13).
- c. Equipment Condition.      Electric motor removed (paragraph 3-27).
- d. General Safety Requirements.

#### WARNINGS

- High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
- Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.

**DISASSEMBLY.**

**NOTE**

Booster pump electric motor and distribution pump electric motor are disassembled the same. Booster pump electric motor is shown.

- a. Remove four screws (1), conduit box cover (2), and gasket (3). Discard gasket.
- b. Remove two screws (4), conduit box (5), and insulator (6). Discard insulator.
- c. Remove three screws (8) and fan cover (9).
- d. Remove setscrews (10), fan clamp (11), and external fan (12) from rotor shaft (13).

**NOTE**

Mark fan end plate, case, and pump end plate to assist in alignment during assembly.

- e. Remove four bolts (14).
- f. Tap plate (15) with soft-faced mallet to break bond with case (16) and remove plate.
- g. Remove wavy washer (17) and shim (18) from rotor shaft (13).
- h. Using arbor press, remove bearing (19) from rotor shaft (13).

**CAUTION**

Stator wiring inside case can be damaged by rotor shaft if rotor shaft is not removed carefully. Guide rotor shaft carefully while removing it.

- i. Tap plate (20) with soft-faced mallet to break bond case (16) and remove plate with rotor shaft (13) attached.
- j. Remove two screws (21) and plate (20) from rotor shaft (13).
- k. Using arbor press, remove bearing (22) and sleeve (23) from plate (20).
- l. Remove retainer ring (24).

**CLEANING.**

**WARNING**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi (207 kPa) air pressure.

- a. Using compressed air, blow dust and grit from stator and rotor assemblies. Wipe rotor assembly with clean rag.
- b. Clean fan cover vent slots with compressed air and wipe with clean rag.

**CLEANING. (Cont)**

- c. Wipe bearings with clean rag.
- d. Scrape loose paint from fan cover, case, and pump end plate. Prime and paint as necessary.

**INSPECTION.**

- a. Inspect leads and windings of stator in case for evidence of cracked or burned insulation. Replace as required.
- b. Inspect rotor shaft for loose or burned conducting bars. Replace as required.
- c. Inspect bearings for wear. Replace as required.
- d. Inspect end plates for cracks. Replace as required.
- e. Using multimeter set to OHMS X1 scale, connect test leads to pairs of motor lead sets: 4, 5, and 9 to 1 and 7; 1 and 7 to 2 and 8; 1 and 7 to 3 and 6; and 2 and 8 to 3 and 6.
- f. If multimeter indication is not 0 ohm for each pair of windings, replace stator.
- g. Set multimeter to OHMS X1000 scale. Connect one lead to stator housing. Connect other lead to each motor lead in turn.
- h. If multimeter indication is not infinity for each motor lead, replace stator.

**ASSEMBLY.**

**NOTE**

Booster pump electric motor and distribution pump electric motor are assembled the same. Booster pump electric motor is shown.

- a. Pack two bearings (19) and (22) and use arbor press to install bearing (19) on short end of rotor shaft (13).
- b. Position retainer ring (14) on rotor shaft (13) and use arbor press to install sleeve (23) and bearing (22) on rotor shaft (13).
- c. Align retainer ring (24) with screw holes on plate (20) and install two screws (21).

**CAUTION**

Stator wiring inside case can be damaged by rotor shaft if rotor shaft is not installed carefully. Guide rotor shaft carefully while installing it.

- d. Insert rotor shaft (13) through (16).
- e. Position plate (20). Align mark made during disassembly with mark on case (16).
- f. Install wavy washer (17) on short end of rotor shaft (13).

**ASSEMBLY. (Cont)**

- g. While holding plate (20) aligned on one end of case (16), position plate (15) on other end. Align mark made on plate during disassembly with mark on case.
- h. Install four bolts (14).
- i. Install fan (12), fan clamp (11), and setscrews (10).
- j. Install fan cover (9) and three screws (8).
- k. Position insulator (6) and conduit box (5) and install two screws (4).
- l. Position gasket (3) and conduit box cover (2) and install four screws (1).

**TEST.**

- a. Secure motor to test bench.

**WARNING**

Electrical high voltages can cause serious injury or death. Some tests require power to be connected. Always take proper measures to ensure personal safety.

- b. Connect motor wiring to test bench leads.
- c. Connect power and run motor with and without load.
- d. Check motor for excessive vibration and fast temperature rise.
- e. Disconnect motor from test bench leads.

---

**3-30. REPAIR BOOSTER PUMP AND DISTRIBUTION PUMP ELECTRIC MOTOR.  
(BALDOR MOTOR).**

This task covers:            a. Disassembly.            b. Cleaning.            c. Inspection.            d. Assembly.

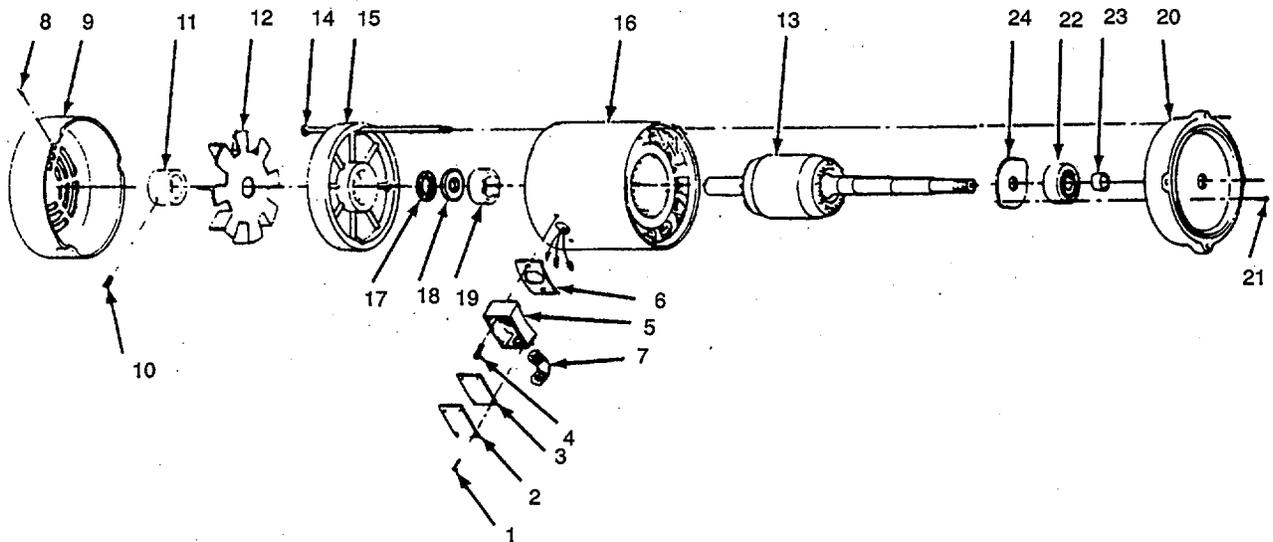
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**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Multimeter (Appx B, Sect III, Item 7).  
Arbor Press.
- b. Materials/Parts. Grease (Appx C, Sect II, Item 9).  
Rags (Appx C, Sect II, Item 13).
- c. Equipment Condition. Electric motor removed (paragraph 3-27).
- d. General Safety Requirements.

**WARNINGS**

- High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
  - Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.
- 



**DISASSEMBLY.**

**NOTE**

Booster pump electric motor and distribution pump electric motor are disassembled the same. Booster pump electric motor is shown.

- a. Remove four screws (1), conduit box cover (2), and gasket (3). Discard gasket.
- b. Remove elbow (7).
- c. Remove two screws (4), conduit box (5), and insulator (6). Discard insulator (6).
- d. Remove grounding screw (23).
- e. Remove three screws (8) and fan cover (9).
- f. Remove setscrew (10), fan clamp (11) and external fan (12) from rotor shaft (13).

**NOTE**

Mark fan end plate, case and pump end plate to assist in alignment during assembly.

- g. Remove four bolts (14).
- h. Tap plate (15) with soft-faced mallet to break bond with case (16) and remove plate.
- i. Remove wavy washer (17) and shim (18) from rotor shaft (13).
- j. Using arbor press, remove bearing (19) from rotor shaft (13).

**CAUTION**

Stator wiring inside case can be damaged by rotor shaft if rotor shaft is not removed carefully. Guide rotor shaft carefully while removing it.

- k. Tap plate (20) with soft-faced mallet to break bond case (16) and remove plate with rotor shaft (13) attached.
- l. Remove two screws (21) and plate (20) from rotor shaft (13).
- m. Using arbor press, remove bearing (22) from plate (20).
- n. Remove retainer ring (24).

**CLEANING.**

**WARNING**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi (207 kPa) air pressure.

- a. Using compressed air, blow dust and grit from stator and rotor assemblies. Wipe rotor assembly with clean rag.

**CLEANING. (Cont)**

- b. Clean fan cover vent slots with compressed air and wipe with clean rag.
- c. Wipe bearing with clean rag.
- d. Scrape loose paint from fan cover, case and pump end plate. Prime and paint as necessary.

**INSPECTION.**

- a. Inspect leads and windings of stator in case for evidence of cracked or burned insulation. Replace as required.
- b. Inspect rotor shaft for loose or burned conducting bars. Replace as required.
- c. Inspect bearings for wear. Replace as required.
- d. Inspect end plates for cracks. Replace as required.
- e. Using multimeter set to OHMS X1 scale, connect test leads to pairs of motor lead sets: 4, 5, and 9 to 1 and 7:1 and 7 to 2 and 8; 1 and 7 to 3 and 6; and 2 and 8 to 3 and 6.
- f. If multimeter indication is not 0 ohm for each pair of windings, replace stator.
- g. Set multimeter to OHMS X1000 scale. Connect one lead to stator housing. Connect other lead to each motor lead in turn.
- h. If multimeter indication is not infinity for each motor lead, replace stator.

**ASSEMBLY.**

**NOTE**

Booster pump electric motor and distribution pump electric motor are assembled the same. Booster pump electric motor is shown.

- a. Pack two bearings (19) and (22) and use arbor press to install bearing (19) on short end of rotor shaft (13).
- b. Using arbor press, install bearing (22) on plate (20).
- c. Install retainer ring (24) and two screws (21) on plate (20).

**CAUTION**

Stator wiring inside case can be damaged by rotor shaft if rotor shaft is not installed carefully. Guide rotor shaft carefully while installing it.

- d. Insert rotor shaft (13) through case (16).
- e. Position plate (20). Align mark made during disassembly with mark on case (16).
- f. Install wavy washer (17), shim (18) in plate (15).
- g. While holding plate (20) aligned on one end of case (16), position plate (15) on other end. Align mark made on plate during disassembly with mark on case.

**ASSEMBLY. (Cont)**

- h. Install four bolts (14).
- i. Install fan (12), fan clamp (11) and setscrew (10).
- j. Install fan cover (9) and three screws (8).
- k. Install grounding screws (23).
- l. Position insulator (6) and conduit box (5) and install two screws (4).
- m. Install elbow (7).
- n. Position gasket (3) and conduit box cover (2) and install four screws (1).

**TEST.**

- a. Secure motor to test bench.

**WARNING**

Electrical high voltages can cause serious injury or death. Some tests require power to be connected. Always take proper measures to ensure personal safety.

- b. Connect motor wiring to test bench leads.
- c. Connect power and run motor with and without load.
- d. Check motor for excessive vibration and fast temperature rise.
- e. Disconnect motor from test bench leads.

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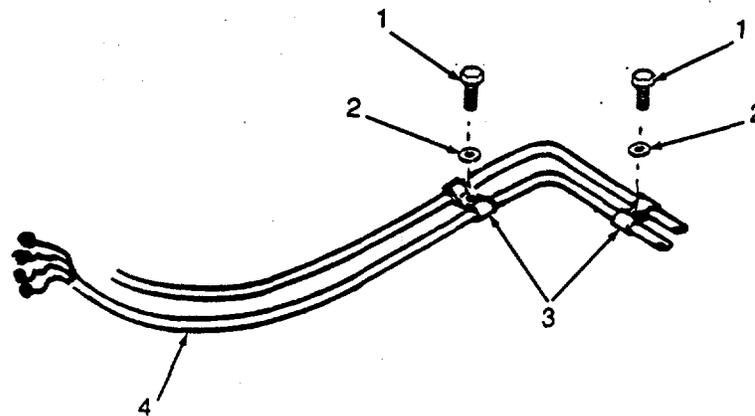
### 3-31. REPLACE BOOSTER PUMP CABLE ASSEMBLY.

This task covers:           a. Removal.           b. Installation.

---

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts. Twine (Appx C, Sect II, Item 20).  
Tape, Electrical (Appx C, Sect II, Item 18).
  - c. Personnel Required. 2
  - d. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 10-4610-239-10).  
Booster Pump Removed (paragraph 2-82)
- 



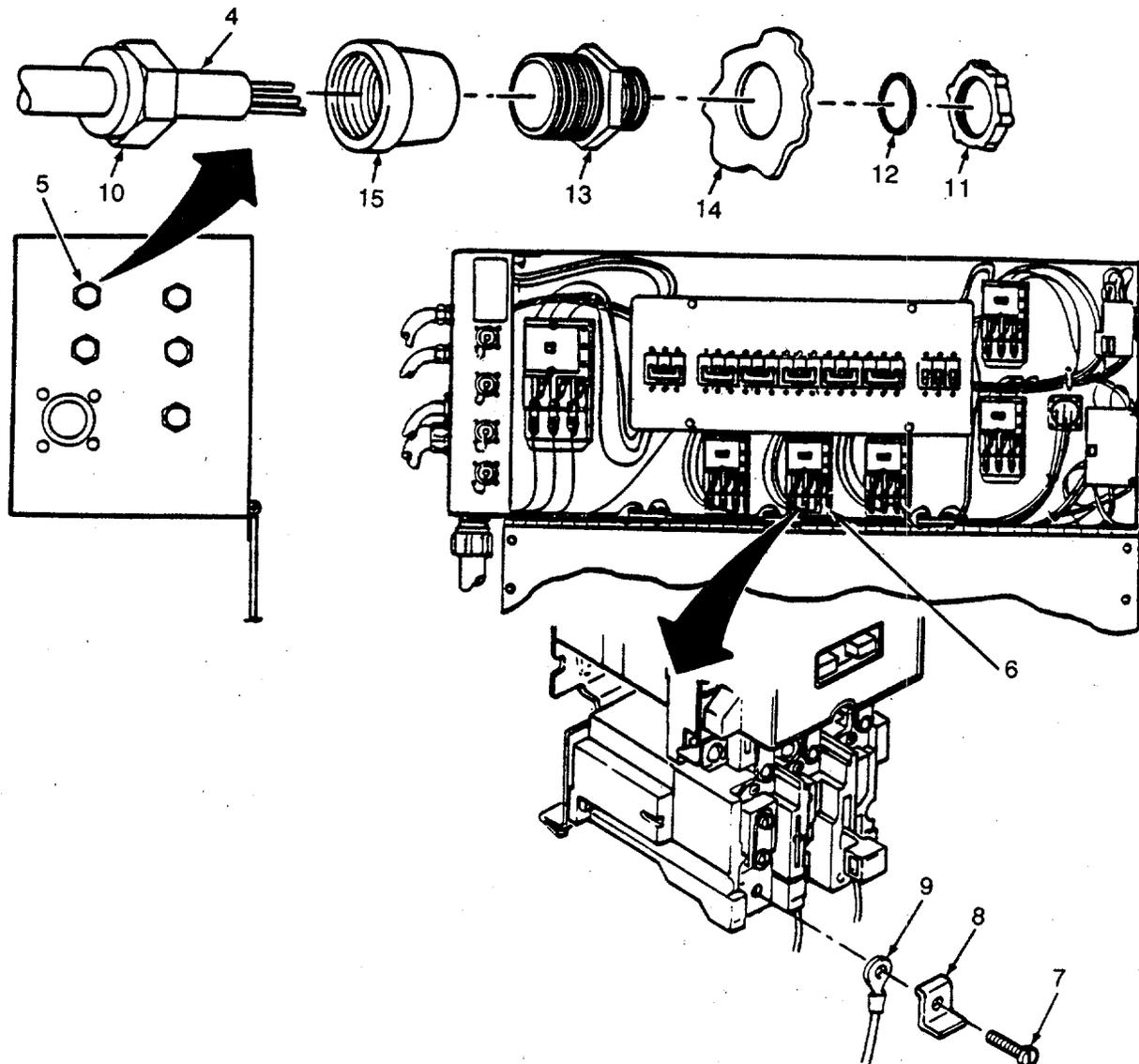
#### REMOVAL.

#### NOTE

Note routing of booster pump cable assembly.

- a. Remove two screws (1), flat washers (2), and clamps (3) securing booster pump cable assembly (4) to ROWPU deck.
- b. Working at electrical junction box, cut wire ties containing wires between sealing grip (5) and motor controller K6 (6).

REMOVAL. (Cont)



**NOTE**

Tag all wires before removal.

- c. Remove three screws (7), lug washers (8), and terminal lug (9) from bottom terminals of motor controller K6 (6).
- d. Loosen nut (10).
- e. Remove locknut (11) and O-ring (12). Discard O-ring (12).
- f. Carefully pull booster pump cable assembly (4) and cable sealing grip body (13) from electrical junction box (14).

**REMOVAL. (Cont)**

- g. Remove cable sealing grip body (13), washer (15), and nut (10) from booster pump cable assembly (4) and remove cable from ROWPU.

**INSTALLATION.**

- a. Slide nut (10), washer (1), and cable sealing grip body (3) on booster pump cable assembly (4).
- b. Pull booster pump cable assembly (4) through wall of electrical junction box (14) and position cable sealing grip body (13).
- c. Install new O-ring (12) and locknut (11) on cable sealing grip body (13).
- d. Install nut (10) on sealing grip body (13).
- e. Working inside electrical junction box, position three terminal lugs (9) as tagged, lug washers (8), and screws (7) on bottom terminals of motor controller K6 (6).
- f. Use wire ties to secure three wires to wire bundle on bottom left wall of electrical junction box.
- g. Position booster pump cable assembly (4) on ROWPU deck as noted during removal and install two clamps (3), flat washers (2), and screws (1).

**Section V. CONTROL BOX AND JUNCTION BOX ASSEMBLY  
MAINTENANCE PROCEDURES**

	Para	Page
Replace Control Box Assembly .....	3-32	3-161
Repair Control Box Assembly .....	3-33	3-164
Replace Switches .....	3-34	3-166
Replace Indicator Lampholders .....	3-35	3-169
Replace Terminal Board .....	3-36	3-171
Replace Receptacle Connectors .....	3-37	3-173
Replace Wiring Harness and Wire Leads .....	3-38	3-176
Repair Wiring Harness and Wire Leads .....	3-39	3-178
Replace Electrical Relays K10 and K11 .....	3-40	3-180



**REMOVAL.**

**WARNING**

High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.

- a. Remove 14 screws (1), flat washers (3), lockwashers (2), and control box cover (4).
- b. Remove cable connector (5) from receptacle connector (6).

**NOTE**

- There are two electrical cables installed on terminals in the control box assembly. Both are removed the same.
  - Tag wires before removal.
- c. Remove three screws (7) and wires (8).
  - d. Remove locknut (9) from cable grip (10) and remove electrical cable (11). Retain locknut.
  - e. Repeat steps c and d for electrical cable (12).
  - f. Support control box assembly (13) and remove four nuts (14), lockwashers (15), flat washers (16), and screws (17). Discard lockwashers.
  - g. Remove control box assembly (13).
  - h. Close control box cover (4) and install but do not tighten 14 screws (1), lockwashers (2), and flat washers (3).

**INSTALLATION.**

**WARNING**

- High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.
  - The control box assembly is heavy/difficult to handle. Two people are needed to lift it to prevent personal injury or damage to the equipment.
- a. Remove 14 screws (1), lockwashers (2), and flat washers (3). Lower control box cover (4). Discard lockwashers.

**WARNING**

The control box assembly is heavy/difficult to handle. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- b. Support control box assembly (13) and install four screws (17), flat washers (16), new lockwashers (15), and nuts (14).
- c. Install cable connector (5) on receptacle connector (6).

**INSTALLATION. (Cont)**

**NOTE**

There are two electrical cables installed on terminals in the control box assembly. Both are installed the same.

- d. Position electrical cable (11) and install cable grip locknut (9) on cable grip (10).
- e. Position three wires (8) on terminals as tagged and install three screws (7).
- f. Repeat steps d and e for electrical cable (12).
- g. Position control box cover (4) and install 14 screws (1), flat washers (3) and lockwashers (2).

---

### 3-33. REPAIR CONTROL BOX ASSEMBLY.

This task covers:           a. Disassembly.           b. Cleaning.           c. Inspection.           d. Assembly.

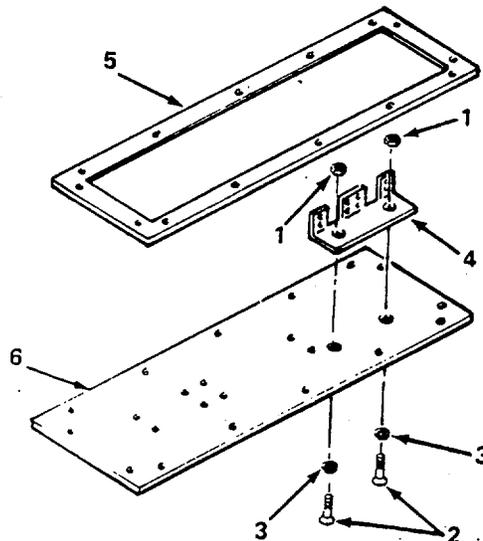
---

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts.           Detergent (Appx C, Sect II, Item 3).  
                                  Rags (Appx C, Sect II, Item 13).  
                                  Antiseize Tape (Appx C, Sect II, Item 17).
  - c. Equipment Condition.       Control box assembly removed (paragraph 3-32).
- 

#### DISASSEMBLY

- a. Remove electrical relays K10 and K11. Refer to paragraph 3-40.
- b. Remove wiring harnesses W1, W2, and W58. Refer to paragraph 3-38.
- c. Remove receptacle connectors. Refer to paragraph 3-37.
- d. Remove 11 switches. Refer to paragraph 3-34.
- e. Remove nine indicator lampholders. Refer to paragraph 3-35.
- f. Remove terminal boards TB5, TB6, and TB8. Refer to paragraph 3-36.



**DISASSEMBLY. (Cont)**

- g. Remove two nuts (1), screws (2), lockwashers (3), and bracket (4). Discard lockwashers.
- h. Remove gasket (5) from control box cover (6).

**CLEANING.**

- a. Using soap solution, clean control box assembly and control box cover. Wipe dry with clean cloth.
- b. Clean attaching hardware.

**INSPECTION.**

- a. Inspect control box assembly and control box cover for dents, cracks, and excessive corrosion. Repair or replace as required.
- b. Inspect cover gasket for cracks, deterioration, and general serviceability. Replace as required.
- c. Inspect attaching hardware for damage and corrosion. Replace as required.

**ASSEMBLY.**

- a. Install gasket (5) on control box cover (6).
- b. Position bracket (4) on control box cover (6) and install two screws (2), new lockwashers (3), and nuts (1).
- c. Install wiring harnesses W1, W2, and W58. Refer to paragraph 3-38.
- d. Install receptacle connectors. Refer to paragraph 3-37.
- e. Install terminal boards TB5, TB6, and TB8. Refer to paragraph 3-36.
- f. Install nine indicator lampholders. Refer to paragraph 3-35.
- g. Install 11 switches. Refer to paragraph 3-34.
- h. Install electrical relays K10 and K11. Refer to paragraph 3-40.

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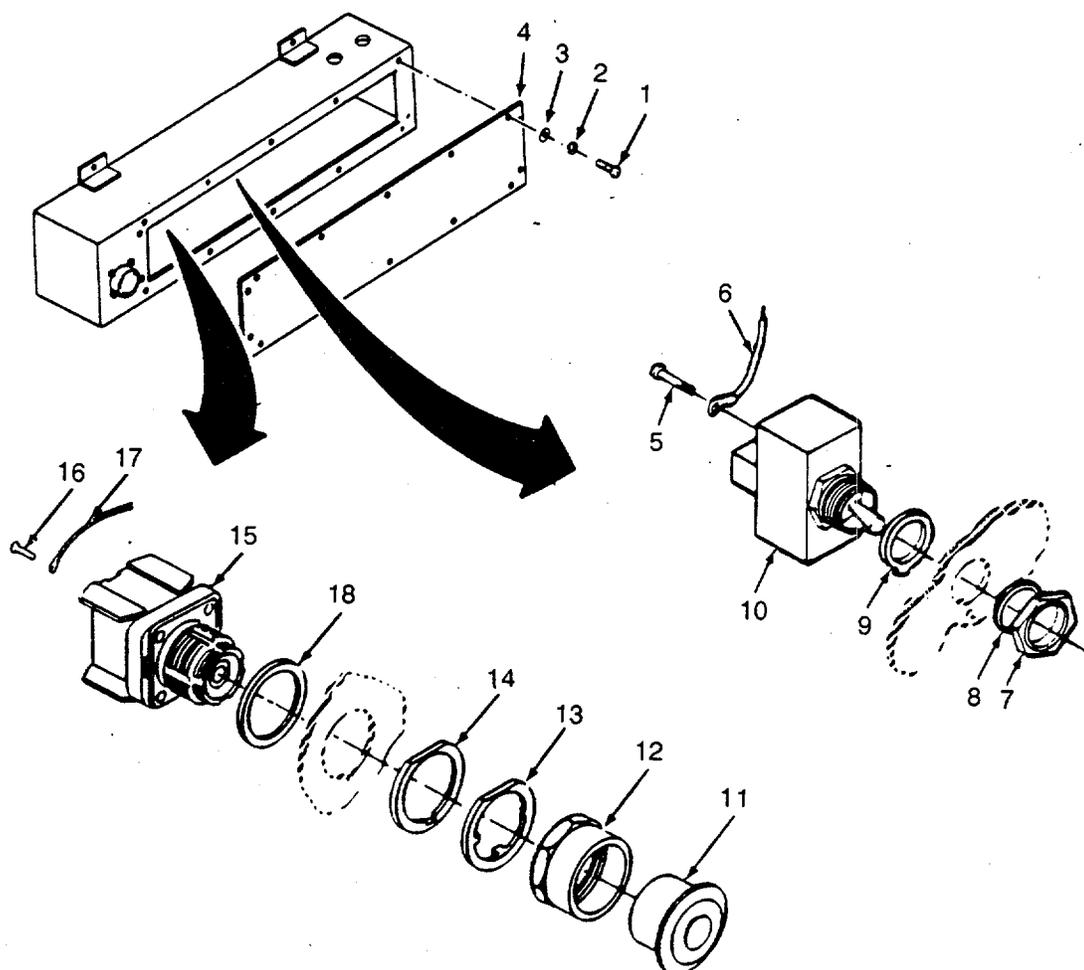
**3-34. REPLACE SWITCHES.**

This task covers:           a. Removal.           b. Installation.

---

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Multimeter (Appx B, Sect III, Items 6 and 9).
  - b. Equipment Condition. Control box assembly removed (paragraph 3-32).
- 



**REMOVAL.**

**TOGGLE SWITCHES**

**NOTE**

- There are 11 toggle switches. The number of wires attached to each switch may vary depending on use. All switches are removed the same. One is shown.
  - Tag all wires before removal.
- a. Remove 14 screws (1), lockwashers (2), and flat washers (3). Lower control box cover (4).
  - b. From inside control box assembly, remove two screws (5) and remove wires (6).
  - c. From front of control box assembly, remove mounting nut (7) and O-ring seal (8).
  - d. Remove lockring (9) and switch body (10).
  - e. Close control box cover (4) and install but do not tighten 14 screws (1), lockwashers (2), and flat washers (3).

**EMERGENCY STOP SWITCH**

- a. Remove 14 screws (1), lockwashers (2), and flat washers (3). Lower control box cover (4).
- b. Remove cap (11), locknut (12), keyway washer (13), and fiber washer (14) from switch body (15).
- c. Remove four screws (16) and remove wires (17).
- d. Remove switch body (15) and rubber washer (18).
- e. Close control box cover (4) and install but do not tighten 14 screws (1), lockwashers (2), and flat washers (3).

**INSTALLATION.**

**TOGGLE SWITCHES**

**NOTE**

- There are 11 toggle switches. The number of wires attached to each switch may vary depending on use. All switches are installed the same. One is shown.
- a. Remove 14 screws (1), lockwashers (2), and flat-washers (3). Lower control box cover (4).
  - b. Install lockring (9) and position switch body (10) in control box assembly.
  - c. Install O-ring seal (8) and mounting nut (7).
  - d. Install wires (6) as tagged and two screws (5).
  - e. Close control box cover (4) and install but do not tighten 14 screws (1), lockwashers (2), and flat washers (3).

**INSTALLATION. (Cont)**

**EMERGENCY STOP SWITCH**

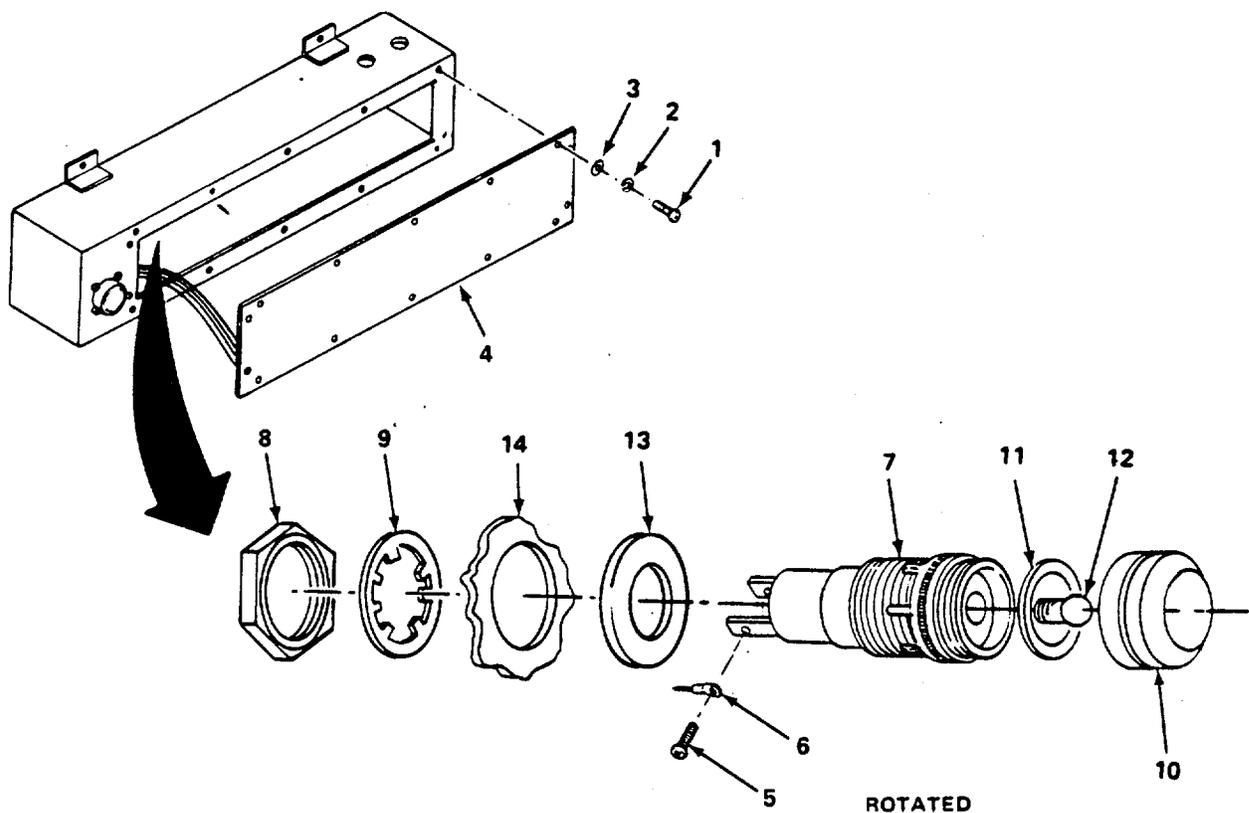
- a. Remove 14 screws (1), lockwashers (2), and flat washers (3). Lower control box cover (4).
- b. Install rubber washer (18) and position switch body (15) in control box assembly.
- c. Install fiber washer (14), keyway washer (13), locknut (12), and cap (11).
- d. Install wires (17) as tagged and four screws (16).
- e. Close control box cover (4) and install but do not tighten 14 screws (1), lockwashers (2), and flat washers (3).

### 3-35. REPLACE INDICATOR LAMPHOLDERS.

This task covers:           a. Removal.           b. Installation.

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Multimeter (Appx B, Sect III, Items 6 and 9).
- b. Equipment Condition. Control box assembly removed (paragraph 3-32).



#### REMOVAL.

#### NOTE

- There are nine lampholders. All are removed the same. One is shown.
- Tag all wires before removal.

- a. Remove 14 screws (1), lockwashers (2), and flat washers (3). Lower control box cover (4).
- b. From inside control box assembly, remove two screws (5) and three wires (6) from lampholder (7).

**REMOVAL. (Cont)**

- c. Remove nut (8) and lockwasher (9).
- d. From front of control box assembly, remove lens (10), gasket (11), and bulb (12).
- e. Remove lampholder (7) and rubber washer (13) from control box assembly (14).
- f. Close control box cover (4) and install but do not tighten 14 screws (1), lockwashers (2), and flat washers (3).

**INSTALLATION.**

**NOTE**

There are nine lampholders. All are installed the same. One is shown.

- a. Remove 14 screws (1), lockwashers (2), and flat washers (3). Lower control box cover (4).
- b. Position lampholder (7) with rubber washer (13) on control box assembly (14).
- c. Install bulb (12), gasket (11), and lens (10).
- d. From inside control box assembly, install lockwasher (9) and nut (8).
- e. Install three wires (6) as tagged and two screws (5).
- f. Close control box cover (4) and install but do not tighten 14 screws (1), lockwashers (2), and flat washers (3).

---

### 3-36. REPLACE TERMINAL BOARD.

This task covers:           a. Removal.                   b. Installation.

---

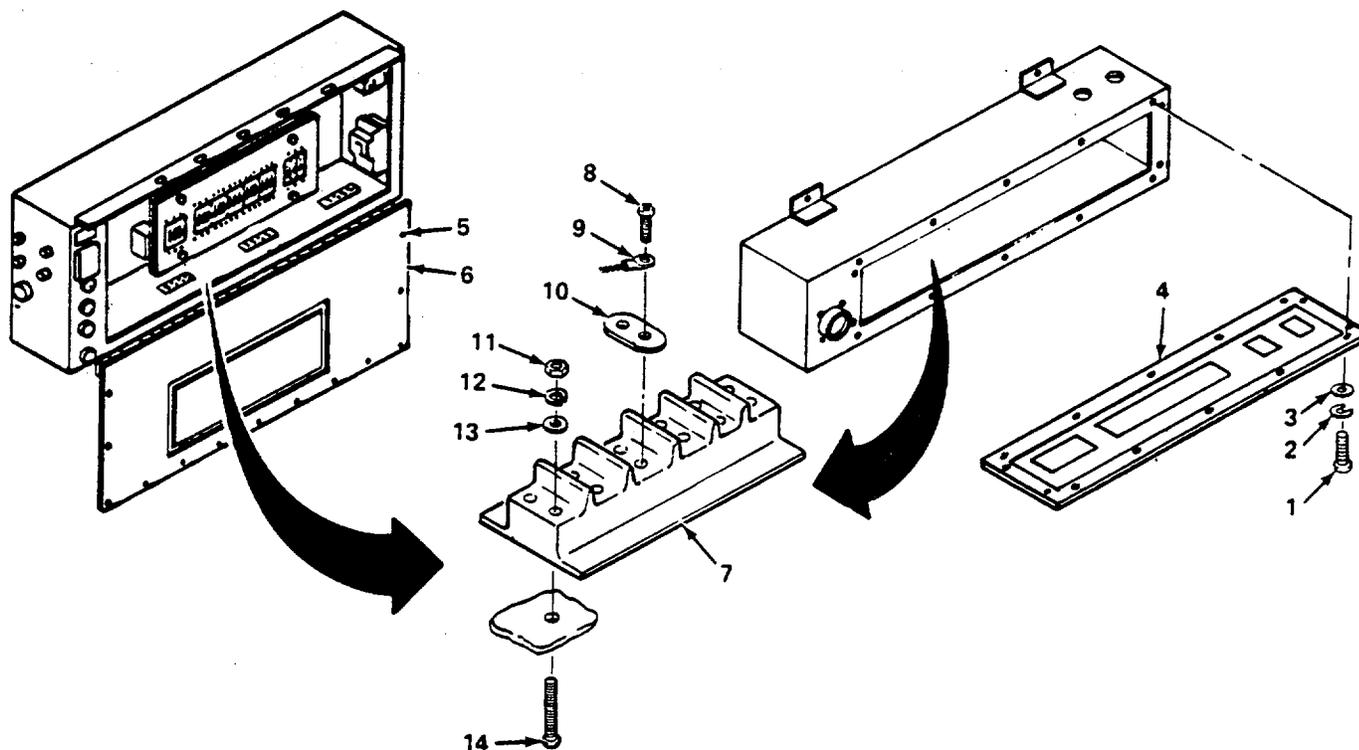
#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment Condition.    Junction box assembly; power shut down (power source manual).  
                                  Control box assembly removed (paragraph 3-32).
- c. General Safety Requirements.

#### WARNING

High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.

---



**REMOVAL.**

**WARNING**

High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.

**NOTE**

This task is the same for control box and junction box assemblies.

- a. If working on control box assembly, remove 14 screws (1), lockwashers (2), and flat washers (3). Lower control box cover (4).
- b. If working on junction box assembly, turn 13 rotary fasteners (5) and lower junction box cover (6).

**NOTE**

Tag all wires before removal.

- c. At each terminal on terminal board (7), remove screws (8) and terminal lugs (9).
- d. Remove terminal link(10)
- e. At each end of terminal board (7), remove two nuts (11), lockwashers (12), flat washers (13), and screws (14). Discard lockwashers.
- f. Remove terminal board (7).
- g. If working on control box assembly, close control box cover (4) and install but do not tighten 14 screws (1), lockwashers (2), and flat washers (3).

**INSTALLATION.**

- a. If working on control box assembly, remove 14 screws (1), lockwashers (2), and flat washers (3). Lower control box cover (4).
- b. Position terminal board (7) and align mounting holes.
- c. At each end of terminal board (7), install two screws (14), flat washers (13), new lockwashers (12), and nuts (11).
- d. Position terminal link (10) and terminal lugs (9) as tagged and install screws (8).
- e. If working on junction box assembly, close junction box cover (6) and secure 13 rotary fasteners (5).
- f. If working on control box assembly, close control box cover (4). Install but do not tighten 14 screws (1), lockwashers (2), and flat washers (3).

---

### 3-37. REPLACE RECEPTACLE CONNECTORS.

This task covers:           a. Removal.                   b. Installation.

---

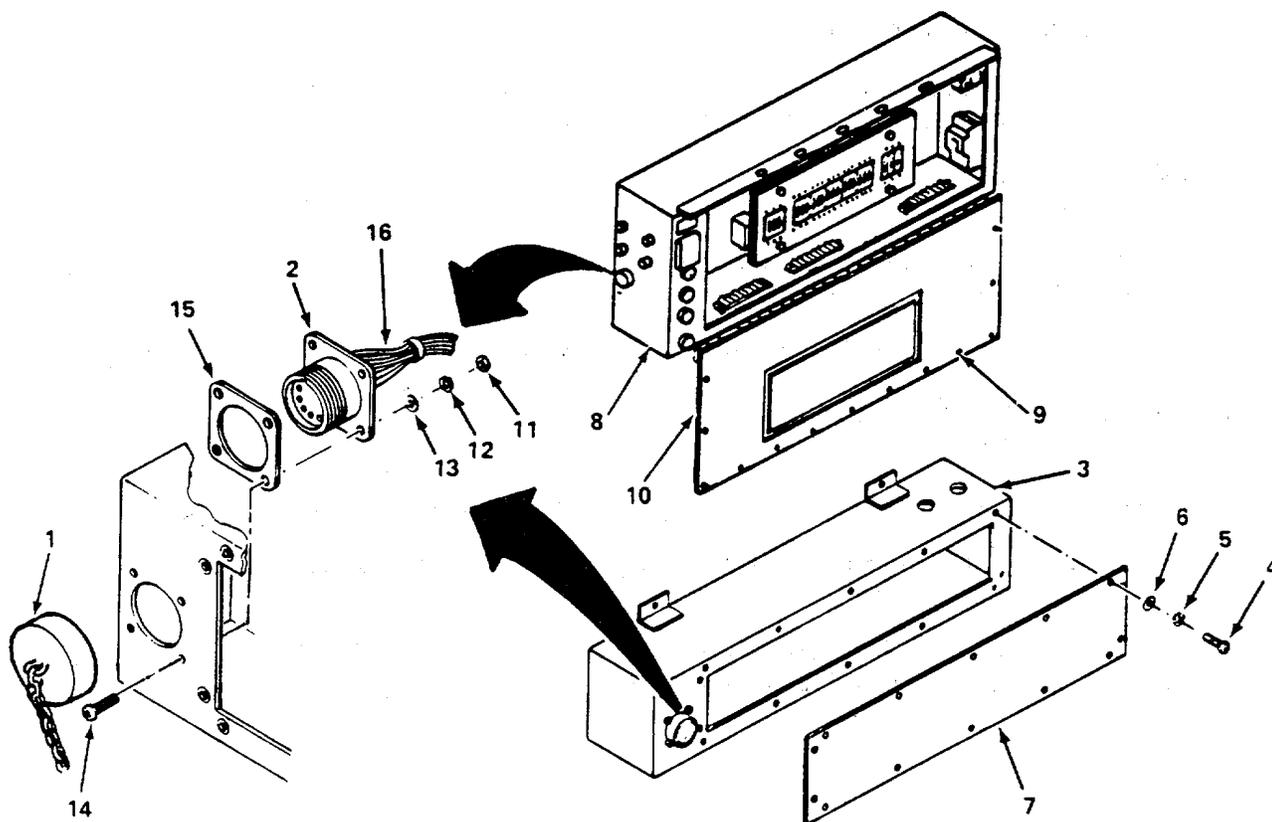
#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Soldering Gun Kit (Appx B, Sect III, Items 6 and 9).
- b. Equipment Condition. Junction box assembly; power shut down (power source manual).  
Power cables removed from receptacles.  
Control box assembly removed (paragraph 3-32).
- c. General Safety Requirements.

#### WARNING

High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.

---



**REMOVAL.**

**WARNING**

High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.

**NOTE**

All receptacle connectors in the control box and junction box assemblies are removed the same. One receptacle connector is shown as typical.

- a. Remove cap (1) from receptacle connector (2).

**NOTE**

If working on junction box assembly, go to step d.

- b. To remove receptacle connector located in the control box assembly (3), remove 14 screws (4), lockwashers (5), and flat washers (6).
- c. Lower control box cover (7) and go to step e.
- d. To remove receptacle connector from the junction box assembly (8), turn 1.3 rotary fasteners (9) and lower junction box cover (10).
- e. Remove four nuts (11), lockwashers (12), flat washers (13), and screws (14). Discard lockwashers.
- f. Remove receptacle connector (2) and gasket (15).

**NOTE**

- To unsolder wires from receptacle connectors, it may be necessary to remove wiring harness clamps for access. Refer to paragraph 3-38.
  - Tag wires with pin connection before unsoldering.
- g. Using soldering gun, unsolder wires (16) from receptacle connector (2) and remove receptacle connector.
  - h. If working on control box assembly, close control box cover (7) and install, but do not tighten 14 screws (4), lockwashers (5), and flat washers (6).

**INSTALLATION.**

**NOTE**

- All receptacle connectors in the control box and junction box assemblies are removed and installed the same. One receptacle connector is shown as typical.
  - Wires must be soldered to pin connections as tagged.
- a. If working on control box assembly, remove 14 screws (4), lockwashers (5), and flat washers (6). Lower control box cover (7).
  - b. Using soldering gun, solder wires (16) to receptacle connector (2).

**INSTALLATION. (Cont)**

- c. Position gasket (15) on box (3) or (8) and position receptacle connector (2) in box cutout.
- d. Install four screws (14), flat washers (13), new lockwashers (12), and nuts (11).
- e. If working on control box assembly, close control box cover (7). Install but do not tighten 14 screws (4), lockwashers (5), and flat washers (6).
- f. If working on junction box assembly, close junction box cover (10) and secure 13 rotary fasteners (9).

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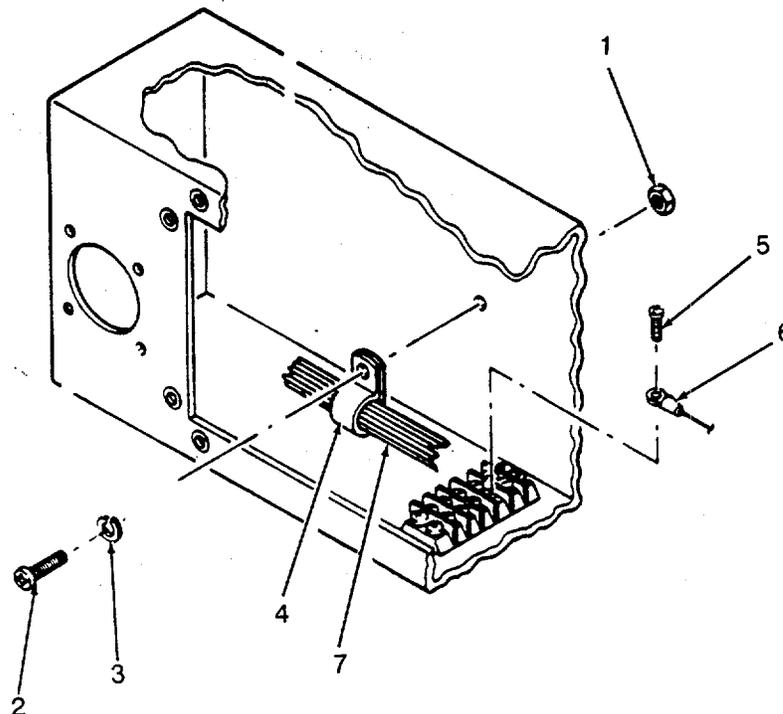
**3-38. REPLACE WIRING HARNESS AND WIRE LEADS.**

This task covers:            a. Removal.            b. Inspection.            c. Installation.

---

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Equipment Condition:    Control Box and Junction Box assembly:  
                                  Power shut down (power source manual).  
                                  ROWPU shut down (TM 10-4610-239-10).  
                                  Control box assembly removed (paragraph 3-32).  
                                  Receptacle connector removed (paragraph 3-37).
- 



**NOTE**

Procedures are typical and can be used for all wiring harnesses in the ROWPU. Wiring harness in control box assembly is shown.

**REMOVAL.**

- a. Cut all wire ties

**NOTE**

Note routing of wiring harness.

- b. Remove nut (1), screw (2), and lockwasher (3). Spread open and remove clamp (4). Discard lock washer.

**NOTE**

- Tag all wires before removal
- There are multiple wires with terminal lugs at end. One is shown.

- c. Remove screw (5) and remove wire lug (6). Install screw in place.
- d. Remove wiring harness (7).

**INSPECTION.**

**NOTE**

Refer to paragraph 3-39 for repair.

- a. Inspect wiring harness for cracked, cut, or burned wires. Tag damaged wires.
- b. Inspect terminals for good connection. Tag damaged wires.
- c. Check for continuity on all wires. Tag faulty wires.

**INSTALLATION.**

- a. Route wiring harness (7) as noted during removal.
- b. Install wire lug (6) as tagged in removal procedure.
- c. Install Screw (5).
- d. Position clamp (4) and install screw (2), new lockwasher (3), and nut (1).
- e. Install wire ties on wiring harness (7).

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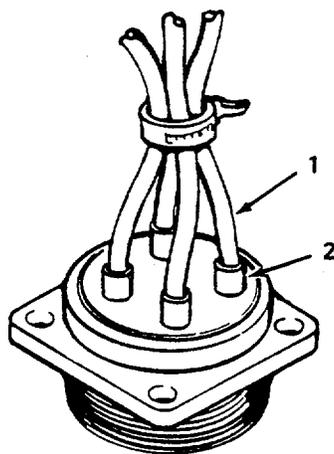
### 3-39. REPAIR WIRING HARNESS AND WIRE LEADS.

This task covers:           a. Disassembly.           b. Assembly.

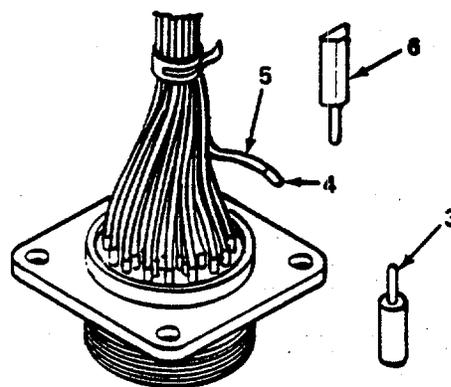
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#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Soldering Gun Kit (Appx B, Sect III, Items 6 and 3).  
Pin Insertion Tool (Appx B, Sect III, Items 6 and 3).  
Pin Removal Tool (Appx B, Sect III, Items 6 and 3).
  - b. Equipment Condition. Wiring harness removed (paragraph 3-38).
- 



FRONT PANEL  
CONNECTOR.



INTERNAL  
CONNECTOR

#### NOTE

- Procedures are typical and can be used for all wiring harnesses and wire leads in the ROWPU.
- Refer to wiring diagram in foldout section for wiring harness being repaired.

#### DISASSEMBLY.

- a. Lay out wiring harness on a flat surface.
- b. Remove damaged or faulty wire.

**DISASSEMBLY. (Cont)**

**NOTE**

- For wires attached to a front panel multipin connector, complete step c.
- For wires attached to an internal multipin connector, go to step d.

**NOTE**

Tag all wires before removal.

- c. Using soldering gun, unsolder wires (1) from terminals (2) and remove wires.
- d. Using pin removal tool (3) push terminals (4) with bad wires out of connector.
- e. Using soldering gun, unsolder wires (5) from terminals (4).

**ASSEMBLY.**

- a. Cut a new length of wire same size as faulty wire.
- b. Solder new terminal of same type as used on old wire to new wire.

**NOTE**

- For wires attached to a front panel multipin connector, complete step c.
  - For wires attached to an internal multipin connector, go to step d.
- c. Using soldering gun, solder wires (1) to terminals (2) as tagged.
  - d. Using soldering gun, solder wires (5) into terminals(4).
  - e. Using pin insertion tool (6), insert terminals (4) into connector as tagged.

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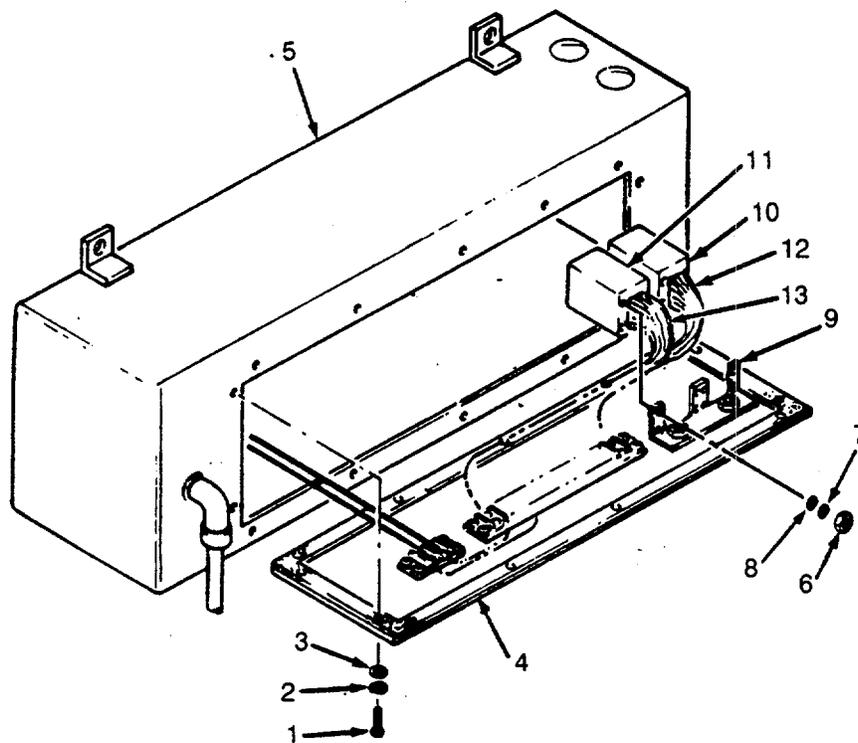
### 3-40. REPLACE ELECTRICAL RELAYS K10 AND K11.

This task covers:           a. Removal.           b. Installation.

---

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Soldering Gun Kit (Appx B, Sect m, Items 6 and 9).
  
  - b. Equipment Condition. Control box assembly removed (paragraph 3-32).
- 



#### REMOVAL.

- a. Remove 14 screws (1), lockwashers (2), and flat washers (3). Lower control box cover (4).

#### NOTE

Tag all wires before removal.

- b. Unsolder 11 wires (12) from relay K11 (10) and 13 wires (13) from relay K10 (11).
- c. Remove eight nuts (6), lockwashers (7), and flat washers (8) from bracket (9) and remove relays K11 (10) and K10 (11). Discard lockwashers.
- d. Close control box cover (4) and install but do not tighten 14 screws (1), lockwashers (2), and flat washers (3).

**INSTALLATION.**

- a. Remove 14 screws (1), lockwashers (2), and flat washers (3). Lower control box cover (4).
- b. Position relay K10 (11) and relay K11 (10) on bracket (9) and install eight flat washers (8), new lockwashers (7), and nuts (6).
- c. Solder 13 wires (13) to pins on relay K10 (11) as tagged.
- d. Solder 11 wires (12) to pins on relay K11 (10) as tagged.
- e. Close control box cover (4) and install but do not tighten 14 screws (1), lockwashers (2), and flat washers (3).

**Section VI. JUNCTION BOX ASSEMBLY MAINTENANCE PROCEDURES**

	Para	Page
Replace Electrical Junction Box Assembly .....	3-41	3-183
Repair Electrical Junction Box Assembly .....	3-42	3-186
Replace Circuit Breaker and Circuit Breaker Plate .....	3-43	3-190
Replace Receptacle Connectors. For procedures to replace receptacle connectors, refer to .....	3-37	3-173
Replace Terminal Board. For procedures to replace terminal board, refer to .....	3-36	3-171
Replace Control Relay .....	3-44	3-191
Replace Utility Receptacle .....	3-45	3-193
Replace Motor Controllers K1 and K2 .....	3-46	3-195
Repair Motor Controllers (Model Nos. A200MICAC and A200M3CAC) .....	3-47	3-197
Replace Wiring Harness and Wire Leads. For procedures to replace wiring harness and wire leads, refer to .....	3-38	3-176
Repair Wiring Harness and Wire Leads. For procedures to repair wiring harnesses and wire leads, refer to .....	3-39	3-178
Replace Motor Controllers K3 thru K7 .....	3-48	3-202
Repair Motor Controllers (Model Nos. A200MABR, A200MACAC, and A200MOCAC) .....	3-49	3-205

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### 3-41. REPLACE ELECTRICAL JUNCTION BOX ASSEMBLY.

This task covers:            a. Removal.            b. Installation.

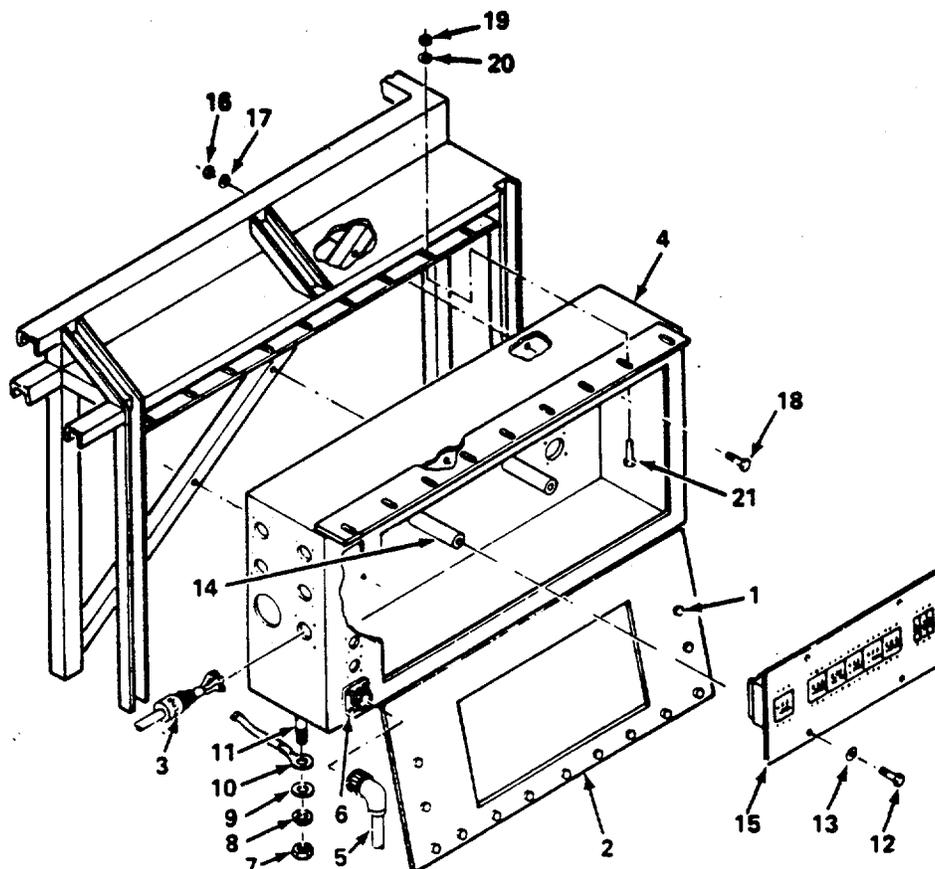
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#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Personnel Required. 2
- c. Equipment Condition. Power shut down (power source manual).
- d. General Safety Requirements.

#### WARNINGS

- \* High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
  - \* Lifting heavy equipment can cause serious injury. Two personnel are required when replacing spare tire and wheel assembly.
- 



**REMOVAL.**

**WARNING**

High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.

- a. Turn 13 rotary fasteners (1) and lower junction box cover (2).

**NOTE**

- Tag all wires before removal.
- There are five electrical cables connected to terminals in the junction box assembly. All are removed the same. One is shown.

- b. Remove electrical cable (3) from junction box assembly (4). Refer to paragraph 3-38.

**NOTE**

There are seven cables with connectors which attach to receptacles mounted on the junction box assembly. All are removed the same. One is shown.

- c. Remove cable connector (5) from receptacle (6).
- d. Remove nut (7), lockwasher (8), flat washer (9), and wire lug (10) from ground stud (11). Discard lockwasher.
- e. Remove four screws (12) and flat washers (13) from standoffs (14).
- f. Tilt circuit breaker plate (15) forward to access mounting hardware.
- g. Remove three nuts (16), lockwashers (17), and screws (18). Discard lockwashers.
- h. Position circuit breaker plate (15) on standoffs (14) and install four screws (12) and flat washers (13).

**WARNING**

The junction box assembly is heavy/difficult to handle. Two people are needed to support/lift it to prevent personal injury or damage to the equipment.

- i. Support junction box assembly (4) and remove nine nuts (19), lockwashers (20), and screws (21). Discard lockwashers.
- j. Close junction box cover (2) and turn 13 rotary fasteners (1).
- k. Remove junction box assembly (4).

**REMOVAL.**

**WARNING**

- High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.
  - The junction box assembly is heavy/difficult to handle. Two people are needed to lift it to prevent personal injury or damage to the equipment.
- a. Position junction box assembly (4), turn 13 rotary fasteners (1), and lower junction boxcover (2).
  - b. Support junction box assembly (4) and install nine screws (21), new lockwashers (20), and nuts (19). Do not tighten screws.
  - c. Remove four screws (12) and flat washers (13) and tilt circuit breaker plate (15) forward.
  - d. Align junction box and install three screws (18), new lockwashers (17), and nuts (16).
  - e. Tighten 12 screws (18) and (21).
  - f. Position circuit breaker plate (15) on four standoffs (14) and install four screws (12) and flat washers (13).

**NOTE**

There are seven cables with connectors which attach to receptacles mounted on the junction box assembly. All are installed the same. One is shown.

- g. Install cable connector (5) on receptacle (6).

**NOTE**

There are five electrical cables connected to terminals in the junction box assembly. All are installed the same. One is shown.

- h. Install electrical cable (3) as tagged. Refer to paragraph 3-38.
- i. Close junction box cover (2) and turn 13 rotary fasteners (1) to secure.
- j. Install wire lug (10), flat washer (9), new lockwasher (8), and nut (7) on ground stud (11).

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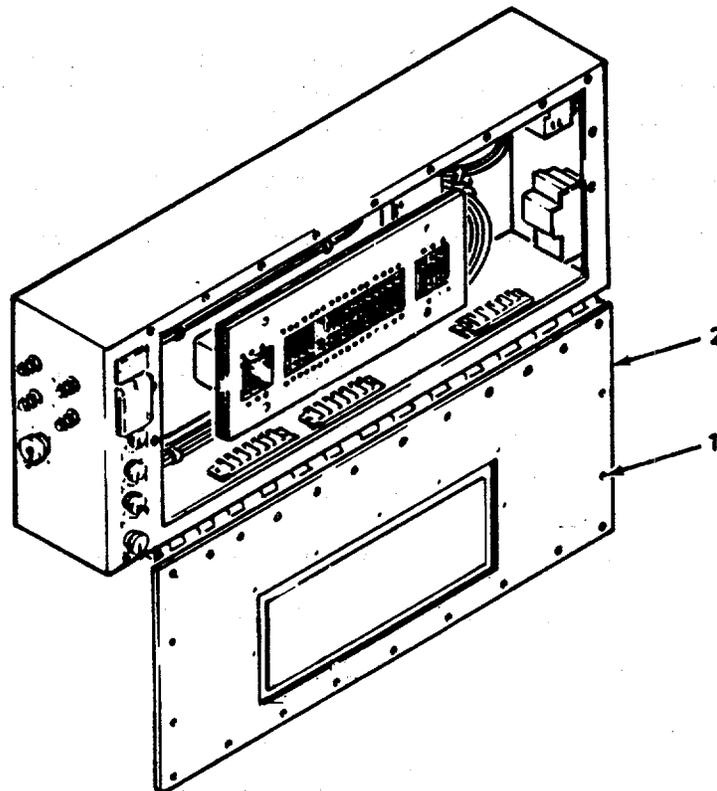
### 3-42. REPAIR ELECTRICAL JUNCTION BOX ASSEMBLY.

This task covers:            a. Disassembly.            b. Cleaning.            c. Inspection.            d. Assembly.

---

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
  - b. Materials/Parts.            Detergent (Appx C, Sect II, Item 3).  
                                         Rags (Appx C, Sect II, Item 13).
  - c. Equipment Condition.        Electrical junction box assembly removed (paragraph 3-41).
- 



#### DISASSEMBLY.

- a. Turn 13 rotary fasteners (1) and lower junction box cover (2).
- b. Remove circuit breakers and circuit breaker plate. Refer to paragraph 3-43.
- c. Remove control relays K8 and K9. Refer to paragraph 3-44.
- d. Remove utility receptacle. Refer to paragraph 3-45.
- e. Remove motor controllers K1 and K2. Refer to paragraph 3-46.
- f. Remove motor controllers K3 thru K7. Refer to paragraph 3-48.

**DISASSEMBLY. (Cont)**

- g. Remove receptacle connectors. Refer to paragraph 3-37.
- h. Remove terminal boards. Refer to paragraph 3-36.
- i. Remove wiring harnesses and wire leads. Refer to paragraph 3-38.

**CLEANING.**

- a. Using soap solution, clean electrical junction box assembly. Wipe dry with clean cloth.
- b. Clean attaching hardware.

**INSPECTION.**

- a. Inspect electrical junction box assembly and junction box cover for dents, cracks, and excessive corrosion. Repair or replace as required. To replace junction box cover, refer to paragraph 2-119. To repair junction box cover, refer to paragraph 2-120.
- b. Inspect cover gasket for cracks, deterioration, and general serviceability. Replace as required.
- c. Inspect attaching hardware for damage and corrosion. Replace as required.

**ASSEMBLY.**

- a. Install wiring harnesses and wire leads. Refer to paragraph 3-38.
- b. Install terminal boards. Refer to paragraph 3-36.
- c. Install receptacle connectors. Refer to paragraph 3-37.
- d. Install motor controllers K3 thru K7. Refer to paragraph 3-48.
- e. Install motor controllers K1 and K2. Refer to paragraph 3-46.
- f. Install utility receptacle. Refer to paragraph 3-45.
- g. Install control relays K8 and K9. Refer to paragraph 3-44.
- h. Install circuit breakers and circuit breaker plate. Refer to paragraph 3-43.
- i. If junction box cover was removed for repair, install junction box cover. Refer to paragraph 2-118.
- j. Close junction box cover (2) and turn 13 rotary fasteners (1).

---

### 3-43. REPLACE CIRCUIT BREAKERS AND CIRCUIT BREAKER PLATE.

This task covers: a. Removal. b. Installation.

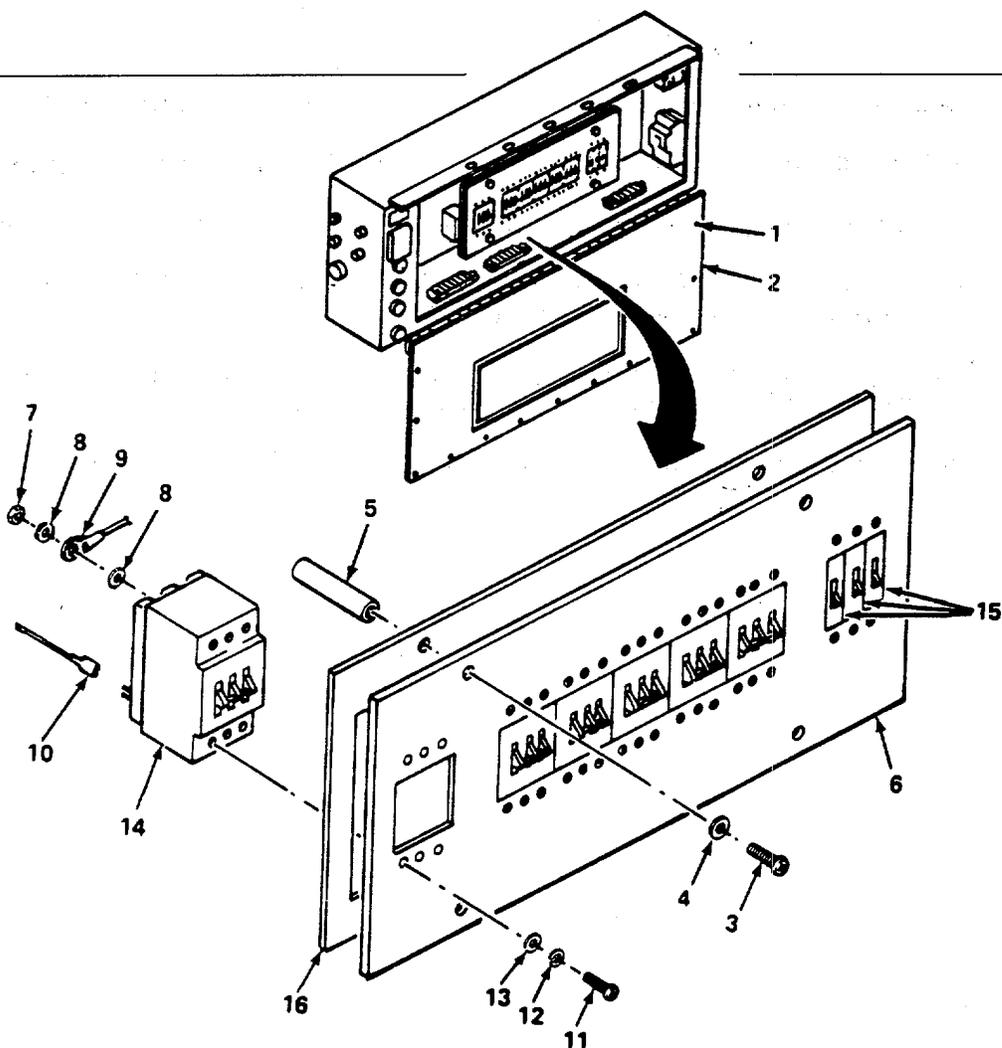
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#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment Condition. Power shut down (power source manual).
- c. General Safety Requirements.

#### WARNING

High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.



**REMOVAL.**

**WARNING**

High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.

- a. Turn 13 rotary fasteners (1) and open junction box cover (2)
- b. Remove four screws (3) and flat washers (4) from standoffs (5).
- c. Tilt circuit breaker plate (6) forward to reach wires and attaching hardware.

**NOTE**

- Tag all wires before removal.
  - To remove circuit breaker plate, remove all circuit breakers.
  - To remove CB1 or CB2, go to step d.
  - To remove CB3 thru CB6, go to step e.
  - To remove CB7 thru CB9, go to step f.
- d. Tag 11 wires and remove 6 nuts (7), 12 flat washers (8), 11 terminal lugs (9). Go to step g.
  - e. Tag 9 wires and remove 6 nuts (7), 12 flat washers (8), and 9 terminal lugs (9). Go to step g.
  - f. Remove two nuts (7), four flat washers (8), and two terminal lugs (9). Go to step h.
  - g. Remove six screws (11), lockwashers (12), flat washers (13), and circuit breaker (14). Discard lockwashers. This completes removal of circuit breaker.
  - h. Remove two screws (11), lockwashers (12), flat washers (13), and circuit breaker (15). Discard lockwashers. This completes removal of circuit breaker.
  - i. Remove circuit breaker plate (6) and insulating plate (16).

**INSTALLATION.**

**WARNING**

High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.

**NOTE**

- For installation of circuit breaker, go to step b.
- For installation of circuit breaker plate, go to step a.

a. Position insulating plate (16) on circuit breaker plate (6).

**NOTE**

- For installation of circuit breaker plate, install all circuit breakers.
- To install CB7 thru CB9, go to step b.
- To install CB3 thru CB6, go to step c.
- To install CB 1 or CB2, go to step d.

b. Position circuit breaker (15). Install two screws (11), new lockwashers (12), and flat washers (13). Go to step e.

c. Position circuit breaker (14). Install six screws (11), new lockwashers (12), and flat washers (13). Go to step f.

d. Position circuit breaker (14). Install six screws (11), new lockwashers (12), and flat washers (13). Go to step g.

e. Install two terminal lugs (9) as tagged, nuts (7), and two flat washers (8).

f. Install 9 terminal lugs (9) as tagged, 12 flat washers (8), and 6 nuts (7).

g. Install 12 flat washers (8), 11 terminal lugs (9) as tagged, and 6 nuts (7).

h. Position circuit breaker plate (6) flush with four standoffs (5). Install four screws (3) and flat washers (4).

i. Position all circuit breakers to OFF.

j. Close junction box cover (2) and tighten 13 rotary fasteners (1).

---

**3-44. REPLACE CONTROL K-8 and K-9 RELAYS.**

This task covers:           a. Removal.           b. Installation.

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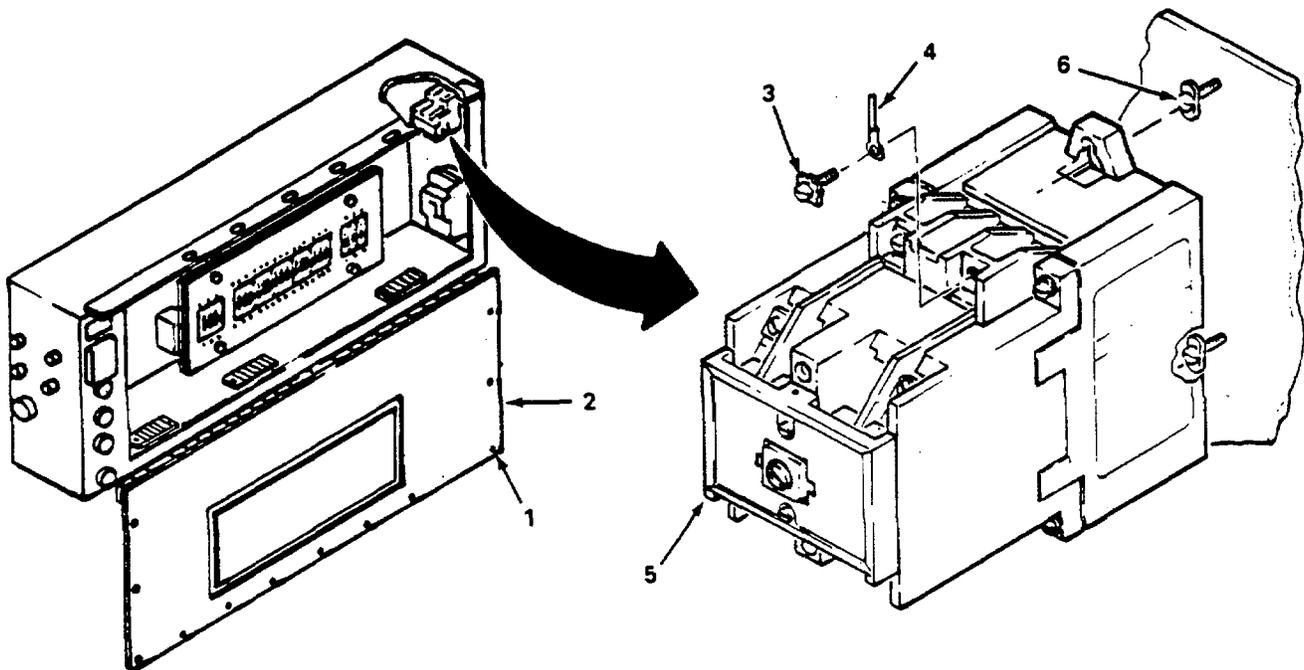
**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment Condition. Power shut down (power source manual).
- c. General Safety Requirements.

**WARNING**

High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.

---



**WARNING**

High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.

**NOTE**

There are two control relays in the electrical junction box assembly. Both are removed and installed the same. One is shown. K-8 relay has eight wires and K-9 relay has seven wires.

**REMOVAL.**

- a. Turn 13 rotary fasteners (1) and lower junction box cover (2).

**NOTE**

Tag all wires before removal.

- b. Remove six screws (3) and eight terminal lugs (4) from control relay (5).
- c. Loosen two screws (6) and lift up and remove control relay (5).

**INSTALLATION.**

- a. Position control relay (5) and tighten two screws (6).
- b. Position eight wires (4) as tagged and install six screws (3).
- c. Close junction box cover (2) and turn 13 rotary fasteners (1).

---

**3-45. REPLACE UTILITY RECEPTACLE.**

This task covers:      a. Removal.                      b. Installation.

---

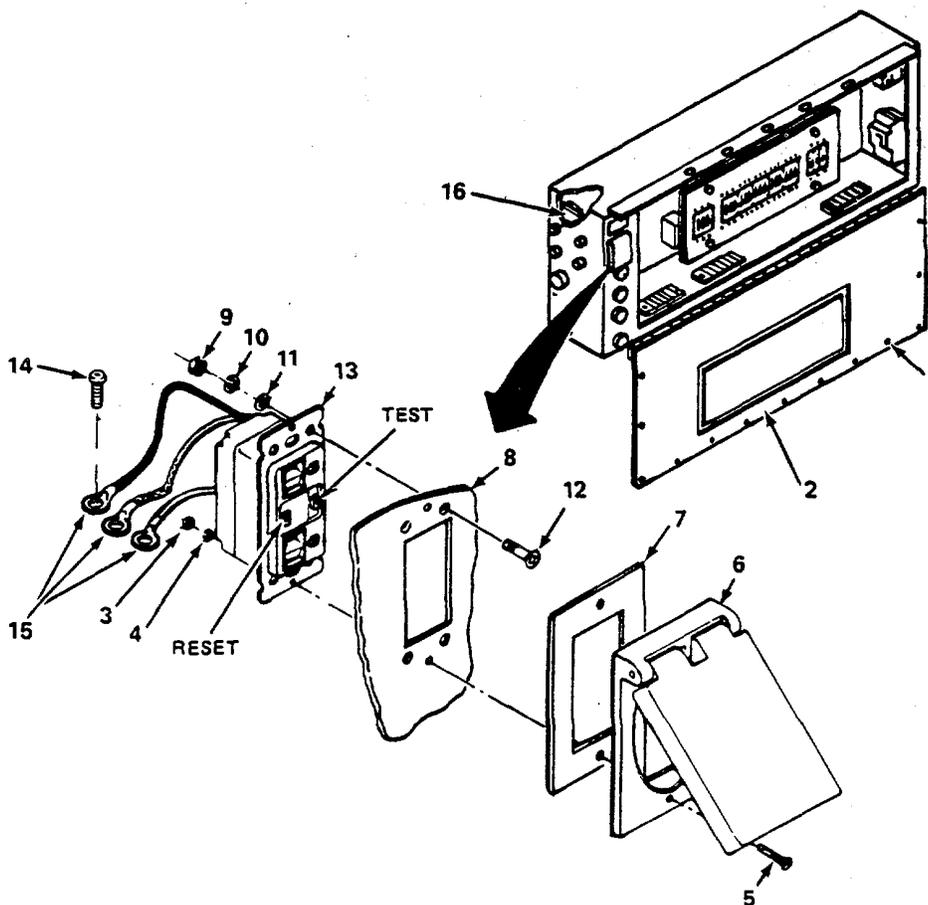
**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment condition. Power shut down. (power source manual)
- c. General Safety Requirements.

**WARNING**

High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.

---



### WARNING

High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.

### NOTE

There are two control relays in the electrical junction box assembly. Both are removed and installed the same. One is shown. K-8 relay has eight wires and K-9 relay has seven wires.

### REMOVAL.

- a. Turn 13 rotary fasteners (1) and lower junction box cover (2).
- b. Remove two nuts (3), lockwashers (4), and screws (5). Discard lockwashers.
- c. Remove utility receptacle cover (6) and gasket (7) from electrical junction box assembly (8).
- d. Remove four nuts (9), lockwashers (10), flat washers (11), and screws (12). Discard lockwashers.

### NOTE

Tag wires before removal.

- e. Inside junction box, remove three screws (14) and terminal lugs (15) from terminal board TB4 (16).
- f. Remove utility receptacle (13).

### INSTALLATION.

- a. Install three terminal lugs (15) and screws (14) on terminal board TB4 (16) as tagged.
- b. Position utility receptacle (13) and install four screws (12), flat washers (11), new lockwashers (10), and nuts (9).
- c. Position gasket (7) and utility receptacle cover (6) on electrical junction box assembly (8) and install two screws (5), new lockwashers (4), and nuts (3).
- d. Close junction box cover (2) and turn 13 rotary fasteners (1).

**3-46. REPLACE MOTOR CONTROLLERS K1, R. O. PUMP AND K2, BACKWASH PUMP.**

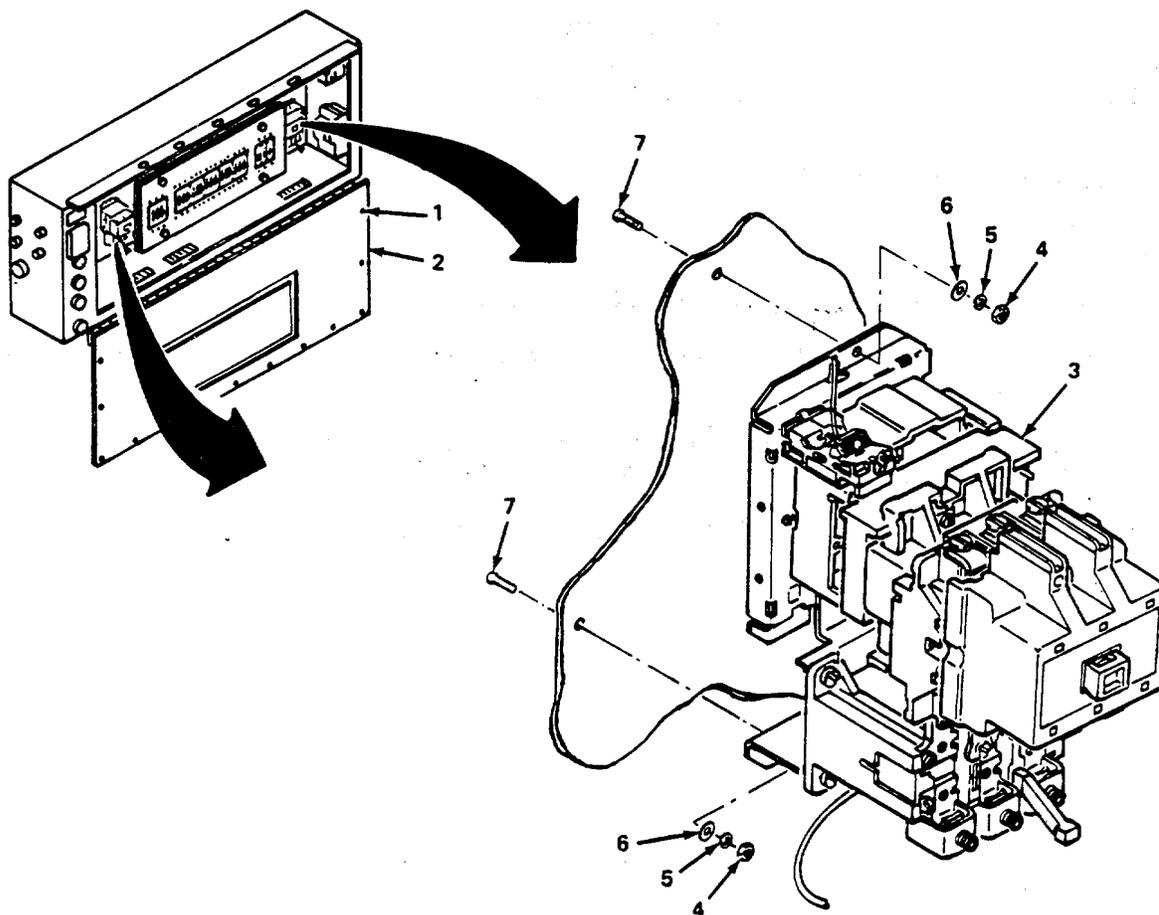
This task covers:      a. Removal.                      b. Installation.

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment Condition. Power shut down (power source manual).
- c. General Safety Requirements.

**WARNING**

High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.



### WARNING

High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.

#### REMOVAL.

- a. Turn 13 rotary fasteners (1) and lower junction box cover (2).

#### NOTE

- Motor controllers K1 and K2 are removed and installed the same. One is shown.
- Tag all wires before removal.

- b. Disconnect and remove external wires and terminal lugs from motor controller (3).
- c. Remove three nuts (4), lockwashers (5), and flat washers (6) from three screws (7). Discard lockwashers.
- d. Remove motor controller (3) from three screws (7).
- e. Remove screws (7).

#### INSTALLATION.

- a. Position three screws (7) and motor controller (3).
- b. Install three flat washers (6), new lockwashers (5), and nuts (4).
- c. Install wires and terminal lugs on motor controller (3) as tagged.
- d. Close junction box cover (2) and turn 13 rotary fasteners (1).

**3-47. REPAIR MOTOR CONTROLLERS (MODEL NOS. A200M1CAC AND A200M3CAC).**

This task covers:     a. Disassembly.     b. Cleaning.     c. Inspection.     d. Assembly     e. Test

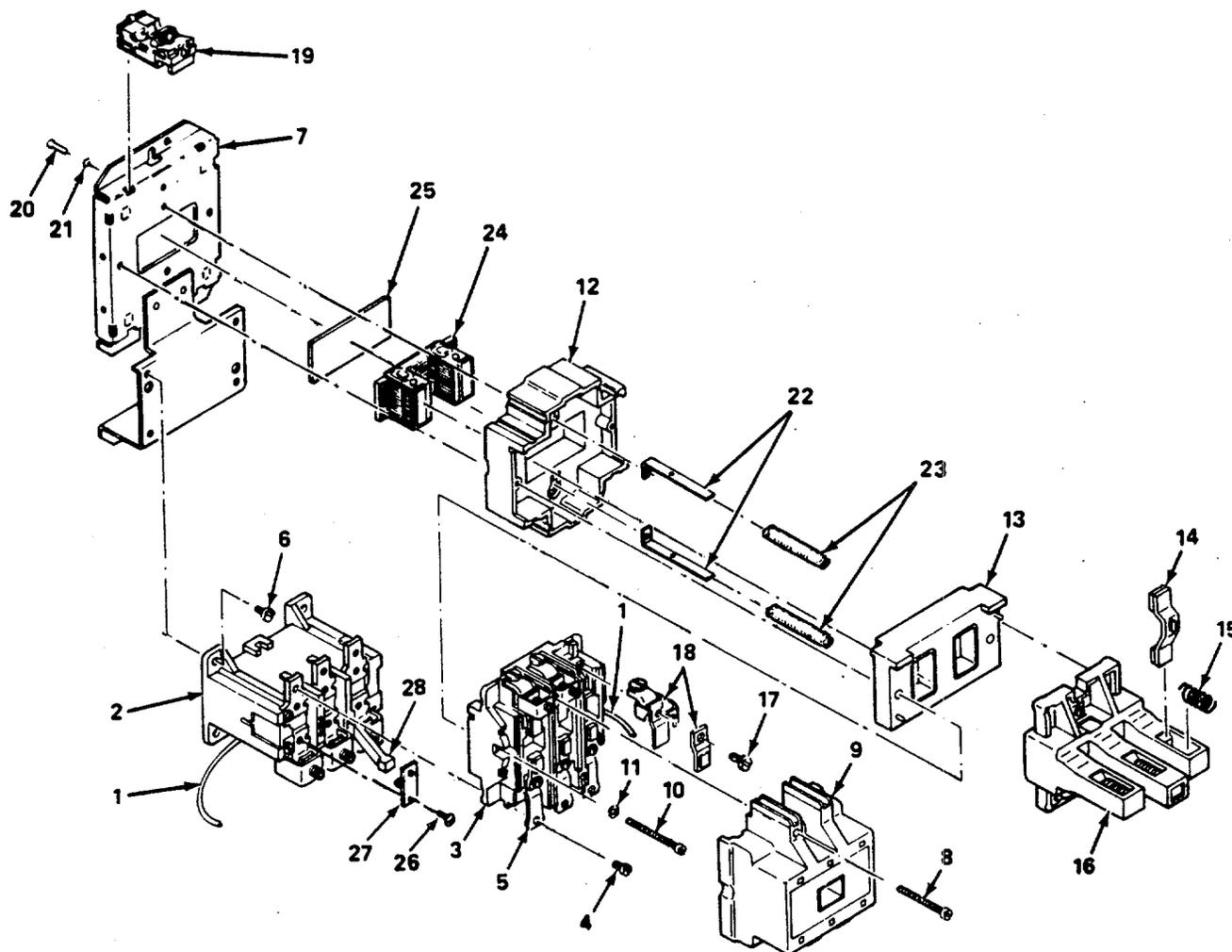
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**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Soft-Bristled Brush (Appx B, Sect III; Item 2).  
Multimeter (Appx B, Sect III, Item 6).
- b. Materials/Parts.                    Dry-cleaning Solvent (Appx C, Sect II, Item 16).
- c. Personnel Required.                2
- d. Equipment Condition.             Motor controller removed from electrical junction box  
(paragraph 3-46).
- e. General Safety Requirements.

**WARNINGS**

- High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
  - Burned out overload relay may cause fire or electrical shock.
  - Dry-cleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.
-



**DISASSEMBLY.**

- a. Tag, note location, and remove wire (1) from overload relay (2) and upper base structure (3).
- b. Remove three screws (4) from three connector straps (5).
- c. Remove two screws (8) and remove arc box (9).
- d. Remove two screws (10) and lockwashers (11). Discard lockwashers.
- e. Remove upper base structure (3) from lower base structure (12).
- f. Remove four screws (6) from overload relay (2) and mounting bracket (7). Remove overload relay (2).
- g. Remove coil (13).
- h. Remove moveable contacts (14) and springs (15) from crossbar (16).

**DISASSEMBLY. (Cont)**

- i. Remove crossbar (16) from upper base structure (3).
- j. Remove six screws (17) and stationary contacts (18).
- k. Tag and remove two auxiliary contacts (19).
- l. Remove two screws (20) and lockwashers (21). Discard lockwashers.
- m. Remove two spring supports (22), springs (23), lower base structure (12), yoke (24), and pad (25).
- n. Remove six screws (26) and three heaters (27) from overload relay (2).

**CLEANING.**

**WARNING**

Dry-cleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Using a soft brush and dry-cleaning solvent; remove dirt, dust, and contaminants from metal and plastic parts.
- b. Remove dirt, carbon, and dust from electrical contacts.
- c. Clean threads of parts and hardware.
- d. Allow parts to air dry.

**INSPECTION.**

- a. Inspect plastic parts for cracks, fractures, or chipped edges.

**WARNING**

To provide continued protection against fire and shock hazard, replace overload relay and heater element if a current heater element burns out.

- b. Inspect heat element for cracks and signs of burns. Replace as required.
- c. Inspect overload relay for overheating, fractures, or breaks. Replace as required.

**NOTE**

Replace all contacts and springs as a group to prevent misalignment.

- d. Inspect electrical contacts for pits or burning. Replace as required.
- e. Inspect contact springs for broken or deformed coils. Replace as required.
- f. Inspect reset lever for freedom of movement. Replace overload relay if movement is impaired.
- g. Inspect mounting bracket for damage. Replace as required.

**INSPECTION. (Cont)**

- h. Inspect coil for signs of burning, cracks, or damaged pins. Replace as required.
- i. Inspect all hardware for damaged heads or threads. Replace as required.

**ASSEMBLY.**

- a. Position pad (25), yoke (24), lower base structure (12), and two spring supports (22) with springs (23) on mounting bracket (7). Install two new lockwashers (21) and screws (20).
- b. Position auxiliary contacts (19) on top of lower base structure (12) with end clip in hole in mounting bracket (7).
- c. Position six stationary contacts (18) and install six screws (17).
- d. Position crossbar (16) in upper base structure (3).
- e. Position springs (15) and moveable contacts (14) in crossbar (16).
- f. Position coil (13) in upper base structure (3).
- g. Position upper base structure (3) on lower base structure (12). Install two new lockwashers (11) and screws (10).
- h. Position three heaters (27) on overload relay (2) and install six screws (26).
- i. Position overload relay (2) on mounting bracket (7) and install four screws (6).
- j. Position three connector straps (5) and install three screws (4).
- k. Install wire (1) on overload relay (2) and upper base structure (3).

**TEST.**

- a. Using multimeter set at 0 to 100 ohms, check between upper and lower sets of stationary contacts (18). Check for 0 ohm for each pair.
- b. Check across terminals of overload relay (2). Indication should be zero resistance indicating a short. If indication is infinity, press reset rod (28) and recheck. If indication remains infinity, replace overload relay.
- c. Check between two terminals of auxiliary contacts (19). Indication should be 0 ohm. If indication is infinity, replace auxiliary contacts.

**NOTE**

Two people are required for steps d, e, and f.

- d. Helper, manually press crossbar (16) and hold in position. Place test leads on sets of upper and lower contacts (18).
- e. With crossbar (16) still pressed, check for infinity across terminals of auxiliary contacts (19). Release crossbar. Replace auxiliary contacts if shorted.

**TEST. (Cont)**

**WARNING**

Electrical high voltage can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety.

- f. Apply 110 V ac, 60 Hz across terminals of coil (13). Crossbar (16) should activate. If crossbar does not move, replace motor controller. Refer to paragraph 3-46.
- g. Remove power from coil.
- h. Position arc box (9) on upper base structure (3) and install two screws (8).
- i. Install motor controller. Refer to paragraph 3-46.

**3-48. REPLACE MOTOR CONTROLLERS K3 THRU K7.**

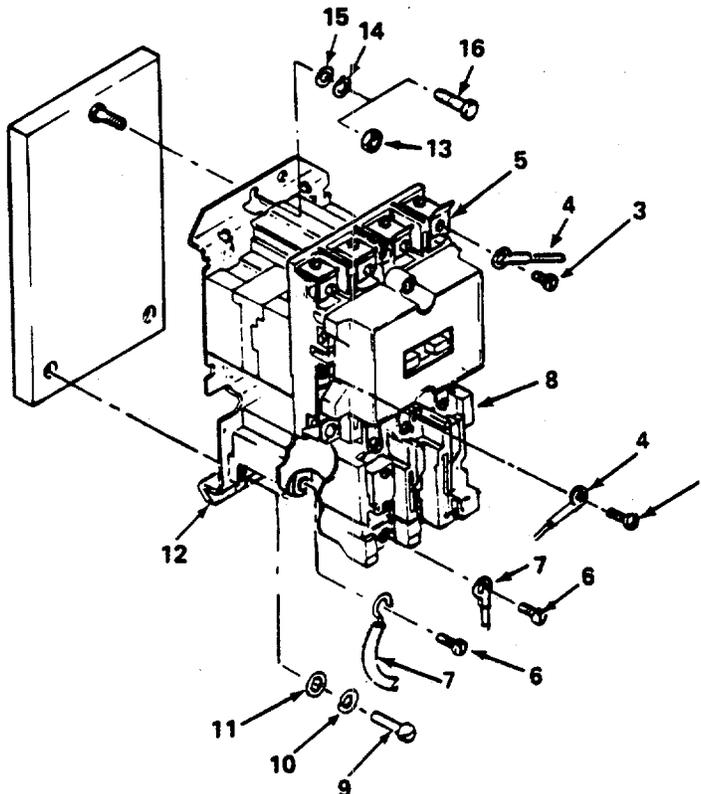
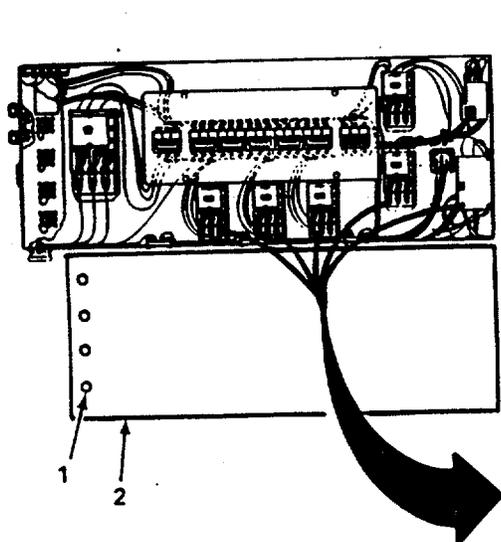
This task covers:      a. Removal.                      b. Installation.

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).
- b. Equipment Condition. Power shut down (power source manual).
- c. General Safety Requirements.

**WARNING**

High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.



**REMOVAL.**

**WARNING**

High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.

- a. Turn 13 rotary fasteners (1) and lower junction box cover (2).

**NOTE**

- Motor controllers K3 thru K7 are removed the same. One is shown.
- To remove motor controllers K5 thru K7, move circuit breaker plate out of the way. Refer to paragraph 3-43.
- Tag all external wires before removal.
- Motor controller K7 has six external wires connected to upper base structure.

- b. Remove five screws (3) and external wires (4) from upper base structure (5).

- c. Install five screws (3).

**NOTE**

Motor controller K7 has two external wires connected to overload relay.

- d. Remove four screws (6) and external wires (7) from overload relay (8).

- e. Install four screws (6).

- f. Remove two screws (9), lockwashers (10), and flat washers (11). Discard lockwashers.

**NOTE**

- To remove motor controllers K3 and K4, complete step g.
- To remove motor controllers K5 thru K7, go to step h.

- g. Support motor controller (12), remove nut (13), lockwasher (14), and flat washer (15). Discard lockwasher. Go to step i.

- h. Support motor controller (12), remove screw (16), lockwasher (14), and flat washer (15). Discard lockwasher.

- i. Remove motor controller (12).

**INSTALLATION.**

**WARNING**

High voltages in this equipment can cause serious injury or death. Be certain that all power is removed before performing maintenance.

**NOTE**

Motor controllers K3 thru K7 are installed the same. One is shown.

- a. Position motor controller (12).

**NOTE**

If installing motor controllers K5 thru K7, go to step c.

- b. Support motor controller (12), install flat washer (15), new lockwasher (14), and nut (13). Go to step d.
- c. Support motor controller (12), install flat washer (15), new lockwasher (14), and screw (16).
- d. Install two flat washers (11), new lockwashers (10), and screws (9).
- e. Remove five screws (3) from upper base structure (5).

**NOTE**

Motor controller K7 has six external wires on upper base structure.

- f. Install five external wires (4) as tagged and screws (3) on upper base structure (5).
- g. Remove four screws (6) from overload relay (8).

**NOTE**

Motor controller K7 has two external wires connected to overload relay.

- h. Install four external wires (7) as tagged and screws (6) on overload relay (8).
- i. If motor controllers K5 thru K7 were installed, install circuit breaker plate. Refer to paragraph 3-43.
- j. Close junction box cover (2) and turn 13 rotary fasteners (1).

### 3-49. REPAIR MOTOR CONTROLLERS (RELAYS K-3 THROUGH K-7) AND A200MOCAC.

This task covers:      a. Disassembly.      b. Cleaning.      c. Inspection.      d. Assembly.      e. Test.

---

#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Soft-Bristled Brush (Appx B, Sect III, Item 2).  
Multimeter (Appx B, Section III, Item 6).
- b. Materials/Parts.                      Dry-cleaning Solvent (Appx C, Sect II, Item 16).
- c. Equipment Condition.              Motor controller removed from electrical junction box (paragraph 3-48).
- d. General Safety Requirements.

#### WARNINGS

- High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
  - Burned out overload relay may cause fire or electrical shock.
  - Dry-cleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.
- 

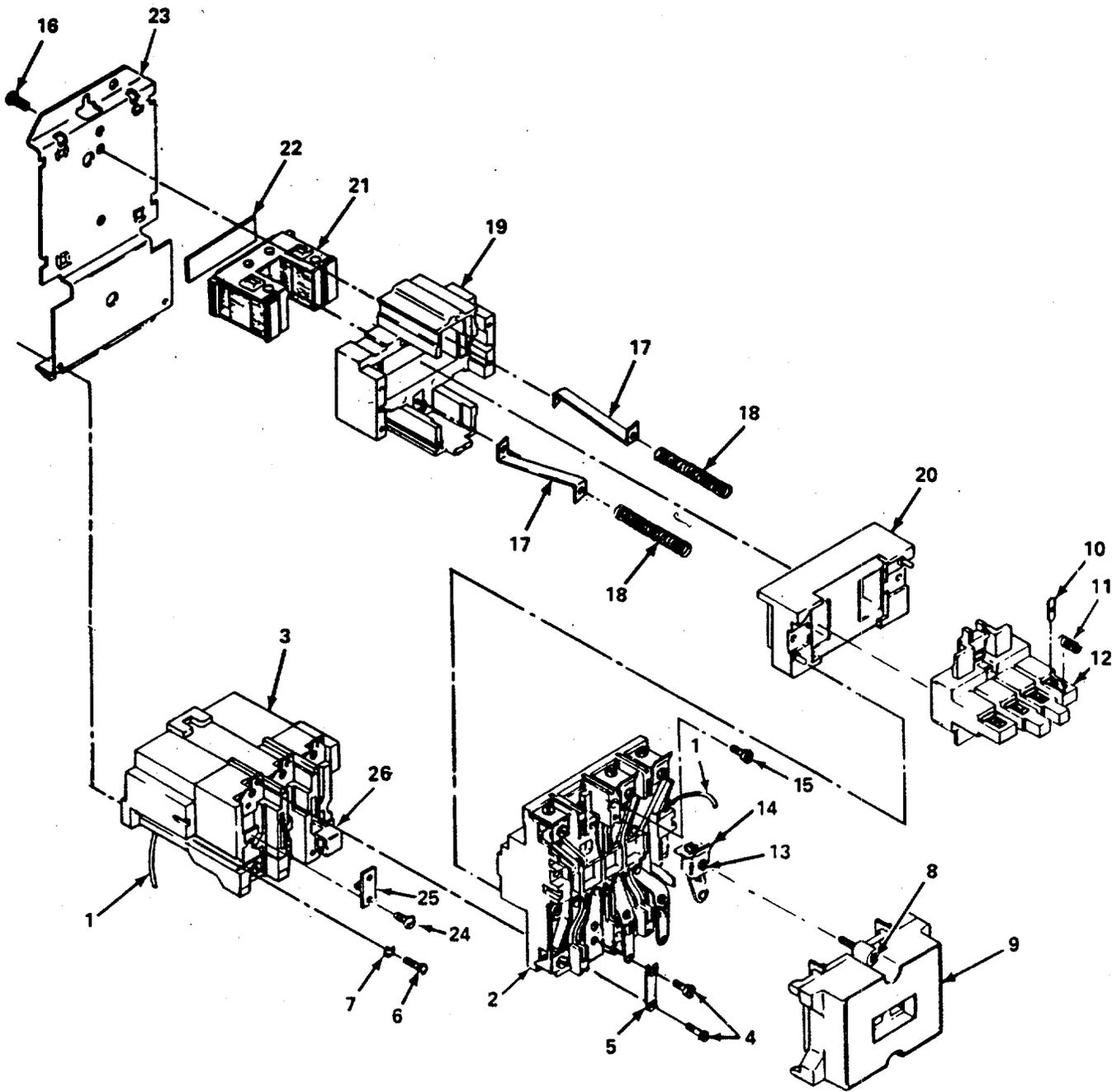
#### **DISASSEMBLY.**

#### NOTE

There are five motor controllers covered in this task. All are disassembled the same. Minor differences are noted in text.

- a. For K3 thru K6, tag and remove wire (1) from upper base structure (2) and overload relay (3). For K7, tag and remove three wires (1) from upper base structure (2) and overload relay (3).
- b. For K3 thru K6, remove six screw (4) and three connector straps (5). For K7, remove four screws (4) and two connector straps (5).
- c. Remove two screws (6), lockwashers (7), and overload relay (3). Discard lockwashers.
- d. Loosen two captive screws (8) and remove arc box (9).
- e. For K3 thru K6, remove four moveable contacts (10) and springs (11) from crossbar (12). For K7, remove two moveable contacts (10) and springs (11) from crossbar (12).

DISASSEMBLY. (Cont)



**DISASSEMBLY. (Cont)**

- f. For K3 thru K6, loosen four screws (13) and remove four stationary contact assemblies (14). For K7, remove two screws (13) and remove two stationary contact assemblies (14).
- g. Remove two screws (15). Remove upper base structure (2) and crossbar (12).
- h. Remove two screws (16), two spring supports (17) with springs (18), lower base structure (19), coil (20), yoke (21), and pad (22) from mounting bracket (23).
- i. For K3 thru K6, remove six screws (24) and three heaters (25) from overload relay (3). For K7, remove four screws (24) and two heaters (25) from overload relay (3).

**CLEANING.**

**WARNING**

Dry-cleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Using a soft brush and dry-cleaning solvent AA 711 TYPE I & II remove dirt, dust, and contaminants from metal and plastic parts.
- b. Remove dirt, carbon, and dust from electrical contacts.
- c. Clean threads of parts and hardware.
- d. Allow parts to air dry.

**INSPECTION.**

- a. Inspect coils for breaks, cracks, and heat damage. Replace as required.

**NOTE**

Replace all contacts and springs as a group to prevent misalignment.

- b. Inspect electrical contacts for pits or burning. Replace as required.
- c. Inspect contact springs for broken or deformed coils. Replace as required.
- d. Inspect mounting bracket for damage. Replace as required.
- e. Inspect all hardware for damaged heads or threads. Replace as required.

**WARNING**

To provide continued protection against fire and shock hazard, replace the complete overload relay if burnout of a current heater element occurs.

- f. Inspect overload relay for overheating, fractures, or breaks. Replace as required.
- g. Inspect overload relay reset lever for freedom of movement. Replace overload relay if movement is impaired.

**ASSEMBLY.**

**NOTE**

There are five motor controllers covered in this task. All are assembled the same. Minor differences are noted in text.

- a. Position pad (22), yoke (21), coil (20), lower base structure (19), spring supports (17), and springs (18) on mounting bracket (23). Install two screws (16).
- b. Position crossbar (12) in upper base structure (2).
- c. Position upper base structure (2) on lower base structure (19). Install two screws (15).
- d. For K3 thru K6, position four stationary contact assemblies (14) and install four screws (13). For K7, position two stationary contact assemblies (14) and install two screws (13).
- e. For K3 thru K6, install three moveable contacts (10) and springs (11) on crossbar (12). For K7, install two moveable contacts (10) and springs (11) on crossbar (12).
- f. For K3 thru K6, position three heaters (25) on overload relay (3) and install six screws (24). For K7, position two heaters (25) and install four screws (24).
- g. Position overload relay (3) and install two new lockwashers (7) and screws (6).
- h. For K3 thru K6, position three connector straps (5) and install six screws (4). For K7, position two connector straps (5) and install two screws (4).
- i. For K3 thru K6, attach wire (1) to overload relay (3) and upper base structure (2). For K7, attach three wires (1) to overload relay (3) and upper base structure (2).

**TEST.**

- a. Using multimeter set at 0 to 100 ohms, check between upper and lower sets of stationary contacts (14). Check for 0 ohm for each pair.
- b. Check across terminals of overload relay (3). Indication should be infinity indicating an open circuit. If indication is 0, press reset rod (26) and recheck. If indication remains 0, replace overload relay.

**WARNING**

Electrical high voltage can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety.

- c. Apply 110 V ac, 60 Hz across terminals of coil (20). Crossbar (12) should activate. If crossbar does not move, replace motor controller. Refer to paragraph 3-48.
- d. Remove power from coil (20).
- e. Position arc box (9) and secure with two captive screws (8).
- f. Install motor controller. Refer to paragraph 3-48.

**Section VII. CHEMICAL FEED METERING PUMP AND R.O. PUMP ASSEMBLIES  
MAINTENANCE PROCEDURES**

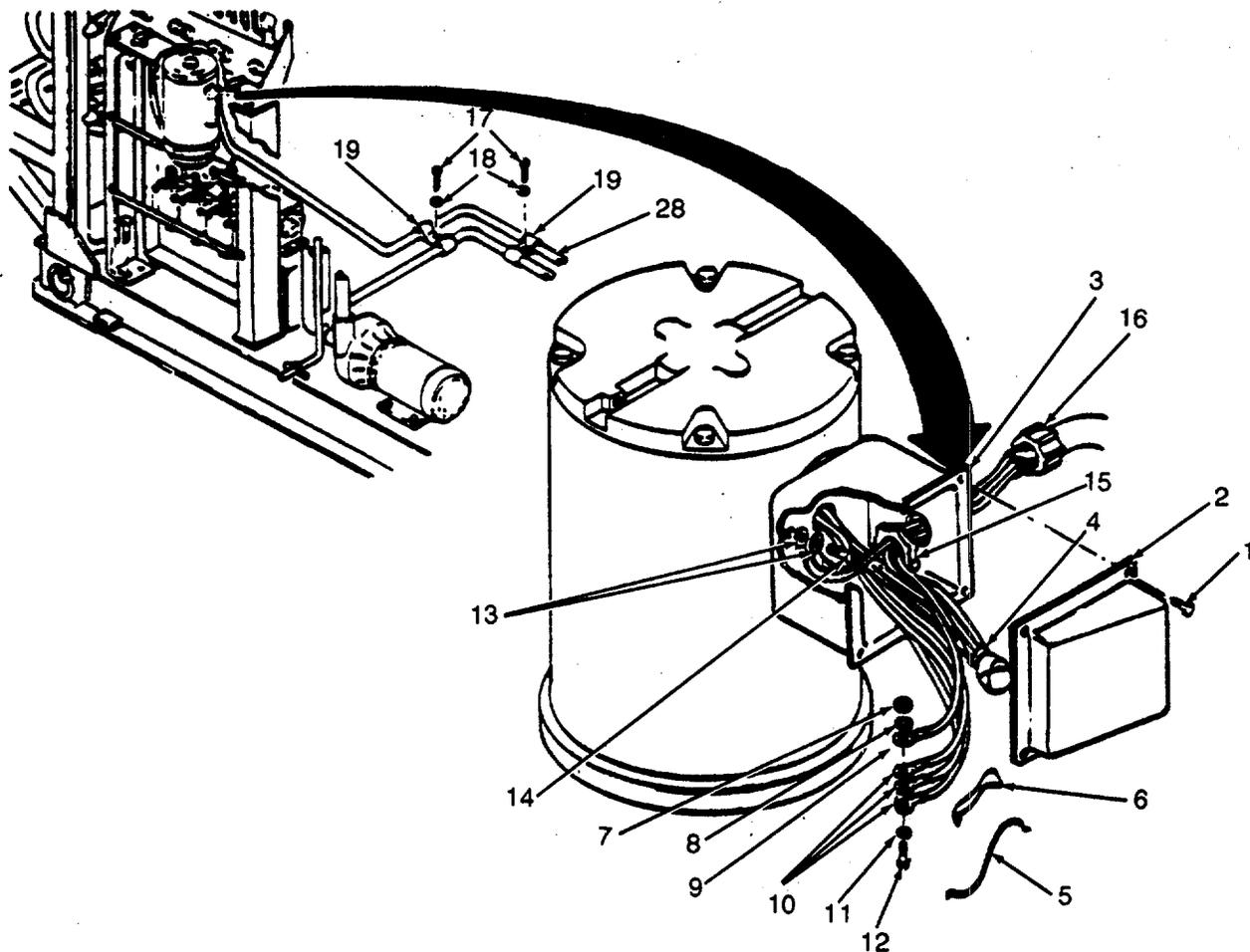
	Para	Page
Repair Chemical Feed Metering Pump Cable Assembly. For procedures to repair chemical feed metering pump cable assembly, refer to.....	3-17	3-113
Replace Chemical Feed Metering Pump Cable Assembly.....	3-50	3-210
Repair R.O. Pump Cable Assembly. For procedures to repair R.O. pump cable assembly, refer to .....	3-17	3-113
Repair Chemical Feed Metering Pump.....	3-51	3-214
Repair Chemical Feed Metering Pump Electric Motor .....	3-52	3-225
Repair R.O. Pump Electric Motor .....	3-53	3-231
Replace R.O. Pump Fluid End Assembly.....	3-54	3-236
Repair R.O. Pump Fluid End Assembly.....	3-55	3-239

**3-50. REPLACE CHEMICAL FEED METERING PUMP CABLE ASSEMBLY.**

This task covers:      a. Removal.                      b. Installation.

**INITIAL SETUP.**

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Multimeter (Appx B, Sect III, Items 6 and 9)
- b. Materials/Parts. Twine (Appx C, Sect II, Item 20).  
Tape, Electrical (Appx C, Sect II, Item 18).
- c. Equipment Condition. Power shut down (power source manual).  
ROWPU shut down (TM 5-4610-239-10).



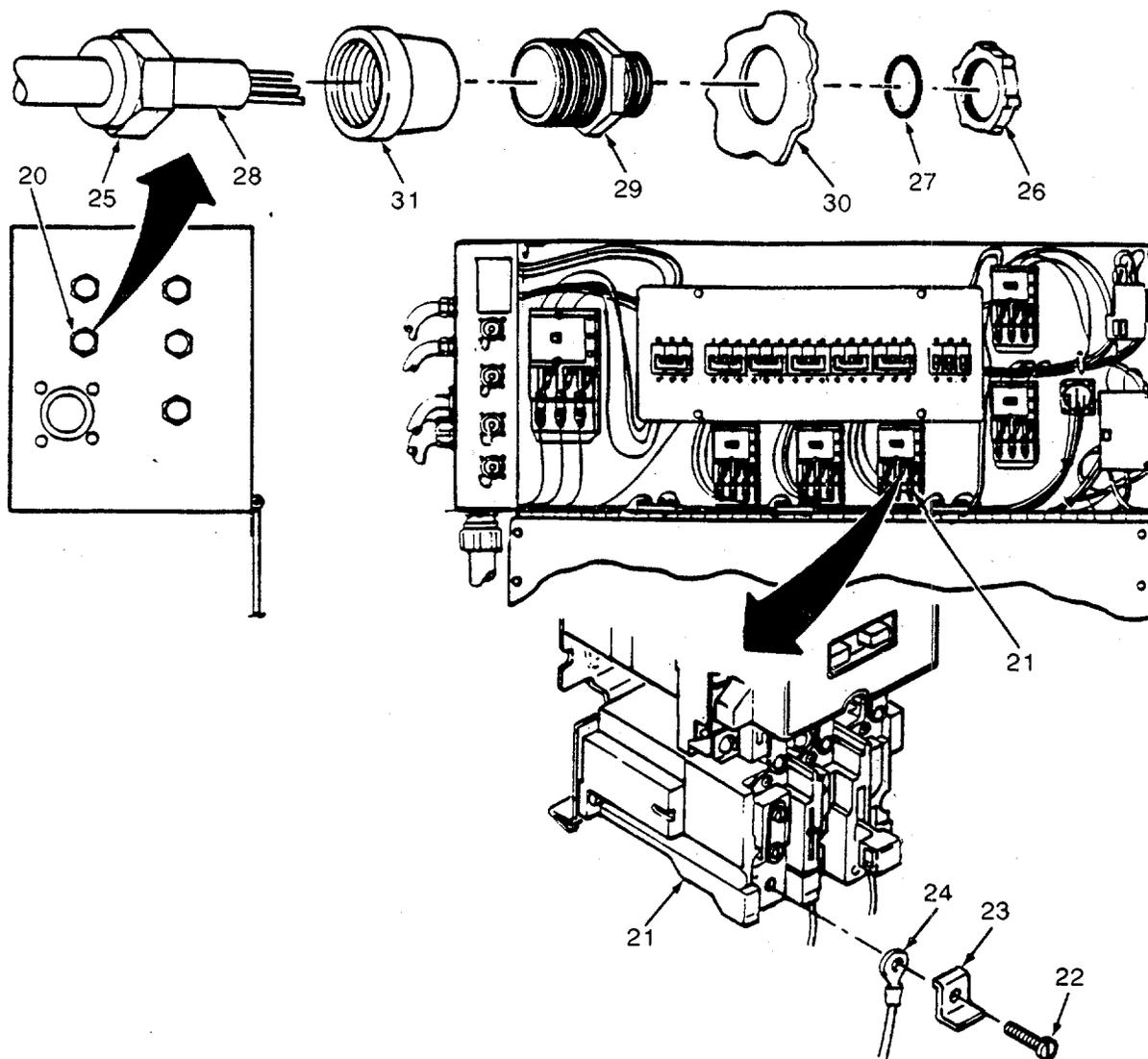
**REMOVAL.**

- a. Remove four screws (1) and conduit box cover (2) from conduit box (3).

**NOTE**

Tag all wires before removal.

- b. Pull two wire bundles (4) out of conduit box (3) far enough to expose taped ends. Remove twine (5) from both bundles.
- c. Remove electrical tape (6) from two wire bundles (4) and tag motor wires with color of power source wire in each bundle.
- d. Remove nut (7), lockwasher (8), four wire lugs (9) and (10), and flat washer (11) from screw (12) on each wire bundle (4).
- e. Install flat washer (11), three wire lugs (10) from motor, lockwasher (8), and nut (7) on screw (12) on each wire bundle (4).
- f. Tag two wire lugs (13) and remove screw (14) and two wire lugs from conduit box (3).
- g. Remove cable grip nut (15) from cable grip (16) and pull cable grip and three wires (13) and (9) out of conduit box (3).
- h. Remove two screws (17), flat washers (18), and cable clamps (19) securing chemical feed metering pump cable assembly to ROWPU deck.



**REMOVAL. (Cont)**

- i. Working inside electrical junction box, cut wire ties containing wires between sealing grip (20) and motor controller K7 (21).

**NOTE**

Tag all wires before removal.

- j. Remove three screws (22), three lug washers (23), and three wire lugs (24) from bottom terminals of motor controller K7(21).
- k. Loosen nut (25).
- l. Remove locknut (26) and O-ring (27). Discard O-ring.

**REMOVAL. (Cont)**

- m. Carefully pull chemical feed metering pump cable assembly (28) and cable sealing grip body (29) from electrical junction box (30).
- n. Remove cable sealing grip body (29), washer (31), and nut (25) from chemical feed metering pump cable assembly (28) and remove cable assembly from ROWPU.

**INSTALLATION.**

- a. Position nut (25), washer (31), and cable sealing grip body (29) on chemical feed metering pump cable assembly (28).
- b. Carefully pull chemical feed metering pump cable assembly (28) into electrical junction box (30), O-ring (29) and locknut (28) until wire lugs (24) reach motor controller K7 (21).
- c. Position three wire lugs (24) on bottom terminals of motor controller K7 (21) as tagged and install three lug washers (23) and screws (22).
- d. Route chemical feed metering pump cable assembly (28) along wire bundles between sealing grip (20) and motor controller K7 (21). Use wire ties to secure chemical feed metering pump cable assembly to wire bundles.
- e. Position cable sealing grip body (29) in hole in electrical junction box (30) and install new O-ring (27) and locknut (26).
- f. Route chemical feed metering pump cable assembly (28) across ROWPU deck and install two cable clamps (19), flat washers (18), and screws (17).
- g. Position cable grip (16) on cable assembly (30) and carefully pull three wires (9) and (13) into conduit box (3) through cable grip nut (15) until cable grip (16) is positioned inside the conduit box opening.
- h. Position cable grip nut (15) on cable grip (16) and secure cable grip nut (15).
- i. Position two wire lugs (13) as tagged on inside of conduit box (3) and install screw (14).
- j. Pull two wire bundles (4) out of conduit box (3) far enough to work on wire lugs (10) and connecting hardware.
- k. Remove nut (7), lockwasher (8), three wire lugs (10), and flat washer (11) from screw (12) on each wire bundle (4).
- l. Install flat washer (11), four wire lugs (9) and (10) as tagged, lockwasher (8), and nut(7) on screw (12) on each wire bundle (4).
- m. Using electrical tape (6), tape end of each wire bundle (4) to completely cover all hardware, including tube portion of all wire lugs.
- n. Secure electrical tape (6) on each wire bundle (4) with twine (5).
- o. Position two wire bundles (4) in conduit box (3).
- p. Position conduit box cover (2) conduit box (3) and install four screws (1).

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### 3-51. REPAIR CHEMICAL FEED METERING PUMP.

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly.

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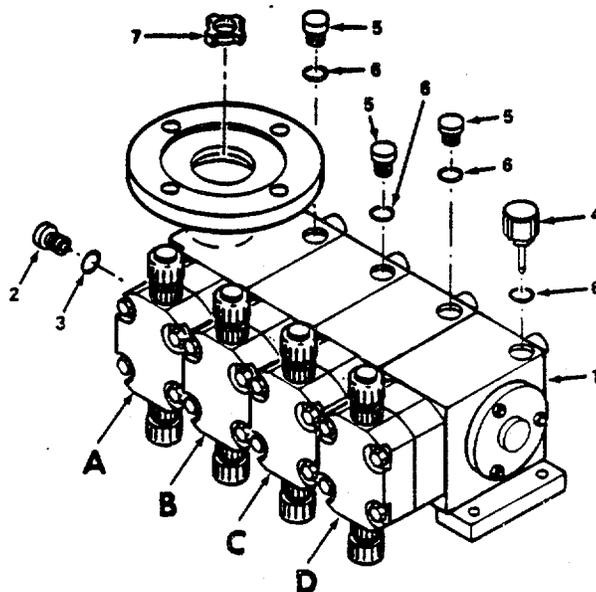
#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Soft-Bristled Brush (Appx B, Sect III, Item 2).
- b. Materials/Parts. Dry-cleaning Solvent (Appx C, Sect II, Item 16).  
Detergent (Appx C, Sect II, Item 3).  
Antiseize Tape (Appx C, Sect II, Item 17).  
Container (large enough for chemical feed pump oil drain)
- c. Equipment Condition. Chemical feed metering pump electric motor removed (paragraph 3-52).  
Manual stroke adjustment assemblies removed (paragraph 2-115).  
Chemical feed metering pump metering and drive assembly removed (paragraph 2-114).
- d. General Safety Requirements.

#### WARNING

Dry-cleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respirator protection. Use in a well-ventilated area.

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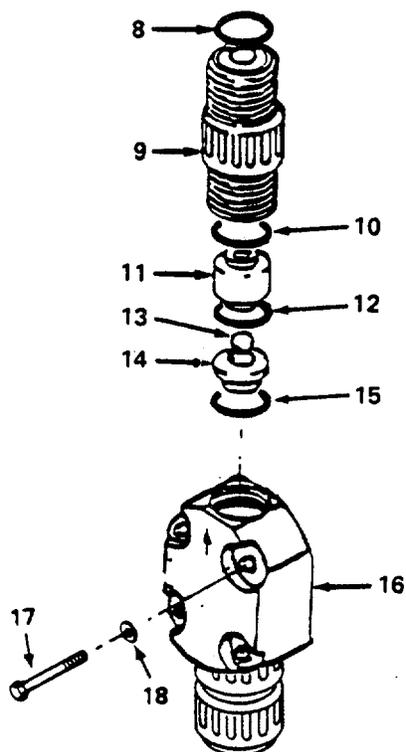


**DISASSEMBLY.**

- a. Place chemical feed metering pump (1) on workbench.
- b. Place container below chemical feed pump (1), remove oil drain plug (2) and seal (3) and drain oil from chemical feed metering pump (1).
- c. Remove air filter (4), three plugs (5), and four seal rings (6), and remove any remaining oil from feed pump. Refer to L0 10-4610-239-12.
- d. Remove toothedrim (7).

**NOTE**

The chemical feed metering pump has four diaphragm body assemblies attached to diaphragm drive housings. All are removed and disassembled the same. One is shown.



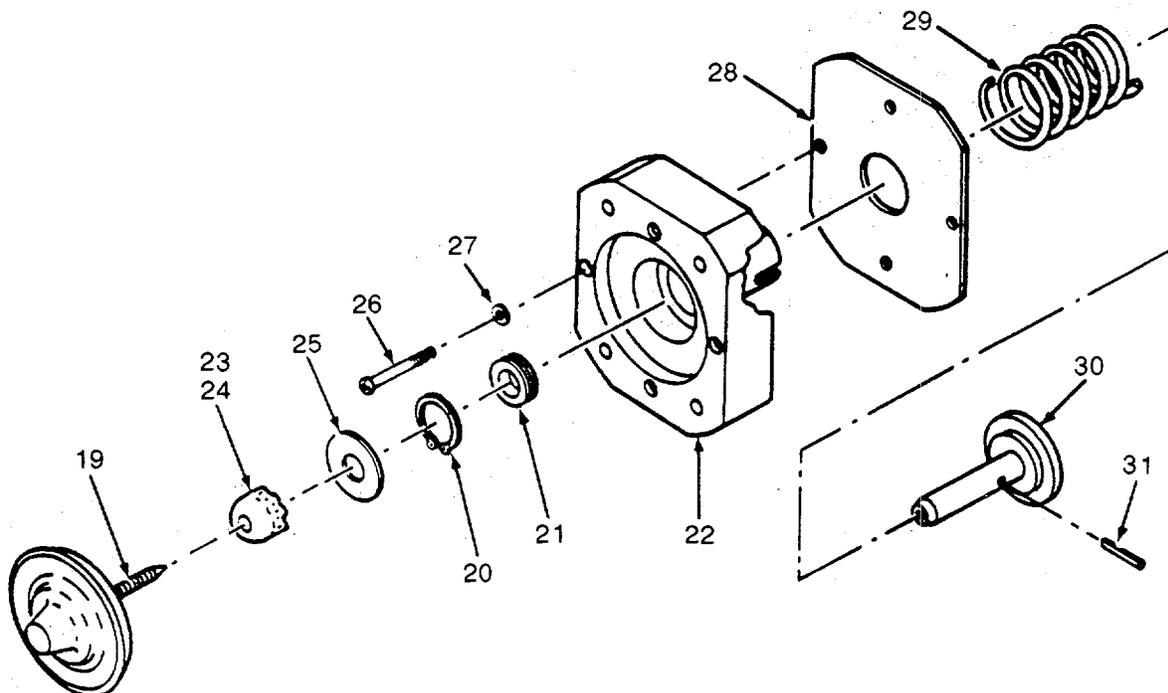
- e. Remove O-ring (8) and valve carrier (9).
- f. Working at bottom of valve carrier (9), remove O-ring (10), valve guide (11), and O-ring (12).
- g. Remove ball (13), valve seat (14), and O-ring (15).
- h. Turn chemical feed metering pump with top down on bench.
- i. Repeat steps e thru g at bottom of diaphragm body (16).

**DISASSEMBLY. (Cont)**

- j. Remove four screws (17), washers (18), and diaphragm body (16).

**NOTE**

There are four diaphragm drive assemblies on the chemical feed metering pump. All are disassembled the same. One is shown.



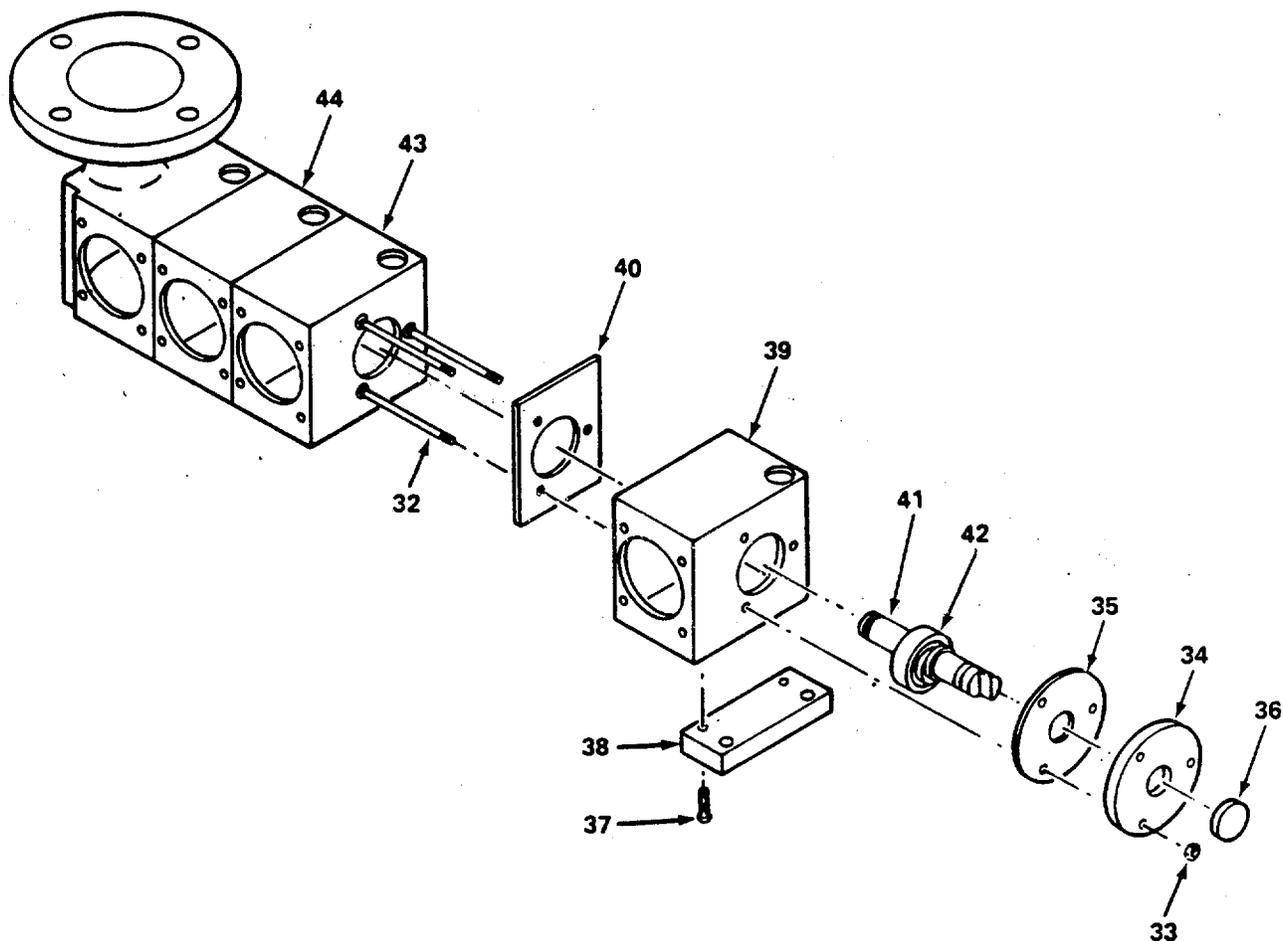
- k. Grip diaphragm (19) by edge and turn counterclockwise.  
l. Remove diaphragm (19), intermediate diaphragm (23) push plate (24), and splash disk (25).  
m. Remove V-ring (20) and grooved ring (21) from diaphragm drive housing (22).

**WARNING**

Diaphragm drive is under spring tension. Use care in removing diaphragm drive to prevent personal injury or damage to equipment.

- n. Remove four cylindrical screws (26), washers (27), diaphragm drive (22), and gasket (28).  
o. Remove locking pin (31), thrust rod (30), and spring (29).

DISASSEMBLY. (Cont)

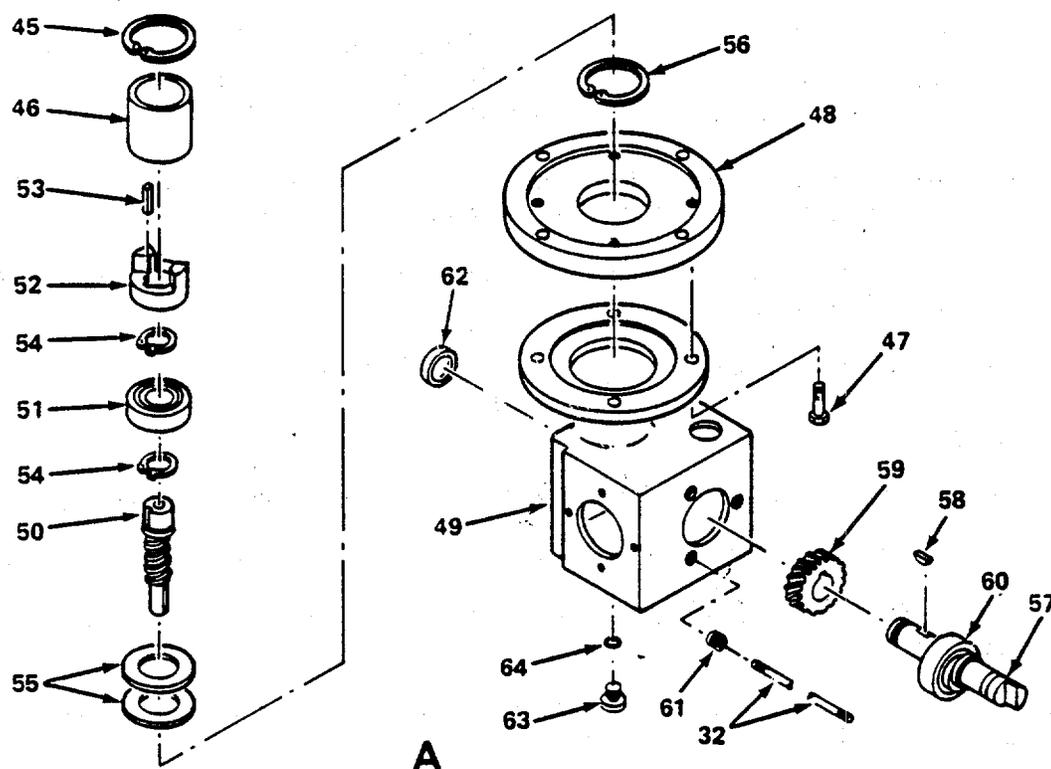


NOTE

Tie rods (32) may come out when nuts (33) are removed.

- p. Remove three nuts (33), cover (34), gasket (35), cover (36), four Allen screws (37), and two foot fittings (38).
- q. Remove drive unit casing (39) and gasket (40) from tie rods (32).
- r. Remove eccentric shaft (41) and ball bearing (42) from drive unit casing (39).
- s. Repeat steps q and r to remove two center drive unit casings (43) and (44).

DISASSEMBLY. (Cont)



- t. Remove circlip (45) and pipe spacer (46).
- u. Remove four screws (47) and adapter (48) from drive unit casing (49).
- v. Remove worm shaft (50) with grooved ball bearing (51), hub (52), and key (53).
- w. Remove hub (52) and key (53) from shaft (50).
- x. Remove two circlips (54) and bearing (51) from worm shaft (50).
- y. Remove circlip (56) and shims (55).
- z. Remove eccentric shaft (57), woodruff key (58), worm wheel (59), ball bearing (60), three tie rods (32), and lock bushings (61).
- aa. Remove cap (62), screw plug (63), and seal ring (64).

**CLEANING.**

**WARNING**

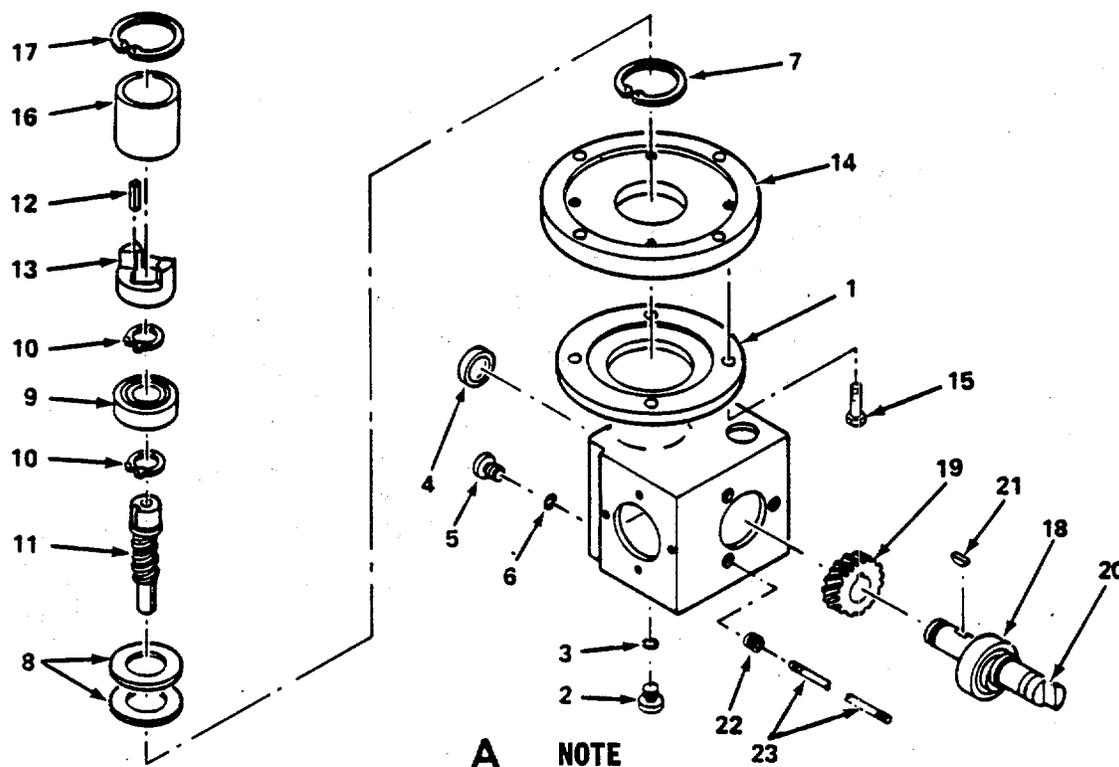
Dry-cleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Using a soft-bristled brush and dry-cleaning solvent, clean all metal parts of the chemical feed metering pump assembly and mounting hardware. Allow parts to air dry.
- b. Using soap solution, clean plastic parts, diaphragms, intermediate diaphragms, splash disks, and push plates. Rinse parts in clear water and air dry.
- c. Using soap solution, clean seal rings and gaskets. Rinse in clear water and air dry.

**INSPECTION.**

- a. Inspect plastic parts for cracks, breaks, and excessive wear. Replace as required.
- b. Inspect O-rings and gaskets for cracks, checks, and serviceability. Replace as required.
- c. Inspect washers, screws, locking sleeves, V-rings, and grooved rings for wear and damage. Replace as required.
- d. Inspect thrust rods, eccentric drives, tie rods, worm shaft, and worm wheel for damage and excessive wear. Replace items as required.
- e. Inspect diaphragm bodies, diaphragm drives, and drive unit casings for cracks, breaks, damage, and excessive wear. Replace as required.
- f. Inspect air filters, oil fill plugs, and lock bushings for damaged threads. Replace as required.

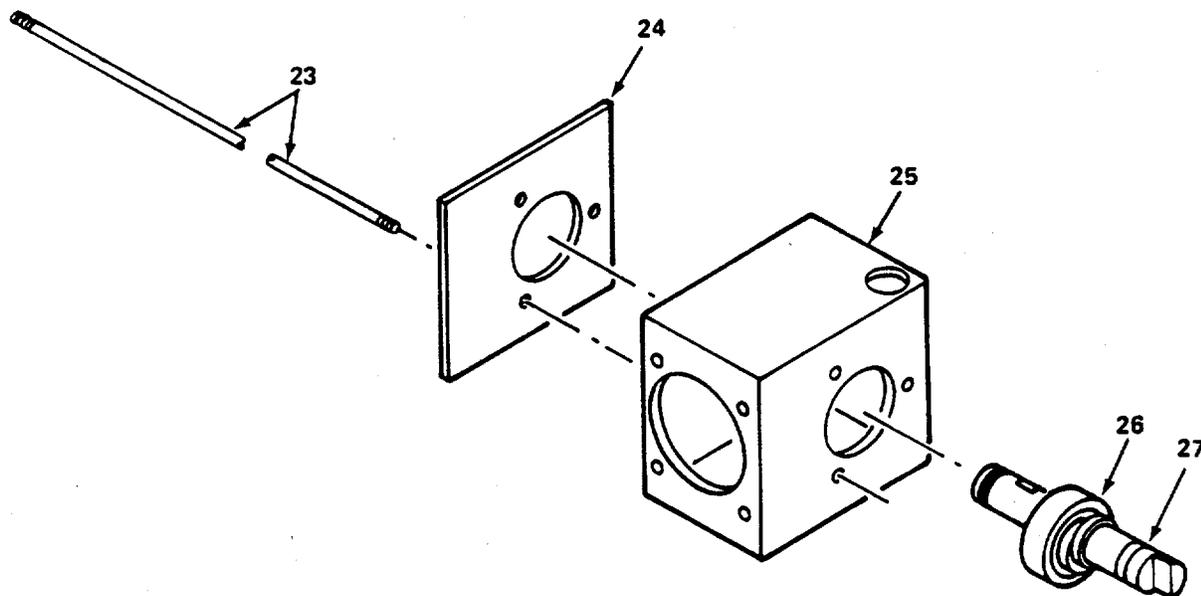
**ASSEMBLY.**



**NOTE**

Apply antiseize tape to pipe threads before installation.

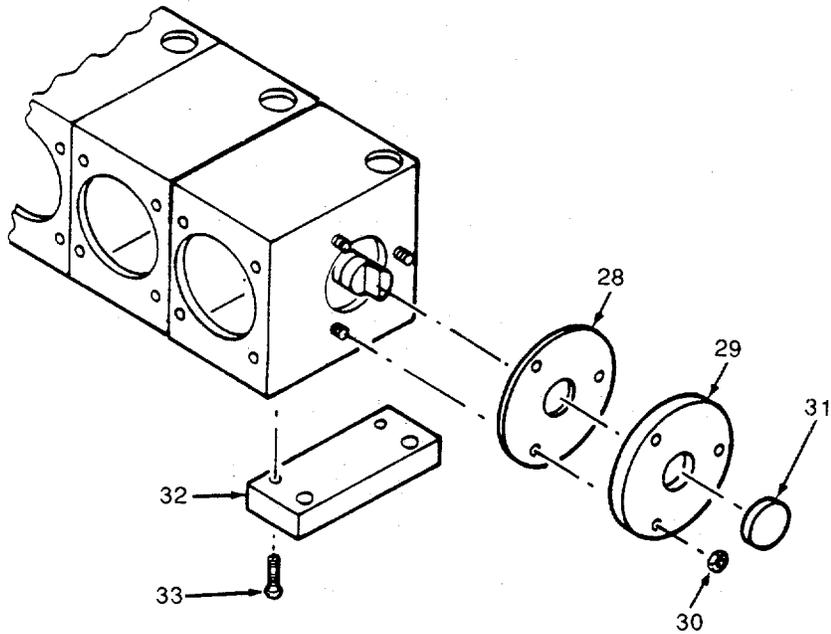
- a. Position drive unit casing A (1) and install screw plug (2), seal ring (3), cap (4), drain plug (5), and seal ring (6).
- b. Install two shims (8) and circlip (7) in drive unit casing (1).
- c. Install grooved ball bearing (9) and two circlips (10) on worm shaft (11).
- d. Install key (12) and hub (13) on wormshaft (11).
- e. Install adapter (14) and four screws (15).
- f. Position worm shaft (11) in drive unit casing (1) and install pipe spacer (16) and circlip (17).
- g. Position ball bearing (18), shaft (20) position woodruff key (21) and install worm wheel (19) on shaft (20).
- h. Position eccentric shaft assembly in drive unit casing (1) with end resting against cap (4). Mesh grooves of worm wheel (19) with teeth of worm shaft (11).
- i. Install lock bushing (22) and three tie rods (23).

**ASSEMBLY. (Cont)****NOTE**

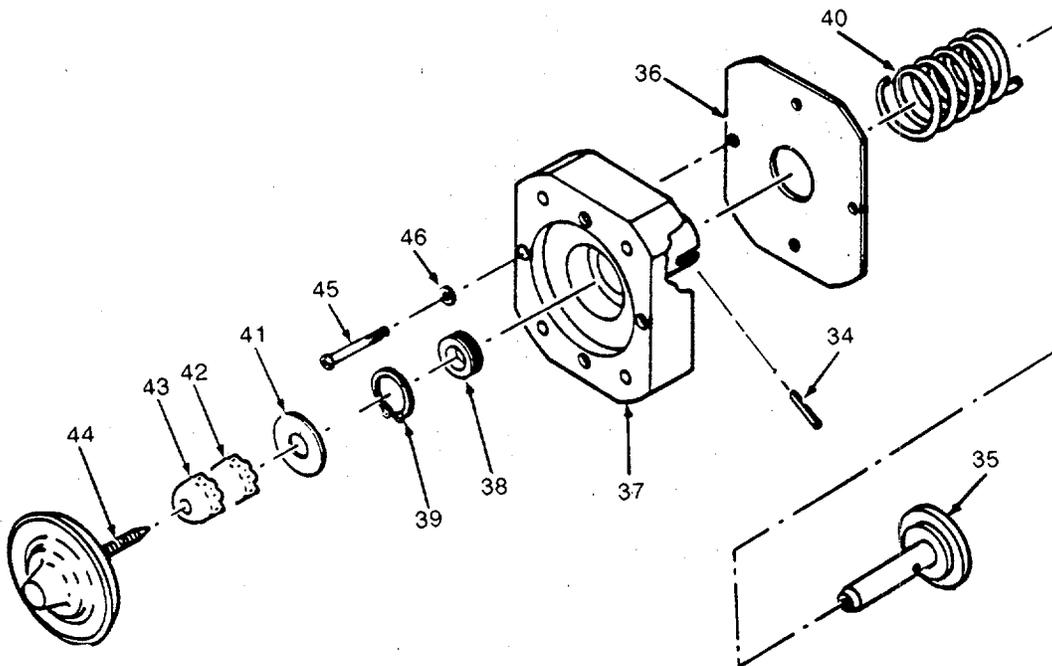
Drive unit casings B, C, and D are identical and are assembled and installed the same. One is shown.

- j. Position gasket (24) and drive unit casing (25) on tie rods (23) and slide into position next to assembled drive unit casing.
- k. Press ball bearing (26) on eccentric shaft (27) and install shaft in drive unit casing (25).

**ASSEMBLY. (Cont)**



- l. Install gasket (28), cover (29), three nuts (30), and cover (31).
- m. Position one foot fitting (32) at each end of pump assembly and install four screws (33).

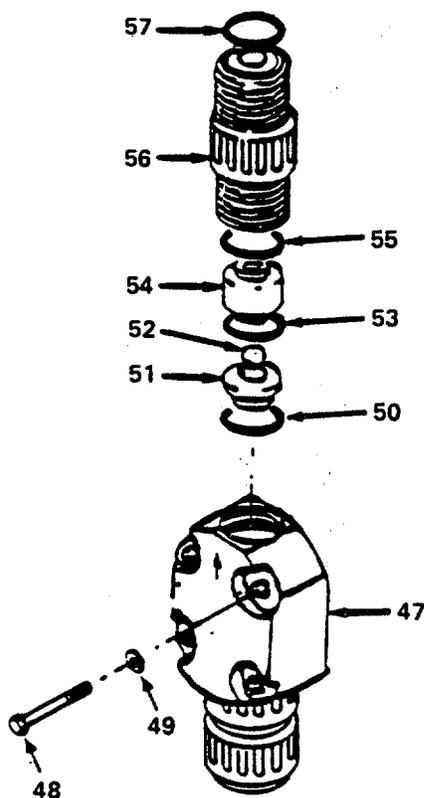


**ASSEMBLY. (Cont)**

**NOTE**

There are four diaphragm drive assemblies on the chemical feed metering pump. All are assembled the same. One is shown.

- n. Position spring (40) on trust rod (35) and gasket (36) on diaphragm drive housing (37).
- o. Position trust rod (35) in housing (37), compress spring (40) and install locking sleeve (34) in the slot on housing (37).
- p. Position diaphragm drive housing (37) on drive unit and install four washers (46) and screws (45).
- q. Install grooved ring (38) and V-ring (39) in housing (37).
- r. Position intermediate diaphragm (43), push plate (42), and splash disk (41) on diaphragm (44).
- s. Install diaphragm (44) on diaphragm housing (37).
- t. Position diaphragm drive housing (37) on drive unit and install four screws (45) and washers (46).

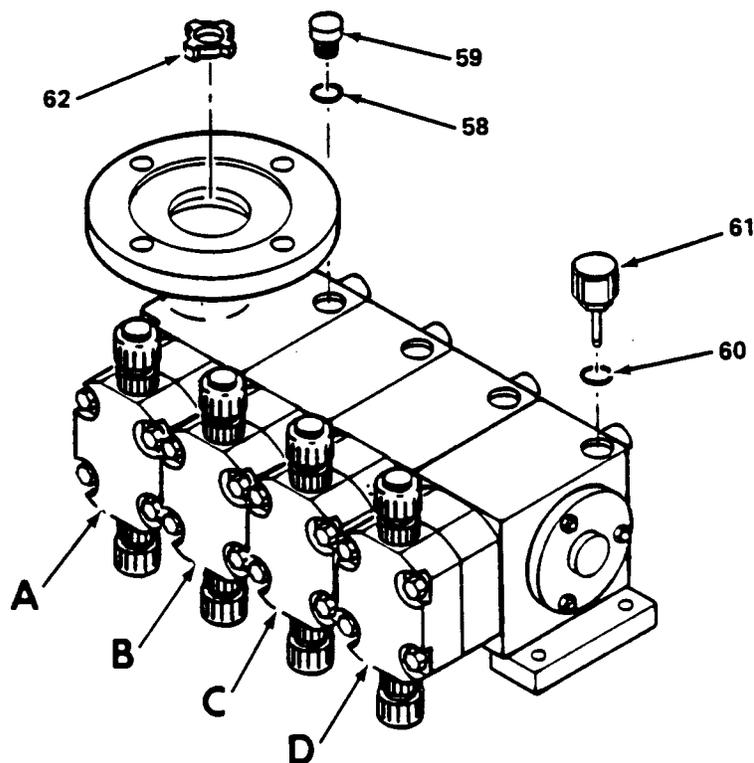


**ASSEMBLY. (Cont)**

**NOTE**

There are four diaphragm body assemblies on the chemical feed metering pump. All are assembled the same. One is shown.

- u. Position diaphragm body (47) on diaphragm drive housing (37) and install four screws (48) and washers (49). Ensure arrow on face of diaphragm body points to top of diaphragm drive housing.
- v. Install O-ring (50), valve seat (51), ball (52), O-ring (53), valve guide (54), and O-ring (55) in valve carrier (56).
- w. Install valve carrier (56) and O-ring (57) in diaphragm body (47).
- x. Turn chemical feed metering pump with top down on bench.
- y. Repeat step v and w at bottom of diaphragm body (47).



- z. Install three seal rings (58) and plugs (59) on drive units A, B, and C.
- aa. Install seal ring (60) and air filter (61).
- ab. Install tothedrim (62).

### 3-52. REPAIR CHEMICAL FEED METERING PUMP ELECTRIC MOTOR.

This task covers:      a. Removal.      b. Test.      c. Disassembly.      d. Cleaning.      e. Inspection.  
                                 f. Assembly.      g. Installation

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#### INITIAL SETUP.

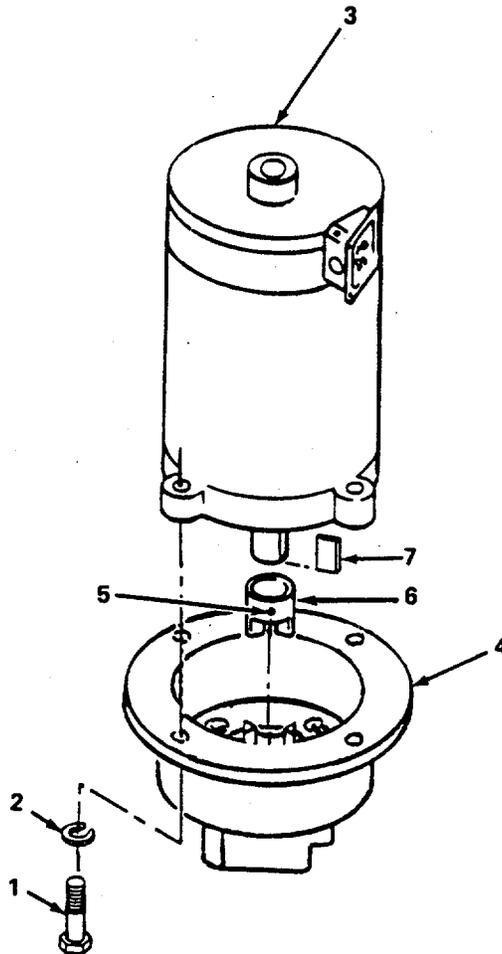
- a. Tools.      Tool Kit (Appx B, Sect III, Item 10).  
                         Automotive Repair Shop Set (Appx B, Sect III, Item 9).  
                         Arbor Press.
  
- b. Materials/Parts.      Grease (Appx C, Sect II, Item 8).  
                                 Rags (Appx C, Sect II, Item 13).
  
- c. Equipment Condition.      Power shut down (power source normal).  
                                 ROWPU shut down (TM 10-4610-239-10).  
                                 Chemical feed pump removal (paragraph 3-50).
  
- d. General Safety Requirements.

#### WARNINGS

- High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
  
  - Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.
-

**REMOVAL.**

- a. Remove four screws (1) and lockwashers (2).
- b. Remove electric motor (3) from drive housing (4).
- c. Loosen setscrew (5) and remove coupler (6) and shaft key (7).



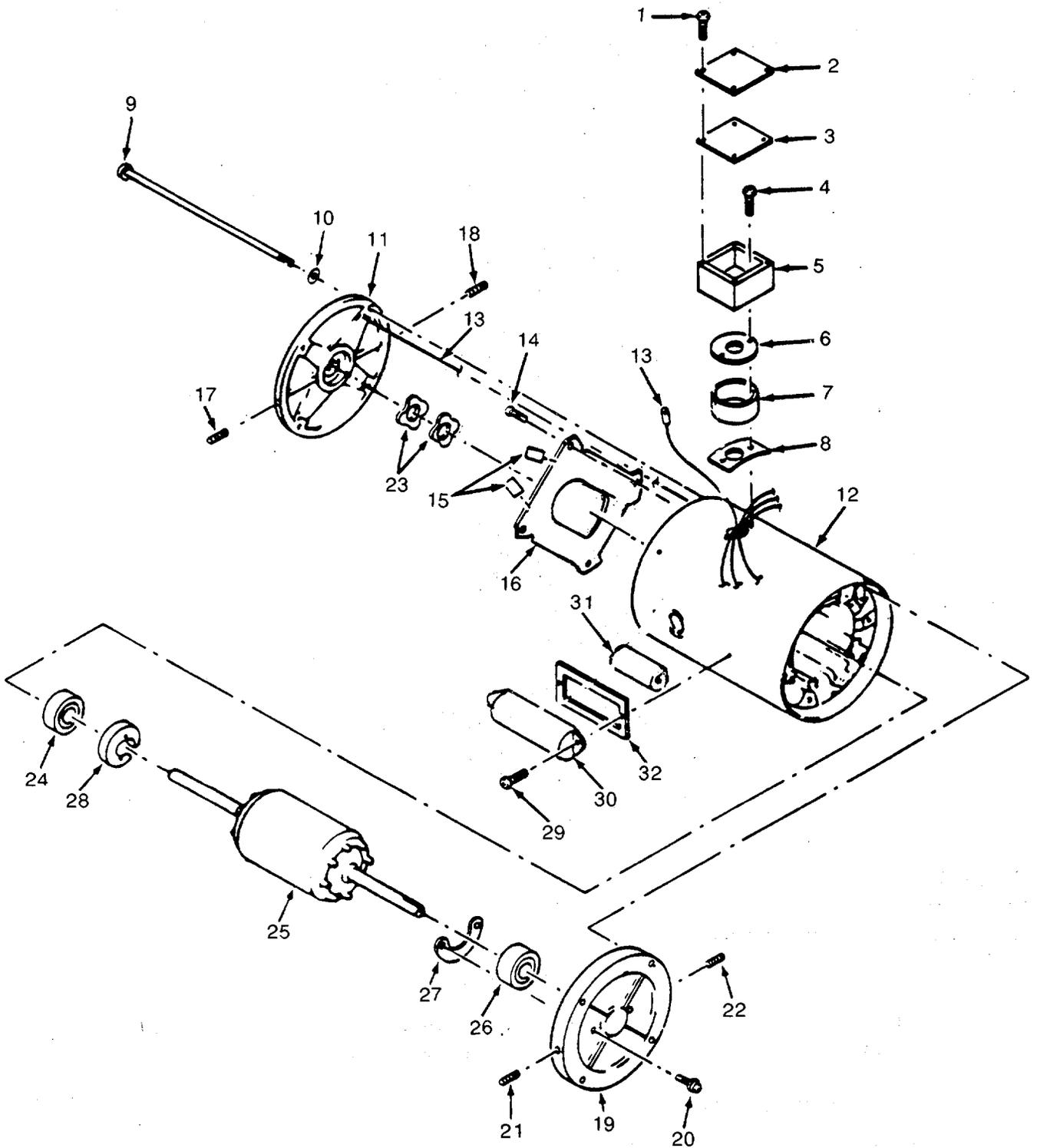
**TEST.**

- a. Secure motor to test bench.

**WARNING**

Electrical high voltages can cause serious injury or death. Some tests require power to be connected. Always take proper measures to ensure personal safety.

- b. Connect motor wiring to test bench leads.
- c. Connect power and run motor with and without load.
- d. If motor won't start; turn off power, spin shaft by hand, and turn on power while shaft is spinning. If motor continues to run, stationary switch must be tested after disassembly.



**TEST. (Cont)**

- e. Disconnect motor from test bench leads.

**DISASSEMBLY.**

- a. Remove four screws (1), cover (2), and gasket (3).
- b. Remove two screws (4), conduit box (5), gasket (6), conduit spacer (7), and gasket (8). Discard gaskets.

**NOTE**

Mark both end shields and shell to assist in alignment during assembly.

- c. Remove four bolts (9) and flat washers (10).

**CAUTION**

Stationary switch mounted on end shield is connected to stator by two wires. Failure to disconnect wires from stator before moving end shield more than wire length from stator can damage wires or stator. Be careful when removing end shield.

**NOTE**

Tag all wires before removal.

- d. Tap end shield (11) with soft-faced mallet to break bond with shell (12).
- e. Carefully move end shield (11) away from shell (12) while guiding wires (13) through side of shell. Disconnect wires (13).
- f. Remove two screws (14), two wire clips (15), and stationary switch (16) from shell (12).
- g. Remove pipe plug (17) and T-drain (18).

**NOTE**

Place alignment marks on end shield and shell before disassembly.

- h. Tap end shield (19) with soft-faced mallet to break bond with shell (12) and remove shell (12).
- i. Remove two screws with washers (20) from end shield (19).
- j. Remove pipe plug (21) and T-drain (22).
- k. Remove two wavy washers (23) from end of shield (19).

**CAUTION**

Stator wiring can be damaged by rotor or rotor shaft if it is not removed carefully.

- l. Remove end shield (19) from rotor (25).

**DISASSEMBLY. (Cont)**

- m. Using arbor press, remove two bearings (24) and (26) and one bearing lockring (27).
- n. Using arbor press, remove centrifugal switch (28) from shaft of rotor (25).
- o. Remove four screws (29) and capacitor cover (30).

**NOTE**

Tag capacitor wires before removal.

- p. Disconnect capacitor leads T10 and remove capacitor (31) and gasket (32).

**CLEANING.**

**WARNING**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi (207 kPa) air pressure.

- a. Scrape loose paint from fan cover, shell, and pump end shields. Prime and paint as necessary.
- b. Using compressed air, blow dust and grit from stator and rotor. Wipe rotor with clean rag.
- c. Wipe bearings with clean rag if grease is dry or dirty.

**INSPECTION.**

- a. Inspect leads and windings of stator for evidence of cracked or burned insulation. Replace shell if stator is damaged.
- b. Inspect rotor for loose or burned conducting bars. Replace as required.
- c. Inspect bearings for wear. Replace as required.
- d. Inspect end shields for cracks. Replace as required.
- e. Using multimeter set to OHMS X1 scale, connect one test lead to each set of motor leads.
- f. If multimeter indication is not 0 ohm, replace stator.
- g. Set multimeter to OHMS X1000 scale. Connect one lead to stator housing. Connect other lead to each set of motor leads in turn.
- h. If multimeter indication is not infinity for each motor lead, replace stator.
- i. Connect multimeter leads to capacitor leads. If multimeter indication does not indicate resistance, increasing to more than 50K ohms, replace capacitor.
- j. Set multimeter to OHMS X1 scale. Connect leads to stationary switch leads. If multimeter indication is not 0 ohm, replace stationary switch. If multimeter indication is 0 ohm, but motor started only by hand during test, replace centrifugal switch.

**ASSEMBLY.**

- a. Position gasket (32) and connect tagged capacitor leads T9 and T10. Position capacitor cover(30) and install four screws (29).
- b. Install pipe plug (17), T-drain (18), pipe plug (21), and T-drain (22) on end shields (11) and (19).
- c. Pack two bearings (24) and (26) with grease.
- d. Position retaining ring (27) on rotor (25) and, using arbor press, install centrifugal switch (28), bearings (24) and (26) on rotor shaft (25).
- e. Position end shield (19) on rotor (25) and install two screws and washers (20) on retaining ring (27).
- f. Install wavy washers (23) in end shield (11).
- g. Position end shield (19) and rotor (25) in stator (12).
- h. Position stationary switch (16) on stator (12), connect two wire clips (15) and install screws (14).
- i. Hold end shield (11) close to stator (12), connect wires (13), align end shields (19) and (11) as previously marked and install bolts (9).
- j. Position new gaskets (8), conduit spacer (7), new gasket (6) and conduit box (5) over wires of stator (12) and install screws (4).

**INSTALLATION.**

- a. Position shaft key (7) and coupler (6) on motor (3) and tighten setscrew (5).
- b. Position motor (3) on drive housing (4).
- c. Install four screws (1) and lockwashers (2).

### 3-53. REPAIR R.O. PUMP ELECTRIC MOTOR.

This task covers:     a. Disassembly.   b. Cleaning.     c. Inspection.     d. Assembly.     e. Test.

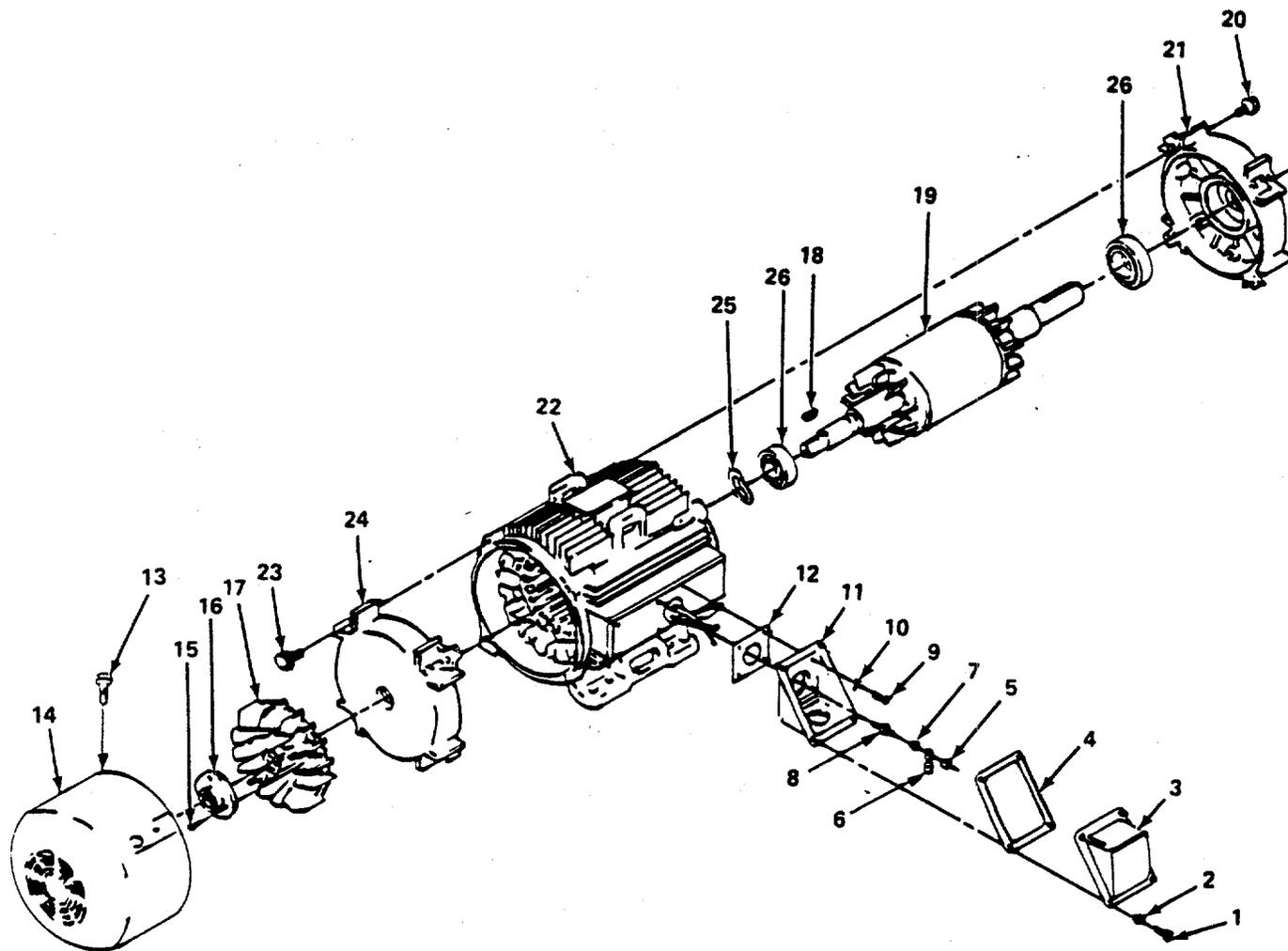
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#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Automotive Repair Shop Set (Appx B, Sect III, Item 9).  
Multimeter (Appx B, Sect III, Items 6 and 9).
- b. Materials/Parts.                   Grease (Appx C, Sect II, Items 8).  
                                          Rags (Appx C, Sect II, Items 13).
- c. Equipment Condition.            Electric motor removed from R.O. pump assembly (paragraph 2-124).
- d. General Safety Requirements.

#### WARNINGS

- High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
  - Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.
  - Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.
-



**DISASSEMBLY.**

**WARNING**

Weight of R.O. pump motor is 251 pounds (114 kg). Attempting to move it without proper equipment could cause serious injury. Hoist motor with equipment rated at 1 ton or more.

- a. Remove four screws (1) and lockwashers (2), conduit box cover (3), and gasket (4). Discard gasket.
- b. Remove nut (5), ground lug (6), nut (7), and grounding stud(8).
- c. Remove four screws (9) and lockwashers (10), conduit box (11), and gasket (12). Discard gasket.
- d. Remove four screws (13) and fan cover (14).
- e. Remove three screws (15), holding clamp (16), fan (17), and woodruff key (18) from shaft of rotor (19).

**DISASSEMBLY. (Cont)**

**NOTE**

Mark fan end plate, motor casing, and drive end plate to assist in alignment during assembly.

- f. Remove four bolts (20).
- g. Tap drive end plate (21) with soft-faced mallet to break bond with motor casing (22) and then remove drive end plate.
- h. Remove four bolts (23).
- i. Tap fan end plate (24) with soft-faced mallet to break bond with motor casing (22) and remove fan end plate.

**CAUTION**

Stator wiring inside motor casing can be damaged by rotor or rotor shaft if rotor is not removed carefully. Guide rotor carefully while removing it.

- j. Remove rotor (19) through drive end of motor casing (22).
- k. Remove wavy washer (25) from shaft of rotor (19).
- l. Using arbor press, remove two bearings (26) from shaft of rotor (19).

**CLEANING**

**WARNING**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi (207 kPa) air pressure.

- a. Using compressed air, blow dust and grit from stator and rotor. Wipe rotor with clean rag.
- b. Clean end plate vent slots with compressed air and wipe with clean rag.
- c. Wipe bearings with clean rag if grease is dry or dirty.
- d. Scrape loose paint from fan cover, motor casing, and drive end plate. Prime and paint as necessary

**INSPECTION.**

- a. Inspect leads and windings of stator for evidence of cracked or burned insulation. Replace as required.
- b. Inspect rotor assembly for loose or burned conducting bars. Replace as required.
- c. Inspect bearings for wear. Replace as required.
- d. Inspect end plates for cracks or plugged vent slots.

**INSPECTION. (Cont)**

- e. Using multimeter set to OHMS X1 scale, connect test leads to pairs of motor leads; 1 and 7 to 2 and 8, 1 and 7 to 3 and 6, 2 and 8 to 3 and 6.
- f. If multimeter indication is not 0 ohm for each pair of windings, replace stator.
- g. Set multimeter to OHMS X1000 scale. Connect one lead to stator housing. Connect other lead to each motor lead in turn.
- h. If multimeter indication is not infinity for each motor lead, replace stator.

**ASSEMBLY.**

**WARNING**

Weight of R.O. pump motor is 251 pounds (114 kg). Attempting to move it without proper equipment could cause serious injury. Hoist motor with equipment rated at 1 ton or more.

- a. Position fan end plate (24). align mark made during disassembly with mark on motor casing (22) and install four bolts (23).
- b. Pack two bearings (26) and use arbor press to install one bearing on each end of rotor (19).
- c. Install wavy washer (25) on fan end shaft of rotor (19).

**CAUTION**

Stator wiring inside motor casing can be damaged by rotor or rotor shaft if rotor is not installed carefully.

- d. Install rotor (19) in motor casing (22) with rotor shaft through fan end plate (24).
- e. Position drive end plate (21). align mark made during disassembly with mark on motor casing (22) and install four bolts (20).
- f. Install woodruff key (18), fan (17), holding clamp (16), and three screws (15).
- g. Position fan cover (14) and install four screws (13).
- h. Position gasket (12) and conduit box (11) over wires on side of motor casing (22) and install four lockwashers (10) and screws (9).
- i. Install grounding stud (8), nut (7), ground lug (6), and nut (5).
- j. Position gasket (4) and conduit box cover (3) and install four lockwashers (2) and screws (1).

TEST.

**WARNING**

Weight of R.O. pump motor is 251 pounds (114 kg). Attempting to move it without proper equipment could cause serious injury. Hoist motor with equipment rated at 1 ton or more.

- a. Secure motor to test bench.

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests require power to be connected. Always take proper measures to ensure personal safety.

- b. Connect motor wiring to test bench leads.
- c. Connect power and run motor with and without load.
- d. Check motor for excessive vibration and fast temperature rise.
- e. Disconnect motor from test bench leads.

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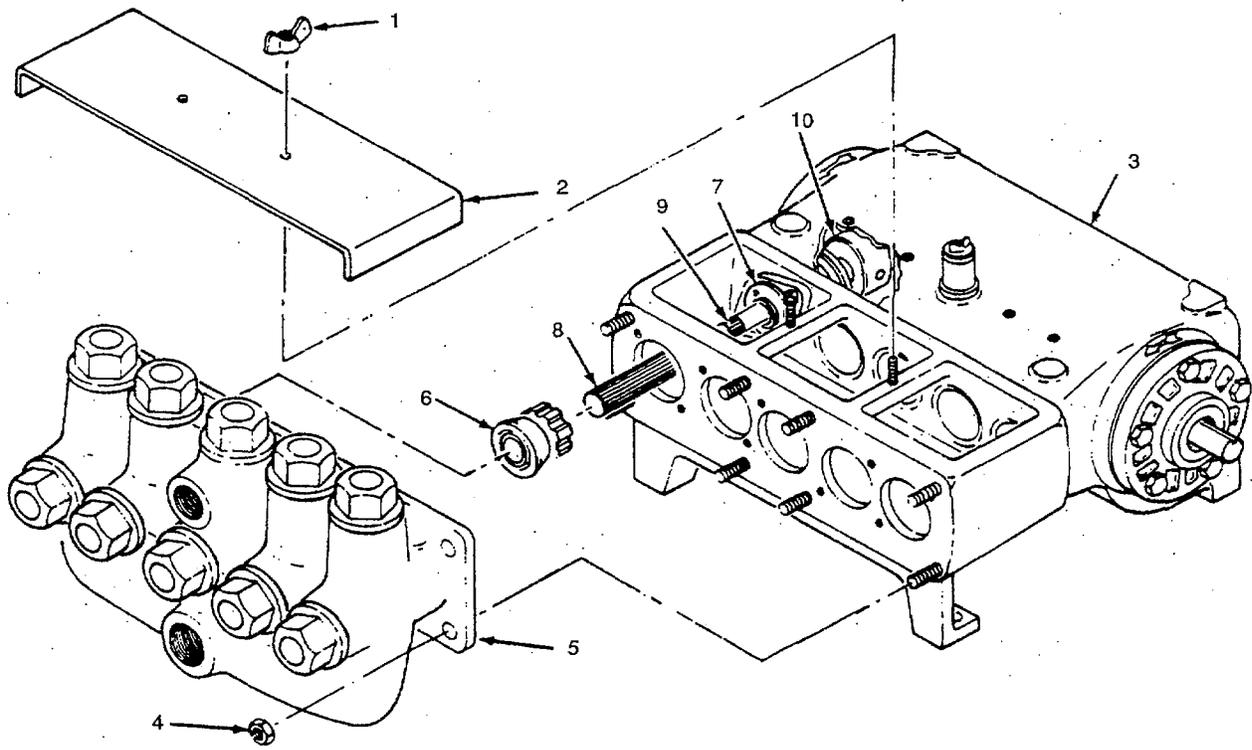
### 3-54. REPLACE R.O. PUMP FLUID END ASSEMBLY.

This task covers:      a. Removal.                      b. Cleaning.                      c. Inspection.                      d. Installation.

---

#### INITIAL SETUP.

- a. Tools.                      Tool Kit (Appx B, Sect III, Item 10).  
                                    Spanner Wrench
  
  - b. Materials/Parts.                      Detergent (Appx C, Sect II, Item 3).  
                                    Rags (Appx C, Sect II, Item 13).
  
  - c. Equipment Condition.                      R.O. pump assembly removed from ROWPU (paragraph 2- 128).
- 



#### REMOVAL.

- a. Remove two wingnuts (1) and barrel cover (2) from R.O. pump power frame assembly (3).
- b. Using spanner wrench, loosen five stuffing nuts (11) from plunger (9).
- c. Remove eight nuts (4) and R.O. pump fluid end assembly (5) from R.O. pump power frame assembly (3).

#### NOTE

There are five adapter assemblies and plungers. All are removed the same. One is shown.

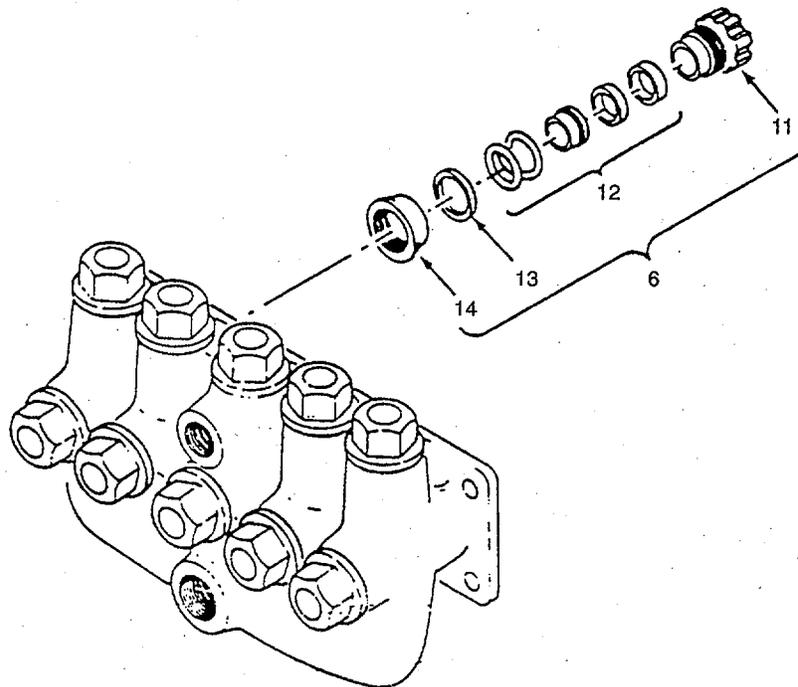
**REMOVAL. (Cont)**

- d. Remove adapter assembly (6).
- e. Slide baffle disc (7) off knurled surface (8) of plunger (9).

**CAUTION**

Nicks on the plunger body will cause packing ring failure. Use tools only on plunger knurled surface to prevent damage to equipment.

- f. Using wrench, remove plunger (9) from crossheads (10) in R.O. pump power frame assembly.
- g. Remove baffle disc (7) from plunger.



**NOTE**

- There are five adapter assemblies. All are separated the same. One is shown.
- Record sequence of components in packing kit for installation.
- Packing kit components may separate during removal of stuffing box nut.

- h. Using spanner wrench, remove stuffing box nut (11).
- i. Remove packing kit (12) and throat bushing (13) from adapter (14). Discard packing kit.

**CLEANING.**

- a. Wash plungers, baffle discs, stuffingbox nuts, throat bushings, and adapters with mild soap solution.

**CLEANING. (Cont.)**

- b. Rinse with clean water and dry with clean rags.

**INSPECTION.**

- a. Inspect plungers, stuffing box nuts, adapters, and nuts for stripped threads. Replace damaged parts.
- b. Inspect throat bushings for excessive wear. Replace as required.
- c. Inspect plungers for nicks or burrs. Replace as required.
- d. Inspect baffle discs for excessive wear, cracks, or tears. Replace as required.

**INSTALLATION.**

**NOTE**

There are five adapter assemblies. All five are assembled the same. One is shown.

- a. Position throat bushing (13) on adapter (14).
- b. Position new packing kit (12) on throat bushing (13) with components in same sequence as recorded during removal.
- c. Install stuffing box nut (11) fingertight on adapter (14).

**NOTE**

There are five adapter assemblies and plungers. All are installed the same. One is shown.

- d. Install baffle disc (7) on plunger (9).
- e. Position plunger (9) in R.O. pump power frame assembly (3).

**CAUTION**

Nicks on the plunger body will cause packing ring failure. Use tools only on plunger knurled surface to prevent damage to equipment.

- f. Using wrench, install plunger (9) on crosshead (10) in R.O. pump power frame assembly (3).
- g. Slide baffle disc (7) over knurled surface (8) of plunger (9).
- h. Position adapter assembly (6) in R.O. pump fluid end assembly (5).
- i. Carefully position R.O. fluid end assembly (5) by sliding adapter assemblies (6) over R.O. plungers (9) and studs (12) on R.O. power frame assembly (3).
- j. Install eight nuts (4) and, using spanner wrench, tighten five stuffing box nuts (11).
- k. Position barrel cover (2) on R.O. pump power frame assembly and install two wingnuts (1).

---

**3-55. REPAIR R.O. PUMP FLUID END ASSEMBLY.**

This task covers:      a. Disassembly.      b. Cleaning.      c. Inspection.      d. Assembly.

---

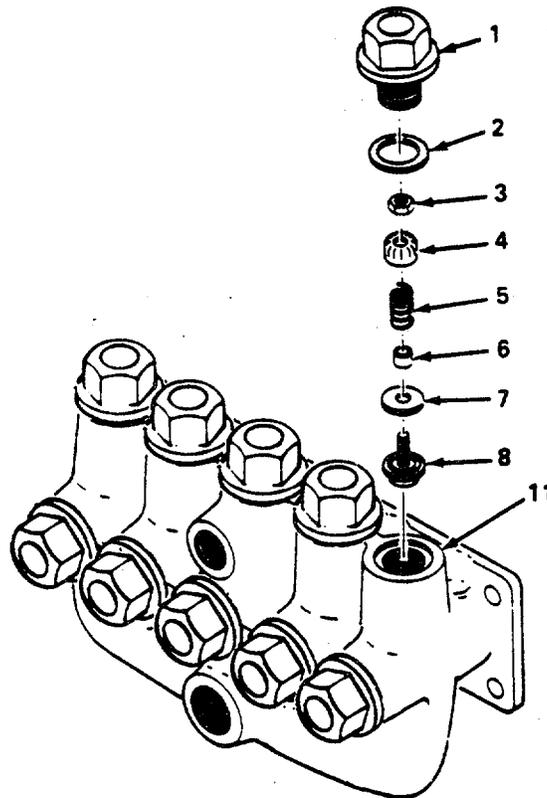
**INITIAL SETUP.**

- a. Tools.                      Tool Kit (Appx B, Sect III, Item 10).  
                                    Valve Seat Puller (Appx B, Sect III, Item 4).
- b. Materials/Parts.                      Detergent (Appx C, Sect II, Item 3).  
                                    Rags (Appx C, Sect II, Item 13).
- c. Equipment Condition.                      R.O. Pump fluid end removed (paragraph 3-54).
- d. General Safety Requirements.

**WARNING**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.

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**DISASSEMBLY.**

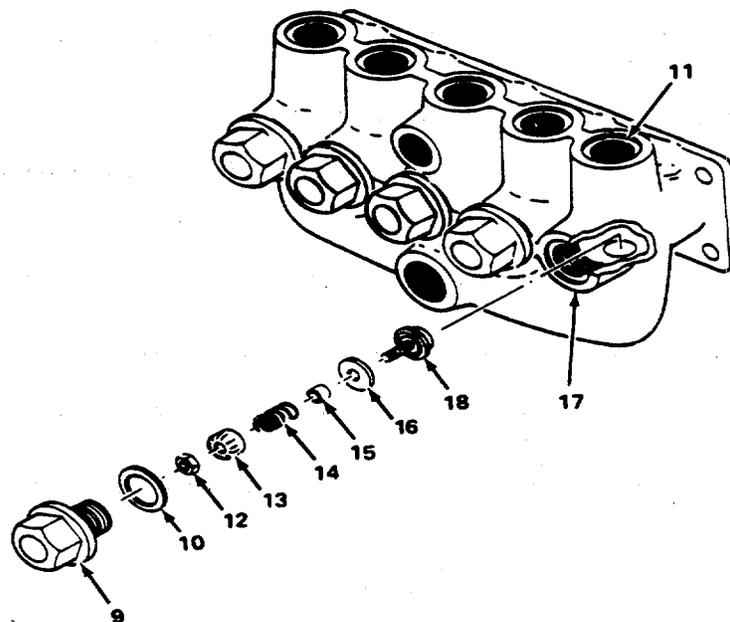
**CAUTION**

R.O. pump fluid end assembly is made from cast aluminum bronze. To prevent damage to equipment, do not hit or drop R.O. pump fluid end assembly.

**NOTE**

There are five cylinder heads, seals, and discharge valve assemblies at top of fluid end assembly. All are removed the same. One is shown.

- a. Remove cylinder head (1) and seal (2). Discard seal.
- b. Remove nut (3), retainer (4), spring (5), sleeve (6), and disc (7). Save disc for assembly.
- c. Using valve seat puller, remove seat (8).



**NOTE**

There are five cylinder heads, seals, and suction valve assemblies in bottom of fluid end assembly. All five are removed the same. One is shown.

- d. Remove cylinder head (9) and seal (10). Discard seal.
- e. Working through top cylinder opening (11), loosen nut (12).
- f. Remove nut (12), retainer (13), spring (14), sleeve (15), and disc (16) through cylinder opening (17). Save disc for assembly.

**DISASSEMBLY. (Cont)**

- g. Working through top cylinder opening (11) and using seat valve puller, loosen seat (18).
- h. Remove seat (18) through cylinder opening (17).

**CLEANING.**

- a. Wash R.O. pump fluid end body with strong soap solution.
- b. Wash cylinder heads and valve assembly components.
- c. Rinse all parts with clean water.
- d. Dry cylinder heads and valve assembly components with clean rags.

**WARNING**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi (207 kPa) air pressure.

- e. Use compressed air to dry the R.O. pump fluid end body,
- f. Remove rust and loose paint from cylinder heads and R.O. pump fluid end body.

**INSPECTION.**

- a. Inspect R.O. pump fluid end body for cracks, deformed threads, and warping. Replace as required.
- b. Inspect cylinder heads for cracks and deformed threads. Replace as required.
- c. Inspect valve assemblies for broken or excessive wear on seats and discs, bent or broken retainers, and broken springs. Replace as required.
- d. Inspect valve assembly nuts for deformed heads and threads. Replace as required.

**ASSEMBLY.**

**CAUTION**

R.O. pump fluid end assembly is made from cast aluminum bronze. To prevent damage to equipment, do not hit or drop R.O. pump fluid end assembly.

**NOTE**

There are five suction valve assemblies, seals, and cylinder heads in bottom of fluid end assembly. All are installed the same. One is shown.

- a. Position old disc (16) on seat (18).
- b. Position seat (18) in R.O. pump fluid end body through cylinder opening (17).

**ASSEMBLY. (Cont)**

**CAUTION**

A broken or distorted seat will cause the R.O. pump assembly to malfunction. Use care when installing seat to prevent equipment damage.

- c. Using 1-inch pipe and mallet through cylinder opening (11), tap seat (18) until firmly seated.
- d. Remove and discard disc (16).
- e. Working through cylinder opening (17); install new disc (16), sleeve (15), spring (14), and retainer (13) on seat (18).
- f. Working through cylinder opening (11), install nut (12) on seat (18).
- g. Position seal (10) on cylinder and install cylinder head (9).

**NOTE**

There are five discharge valve assemblies, seals, and cylinder heads at top of fluid end assembly. All are installed the same. One is shown.

- h. Working through cylinder opening (11), position seat (8) in R.O. pump fluid end body.
- i. Position old disc (7) on seat (8).
- j. Using 1-inch pipe and mallet, tap seat (8) until firmly seated.
- k. Remove and discard disc (7).
- l. Install new disc (7), sleeve (6), spring (5), retainer (4), and nut (3) on seat (8).
- m. Position seal (2) on cylinder and install cylinder head (1).
- n. Install R.O. pump fluid end assembly.

**Section VIII. RAW WATER PUMP ASSEMBLY MAINTENANCE PROCEDURES**

	Para	Page
Repair Raw Water Pump.....	3-56	3-244
Repair Raw Water Pump Electric Motor. ....	3-57	3-247
Repair Raw Water Pump Cable Assembly. For procedures to repair raw water pump cable assembly, refer to.....	3-17	3-113



**DISASSEMBLY.**

- a. Remove four screws (1) and washers (2).
- b. Remove pump case (3).
- c. Remove bushing (4), two screws (6), lockwashers (7), and dowel pins (8) from diffuser (9).
- d. Remove diffuser (9) from electric motor shaft (10) and O-ring (5) from frame (18).
- e. Remove lock screw (11) and washer (12).
- f. Unscrew impeller (13) and remove seal assembly (14). Discard seal assembly.
- g. Remove four screws (15) and lockwashers (16).
- h. Separate electric motor (17) and adapter (18). Remove flinger (19) from electric motor shaft (10).
- i. Remove screw (20) lockwasher (21) and bracket (22).
- j. Remove priming plug (23).

**CLEANING.**

**WARNING**

- Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.
- Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi (207 kPa) air pressure.

- a. Clean pump case and adapter with drycleaning solvent. Dry with compressed air.
- b. Using a stiff-bristled brush, remove rust and corrosion from pump case and adapter.

**INSPECTION.**

- a. Inspect attaching hardware for damage. Replace as required.
- b. Inspect impeller, diffuser, flinger, bracket, case, and adapter for cracks and serviceability. Replace items as required.

**ASSEMBLY.**

- a. Install priming plug (23) on pump case (3).
- b. Position adapter (18) on bracket (22) and secure with screw (20) and lockwasher (21).
- c. Install flinger (19) on electric motor shaft (10).
- d. Install adapter on electric motor (17) and secure with four screws (15) and lockwashers (16).
- e. Install new seal assembly (14) on electric motor shaft (10).

**ASSEMBLY. (Cont)**

- f. Install impeller (13), washer (12), and lock screw (11) on electric motor shaft (10).
- g. Install Q-rings (5) and bushing (4) on diffuser (9).
- h. Position diffuser (9) and install two dowel pins (8), screws (6), and lock washers (7).
- i. Position pump case (3) and install four screws (1) and washers (2).

---

### 3-57. REPAIR RAW WATER PUMP ELECTRIC MOTOR.

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly. e. Test.

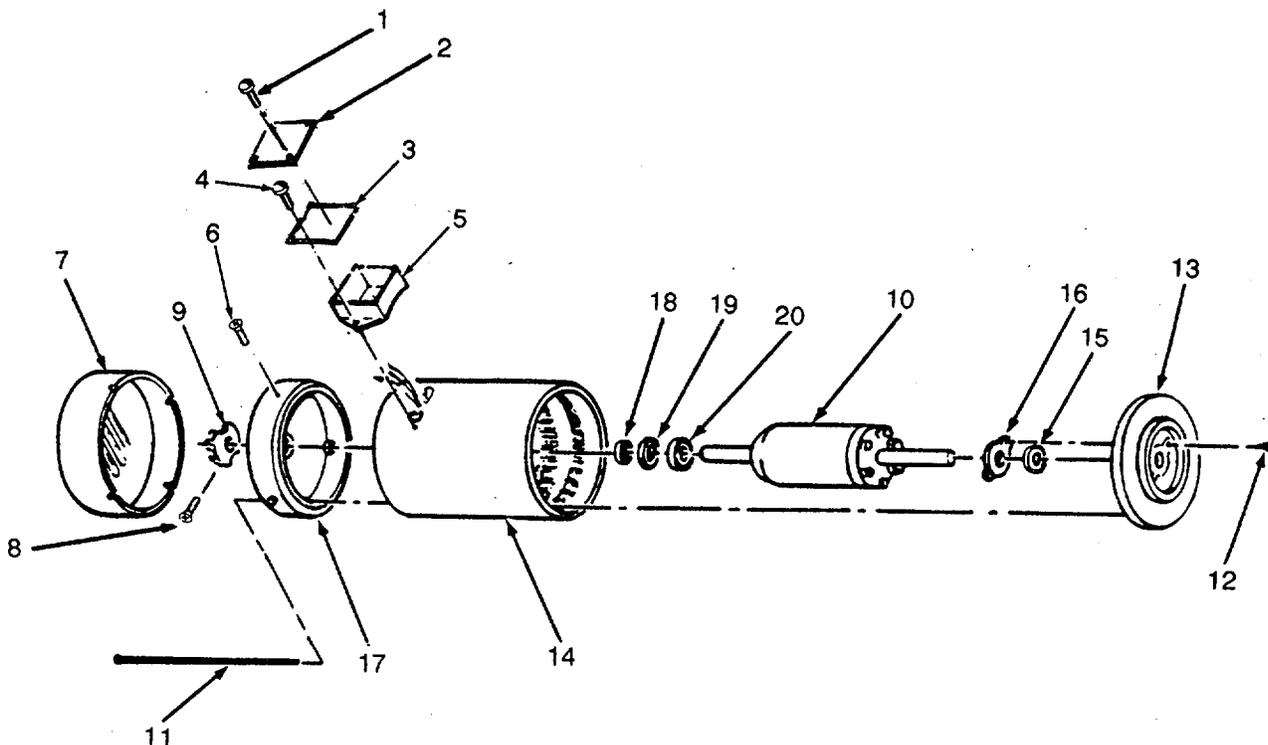
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#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect III, Item 10).  
Multimeter (Appx B, Sect III, Item 9).  
Arbor Press.
- b. Materials/Parts. Grease (Appx C, Sect II, Item 8).
- c. Equipment Condition. Raw water pump electric motor removed (paragraph 3-56.)
- d. General Safety Requirements.

#### WARNING

- High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
  - Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.
- 



**DISASSEMBLY.**

- a. Remove four screws (1), conduit box cover (2) and conduit box gasket (3).
- b. Remove two screws (4) and conduit box (5).
- c. Remove four screws (6) and fan cover (7).
- d. Remove setscrew (8) and remove fan (9).

**NOTE**

Mark fan end plate, motor casing, and pump end plate to assist in alignment during assembly.

- e. Remove four through-bolts (11).
- f. Remove two screws (12).
- g. Tap pump end plate (13) with soft-faced mallet to break bond with stator (14) and remove pump end plate (13).

**CAUTION**

Stator wiring inside motor casing can be damaged by rotor or shaft if rotor is not removed carefully.

- h. Remove rotor (10) from stator (14).
- i. Pull bearing (15) from shaft of rotor (10).
- j. Remove bearing retainer plate (16).
- k. Tap fan end plate (17) with soft-faced mallet to break bond with stator (14) and remove fan end plate (17).
- l. Remove flat washer (18) and wavy washer (19) from shaft of rotor (10).
- m. Using arbor press, remove bearing (20) from shaft of rotor (10).

**CLEANING.**

**WARNING**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi (207 kPa) air pressure.

- a. Scrape loose paint from stator assembly and fan cover. Prime and paint as necessary.
- b. Using compressed air, blow dust and grit from stator and rotor assemblies. Wipe rotor assembly with clean rag.
- c. Clean fan cover vent slots with compressed air and wipe with clean rag.
- d. Wipe bearings with clean rag.

**INSPECTION.**

- a. Inspect leads and windings of stator assembly for evidence of cracked or burned insulation. Replace as required.
- b. Inspect rotor assembly for loose or burned conducting bars. Replace as required.
- c. Inspect bearings for wear. Replace as required.
- d. Inspect end plates for cracks. Replace as required.
- e. Inspect bushings for cracks or brittleness. Replace as required.
- f. Using multimeter set to OHMS X1 scale, connect test leads to pairs of motor leads in the following order: T1 and T2, T1 and T3, T2 and T3.
- g. If multimeter indication is not 0 ohm for each pair of windings, replace stator.
- h. Set multimeter to OHMS X1000 scale. Connect one lead to stator housing. Connect other lead to each motor lead in turn.
- i. If multimeter indication is not infinity for each motor lead, replace stator.

**ASSEMBLY.**

- a. Pack two bearings (15) and (20) and use arbor press to install bearing (20) on fan end shaft of rotor (10).
- b. Install wavy washer (19) and flat washer (18) on fan end shaft of rotor (10).
- c. Position fan end plate (17). align marks on fan end plate (17) and stator (14) made during disassembly.

**CAUTION**

Wiring inside stator can be damaged by rotor or shift if rotor is not installed carefully.

- d. Install bearing retainer plate (16) and press on bearing (15) on rotor (10).
- e. Align bearing retainer plate (16) with end plate (13) screw holes and install screws (12).
- f. Align marks on end plate and stator (14) made during disassembly and install four through-bolts (11).
- g. Position fan (9) and install setscrew (8).
- h. Position fan cover (7) and install four screws (6).
- i. Position conduit box (5) and install two screws (4).
- j. Position conduit box gasket (3) on conduit box cover (2) and install two screws (1).

**TEST.**

- a. Secure motor to test bench.

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests require power to be connected. Always take proper measures to ensure personal safety.

- b. Connect motor wiring to test bench leads.
- c. Connect power and run motor with and without load.
- d. Check motor for excessive vibration and fast temperature rise.
- e. Disconnect motor from test bench leads.

**Section IX. BACKWASH PUMP ASSEMBLY MAINTENANCE PROCEDURES**

	Para	Page
Repair Backwash Pump Strainer Assembly .....	3-58	3-252
Repair Backwash Centrifugal Pump.....	3-59	3-255
Repair Backwash Centrifugal Pump (SCOT).....	3-60	3-258
Repair Backwash Pump Electrical Motor (SCOT & AMPCO) .....	3-61	3-261
Repair Backwash Pump Cable Assembly, For procedures to repair backwash pump cable assembly, refer to.....	3-17	3-113
Repair Backwash Pump Frame.....	3-62	3-265
Remove/Install Generator Set .....	3-63	3-266

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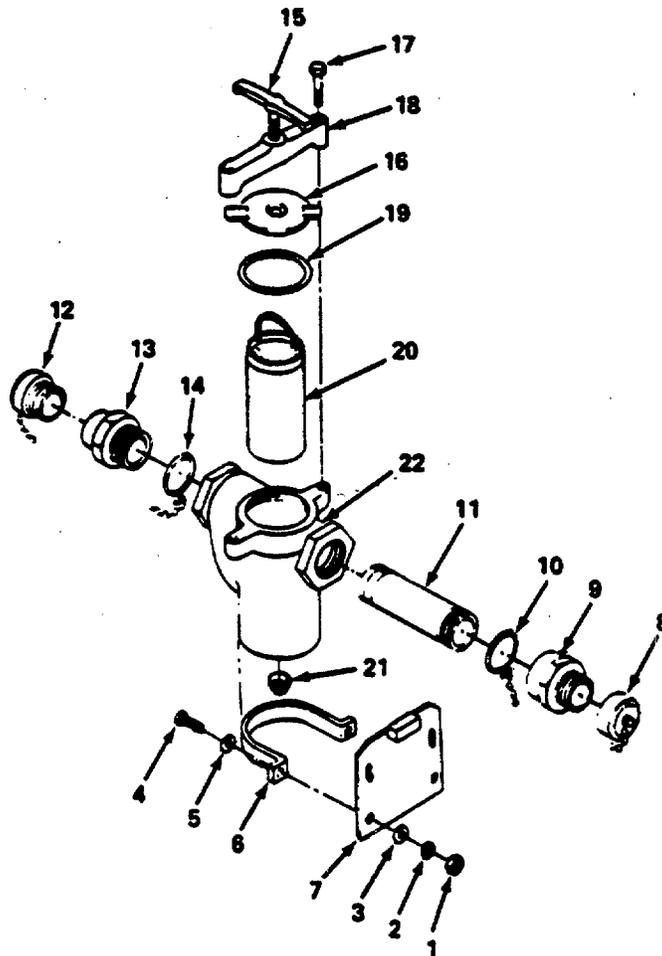
**3-58. REPAIR BACKWASH PUMP STRAINER ASSEMBLY.**

This task covers:      a. Disassembly.      b. Cleaning.      c. Inspection.      d. Assembly.

---

**INITIAL SETUP.**

- a. Tools.                      Tool Kit (Appx B, Sect III, Item 10).  
                                    Stiff-Bristled Brush (Appx B, Sect III, Item 1).
  
  - b. Materials/Parts.           Antiseize Tape (Appx C, Sect II, Item 17).  
                                    Detergent (Appx C, Sect II, Item 3).
  
  - c. Equipment Condition.      ROWPU shut down (TM 10-4610-239-10).  
                                    Backwash pump strainer assembly removed (paragraph 2-136)
- 



**DISASSEMBLY.**

- a. Remove two nuts (1), lockwashers (2), flat washers (3), screws (4), flat washers (5), retaining strap (6), and mounting plate (7).
- b. Remove cap (8), adapter (9), brass ring (10), and pipe (11).
- c. Remove hose plug (12), swivel adapter (13), and brass ring (14).
- d. Loosen yoke screw (15) to relieve pressure on cover (16).
- e. Remove two screws (17) and yoke (18).
- f. Remove cover and preformed packing (19).
- g. Remove strainer basket (20) and pipe plug (21).

**CLEANING.**

- a. Flush foreign matter from strainer body and strainer basket with water.
- b. Using mild soap solution and stiff-bristled brush; clean strainer basket, strainer body, gasket mounting surfaces, and all attaching parts.
- c. Rinse items with water and air dry.
- d. Using steel brush; clean corrosion from strainer body, retaining strap, mounting plate, yoke, and cover.

**INSPECTION.**

- a. Inspect strainer body, yoke, cover, mounting plate, and retaining strap for cracks, condition of threads, and serviceability. Replace parts as required.
- b. Inspect strainer basket for tears, holes, and dents. Replace as required.
- c. Inspect plugs, cap, adapters, pipe, and screws for damaged threads. Replace as required.
- d. Inspect preformed packing for cracks and breaks. Replace as required.

**ASSEMBLY.**

**NOTE**

Apply antiseize tape to all male pipe threads before assembly.

- a. Install pipe plug (21).
- b. Position strainer basket (20) in strainer body (22).
- c. Position preformed packing (19) on cover (16) and install cover.
- d. Position yoke (18) on strainer body (22).
- e. Install two screws (17).

**ASSEMBLY. (Cont)**

- f. Tighten yoke screw (15).
- g. Install brass ring (14), swivel adapter (13), and hose plug (12).
- h. Install pipe (11), brass ring (10), adapter (9), and cap (8).
- i. Position mounting plate (7) on strainer body (22).
- j. Install retaining strap (6), two flat washers (5), screws (4), flat washers (3), lockwashers (2), and nuts (1).

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### 3-59. REPAIR BACKWASH CENTRIFUGAL PUMP.

This task covers:      a. Disassembly.      b. Cleaning.      c. Inspection.      d. Assembly.

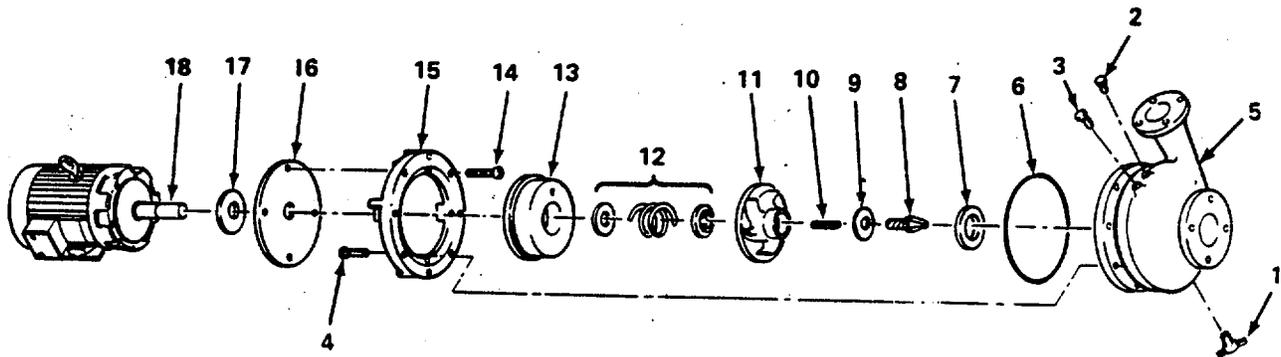
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#### INITIAL SETUP.

- a. Tools.      Tool Kit (Appx B, Sect III, Item 10).  
Stiff-Bristled Brush (Appx B, Sect III, Item 1).  
Arbor Press.
- b. Materials/Parts.      Drycleaning Solvent (Appx C, Sect II, Item 16).  
Detergent (Appx C, Sect II, Item 3).
- c. Equipment Condition.      Backwash pump assembly removed (paragraph 2-137).
- d. General Safety Requirements.

#### WARNING

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.



#### DISASSEMBLY.

- a. Remove drain cock (1), vent plug (2), and priming plug (3).
- b. Remove eight screws (4) and pump case (5).
- c. Remove pump case gasket (6). Discard gasket.

**DISASSEMBLY. (Cont)**

**CAUTION**

Because of tight fit of wear ring in housing, wear ring must be broken and removed in pieces. Remove wear ring only when excessively worn.

- d. Position pump case (5) on drill press and drill two 3/16-inch (4.76 mm) holes in wear ring (7). Drill holes on opposite sides of ring, not to exceed 3/4 inch (19.05 mm) deep.
- e. Break wear ring (7) and remove pieces from pump case (5).
- f. Remove impeller retaining screw (8), gasket (9), key (10), and impeller (11). Discard gasket.
- g. Remove seal assembly (12) and cover (13). Discard seal assembly.
- h. Remove four screws (14), adapter (15), splash plate (16), and slinger (17).

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Using drycleaning solvent, clean pump case and adapter. Air dry parts.
- b. Using steel brush, clean rust and corrosion from pump case and adapter.
- c. Using mild soap solution, wash pump case internally, impeller, and retaining assembly.

**INSPECTION.**

Inspect pump case, impeller wear ring, and adapter for cracks, damage, and excessive wear. Replace as required.

**ASSEMBLY.**

- a. Install slinger (17) on motor shaft (18).
- b. Position splash plate (16) and adapter (15) on motor shaft (18).
- c. Install cover (13) on adapter (15).
- d. Install new seal assembly (12) on motor shaft (18).
- e. Install impeller (11) and key (10) on motor shaft (18).
- f. Install new gasket (9) and impeller retaining screw (8).

**ASSEMBLY. (Cont)**

**CAUTION**

Wear ring must be installed in exact alignment with seat in case. If incorrectly aligned, pump case may be damaged.

- g. Position new wear ring (7) in pump case (5). Using arbor press, press wear ring into place.
- h. Install new pump case gasket (6).
- i. Position pump case (5) and install eight screws (4).
- j. Install priming plug (3), vent plug (2), and drain cock (1).

---

### 3-60. REPAIR BACKWASH CENTRIFUGAL PUMP. (SCOT)

This task covers:      a. Disassembly.      b. Cleaning.      c. Inspection.      d. Assembly.

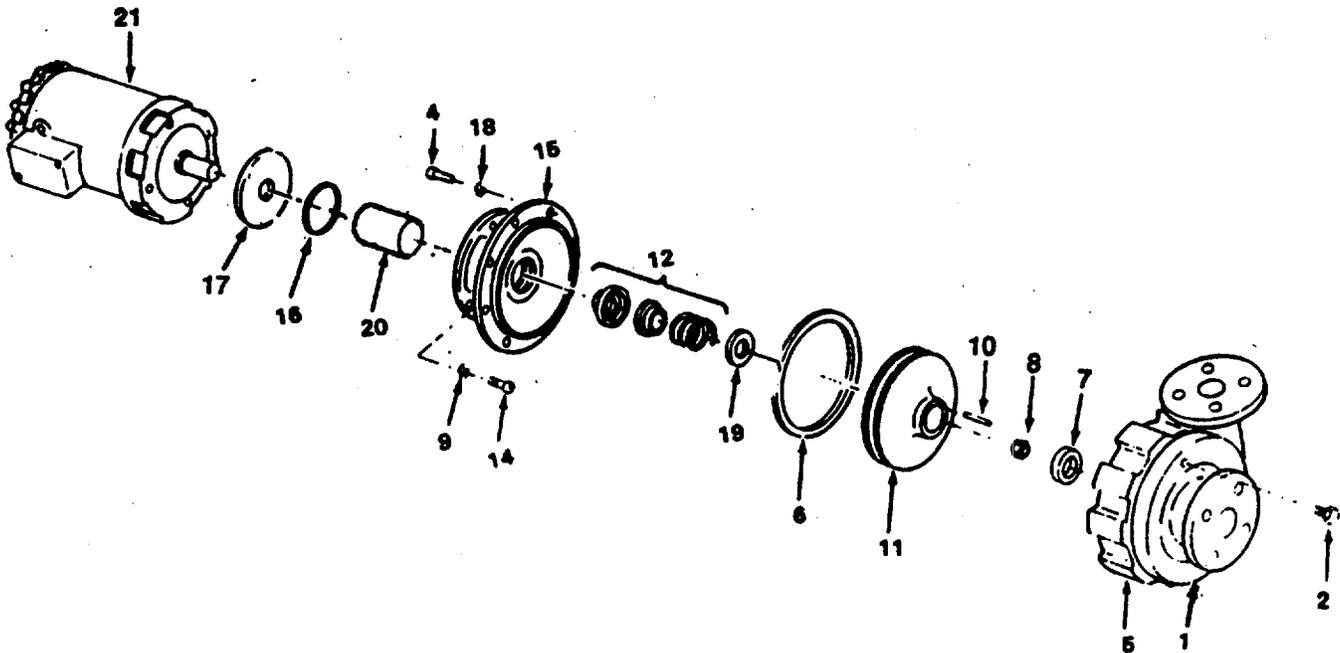
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#### INITIAL SETUP.

- a. Tools.      Tool Kit (Appx B, Sec III, Item 10).  
                 Stiff-Bristled Brush (Appx B, Sect m, Item 9).  
                 Arbor Press.
- b. Materials/Parts.      Drycleaning solvent (Appx C, Sect 11, Item 16).  
                                 Detergent (Appx C, Sect 11, Item 3)
- c. Equipment Condition.      Backwash pump assembly removed (paragraph 2-137).
- d. General Safety Requirements.

#### WARNING

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.



**DISASSEMBLY.**

- a. Remove drain cock (1) and vent plug (2).
- b. Remove eight screws (4) eight lockwashers (18) and pump case (5).
- c. Remove pump case gasket (6). Discard gasket.

**CAUTION**

Because of tight fit of wear ring in housing, wear ring must be broken and removed in pieces. Remove wear ring only when excessively worn.

- d. Position pump case (5) on drill press and drill two 3/16-inch (4.76 mm) holes in wear ring (7). Drill holes on opposite sides of ring, not to exceed 3/4 inch (19.05 mm) deep.
- e. Break wear ring (7) and remove pieces from pump case (5).
- f. Remove impeller retaining nut (8), key (10) and impeller (11).
- g. Remove seal retainer (19), seal assembly (12). Discard seal assembly.
- h. Remove four bolts (14), lockwasher (9), adapter (15), O-ring (16) and sling (17).
- i. Remove stub shaft (20) from electric motor shaft (21).

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

- a. Using drycleaning solvent, clean pump case and adapter. Air dry parts.
- b. Using steel brush, clean rust and corrosion from pump case and adapter.
- c. Using mild soap solution, wash pump case internally, impeller, and retaining assembly.

**INSPECTION.**

Inspect pump case, impeller wear ring, and adapter for cracks, damage and excessive wear. Replace as required.

**ASSEMBLY.**

- a. Install stub shaft (20) on motor shaft (18).
- b. Install slinger (17) on stub shaft (20).
- c. Position adapter (15) on electric motor shaft (21).
- d. Install four lockwashers (9) and bolts (14) to housing.
- e. Install new seal assembly (12) on electric motor shaft (21).



**ASSEMBLY. (Cont)**

- f. Install impeller (11) and key (10) on electric motor shaft (21).
- g. Install impeller retaining nut (8).

**CAUTION**

Wear ring must be installed in exact alignment with seat in case. If incorrectly aligned, pump case may be damaged.

- h. Position new wear ring (7) in pump case (5). Using arbor press, press wear ring into place.
- i. Install new pump case gasket (6).
- j. Position pump case (5) and install eight screws (4).
- k. Install vent plug (2) and drain cock (1).

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### 3-61. REPAIR BACKWASH PUMP ELECTRIC MOTOR. (SCOT & AMPCO)

This task covers: a. Disassembly. b. Cleaning. c. Inspection. d. Assembly. e. Test.

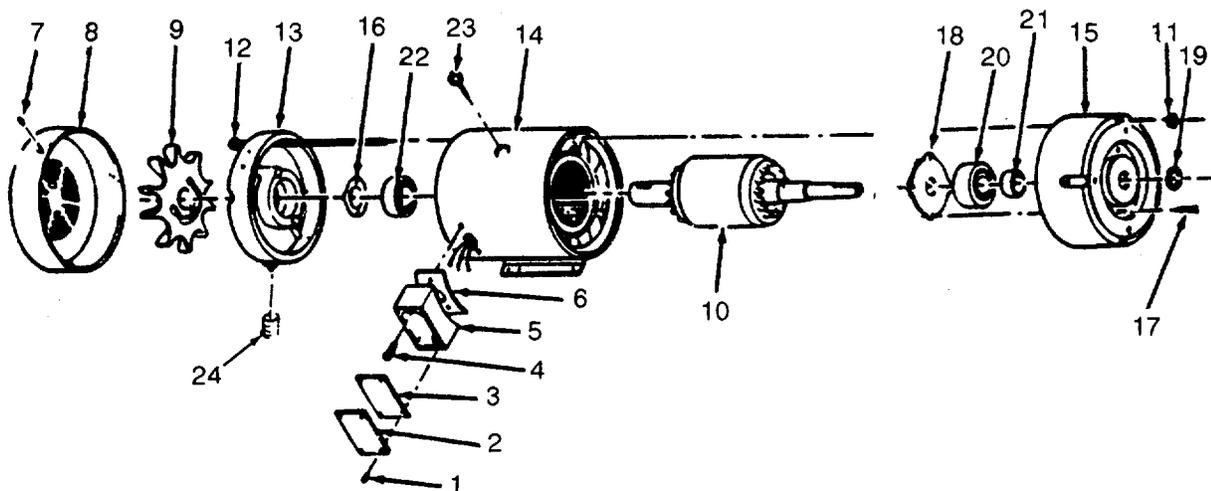
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#### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sec III, Item 10).  
Multimeter (Appx B, Sect III, Item 9).  
Arbor Press.
- b. Materials/Parts. Grease (Appx C, Sect II, Item 8).
- c. Equipment Condition. Backwash pump electric motor removed (paragraph 3-60).
- d. General Safety Requirements.

#### WARNINGS

- High voltages in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
  - Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.
- 



#### DISASSEMBLY.

- a. Remove four screws (1), cover (2), and gasket (3). Discard gasket.
- b. Remove two screws (4), conduit box (5), and gasket (6). Discard gasket.

**DISASSEMBLY. (Cont)**

- c. Remove three screws (7) and fan cover (8).
- d. Remove fan (9) from rotor shaft (10).

**NOTE**

Mark fan end housing, stator, and shaft end plate to assist in alignment during assembly.

- e. Remove nuts (11) and four bolts (12).
- f. Tap fan end housing (13) with soft-faced mallet to break bond with stator(14) and remove fan end housing.
- g. Tap shaft end plate (15) with soft-faced mallet to break bond with stator (14) and remove shaft end plate.
- h. Remove wavy washer (16) from rotor shaft (10).
- i. Remove four screws (17) from bearing retainer plate (18).
- j. Remove ring seal (19) from shaft end plate (15). Discard ring seal.
- k. Using arbor press, remove bearing (20), sleeve (21), and bearing retainer plate (18) from rotor shaft (10).

**CAUTION**

Wiring inside stator can be damaged by rotor shaft if rotor is not removed carefully.

- l. Remove rotor (10) through pump end of stator (14).
- m. Using arbor press, remove bearing (22) from rotor shaft (10).
- n. Remove eye bolt (23).
- o. Remove two grease fittings (24).

**CLEANING.**

**WARNING**

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psi (207 kPag) air pressure.

- a. Scrape loose paint from fan cover, stator, and shaft end plate. Prime and paint as necessary.
- b. Using compressed air, blow dust and grit from stator and rotor shaft. Wipe rotor shaft with clean rag.
- c. Wipe bearings with clean rag if grease is dry or dirty.
- d. Clean fan cover vent slots with compressed air and wipe with clean rag.

**INSPECTION.**

- a. Inspect leads and windings of stator for evidence of cracked or burned insulation. Replace as required.
- b. Inspect rotor shaft for loose or burned conducting bars. Replace as required.
- c. Inspect bearings for wear. Replace as required.
- d. Inspect shaft end plate and fan end housing for cracks. Replace as required.
- e. Using multimeter set to OHMS X1 scale, connect test leads to pairs of motor leads in the following order: T1 and T2, T1 and T3, T2 and T3.
- f. If multimeter indication is not 0 ohm for each pair of windings, replace stator.
- g. Set multimeter to OHMS X1000 scale. Connect one lead to stator housing. Connect other lead to each motor lead in turn.
- h. If multimeter indication is not infinity for each motor lead, replace stator.

**ASSEMBLY.**

- a. Install two grease fittings (24).
- b. Install eyebolt (23).
- c. Pack two bearings (20) and (22) and use arbor press to install bearing (23) on short end of rotor shaft (10).
- d. Position bearing retainer plate (18) on rotor (10) and install bearing (20) and sleeve (21) in end plate (15).
- e. Align bearing retainer plate (18) with holes on end plate (15) and install screws (17).

**CAUTION**

Wiring inside stator can be damaged by rotor shaft if rotor is not installed carefully.

- f. Install wavy washer (16) in fan end housing(13).
- g. Position end plate (15) on rotor (10) and carefully install rotor (10) in stator (14) and install ring seal (19) in end plate (15).
- h. Position shaft end plate (15). align mark made during disassembly with mark on stator (14).
- i. While holding shaft end plate (15) aligned on one end of stator (14), position fan end housing (13) on other end. align mark made on fan end housing during disassembly with mark on stator.
- j. Install four bolts (12) and nuts (11).
- k. Install fan (9).
- l. Install fan cover (8) and three screws (7).

**ASSEMBLY. (Cont)**

- m. Position gasket (6) and conduit box (5) over wires on side of stator (15) and install four screws (4).
- n. Position gasket (3) and cover (2) and install two screws (1).

**TEST.**

- a. Secure motor to test bench.

**WARNING**

Electrical high voltage can cause serious injury or death. Some tests require power to be connected. Always take proper measures to ensure personal safety.

- b. Connect motor wiring to test bench leads.
- c. Connect power and run motor with and without load.
- d. Check motor for excessive vibration and fast temperature rise.
- e. Disconnect motor from test bench leads.

**3-62. REPAIR BACKWASH PUMP FRAME.** For procedures to repair the backwash pump frame, refer to welding procedures given in TM 9-237.

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### 3-63. REMOVE/INSTALL GENERATOR SET.

This task covers:      a. Removal              b. Installation

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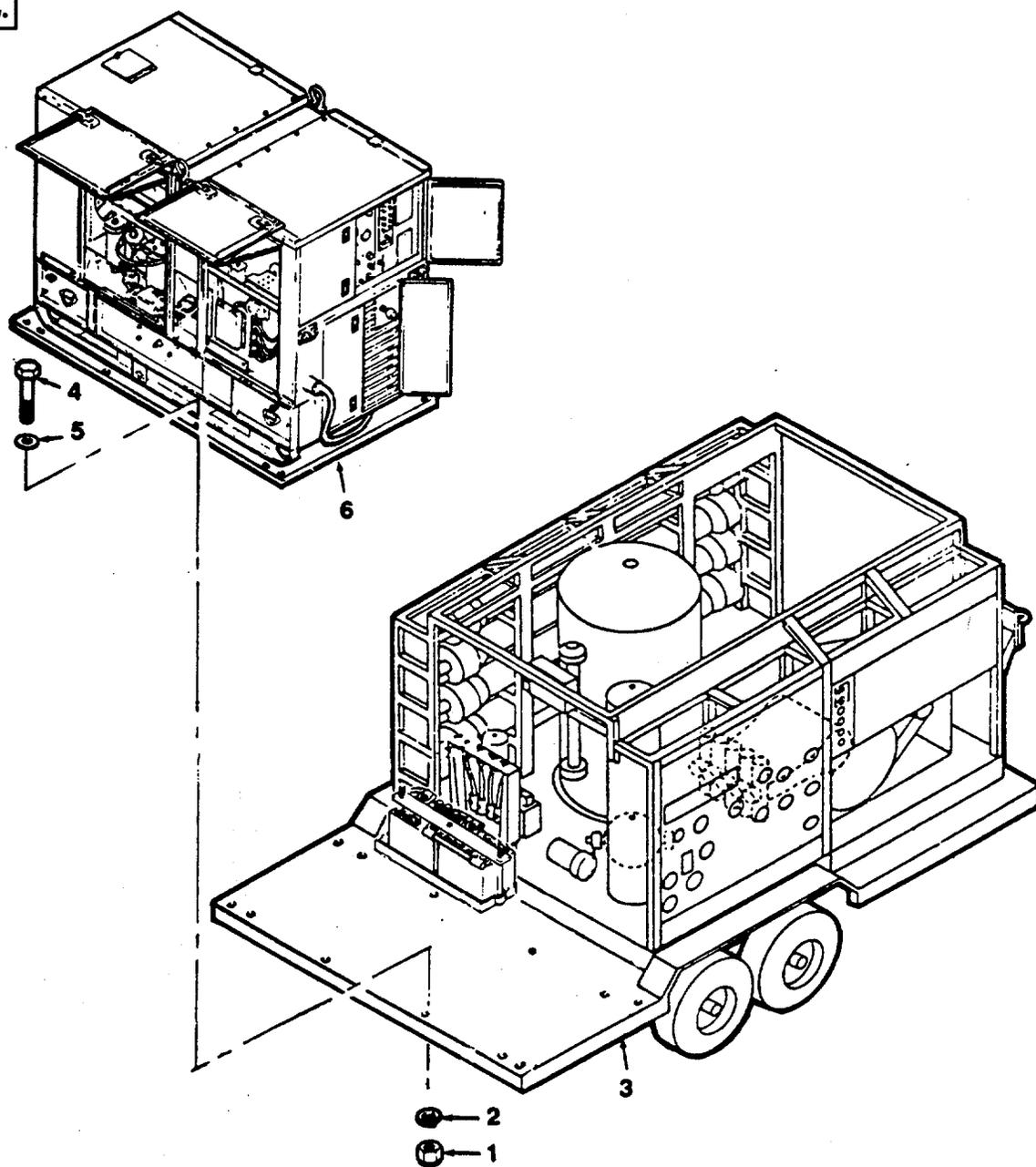
#### INITIAL SETUP.

- a. Tools.                      Lifting Device  
                                    Tool Kit (Appx B, Sect III, Item 10).  
                                    Torque Wrench (Appx B, Sect m, Item 6)  
                                    Ratchet (Appx B, Sect III, Item 6)  
                                    Open End/Box Wrench (Appx B, Sect III, Item 6)
- b. Materials/Parts.              Lockwashers, P/N MS-35338-50  
                                    Flatwashers, P/N MS-27183-21
- c. Equipment Condition.      ROWPU Shutdown, TM 10-4610-239-10  
                                    ROGEN Shutdown, TM 5-6115-465-12  
                                    Power Cable (W40) Removed, Paragraph 2-138)
- d. Personnel Required          3
- e. General Safety Requirements.

#### WARNINGS

- High voltage in this equipment can cause serious injury or death. When applying power during a test, take proper measures to ensure personal safety. Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid.
- Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.

**REMOVAL.**

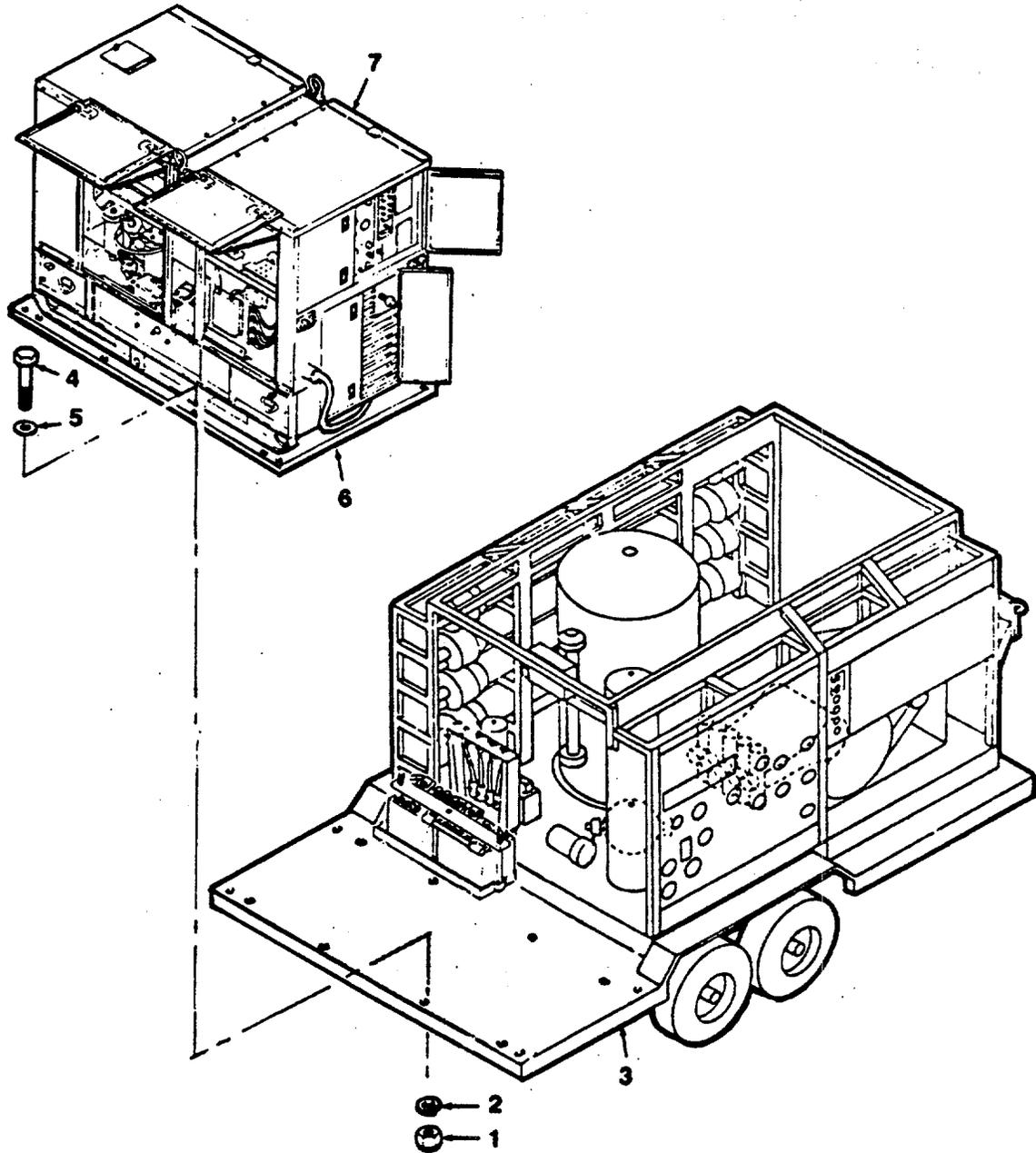


- a. Remove eight nuts (1) and eight lockwasher (2) from under side of flatbed trailer (3).
- b. Remove eight bolts (4) and eight flatwashers (5), from top side of generator mounts (6).
- c. Using lifting device, lift generator from flatbed trailer (3).

INSTALLATION.

NOTE

- Generator is mounted with its control panel to the right side of ROWPU.
- Only the inside eight mounting holes are utilized when mounting the 30 kW generator on the ROWPU.



**INSTALLATION. (Cont)**

- a. Using lifting device, position generator (7) over flatbed trailer (3) and install flatwashers (5) and eight bolts (4) into mounting holes on generator skids (3).
- b. With generator still supported by lifting device, align bolts (4) with mounting holes on flatbed trailer (3).
- c. Carefully lower generator (8) onto flatbed trailer (3) so that bolts (4) can be inserted into mounting holes on flatbed trailer (3).
- d. Set generator (7) in place with bolts in proper mounting holes on flatbed trailer (3) and install eight lockwashers (2), and eight nuts (1) on underside of flatbed trailer (3).
- e. Torque nuts (1) to 100-115 ft lb.

**CHAPTER 4  
GENERAL SUPPORT MAINTENANCE INSTRUCTIONS**

	Section
Flatbed Cargo Trailer and ROWPU Assembly Maintenance Procedures .....	I
R.O. Pump Assembly Maintenance Procedures .....	II
Pump Frame Maintenance Procedures.....	III

**Section I. FLATBED CARGO TRAILER AND ROWPU ASSEMBLY  
MAINTENANCE PROCEDURES**

	Para	Page
Repair Flatbed Cargo Trailer Frame.....	4-1	4-1
Repair ROWPU and Flatbed Cargo Trailer.....	4-2	4-2
Repair ROWPU Frame .....	4-3	4-16
Repair Chemical Feed Metering Pump and Stand Assembly.....	4-4	4-16

**4-1. REPAIR FLATBED CARGO TRAILER FRAME.**

For procedures to repair the flatbed cargo trailer frame, refer to welding procedures given in TM 9-237.

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## 4-2. REPAIR ROWPU AND FLATBED CARGO TRAILER.

- This task covers:
- |                                                    |                 |            |              |
|----------------------------------------------------|-----------------|------------|--------------|
| a. Removal of ROWPU from flatbed cargo trailer.    | b. Disassembly. |            |              |
| c. Cleaning.                                       | d. Inspection.  | e. Repair. | f. Assembly. |
| g. Installation of ROWPU on flatbed cargo trailer. | h. Test.        |            |              |

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### INITIAL SETUP.

- |                                 |                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a. Tools.                       | General Mechanics Tool Kit (Appendix B, Section III, Item 4).<br>Hoisting sling (10 ton minimum capacity)<br>Crane or lifting device (10 ton minimum capacity)       |
| b. Personnel Required.          | 4                                                                                                                                                                    |
| c. Materials/Parts.             | Adhesive (Appendix C, Section II, Item 21)<br>Lockwasher (16) - MS35338-50                                                                                           |
| d. Equipment Condition.         | ROWPU prepared for movement; all loose accessories removed (TM 10-4610-239-10).<br>Landing jacks set (TM 10-4610-239-10).<br>Generator set removed (paragraph 3-63). |
| e. General Safety Instructions. |                                                                                                                                                                      |

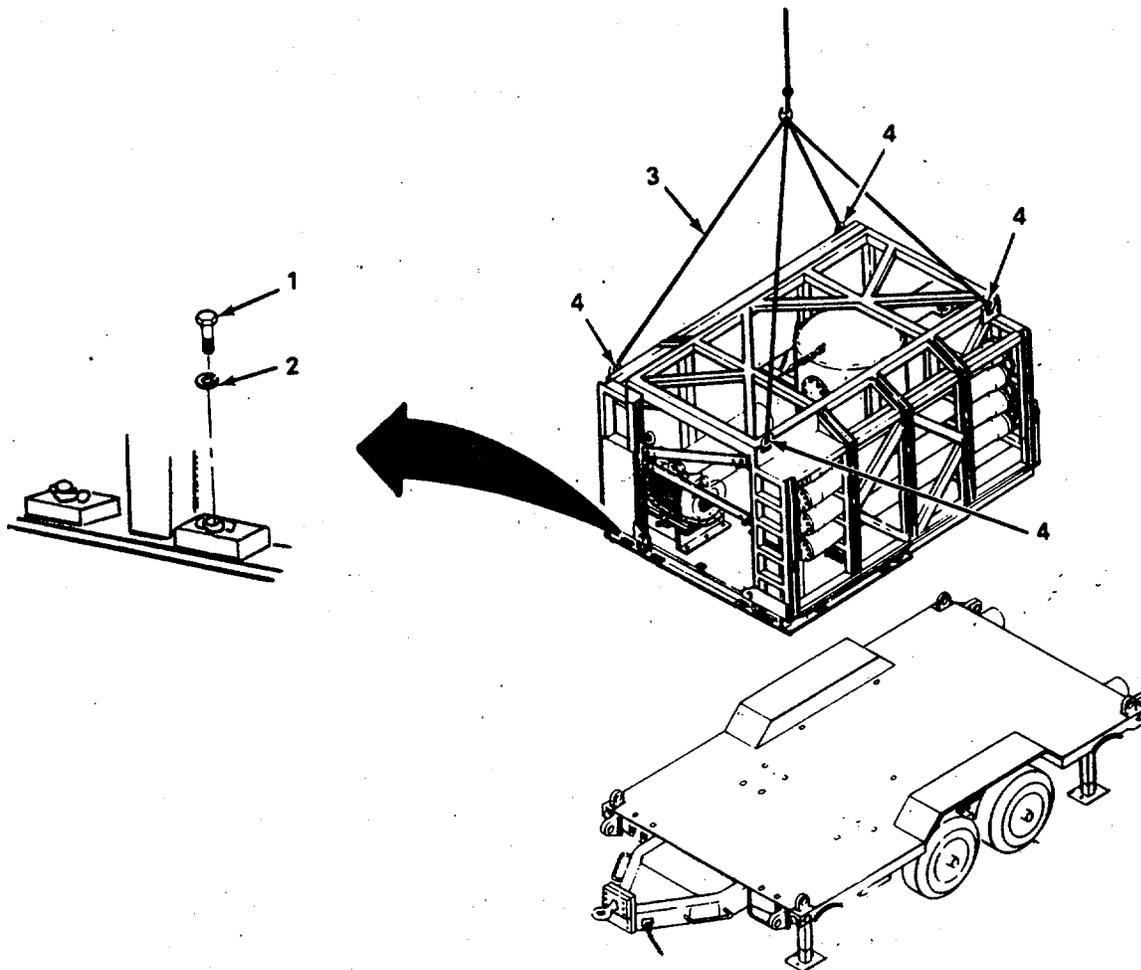
### WARNING

- Required weight of ROWPU is 11,380 pounds (6 tonnes). To prevent injury to personnel and damage to the equipment, use proper lifting equipment rated at 10 tons (9.1 tonnes) or greater.
- Lack of attention or being in an improper position during lifting operation can result in serious injury or death. Pay close attention to movements of equipment being lifted. Do not stand under or in a position where you could be pinned against another object. Watch your footing.

### NOTE

- This task gives procedures for repair of ROWPU and flatbed cargo trailer. Use only those procedures that apply to the equipment being repaired. Only those items on frames that have damage and require maintenance actions shall be repaired. Repairs of all assemblies shall be done unless a new or stocked assembly will be installed.
- Each unit shall be tested in accordance with the test procedures given after each repair. Follow the procedures given in TM 38-230-1/-2 for preservation, packaging, and packing of military supplies and equipment after test is complete.

REMOVAL OF ROWPU FROM FLATBED CARGO TRAILER.



- a. Remove all portable items from ROWPU. Refer to TM 10-4610-239-10.
- b. Disconnect generator from ROWPU. Refer to TM 10-4610-239-10.
- c. Remove generator from trailer. Refer to paragraph 3-63.
- d. Remove 16 bolts (1) and lockwashers (2).
- e. Attach sling (3) to four lifting rings (4).

**WARNING**

Weight of ROWPU is 11, 380 pounds (6tonnes). Attempting to move it without proper equipment could cause serious injury. Lift ROWPU with equipment rated at 10 tons (9.1 tonnes) or greater.

- f. Using crane, lift ROWPU from flatbed cargo trailer.

**DISASSEMBLY.**

**FLATBED CARGO TRAILER**

- a. Remove reflectors. Refer to paragraph 2-38.
- b. Remove lunette. Refer to paragraph 2-39.
- c. Remove spare tire and wheel assembly. Refer to paragraph 2-41.
- d. Remove data and lubrication plates. Refer to paragraph 2-43.
- e. Remove manual container. Refer to paragraph 2-44.
- f. Remove two chain assemblies. Refer to paragraph 2-45.
- g. Remove two airbrake hose assemblies. Refer to paragraph 2-48.
- h. Remove reservoir. Refer to paragraph 2-50.
- i. Remove hose assembly pipe couplings. Refer to paragraph 2-52.
- j. Remove all airbrake system tubing. Refer to paragraphs 2-53 and 2-91.
- k. Remove airbrake system anchor tees. Refer to paragraph 2-54.
- l. Remove two brake line air filters. Refer to paragraph 2-55.
- m. Remove airbrake relay valve and adapter. Refer to paragraph 2-57.
- n. Remove power cable assembly. Refer to paragraph 2-63.
- o. Remove two composite lights. Refer to paragraph 2-59.
- p. Remove wiring harness connector clips. Refer to paragraph 2-61.
- q. Remove chassis wiring harness. Refer to paragraph 2-62.
- r. Remove four leveling jack assemblies. Refer to paragraph 2-40.
- s. Remove suspension assembly. Refer to paragraph 3-7.
- t. Remove four air chamber assemblies. Refer to paragraph 2-70.

**ROWPU**

- a. Remove pulse dampener. Refer to paragraph 2-74.
- b. Remove storage box. Refer to paragraph 2-75.
- c. Remove data and instruction plates. Refer to paragraph 2-76.
- d. Remove R.O. pressure tube piping. Refer to paragraph 2-77 or 2-78.
- e. Remove cartridge filter. Refer to paragraph 2-79.
- f. Remove booster pump assembly. Refer to paragraph 2-82.

**DISASSEMBLY. (Cont)**

- g. Remove low-pressure switch. Refer to paragraph 2-83.
- h. Remove high-pressure switch. Refer to paragraph 2-85.
- i. Remove multimedia filter control valve. Refer to paragraph 2-86.
- j. Remove diaphragm valve assembly. Refer to paragraph 2-87.
- k. Remove backwash timer assembly. Refer to paragraphs 2-90 (Culligan) and 2-91 (MECO).
- l. Remove R.O. pressure tubes. Refer to paragraph 2-92.
- m. Remove all piping. Refer to paragraph 2-94.
- n. Remove vent vessels gate valve. Refer to paragraph 2-95.
- o. Remove raw water flowmeter. Refer to paragraph 2-97.
- p. Remove brine water flowmeter. Refer to paragraph 2-98.
- q. Remove backwash water flowmeter. Refer to paragraph 2-99.
- r. Remove backwash valve. Refer to paragraph 2-100.
- s. Remove product water flowmeter. Refer to paragraph 2-102.
- t. Remove cartridge filter, multimedia filter, and R.O. vessels differential pressure gages. Refer to paragraph 2-103.
- u. Remove R. O. pressure gage. Refer to paragraph 2-104.
- v. Remove water meter. Refer to paragraph 2-105.
- w. Remove needle valve. Refer to paragraph 2-106.
- x. Remove seven drain ball valves. Refer to paragraph 2-107.
- y. Remove product water check valve. Refer to paragraph 2-108.
- z. Remove relief valve. Refer to paragraph 2-109.
- aa. Remove backwash check valve. Refer to paragraph 2-110.
- ab. Remove four elliptic valves. Refer to paragraph 2-111.
- ac. Remove four ball valves. Refer to paragraph 2-112.
- ad. Remove cartridge filter, pulse dampener, and multimedia filter vent valves. Refer to paragraph 2-113.
- ae. Remove chemical feed metering pump stand, brackets, and mounting plate. Refer to paragraph 2-117.
- af. Remove R.O. pump and motor stand. Refer to paragraph 2-129.

**DISASSEMBLY. (Cont)**

- ag. Remove control box assembly. Refer to paragraph 3-32.
- ah. Remove all wiring harnesses. Refer to paragraph 3-38.
- ai. Remove multimedia filter assembly. Refer to paragraph 3-18.
- aj. Remove electrical junction box assembly. Refer to paragraph 3-41.

**CLEANING.**

**WARNING**

Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.

**FLATBED CARGO TRAILER**

- a. Using a scraper and wire brush, remove all rust and loose paint.
- b. Using an electric grinding wheel, remove all heavy rusted and pitted areas.
- c. Using drycleaning solvent, wash flatbed cargo trailer and let air dry.

**ROWPU**

**WARNING**

Do not use a grinding wheel on ROWPU frame. ROWPU frame is made of aluminum. Heavy grinding will damage frame components.

- a. Using a scraper and wire brush, remove all corrosion and loose paint.
- b. Using electric sanding equipment, remove all heavy corrosion.
- c. Using drycleaning solvent, wash ROWPU frame and let air dry.

**INSPECTION.**

- a. Inspect for cracks and broken welds. Repair as required.
- b. Inspect for damaged threads on flatbed cargo trailer and mounting hardware. Repair or replace as required. Refer to Chapter 2 Section VI.
- c. Inspect all data and lubrication plates for readability.

**REPAIR.**

**FLATBED CARGO TRAILER**

- a. Repair cracks and broken welds. Refer to TM 9-237.
- b. Repair damaged internal threads. Refer to general repair procedures, paragraph 2-34.

**REPAIR. (Cont)**

- c. Straighten all bent, twisted, or dented components. Refer to TM 9-450.
- d. Repair or remanufacture damaged data and lubrication plates.
- e. Repair spare tire carrier. Refer to paragraph 2-42.
- f. Repair two chain assemblies. Refer to paragraph 2-46.
- g. Repair two airbrake hose assemblies. Refer to paragraph 2-49.
- h. Repair airbrake relay valve. Refer to paragraph 2-58.
- i. Repair composite light. Refer to paragraph 2-60.
- j. Repair four hub and drum assemblies. Refer to paragraph 2-69.
- k. Repair tire and wheel assemblies. Refer to TM 9-2610-200-20.
- l. Repair four service brake assemblies. Refer to paragraph 2-72.
- m. Repair chassis wiring harness. Refer to paragraph 3-5.
- n. Repair power cable assembly. Refer to paragraph 3-6.
- o. Repair damaged spring assemblies. Refer to paragraph 3-9.
- p. Repair brake drum. Refer to paragraph 3-10.
- q. Repair four air chamber assemblies. Refer to paragraph 3-11.
- r. Repair brakeshoes. Refer to paragraph 3-12.
- s. Paint flatbed cargo trailer with camouflaging required by operating unit. Refer to Painting Instructions For Field Use, TM 9-213, TM 43-0139, FM 5-20B, and TM 740-90-1.

**ROWPU**

- a. Repair cracks and broken welds. Refer to TM 9-237.
- b. Replace damaged threaded insert screws. Refer to general repair procedures paragraph 2-34.
- c. Straighten all bent, twisted, or dented components. Refer to TM 9-450.
- d. Repair or remanufacture damaged data and instruction plates.
- e. Repair cartridge filter. Refer to paragraphs 2-80 (FILTRITE and PECO) and 2-81 (SERFILCO and MECO).
- f. Repair panel light assembly. Refer to paragraph 2-84.
- g. Repair diaphragm valve assembly. Refer to paragraphs 2-88 (Culligan) and 2-89 (MECO).
- h. Repair R.O. pressure tubes. Refer to paragraph 2-93.
- i. Repair vent vessels gate valve. Refer to paragraph 2-96.

**REPAIR. (Cont)**

- j. Repair product water flowmeter. Refer to paragraph 2-102.
- k. Repair backwash valve. Refer to paragraph 3-14.
- l. Repair low-pressure switch. Refer to paragraph 3-15.
- m. Repair high-pressure switch. Refer to paragraph 3-16.
- n. Repair cable assemblies. Refer to paragraph 3-17.
- o. Repair multimedia filter. Refer to paragraphs 3-19 (Culligan) and 3-20 (MECO).
- p. Repair multimedia filter control valve. Refer to paragraphs 3-21 (Culligan) and 3-22 (MECO).
- q. Repair solid-state backwash timer. Refer to paragraph 3-24.
- r. Repair booster pump. Refer to paragraph 3-29.
- s. Repair distribution pump. Refer to paragraph 3-27.
- t. Repair booster pump electric motor. Refer to paragraph 3-29.
- u. Repair distribution pump electric motor. Refer to paragraph 3-29.
- v. Repair wiring harnesses and wire leads. Refer to paragraph 3-39.
- w. Repair control box assembly. Refer to paragraph 3-33.
- x. Repair electrical junction box assembly. Refer to paragraph 3-42.
- y. Repair motor controllers. Refer to paragraph 3-47 or 3-49.
- z. Repair chemical feed metering pump. Refer to paragraph 3-51.
- aa. Repair chemical feed metering pump electric motor. Refer to paragraph 3-52.
- ab. Repair R.O. pump electric motor. Refer to paragraph 3-53.
- ac. Repair R.O. pump power frame assembly. Refer to paragraph 4-5.
- ad. Repair R.O. pump fluid end assembly. Refer to paragraph 3-55.
- ae. Repair raw water pump. Refer to paragraph 3-56.
- af. Repair raw water pump electric motor. Refer to paragraph 3-57.
- ag. Repair backwash pump strainer assembly. Refer to paragraph 3-58.
- ah. Repair backwash pump. Refer to paragraph 3-59.
- ai. Repair backwash pump electric motor. Refer to paragraph 3-61.
- aj. Repair backwash pump frame. Refer to paragraphs 3-62 and 4-9.
- ak. Paint ROWPU frame and all assemblies with camouflaging required by operating unit. Refer to Painting Instructions For Field Use, TM 9-213, TM 43-0139, FM 5-20B, and TM 740-90-1.

**REPAIR. (Cont)**

- a. Repair ROWPU and pump covers. Refer to paragraph 3-13.

**ASSEMBLY.**

**FLATBED CARGO TRAILER**

- a. Install four air chambers. Refer to paragraph 2-70.
- b. Install suspension assembly. Refer to paragraph 3-7.
- c. Install four leveling jack assemblies. Refer to paragraph 2-40.
- d. Install chassis wiring harness. Refer to paragraph 2-62.
- e. Install wiring harness connector clips. Refer to paragraph 2-61.
- f. Install two composite lights. Refer to paragraph 2-59.
- g. Install power cable assembly. Refer to paragraph 2-63.
- h. Install airbrake relay valve and adapter. Refer to paragraph 2-57.
- i. Install two brake line air filters. Refer to paragraph 2-55.
- j. Install airbrake system anchor tees. Refer to paragraph 2-54.
- k. Install all airbrake system tubing. Refer to paragraph 2-53.
- l. Install hose assembly pipe couplings. Refer to paragraph 2-52.
- m. Install reservoir. Refer to paragraph 2-50.
- n. Install two airbrake hose assemblies. Refer to paragraph 2-48.
- o. Install two chain assemblies. Refer to paragraph 2-45.
- p. Install manual container. Refer to paragraph 2-44.
- q. Install data and lubrication plates. Refer to paragraph 2-43.
- r. Install spare tire and wheel assembly. Refer to paragraph 2-41.
- s. Install lunette. Refer to paragraph 2-39.
- t. Install reflectors. Refer to paragraph 2-38.
- u. Touch up all paint and hardware with camouflaging required by operating unit. Refer To Painting Instructions For Field Use, TM 9-213, TM 43-0139, FM 5-20B, and TM 740-90-1.

**ROWPU**

- a. Install electrical junction box assembly. Refer to paragraph 3-41.
- b. Install multimedia filter assembly. Refer to paragraph 3-18.

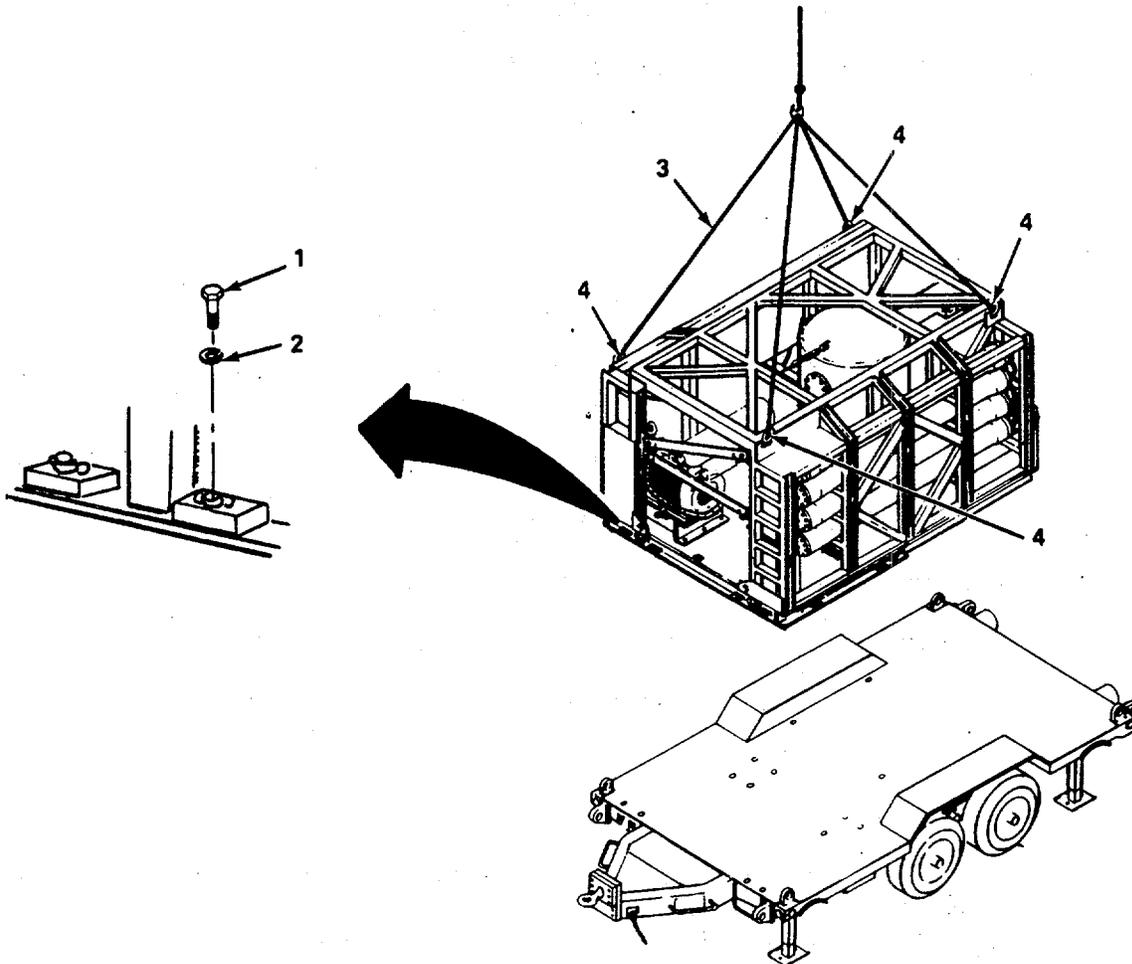
**ASSEMBLY. (Cont)**

- c. Install all wiring harnesses. Refer to paragraph 3-38.
- d. Install R.O. pump and motor stand. Refer to paragraph 2-129.
- e. Install control box assembly. Refer to paragraph 3-32.
- f. Install chemical feed metering pump stand, brackets, and mounting plate. Refer to paragraph 2-117.
- g. Install cartridge filter pulse dampener, and multimedia filter vent valves. Refer to paragraph 2-113.
- h. Install four ball valves. Refer to paragraph 2-112.
- i. Install four elliptic valves. Refer to paragraph 2-111.
- j. Install backwash check valve. Refer to paragraph 2-110.
- k. Install relief valve. Refer to paragraph 2-109.
- l. Install product water check valve. Refer to paragraph 2-108.
- m. Install seven drain ball valves. Refer to paragraph 2-107.
- n. Install needle valve. Refer to paragraph 2-106.
- o. Install water meter. Refer to paragraph 2-105.
- p. Install R.O. pressure gage. Refer to paragraph 2-104.
- q. Install cartridge filter, multimedia filter, and R.O. vessels differential pressure gages. Refer to paragraph 2-103.
- r. Install product water flowmeter. Refer to paragraph 2-101.
- s. Install backwash valve. Refer to paragraph 2-100.
- t. Install backwash water flowmeter. Refer to paragraph 2-99.
- u. Install brine water flowmeter. Refer to paragraph 2-98.
- v. Install raw water flowmeter. Refer to paragraph 2-97.
- w. Install vent vessels gate valve. Refer to paragraph 2-95.
- x. Install all piping. Refer to paragraph 2-94.
- y. Install R.O. pressure tubes. Refer to paragraph 2-92.
- z. Install backwash timer assembly. Refer to paragraphs 2-90 (Culligan) and 2-91 (MECO).
- aa. Install diaphragm valve assembly. Refer to paragraph 2-87.
- ab. Install multimedia filter control valve. Refer to paragraph 2-86.

**ASSEMBLY. (Cont)**

- ac. Install high-pressure switch. Refer to paragraph 2-85.
- ad. Install low-pressure switch. Refer to paragraph 2-83.
- ae. Install booster pump assembly. Refer to paragraph 2-82.
- af. Install cartridge filter. Refer to paragraph 2-79.
- ag. Install R.O. pressure tube piping. Refer to paragraph 2-77 or 2-78.
- ah. Install data and instruction plates. Refer to paragraph 2-76.
- ai. Install storage box. Refer to paragraph 2-75.
- aj. Install pulse dampener. Refer to paragraph 2-74.
- ak. Touch up all paint and hardware with camouflaging required by operating unit. Refer to Painting Instructions For Field Use, TM 9-213, TM 43-019, FM 5-20B, and TM 740-90-1.

**INSTALLATION OF ROWPU ON FLATBED CARGO TRAILER.**



**WARNING**

Weight of ROWPU is 11,380 pounds (6 tonnes). Attempting to move it without proper equipment could cause serious injury. Lift ROWPU with equipment rated at 10 tons (9.1 tonnes) or greater.

- a. Using crane, lift ROWPU onto flatbed cargo trailer and align 16 mounting holes in ROWPU with 16 screw holes in flatbed cargo trailer.
- b. Install 16 bolts (1) and lockwashers (2).
- c. Remove sling (3) from four lifting rings (4).
- d. Install generator on flatbed cargo trailer. Refer to paragraph 3-63.
- e. Connect generator to ROWPU. Refer to TM 10-4610-239-10.
- f. Touch up all paint and hardware with camouflaging required by operating unit. Refer to Painting Instructions For Field Use; TM 9-213, TM 43-019, FM 5-20B, and TM 740-90-1.

**INSTALLATION OF ROWPU ON FLATBED CARGO TRAILER. (Cont)**

- g. Install pump covers. Refer to TM 10-4610-239-10.
- h. Install portable items on ROWPU. Refer to TM 10-4610-239-10.
- i. Install ROWPU cover. Refer to TM 10-4610-239-10.

**TEST.**

**FLATBED CARGO TRAILER**

- a. Hook up towing vehicle. Refer to TM 10-4610-239-10.
- b. Start engine of towing vehicle and wait for towing vehicle air compressor to fully charge flatbed cargo trailer brake system. Refer to Operator's Manual for towing vehicle.
- c. Uncage compression springs on all four air chambers. Refer to paragraph 2-47.
- d. Check airbrake system for leaking compressed air.
- e. Check lighting system for proper operation of all lights.
- f. Lubricate chassis in accordance with LO 10-4610-239-12/LI 08580B-12.
- g. Tow flatbed cargo trailer at different speeds to ensure proper operation.

**ROWPU**

**NOTE**

This test checks overall operating condition of ROWPU after repair. The test consists of operating the ROWPU on synthetic sea water for 6 hours, followed by a backwash cycle, then a fresh water flush of the ROWPU.

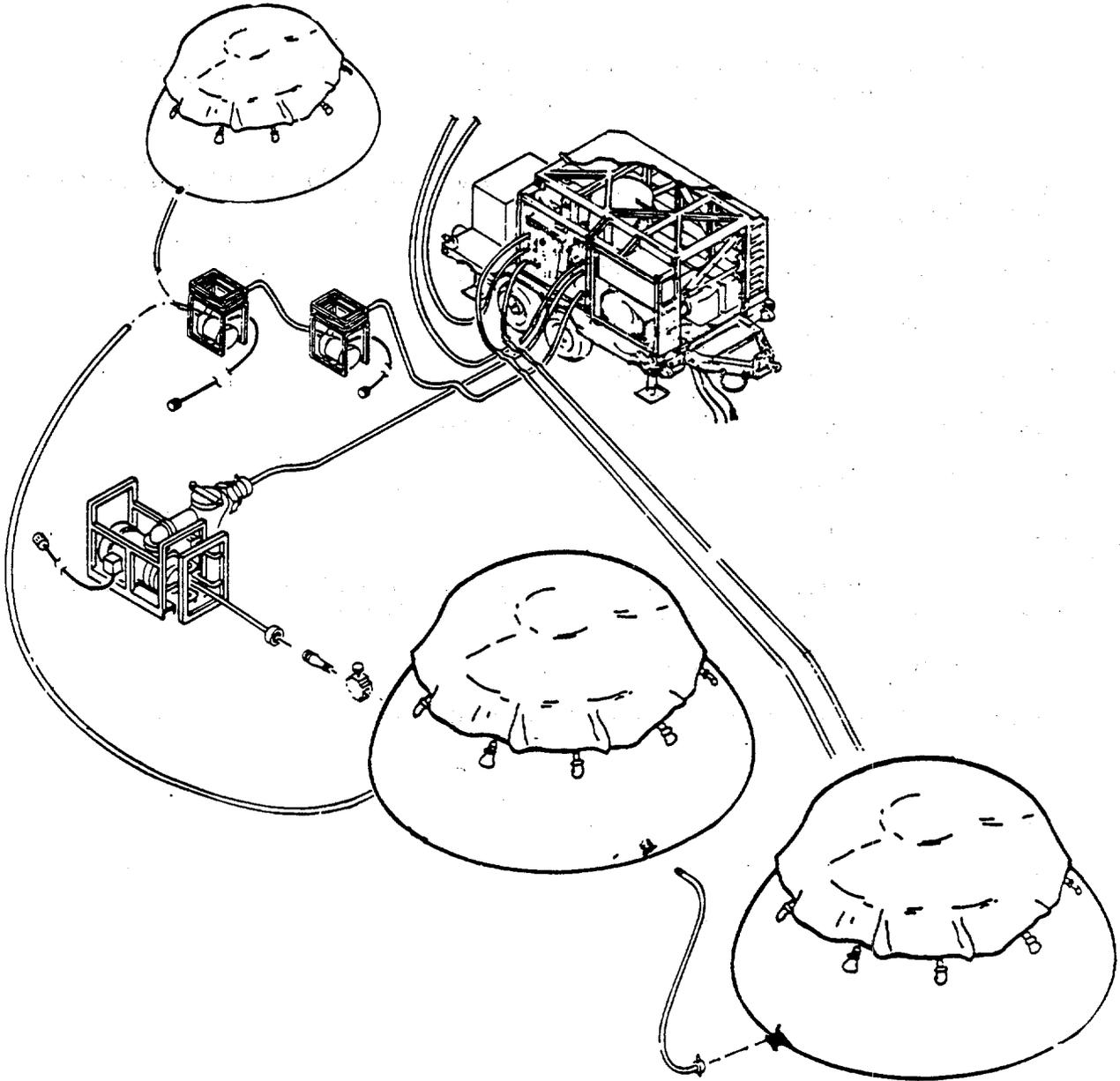
- a. Lubricate chemical feed metering pump. Refer to LO 10-4610-239-12/LI 08580B-12.
- b. Lubricate R.O. pump. Refer to LO 10-4610-239-12/LI 08580B-12.

**NOTE**

During preparation of ROWPU for test, position tanks and pumps and connect hoses and pump power cables according to steps e thru q. Perform other steps in ROWPU preparation according to TM 10-4610-239-10.

- c. Prepare ROWPU for use. Refer to TM 10-4610-239-10.

TEST. (Cont)



**TEST. (Cont)**

**WARNING**

Sodium bisulfite is toxic to skin, eyes, and breathing passages. Wear eye, skin, and respiratory protection. Avoid repeated or prolonged contact.

**CAUTION**

Chlorinated water can damage ROWPU membranes. If chlorine-free water is not available, add 1/2 cup (4 oz) sodium bisulfite to each tank while filling to neutralize chlorine.

- d. Operate ROWPU continuously for 6 hours. During operation, monitor ROWPU for defects. If a defect is found, shut down ROWPU, repair defect, and retest.
- e. Check for leaks at welded seams and connections.
- f. Check for failure of any light or switch.
- g. Check for faulty operation of any valves.
- h. Check for mechanical or electrical failure of any component.
- i. Shut down ROWPU. Refer to TM 10-4610-239-10.
- j. Perform backwash. Refer to TM 10-4610-239-10.
- k. After backwash, prepare ROWPU for use and operate until water level in tank (1) reaches top of 3000 gallon tank (about 20 minutes). Refer to TM 10-4610-239-10.
- l. Shut down ROWPU. Refer to TM 10-4610-239-10.
- m. Prepare ROWPU for movement. Refer to TM 10-4610-239-10.

**4-3. REPAIR ROWPU FRAME.**

For procedures to repair the ROWPU frame, refer to welding procedures given in TM 9-237.

**4-4. REPAIR CHEMICAL FEED METERING PUMP AND STAND ASSEMBLY.**

For procedures to repair the chemical feed metering pump and stand assembly, refer to welding procedures given in TM 9-237.

**Section II R.O. PUMP ASSEMBLY MAINTENANCE PROCEDURES**

	Para	Page
Repair R.O. Pump Power Frame Assembly .....	4-5	4-17
Repair R.O. Pump Stand Assembly .....	4-6	4-26

#### 4-5. REPAIR R.O. PUMP POWER FRAME ASSEMBLY.

This task covers:      a. Disassembly.      b. Cleaning.      c. Inspection.      d. Assembly.

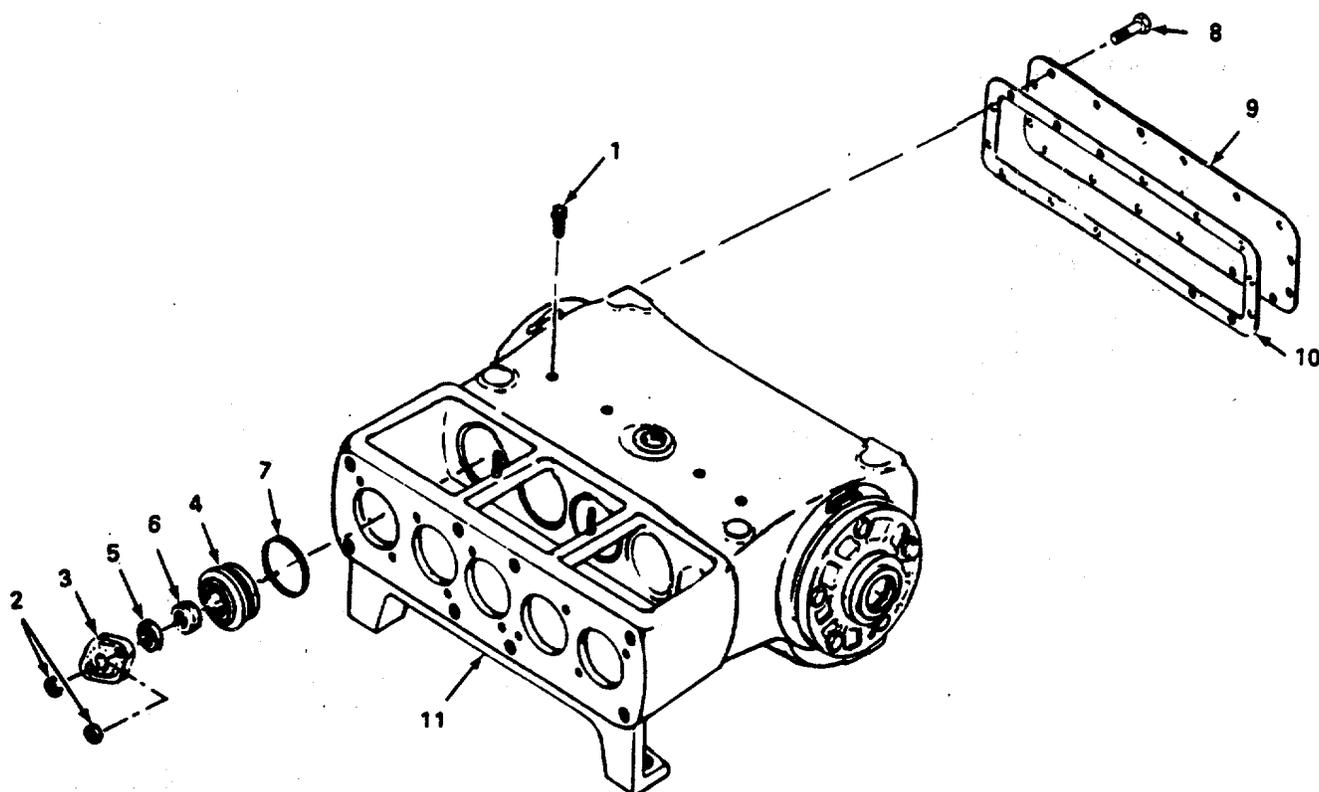
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##### INITIAL SETUP.

- a. Tools. Tool Kit (Appx B, Sect HI, Item 10).
  - Reamer Kit.
  - Arbor Hydraulic Press.
- b. Materials/Parts.      Lubricating Oil (Appx C, Sect II, Item 11).  
                                 Sandpaper (Appx C, Sect II, Item 15).  
                                 Dry Ice.
- c. Personnel Required.    2
- d. Equipment Condition. Oil drained from R.O. pump assembly (TM 10-4610-239-10).  
                                 R.O. pump fluid end assembly removed (paragraph 3-54).
- e. General Safety Requirements.

##### WARNING

- Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Don't support heavy weight with your back.
  - Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbides, and chlorates. Wear eye, skin, and respiratory protection. Use in a well-ventilated area.
  - Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig (207 kPag) air pressure.
  - Using dry ice can cause severe burns or even death. Wear protective clothing to avoid injury.
-



**DISASSEMBLY.**

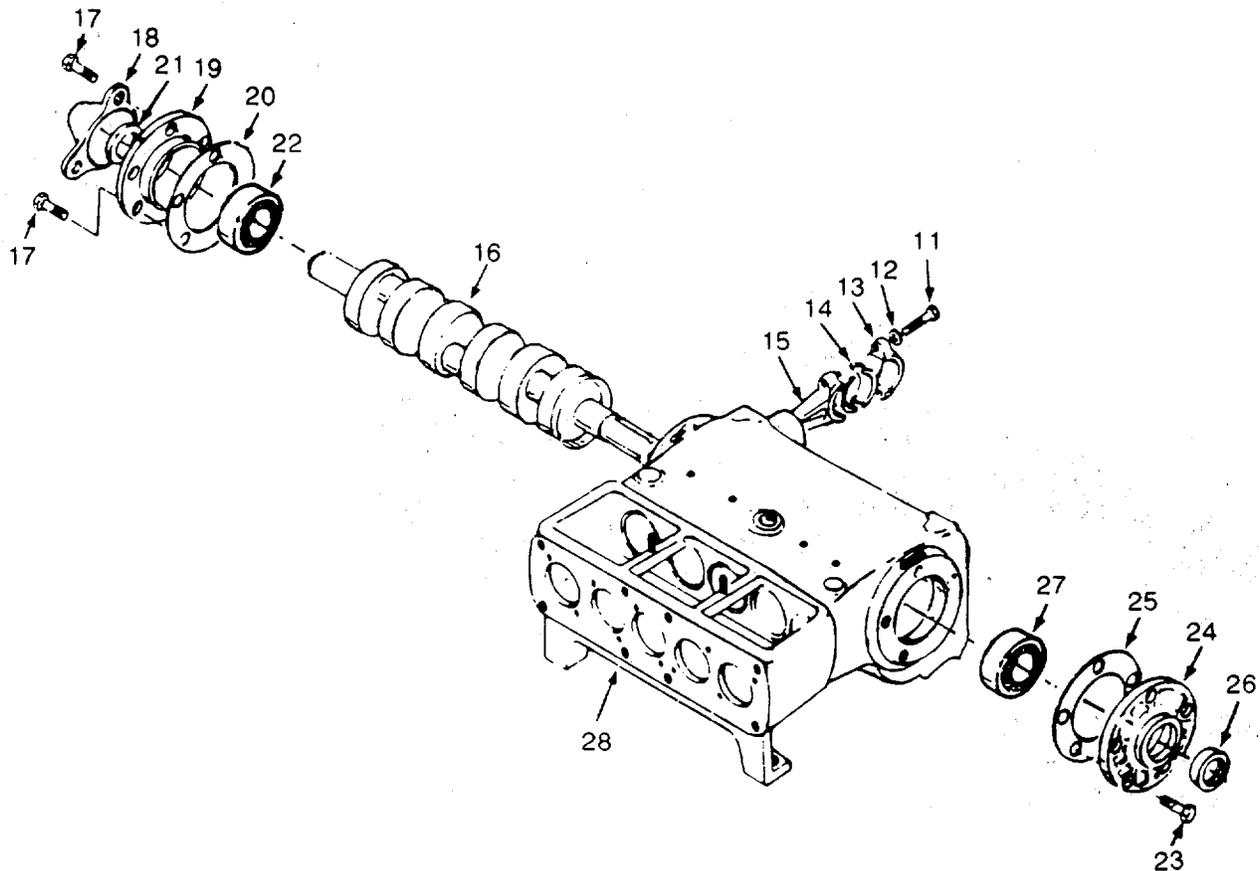
- a. Remove four plugs (1).

**NOTE**

There are five wiper boxes. All are disassembled the same. One is shown.

- b. Remove two nuts (2), gland (3), and wiper box (4).
- c. Remove follower (5), packing (6), and O-ring (7) from wiper box (4). Discard packing (6) and O-ring (7).
- d. Remove 16 cap screws (8), crankcase cover (9), and gasket (10). Discard gasket (10).

**DISASSEMBLY. (Cont)**



**CAUTION**

Mark the top of each connecting rod cap for assembly. Incorrect installation of connecting rod cap may damage equipment.

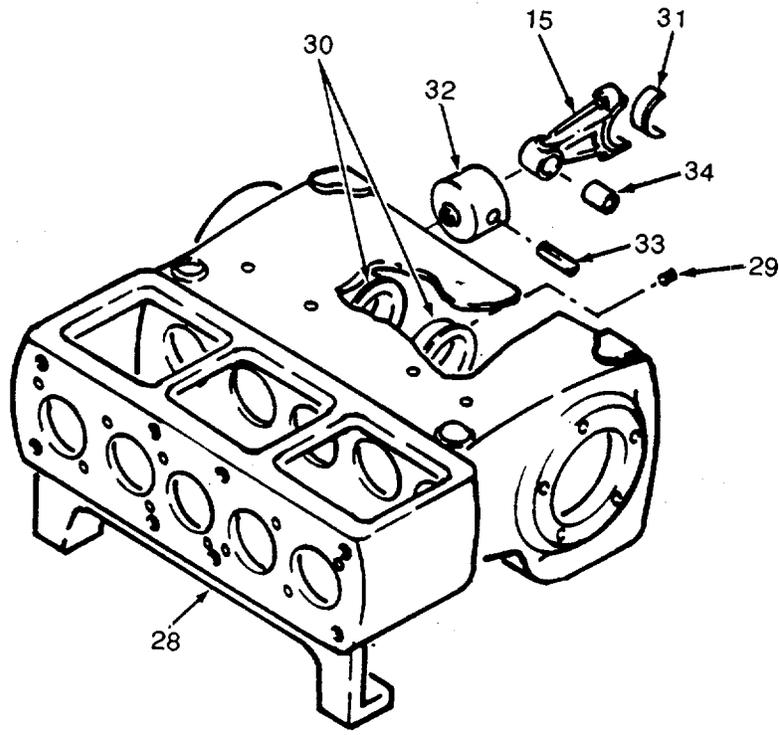
**NOTE**

There are five connecting rods. All are disassembled the same. One is shown.

- e. Remove two cap screws (11), lockwashers (12), connecting rod cap (13), and shell bearing half (14). Discard shell bearing half (14).
- f. Push connecting rod (15) out of cylinder away from crankshaft (16).
- g. Remove five cap screws (17), extension guard (18), bearing housing (19), and shim gasket (20). Discard shim gasket (20).
- h. Remove oil seal (21) from bearing housing (19). Discard oil seal (21).
- i. Using bearing puller, remove bearing (22) from bearing housing (19).
- k. Remove five cap screws (23), bearing housing (24), and shim gasket (25). Discard shim gasket (25).
- L. Remove oil seal (26) from bearing housing (24). Discard oil seal (26).

**DISASSEMBLY. (Cont)**

- m. Using bearing puller, remove bearing (28) from bearing housing (24).
- n. Remove crankshaft (16) from R.O. pump power frame (28).



- o. Remove two setscrews (29) from R.O. pump power frame (28).
- p. Using bearing puller, remove two main bearings (30).

**CAUTION**

Mark the top of each connecting rod and crosshead for assembly. Incorrect installation of connecting rod and crosshead may damage equipment.

**NOTE**

There are five connecting rods, shell bearing halves, and crossheads. All are disassembled the same. One is shown.

- q. Pull connecting rod (15) with shell bearing half (31) and crosshead (32) from R.O. pump power frame (28).
- r. Remove shell bearing half (31). Discard shell bearing half (31).
- s. Remove wrist pin (33).

**DISASSEMBLY. (Cont)**

- t. Remove crosshead (32).
- u. Remove bushing (34).

**WARNING**

The R.O. pump power frame is heavy/difficult to handle. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- v. Position R.O. pump power frame (28) to access bottom.

**CLEANING.**

**WARNING**

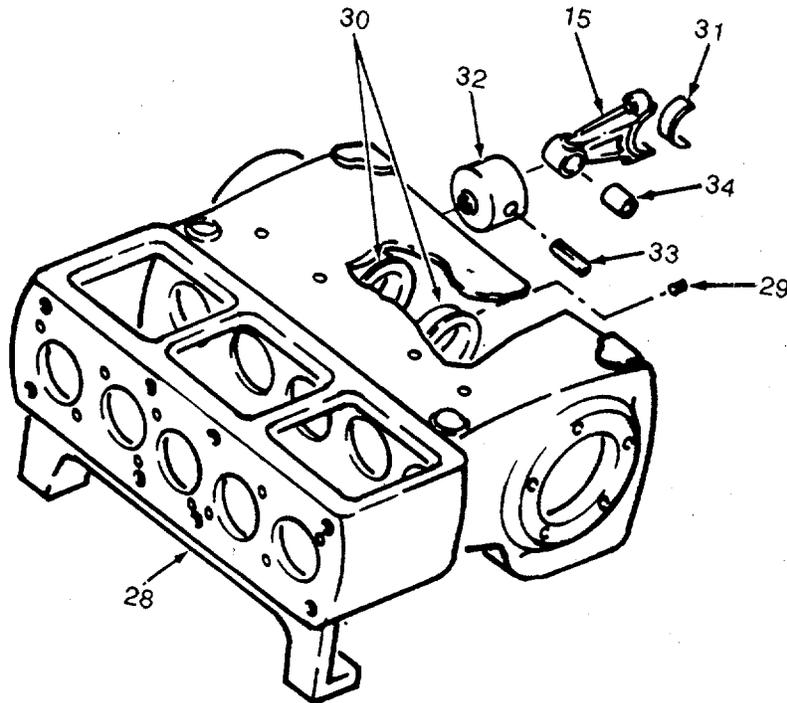
Drycleaning solvent AA 711 TYPE I & II is highly toxic and can ignite organic materials, nitrates, carbines, and chlorates. Wear eye, skin, and respiratory protection. Use in a well ventilated area.

- a. Wash metallic parts, including air breather, bearings, crankshaft, and the inside of the R.O. pump power frame, with drycleaning solvent.
- b. Rinse with a clean solution of drycleaning solvent and allow to air dry.
- c. Remove rust and loose paint from the R.O. pump power frame exterior.
- d. Remove rust and corrosion from nuts, screws, bolts, and studs.

**INSPECTION.**

- a. Inspect R.O. pump power frame for cracks and stripped threads. Repair as required.
- b. Inspect crankshaft for scratches, pitting, and excessive wear. Buff out scratches and pits with fine emery cloth. Repair as required.
- c. Inspect crossheads, wrist pins, glands, followers, and wiper boxes for damage and excessive wear. Repair as required.
- d. Inspect end bearing and main bearings for deformation, pitting, and excessive wear. Replace as required.
- e. Inspect connecting rods and connecting rod caps for damage, pitting around shell bearing housing, and for stripped heads and threads. Replace as required.
- f. Inspect studs, cap screws, pipe nipples, oil valve, pipe elbows, and nuts for stripped and damaged threads, bent or broken shanks, and cracks. Replace as required.
- g. Inspect bushing for tightness of fit in connecting rod. Replace as required.

ASSEMBLY.



**WARNING**

The R.O. pump power frame is heavy/difficult to handle. Two people are needed to lift it to prevent personal injury or damage to the equipment.

- a. Position R.O. pump power frame (28) to access bottom.
- b. Position R.O. pump power frame (28) to access top.

**NOTE**

There are five connecting rods, shell bearing halves, and crossheads. All are installed the same. One is shown.

- c. Install bushing (34) in connecting rod (15).
- d. Position crosshead (32) on connecting rod (15) with oil groove on crosshead toward oil hole at bushing (34).

**NOTE**

New bushing may require reaming until wrist pin fits snugly without binding.

- e. Install wrist pin (33) to secure crosshead (32).

**CAUTION**

Install shell bearing and connecting rod as marked during disassembly. Incorrect assembly of connecting rod and shell bearing may damage equipment.

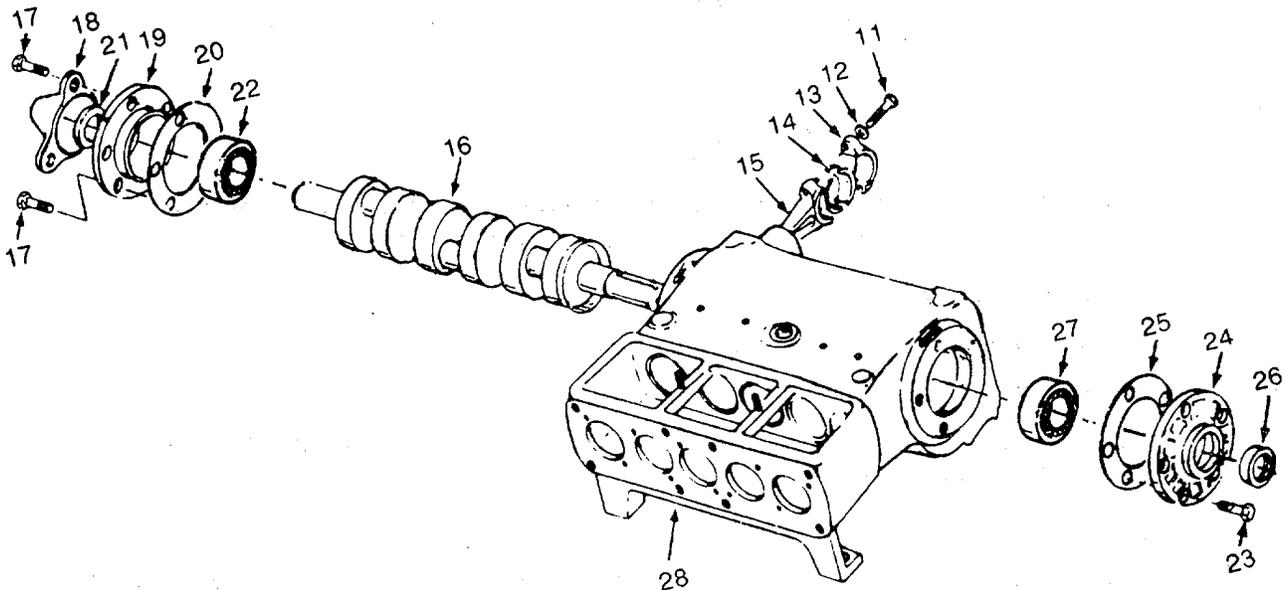
**ASSEMBLY. (Cont)**

- f. Position new shell bearing half (31) on connecting rod (15).
- g. Position connecting rod (15) with shell bearing half (31) and crosshead (32) in R.O. pump power frame (28).

**WARNING**

- Contact with dry ice or objects that have been packed in dry ice can cause severe burns. Always wear proper protective gloves when using dry ice.
- Dry ice displaces oxygen during evaporation. Use only in a well-ventilated area to prevent injury to personnel.

- i. Pack two main bearings (30) in dry ice for 20 minutes.
- j. Install two main bearings (30) in R.O. pump power frame (28).
- k. Install two setscrews (29) to secure two main bearings (30).

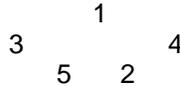


- l. Install bearing (22) and bearing (27) in bearing housings (19) and (24).
- m. Position crankshaft (16) in R.O. pump power frame (28).
- n. Install new oil seals (21) and (26) in bearing housings (19) and (24).

**ASSEMBLY. (Cont)**

**NOTE**

- Torque cap screws to 195 lb-ft (264N.m) in crossing pattern as follows:



- Bearing adjustment is accomplished by using varying thicknesses of shim gaskets. Adjustment is correct when the cap screws have been tightened and only a slight drag is noticeable when crankshaft is rotated. Two or more shim gaskets may be used on each bearing housing to obtain the correct adjustment.
- o. Install new shim gasket (25), bearing housing (24), and five cap screws (23).
- p. Install new shim gasket (20), bearing housing (19), extension guard (18), and five cap screws (17).

**CAUTION**

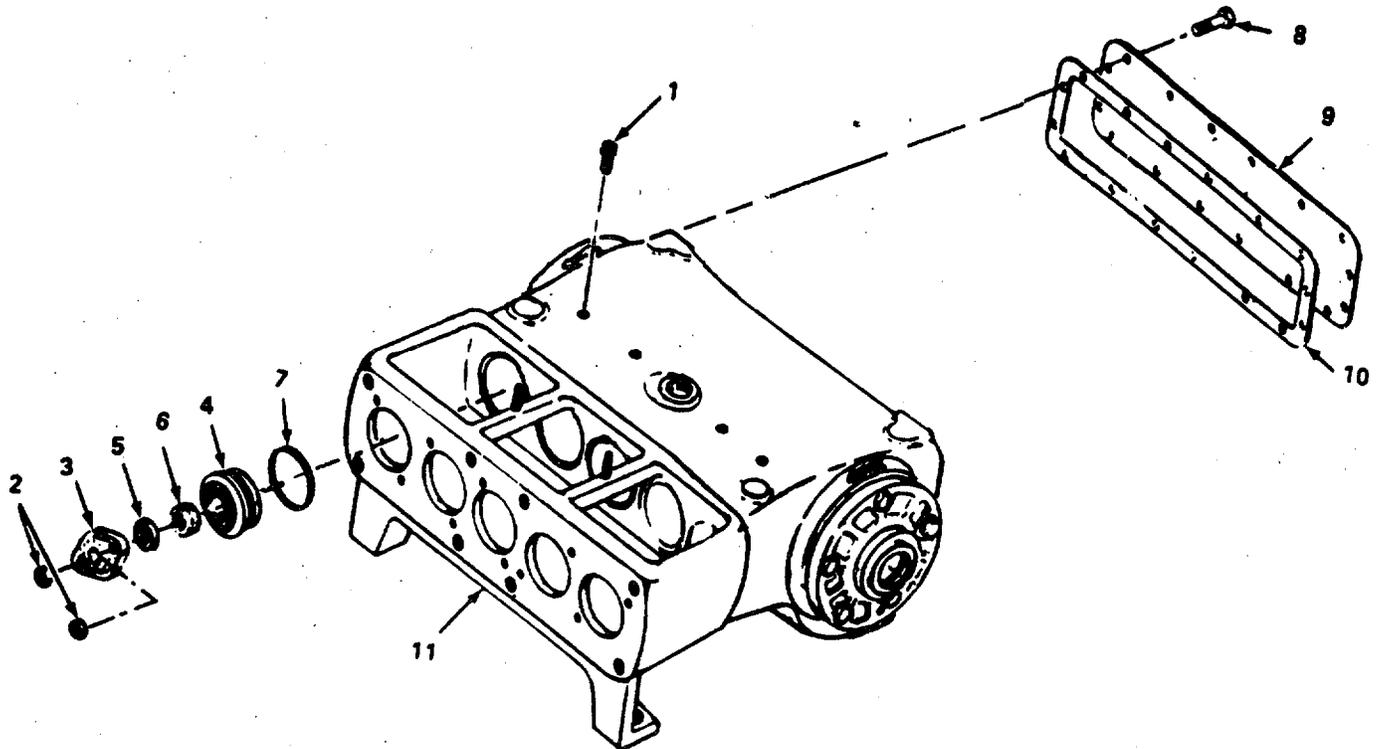
Assemble connecting rod caps and shell bearings as marked during disassembly. Incorrect assembly of connecting rod caps and shell bearings may damage equipment.

**NOTE**

There are five connecting rod caps. All are assembled the same. One is shown.

- q. Position new shell bearing half (14) and connecting rod cap (13) on connecting rod (15) with top as marked in disassembly.
- r. Install two cap screws (11) and lockwashers (12) to secure connecting rod cap (13).
- s. Torque two cap screws (11) 18 to 24 lb-ft (24 to 33N.m).
- t. Position new gasket (10) and crankcase cover (9) on R.O. pump power frame (28) and install 16 cap screws (8).

ASSEMBLY. (Cont)



NOTE

There are five wiper boxes. All are assembled the same. One is shown. Install packing rings with lips facing crosshead.

- u. Install new O-ring (7) on wiper box (4).
- v. Install new packing (6) and follower (5) in wiper box (4).
- w. Position wiper box (4) in R.O. pump power frame (11).
- x. Position gland (3) on R.O. pump power frame (11) and secure with two nuts (2).
- y. Install four plugs (1).
- z. Install R.O. pump fluid end assembly. Refer to paragraph 3-54.

**4-6. REPAIR R.O. PUMP STAND ASSEMBLY.**

For procedures to repair the R.O. pump stand assembly, refer to welding procedures given in TM 9-237.

**Section III. PUMP FRAME MAINTENANCE PROCEDURES**

	Para	Page
Repair Distribution Pump Frame .....	4-7	4-26
Repair Raw Water Pump Frame .....	4-8	4-26
Repair Backwash Pump Frame.....	4-9	4-26

**4-7. REPAIR DISTRIBUTION PUMP FRAME.**

For procedures to repair the distribution pump frame, refer to welding procedures given in TM 9-237.

**4-8. REPAIR RAW WATER PUMP FRAME.**

For procedures to repair the raw water pump frame, refer to welding procedures given in TM 9-237.

**4-9. REPAIR BACKWASH PUMP FRAME.**

For procedures to repair the backwash pump frame, refer to welding procedures given in TM 9-237.

**APPENDIX A**

**REFERENCES**

**A-1. SCOPE.** This appendix lists all forms, technical manuals, and miscellaneous publications referenced in this manual.

**A-2. FORMS.**

Recommended Changes to Publications and Blank Forms.....	DA Form 2028
Recommended Changes to Equipment Technical Manual.....	DA Form 2028-2
Equipment Inspection and Maintenance Worksheet .....	DA Form 2404
Maintenance Request.....	DA Form 2407
Packaging Improvement Report .....	DD Form 6
Discrepancy in Shipment Report .....	Form SF 361
Report of Discrepancy.....	Form SF 364
Quality Deficiency Report .....	Form SF 368

**A-3. TECHNICAL MANUALS.**

Lubrication Order; Water Purification Unit, Reverse Osmosis 600 GPH, Trailer Mounted, Flatbed Cargo, 5 Ton 4 Wheel Tandem Model ROWPU 600 GPH Skid Mounted Model ROWPU 600-3.....	LO 10-4610-239-12 LI 08580B-12
Operator's Manual; Water Purification Unit, Reverse Osmosis, 600 GPH Trailer Mounted, Flatbed Cargo, 5 Ton 4 Wheel Tandem Model 0996109001, and 600 GPH Skid Mounted ROWPU Model 0996108001 .....	TM 10-4610-239-10 TM 08580B-10/1
Unit, Intermediate Direct Support, and Intermediate General Support Repair Parts and Special Tools List; Water Purification Unit, Reverse Osmosis, 600-gph; Trailer-Mounted, Flatbed Cargo, 5-Ton, 4-Wheel Tandem Model 0996109001 and Skid Mounted Model 0996108001 .....	TM 10-4610-239-24P/2
Painting Instructions for Field Use.....	TM 9-213
Inspection, Care and Maintenance of Antifriction Bearings.....	TM 9-214
Operator's Manual: Welding Theory and Application.....	TM 9-237
Metal Body Repair and Related Operations .....	TM 9-450

Organizational Care, Maintenance and Repair of Pneumatic Tires  
and Inner Tubes..... TM 9-2610-200-20

Operator's Manual: Lathe, Brake Drum, Floor Mounted..... TM 9-4910-482-10

Preservation, Packaging and Packing of Military Supplies and Equipment..... TM 38-230-1/-2

Painting Instructions for Field Use..... TM 43-0139

Painting, Preserving, and Waterproofing Instructions..... TM 740-90-1

Destruction of Army Material to Prevent Enemy Use..... TM 750-244-3

Equipment Records Procedures..... TM 4700-15/1

**A-4. MISCELLANEOUS.**

Reporting of Transportation Discrepancies in Shipment..... AR 55-38

Security Procedures..... AR 190-11, AR 190-13

Packaging Improvement Reporting ..... AR 735-11-2

Consolidated Index of Army Publications and Blank Forms ..... DA Pam 25-30

The Army Maintenance Management System (TAMMS)..... DA Pam 738-750

Camouflage of Vehicles ..... FM 5-20B

First Aid for Soldiers..... FM 21-11

General Repair for Canvas and Webbing..... FM 43-3

Discrepancy and Shipment Report ..... MCO P4610.19

Marine Corps, Military Incentive Awards Program ..... MCO 1650.17

Report of Item and Packaging Discrepancy..... MCO 4430.3

Report of Item and Packaging Discrepancy..... NAVMATINST 4355.73B

Index of Authorized Publications ..... SL-1-2

## APPENDIX B

### MAINTENANCE ALLOCATION CHART (MAC)

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#### Section I. INTRODUCTION

##### B-1. The Army Maintenance System MAC

- a. This introduction (Section I) provides a general explanation of all maintenance and repair functions authorized at the two maintenance levels under the Two-Level Maintenance System concept.
- b. The MAC (immediately following, Section II) designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component shall be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Field – includes two sub columns, Unit (C (operator/crew) and O (unit)) and Direct Support (F) maintenance.

Sustainment – includes two sub columns, General Support (H) and Depot (D).

- c. Section III, Tools and Test Equipment, lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.
- d. Section IV, Remarks, contains supplemental instructions and explanatory notes for a particular maintenance function.

##### B-2. Maintenance Functions

Maintenance functions are limited to and defined as follows:

- a. **Inspect.** To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination (e.g., by sight, sound or feel).
- b. **Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.
- c. **Service.** Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint or to replenish fuel, lubricants, chemical fluids or gases. The following are examples of service functions:
  - (1) **Unpack.** To remove from packing box for service or when required for the performance of maintenance operations.
  - (2) **Repack.** To return item to packing box after service and other maintenance operations.
  - (3) **Clean.** To rid the item of contamination.
  - (4) **Touch up.** To spot paint scratched or blistered surfaces.
  - (5) **Mark.** To restore obliterated identification.

- d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.
- e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.
- f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments of test, measuring and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.
- g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating or fixing into position a spare, repair part or module (component or assembly) in a manner to allow the proper functioning of equipment or a system.
- h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and the assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.
- i. Repair. The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, faults, malfunction or failure in a part, subassembly, module (component or assembly), end item or system.

#### NOTE

The following definitions are applicable to the "repair" maintenance function:

- (1) Services. Inspect, test, service, adjust, align, calibrate and/or replace.
  - (2) Fault location/troubleshooting. The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).
  - (3) Disassembly/assembly. The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).
  - (4) Actions. Welding, grinding, riveting, straightening, facing, machining and/or resurfacing.
- j. Overhaul. The maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.
  - k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

### B-3. Explanation of Columns in the MAC, Section II

- a. Column (1) Group Number. Column (1) lists Functional Group Code (FGC) numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies and modules with the Next Higher Assembly (NHA).
- b. Column (2) Component/Assembly. Column (2) contains the item names of components, assemblies, subassemblies and modules for which maintenance is authorized.
- c. Column (3) Maintenance Function. Column (3) lists the functions to be performed on the item listed in column (2). (For a detailed explanation of these functions refer to "Maintenance Functions" previously defined).
- d. Column (4) Maintenance Level. Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as man-hours in whole hours or decimals) in the appropriate sub column. This work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

Field:

C	Operator or Crew maintenance
O	Unit maintenance
F	Direct Support maintenance

Sustainment:

H	General Support maintenance
D	Depot maintenance

- e. Column (5) Tools and Test Equipment Reference Code. Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE) and special tools, special TMDE and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table in Section III.
- f. Column (6) Remarks Code. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries in Section IV.

**B-4. Explanation of Columns in the Tools and Test Equipment Requirements, Section III**

- a. Column (1) Tool or Test Equipment Reference Code. The tool or test equipment reference code correlates with a code used in column (5) of the MAC.
- b. Column (2) Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.
- c. Column (3) Nomenclature. Name or identification of the tool or test equipment.
- d. Column (4) National Stock Number (NSN). The NSN of the tool or test equipment.
- e. Column (5) Tool Number. The manufacturer's part number.

**B-5. Explanation of Columns in the Remarks, Section IV**

- a. Column (1) Remarks Code. The code recorded in column (6) of the MAC.
- b. Column (2) Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

**SECTION II. MAINTENANCE ALLOCATION CHART  
FOR  
WATER PURIFICATION UNIT, REVERSE OSMOSIS**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Test Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
00	600-GPH REVERSE OSMOSIS WATER PURIFICATION UNIT, TRAILER-MOUNTED, MODEL 0996109001	Repair				40.0		7,9,10,	A
	600-GPH REVERSE OSMOSIS WATER PURIFICATION UNIT, SKID-MOUNTED, MODEL 0996108001	Repair				40.0		7,9,10	A
01	TRAILER, FLATBED CARGO	Inspect Test Service Replace Repair	5.4 1.0 1.0	1.2 0.2 1.0	2.3 0.2			10 10 9,10 9,10	A
	Chain Assy	Inspect Replace Repair	0.1	0.2 0.3				10 10 10	
	Brake System, Air, ROWPU Trailer	Inspect Test Adjust Replace Repair	0.5 0.2 1.2	0.2 0.2 2.0 4.0 2.5	0.5			10 10 10 6,10 6,10	
	Filter Assy Airbrake Line	Inspect Replace Repair	0.3			0.2 0.5		10 7,10	
	Valve, Relay, Airbrake	Inspect Replace Repair	0.2			1.0 2.0		10 10	
	Electrical Installation, ROWPU Trailer	Inspect Test Replace Repair	1.7 0.5		0.2 0.2 3.3 1.5	0.2 0.2 2.0		7 7,10 7,10	
	Light Assy	Inspect Replace Repair	0.1	0.3 0.3				10 10	
	Wiring Harness Assy	Inspect Replace Repair	0.5	1.0	0.5			7,10 7,10	

**SECTION II. MAINTENANCE ALLOCATION CHART – cont'd  
 FOR  
 WATER PURIFICATION UNIT, REVERSE OSMOSIS**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Test Equipment Ref Code	(6) Remarks Code
			Field		Sustainment				
			Unit		DS	GS	Depot		
			C	O	F	H	D		
	Cable Assembly, Trailer	Inspect	0.2		0.2				
		Test	0.3		0.2			7	
		Replace		2.0				7,10	
		Suspension Assembly	Repair			1.5			6,10
			Inspect	3.0	0.8	1.6			10
			Service	1.0					7,10
		Spring Assy	Adjust		3.0				6,10
			Replace		12.6	4.0			6,10
			Repair		6.3	11.0			6,10
		Axle Assembly	Inspect	0.3	0.3				6,10
Replace				1.0				6,10	
Repair				1.0				9,10	
	Hub & Drum Assy	Inspect	2.0	0.4	0.5			10	
		Service		0.5				7,10	
		Adjust		1.5				7,10	
		Replace		6.0				7,10	
		Repair			2.0			7,10	
	Drum	Inspect	0.2					7,10	
		Replace		0.5				7,10	
		Repair		0.3				7,10	
	Air Chamber Assembly	Inspect	0.1		0.3			10	
		Replace		0.3				7,10	
		Repair			2.0			9,10	
		Inspect	2.0	0.2				10	
	Brake Assembly, Service	Adjust		0.5				10	
		Replace		2.0				10	
		Repair			2.0			6,10	
		Inspect	0.2	0.2				7,10	
		Service		0.5				7,10	
	Jack Assembly, Leveling	Adjust		1.0				7,10	
		Replace		4.0				7,10	
		Repair		6.0	4.0			1,5,6,10	
		Inspect	0.2					10	
		Replace		0.5					

**SECTION II. MAINTENANCE ALLOCATION CHART- cont'd  
 FOR  
 WATER PURIFICATION UNIT, REVERSE OSMOSIS**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Test Equipment Ref Code	(6) Remarks Code
			Field		Sustainment				
			Unit		DS	GS	Depot		
			C	O	F	H	D		
02	ROWPU ASSEMBLY, 600-GPH	Inspect	9.0	9.2	10.3	2.5	7	A,B	
		Test		10.4					
		Calibrate	0.3						
		Service	3.5	1.0					
		Adjust		0.5					
		Replace	0.1	57.4					
	Repair		22.6	79.0	40.0				
	Installation, Piping	Inspect	1.9	0.5					
		Replace		11.0			10		
		Repair		0.3			10		
	Valve, Gate, Vent Vessels	Inspect	0.1						
		Replace		0.8			10		
		Repair		1.0			2,10		
	Raw Water Flow meter	Inspect	0.2	0.2					
		Replace		1.0			10		
	Brine Flow meter	Inspect	0.2						
		Replace		1.0			10		
	Backwash Water Flow meter	Inspect	0.2						
		Replace		1.0			10		
Valve, Backwash	Inspect	0.1							
	Replace		1.0			10			
	Repair			1.0		2,7,10			
Product Water Flow meter	Inspect	0.2							
	Replace		1.0			10			
	Repair		1.0						
Multimedia Filter Gage	Inspect	0.2							
	Replace		1.0			10			
Cartridge Filter Gage	Inspect	0.2							
	Replace		1.0			10			
R.O. Vessels Gage	Inspect	0.2							
	Replace		1.0			10			
R.O. Pressure PSI Gage	Inspect	0.2							
	Replace		1.0			10			

**SECTION II. MAINTENANCE ALLOCATION CHART- cont'd  
 FOR  
 WATER PURIFICATION UNIT, REVERSE OSMOSIS**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Test Equipment Ref Code	(6) Remarks Code
			Field		Sustainment				
			Unit		DS	GS	Depot		
			C	O	F	H	D		
	Water meter	Inspect Replace	0.2	1.0				10	
	In-line TDS Monitor	Inspect Replace	0.2 0.1					10	
	Filter, Cartridge	Inspect	0.5	0.5				10	
Service		1.5					10		
Replace Repair			2.0 3.0				10 10		
	Pump Assembly, Booster	Inspect	0.2	0.2	0.7				
Replace				1.0	4.0			10	
Repair					7.0			10	
	Pump, Booster	Inspect	0.1		0.5				
Test					0.5			7,10	
Replace					2.0			7,10	
Repair					2.0			7,10	
	Motor, Electric, Booster Pump	Inspect	0.1	0.1	0.2				
Test				0.5	0.5			7	
Replace					2.0			7,10	
Repair					5.0			7,10	
	Pump and Stand Assembly, Chemical Feed	Inspect	3.0	0.3					
Replace				1.0				10	
Repair				2.0		1.0		8,10	C
	Pump, Metering, Chemical Feed	Inspect	0.2	0.2	0.2				
Test				0.5	0.5			7,10	
Service			0.5						
Calibrate			0.3						
Replace				1.0				10	
Repair					5.0			6,10	
	Motor, Electric, Chemical Feed Metering Pump	Inspect	0.1	0.1	0.2			10	
Test				0.5	0.5			6,10	
Replace					1.0			10	
Repair					5.0			6,10	
	Control Box Assembly	Inspect	0.2	1.0	1.6			10	
Test				2.0	3.1			7	
Replace				5.0	8.2			6,10	
Repair					9.0			6,10	
	Wiring Harness W 2 (Control Box)	Inspect			0.5			10	
Test					1.0			7	
Replace					2.0			7,10	
Repair					3.0			7,10	

**SECTION II. MAINTENANCE ALLOCATION CHART- cont'd  
 FOR  
 WATER PURIFICATION UNIT, REVERSE OSMOSIS**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Test Equipment Ref Code	(6) Remarks Code
			Field		Sustainment				
			Unit		DS	GS	Depot		
			C	O	F	H	D		
	Wiring Harness W 1 (Control Box)	Inspect Test Replace Repair			0.5 1.0 3.0 3.0			10 7 7,10 7,10	
	Relay, Electrical	Inspect Test Replace			0.1 0.1 0.2			7,10 7,10 10	
	Wiring Harness W 58	Inspect Test Replace Repair			0.5 1.0 3.0 3.0			10 7,10 7,10 7,10	
	Switch, Low-Pressure	Inspect Test Calibrate Replace Repair	0.2	0.2	0.5 0.5 1.0 2.0			6,10 6,10 7,10 6,10	
	Light Assembly, Panel	Inspect Test Replace Repair	0.1	0.2	0.5 0.6			10 10	
	Switch, High-Pressure	Inspect Test Calibrate Replace Repair	0.1	0.1 0.2 1.0	0.6 0.5 0.5 1.0			10 7 6,7,10 6,7,10 6,7,10	
	Junction Box Assembly	Inspect Test Replace Repair	0.2	2.2 6.8 0.4 0.5	12.6 29.0			10 7,10 9,10 2,9,10	
	Cover, Junction Box	Inspect Replace Repair	0.1	0.4 0.5				10 10 5,10	
	Controller, Motor, Model J, Size 00	Inspect Test Replace Repair			0.2 0.5 0.6 1.0			10 6,10 6,10 1,6,10	

**SECTION II. MAINTENANCE ALLOCATION CHART- cont'd  
 FOR  
 WATER PURIFICATION UNIT, REVERSE OSMOSIS**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Test Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
	Controller, Motor, Model J, Size 3	Inspect			0.2			10	
		Test			0.5			6,10	
		Replace			0.6			6,10	
		Repair			1.0			1,6,10	
	Wiring Harness W 5 (Generator)	Inspect			0.2			10	
		Test			0.5			6,10	
		Replace			0.6			6,10	
		Repair			3.0			6,10	
	Wiring Harness W 6 (Backwash Pump)	Inspect			0.2			7,10	
		Test			0.3			7,10	
		Replace			1.0			7,10	
		Repair			3.0			7,10	
	Wiring Harness W 7 (Raw Water Pump NO. 1)	Inspect			0.2			7,10	
		Test			0.5			7,10	
		Replace			0.6			7,10	
		Repair			3.0			7,10	
	Wiring Harness W 8 (Raw Water Pump NO. 2)	Inspect			0.2			10	
		Test			0.5			7,10	
		Replace			0.6			7,10	
		Repair			3.0			7,10	
	Wiring Harness W 9 (Distribution Pump)	Inspect			0.2			10	
		Test			0.5			7,10	
		Replace			0.6			7,10	
		Repair			3.0			7,10	
	Wiring Harness W 10 (Junction Box)	Inspect			0.2			10	
		Test			0.5			7,10	
		Replace			0.6			7,10	
		Repair			3.0			7,10	
	Wiring Harness W 4 (Junction Box)	Inspect			0.2			10	
		Test			1.0			7,10	
		Replace			2.0			7,10	
		Repair			3.0			7,10	
	Wiring Harness W 3 (Junction Box)	Inspect			0.2			10	
		Test			1.0			7,10	
		Replace			3.0			7,10	
		Repair			3.0			7,10	
	Wiring Harness W 39 (Junction Box)	Inspect			0.2			10	
		Test			1.0			7,10	
		Replace			2.0			7,10	
		Repair			3.0			7,10	

**SECTION II. MAINTENANCE ALLOCATION CHART- cont'd  
FOR  
WATER PURIFICATION UNIT, REVERSE OSMOSIS**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Test Equipment Ref Code	(6) Remarks Code
			Field		Sustainment				
			Unit		DS	GS	Depot		
			C	O	F	H	D		
	Pump Assembly, Reverse Osmosis	Inspect Test Service Replace Repair	0.7 0.5	0.77 1.0 1.0 8.5 2.0	0.5 2.0	2.5 18.0	7,10 10 7,10 1,4,9,10		
	V-Belts	Inspect Adjust Replace	0.2	0.5 1.0			10 10	D	
	Pump Assembly, High-Pressure	Inspect Service Adjust Replace Repair	0.2 0.5	0.5 1.0 0.5 4.0	0.5 2.0	0.5 10.0	10 7,10 7,10 1,4,9,10		
	End Assy, Fluid	Inspect Replace Repair			2.0 2.0 2.0		9,10 9,10		
	Motor, Electric	Inspect Test Replace Repair	0.2	0.2 1.0 2.0	0.5 1.0 5.0		7,10 7,10 9,10		
	Stand, Pump Motor	Inspect Replace Repair	0.3	1.5		4.0	7,10 1,9,10		
	Installation, Electrical	Inspect Test Replace Repair			3.7 6.5 14.5 14.5		7 9,10 9,10		
	Cable Assembly W 41 (R.O. Pump)	Inspect Test Replace Repair		1.0	0.2 0.5 1.0		7 6,10 9,10		
	Cable Assembly W 46 (High-Pressure Switch)	Inspect Test Replace Repair			0.3 0.5 1.0 1.0		7 7,10 9,10		
	Cable Assembly W 52 (Junction Box to Control Box)	Inspect Test Replace Repair			0.3 0.5 1.0 1.0		10 6,10 9,10		

**SECTION II. MAINTENANCE ALLOCATION CHART– cont'd  
 FOR  
 WATER PURIFICATION UNIT, REVERSE OSMOSIS**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Test Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
	Lead, Electrical W 38	Inspect Replace Repair			0.3 0.5 0.5			1, 6,10 9,10	
	Cable Assembly W 48 (Panel Light)	Inspect Test Replace Repair			0.3 0.5 1.0 1.0			6,10 6,10 6,10	
	Cable Assembly W 47 (Low-Pressure Switch)	Inspect Test Replace Repair			0.3 0.5 1.0 1.0			6,10 6,10 9,10	
	Cable Assembly W 40 (Utility Receptacle)	Inspect Test Replace Repair		0.2	0.2 0.5 1.0 1.0			9 9,10 9,10	
	Cable Assembly W 50 (Chemical Feed Metering Pump)	Inspect Test Replace Repair			0.2 0.5 1.0 1.0			9 9,10 9,10	
	Cable Assembly W 51 (Booster Pump)	Inspect Test Replace Repair		1.0	0.2 0.5 1.0			9 9,10 9,10	
	Cable Assembly W 56 (D.S. Monitor Meter)	Inspect Test Replace Repair			0.2 0.5 1.0 1.0			9 9,10 9,10	
	Cable Assembly W 57 (D.S. Monitor Meter)	Inspect Test Replace Repair			0.2 0.5 1.0 1.0			9 9,10 9,10	
	Cable Assembly W 49 (Backwash Timer)	Inspect Test Replace Repair			0.2 0.5 1.0 1.0			7 9,10 9,10	
	Cable Assembly W 53 (Backwash Timer)	Inspect Test Replace Repair			0.2 0.5 1.0 1.0			7 9,10 9,10	

**SECTION II. MAINTENANCE ALLOCATION CHART- cont'd  
 FOR  
 WATER PURIFICATION UNIT, REVERSE OSMOSIS**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Test Equipment Ref Code	(6) Remarks Code
			Field			Sustainment			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
	Filter Assembly Multimedia	Inspect	1.2	0.7	0.7				
		Test			1.0			9	
		Adjust		0.3	0.3			10	
		Service			1.5			10	
		Replace	7.5	4.0				9,10	
	Filter Assembly	Repair			12.5			9,10	
		Inspect	0.5						
		Service		1.5				10	
	Control Valve	Replace	2.0	4.0				9,10	
		Repair			10.0			3,9,10	
		Inspect	0.5						
	Valve, Diaphragm	Replace	3.0	1.5				10	
		Repair						2,9,10	
	Timer Assembly, Backwash	Inspect	0.2						
		Replace		3.5				10	
		Repair		1.0				10	
		Inspect	0.2	0.2	0.2				
	Cable Assembly W 55 (D.S. Monitor Meter)	Test			1.0			7	
		Adjust		0.3	0.3			10	
		Replace		1.0				9,10	
		Repair			2.5			9,10	
		Inspect			0.2				
	Cable Assembly W 54 (D.S. Monitor Sensor)	Test			0.5			9	
		Replace			1.0			10	
		Repair			1.0			9,10	
		Inspect	0.2	0.2					
	Tube, Pressure	Service	1.5					10	
		Replace		3.0				10	
		Repair		3.0				7,10	
		Inspect	0.1					10	
	End Cap Assy	Replace		0.3				10	
		Repair		0.5				7,10	
		Inspect	3.0	3.0	3.0				
	Frame	Replace		1.0				10	
		Repair			4.0	2.0		9,10	
								C	

**SECTION II. MAINTENANCE ALLOCATION CHART- cont'd  
 FOR  
 WATER PURIFICATION UNIT, REVERSE OSMOSIS**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Test Equipment Ref Code	(6) Remarks Code
			Field		Sustainment				
			Unit		DS	GS	Depot		
			C	O	F	H	D		
03	PUMP AND FRAME ASSEMBLY, DISTRIBUTION	Inspect	0.5	0.5	0.4				
		Test		0.7	1.0			7	
		Replace	0.1	3.0				7,10	
		Repair			2.0	2.0		8,9,10	
	Pump Assembly, Distribution	Inspect	0.2	0.2	0.2				
		Replace		2.0				10	
		Repair			6.0			9,10	
	Pump Distribution	Inspect			0.5				
		Test			0.5			9,10	
		Replace			2.0			9,10	
		Repair			4.0			9,10	
	Motor, Electric Distribution Pump	Inspect	0.2	0.2	0.2				
		Test		0.5	1.0			9	
		Replace			2.0			10	
Repair				2.0			9,10		
Cable Assembly W 45 (Distribution Pump)	Inspect			0.1			10		
	Test			0.2			9		
	Replace		0.5				10		
	Repair			1.0			9		
Frame	Inspect	0.5							
	Replace		1.0						
	Repair			2.0	3.0				
04	PUMP AND FRAME ASSEMBLY, RAW WATER	Inspect	0.5	0.5	0.4			10	
		Test		0.5	1.0			9	
		Replace	0.1	5.0				10	
		Repair		1.0	7.0	2.0		8,9,10	
	Pump Assembly, Raw Water	Inspect	0.2	0.2	0.2			10	
		Replace		2.0				7,10	
		Repair			4.0			6,10	
	Pump, Raw Water	Inspect	0.2	0.2	0.2			10	
		Replace			2.0			10	
		Repair			2.0			10	
	Motor, Electric, Raw Water Pump	Inspect	0.2	0.2	0.2			6	
		Test			1.0			10	
		Replace			2.0			6,10	
		Repair			2.0			6,10	
Cable Assembly W 43 (Raw Water Pump NO.1)	Inspect			0.1			6		
	Test			0.2			6,10		
	Replace		0.5				6,10		
	Repair			1.0			6,10		

**SECTION II. MAINTENANCE ALLOCATION CHART- cont'd  
FOR  
WATER PURIFICATION UNIT, REVERSE OSMOSIS**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Test Equipment Ref Code	(6) Remarks Code
			Field		Sustainment				
			Unit		DS	GS	Depot		
			C	O	F	H	D		
05	Cable Assembly W 44 (Raw Water Pump NO.2)	Inspect			0.1			10	C
		Test			0.2			10	
		Replace		0.5				6,10	
		Repair			1.0			6,10	
	Frame	Inspect	0.5					10	
		Replace		2.0				6,10	
		Repair			1.0	2.0		6,10	
		Inspect	0.5	0.4	0.4	0.5		10	
	PUMP AND FRAME ASSEMBLY, BACKWASH	Test		0.7	0.5			6	
		Replace		4.0				7,10	
		Repair		1.0	2.0	2.0		8,9,10	
		Inspect	0.5					10	
	Strainer Assy	Replace	0.1	0.1				10	
		Repair			0.5			1,10	
Inspect		0.2					10		
Pump Assembly, Backwash	Test			0.5			10		
	Replace		2.0				6,10		
	Repair			2.0			6,10		
Pump, Backwash	Inspect	0.2	0.2	0.2			10		
	Replace			2.0			6,10		
	Repair			2.0			6,10		
Motor, Electric, Backwash Pump	Inspect	0.2	0.2	0.2			6		
	Test			0.5			6,10		
	Replace			2.0			6,10		
	Repair			2.0			6,10		
Cable Assembly W 42 (Backwash Pump)	Inspect			0.1			6,10		
	Test			0.2			6,10		
	Replace		0.5				6,10		
	Repair			1.0			6,10		
Frame	Inspect	0.5					10		
	Replace		2.0				10		
	Repair			1.0	1.0		6,10		
	Remove/Install			1.5			6		
06	GENERATOR SET, 30 KW						6	E	

**SECTION III. TOOLS AND TEST EQUIPMENT  
 FOR  
 WATER PURIFICATION UNIT, REVERSE OSMOSIS**

<b>Tool or Test Equipment Ref. Code</b>	<b>Maintenance Level</b>	<b>Nomenclature</b>	<b>National Stock Number (NSN)</b>	<b>Tool Number</b>
1	O	Brush, Engine	7920-00-215-7134	998-016201-030
2	O	Brush, Tool Cleaning	7920-00-062-5468	
3	O	Hose, Garden, 5/8-in. Diameter	4720-01-245-3656	
4	F	Puller, Valve Seat (R.O. Pump)		
5	C	Riveter, Blind, Hand	5120-00-060-2131	
6	F	Shop, Equipment, Automotive Maintenance and Repair: Field Maintenance, Common No. 2	4910-00-754-0061	
7	O	Shop, Equipment, Automotive Maintenance and Repair: Organizational, Common No. 1	4910-00-754-0654	
8	F	Shop Equipment Welding, Field Maintenance	3470-00-357-7268	
9	F	Shop Set, Field Maintenance Automotive Repair	4910-00-754-0705	
10	C	Tool Kit, General Mechanic, Automotive	5180-00-177-7033	
11	O	Tool, Packing Removal		
12		Tool, Seat Removal		

**SECTION IV. REMARKS  
 FOR  
 WATER PURIFICATION UNIT, REVERSE OSMOSIS**

<b>Remarks Code</b>	<b>Remarks</b>
A	Army Model.
B	Marine Corp Model.
C	Repair by welding at General Support Maintenance.
D	V-Belts must be replaced as a matched set.
E	Government furnished Equipment.

**APPENDIX C**  
**EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST**

**Section I. INTRODUCTION**

**C-1. SCOPE.** This appendix lists expendable/durable supplies and materials you will need to operate and maintain the Reverse Osmosis Water Purification Unit. This listing is for informational purpose only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

**C-2. EXPLANATION OF COLUMNS.**

a. Column (1) - Item number. This number is assigned to the entry in the listing and is referenced in the task Initial Setup instructions to identify the material; e.g., "Drycleaning solvent (Appx C)."

b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew

O - Unit Maintenance

F - Direct Support Maintenance

H - General Support Maintenance

c. Column (3) - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. (4) - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity (CAGE) code, as listed in H4/H8 Cataloging Handbook, in parentheses followed by the part number.

e. Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation; e.g., ea, in, pr. If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NO.	(2) STOCK LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	F	4610-01-355-7780	Anthracite, No. 2 (71726) 1610-10	ea
2	O	5330-01-083-0081	Cloth, lint-free	lb
3	O	7930-00-282-9699	Detergent, GP, Liq, WS, A (81349) MIL-D-16791	gl
4	O	4610-01-355-7783	Garnet, No. 12 (71726) 1633-05	lb
5	O	4610-01-355-7782	Garnet, No. 50 fine (71726) 1630-05	lb
6	O	4610-01-355-7784	Gravel, 1/4-in. (71726) 1621-01	lb
7	O		Grease, 35-616	lb
8	O	9150-00-190-0904	Grease, automotive and artillery, GAA (81349) MIL-G-10924	ea
9	O	9150-01-035-5395	Grease, wheel bearing	ea
10	O		Media, plastic (71726) 1631-03	lb
11	O	9150-01-152-4117	Oil, lubricating, internal combustion engine (81349) MIL-L-2104	gl
12	O		Oil, lubricating, multipurpose	gl
13	C	7920-00-205-1711	Rags, wiping (58536) A-A-531	lb
14	O	4610-01-355-7781	Sand, filter (71726) 1632-10	lb
15	O		Sandpaper, No. 00	ea
16	C	6850-00-664-5685	Solvent, drycleaning (81349) AA 711, TYPE I AND II	gl
17	O	8030-00-889-3534	Tape, antiseize, roll (81349) MIL-T-27730	ea
18	O	5970-00-147-5674	Tape, electrical, roll (81349) MIL-I-24391	ea

## Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NO.	(2) STOCK LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
19	O		Tape, Nomex, roll	ea
20	O	4020-00-138-7042	Twine, ball (81349) MIL-T-713	ea
21	O	8040-00-262-9005	Adhesive (81348) MMM-A-1617, Type II	tb
22	O	9150-01-161-4600	Grease, silicone (71984) DC-18	tb
23	O	6750-00-291-551	Sodium Bisulfide	16
24		5310-00-232-8194	Lockwashers, MS 35338-50	
25		5310-00-003-9174	Flatwashers, MS 27183-21	

**APPENDIX D**

**ILLUSTRATED LIST OF MANUFACTURED ITEMS**

**D-1. INTRODUCTION.** This appendix includes complete instructions for making items authorized to be manufactured or fabricated at unit maintenance. A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

**D-2. MANUFACTURED ITEMS PART NUMBER INDEX.**

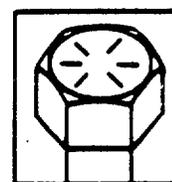
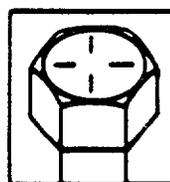
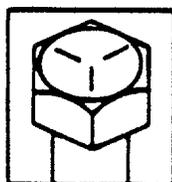
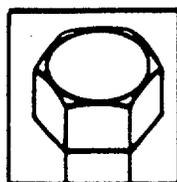
Part Number	Part Name	Figure Number
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APPENDIX E  
TORQUE LIMITS

USAGE	MUCH USED	MUCH USED	USED AT TIMES	USED AT TIMES
	To 1/2-69.000 [4850.7000]	To 3/4-120.000 [8436.0000]	To 5/8-140.000 [9842.0000]	150.000 [10545.0000]
CAPSCREW DIAMETER METER AND MINIMUM TENSILE STRENGTH PSI [KG/SQ CM]	To 3/4-64.000 [4499.2000]	To 1-115.000 [8084.5000]	To 3/4-133.000 [9349.9000]	
	To 1-55.000		[3866.5000]	
QUALITY OF MATERIAL	INDETERMINATE	MINIMUM COMMERCIAL	MEDIUM COMMERCIAL	BEST COMMERCIAL
SAE GRADE NUMBER	1 or 2	5	6 or 7	8

CAPSCREW HEAD MARKINGS

Manufacturer's marks may vary. These are all SAE Grade 5 (3-line)



CAPSCREW BODY SIZE (INCHES)-(THREAD)	TORQUE FT-LB [KGM]	TORQUE FT-LB [KGM]	TORQUE FT-LB [KGM]	TORQUE FT-LB [KGM]
1/4 - 20	5 [0.6915]	8 [1.1064]	10 [1.3830]	12 [1.6596]
- 28	6 [0.8293]	10 [1.3830]		14 [1.9362]
5/16 - 18	11 [1.5213]	17 [2.3511]	19 [2.6277]	24 [3.3192]
- 24	13 [1.7979]	19 [2.6277]		27 [3.7341]
3/8 - 16	18 [2.4894]	31 [4.2873]	34 [4.7022]	44 [6.0852]
- 24	20 [2.7660]	35 [4.8405]		49 [6.7767]
7/16 - 14	28 [3.8132]	49 [6.7767]	55 [7.6065]	70 [9.6810]
- 20	30 [4.1490]	55 [7.6065]		78 [10.7874]
1/2 - 13	39 [5.3937]	75 [10.3725]	85 [11.7555]	105 [14.5215]
- 20	41 [5.6703]	85 [11.7555]		120 [16.5960]
9/16 - 12	51 [7.0533]	110 [15.2130]	120 [16.5960]	155 [21.4365]
- 18	55 [7.6065]	120 [16.5960]		170 [23.5110]
5/8 - 11	83 [11.4789]	150 [20.7450]	167 [23.0961]	210 [29.0430]
- 18	95 [13.1385]	170 [23.5110]		240 [33.1920]
3/4 - 10	105 [14.5215]	270 [37.3410]	280 [38.7240]	375 [51.8625]
- 16	115 [15.9045]	295 [40.7985]		420 [58.0860]
7/8 - 9	160 [22.1280]	395 [54.6285]	440 [60.8520]	605 [83.6715]
- 14	175 [24.2025]	435 [60.1605]		675 [93.3525]
1 - 8	235 [32.5005]	590 [81.5970]	660 [91.2780]	910 [125.8530]
- 14	250 [34.5750]	660 [91.2780]		990 [136.9170]

1. Always use the torque values listed above when specific specifications are not available.

NOTE

Do not use above values in place of those specified in this manual, special attention should be observed in case of SAE Grade 6, 7 and 8 cap screws.

- The above is based on use of clean and dry threads.
- Reduce torque by 10% when oil is used as a lubricant.
- Reduce torque by 20% if new plated cap screws are used.

CAUTION

Cap screws threaded into aluminum may require reductions in torque of 30% or more, unless inserts are used.

**GLOSSARY**

**Section I. ABBREVIATIONS**

R.O. ....reverse osmosis  
ROWPU..... reverse osmosis water purification unit

**Section II. DEFINITION OF UNUSUAL TERMS**

No unusual terms are used in this manual.

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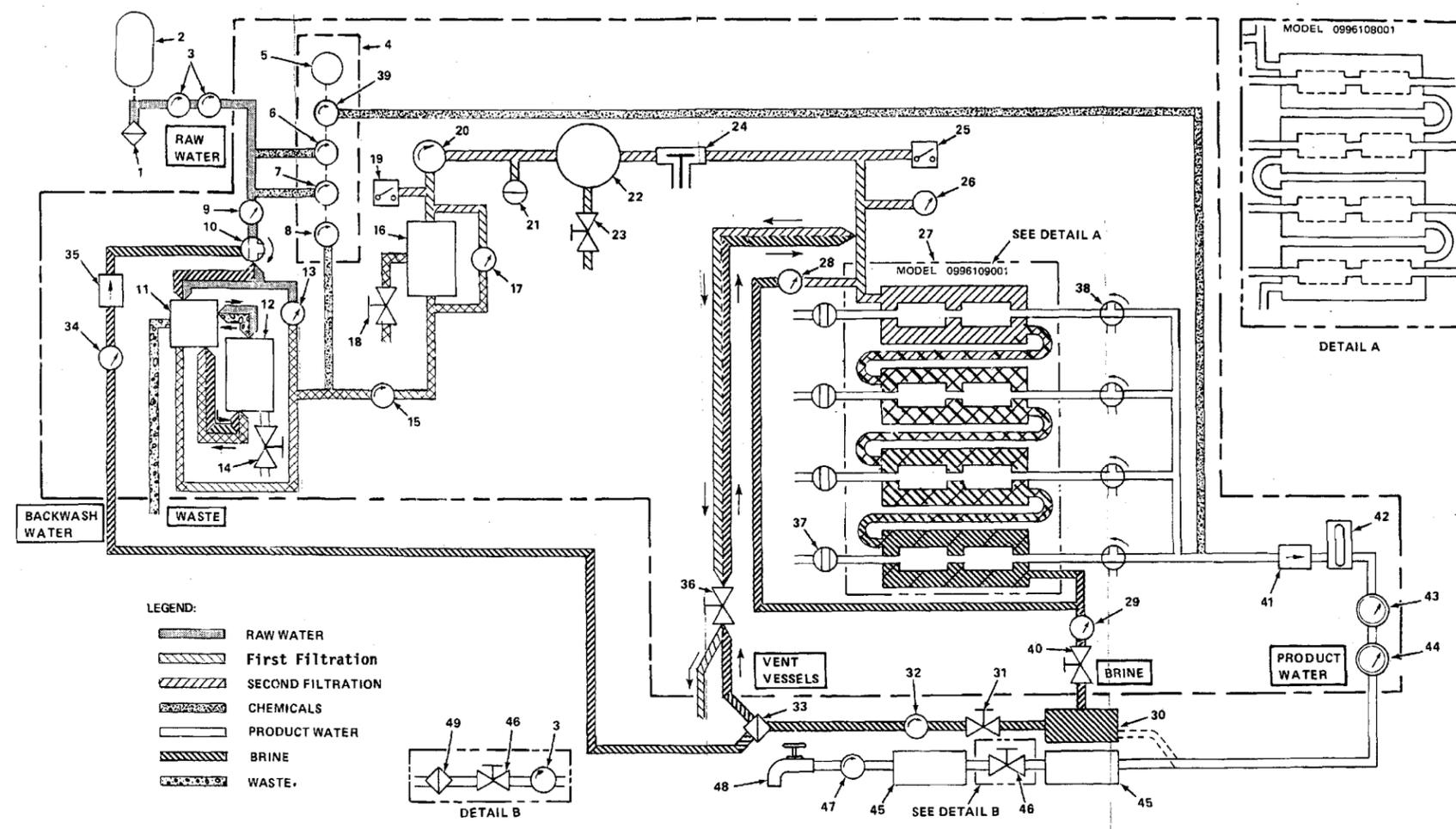
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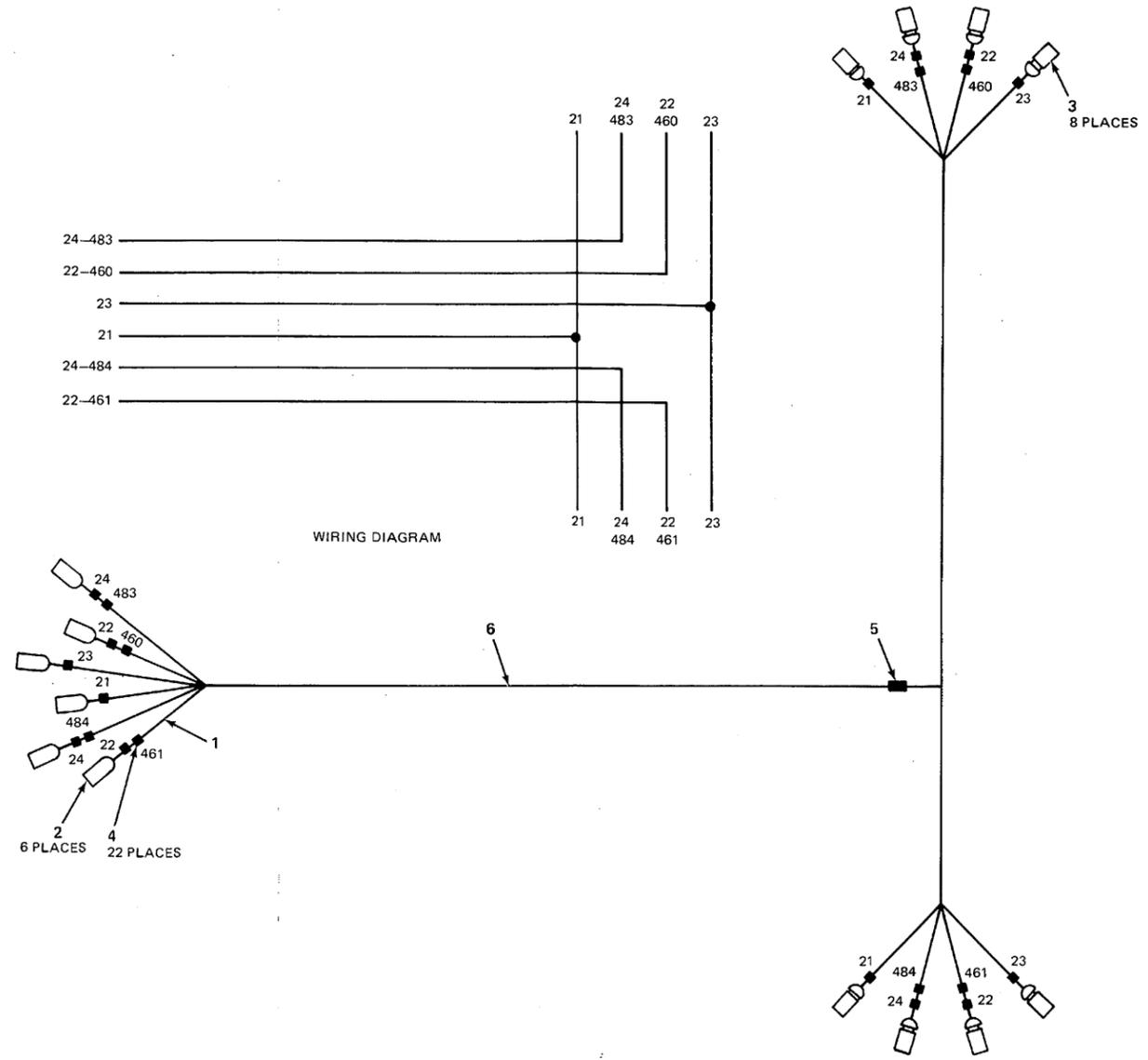
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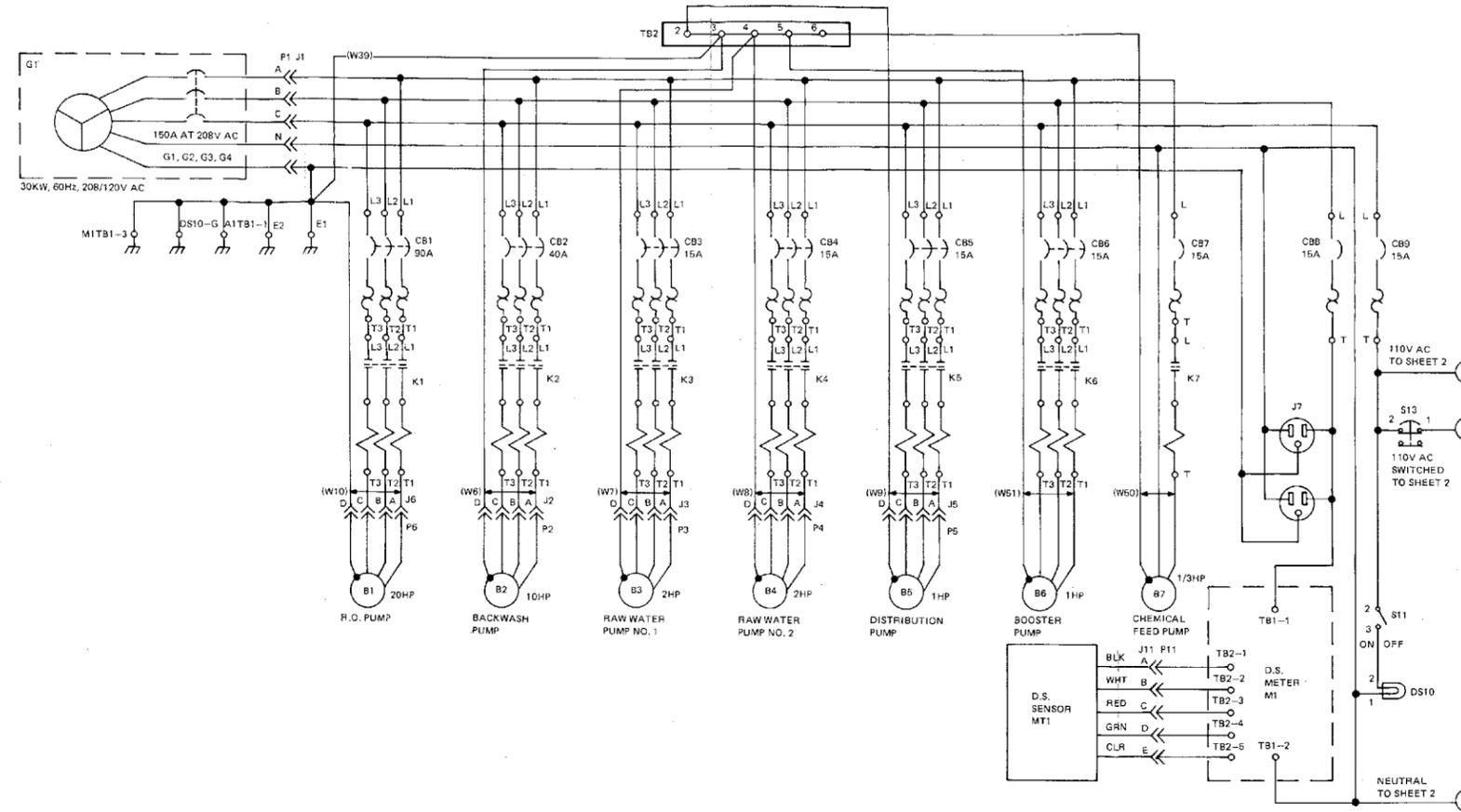
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FO-1. ROWPU Water Processing Flow Diagram  
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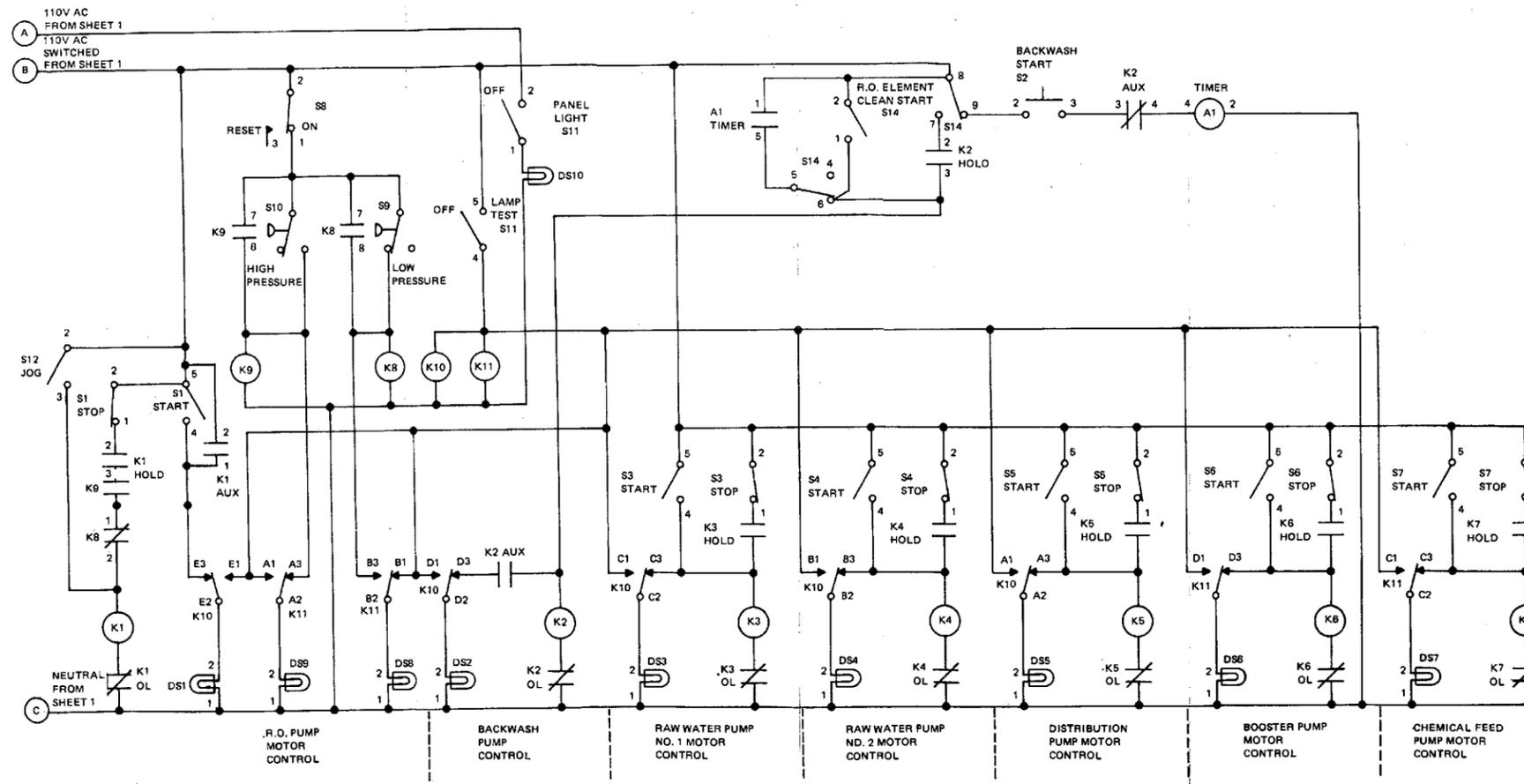


FO-2. Wiring Diagram and Schematic, Trailers Harness  
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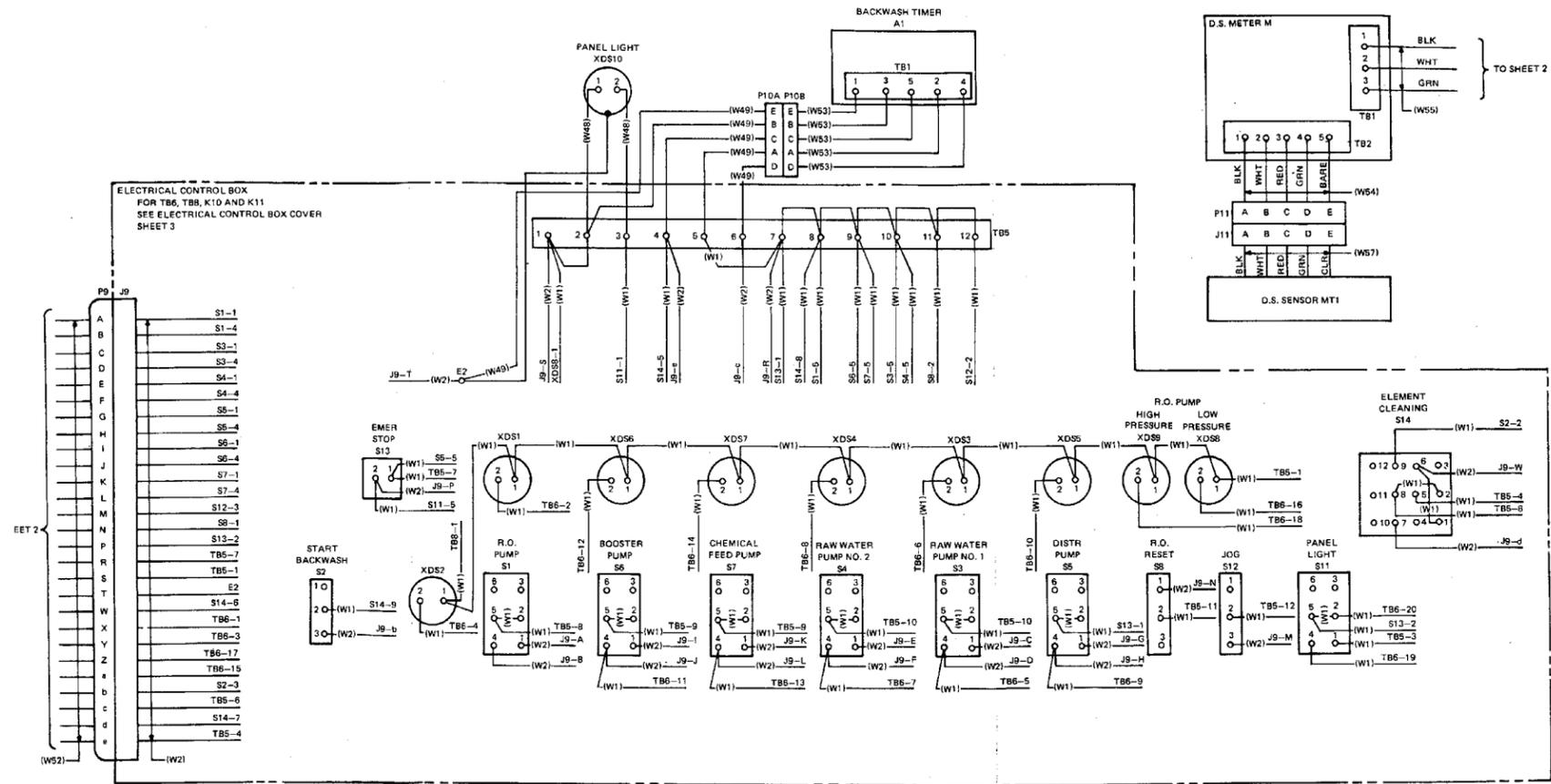
FO-3. Schematic Diagram, ROWPU (Sheet 1 of 2)

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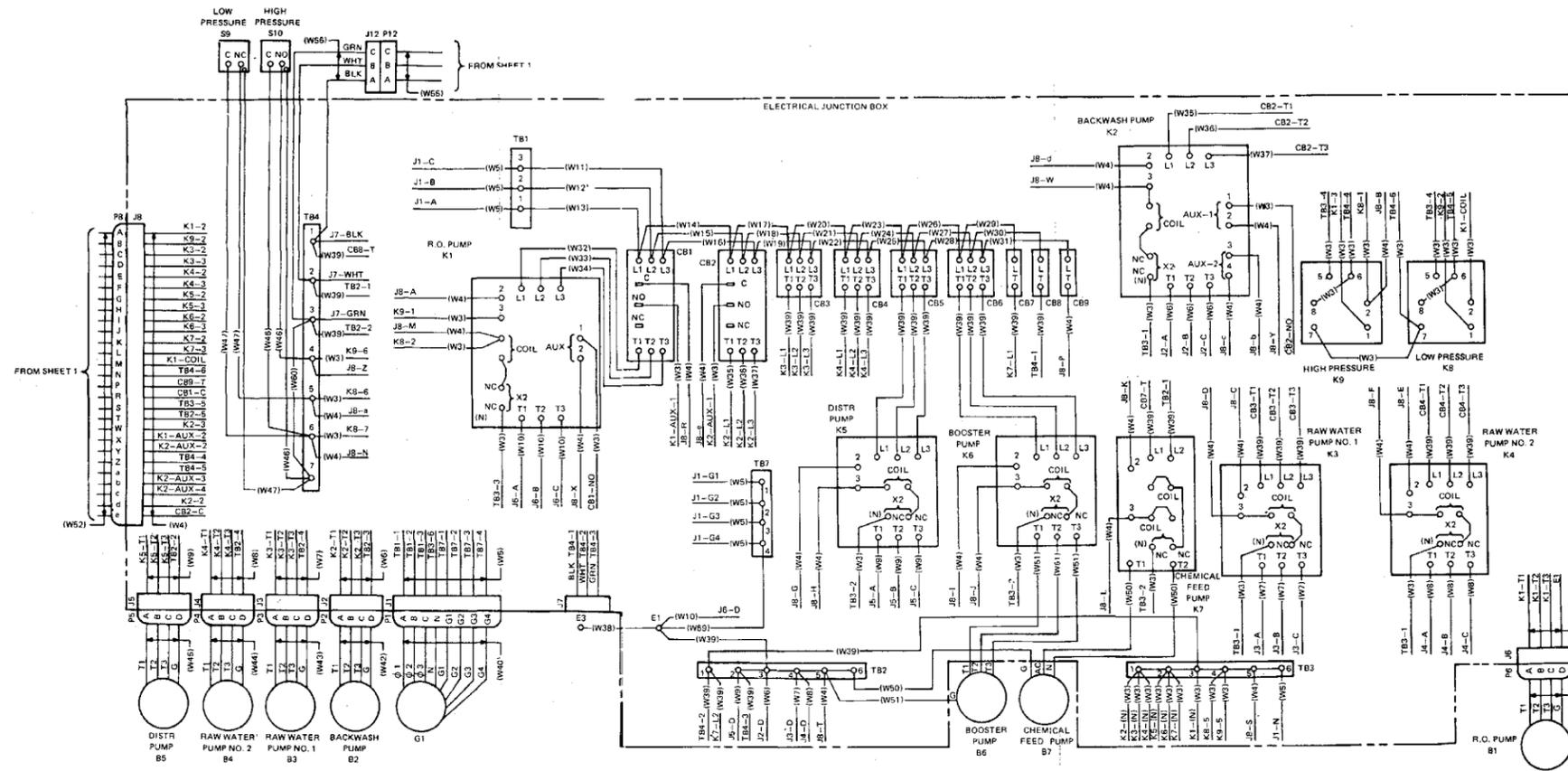
FO-3. Schematic Diagram, ROWPU (Sheet 2 of 2)

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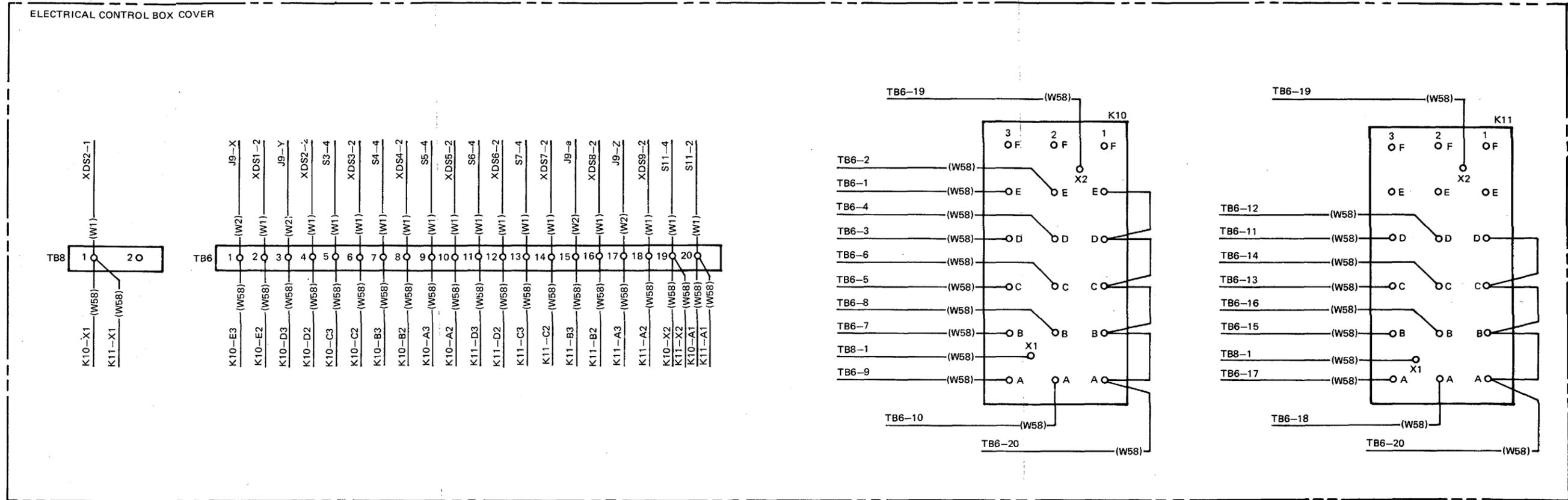
FO-4. Interconnection Diagram, ROWPU (Sheet 1 of 3)

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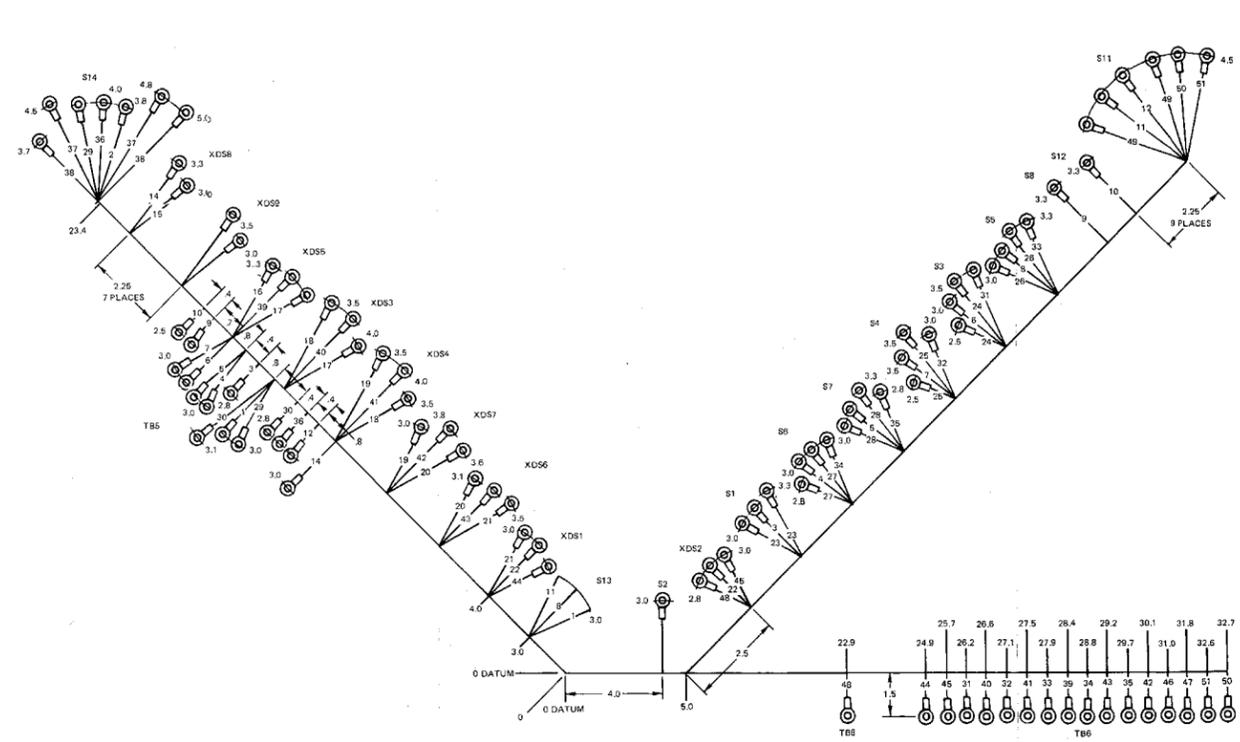


FO-4. Interconnection Diagram, ROWPU (Sheet 2 of 3)

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FO-4. Interconnection Diagram, ROWPU  
 (Sheet 3 of 3)



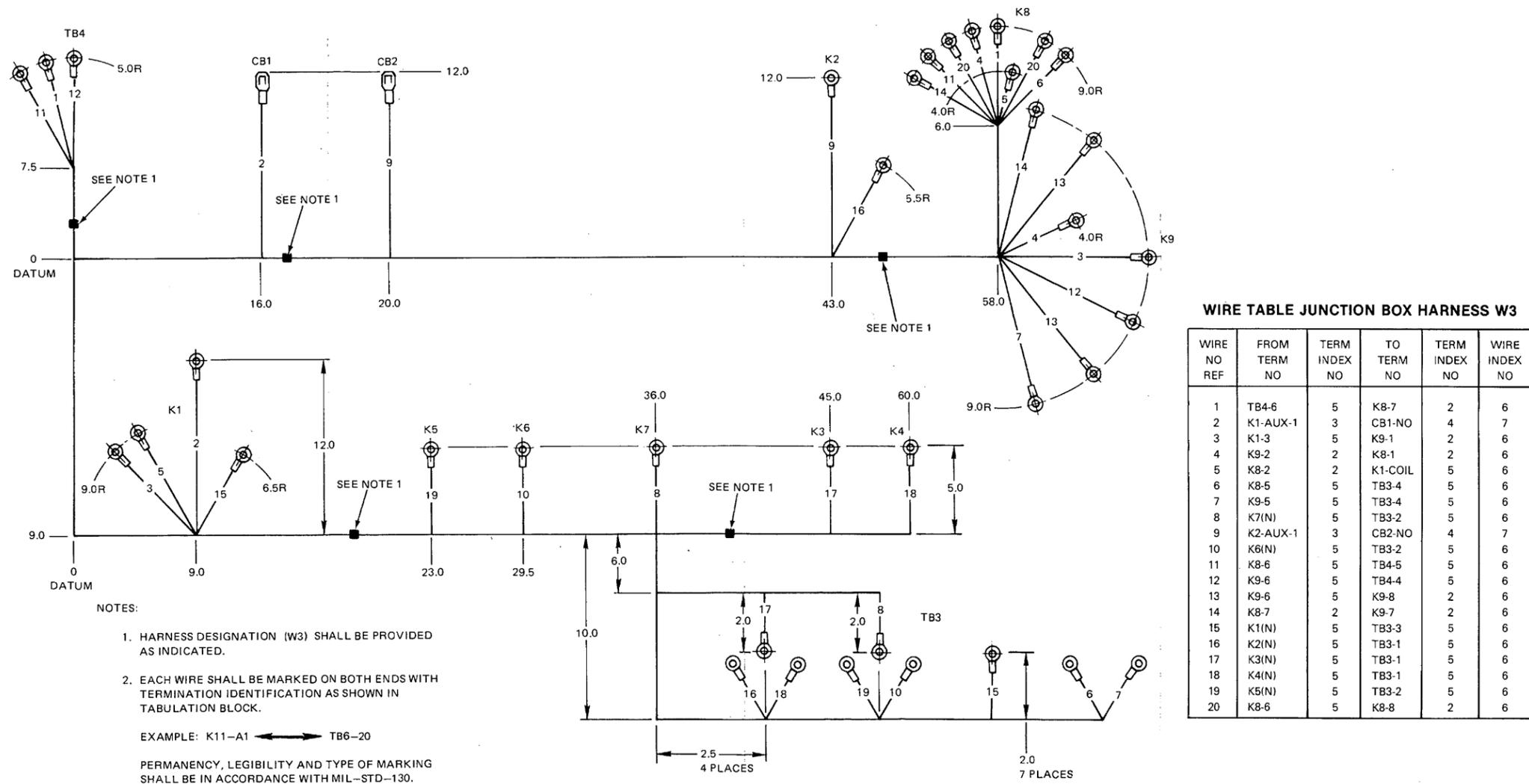
WIRE TABLE CONTROL BOX HARNESS W1

WIRE NO	FROM TERM NO	TO TERM NO	WIRE INDEX NO	WIRE INDEX NO
1	S13-1	TB5-7	2	4
2	S14-8	S2-2	3	5
3	TB5-8	S1-5	3	5
4	TB5-9	S6-5	3	5
5	TB5-9	S7-5	3	5
6	TB5-10	S3-5	3	5
7	TB5-10	S4-5	2	5
8	S13-1	S5-5	3	5
9	TB5-11	S8-2	3	5
10	TB5-12	S12-2	3	5
11	S13-2	S11-2	3	5
12	TB5-3	S11-1	3	5
13	DELETED			
14	XDS8-1	TB5-1	3	5
15	XDS8-1	XDS9-1	3	5
16	XDS5-1	XDS9-1	3	5
17	XDS5-1	XDS3-1	3	5
18	XDS3-1	XDS4-1	3	5
19	XDS4-1	XDS7-1	3	5
20	XDS7-1	XDS6-1	3	5
21	XDS1-1	XDS6-1	3	5
22	XDS1-1	XDS2-1	3	5
23	S1-2	S1-5	3	5
24	S3-2	S3-5	3	5
25	S4-2	S4-5	3	5
26	S5-2	S5-5	3	5
27	S6-2	S6-5	3	5
28	S7-2	S7-5	3	5
29	S14-8	TB5-7	3	5
30	TB5-5	TB5-7	3	5
31	S3-4	TB6-5	3	5
32	S4-4	TB6-7	3	5
33	S5-4	TB6-9	3	5
34	S6-4	TB6-11	3	5
35	S7-4	TB6-13	3	5
36	S14-5	TB6-4	3	5
37	S14-8	S14-2	3	5
38	S14-1	S14-6	3	5
39	XDS5-2	TB6-10	3	5
40	XDS3-2	TB6-8	3	5
41	XDS4-2	TB6-9	3	5
42	XDS1-2	TB6-14	3	5
43	XDS6-2	TB6-12	3	5
44	XDS1-2	TB6-2	3	5
45	XDS2-2	TB6-4	3	5
46	XDS6-2	TB6-16	3	5
47	XDS2-2	TB6-18	3	5
48	XDS2-1	TB6-1	3	5
49	S11-5	S11-2	3	5
50	S11-5	TB6-20	3	5
51	S11-4	TB6-19	3	5

FO-5. Wiring Diagram, Control Box  
Harness W1

FP-15 / (FP-16 blank)

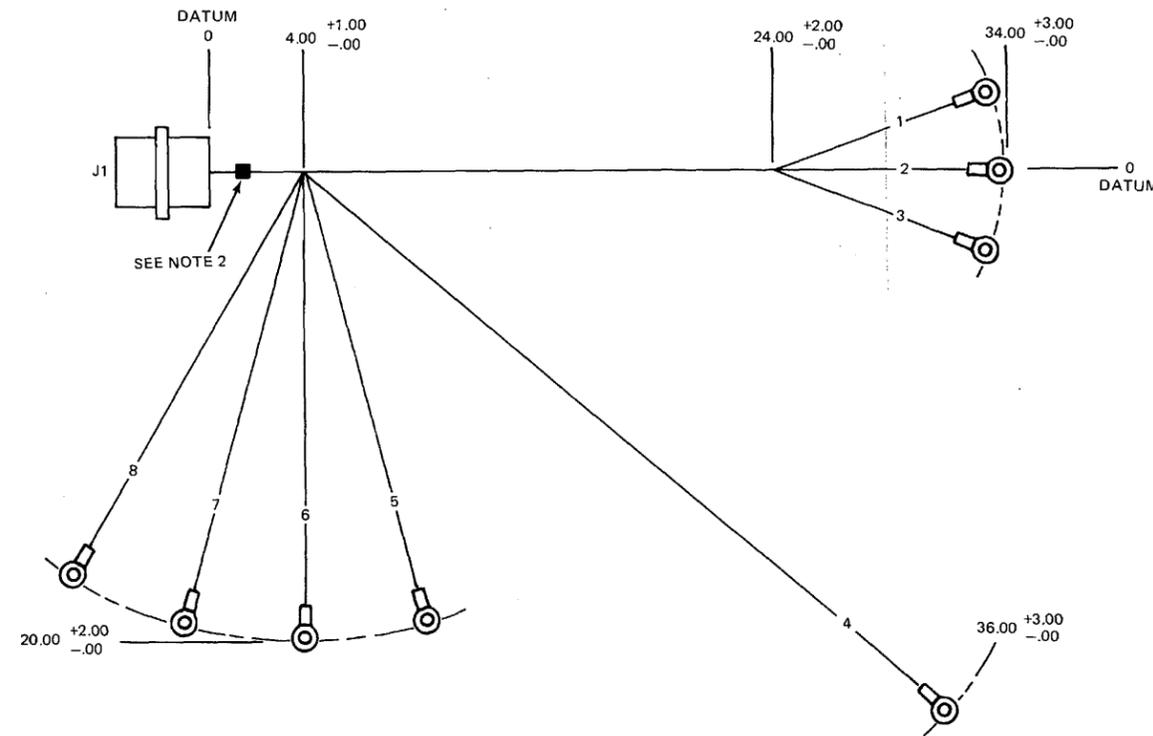




FO-7. Wiring Diagram, Junction Box  
Harness W3

FP-19 / (FP-20 blank)





NOTES:

1. ELECTRICAL CONNECTIONS SHALL BE SOLDERED IN ACCORDANCE WITH DoD-STD-2000-4 USING SOLDER. SPECIFICATION QQ-S-571.
2. HARNESS DESIGNATION (W5) SHALL BE PROVIDED AS INDICATED.
3. EACH WIRE SHALL BE MARKED ON BOTH ENDS WITH TERMINATION IDENTIFICATION AS SHOWN IN TABULATION BLOCK.

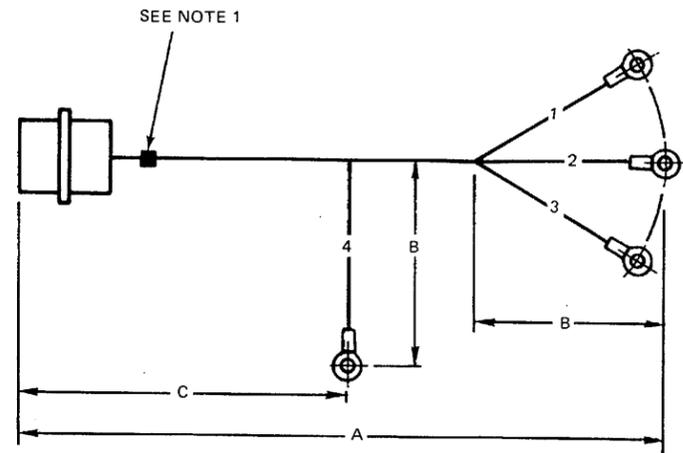
EXAMPLE: K11-A1 ← → TB6-20

PERMANENCY LEGIBILITY AND TYPE OF MARKING SHALL BE IN ACCORDANCE WITH MIL-STD-130.

**WIRE TABLE JUNCTION BOX HARNESS W5**

WIRE NO REF	FROM TERM NO	TERM INDEX NO	TO TERM NO	TERM INDEX NO	WIRE INDEX NO
1	J1-A	2	TB1-1	3	6
2	J1-B	2	TB1-2	3	6
3	J1-C	2	TB1-3	3	6
4	J1-N	2	TB3-6	4	7
5	J1-G1	2	TB7-1	5	8
6	J1-G2	2	TB7-2	5	8
7	J1-G3	2	TB7-3	5	8
8	J1-G4	2	TB7-4	5	8

FO-9. Wiring Diagram, Junction Box  
Harness W5



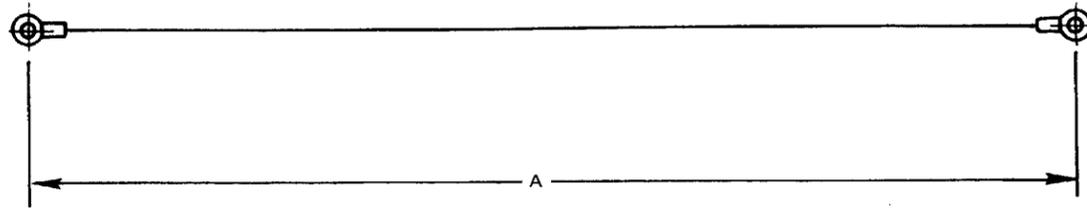
NOTES:

1. HARNESS DESIGNATION (AS APPLICABLE) SHALL BE PROVIDED AS INDICATED.
  2. EACH WIRE SHALL BE MARKED ON BOTH ENDS WITH TERMINATION IDENTIFICATION AS SHOWN IN TABULATION BLOCK.  
EXAMPLE: J1-A ←→ TB1-1
- PERMANENCY, LEGIBILITY AND TYPE OF MARKING SHALL BE IN ACCORDANCE WITH MIL-STD-130.

WIRE TABLE W6 THRU W10

HARNESS REFERENCE DESIGNATOR	WIRE NO REF	FROM TERM NO	TERM INDEX NO	TO TERM NO	TERM INDEX NO	WIRE INDEX NO	DIMENSION IN INCHES		
							A	B	C
W6	1	J2-A	5	K2-T1	3	4	71	6	—
W6	2	J2-B	5	K2-T2	3	4	71	6	—
W6	3	J2-C	5	K2-T3	3	4	71	6	—
W6	4	J2-D	5	TB2-3	2	4	—	6	24
W7	1	J3-A	10	K3-T1	8	9	65	6	—
W7	2	J3-B	10	K3-T2	8	9	65	6	—
W7	3	J3-C	10	K3-T3	8	9	65	6	—
W7	4	J3-D	10	TB2-4	7	9	—	6	24
W8	1	J4-A	15	K4-T1	13	14	75	6	—
W8	2	J4-B	15	K4-T2	13	14	75	6	—
W8	3	J4-C	15	K4-T3	13	14	75	6	—
W8	4	J4-D	15	TB2-4	12	14	—	6	24
W9	1	J5-A	20	K5-T1	18	19	43	6	—
W9	2	J5-B	20	K5-T2	18	19	43	6	—
W9	3	J5-C	20	K5-T3	18	19	43	6	—
W9	4	J5-D	20	TB2-2	17	19	—	6	24
W10	1	J6-A	24	K1-T1	—	23	60	10	—
W10	2	J6-B	24	K1-T2	—	23	60	10	—
W10	3	J6-C	24	K1-T3	—	23	60	10	—
W10	4	J6-D	24	E1	22	23	—	10	50

FO-10. Wiring Diagram, Cables  
W6 thru W10



**WIRE TABLE ELECTRICAL LEADS W11 –  
W38, W59, AND W60**

LEAD REF DES	TERMINATION		DIMENSION IN INCHES A
	FROM	TO	
W11	TB1-1	CB1-L1	47.00
W12	TB1-2	CB1-L2	47.00
W13	TB1-3	CB1-L3	47.00
W14	CB1-L1	CB2-L1	9.00
W15	CB1-L2	CB1-L2	9.00
W16	CB1-L3	CB2-L3	9.00
W17	CB2-L1	CB3-L1	9.00
W18	CB2-L2	CB3-L2	9.00
W19	CB2-L3	CB3-L3	9.00
W20	CB3-L1	CB4-L1	9.00
W21	CB3-L2	CB4-L2	9.00
W22	CB3-L3	CB4-L3	9.00
W23	CB4-L1	CB5-L1	9.00
W24	CB4-L2	CB5-L2	9.00
W25	CB4-L3	CB5-L3	9.00
W26	CB5-L1	CB6-L1	9.00
W27	CB5-L2	CB6-L2	9.00
W28	CB5-L3	CB6-L3	9.00
W29	CB6-L1	CB7-L	9.00
W30	CB6-L2	CB8-L	9.00
W31	CB6-L3	CB9-L	9.00
W32	CB1-T1	K1-L1	9.00
W33	CB1-T2	K1-L2	9.00
W34	CB1-T3	K1-L3	9.00
W35	CB2-T1	K2-L1	62.00
W36	CB2-T2	K2-L2	62.00
W37	CB2-T3	K2-L3	62.00
W38	E1	E3	10.00
W59	TB7-4	E1	00.00
W60	TB4-3	TB4-7	00.00

NOTES:

1. CONNECTIONS SHALL BE IN ACCORDANCE WITH MIL-STD-454.
2. EACH WIRE SHALL BE MARKED ON BOTH ENDS WITH TERMINATION IDENTIFICATION AS SHOWN IN TABULATION BLOCK.

EXAMPLE: TB-1 ←→ CB1-L1 (W11)

PERMANENCY LEGIBILITY AND TYPE OF MARKING SHALL BE IN ACCORDANCE WITH MIL-STD-130.

**F0-11. Wiring Diagram, Electrical  
Leads W11 thru W38, W59, and W60**

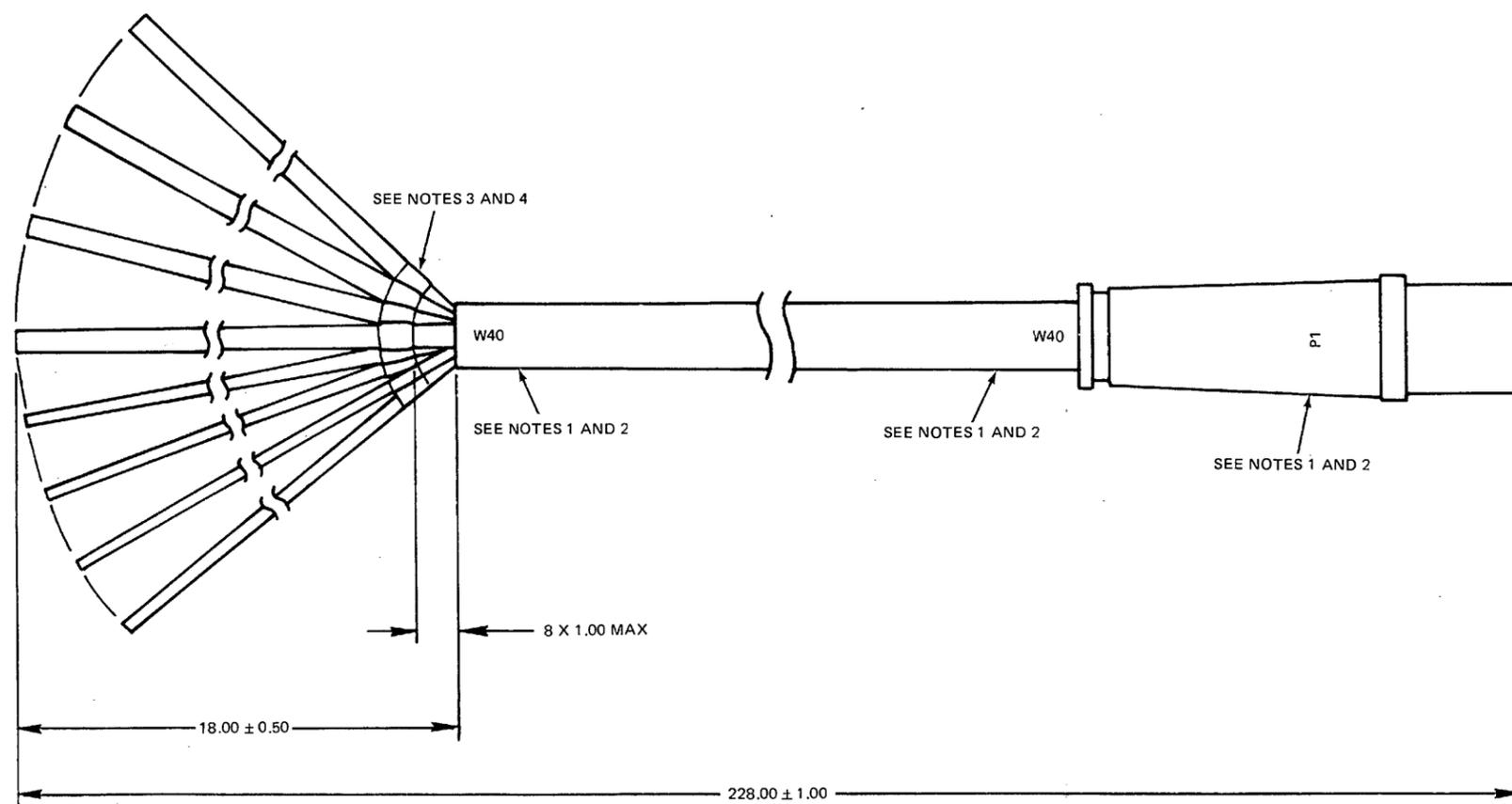
FP-27/(FP-28 blank)



NOTES:

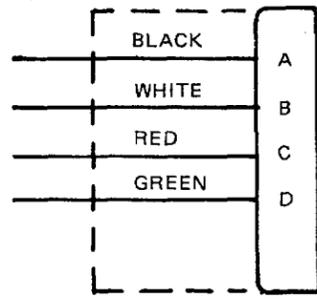
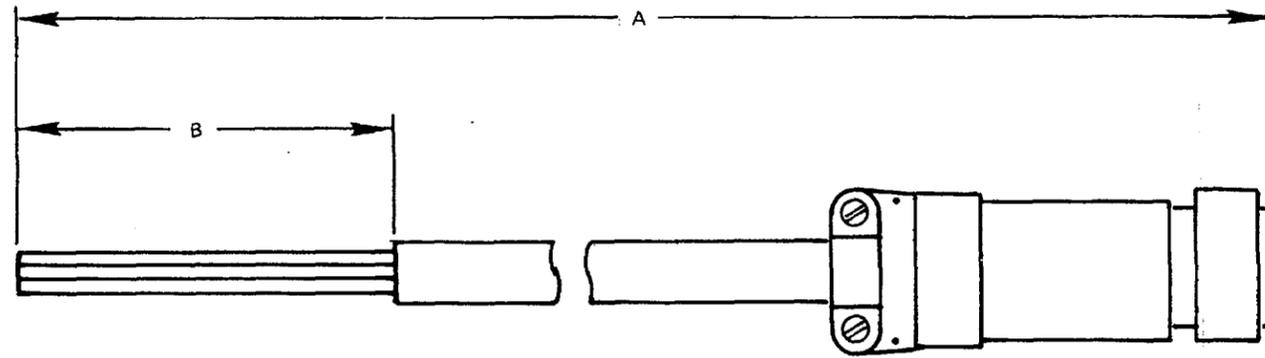
1. ELECTRICAL CONNECTIONS SHALL BE SOLDERED IN ACCORDANCE WITH DoD-STD-2000-4 USING SOLDER. SPECIFICATION QQ-S-571.
2. CABLE DESIGNATION (W40) SHALL BE PROVIDED AS INDICATED.
3. PERMANENCY LEGIBILITY AND TYPE OF MARKING SHALL BE IN ACCORDANCE WITH MIL-STD-130.
4. INSULATION SLEEVING SHALL BE INSTALLED AND HEAT SHRUNK TO A FIRM FIT. MARKING SHALL BE ACCORDING TO THE FOLLOWING:

WIRE COLOR	MARKING	PIN DES
GREEN	L0	N
BLACK	L1	A
WHITE	L2	B
RED	L3	C
UNINSULATED WIRES (4)	L0	G1,G2,G3,G4

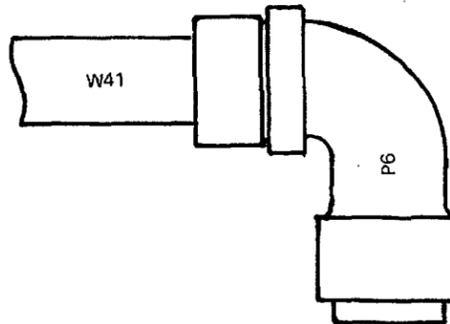


F0-13. Wiring Diagram, ROWPU Power Cable W40

FP-31/(FP-32 blank)



WIRING DIAGRAM



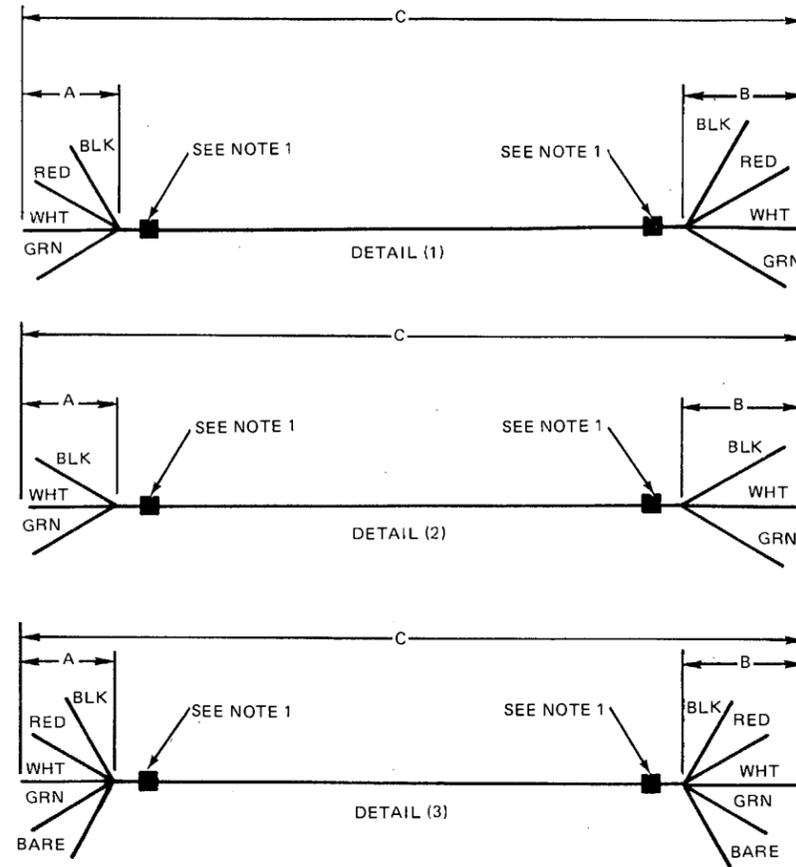
INDEX NUMBER		REFERENCE DESIGNATOR		DIMENSION	
CONNECTOR	CABLE	CONNECTOR	CABLE	A	B
10	13	P6	W41	86.00	12.00
11	14	P2	W42	424.00	4.00
8	12	P3	W43	1084.00	4.00
8	12	P4	W44	1084.00	4.00
8	12	P5	W45	724.00	4.00

NOTES:

1. CONNECTIONS SHALL BE IN ACCORDANCE WITH MIL-STD-454.
2. CONNECTOR AND CABLE SHALL BE MARKED AS INDICATED IN 0.19 HIGH CHARACTERS TWO PLACES  $180^\circ \pm 15^\circ$  APART. PERMANENCY LEGIBILITY AND TYPE OF LETTERING SHALL BE IN ACCORDANCE WITH MIL-STD-130.

F0-14. Wiring Diagram, Cables W41  
thru W45

FP-33/(FP-34 blank)



WIRE TABLE W46, W47, W48, W50, AND W51

CABLE REFERENCE DESIGNATOR	WIRE COLOR	TERMINALS				CABLE INDEX NO.	DIMENSIONS IN INCHES			DETAIL
		FROM	INDEX NO.	TO	INDEX NO.		A	B	C	
W46	BLK	TB4-4	5	S10-NO	5	2	4.0	4.0	24.0	(2)
	WHT	TB4-6	5	S9-C	5	2	4.0	4.0	24.0	
	GRN	TB4-7	5	S10-G	7	2	4.0	4.0	24.0	
W47	BLK	TB4-5	5	S9-NC	7	2	4.0	4.0	62.0	(2)
	WHT	TB4-6	5	S9-C	7	2	4.0	4.0	62.0	
	GRN	TB4-7	5	S9-G	8	2	4.0	4.0	62.0	
W48	BLK	TB5-3	5	XDS10-2	6	2	6.0	6.0	66.0	(2)
	WHT	TB5-2	5	XDS10-1	6	2	6.0	6.0	66.0	
	GRN	E2	5	XDS10-G	6	2	6.0	6.0	66.0	
-	BLK	-	5	-	7	4	20.0	8.0	76.0	(3)
	WHT	-	5	-	7	4	20.0	8.0	76.0	
	RED	-	5	-	7	4	20.0	8.0	76.0	
	GRN	-	5	-	5	4	20.0	8.0	76.0	
	BARE	-	5	-	7	4	20.0	8.0	76.0	
W50	BLK	K7-T1	8	B7-AC	-	2	56.0	8.0	209.0	(2)
	WHT	K7-T4	5	B7-N	-	2	56.0	8.0	209.0	
	GRN	TB2-6	5	B7-G	-	2	48.0	8.0	199.0	
W51	BLK	K6-T1	8	B6-T1	-	3	44.0	8.0	177.0	(1)
	WHT	K6-T2	8	B6-T2	-	3	44.0	8.0	177.0	
	RED	K6-T3	8	B6-T3	-	3	44.0	8.0	177.0	
	GRN	TB2-5	5	B6-G	-	3	37.0	8.0	170.0	

NOTES:

1. CABLE ELECTRICAL DESIGNATION (AS APPLICABLE) SHALL BE PROVIDED AS INDICATED.
2. EACH WIRE SHALL BE MARKED ON BOTH ENDS WITH TERMINATION IDENTIFICATION AS SHOWN IN TABULATION BLOCK.

EXAMPLE: TB4-3 ↔ S10-NO

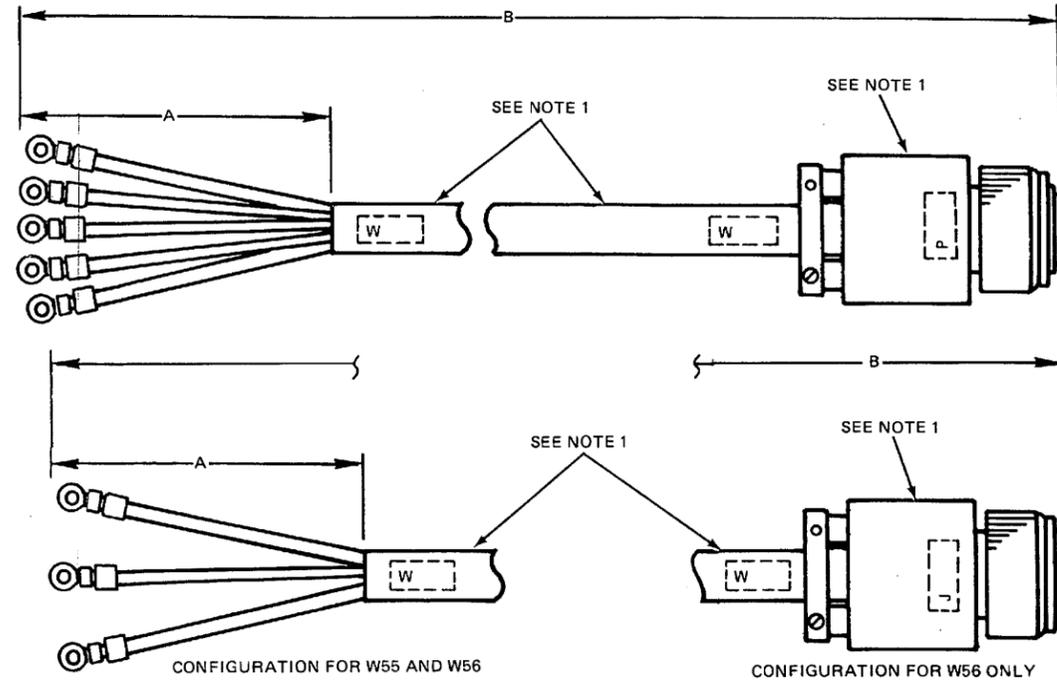
PERMANENCY, LEGIBILITY AND TYPE OF MARKING SHALL BE IN ACCORDANCE WITH MIL-STD-130.

F0-15. Wiring Diagram, Cables W46 thru W48, W50, and W51

FP-35/(FP-36 blank)

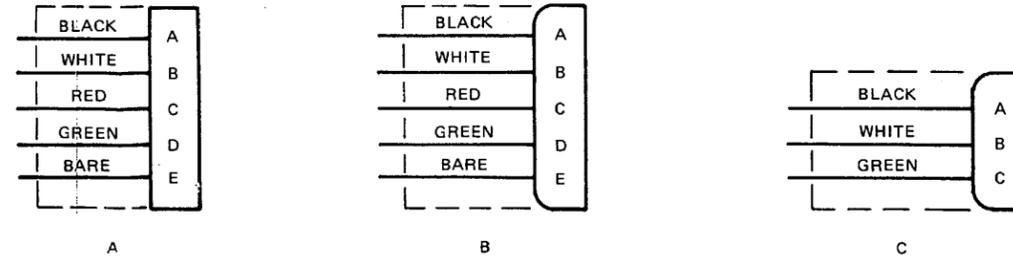
WIRE TABLE W49 AND W53 TO W56

CABLE REF DES	WIRE COLOR	FROM TERM NO	TO TERM NO	DIMENSION IN INCHES		WIRING DIAGRAM
				A	B	
W49	BLACK	TB5-5	P10A-A	18.00	70.00	A
W49	WHITE	TB5-2	P10A-B	18.00	70.00	A
W49	RED	TB5-4	P10A-C	18.00	70.00	A
W49	GREEN	TB5-6	P10A-D	18.00	70.00	A
W49	BARE	E2	P10A-E	18.00	70.00	A
W53	BLACK	A1-TB-1	P10B-A	8.00	18.00	A
W53	WHITE	A1-TB-2	P10B-B	8.00	18.00	A
W53	RED	A1-TB-5	P10B-C	8.00	18.00	A
W53	GREEN	A1-TB-4	P10B-D	8.00	18.00	A
W53	BARE	A1-TB-3	P10B-E	8.00	18.00	A
W54	BLACK	M-TB2-1	P11-A	1.00	36.00	B
W54	WHITE	M-TB2-2	P11-B	1.00	36.00	B
W54	RED	M-TB2-3	P11-C	1.00	36.00	B
W54	GREEN	M-TB2-4	P11-D	1.00	36.00	B
W54	BARE	M-TB2-5	P11-E	1.00	36.00	B
W55	BLACK	M-TB1-1	P12-A	3.00	34.00	C
W55	WHITE	M-TB1-2	P12-B	3.00	34.00	C
W55	GREEN	M-TB1-3	P12-C	3.00	34.00	C
W56	BLACK	TB4-1	J12-A	4.00	48.00	
W56	WHITE	TB4-2	J12-B	4.00	48.00	
W56	GREEN	TB4-3	J12-C	4.00	48.00	



NOTES:

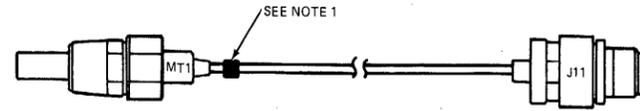
1. CONNECTIONS SHALL BE IN ACCORDANCE WITH MIL-STD-454.
2. CABLE DESIGNATION SHALL BE PROVIDED AS INDICATED. PERMANENCY LEGIBILITY AND TYPE OF MARKING SHALL BE IN ACCORDANCE WITH MIL-STD-130.
3. FOR W53 AND W54 — STRIP TO 3/8 INCH LENGTH.



WIRING DIAGRAMS

F0-16. Wiring Diagram, Cables W49 and W53 thru W56

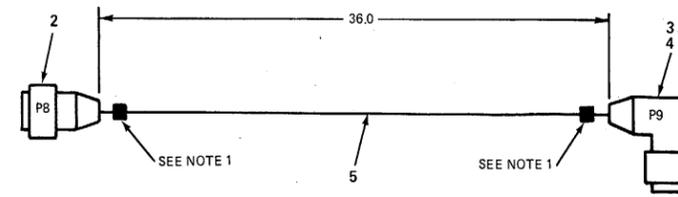
FP-37/(FP-38 blank)



WIRE TABLE W57

WIRE COLOR	TERM FROM	TERM TO
BLACK	MT1	J11-A
WHITE	MT1	J11-B
RED	MT1	J11-C
GREEN	MT1	J11-D
CLEAR	MT1	J11-E

- NOTES:
1. CABLE DESIGNATION (W52) AND (W57) SHALL BE PROVIDED AS INDICATED. PERMANENCY, LEGIBILITY, AND TYPE OF MARKING SHALL BE IN ACCORDANCE WITH MIL-STD-130.
  2. CONNECTIONS SHALL BE IN ACCORDANCE WITH MIL-STD-130.

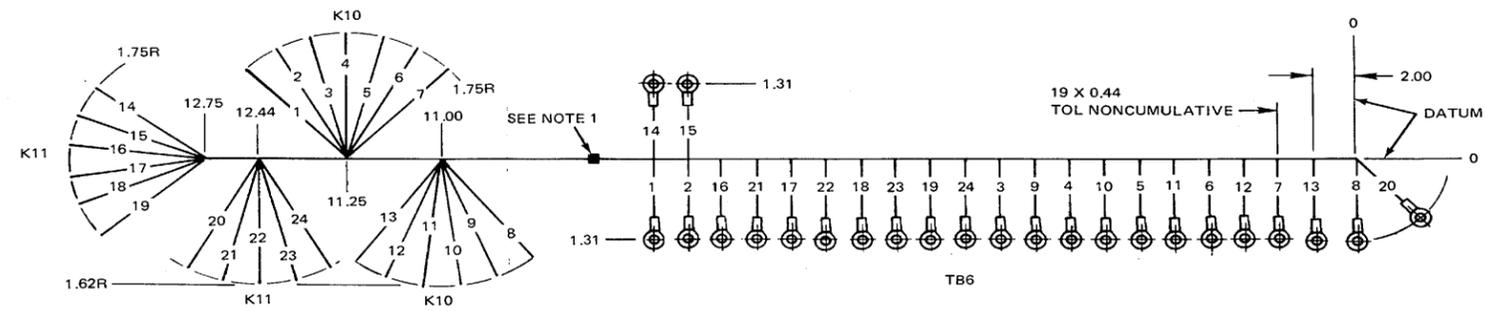


WIRE TABLE W52

WIRE NO.	TERM FROM	TERM TO	WIRE SIZE
1	P8-P	P9-P	12
2	P8-R	P9-R	14
3	P8-A	P9-A	18
4	P8-B	P9-B	18
5	P8-C	P9-C	18
6	P8-D	P9-D	18
7	P8-E	P9-E	18
8	P8-F	P9-F	18
9	P8-G	P9-G	18
10	P8-H	P9-H	18
11	P8-I	P9-I	18
12	P8-J	P9-J	18
13	P8-K	P9-K	18
14	P8-L	P9-L	18
15	P8-M	P9-M	18
16	P8-N	P9-N	18
17	P8-W	P9-W	18
18	P8-X	P9-X	18
19	P8-Y	P9-Y	18
20	P8-Z	P9-Z	18
21	P8-a	P9-a	18
22	P8-S	P9-S	14
23	P8-b	P9-b	18
24	P8-c	P9-c	18
25	P8-d	P9-d	18
26	P8-e	P9-e	18
27	P8-T	P9-T	12
28	P8-V	P9-V	14
29	P8-f	P9-f	18
30	P8-g	P9-g	18

FO-17. Wiring Diagram, Cables W52 and W57

FP-39/(FP-40 blank)



WIRE TABLE W58

WIRE NO REF	FROM TERM NO	TERM INDEX NO	TO TERM NO	TERM INDEX NO	WIRE INDEX NO
1	K10-A1		TB6-20	2	3
2	K10-X2		TB6-19	2	3
3	K10-A2		TB6-10	2	3
4	K10-B2		TB6-8	2	3
5	K10-C2		TB6-6	2	3
6	K10-D2		TB6-4	2	3
7	K10-E2		TB6-2	2	3
8	K10-X1		TB6-1	2	3
9	K10-A3		TB6-9	2	3
10	K10-B3		TB6-7	2	3
11	K10-C3		TB6-5	2	3
12	K10-D3		TB6-3	2	3
13	K10-E3		TB6-1	2	3
14	K11-A1		TB6-20	2	3
15	K11-X2		TB6-19	2	3
16	K11-A2		TB6-18	2	3
17	K11-B2		TB6-16	2	3
18	K11-C2		TB6-14	2	3
19	K11-D2		TB6-12	2	3
20	K11-X1		TB6-1	2	3
21	K11-A3		TB6-17	2	3
22	K11-B3		TB6-15	2	3
23	K11-C3		TB6-13	2	3
24	K11-D3		TB6-11	2	3

NOTES:

- HARNES DESIGNATION (W58) SHALL BE PROVIDED AS INDICATED.
- EACH WIRE SHALL BE MARKED ON BOTH ENDS WITH TERMINATION IDENTIFICATION AS SHOWN IN TABULATION BLOCK.

EXAMPLE: K11-A1 ↔ TB6-20

PERMANENCY, LEGIBILITY AND TYPE OF MARKING SHALL BE IN ACCORDANCE WITH MIL-STD-130.

FO-18. Wiring Diagram, Wiring  
Harness W58

FP-41/(FP-42 blank)

By Order of the Secretaries of the Army, and Navy (Including the Marine Corps):

Official:



MILTON H. HAMILTON

*Administrative Assistant to the  
Secretary of the Army*

03486

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

DAVID E. BOTTORFF  
*Rear Admiral, CEC, US Navy  
Commander  
Navy Facilities Engineering Command*

**H. E. REESE**  
*Deputy for Support  
Marine Corps Research, Development and  
Acquisition Command*

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To be distributed in accordance with DA Form 12-25-E, block no. 2016,  
requirements for TM 10-4610-239-24.

**These are the instructions for sending an electronic 2028**

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however, only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17 and 27.

**From:** "Whomever" [whomever@avma27.army.mil](mailto:whomever@avma27.army.mil)  
**To:** [tacom-tech-pubs@tacom.army.mil](mailto:tacom-tech-pubs@tacom.army.mil)

**Subject DA Form 2028**

1. **From:** Joe Smith
2. **Unit:** home
3. **Address:** 4300 Park
4. **City:** Hometown
5. **St:** MO
6. **Zip:** 77777
7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-1915-200-10
9. **Pub Title:** TM
10. **Publication Date:** 11-APR-88
11. **Change Number:** 12
12. **Submitter Rank:** MSG
13. **Submitter Fname:** Joe
14. **Submitter Mname:** T
15. **Submitter Lname:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem:** 1
18. **Page:** 2
19. **Paragraph:** 3
20. **Line:** 4
21. **NSN:** 5
22. **Reference:** 6
23. **Figure:** 7
24. **Table:** 8
25. **Item:** 9
26. **Total:** 123
27. **Text:**

This is the text for the problem below line 27.



<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b> For use of this form, see AR 25-30; the proponent agency is ODISC4.						Use Part II ( <i>reverse</i> ) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: ( <i>Forward to proponent of publication or form</i> ) ( <i>Include ZIP Code</i> ) AMSTA-LC-LPIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630						FROM: ( <i>Activity and location</i> ) ( <i>Include ZIP Code</i> )	
PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS							
PUBLICATION/FORM NUMBER TM 10-4610-239-24						DATE 20 April 1992	TITLE WATER PURIFICATION UNIT, REVERSE OSMOSIS, 600 GPH
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON <i>(Provide exact wording of recommended changes, if possible).</i>	
<i>*Reference to line numbers within the paragraph or subparagraph.</i>							
TYPED NAME, GRADE OR TITLE				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE	

TO: <i>(Forward direct to addressee listed in publication)</i> AMSTA-LC-LPIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	FROM: <i>(Activity and location) (Include ZIP Code)</i>	DATE
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**PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

PUBLICATION NUMBER TM 10-4610-239-24	DATE 20 April 1992	TITLE WATER PURIFICATION UNIT, REVERSE OSMOSIS, 600 GPH
-----------------------------------------	-----------------------	------------------------------------------------------------

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

**PART III – REMARKS** *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
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<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b>						Use Part II ( <i>reverse</i> ) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
For use of this form, see AR 25-30; the proponent agency is ODISC4.							
TO: ( <i>Forward to proponent of publication or form</i> ) ( <i>Include ZIP Code</i> ) AMSTA-LC-LPIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630						FROM: ( <i>Activity and location</i> ) ( <i>Include ZIP Code</i> )	
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PUBLICATION/FORM NUMBER TM 10-4610-239-24						DATE 20 April 1992	TITLE WATER PURIFICATION UNIT, REVERSE OSMOSIS, 600 GPH
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON ( <i>Provide exact wording of recommended changes, if possible.</i> )	
<i>*Reference to line numbers within the paragraph or subparagraph.</i>							
TYPED NAME, GRADE OR TITLE				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE	

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**PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

PUBLICATION NUMBER TM 10-4610-239-24	DATE 20 April 1992	TITLE WATER PURIFICATION UNIT, REVERSE OSMOSIS, 600 GPH
-----------------------------------------	-----------------------	---------------------------------------------------------------

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

**PART III - REMARKS** *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
----------------------------	--------------------------------------------	-----------

<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b> For use of this form, see AR 25-30; the proponent agency is ODISC4.						Use Part II ( <i>reverse</i> ) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: ( <i>Forward to proponent of publication or form</i> ) ( <i>Include ZIP Code</i> ) AMSTA-LC-LPIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630						FROM: ( <i>Activity and location</i> ) ( <i>Include ZIP Code</i> )	
<b>PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>							
PUBLICATION/FORM NUMBER TM 10-4610-239-24						DATE 20 April 1992	TITLE WATER PURIFICATION UNIT, REVERSE OSMOSIS, 600 GPH
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON ( <i>Provide exact wording of recommended changes, if possible.</i> )	
<i>*Reference to line numbers within the paragraph or subparagraph.</i>							
TYPED NAME, GRADE OR TITLE				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE	

TO: <i>(Forward direct to addressee listed in publication)</i> AMSTA-LC-LPIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	FROM: <i>(Activity and location) (Include ZIP Code)</i>	DATE
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**PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

PUBLICATION NUMBER TM 10-4610-239-24	DATE 20 April 1992	TITLE WATER PURIFICATION UNIT, REVERSE OSMOSIS, 600 GPH
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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

**PART III - REMARKS** *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
----------------------------	--------------------------------------------	-----------

## The Metric System and Equivalents

### *Linear Measure*

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

### *Weights*

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = .035 ounce  
 1 dekagram = 10 grams = .35 ounce  
 1 hectogram = 10 dekagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

### *Liquid Measure*

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

### *Square Measure*

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch  
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet  
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

### *Cubic Measure*

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches  
 1 cu. meter = 1000 cu. decimeters = 35.31 feet

## Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	metric tons	short tons	1.102
pound-feet	newton-meters	1.356	kilograms	pounds	2.205
pound-inches	newton-meters	.11296			

## Temperature (Exact)

°F Fahrenheit temperature

5/9 (after subtracting 32)

°C Celsius temperature

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