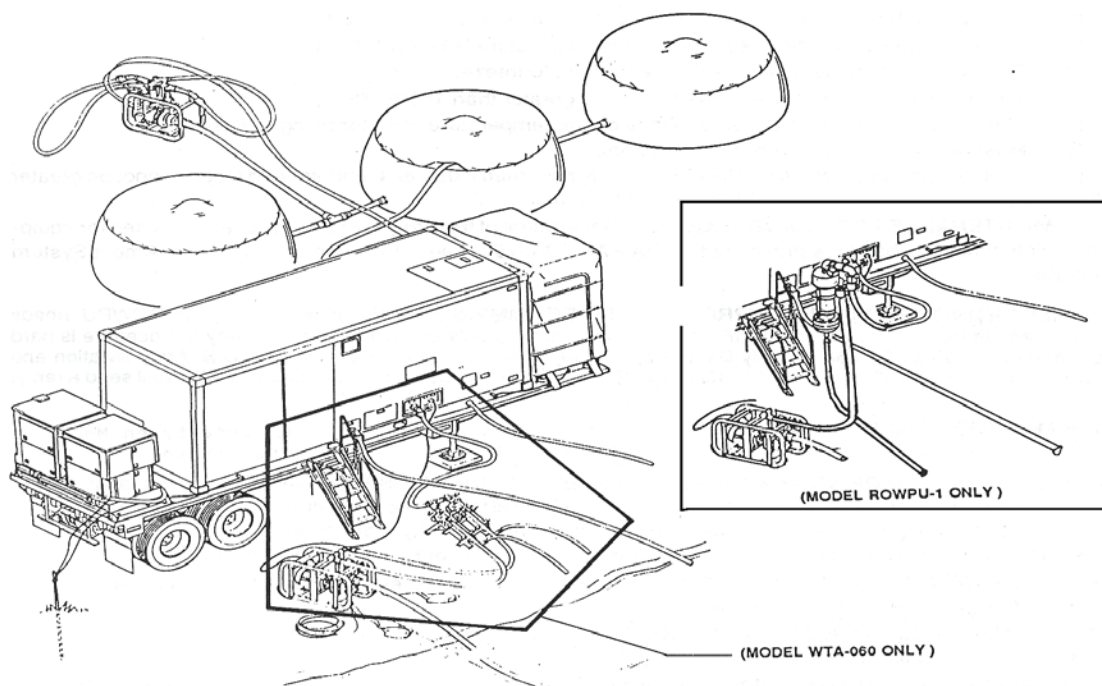


TECHNICAL MANUAL

**WATER PURIFICATION UNIT,
REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO,
22-1/2 TON 8 WHEEL TANDEM
MODEL NO. WTA-060
NSN 4610-01-219-8707
MODEL NO. ROWPU-1
NSN 4610-01-371-1790**



SUPERSEDURE NOTICE: This manual supersedes TM 10-4610-232-34, dated 17 July 1991 including all changes.
DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF ARMY
January 2007

WARNING SUMMARY

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in serious injury or death to personnel.

WARNINGS

Before working on any electrical device, open the main control panel circuit breaker and stop the diesel generator. When working on the distribution pump or raw water pump motors, disconnect the cable at both ends as well. The voltages used in the ROWPU can cause a fatal shock if these precautions are not taken.

Proper hearing protection must be worn within 30 ft. (9 m) of the ROWPU when the ROWPU is operating. Sound pressure levels produced by ROWPU operation could cause permanent hearing damage if hearing protection is not used.

Water standing on the floor is hazardous and may cause injury to personnel.

Make sure electrical power is disconnected before working on unit. Failure to do so could result in serious injury or death from electrical shock or moving parts.

Always disconnect electrical cables at the ROWPU first, then from the motor.

Shut down the generator BEFORE disconnecting the generator cable from the main power cable.

Do not operate ROWPU without ground rod properly set and ground cable connected. Failure to do so may result in severe injury or fatal electrical shock.

Do not wear loose clothing or jewelry while working on equipment.

Cleaning solvent used to clean parts can be dangerous. Wear rubber gloves to protect your hands. Solvent can be absorbed through skin. Wash with soap and water if you get solvent on your skin. Use a lanolin-based skin cream after washing. Do not use near an open flame or heat source. Do not work in a closed area. Be sure your work area gets plenty of fresh air.

Disconnect power cable before removing cyclone separators. The pump motor could start accidentally and cause serious injury.

Shut down electrical power to the ROWPU before attempting to replace drive belts. Failure to do so could result in serious injury.

The air manual blowdown valve must be bled (opened) before removing the filter top plug. Failure to do so will result in the cap being blown off which could cause serious injury.

Relieve air compressor circuit pressure before attempting to do any work on air system. Close the air tank outlet valve and then open the air manifold vent valve to relieve all pressure. Failure to do so could result in serious injury.

Protect eyes and skin from direct contact with chemicals. Be especially careful when opening containers to avoid inhaling chemical powders. Wash hands thoroughly with soap and water after handling chemicals.

WARNING SUMMARY - Continued

Do not remove belt guard while high-pressure pump is running. Do not run pump with belt guard removal.

Make certain air compressor switch is turned OFF and right drain valve has been opened to relieve pressure before working on compressor. Serious injury could result if this is not done.

The air compressor rear connecting rod has an oil thrower pin on the bottom. This pin has a sharp point that can pierce or cut the skin. Cover sharp edges with rag or cloth before working inside of crankcase or handling crankshaft. Be very careful when working with hands inside of the crankcase or when handling crankshaft.

Do not use more than 30 psig (207 kPa) compressed air for parts cleaning. Keep other workers at a safe distance when cleaning parts with compressed air in order to avoid injury.

Always wear eye protection while testing pressure regulators.

Never stand directly in front or in back of a regulator when opening the cylinder valve or manifold. Always stand so that the cylinder valve or manifold is between you and the regulator.

Relieve pump circuit pressure before attempting to do any work on pump. Failure to do so could result in serious injury to personnel.

Use proper lifting equipment to support weight or high-pressure pump during removal and installation.

Make certain ROWPU unit is shut down before working on media filter assembly. Failure to do so could result in serious injury.

Disconnect high-pressure pump motor from electrical power before attempting to do any work on small sheave. Failure to do so could result in serious injury.

Disconnect high-pressure pump motor from electrical power before attempting to do any work on large sheave. Failure to do so could result in serious injury to personnel.

Any welding done on the container may cause a reaction with the insulation inside the walls, roof, floor, access panels and doors. This reaction results in a poisonous gas. The container skin should be removed to be repaired. Internal structural member repair involves removing the SURROUNDING INSULATION before welding to avoid injury or death to personnel.

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

FOR ARTIFICIAL RESPIRATION, REFER TO FM 4-25.11, First Aid.

LIST OF EFFECTIVE PAGES/WORK PACKAGES

Date of issue for the original manual is:

Original 29 January 2007

**TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 18 AND TOTAL
NUMBER OF WORK PACKAGES IS 104, CONSISTING OF THE FOLLOWING:**

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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON DC, 29 January 2007

TECHNICAL MANUAL
DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
FOR
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO,
22-1/2 TON 8 WHEEL TANDEM
MODEL NO. WTA-060 (NSN 4610-01-219-8707)
AND
MODEL NO. ROWPU-1 (NSN 4610-01-371-1790)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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

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HOW TO USE THIS MANUAL

This manual was designed to provide you with the information you will need to maintain the Reverse Osmosis Water Purification Unit (ROWPU).

The information contained in this manual is presented in chapters and work packages. There are 5 chapters consisting of 100 work packages to provide the disassembly, repair and assembly of the ROWPU and its components. When references are made to tables, figures and work packages, refer to those portions of the text.

To find information relating to a specific component or system:

Determine the specific name or function of the components/system.

Find the name or function in the Index, located at the back of this manual.

Refer to appropriate work package(s) called out in the Index.

To find information pertaining to a broader range of information (such as troubleshooting, component repair, and component descriptions):

Identify the desired topic.

Find the general topic in the Table of Contents, located in the front of this manual.

Refer to appropriate work package(s) called out in the Table of Contents.

MAINTENANCE

Maintenance procedures are to be performed in the sequence shown in the text and illustrations. Step 1 must be performed before step 2 and so on. Equipment illustrations use callout numbers to identify parts of the system/components.

Throughout this manual the words WARNING, CAUTION and NOTE appear. There is a different reason and definition for each.

WARNING

A Warning is used to alert the user to hazardous operating and maintenance procedures, practices, conditions, statements, etc. that may result in injury to or DEATH of personnel if not strictly observed.

CAUTION

A Caution is used to alert the user to hazardous operating and maintenance procedures, practices, conditions, statements, etc. that may result in damage to or destruction of equipment or affect mission effectiveness if not observed.

NOTE

A Note is used to inform the user of essential information which is of special interest or importance, or will aid the user in performing a job.

INDEXING

This manual contains several types of indexes to help the user locate information quickly and efficiently. The different indexes are as follows:

- a. Table of Contents. Lists all chapters and work packages contained in the manual, along with the work package numbers where they begin.
- b. Alphabetical Index. Located at the back of the manual, this index lists entries that personnel are most likely to look for. Most listings are provided several times in the index (e.g., "Maintenance Forms, Records and Reports" can also be found as "Forms, Records and Reports, Maintenance," and "Records and Reports, Maintenance Forms,"). This increases the likelihood of finding the information on first entry. Each entry also lists the work package and page number where the information can be found.

CHAPTER 1
GENERAL INFORMATION, EQUIPMENT DESCRIPTION,
AND THEORY OF OPERATION

**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22 1/2 TON 8-WHEEL TANDEM
GENERAL INFORMATION**

SCOPE

Type of Manual: Direct Support and General Support Maintenance.

Model Number and Equipment Name: 3,000 GPH trailer mounted, flatbed cargo, 22-1/2 ton 8-wheel tandem Reverse Osmosis Water Purification Unit (ROWPU). This manual covers two models: WTA-060 and ROWPU-1. When any portion of this manual refers to only one of these models, the statement "(MODEL WTA-060 ONLY)" or "(MODEL ROWPU-1 ONLY)" will be placed immediately after the applicable sentence. If no reference is made to only one model, then that portion of the manual applies to both models.

Purpose of Equipment: Purifies water from many different sources in order to make potable (drinkable) water. Can purify:

- a) dirty fresh water
- b) brackish water (dirty and slightly salty)
- c) sea water (very salty)
- d) fresh water containing nuclear, biological, or chemical (NBC) agents.

Special Limitations on Equipment:

- a) operates in temperatures between -25°F and 110°F (-32°C and 43°C).
- b) winterization kit must be used if operating temperature is below 32°F (0°C).
- c) RO elements may be ruined if they are allowed to freeze.
- d) temperatures of the source water cannot be greater than 110°F (43°C).
- e) the amount of water produced depends on the temperature of water being purified.
- f) ROWPU must be hauled by M818 or M932 tractors.
- g) ROWPU side-to-side slope cannot be more than 5 degrees. Greater slopes could cause unit to tip.

MAINTENANCE FORMS, RECORDS AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by (as applicable) DA PAM 738-750, Functional Users Manual for the Army Maintenance Management System (TAMMS); or AR 700-138, Army Logistics Readiness and Sustainability.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your ROWPU needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to the address specified in DA PAM 738-750, Functional Users Manual for the Army Maintenance Management System (TAMMS), or as specified by the acquiring activity. We will send you a reply.

CORROSION PREVENTION AND CONTROL

Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

Corrosion specifically occurs with metals. It is an electrochemical process that causes the degradation of metals. It is commonly caused by exposure to moisture, acids, bases or salts. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue and/or cracking.

Plastics, composites, and rubbers can also degrade. Degradation is caused by thermal (heat), oxidation (oxygen), salivation (solvents) or photolytic (light, typically ultraviolet) processes. The most common exposures are excessive heat or light. Damage from these processes will appear as cracking, softening, swelling and/or breaking.

The form should be submitted to the address specified in DA PAM 738-750, Functional Users Manual for The Army Maintenance Management System (TAMMS).

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Command decisions, according to tactical decision, will decide when destruction of the ROWPU will take place. A destruction plan will be prepared by the using organization, unless one has been prepared by higher authority. For general destruction procedures for this equipment, refer to TM 750-244-3, Procedures for Destruction of Equipment to Prevent Enemy Use.

PREPARATION FOR STORAGE OR SHIPMENT

Basic requirements for administrative storage are covered in TM 740-90-1, Administrative Storage of Equipment. If materiel is inactivated for a limited time (not to exceed 90 days), it will be processed in accordance with TM 740-90-1.

The preferred storage site for a vehicle is a dry, covered area. When it is necessary to store materiel outdoors in order to protect it from the elements, storage shall be prescribed in SB 740-98-1 and TM 743-200-1, Storage and Materials Handling.

WARRANTY INFORMATION

The ROWPU is covered by warranty. For details of the warranty, refer to TB 10-4610-232-24.

LIST OF ABBREVIATIONS

AEPS	Army Electronic Product Support
C	Celsius
CPC	Corrosion Prevention and Control
CW	chemical warfare
EIR	Equipment Improvement Report
F	Fahrenheit
ft	Foot
gph	gallons per hour
gpm	gallons per minute
ISO	International Standards Organization
kg	kilogram
kPa	kilo Pascal
kW	kilowatts
l	Liter
m	Meter
MAC	Maintenance Allocation Chart
mfd	microfarad
ml	milliliters
MTOE	Modified Table of Organization and Equipment
NBC	nuclear, biological, and chemical
NSN	national stock number
NTU	nephelometric turbidity unit
pCi	picocuries
ppm	Parts per million
psig	pounds per square inch gauge
ROWPU	Reverse Osmosis Water Purification Unit

LIST OF ABBREVIATIONS (cont.)

RPSTL	Repair Parts and Special Tools List
SB	service bulletin
TACOM	Tank-automotive and Armaments Command
TAMMS	The Army Maintenance Management System
TB	technical bulletin
TDS	total dissolved solids
TM	technical manual
TMDE	Test, Measurement, and Diagnostic Equipment
VAC	volts alternating current
VDC	volts direct current
WP	work package

QUALITY OF MATERIAL

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

SAFETY, CARE, AND HANDLING

Always keep in mind the general CAUTIONS and WARNINGS, listed on the Warning pages at the front of this manual, given within procedures throughout this manual and on data plates and decals on the ROWPU itself.

SUPPORTING INFORMATION FOR REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

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

Special Tools: Special tools and support equipment required for the ROWPU are listed and illustrated in TM 10-4610-232-24P and in the Maintenance Allocation Chart (MAC), WP 0142 of TM 10-4610-232-12.

Repair Parts: Repair parts for the ROWPU are listed and illustrated in TM 10-4610-232-24P.

Test, Measurement, and Diagnostic Equipment (TMDE) and Support Equipment: For authorized TMDE, refer to the MTOE applicable to your unit.

**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22 1/2 TON 8-WHEEL TANDEM
EQUIPMENT DESCRIPTION AND DATA**

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

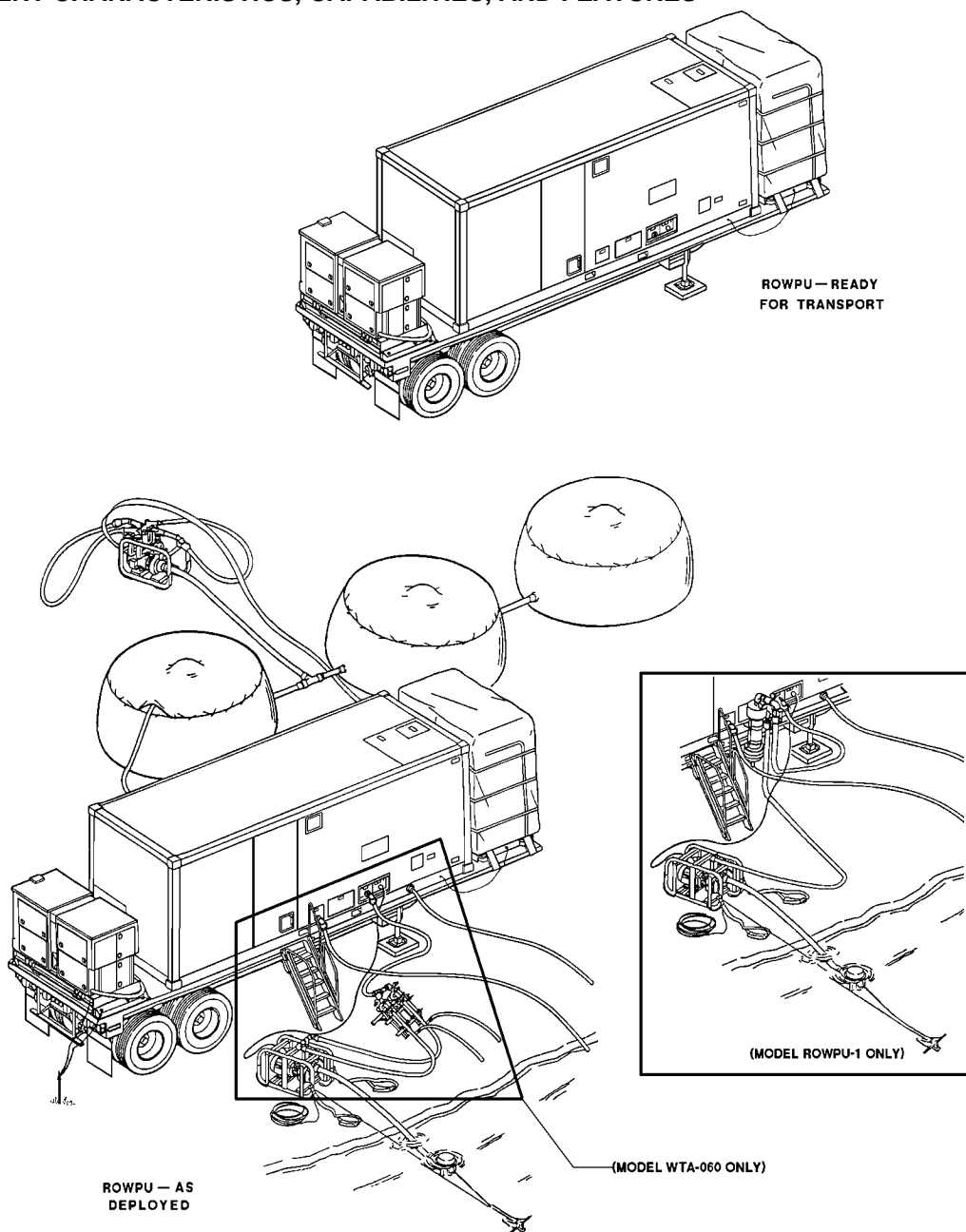


Figure 1. 3,000 GPH ROWPU

Characteristics:

- 1) Contained in a special 8 x 8 x 20 ft (2.4 x 2.4 x 6.1 m) International Standards Organization (ISO) container with skid-mounted external components.
- 2) ROWPU can be shipped by military aircraft.
- 3) ROWPU is mounted on standard 30-ft (9.5-m) M871 military trailer for simplified relocation.
- 4) ROWPU is powered by a 60 kilowatt (kW) utility diesel generator.

Capabilities and Features:

- 1) ROWPU can daily supply 60,000 gallons from fresh waters or brackish waters 75°F (24°C) and over. Less water is produced from colder water sources.
- 2) ROWPU can daily supply 40,000 gallons from sea water 75°F (24°C) and over.
- 3) ROWPU can daily supply 60,000 gallons of fresh water 75°F (24°C) and over from nuclear, biological, and chemical (NBC)-contaminated water.
- 4) ROWPU produces potable water to long-term consumption standards of purity.
- 5) ROWPU can handle raw water turbidity to 150 nephelometric turbidity unit (NTU).
- 6) On an NBC decontamination mission, raw water containing up to 10 parts per million (ppm) chemical warfare (CW) agent, or one million microorganism colonies per 100 ml, or 100,000 picocuries per liter (pCi/l) radioactivity can all be made potable.
- 7) Raw water can be taken from wells, lakes, seas, lagoons, rivers, or through an open ice hole. Raw water pump can lift water about 15 ft (4.5 m) and discharge up to 30 ft (9 m) at 110 gpm (416 lpm).
- 8) Winterization kit allows unit to be operated at a water point where air temperatures are between -25° and 32° F (-32° and 0°C) and water temperatures are above 32°F (0°C).
- 9) ROWPU is set up and operated by a three-person crew, one of whom is a noncommissioned officer (NCO). Operation is semiautomatic.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

The ROWPU is made up of three main systems, as shown in Figure 2. Main systems include 1) raw water intake system, 2) water purification system and 3) potable water distribution system. Major components of each system are described in the following paragraphs.

NOTE

The electrical power source for ROWPU operation is provided by a 60 kW utility diesel generator. See TM 5-6115-545-12 for generator information and operation. If equipped with a tactical quiet generator, reference TM 9-6115-645-10 for generator information and operation.

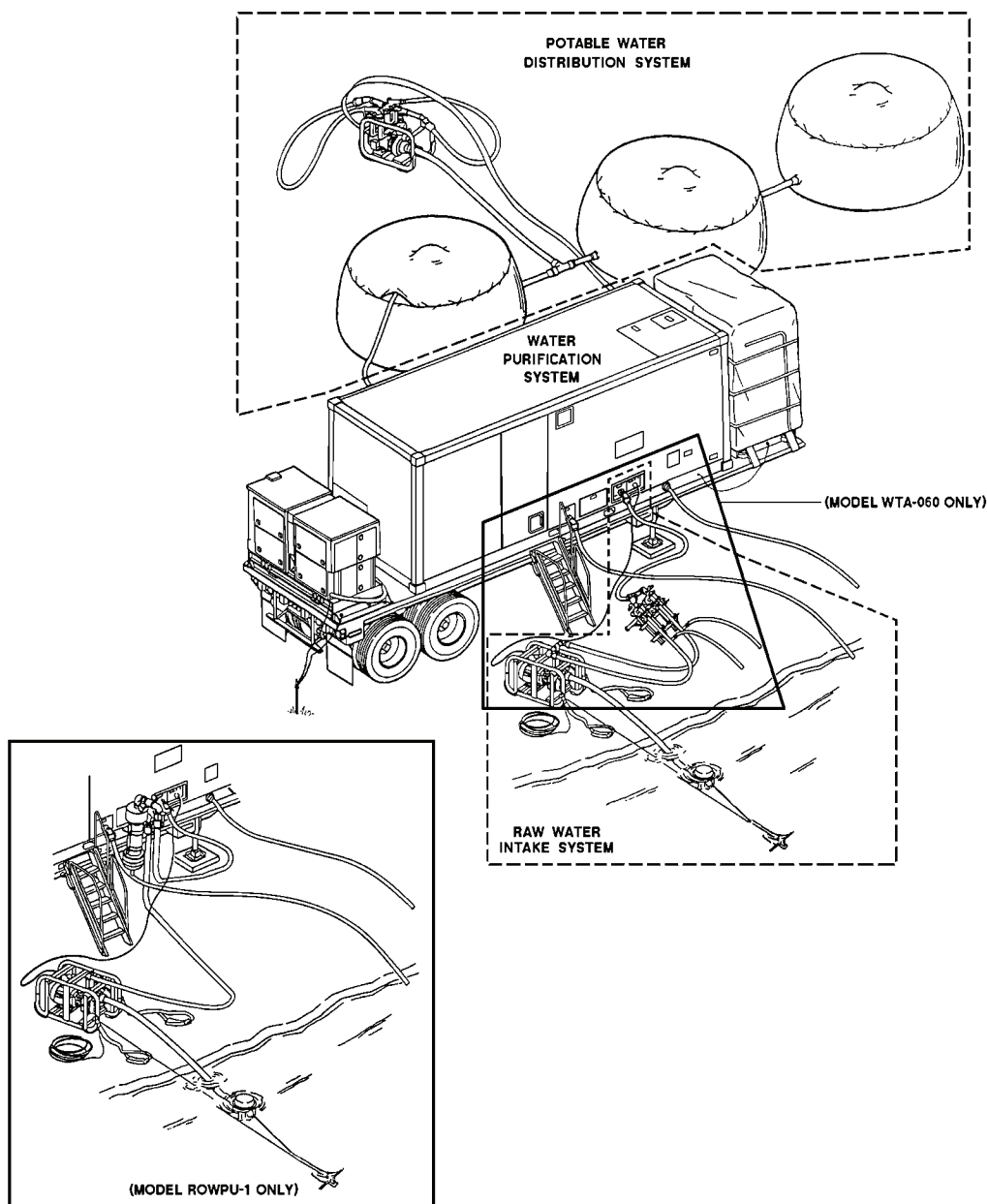


Figure 2. Major Systems of the ROWPU

Raw Water Intake System (Figure 3). Raw water intake system supplies feed water to ROWPU and consists of the following major components.

- 1) Intake strainer (1). A floating intake strainer holds raw water intake hose off bottom of water source and filters leaves, sticks, fish, and other large objects. It is connected by sections of rigid suction hose to raw water pump. Non-floating strainer (part of winterization kit) is used for ice hole operation.
- 2) Anchor (2). Used to deploy the intake strainer and hold it in place.
- 3) Raw water pump (3). Draws water through the intake strainer and discharges water to cyclone separators. A hand priming pump is used to assist initial prime to the water pump.

- 4) Cyclone separators (4). Remove sand and heavy dirt by centrifugal water flow action. Raw water discharge hose sections deliver water from separators to water purification system at feed water booster pump inlet.
- 5) Priming assist pump (5). This hand-operated pump is used to help draw water up to raw water pump. It is disconnected from raw water pump after priming is completed.

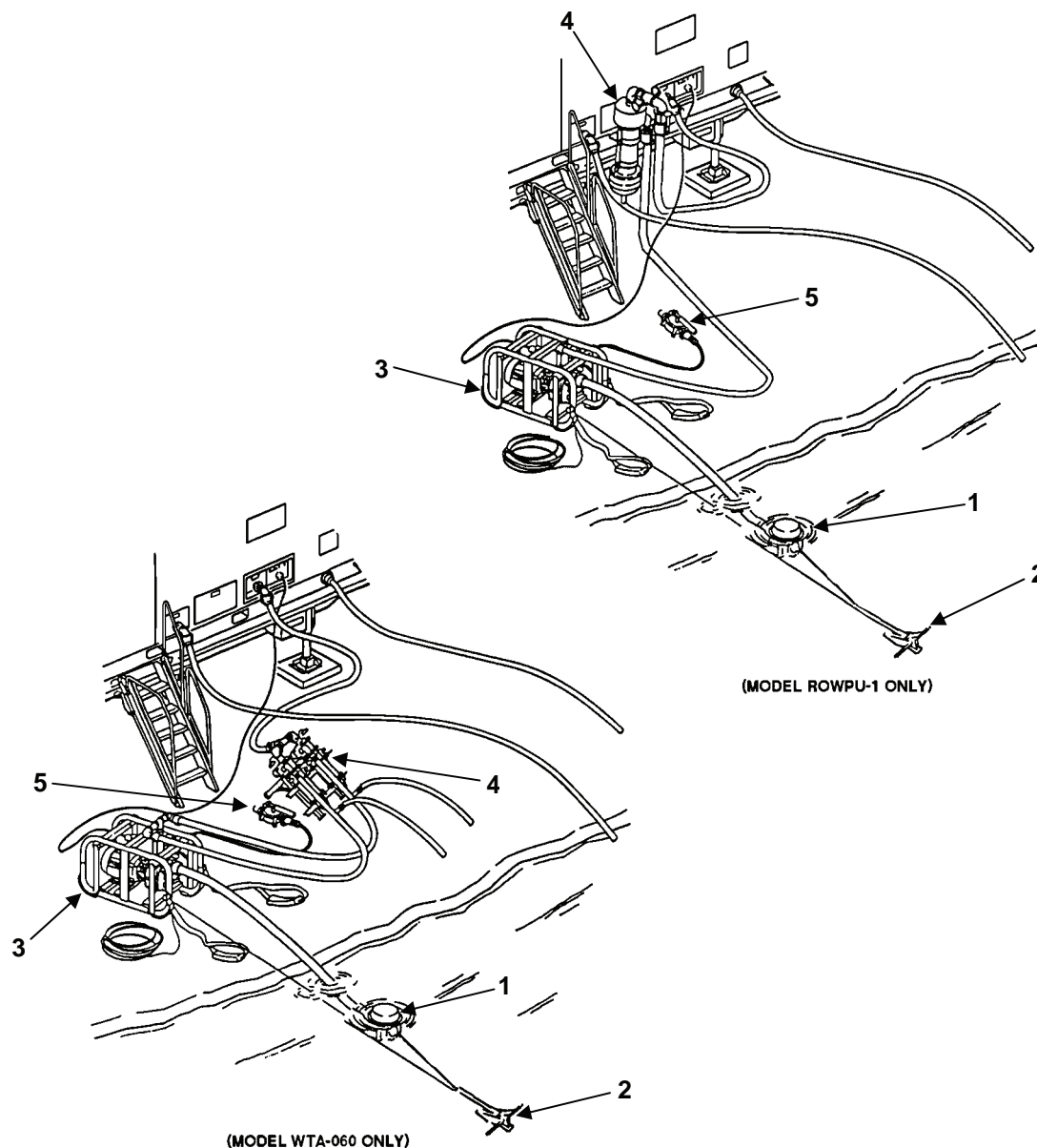


Figure 3. Raw Water Intake System

Water Purification System (Figure 4). This system purifies raw water to make potable water suitable for drinking.

- 1) Components of the water purification system are contained in ISO container (van) (1) and separate high pressure pump assembly (2).

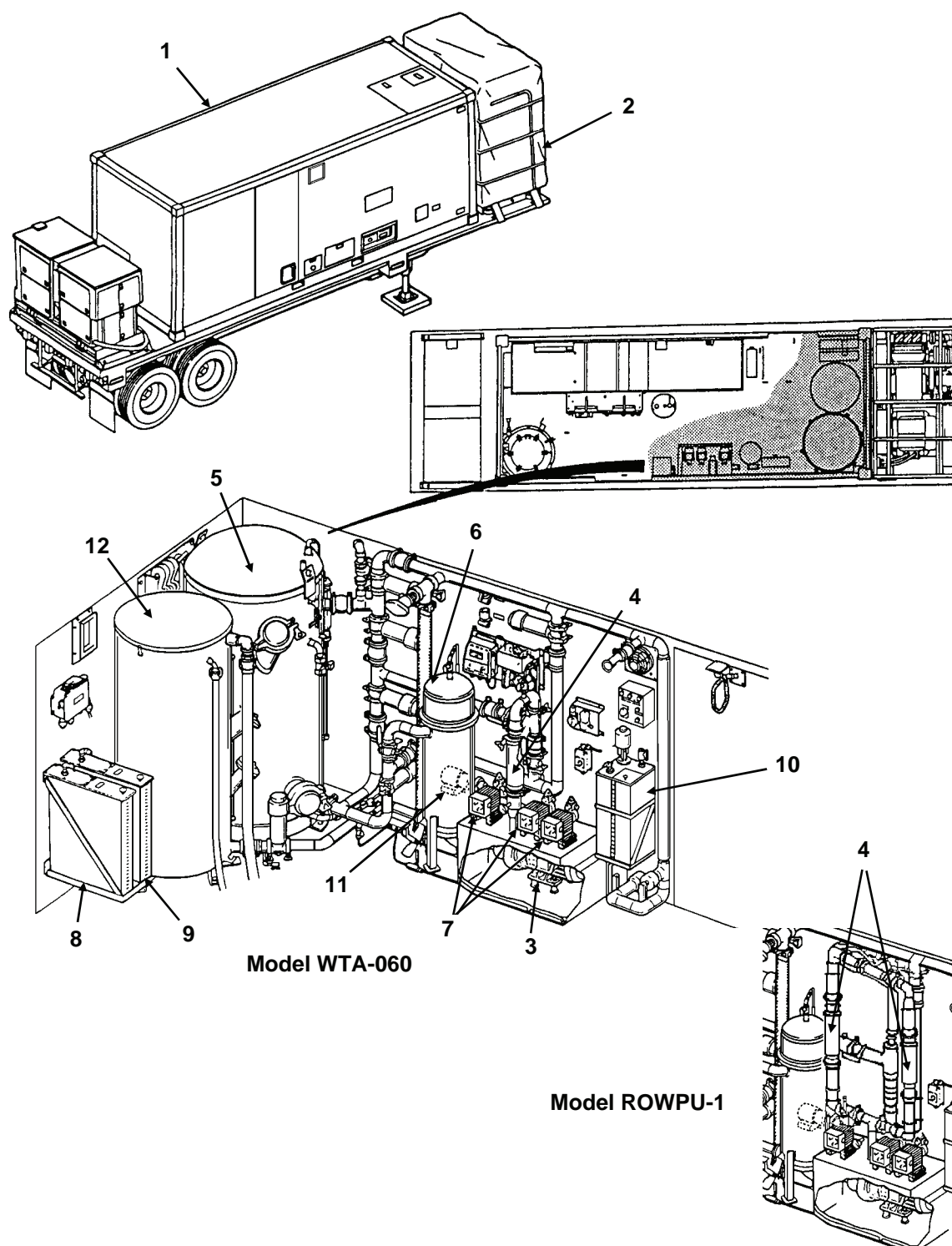


Figure 4. Water Purification System (Sheet 1 of 2)

- 2) Water purification system consists of the following major components and appropriate piping and valves, monitoring devices and semi-automatic controls.
 - a) Feed water booster pump (3). Pressurizes water from raw water system as needed for filtration processes. It is a 115-gpm (435-lpm) pump and requires 35-40 pounds per square inch gauge (psig) [241-276 kilo Pascal (kPa)] to operate.
 - b) Basket strainer (4). Removes remaining large particles from water to prevent clogging of internal distributors of the media filter.

- c) Media filter (5). Removes most suspended solids from raw water by passing water through a filter bed of AG media (special lightweight material) and garnet sand.
- d) Cartridge filter (6). Removes very fine suspended solids in raw water by passing water through replaceable cartridges.
- e) Chemical injection pumps (7). Inject water treatment chemicals into feed and product water.
- f) Polyelectrolyte tank (8). A reservoir for a chemical called polyelectrolyte, which is mixed with water and used to help the media filter remove suspended solids by coagulation.
- g) Sequestrant tank (9). A reservoir for a chemical called sequestrant (scale inhibitor), which is mixed with water and used to prevent scale from building up in the reverse osmosis elements.
- h) Hypochlorite tank (10). Contains a chemical called calcium hypochlorite, which is added to backwash water to control organic growth in media filter. Also injected by a separate pump into product water to control bacterial contamination while in storage tanks and after distribution.
- i) Hypochlorite backwash pump (11). Injects hypochlorite into the media filter backwash water.
- j) Clean/flush tank (12). Reservoir for holding water used to backwash the media filter and to flush and clean system during cleaning procedures.

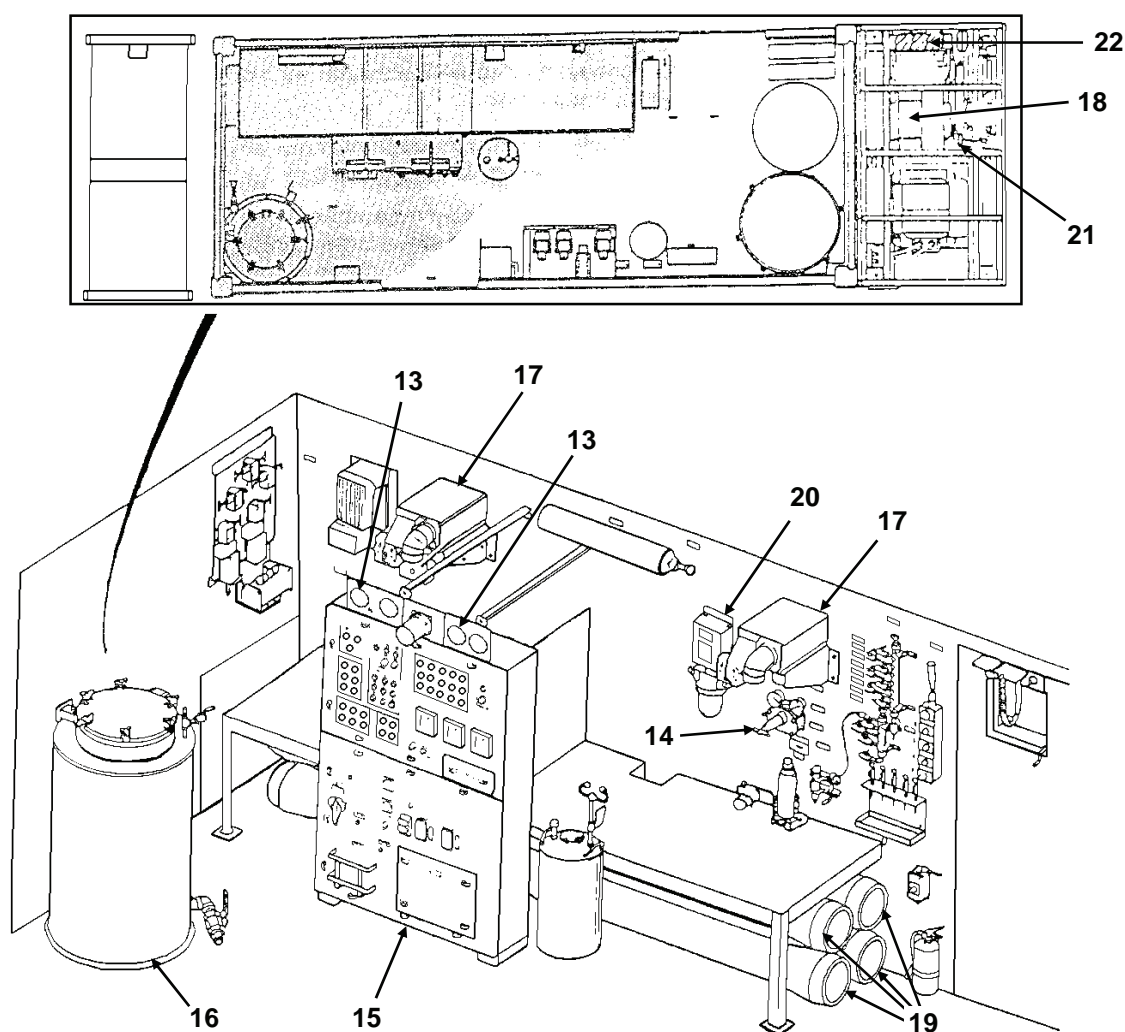


Figure 4. Water Purification System (Sheet 2 of 2)

- k) Gage panel (13). Gages indicate pressure and differential pressure related to filters and reverse osmosis (RO) elements.
- l) System low pressure regulator (14). Regulator valve controls air pressure to automatic valves and other air system components.
- m) Main control panel (15).
 - Low voltage section [110 volts alternating current (VAC)]. Contains electrical controls, lights, circuit breakers, and water flow meters.
 - High voltage section (440 VAC). Contains circuit breakers, motor starters, and transformers needed to operate the ROWPU.
- n) NBC filter (16). Used during NBC decontamination operations. Removes trace NBC contaminants from feed water remaining after purification by filtration and RO process.
- o) Heaters. Diesel-fired heaters (17) provide heat inside of van, an electric heater (18) provides heat to the high pressure pump assembly mounted outside the van.
- p) RO vessels (19). Contain RO elements, which reduce total dissolved solids (TDS) content of feed water.
- q) Carbon monoxide monitor (20). A self-contained device, which indicates presence of harmful amounts of carbon monoxide by an audio alarm and visual display.
- r) Air compressor (21). Provides air for aiding the media filter backwash, for operating automatic valves and utility service air.
- s) High pressure pump (22). Pressurizes feed water after it is filtered for RO process.

Potable Water Distribution System (Figure 5). This system stores and dispenses potable water.

- 1) Distribution pump (1). Draws potable water from storage tanks and pressurizes it.
- 2) Distribution hoses and dispensing nozzles (2). Potable water is dispensed through hoses and manually controlled nozzles.
- 3) Product shutoff valve (3). Normally open, valve closes when cleaning RO elements.
- 4) Storage tanks (4). Three 3,000-gallon collapsible potable water storage tanks (Ref TM 10-5430-237-12&P).

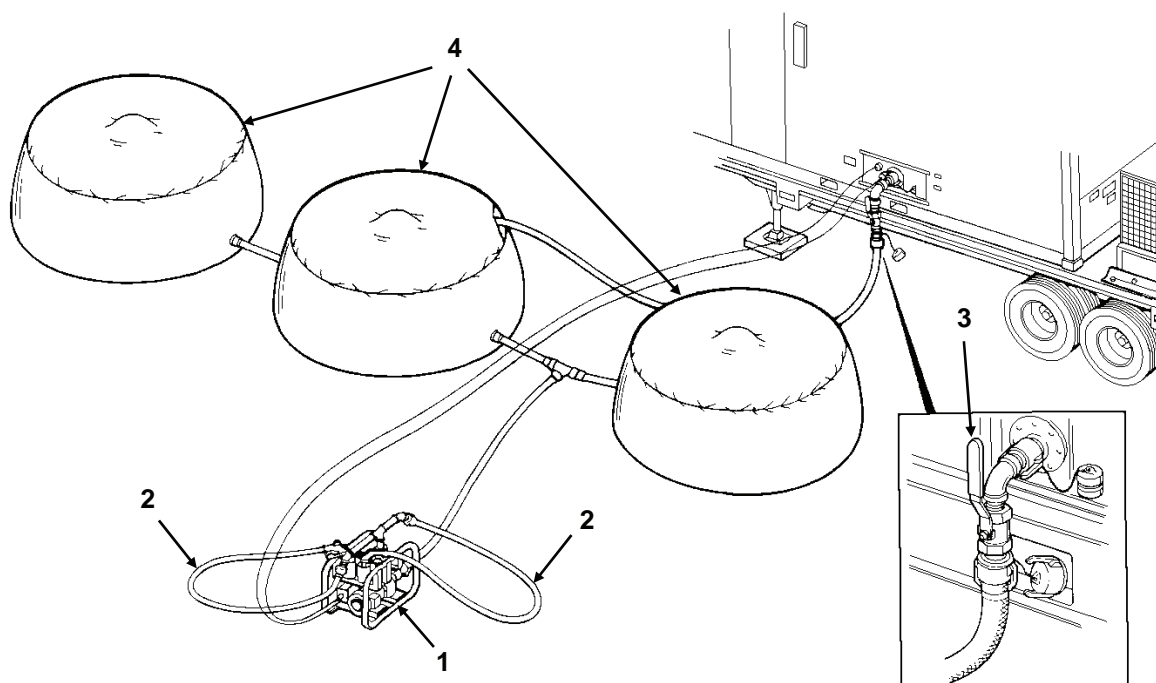


Figure 5. Potable Water Distribution System

Winter Kit (Figure 6). Contains items that are required to prevent freezing of water during cold weather operation. Items 1 through 6 are stored in winter kit storage box when not in use. Covers (8 and 9) and skids (10 and 11) are stored on table to left of main control panel under spare cartridge filter elements.

- 1) Intake strainer (1). Use with ice holes.
- 2) Distribution pump heat lamp (2). Includes 55 ft (17 m) of permanently attached cable.
- 3) Raw water pump heat lamp (3). Includes 100 ft (34 m) of permanently attached cable.
- 4) Extension cord (4). This 110 ft (34 m) cable is used if cable on raw water pump heat lamp does not reach heater outlet on van.
- 5) Electrical harness (5). Used to connect one of van's diesel heaters to the generator battery to provide power for the heater during transport and when power to the ROWPU is off.
- 6) Raw water pump drain hose (6).
- 7) Distribution pump drain hose (7).
- 8) Distribution pump cover (8).
- 9) Raw water pump cover (9).
- 10) Distribution pump skid (10).
- 11) Raw water pump skid (11).

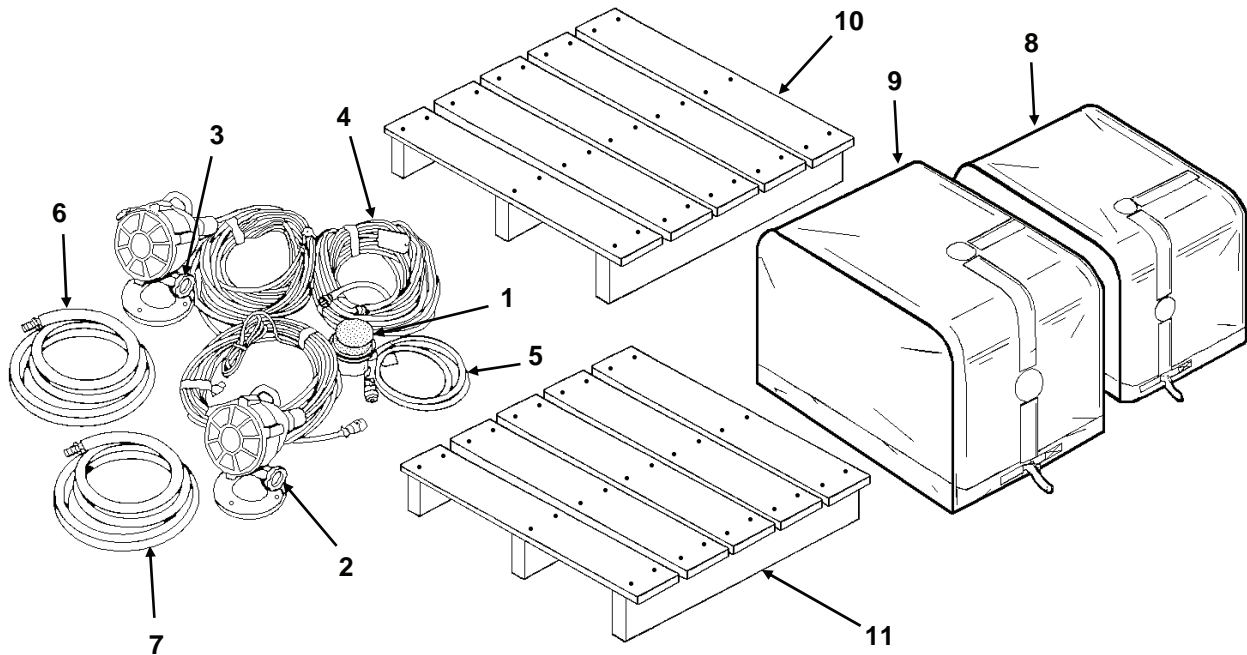


Figure 6. Winter Kit Components

Government Furnished Property (Figure 7). The following Government furnished items are required for ROWPU operation.

- 1) Storage tanks (1). Used to store potable water. See TM 5-5430-225-12&P for more information.
- 2) Semi-trailer (2). ROWPU is mounted on this trailer so it can be moved to mission site. See TM 9-2330-358-14&P or TM 9-2330-386-14&P for more information.
- 3) Generator set (3). Mounted on the same semi-trailer as ROWPU, generator supplies electrical source to equipment. See TM 5-6115-545-12 for more information. For tactical quiet generator, see TM 9-6115-645-10.

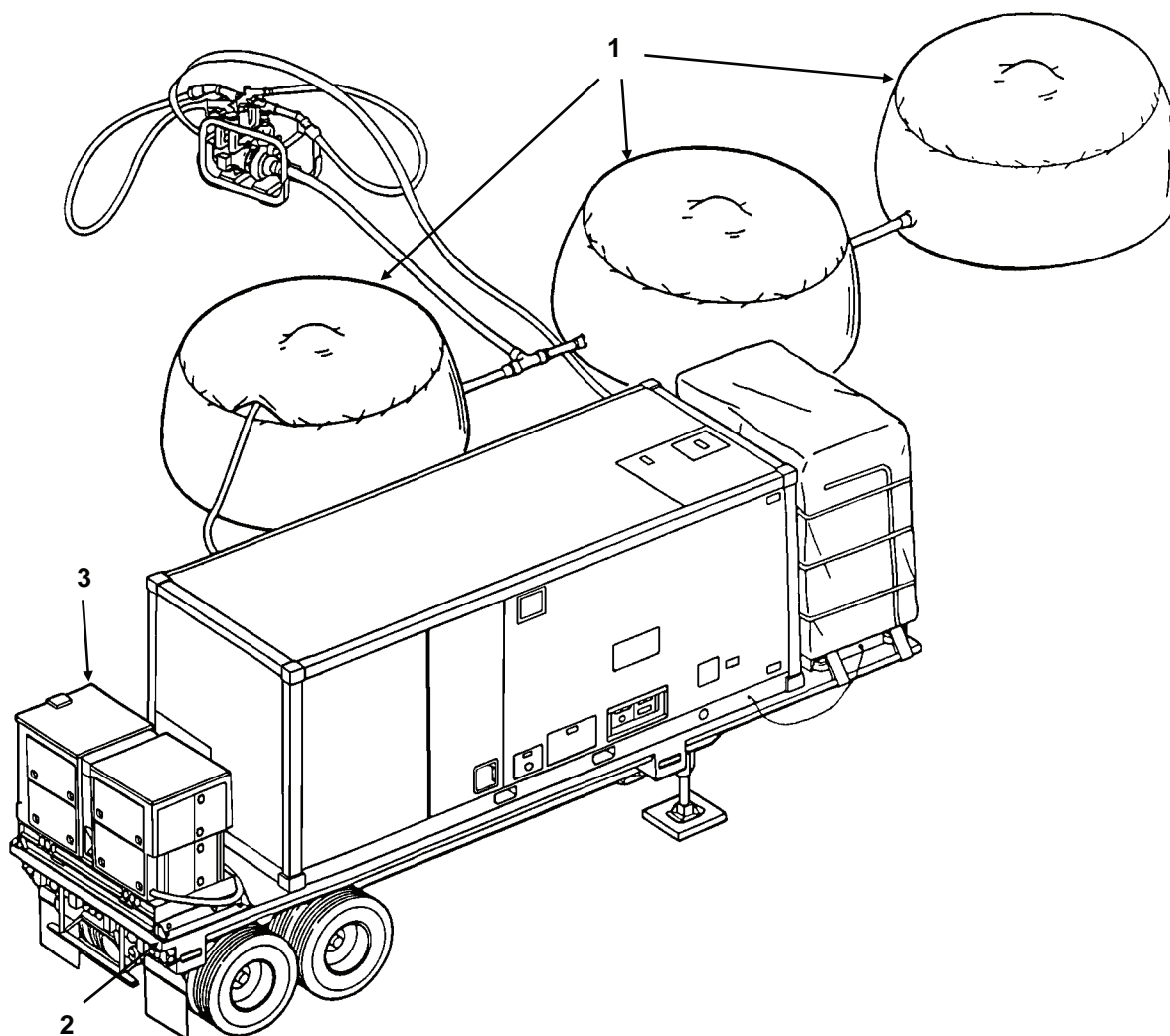


Figure 7. Government Furnished Property

DIFFERENCE BETWEEN MODELS

The ROWPU has two models, WTA-060 and ROWPU-1. Model WTA-060 is manufactured by Aqua-Chem, Incorporated. Model ROWPU-1 is manufactured by Keco Industries. Differences between the two models are as follows:

Cyclone Separators (Figure 8). The cyclone separation system used on the WTA-060 model consists of two separators (1) mounted on a separate frame (2) that is placed on the ground near the ROWPU (3). The cyclone separation system for the ROWPU-1 model consists of only one cyclone separator (4) which has been fabricated to be mounted in one of the stake pockets on the M871 trailer (5) used to transport the ROWPU system. As a result of this difference, the piping system on the raw water pump (6) and raw water hose (7) routing have been modified as shown in the illustration.

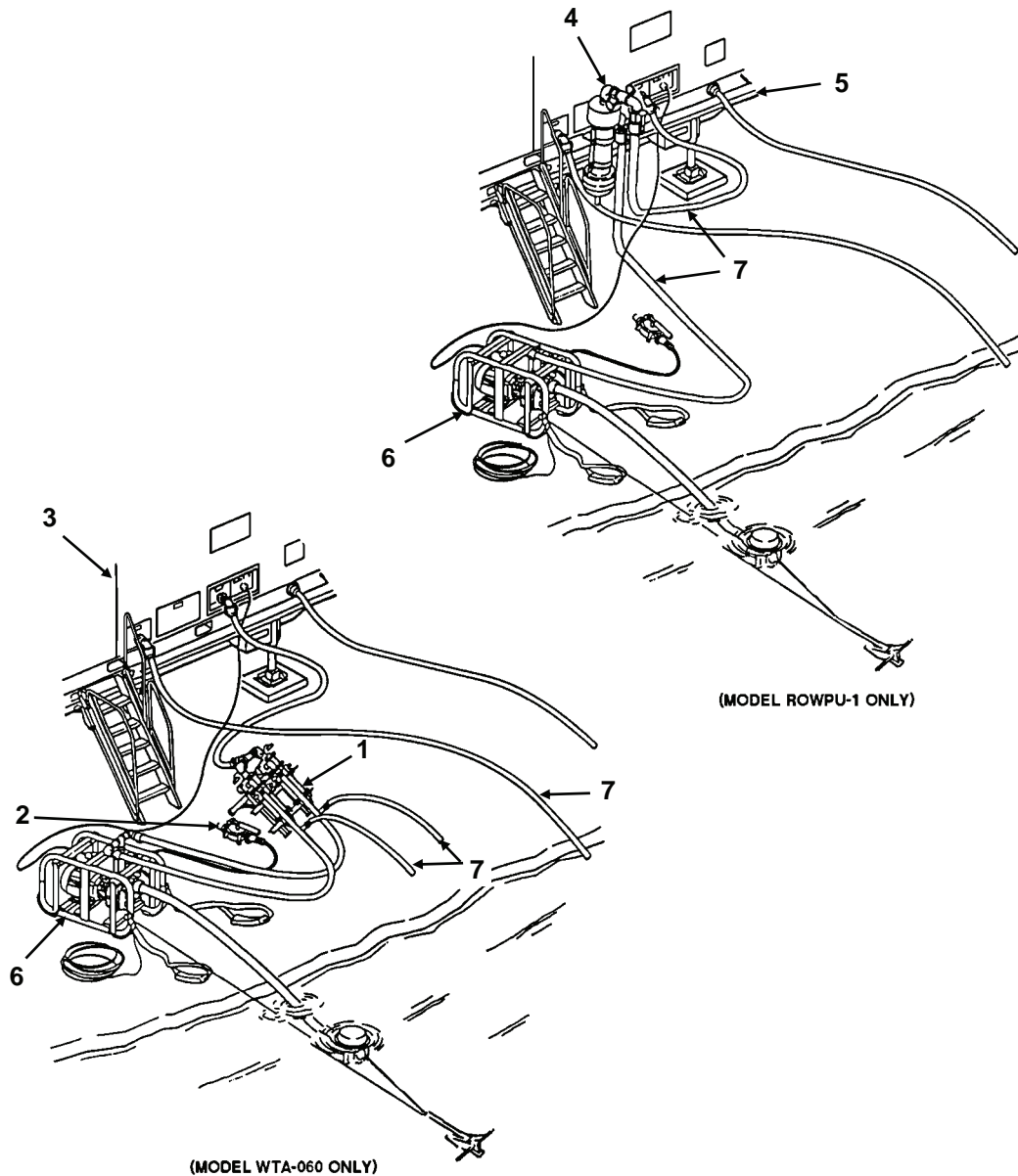


Figure 8. Cyclone Separators

Raw Water Strainer System (Figure 9). Strainer system used on WTA-060 model uses a single strainer (1) in the piping system in order to strain raw water entering ROWPU. ROWPU-1 model, however, is equipped with a dual strainer system (2), which allows ROWPU system to remain in operation while either strainer is being cleaned. One strainer is kept in operation at all times through two manual valves (3).

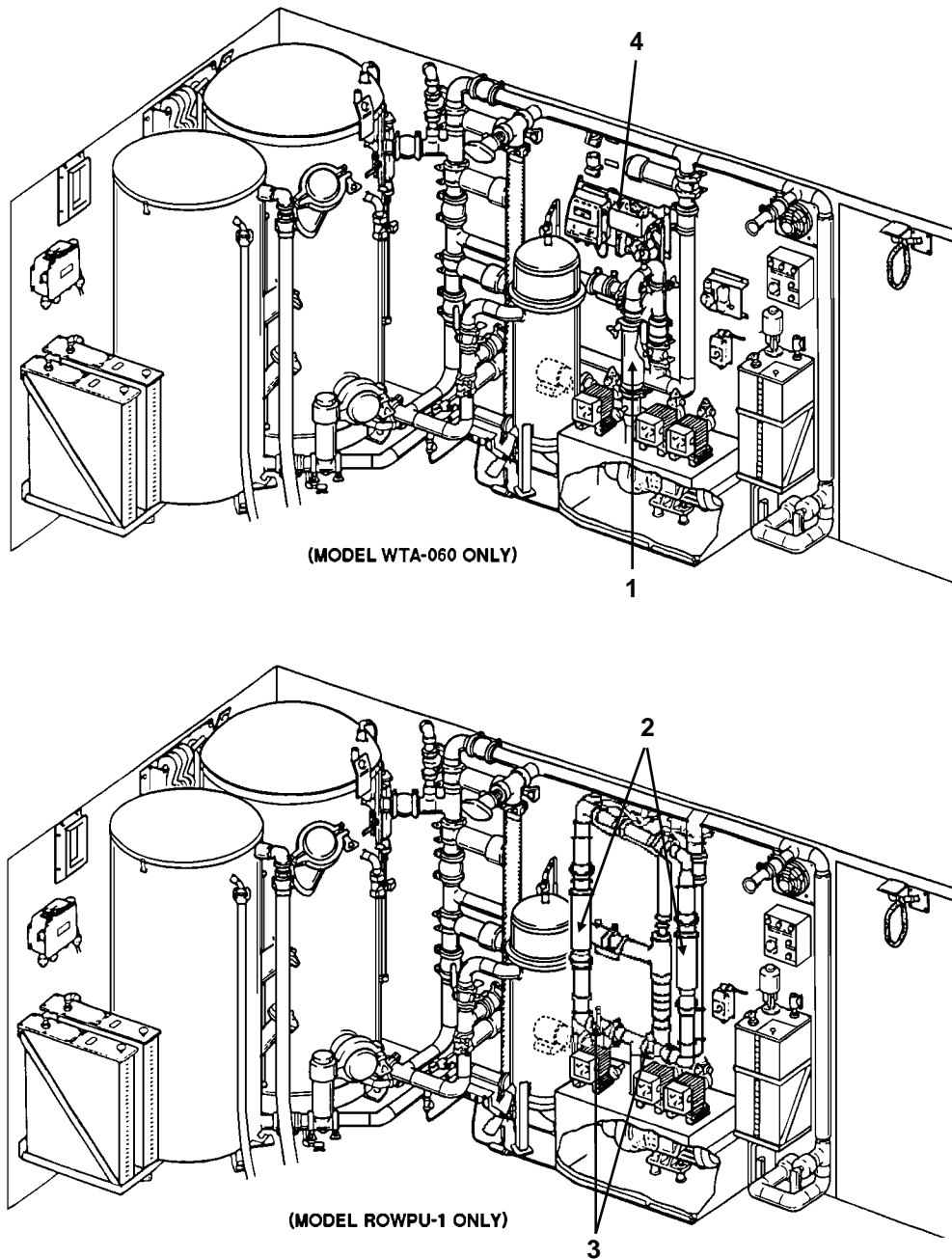


Figure 9. Raw Water Strainer System

Automatic Valves (Figure 10). Throughout the ROWPU system, a series of automatic valves are used to direct the water as it passes through the ROWPU piping. The type of automatic valves (1) used by the WTA-060 model looks slightly different than the automatic valves (2) used on the ROWPU-1 model. Although the appearance of the valves is different, the valve function is identical. The repair procedures differ slightly and are indicated in the related paragraphs for the maintenance of these valves.

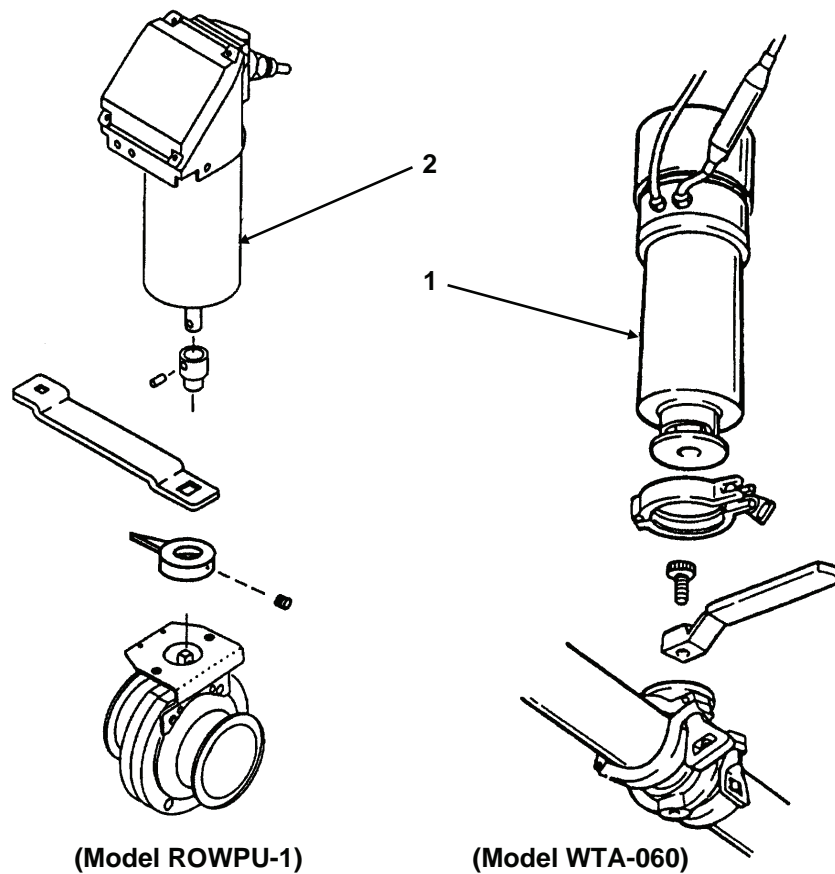


Figure 10. Automatic Valves

Control Panel Gauges Drain Valves (Model ROWPU-1 Only) (Figure 11). In order to prevent freezing of gauges (1) used on top of the control panel, Model ROWPU-1 has been equipped with valves (2) which are used to drain fluids from gauges and gauge tubing prior to shutdown or storage of the unit in cold or freezing conditions. Model WTA-060 does not have these valves.

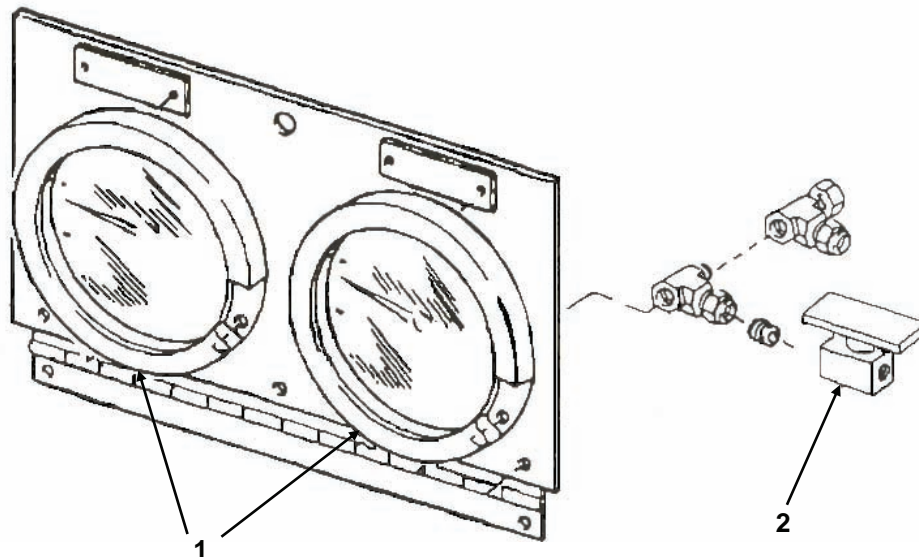


Figure 11. Control Panel Gauges Drain Valves (Model ROWPU-1 Only)

Pressure Switches (Figure 12). Various pressure switches are used in the piping system of ROWPU in order to indicate how various parts of the piping system are functioning. Pressure switches (1) used on Model ROWPU-1 have a different appearance than pressure switches (2) used on Model WTA-060. Although appearances differ, the function of each switch is identical. Repair procedures vary slightly and are described in related maintenance procedures.

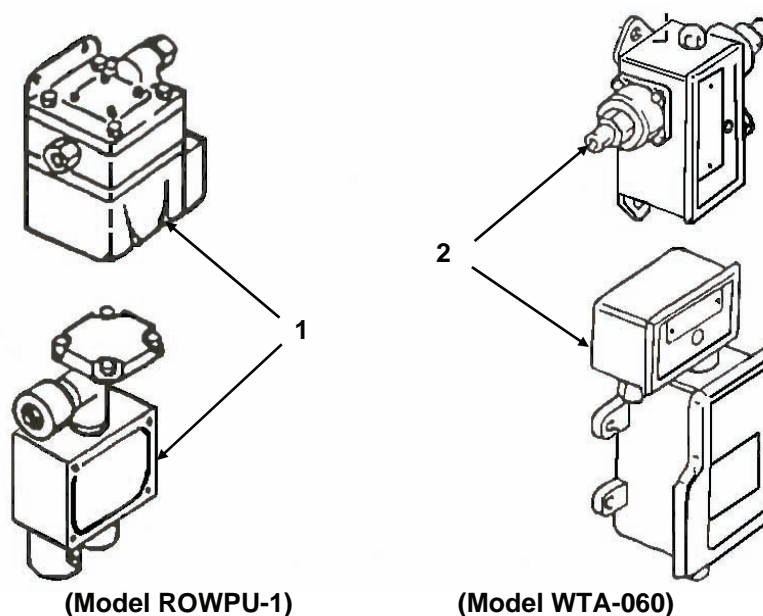


Figure 12. Pressure Switches

High Pressure Pump Jog Switch (Model ROWPU-1 Only) (Figure 13). To prevent cracking of high pressure pump housing during freezing conditions, Model ROWPU-1 has been equipped with a jog switch (1) used to momentarily jog high pressure pump to remove any water that may have been left in the pump housing during shutdown. Model WTA-060 does not have this switch.

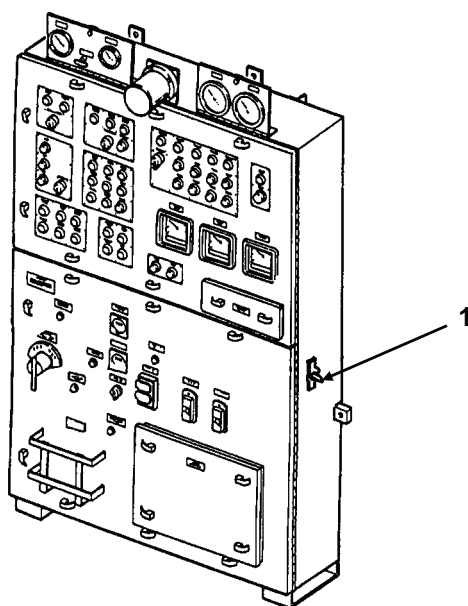


Figure 13. High Pressure Pump Jog Switch (Model ROWPU-1 Only)

Roof Design (Figure 14). The roofing material used on the ROWPU-1 model has been redesigned to incorporate a one-piece roofing skin (1). The WTA-060 model is equipped with a roof design that uses many roof sections to form the roof (2).

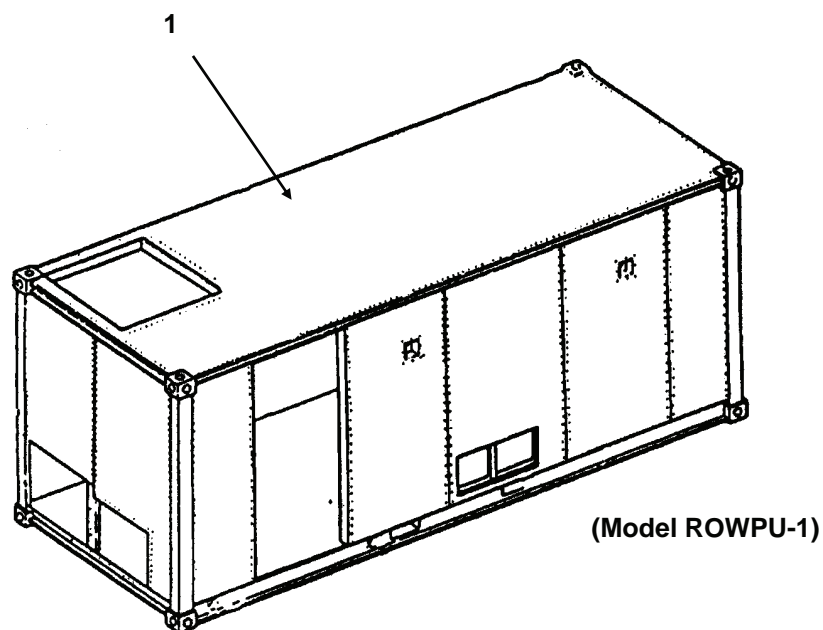
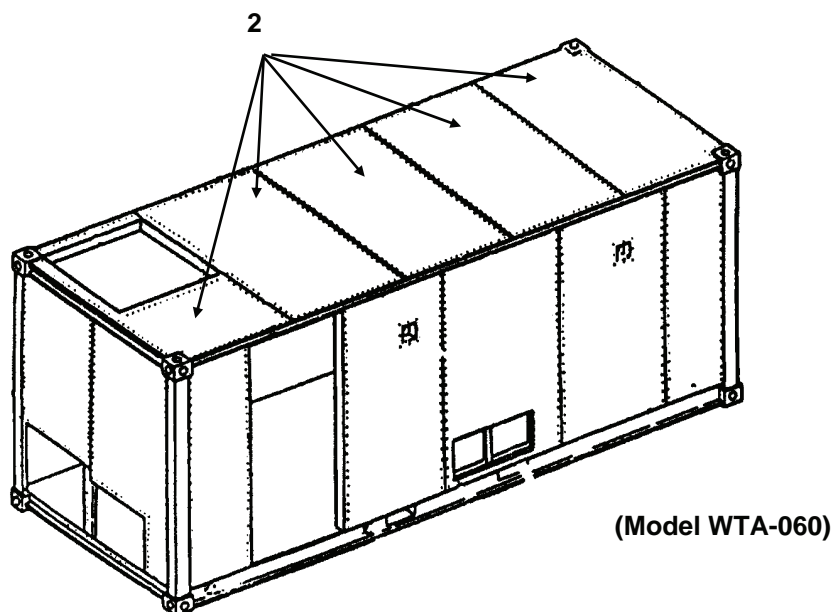


Figure 14. Roof Design

EQUIPMENT DATA

Performance

Brackish water (based upon TDS of 1000 to 15,000 at 77° F (25° C) water temperature:

Flow rate 53 gpm (200 l/min)
 Average daily production 60,000 gallons (227,100 l)
 Quality 20 to 200 ppm TDS
 Fuel consumption 2.0 to 3.4 gph (7.5 to 12.9 l/hr)

Sea water (based upon TDS of 15,000 to 35,000 at 77° F (25° C) water temperature:

Flow rate 34 gpm (128.7 l/min)
 Average daily production 40,000 gallons (151,400 l)
 Quality 470 to 825 ppm TDS
 Fuel consumption 3.0 to 3.4 gph (11.4 to 12.9 l/hr)

Fresh water and NBC-contaminated fresh water (based upon TDS of up to 1000 TDS at 77° F (25° C) water temperature:

Flow rate 53 gpm (200 l/min)
 Average daily production 60,000 gallons (227,100 l)
 Quality 0.1 to 10 ppm TDS
 Fuel consumption 2.0 to 3.4 gph (7.5 to 12.9 l/hr)

NOTE

When the temperature is lower than 75° F (24° C), flow rate and daily production of potable water may be less, due to viscosity effects.

Operating Temperatures -25° F to 100° F (-32° C to 43° C)

Storage Temperatures

ROWPU less-sensitive items -28° F to 145° F (-33° C to 63° C)

Sensitive items 35° F to 110° F (2° C to 43° C)

RO elements
 Polyelectrolyte
 Sequestrant
 Color test kit
 Available chlorine color comparator test kit
 Turbidity standards
 NTP-A cleaner
 Membrane cleaner detergent

Power Requirements 60 kW maximum demand

Dimensions and Weight

ISO container, fully packed (Model WTA-060) 20x8x8 ft (6.1 x 2.4 x 2.4 m), 15,100 lb (6849 kg)

ISO container, fully packed (Model ROWPU-1) 20x8x8 ft (6.1 x 2.4 x 2.4 m), 14,790 lb (6723 kg)

Mobility configured 8x13x30 ft (2.4 x 3.9 x 9.1 m)

ROWPU, generator-mounted, ready for transport and deployment

Model WTA-060 37,960 lb (17,215 kg)

Model ROWPU-1 37,650 lb (17,114 kg)

INTRODUCTION

RAW WATER INTAKE SYSTEM (Figure 1)

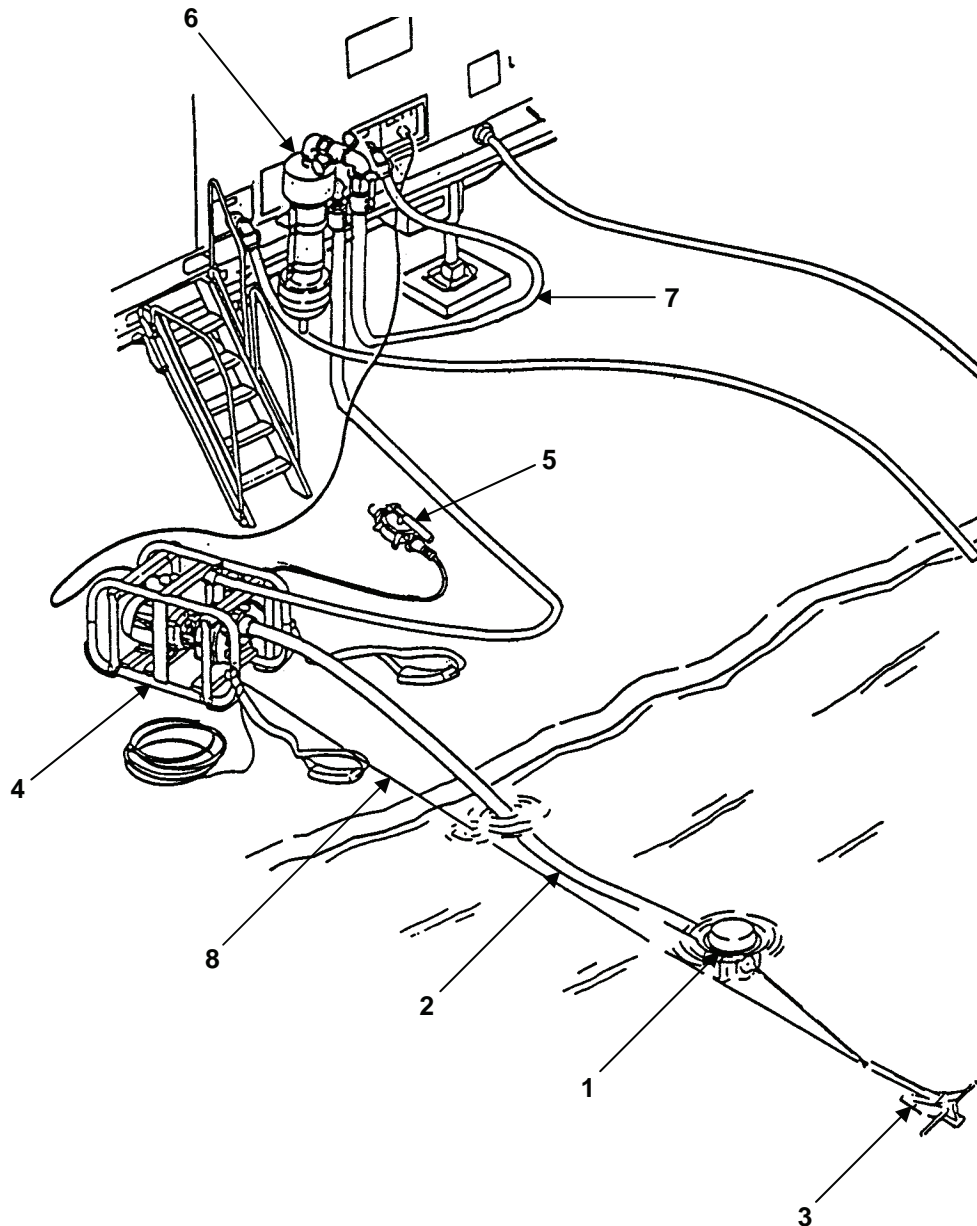
A detailed line drawing of a water pump assembly, likely for a boat. The diagram shows the pump unit (1) connected to a hose (2) that leads to a nozzle (3). The pump is driven by a motor (4) which is connected to a power source (5). A pressure gauge (6) is mounted on the pump. A hose (7) is connected to the pump. A hose (8) is connected to the pump. The diagram is labeled with numbers 1 through 8, corresponding to the following parts:

- 1: Water pump unit
- 2: High-pressure hose
- 3: Spray lance/nozzle
- 4: Electric motor
- 5: Power source/cable
- 6: Pressure gauge
- 7: Suction hose
- 8: Trigger gun

0003 00-1

Intake Strainer (1). The intake strainer is connected to the end of the suction hose (2). The strainer will float just under the water, but still well above the bottom of the river, lake or ocean. This keeps the ROWPU from picking up bottom mud or surface debris and oil. The strainer contains a perforated screen which keeps out large debris and fish. An anchor (3) is used to deploy the strainer and hold it in place. A 300 ft. (91 m) rope (8) secures the anchor to the strainer and is used to deploy and retrieve the anchor and the intake strainer. A second, non-floating strainer is used for ice holes.

Raw Water Suction Hose (2). Ten 10 ft. (3 m) sections of 3 in. (7.6 cm) suction hose come with the ROWPU. These hose sections are used as needed to connect the intake strainer to the raw water pump.



**Figure 1. Raw Water Intake System (Sheet 2 of 2)
(Model ROWPU-1 ONLY)**

Raw Water Pump (4). This pump is mounted on a separate frame so it can be located near the water source. A detachable hand pump (5) is provided to help prime the pump rapidly. The pump is self priming after the initial prime and can pull the air out of the suction hose when started. The hand pump is not mandatory but helps speed the initial priming. Raw water is drawn through the intake strainer and suction hose, pressurized and discharged through the cyclone separators (6) when the pressure is great enough to allow placement of the ROWPU up to 30 ft. (9 m) above the pump.

Cyclone Separators (6). On Model WTA-060, two cyclone separators are mounted on a separate frame and located near the raw water pump frame. On the ROWPU-1 Model, there is one separator which is mounted onto the trailer in one of the trailer stake pockets. As water enters the cyclone separator, a high speed swirl is formed. The heavier dirt is thrown to the outside and drops to the bottom where it is carried out by a small amount of water flow. The main water flow (101 gpm, 382 IPM) leaves the separator at the center of the top and enters the discharge hose to flow to the ROWPU. The cyclone(s) will remove dirt which will settle in a glass in 20 minutes. This is very important for sand removal at ocean beach deployment areas.

Raw Water Discharge Hose (7). On all models, four 50 ft. (15 m) lengths of 2-1/2 in. (6.4 cm) canvas hoses, used to carry raw water to the cyclone separator(s), are supplied with the ROWPU. Model WTA-060 is supplied with two 10 ft. (3 m) lengths of 2 in. (5.1 cm) rubber hoses. Model ROWPU-1 is supplied with one 10 ft. (3 m) length of 2 in. (5.1 cm) rubber hose. These hoses are called raw water to cyclone separator(s) hoses and are used to carry water from the cyclone separator(s) to the Water Purification System. The connectors are cam and groove type (quick disconnect). On Model WTA-060, 9 gallons (34.1 l) of water are lost through drain hoses on the cyclone separators. On Model ROWPU-1, 5 gallons (19 l) of water are lost through the drain hose on the cyclone separator.

WATER PURIFICATION SYSTEM

Water from the Raw Water Intake System is discharged into the Water Purification System. There the water is filtered, treated with chemicals and pressurized for the reverse osmosis process which reduces the TDS of the water. All necessary piping, valves, controls and indicators required to accomplish purification of the feed water and cleaning of the system components are included.

Filtration (Figure 2). The raw water is first treated by filtration. The filters reduce the turbidity of the raw water by removing suspended particles of fine clay, dirt and organic matter. Turbidity not only makes water unfit to drink, but it may also foul (clog) the RO elements. Usually the water leaving the cartridge filter has a turbidity of 0.5 to 1.5 NTU. This turbidity value will cause only slow fouling which can be removed by routine RO element cleaning. Fouling reduces the amount of water which can be produced by the ROWPU.

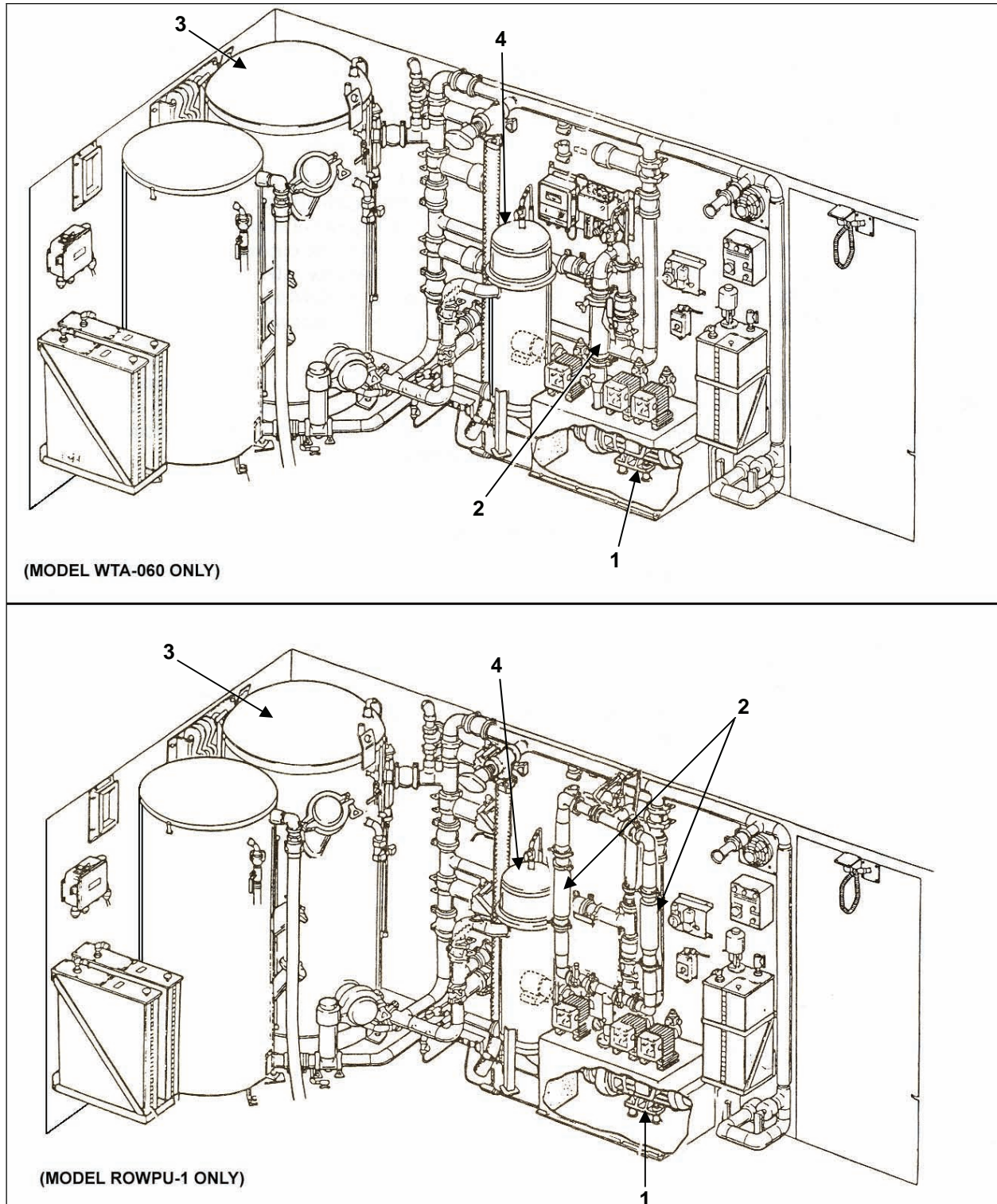


Figure 2. Operation of Water Purification System

- a. Feed Water Booster Pump (1). This centrifugal pump receives water from the raw water discharge hose and pressurizes it so it can go through the following filtration steps.
- b. Basket Strainer (2). The WTA-060 model is equipped with only one basket strainer. The ROWPU-1 model is equipped with two basket strainers to allow the replacement of a clogged strainer without shutting down the ROWPU. The basket strainer removes any remaining large foreign particles not removed by the cyclone separator(s). This prevents clogging of the water distributors inside the media filter. A spare strainer basket is carried on-board to provide for quick change when the basket strainer becomes dirty. When the basket strainer gets dirty, the pressure at the basket strainer outlet becomes lower than the basket strainer inlet. The ROWPU controls sense that pressure drop (or differential) and set off a yellow strainer plugged warning light and pulsing horn.
- c. Media Filter (3). The media filter removes most of the suspended solids. The water enters the top of the filter through the upper distribution, flows downward through one layer of course AG filter media and a final layer of very fine garnet sand. These layers are all supported by three layers of support gravel. A collector picks up the filtered water for discharge. The suspended solids are too small to be removed by the straining action of the filter media and many of the particles contain layers of electrical charges which prevent them from forming larger particles. The secret to removing these particles is the addition to the feed water of a treatment chemical called polyelectrolyte. With the aid of this chemical, the filter can remove most of the suspended solids from the water resulting in a turbidity between 0.5 and 2 NTU in most cases. On Model ROWPU-1, turbidity is measured by taking readings using the portable turbidity meter.
- d. Cartridge Filter (4). This filter contains ten 30 in. (76 cm) filter cartridges. Water goes through these filters for final (polishing) filtration. When it has gone through this filter, the water will normally have a turbidity of 0.5 to 1.5 NTU. In time, these cartridges will become dirty. When the cartridge filter gets dirty, the pressure at the cartridge filter outlet becomes lower than the pressure at the cartridge filter inlet. The ROWPU controls sense that pressure drop (or differential) and set off a yellow cartridge filter plugged warning light and pulsing horn. The ROWPU must be shut down and the dirty cartridges replaced.

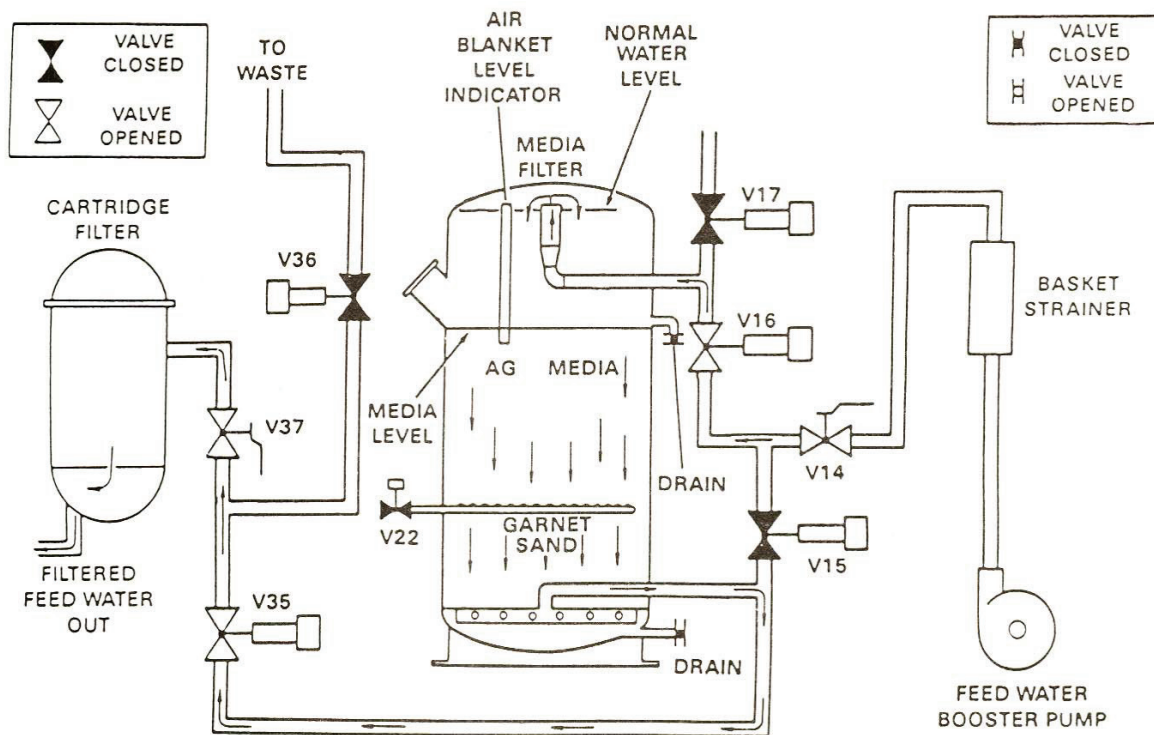


Figure 3. Normal Flow Thru Filters (Sheet 1 of 2)
(Model WTA-060 ONLY)

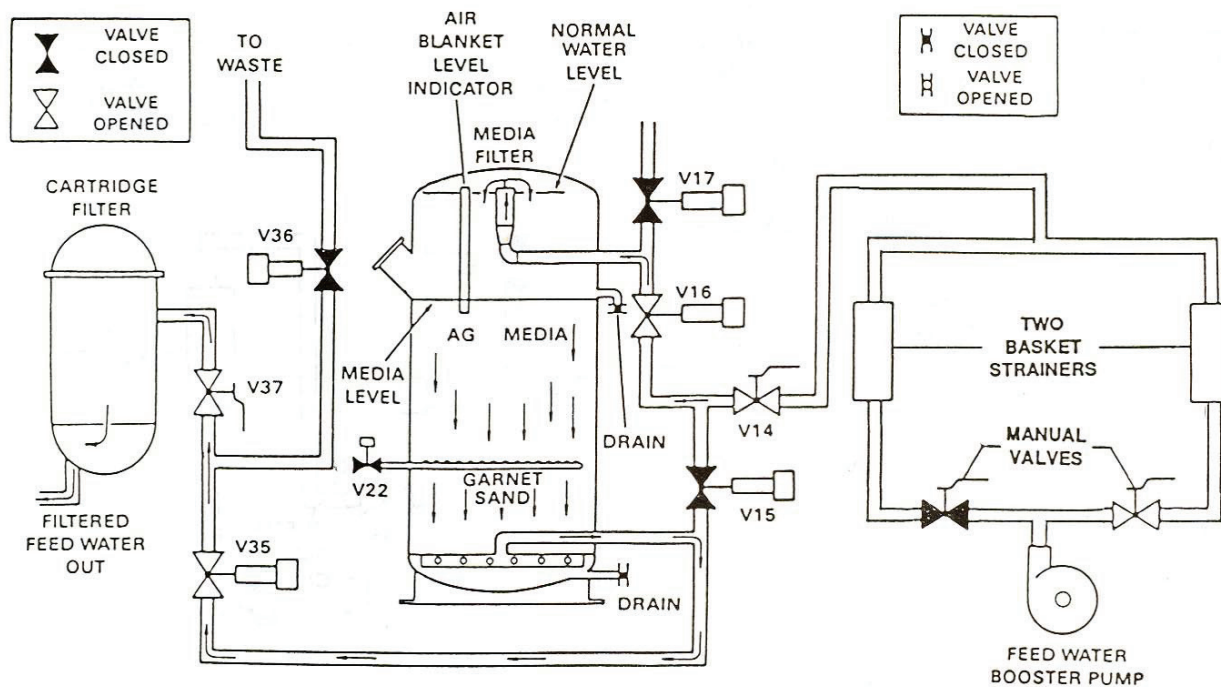


Figure 3. Normal Flow Thru Filters (Sheet 2 of 2)
(Model ROWPU-1 ONLY)

Backwashing. In time, the suspended solids trapped in the media filter will cause an increase in the pressure drop between the inlet and outlet pressure. When the media filter gets dirty, the pressure at the media filter outlet becomes lower than the pressure at the media filter inlet. The ROWPU controls sense that pressure drop (or differential) and set off a yellow media filter plugged warning light and pulsing horn. The controls are then set by the operator to automatically backwash the media filter. Normal flow is shown in figure 3. The backwash cycle is shown in figure 4. The filter is backwashed before the yellow warning light and horn indicates high pressure drop in the following situations:

- When operating on a river or lake with a heavy concentration of organic material present, a turbidity over 15 NTU and a temperature over 70°F (21°C), the media filter is backwashed every 6 hours.
- On any water, the filter is backwashed at least once daily.
- On some waters, most of the places in the filter bed for the suspended solids to stick are used up without causing a high enough pressure drop to set off the alarm. When this happens, the filtered water turbidity begins to increase. If it increases by more than 0.5 NTU, the filter is backwashed.

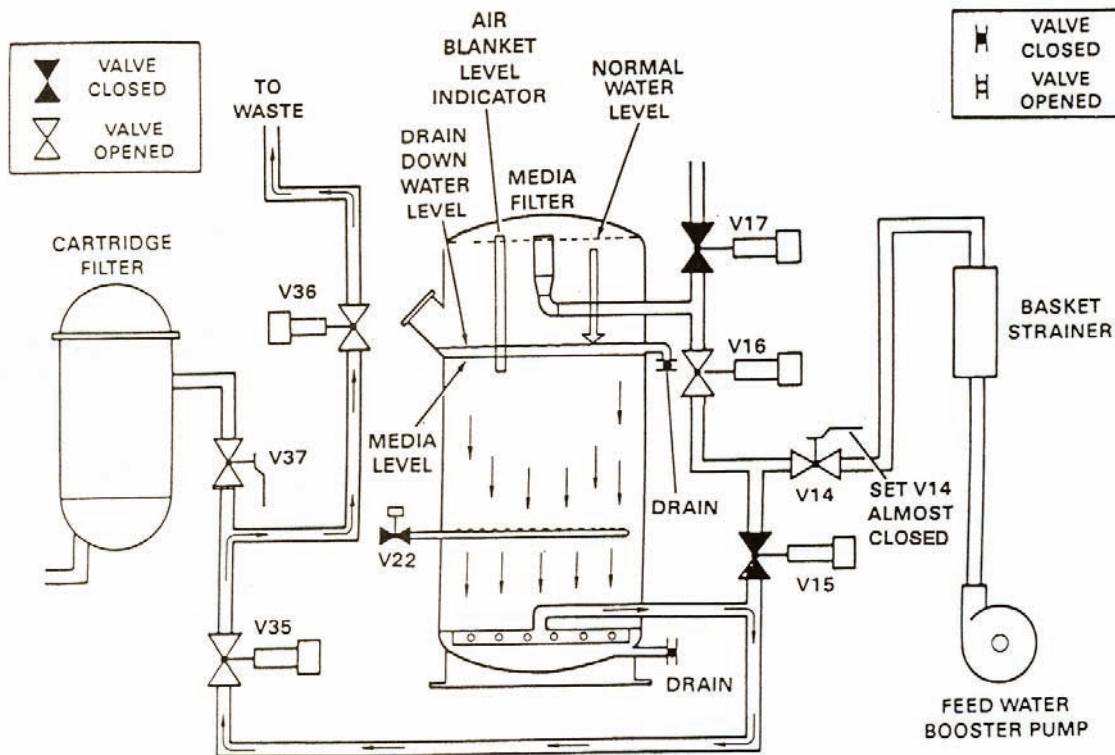


Figure 4. Backwash Cycle (Sheet 1 of 10)
(Model WTA-060 ONLY)

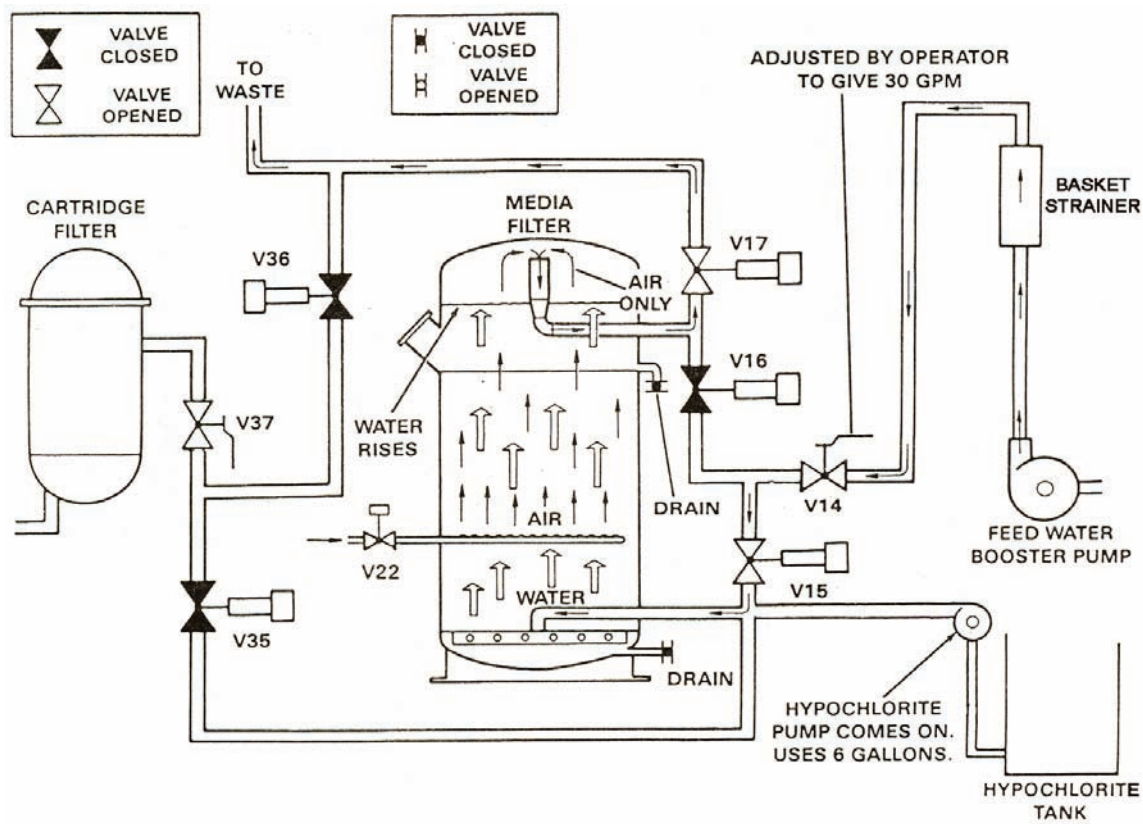


Figure 4. Backwash Cycle (Sheet 2 of 10)
(Model WTA-060 ONLY)

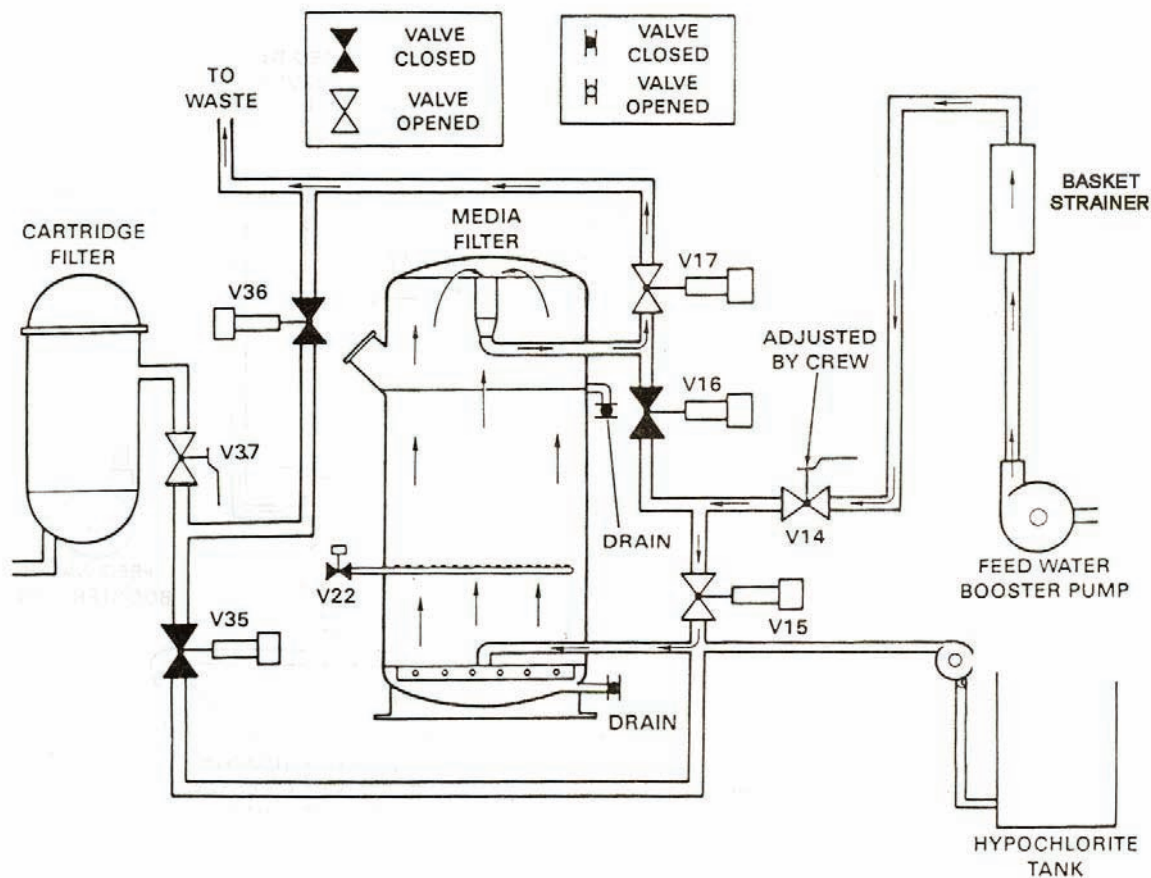


Figure 4. Backwash Cycle (Sheet 3 of 10)
(Model WTA-060 ONLY)

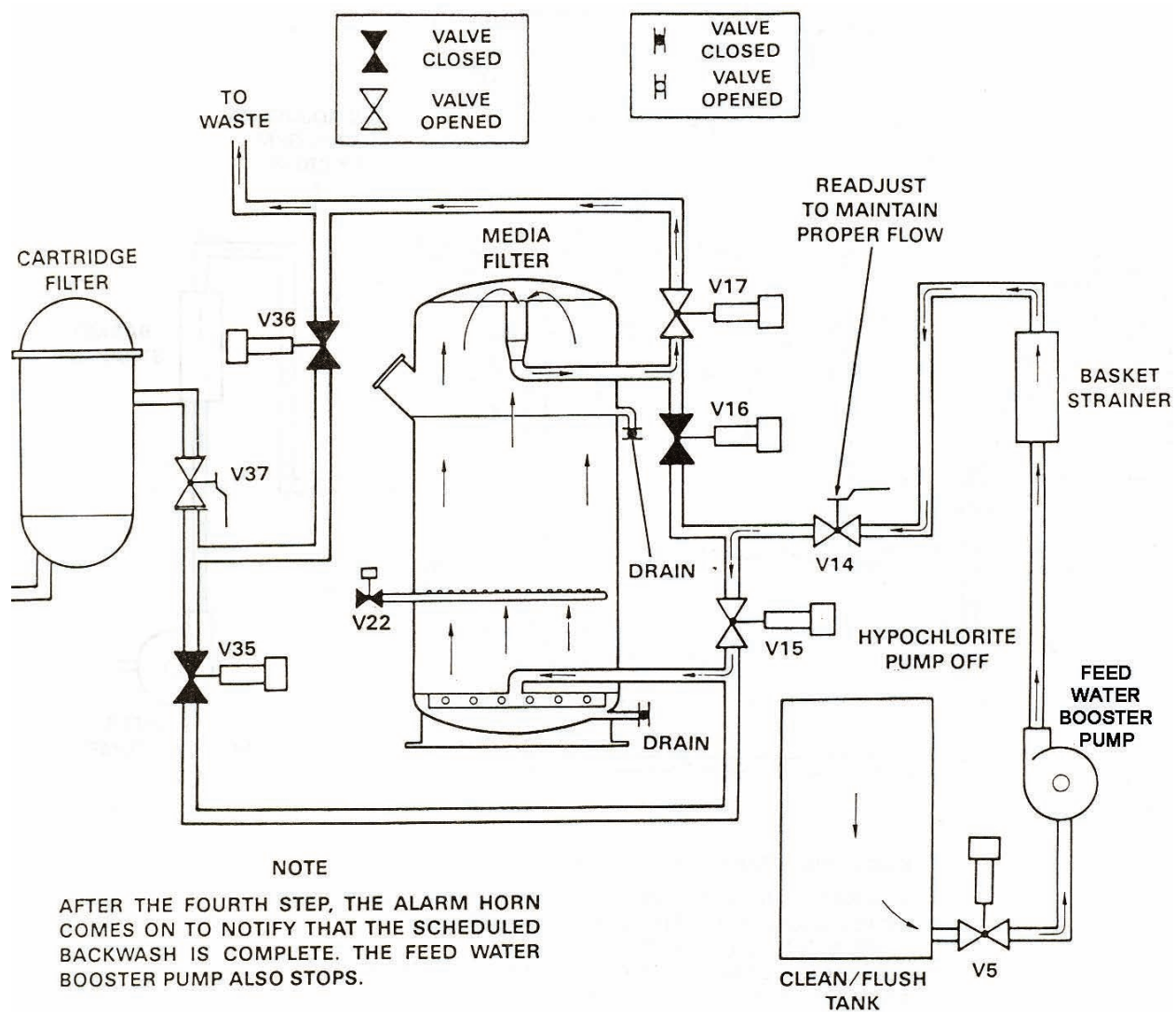


Figure 4. Backwash Cycle (Sheet 4 of 10)
(Model WTA-060 ONLY)

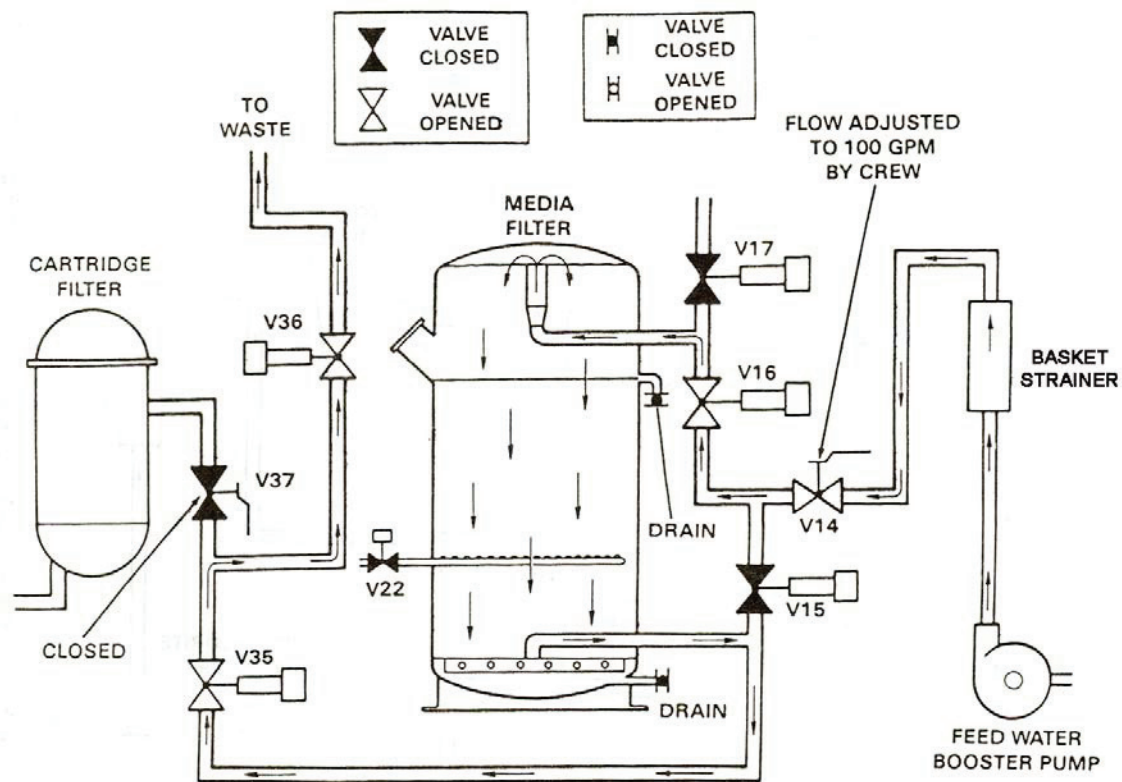


Figure 4. Backwash Cycle (Sheet 5 of 10)
(Model WTA-060 ONLY)

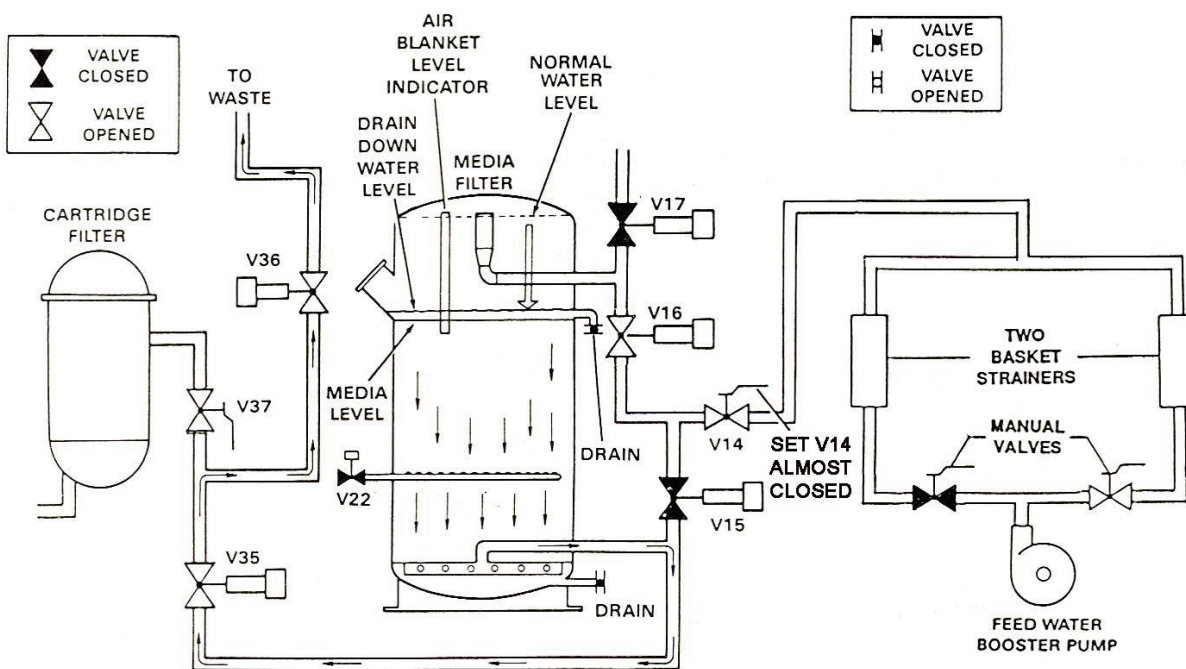


Figure 4. Backwash Cycle (Sheet 6 of 10)
(Model ROWPU-1 ONLY)

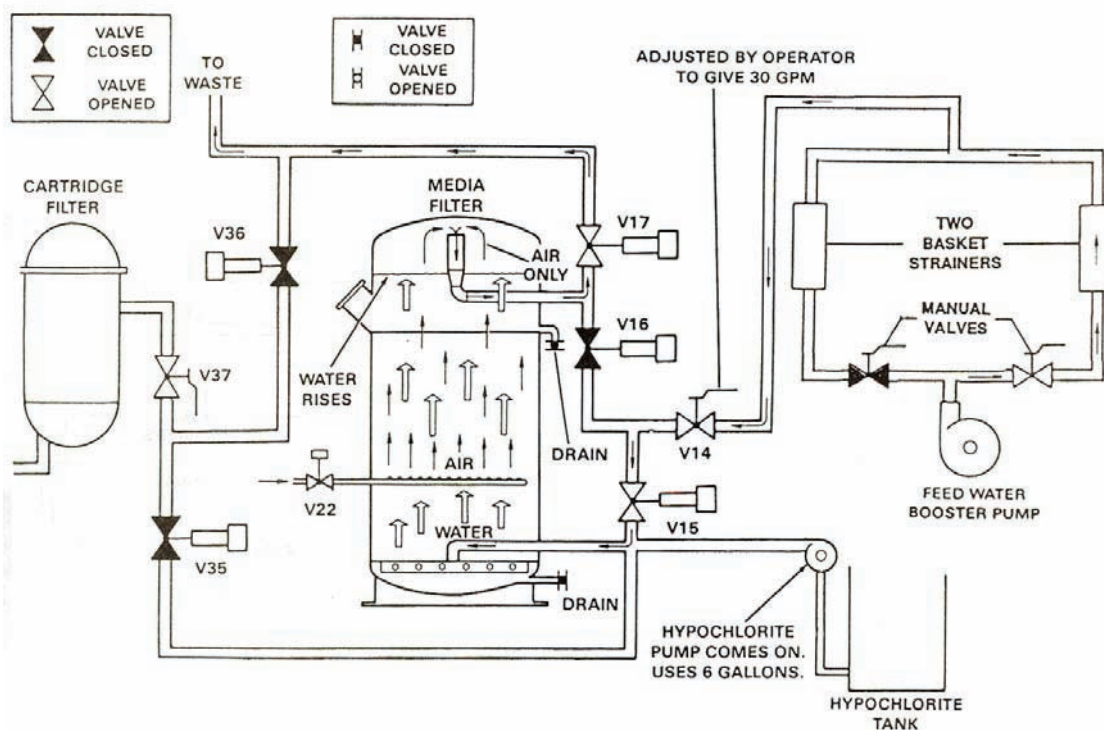


Figure 4. Backwash Cycle (Sheet 7 of 10)
(Model ROWPU-1 ONLY)

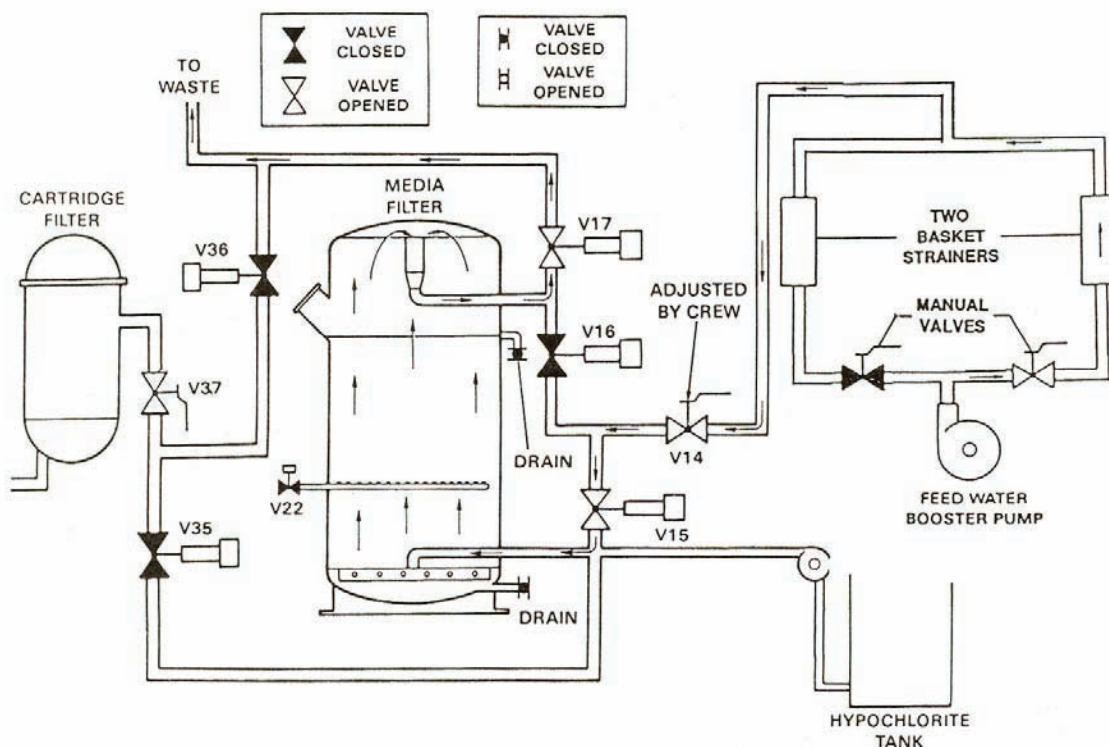


Figure 4. Backwash Cycle (Sheet 8 of 10)
(Model ROWPU-1 ONLY)

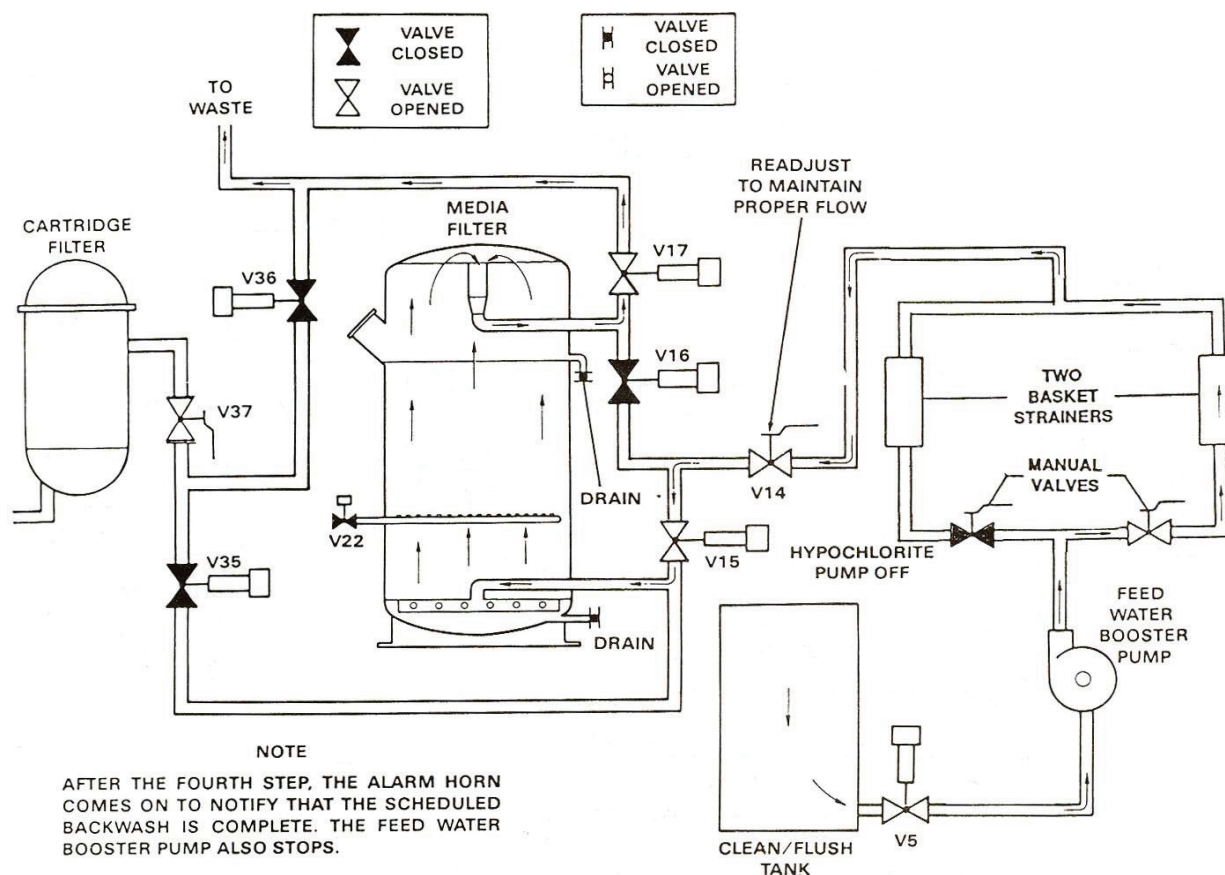


Figure 4. Backwash Cycle (Sheet 9 of 10)
(Model ROWPU-1 ONLY)

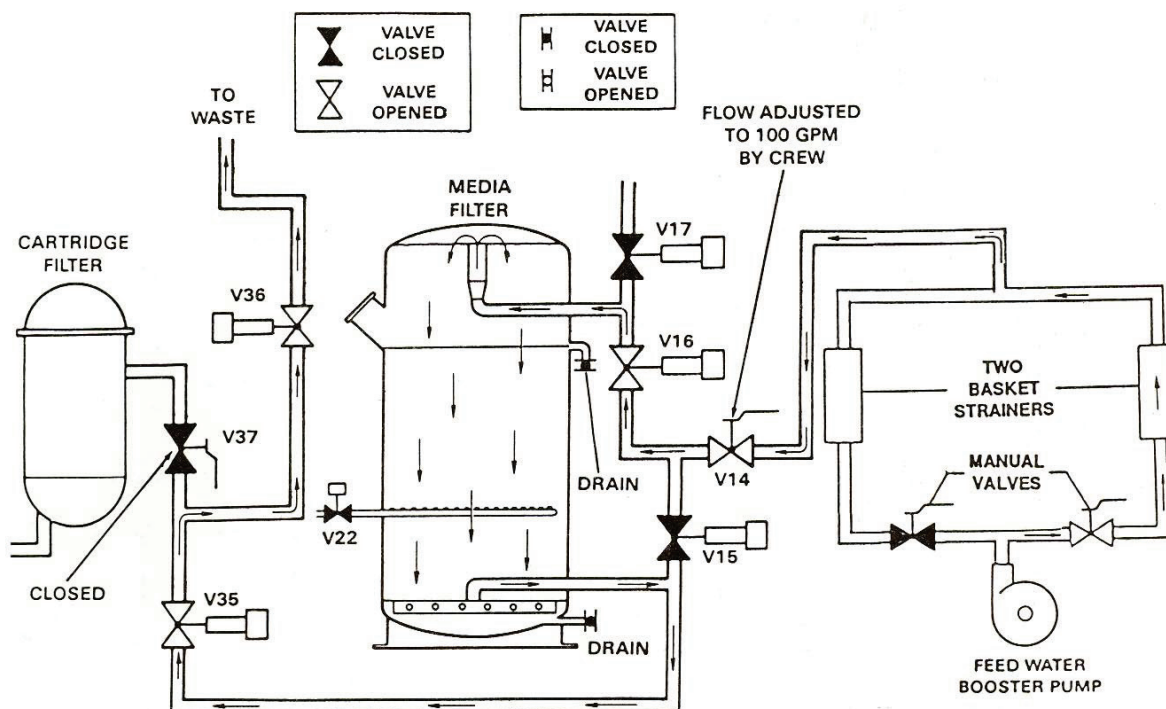


Figure 4. Backwash Cycle (Sheet 10 of 10)
(Model ROWPU-1 ONLY)

Reverse Osmosis (Figure 5). After filtration to remove the suspended solids, the feed water is further processed by reverse osmosis. The feed water is pressurized and delivered to RO vessels containing RO elements. In the RO elements, the feed water flows across sheets of membrane material. Some of the water passes through the membrane sheets and is collected to become product water. Most of the dissolved solids (salts) are blocked from passing through. Only 1/3 to 1/2 of the feed water passes through the membrane sheets to become product water. The rest of the water containing most of the dissolved solids (salts) continues flowing past the membranes and exits the RO vessels as waste water.

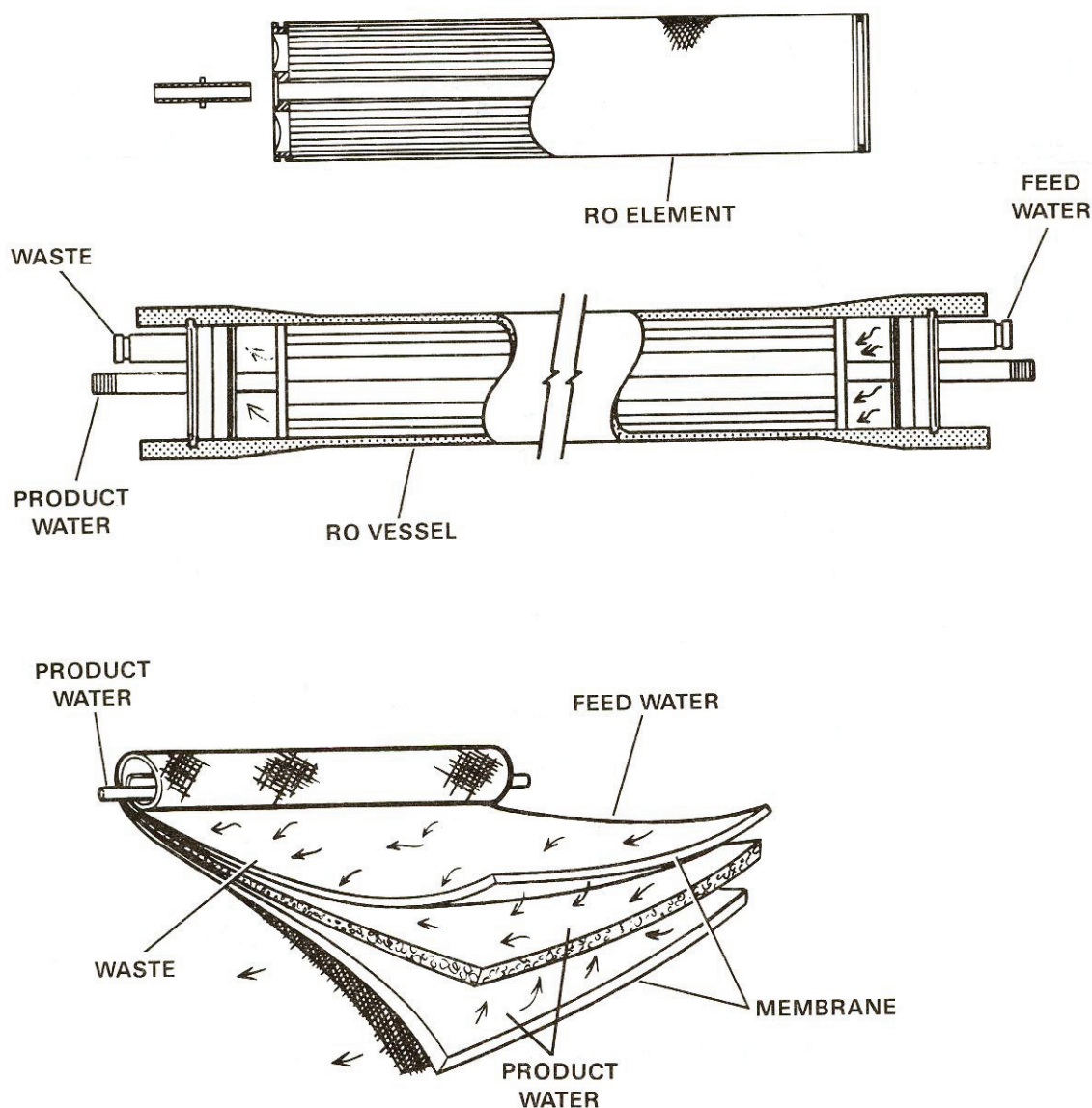
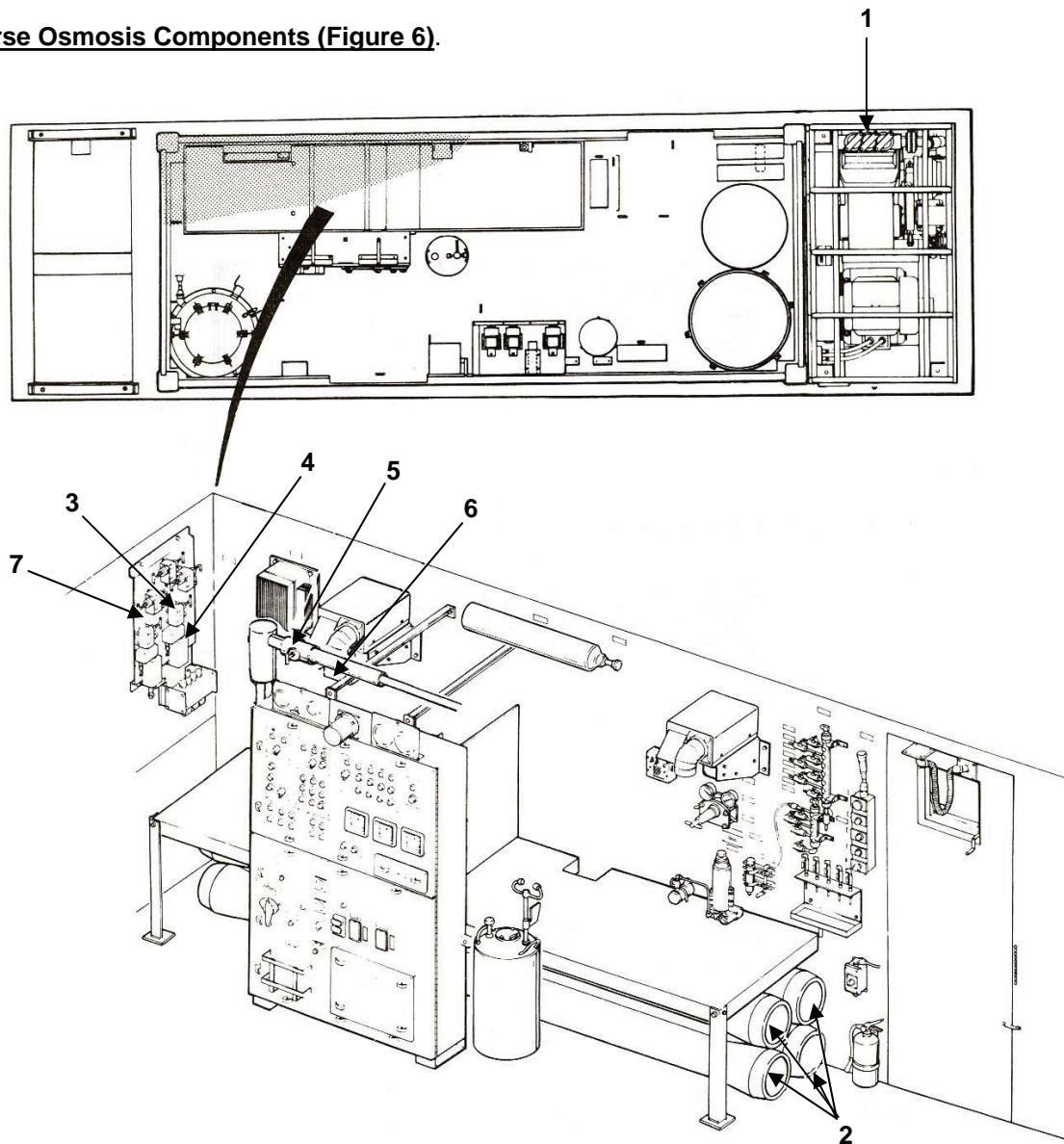


Figure 5. Reverse Osmosis Process

Reverse Osmosis Components (Figure 6).**Figure 6. Reverse Osmosis Components**

- a. High Pressure Pump (1). This is a three-plunger positive displacement pump. It pumps 101 gpm (382 lpm) pressurizing the water to the RO vessels (2). The pump is belt-driven by a 60 hp motor. Pump speed and delivery are fixed. The pump is mounted in a package separate from the ISO container. Restriction of the water supply (blocked intake flow) will cause extreme vibration of the pump, therefore, a low pressure switch (3) will automatically shut down the ROWPU. Extreme discharge pressure from the pump is unsafe, therefore, a high pressure switch (4) will also automatically shut down the ROWPU.
- b. RO Vessels (2). The pressurized feed water is discharged through a high pressure hose to a manifold connecting the top two RO vessels. Pressurized water enters the top two vessels and as it passes across the membrane sheets, some of the water passes through and is collected in a central product water tube. The feed water, now containing a higher concentration of dissolved (higher TDS), discharges through an end fitting into a high pressure pipe which directs the water back to the inlet end of the corresponding lower RO vessel. The water similarly passes across the membrane sheets within the lower vessels, producing additional product water.

- c. **System Pressure Control Valve (5).** The remaining feed water leaving the bottom RO vessels is now waste water and contains concentrated salts. From each vessel, it passes through an orifice to decrease the pressure and then is combined to pass through the high pressure control valve and another orifice. This valve controls the working pressure of the system. By controlling the pressure of the system, the valve controls the amount of product water made. A high pressure switch (4) limits the pressure to 900 psig (6205 kPa).
- d. **Product Water.** The product water from each vessel is collected in a header and piped to the outlet. An in-line TOS meter (6) and portable TDS meter monitor dissolved solids content to assure that product water meets potable water standards. Just before the outlet, calcium hypochlorite is added to disinfect the product water. The chlorinated product water is called potable water. When the TDS meets potable water standards, the product water hose is manually inserted in a storage tank. When the product water does not meet potable water standards, the hose is directed to waste. A pressure switch (7) shuts down the ROWPU if hose blockage causes high pressure.

NBC Filter (Figure 7). The ROWPU can decontaminate waters which contain nuclear, biological or chemical agents. The feed water filters and the reverse osmosis elements remove most of these agents, however, safe levels are not assured. When decontaminating NBC contaminated water, the product water is additionally passed through the NBC filter for final agent removal. After filtration, the water is chlorinated and is potable. The filter is connected by jumper hoses when required. The filter contains a layer (bed) of activated carbon (1) and a layer (bed) of ion exchange resin beads (2). The NBC agents are removed by these materials. The carbon and resin beads are replaced after each 100 hours of water production to assure that there is always capability to absorb NBC materials.

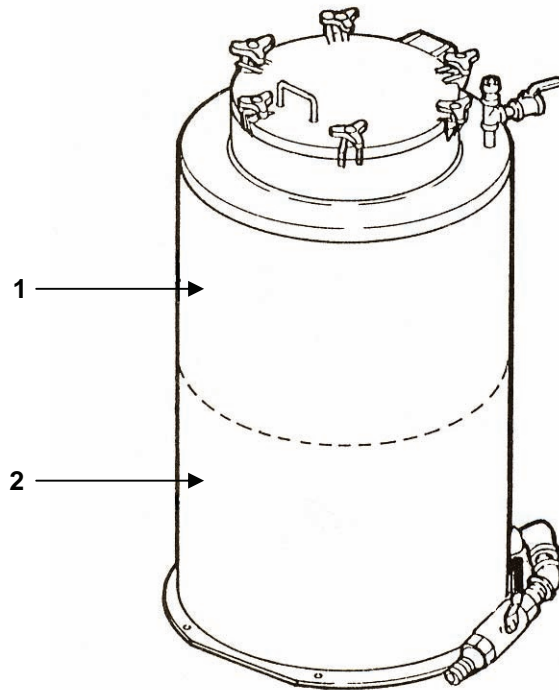


Figure 7. Operation of NBC Filter

Chemical Treatment

- a. Chemical Pumps and Tanks (Figure 8). There are three chemical injection pumps; one for polyelectrolyte (1), one for sequestrant (2) and one for hypochlorite (3). Each pump can be adjusted to control its delivery or to turn it off. Each of the three chemicals is contained in a tank. Each tank is labeled by name and corresponding identifying symbol:

Polyelectrolyte - triangle (4)
Sequestrant - square (5)
Hypochlorite - circle (6)

The tanks are manually filled with potable water from the utility hose. The polyelectrolyte and sequestrant are each supplied in a one gallon container with graduated dispensing neck to allow proper addition to the chemical tanks. Hypochlorite is added by emptying premeasured packages of dry chemical and adding water.

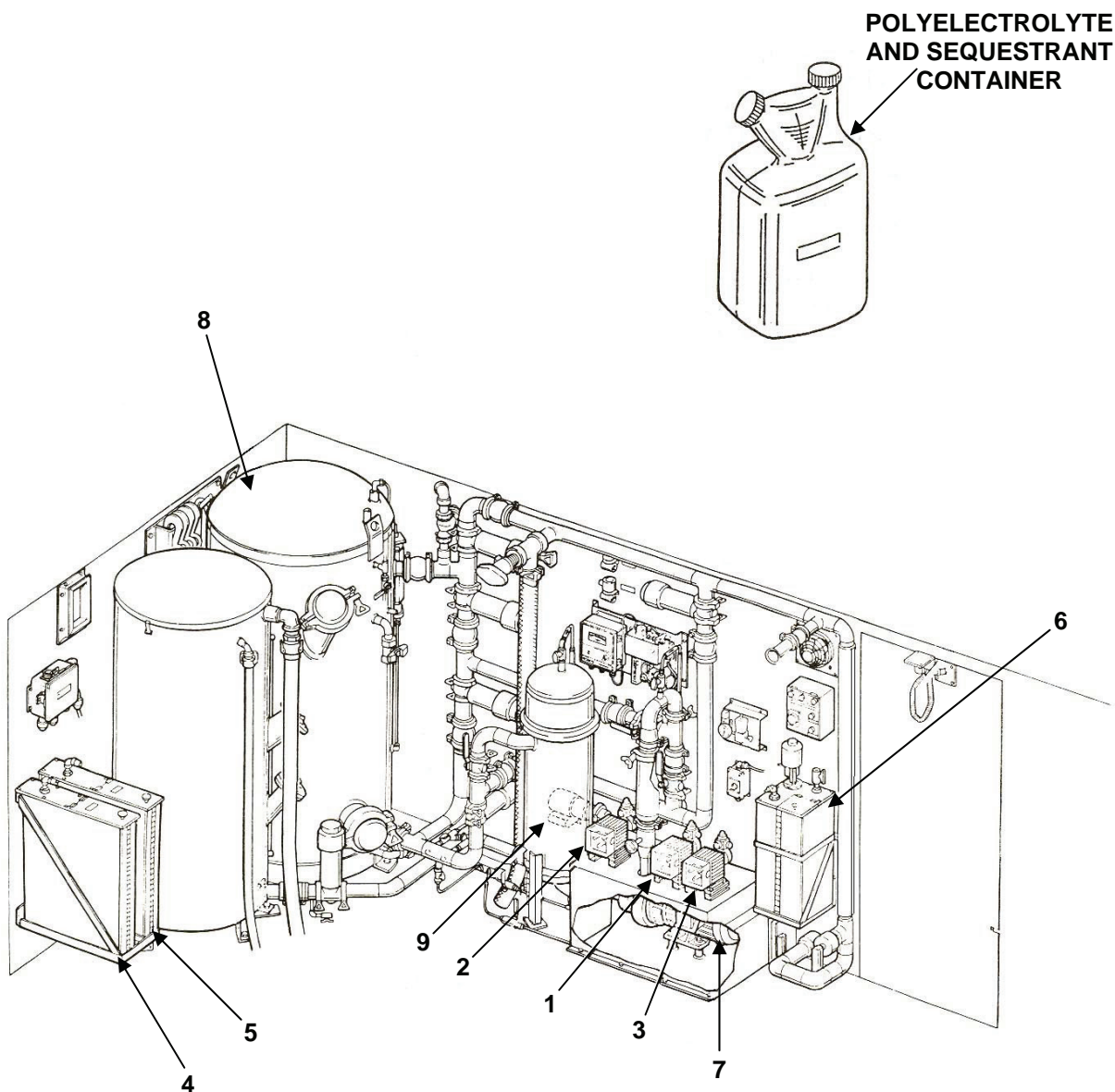


Figure 8. Chemical Treatment Components

- b. **Polyelectrolyte.** The chemical pumped from the polyelectrolyte tank (4) by the polyelectrolyte pump (1). It is injected under pressure into the feed water at the feed water booster pump (7) inlet. The polyelectrolyte acts to trap very fine dirt particles in the media filter (8). These particles normally will not form larger particles because of electrical charges within the structures. The polyelectrolyte is a long string like molecule which also has electrical charges along its length. As a polyelectrolyte string contacts the fine particles, the electrical charges hold them and larger sticky floc particles are formed. When a floc particle contacts a grain of filter media, there is a good chance it will stick. Some polyelectrolyte strings will stick to media grains and then trap fine dirt particles as they pass through the media filter. The amount of polyelectrolyte is very important. If there is not enough polyelectrolyte, too many fine particles escape. If there is too much polyelectrolyte, the electrical charges interfere with each other and many of the fine particles and some polyelectrolyte as well escapes from the filter. The amount of polyelectrolyte used must be carefully optimized to give the best removal of fine particles.
- c. **Sequestrant.** The chemical pumped from the sequestrant tank (5) by sequestrant pump (2). Sequestrant (scale inhibitor) is injected into the feed water after the media filter to minimize or avoid the formation of scale in the RO elements. The amount of sequestrant (if needed at all) depends on the raw water source.
- d. **Hypochlorite.** The chemical pumped from the hypochlorite tank (6) by the hypochlorite backwash pump (9) and injected into the water flow during media filter backwash. It acts to kill algae and bacteria which can form a sticky matt on top of the filter media. If hypochlorite is not used, the algae will make the AG media in the media filter so sticky that backwashing will not remove the suspended solids and algae. The tank and chemical packets are marked with a circle for easy identification. During operation, hypochlorite is pumped by the hypochlorite pump (3) and injected into product water. This provides the chlorine residual amount needed to keep the water safe to drink (potable) during distribution and use.

Air Supply (Figure 9). The air compressor (1), mounted in the high pressure pump package (2), is the source of air pressure to operate automatic valves and aid in media filter backwash. Compressed air is stored in the air reservoir (3) which provides 1800 psig (12,400 kPa) service air. An inlet air filter is located at the air compressor. A high pressure outlet air filter (4) is inside the van. An air system low pressure regulator valve (5) reduces the air pressure to 85 psig (585 kPa) for service use. An air dryer (6) further reduces moisture from the low pressure air used for valves and instruments. Air manifolds (7) and (8) distribute the process and utility air.

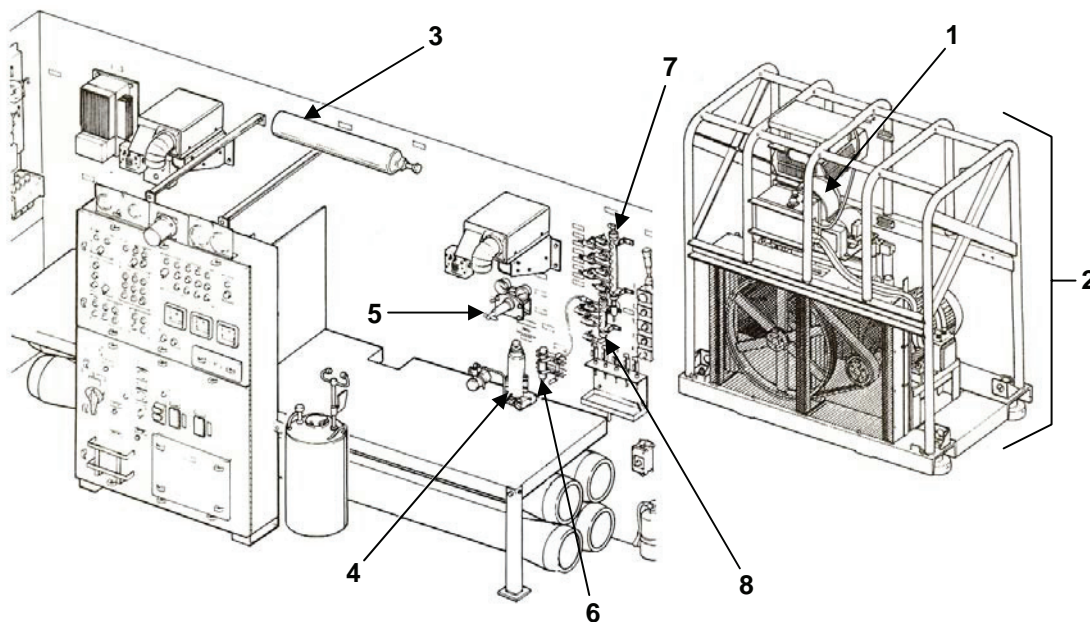
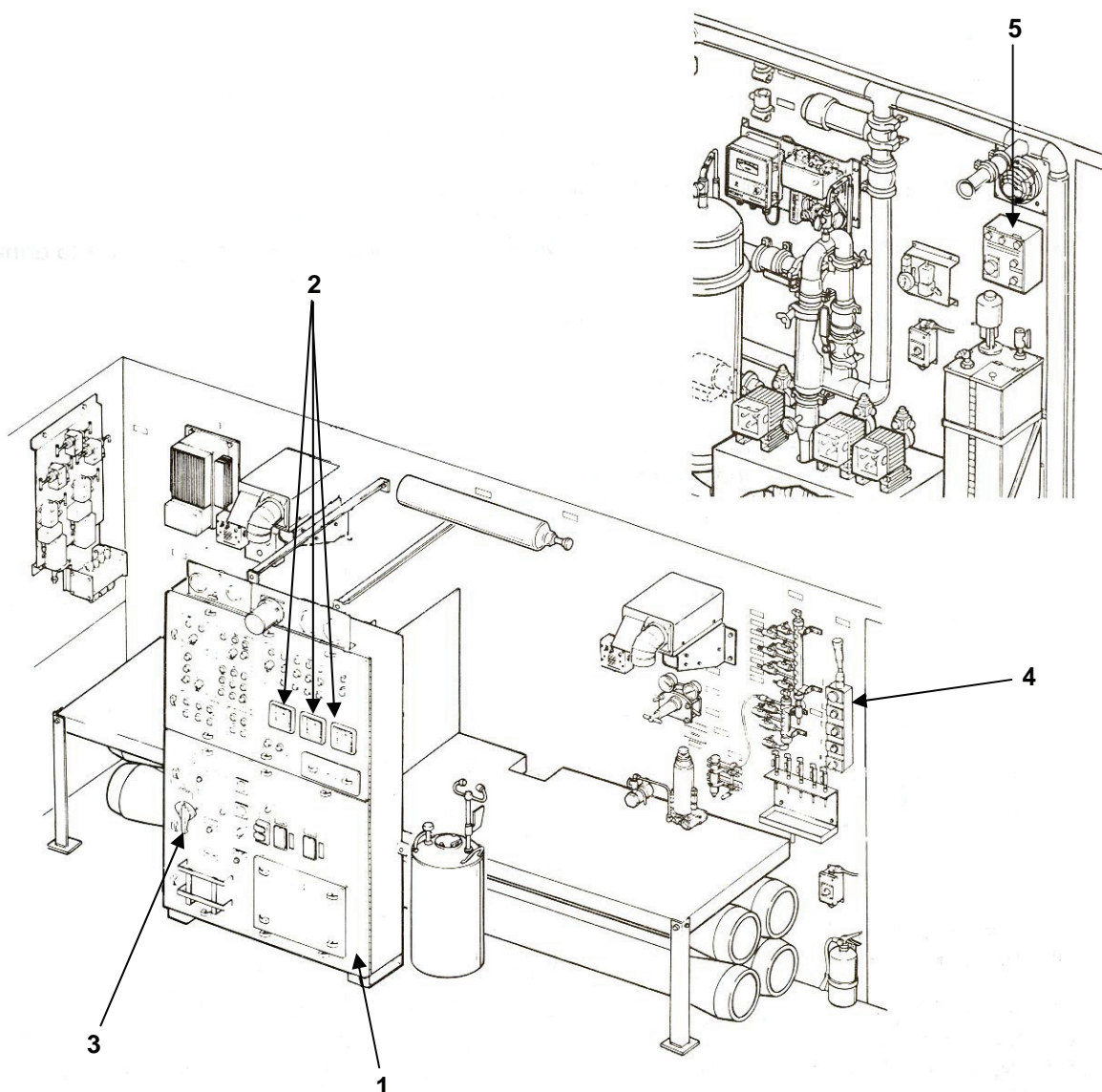


Figure 9. Air Supply Components

Electrical Controls (Figure 10).

- a. Main Control Panel. Almost all the electrical switching gear, electrical controls and indicating lights used to operate the ROWPU are located on the main control panel (1). Flow meters (2) are also mounted in this panel. The main circuit breaker (3) on this panel controls power to all circuits within the ROWPU. Relays and timers are used for control logic. A warning horn sounds and yellow lights go on when operator attention is needed. An alert horn sounds continuously and red lights go on when an automatic shutdown occurs. Blue indicator lights indicate open automatic valves and green lights indicate operating pumps or operating mode.
- b. Switch Panel No. 1 (4). This panel contains distribution pump ON/OFF pushbuttons, a distribution pump ON indicator light, a van interior light switch and a utility outlet.
- c. Switch Panel No. 2 (5). This panel contains the warning and alert horns, a van interior light switch, a hypochlorite tank mixer ON/OFF switch, a vent fan switch and a utility outlet.

**Figure 10. Electrical Controls**

POTABLE WATER DISTRIBUTION SYSTEM (Figure 11). This system handles and stores the potable water produced by the ROWPU.

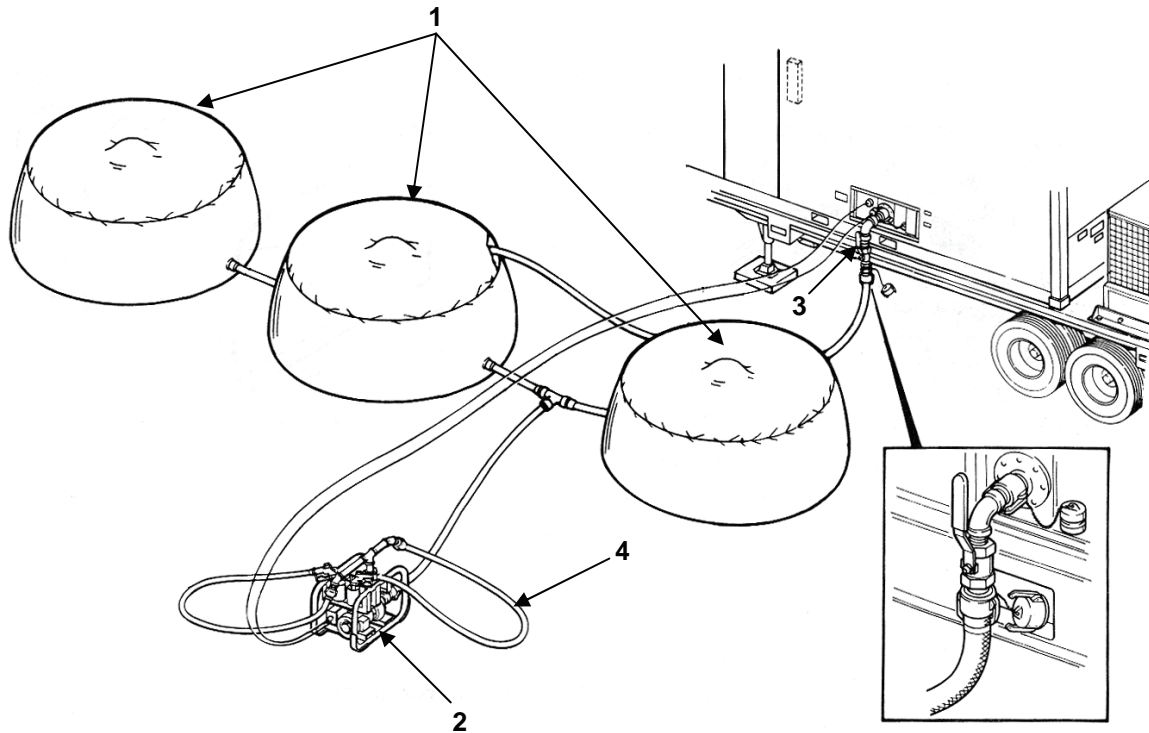


Figure 11. Potable Water Distribution System

- a. **Storage Tanks (1).** Three 3000 gallon (11,355 l) storage tanks provide temporary water storage. The tanks are air collar (onion tank) design.
- b. **Distribution Pump (2).** This pump provides water for distribution through two hoses with dispensing nozzles. The start-stop station for this pump is mounted inside the "rear" door of the van (on distribution system side). A local switch at the pump must be in the ON position before the pump can be turned on. This switch also turns the pump off/on as long as the start button has been pushed.
- c. **Product Shut-Off Valve (3).** This valve blocks water loss during cleaning and can be used to provide sufficient back pressure for the utility hose when filling tanks.
- d. **Dispensing Hoses and Nozzles (4).** These hoses, with attached nozzles, are pressurized by the distribution pump to deliver potable water from the storage tanks.

CHAPTER 2
DIRECT SUPPORT
TROUBLESHOOTING PROCEDURES

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22 1/2 TON 8-WHEEL TANDEM
DIRECT SUPPORT TROUBLESHOOTING PROCEDURES**

INTRODUCTION TO TROUBLESHOOTING

The Troubleshooting Malfunctions list the common malfunctions, which you may find during the operation or maintenance of the ROWPU or its components. Perform the tests/inspections and corrective actions in the order described.

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

TROUBLESHOOTING PROCEDURE

RAW WATER PUMP

SYMPTOM

Raw water pump assembly is noisy.

MALFUNCTION

Check for foreign objects in pump.

CORRECTIVE ACTION

Disassemble pump (WP 0014 00).

Inspect pump internals for wear and damage.

CORRECTIVE ACTION

Replace worn or damaged parts (WP 0014 00).

Turn motor shaft by hand. It should turn easily, without noise, dragging, or rough spots.

CORRECTIVE ACTION

If rotation is not smooth, motor bearings need to be replaced (WP 0015 00).

SYMPTOM

Raw water pump runs but will not prime. Raw water pump does not supply sufficient pressure or flow.

MALFUNCTION

Check pump internals for wear and damage.

CORRECTIVE ACTION

Replace worn or damaged parts (WP 0014 00).

SYMPTOM

Raw water pump motor hums but won't turn.

MALFUNCTION

Check for foreign objects in pump.

CORRECTIVE ACTION

Disassemble pump (WP 0014 00).

Inspect pump internals for wear and damage.

CORRECTIVE ACTION

Replace worn or damaged parts (WP 0014 00).

Tag and disconnect motor leads (T1, T2, T3) (See Interconnection diagram, FO-2, Sheet 10). Set multimeter to Ohms x 1000 scale and connect test leads between each motor lead and the motor frame. Readings should be infinity for each step.

CORRECTIVE ACTION

Replace motor if the meter reading is zero (WP 0015 00).

Set multimeter to Ohms x 1 scale and check for continuity between all pairs of motor leads, T1 and T2, T1 and T3, T2 and T3. Readings should be zero or near zero for each step.

CORRECTIVE ACTION

Replace motor if reading is infinity (WP 0015 00).

Turn motor shaft by hand. It should turn easily, without noise, dragging, or rough spots.

CORRECTIVE ACTION

If rotation is not smooth, motor bearings need to be replaced (WP 0015 00).

Refer to raw water pump electrical troubleshooting, fourth Malfunction.

TROUBLESHOOTING PROCEDURE**AIR BLOWDOWN SOLENOID VALVE****SYMPTOM**

Air blowdown solenoid valve leaks air when it should be closed.

MALFUNCTION

Check valve for plugging or damage.

CORRECTIVE ACTION

Remove valve from piping and disassemble (WP 0052 00).
Clean out valve and inspect for wear.
If necessary, replace valve stem and seat (WP 0052 00).
If necessary, replace valve and solenoid assembly (WP 0052 00).

TROUBLESHOOTING PROCEDURE**AIR COMPRESSOR****SYMPTOM**

Air compressor oil has water in it (looks milky).

MALFUNCTION

Visually inspect for water in air compressor.

CORRECTIVE ACTION

Send to General Support for pistons and piston rings inspection and repair, as necessary (WP 0097 00 or WP 0098 00).

SYMPTOM

Air compressor does not turn over easily by hand.

MALFUNCTION

Visually confirm malfunction.

CORRECTIVE ACTION

Send air compressor to General Support for overhaul (WP 0097 00 or WP 0098 00).

SYMPTOM

Air compressor motor is noisy.

MALFUNCTION

Turn motor shaft by hand. It should turn easily, without noise, dragging, or rough spots.

CORRECTIVE ACTION

Replace bearings if rotation is not smooth (WP 0075 00 or WP 0076 00).
Replace motor if teardown inspection reveals worn or damaged rotor or stator (WP 0075 00 or WP 0076 00).

SYMPTOM

Air compressor has localized overheating.

MALFUNCTION

Locate which cylinder is overheating from recompression, or which high cylinder pressure is causing the problem.

CORRECTIVE ACTION

Replace inlet and outlet valves from affected chamber (WP 0077 00).

SYMPTOM

Air compressor is noisy.

MALFUNCTION

Identify noise.

NOTE

Light tapping when compressor is started is normal.

CORRECTIVE ACTION

Continuous light tapping is caused by oil dipstick. Remove dipstick and make sure it is straight.

Light knocking may be a small-end bearing. Replace air compressor (WP 0077 00).

Send to General Support for repair.

Rumbling usually indicates main bearings. Replace air compressor (WP 0077 00).

Send to General Support for repair.

SYMPTOM

Air compressor interstate relief valves keep blowing.

MALFUNCTION

Locate which relief valve is blowing. This generally indicates pressure leaking back or rising cylinder pressure on the following stage.

CORRECTIVE ACTION

Replace leaking interstage relief valve (WP 0075 00 or WP 0076 00).

Replace inlet and outlet valves on the following stage (WP 0075 00 or WP 0076 00).

Replace air compressor (WP 0078 00 or WP 0079 00). Send to General Support for repair.

SYMPTOM

Air compressor runs but does not build up pressure.

MALFUNCTION

Close air tank block valve and operate air compressor.

CORRECTIVE ACTION

If pressure goes up to compressor shutdown point, air compressor is working correctly. Check for leaks downstream of air regulator.

If pressure does not rise to compressor shutdown, check for leaks or plugging upstream of pressure regulator.

MALFUNCTION

Check all relief valves for leakage. If leakage is evident, check for plugging of air lines (especially in freezing conditions) which may cause the valve to leak.

CORRECTIVE ACTION

If no cause can be found for valve leak, replace leaking relief valve. (Interstate and high pressure relief valve replacement is in WP 0083 00. Low pressure relief valve replacement is in WP 0075 00 or WP 0076 00.

Check air blowdown solenoid valve for internal leakage. Remove outlet tubing from solenoid valve and feel if air is leaking through the valve when it is normally closed. Disconnect valve electrical connector if air can be felt.

CORRECTIVE ACTION

If air leaks continuously through valve, clean and repair air blowdown solenoid valve (WP 0057 00).

If air leak stops when electrical connector is disconnected, refer to air blowdown solenoid valve electrical troubleshooting.

Check relief valve on the back of air pressure regulator.

CORRECTIVE ACTION

If leaking, replace pressure regulator (WP 0066 00).

Inspect all air lines, starting at air compressor and disconnect lines one at a time until the source of air leak or plugging is evident.

CORRECTIVE ACTION

Repair as necessary. Replace air compressor if steps have not isolated the problem (WP 0078 00 or WP 0079 00). Send to General Support for repair.

SYMPTOM

Air compressor runs but does not reach 1700-1800 psig.

MALFUNCTION

Close air tank block valve and operate air compressor.

CORRECTIVE ACTION

If pressure goes up to compressor shutdown point, air compressor is working correctly. Check for leaks downstream of air regulator.

If pressure does not rise to compressor shutdown, check for leaks or plugging upstream of pressure regulator.

MALFUNCTION

Check all relief valves for leakage. If leakage is evident, check for plugging of air lines (especially in freezing conditions) which may cause the valve to leak.

CORRECTIVE ACTION

If no cause can be found for valve leak, replace leaking relief valve. Interstate and high pressure relief valve replacement is in WP 0083 00. Low pressure relief valve replacement is in WP 0075 00 or WP 0076 00.

MALFUNCTION

Check air blowdown solenoid valve for internal leakage. Remove outlet tubing from solenoid valve and feel if air is leaking through the valve when it is normally closed. Disconnect valve electrical connector if air can be felt.

CORRECTIVE ACTION

If air leaks continuously through valve, clean/repair air blowdown solenoid valve (WP 0057 00).

If air leak stops when electrical connector is disconnected, refer to air blowdown solenoid valve electrical troubleshooting.

Check relief valve on the back of air pressure regulator.

CORRECTIVE ACTION

If leaking, replace pressure regulator (WP 0066 00).

Inspect all air lines, starting at air compressor and disconnect lines one at a time until the source of air leak or plugging is evident.

CORRECTIVE ACTION

Repair as necessary (WP 0075 00 or WP 0076 00).

Check the third stage valves.

CORRECTIVE ACTION

Replace inlet and outlet valves on third stage (WP 0075 00 or WP 0076 00).

Replace air compressor (WP 0077 00) and send to General Support for repair.

SYMPTOM

Air compressor has low output.

MALFUNCTION

Check inlet air filter on air compressor.

CORRECTIVE ACTION

Replace inlet air filter if dirty (WP 0077 00).

Check system for air leaks.

CORRECTIVE ACTION

Repair as necessary (WP 0077 00).

MALFUNCTION

Check air compressor first stage valves for wear and corrosion.

CORRECTIVE ACTION

Replace inlet and outlet valves (WP 0082 00).
Replace air compressor (WP 0077 00) and send to General Support for piston and piston ring repair.

TROUBLESHOOTING PROCEDURE**AIR SYSTEM****SYMPTOM**

Air system pressure cannot be adjusted down to 85 psig.

MALFUNCTION

Check air pressure regulator adjustment.

CORRECTIVE ACTION

Replace air pressure regulator (WP 0066 00).

SYMPTOM

Air system pressure is less than 80 psig and cannot be increased.

MALFUNCTION

Problem typically associated with high air consumption. Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Shut off air manifold block valves one at a time until air pressure climbs.

CORRECTIVE ACTION

If closing a specific valve causes air pressure to rise, troubleshoot that device for leakage.
If no leaks are found, replace air regulator (WP 0066 00).

SYMPTOM

Outlet air filter base leaks air.

MALFUNCTION

Isolate leak.

CORRECTIVE ACTION

Replace preformed packings if top cap or filter cylinder leaks at base (WP 0064 00).
Replace top and relief valve assembly if relief valve on filter top leaks (WP 0075 00).
Replace leaking fitting if base leaks at tube fittings (WP 0064 00).
Replace filter assembly if base leaks (WP 0064 00).
Replace air filter cartridge if air comes out from underneath base (WP 0064 00).

SYMPTOM

Outlet air filter suspected of bypassing water or oil.

MALFUNCTION

Turn off air compressor and close air storage tank valve. Relieve air system pressure by opening a drain valve on either air manifold. Remove air filter outlet check valve, install new air filter in filter chamber and start air compressor. Run air compressor for ten minutes and check if water is being blown out of filter outlet port.

CORRECTIVE ACTION

If water is being blown out, filter is bypassing. Replace outlet air filter assembly (WP 0064 00).

SYMPTOM

Air storage tank suspected of holding water.

WARNING

Extreme care must be taken with the following procedure. If pressurized air tank is dropped and valve is damaged, air tank may swing violently and cause personal injury or equipment damage.

MALFUNCTION

Run air compressor and build up 50 psig of pressure. Turn off air compressor and close air storage tank valve. Relieve air system pressure by opening a drain valve on either air manifold. Disconnect air line to air storage tank and carefully remove air line with the air tank from its mounts (WP 0065 00). Hold tank vertical with valve on bottom and slowly open valve. If there is any water in tank, it will be blown out.

CORRECTIVE ACTION

If there is water in tank, refer to Symptom for outlet air filter bypassing water or oil.

SYMPTOM

Air pressure cycles rapidly between 1500-1800 psig.

MALFUNCTION

Check air blowdown solenoid valve for internal leakage. Remove outlet tubing from solenoid valve and feel if air is leaking through valve when it should be closed. Disconnect valve electrical connector if air can be felt.

CORRECTIVE ACTION

Clean and repair air blowdown solenoid valve if air leaks continuously through valve (WP 0057 00).

If air leak stops when electrical connector is disconnected, refer to air blowdown solenoid valve electrical troubleshooting.

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12) and turn off air compressor. Relieve all air system pressure and close air storage tank valve. Start air compressor and let air pressure build to 1800 psig. Open air tank block valve. A rush of air should be heard as air tank valve is opened and tank starts filling.

CORRECTIVE ACTION

If there is no sound, air tank inlet is plugged. Check air lines at tank for plugging. If it sounds as if air bubbles are in the tank, refer to Symptom for air storage tank suspected of holding water.

Check for air leaks or a part that is using too much air, if above steps have not revealed problem. Air is being consumed as fast as air compressor pushes it out.

CORRECTIVE ACTION

Check entire system and repair air leaks as necessary.
Replace air tank if problem has not been corrected (WP 0065 00).

SYMPTOM

Outlet air filter filled with a white, oily substance.

MALFUNCTION

Substance is an oil, water mixture that comes from air compressor.

CORRECTIVE ACTION

Disassemble and clean filter chamber assembly (WP 0064 00).

Check for plugging in outlet air filter blowdown solenoid valve.

CORRECTIVE ACTION

Disassemble and clean air blowdown solenoid valve (WP 0057 00).

Check outlet filter blowdown solenoid valve for correct operation. Start air compressor and check that solenoid valve opens and blows down an air, water mixture for about 30 seconds every 15 minutes of compressor operating time.

CORRECTIVE ACTION

If valve does not operate correctly, refer to air blowdown valve electrical troubleshooting.
Replace/repair air blowdown valve if troubleshooting indicates the valve is not operational (WP 0057 00).

SYMPTOM

Air compressor runs continuously. (Also refer to Symptom air compressor runs but does not reach 1700-1800 psig.)

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Close each valve on both air manifolds, one at a time, and note if the closing of a valve allows air compressor to build up pressure. If a particular valve closing allows air compressor to build up pressure, troubleshoot the air line, its fittings and its components for leakage. Remove tubing from outlet side of solenoid valves to check for leakage through the valve if leakage is traced.

CORRECTIVE ACTION

Replace or repair leaking low pressure air components.

Notify General Support to check for leaks in high pressure valves and fittings.

CORRECTIVE ACTION

Refer to General Support to replace/repair leaking high pressure valves, fittings and components.

TROUBLESHOOTING PROCEDURE

CYCLONE SEPARATORS (Model WTA-060 ONLY)

SYMPTOM

No flow through cyclone separators.

MALFUNCTION

Check for internal plugging.

CORRECTIVE ACTION

Disassemble separator and remove blockage. Replace cyclone liners, if damaged (WP 0017 00).

TROUBLESHOOTING PROCEDURE

BOOSTER PUMP

SYMPTOM

Booster pump assembly is noisy.

MALFUNCTION

Check for foreign objects in pump.

CORRECTIVE ACTION

Disassemble pump (WP 0045 00).

MALFUNCTION

Inspect pump internals for wear and damage.

CORRECTIVE ACTION

Replace worn or damaged parts (WP 0045 00).

Turn motor shaft by hand. It should turn easily, without noise, dragging, or rough spots.

CORRECTIVE ACTION

Replace bearings if rotation is not smooth (WP 0046 00).

SYMPTOM

Booster pump does not supply sufficient pressure or flow.

MALFUNCTION

Check pump internals for wear and damage.

CORRECTIVE ACTION

Replace worn or damaged parts (WP 0045 00).

SYMPTOM

Booster pump motor hums but will not turn.

MALFUNCTION

Check for foreign objects in pump.

CORRECTIVE ACTION

Disassemble pump (WP 0046 00).

Inspect pump internals for wear and damage.

CORRECTIVE ACTION

Replace worn or damaged parts (WP 0046 00).

Tag and disconnect motor leads (T1, T2, T3) (See Interconnection diagram, FO-2, Sheet 10). Set multimeter to Ohms x 1000 scale and connect test leads between each motor lead and motor frame. Readings should be infinity for each step.

CORRECTIVE ACTION

Replace motor if the meter reading is zero (WP 0046 00).

Set multimeter to Ohms x 1 scale and check for continuity between all pairs of motor leads, T1 and T2, T1 and T3, T2 and T3. Readings should be zero or near zero for each step.

CORRECTIVE ACTION

Replace motor if reading is infinity (WP 0046 00).

MALFUNCTION

Turn motor shaft by hand. It should turn easily and without noise, dragging or rough spots.

CORRECTIVE ACTION

If rotation is not smooth, bearings need to be replaced (WP 0046 00).

TROUBLESHOOTING PROCEDURE**PRESSURE GAUGES****SYMPTOM**

Pressure gauge does not register pressure (stays on zero).

WARNING

ROWPU operates with high pressure water and air. Make certain all vents and drains are open and pressure is relieved before disconnecting gauges.

MALFUNCTION

(Model WTA-060 only) Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Remove pressure sensing line from gauge, making sure it does not spray personnel or equipment. Start ROWPU (WP 0008 00, TM 10-4610-232-12) and check that water comes out of disconnected tubing.

CORRECTIVE ACTION

Replace pressure gauge if water comes out of tubing (WP 0023 00).
If water does not come out of tubing, check for blockage in gauge line.

(Model ROWPU-1 only) Check for water in gauge by opening drain valve to check that water comes out of drain valve.

CORRECTIVE ACTION

Replace pressure gauge if water comes out of tubing (WP 0024 00).
If water does not come out of tubing, check for blockage in gauge line.

SYMPTOM

Pressure gauge does not zero.

WARNING

ROWPU operates with high pressure water and air. Make certain all vents and drains are open and pressure is relieved before disconnecting gauges.

MALFUNCTION

Check that there is no pressure on gauge. Shut down ROWPU (WP 0008 00, TM 10-4610-232-12) and open all vents and drains. Carefully start disconnecting sensing line from gauge.

CORRECTIVE ACTION

Replace gauge if it does not zero with the sensing line disconnected (WP 0023 00 or WP 0024 00).

SYMPTOM

Pressure gauge suspected of not being accurate.

WARNING

ROWPU operates with high pressure water and air. Make certain all vents and drains are open and pressure is relieved before disconnecting gauges.

MALFUNCTION

Test gauge (WP 0023 00 or WP 0024 00). Disconnect sensing line from gauge and remove gauge. Use a dead weight tester and check gauge for accuracy.

CORRECTIVE ACTION

Replace gauge if it does not meet test standards listed. Low pressure gauge: $\pm 5\%$ of MI scale. High pressure gauge: $\pm 1.5\%$ of full scale, from 300-900 psig: $\pm 2.5\%$ of full scale, from 0-300 and above 900 psig.

SYMPTOM

System pressure gauge media or cartridge pressure gauges fluctuate.

MALFUNCTION

Check that backwash air solenoid valve is not leaking air into media filter. Close air block valve at the air manifold for backwash air solenoid valve. Operate for 10 minutes and watch gauge fluctuation.

CORRECTIVE ACTION

If fluctuations stop, refer to water in air system troubleshooting of backwash air solenoid valve (TM 10-4610-232-12).

Check high pressure pump inlet and outlet valve discs and spring.

CORRECTIVE ACTION

Replace any valve discs that show radial or circumferential cracks, pitting (other than normal surface wear), nicks, gouges, elongated center holes and a chalky feeling or appearance when scratched with a fingernail (WP 0082 00).
Replace any broken valve springs (WP 0082 00).

MALFUNCTION

Check high pressure pump inlet and outlet valve seats.

CORRECTIVE ACTION

Visual inspection without removing valve seats should reveal seat problems. Remove valve seats if a closer examination is required. Replace any valve seats that show pitting other than minor surface wear, nicks, or gouges (WP 0082 00). Replace pulsation dampener if high pressure pump repairs or inspections have not fixed the problem. Dampener only affects high pressure fluctuations and will have no affect on low pressure suction side fluctuations, which are controlled by media filter and cartridge filter air blankets. Refer to those troubleshooting symptoms and backwash air solenoid leaking problems for continued low pressure fluctuations. Refer to WP 0082 00 for pulsation dampener replacement.

TROUBLESHOOTING PROCEDURE**CARTRIDGE FILTER****SYMPTOM**

Cartridge filter fills with filter media.

MALFUNCTION

Check for broken water distributor in media filter.

CORRECTIVE ACTION

Replace media filter (WP 0047 00).

TROUBLESHOOTING PROCEDURE**NBC FILTER****SYMPTOM**

NBC filter media (resin) in product storage tank.

MALFUNCTION

Remove NBC filter media from tank (WP 0103 00, TM 10-4610-232-12). Inspect NBC tank distribution laterals and headers for cracks or breaks.

CORRECTIVE ACTION

Repair broken distributors by replacement (WP 0063 00).
Replace tank assembly, if necessary (WP 0063 00).

MALFUNCTION

Remove and clean product water backflow check valve (located at the back wall, behind control panel at ceiling). Install product water backflow check valve without spring and disc. Operate ROWPU and flush product water to waste until no media is present in product water hose. Flushing should only take a few minutes unless piping is plugged with media.

CORRECTIVE ACTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12) and install spring and disc on check valve. Return ROWPU to service.

TROUBLESHOOTING PROCEDURE**HIGH PRESSURE PUMP ASSEMBLY MOUNTS****SYMPTOM**

High pressure pump assembly stable level leaks.

MALFUNCTION

Remove high pressure pump assembly and stable level. Pressurize level to 3 psig maximum air pressure and insert in a water tank to find leak.

CORRECTIVE ACTION

Replace stable level if leak is in the body (WP 0082 00).
Repair stable level if leak is in hose (WP 0082 00).
Replace stable level if leak cannot be found (WP 0082 00). Leak may only be evident at higher pressures, which cannot be checked without a load on stable level.

TROUBLESHOOTING PROCEDURE**DISTRIBUTION PUMP****SYMPTOM**

Distribution pump motor hums but will not turn.

MALFUNCTION

Check for foreign objects in pump

CORRECTIVE ACTION

Disassemble pump (WP 0088 00).

Inspect pump internals for wear and damage.

CORRECTIVE ACTION

Replace worn or damaged parts (WP 0088 00).

MALFUNCTION

Tag and disconnect motor leads (T1, T2, T3) (see Interconnection diagram, FO-2, Sheet 10). Set multimeter to Ohms x 1000 scale and connect test leads between each motor lead and the motor frame. Readings should be infinity for each step.

CORRECTIVE ACTION

Replace motor if meter reading is zero (WP 0089 00).

Set multimeter to Ohms x 1 scale and check for continuity between all pairs of motor leads, T1 and T2, T1 and T3, T2 and T3. Readings should be zero or near zero for each step.

CORRECTIVE ACTION

Replace motor if reading is infinity (WP 0089 00).

Turn motor shaft by hand. It should turn easily, without noise, dragging, or rough spots. If rotation is not smooth, bearings need to be replaced.

CORRECTIVE ACTION

Replace motor bearings (WP 0089 00).

SYMPTOM

Distribution pump assembly is noisy.

MALFUNCTION

Check for foreign objects in pump.

CORRECTIVE ACTION

Disassemble pump (WP 0088 00).

Inspect pump internals for wear and damage.

CORRECTIVE ACTION

Replace worn or damaged parts (WP 0088 00).

Turn motor shaft by hand. It should turn easily, without noise, dragging or rough spots.

CORRECTIVE ACTION

If rotation is not smooth, replace motor bearings (WP 0089 00).

SYMPTOM

Distribution pump runs but has low or no flow.

MALFUNCTION

Check pump internals for wear and damage.

CORRECTIVE ACTION

Replace worn or damaged parts (WP 0088 00).

TROUBLESHOOTING PROCEDURE**HIGH PRESSURE PUMP****SYMPTOM**

High pressure pump is noisy. (Also refer to pressure gauge troubleshooting.)

MALFUNCTION

Isolate noise.

CORRECTIVE ACTION

Rumbling indicates bad crankshaft bearings. Replace pump and repair as necessary (WP 0085 00).

Knocking indicates bad connecting rod bearings. Replace pump and repair as necessary (WP 0085 00).

Clicking or tapping indicates valve problems. Check high pressure pump inlet and outlet valve discs and springs. Replace any valve disc that shows radial or circumferential cracks, pitting (other than normal surface wear), nicks, gouges, elongated center holes and a chalky feeling/appearance when scratched with fingernail (WP 0082 00). Replace any broken valve springs (WP 0082 00).

SYMPTOM

High pressure pump motor is noisy.

MALFUNCTION

Turn motor shaft by hand. It should turn easily, without noise, dragging, or rough spots.

CORRECTIVE ACTION

Replace motor bearings if rotation is not smooth (WP 0081 00).

SYMPTOM

High pressure pump oil has water in it (looks milky).

MALFUNCTION

Visually inspect for water in high pressure pump.

CORRECTIVE ACTION

Replace pony rod oil seals (WP 0085 00).

MALFUNCTION

Operate unit and check that plunger packing is not leaking excessively.

CORRECTIVE ACTION

Replace packing, if necessary (WP 0085 00). Replace plunger, if worn (WP 0085 00).

SYMPTOM

High pressure pump discharge pressure will not go to 900 psig.

MALFUNCTION

Check high pressure control valve needle for wear.

CORRECTIVE ACTION

Replace stem and needle, if worn (WP 0082 00).

Check high pressure gauge for accuracy.

CORRECTIVE ACTION

Replace gauge if it does not meet test standards listed below. Low pressure gauge: $\pm 5\%$ of MI scale. High pressure gauge: $\pm 1.5\%$ of full scale, from 300-900 psig: $\pm 2.5\%$ of full scale, from 0-300 and above 900 psig.

Check feed low pressure switch for operation.

CORRECTIVE ACTION

Refer to pressure switch troubleshooting (feed low pressure switch).

SYMPTOM

High pressure pump and piping is moderately or violently pulsating or vibrating. High pressure pump is making hammering noises. (Also refer to pressure gauge troubleshooting.)

MALFUNCTION

Check high pressure pump inlet and outlet valve discs and springs. Replace any valve discs that show radial or circumferential cracks, pitting (other than normal surface wear), nicks, gouges, elongated center holes or a chalky feeling/appearance when scratched with fingernail (WP 0082 00).

CORRECTIVE ACTION

Replace any broken valve springs (WP 0081 00).

Check high pressure pump inlet and outlet valve seats. If a visual inspection does not reveal the problem, remove outlet valve seats for closer examination.

CORRECTIVE ACTION

Replace any seats that show abnormal pitting, nicks, or gouges (WP 0082 00).

MALFUNCTION

Replace pulsation dampener if high pressure pump repairs or inspections have not fixed the problem. Pulsation dampener only affects high pressure fluctuations and will have no affect on low pressure suction side fluctuations, which are controlled by media filter and cartridge filter air blankets. Refer to pulsation dampener troubleshooting and backwash air solenoid troubleshooting for leaking problems with continued low pressure fluctuations.

CORRECTIVE ACTION

Replace pulsation dampener (WP 0082 00).

SYMPTOM

High pressure pump starts but shuts down on feed high pressure.

MALFUNCTION

Check that feed water is flowing out of waste hoses and the raw water and boost pump are running. If water is not flowing, check system to locate blockage. Inspect for frozen hoses, if operating in freezing conditions.

CORRECTIVE ACTION

Repair high pressure pump and hoses, as necessary (WP 0082 00).

Check feed high pressure switch for accuracy.

CORRECTIVE ACTION

Refer to pressure switch troubleshooting (feed high pressure switch).

Check high pressure gauge for accuracy.

CORRECTIVE ACTION

Replace gauge if it does not meet test standards listed below. Low pressure gauge: $\pm 5\%$ of MI scale. High pressure gauge: $\pm 1.5\%$ of full scale, from 300-900 psig: $\pm 2.5\%$ of full scale, from 0-300 and above 900 psig.

SYMPTOM

High pressure pump is started but generator loads down. Overload circuit breakers may open.

WARNING

Do not operate high pressure pump until water flows freely out of waste hoses. Injury to personnel or equipment damage may occur.

NOTE

If water flows freely from waste hose, proceed to malfunction for plugged or frozen high pressure and pressure sensing lines.

MALFUNCTION

Check for plugged or frozen high pressure lines and hoses on high pressure pump skid.

CORRECTIVE ACTION

Repair damaged high pressure lines and hoses, as necessary (WP 0082 00).

MALFUNCTION

Check feed high pressure switch for accuracy.

CORRECTIVE ACTION

Refer to pressure switch troubleshooting (feed high pressure switch).

Check for plugged or frozen high pressure and pressure switch sensing lines.

CORRECTIVE ACTION

Repair damaged high pressure lines and hoses, as necessary (WP 0082 00).
Replace gauge if it does not meet test standards listed. Low pressure gauge: $\pm 5\%$ of MI scale. High pressure gauge: $\pm 1.5\%$ of full scale, from 300-900 psig: $\pm 2.5\%$ of full scale, from 0-300 and above 900 psig.

TROUBLESHOOTING PROCEDURE**VALVES****SYMPTOM**

High pressure control valve leaks at stem.

MALFUNCTION

Tighten stem packing adjustment (WP 0021 00).

CORRECTIVE ACTION

If leak cannot be stopped, replace stem packing (WP 0021 00).

SYMPTOM

System pressure selector valve leaks at stem.

MALFUNCTION

Tighten stem packing adjustment (WP 0021 00).

CORRECTIVE ACTION

If leak cannot be stopped, replace pressure selector valve (WP 0021 00).

SYMPTOM

Automatic valve actuator does not work.

MALFUNCTION

Disassemble actuator and check for damage.

CORRECTIVE ACTION

Repair automatic valve actuator (WP 0048 00 or WP 0049 00).

TROUBLESHOOTING PROCEDURE**SAFETY VALVE****SYMPTOM**

Safety valve does not work. (Refer to schematic FO-1, sheet 8, line 822)

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from TB1-67 and TB1-77 (schematic FO-2, sheet 9). Check continuity, point-to-point, from transformer T1 (X1) (schematic FO-2, sheet 10) to TB1-67 and from TB1(X2) to TB1-77.

CORRECTIVE ACTION

Repair loose and damaged wires (WP 0025 00).

Replace circuit breakers CB7 or CB9 (schematic FO-2, sheet 8), if open (WP 0028 00).

Replace switch PB3 (schematic FO-2, sheet 11), if open (WP 0027 00).

TROUBLESHOOTING PROCEDURE**CHLORINE MIXER****SYMPTOM**

Chlorine mixer does not work (schematic FO-1, sheet 8, line 820).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point T1(X1) (schematic FO-2, sheet 10) to J12B. Repeat procedure from T1 (2X) to J12J (schematic FO-2, sheet 9).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0025 00).

Replace circuit breaker CB7 or CB9 (schematic FO-2, sheet 8), if open (WP 0028 00).

Replace switch PB3 (schematic FO-2, sheet 11), if open (WP 0027 00).

Replace or repair connector J12, if faulty (WP 0026 00).

TROUBLESHOOTING PROCEDURE**CIRCUIT BREAKERS****SYMPTOM**

Control circuit breaker (115 VAC) keeps tripping.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Refer to foldout electrical drawings and determine which breaker is tripping.

CORRECTIVE ACTION

Reset circuit breaker. If breaker will not stay set, replace breaker (WP 0028 00).

MALFUNCTION

In order to isolate grounded portion of circuit, disconnect each connector attached to control panel which ties back to affected breaker. Control panel must be powered up.

NOTE

Circuit breakers 11, 13 and 14 (schematic FO-2, sheet 8) are ground fault breakers. High humidity or moisture around devices controlled by these breakers may occasionally cause problems. Check that atmospheric moisture is not causing tripping by keeping devices dry.

If breakers stay set when a particular connector is disconnected, check devices attached to that connector, which are controlled by the affected circuit breaker for short circuits.

CORRECTIVE ACTION

Replace/repair any shorted or defective component or wire.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Refer to schematics in order to locate affected shorted circuits inside control panel.

CORRECTIVE ACTION

Replace/repair any shorted component or wire.
Replace faulty circuit breaker if no shorts are found (WP 0028 00).

SYMPTOM

Circuit breaker (440 VAC) will not reset.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12).

CORRECTIVE ACTION

Reset breaker. If breaker will not reset, replace breaker (WP 0030 00).

Refer to electrical schematics for short circuits in breaker controls between phases and to ground.

CORRECTIVE ACTION

Repair any loose or damaged wire in control panel (WP 0025 00).
Replace/repair any shorted cable assemblies (WP 0022 00).
Replace/repair any shorted component.
Replace breaker if above steps do not locate the problem (WP 0030 00).

SYMPTOM

Circuit breaker trips whenever its circuit is activated.

MALFUNCTION

Verify problem.

CORRECTIVE ACTION

Repair any loose or damaged wire in control panel (WP 0025 00).
Replace/repair any shorted cable assemblies (WP 0026 00).
Replace/repair any shorted component.
Replace breaker if above steps do not locate the problem (WP 0030 00).

TROUBLESHOOTING PROCEDURE**PUMP HEATERS****SYMPTOM**

Raw water pump heater does not work (schematic FO-1, sheet 11, lines 1105 – 1108).

NOTE

Circuit breaker 13 (schematic FO-2, sheet 8) is a ground fault breaker. High humidity or moisture around devices controlled by this breaker may occasionally cause problems. Check that atmospheric moisture is not causing the tripping by keeping all related devices dry, including wire connections.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T2(1C) to J18D (schematic FO-2, sheet 9). Repeat procedure for transformer T2(2C) (schematic FO-2, sheet 10) to J18E.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace auxiliary contact MS3-1, if open (schematic FO-2, sheet 10) (WP 0030 00).
Replace switch SS6, if open (schematic FO-2, sheet 12) (WP 0027 00).
Replace circuit breaker CB13, if open (schematic FO-2, sheet 8) (WP 0028 00).

SYMPTOM

Distribution pump heater does not work (schematic FO-1, sheet 11, lines 1110 – 1113).

NOTE

Circuit breaker 14 (schematic FO-2, sheet 8) is a ground fault breaker. High humidity or moisture around devices controlled by this breaker may occasionally cause problems. Check that atmospheric moisture is not causing the tripping by keeping all related devices dry, including wire connections.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T2(1C) (schematic FO-2, sheet 10) to J15J (schematic FO-2, sheet 9). Repeat procedure for transformer T2(2C) to J15K.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0025 00).
Replace auxiliary contact MS2-1, if open (schematic FO-2, sheet 10) (WP 0030 00).
Replace switch SS6, if open (schematic FO-2, sheet 12) (WP 0027 00).
Replace circuit breaker CB14, if open (WP 0028 00).

TROUBLESHOOTING PROCEDURE**PUMP SKID HEATER****SYMPTOM**

Pump skid heater does not run (no heat or fan) (schematic FO-1, sheet 5, lines 512 – 516).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from power distribution block (PDB) (schematic FO-2, sheet 10) to J20 (schematic FO-2, sheet 16) on the following lines: AL1 to J20D, AL2 to J20E, and AL3 to J20F. Disconnect J20 connector when testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB17, if open (schematic FO-2, sheet 10) (WP 0030 00).
Replace/repair heater if above checks have not located the problem (WP 0074 00).

SYMPTOM

Pump skid heater fan motor runs but there is no heat (Figure 1).

MALFUNCTION

Disconnect connector P66 (schematic FO-2, sheet 16) from high pressure assembly junction box. Open heater electrical access panel. Check continuity between T1 to T2 (schematic FO-2, sheet 10), between T2 to HL3 and between T1 to HL3. Continuity should be zero or near zero when meter is set on Ohms x 1 scale.

CORRECTIVE ACTION

Replace heater elements if reading is infinity on any connector pair (WP 0074 00).

Install jumper wire across heater terminals 4 and 5. Reconnect P66. Start the heater.

CORRECTIVE ACTION

If heater operates correctly, replace thermostat (WP 0074 00).
Replace element contactor (WP 0074 00).

SYMPTOM

Fan motor runs hot (thermal cutout may be opening).

MALFUNCTION

Check for dust accumulation or excessive dirt on motor.

CORRECTIVE ACTION

Clean off grease and oil accumulation from fan motor and casing.

Check for dirt accumulation in louvers and heating elements.

CORRECTIVE ACTION

Replace motor (WP 0074 00).

SYMPTOM

Thermostat calls for heat but heater does not function (Figure 1).

MALFUNCTION

If thermal cutout is open, heater elements and control circuit become de-energized. This typically occurs when power is cut during heater operation which does not allow fan to purge heat residual. Allow heater to cool, then thermal cutout should reset.

CORRECTIVE ACTION

If thermal cutout does not reset, replace cutout (WP 0074 00).

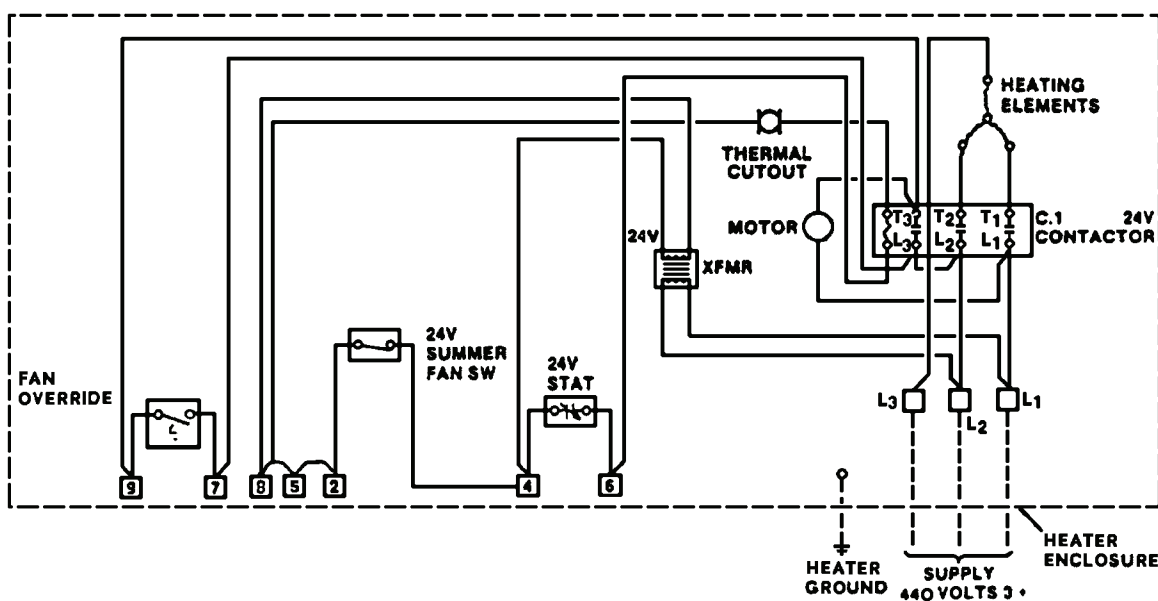


Figure 1. Electric Heater Wiring Diagram

SYMPTOM

Fan motor does not operate (Figure 1).

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.

MALFUNCTION

Check for 208-220 VAC across contactor terminals L1 to T3 (schematic FO-2, sheet 10) when fan should be operating.

CORRECTIVE ACTION

If voltage is present, replace motor (WP 0074 00).
If voltage is not present, replace contactor (WP 0074 00).

TROUBLESHOOTING PROCEDURE**LIGHT TEST****SYMPTOM**

Light test circuit does not work (schematic FO-1, sheet 10, lines 1015 – 1021).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Open control panel and restart ROWPU. Push light test, PB18 (schematic FO-2, sheet 12) and watch relays LTK1, LTK2, LTK3, (schematic FO-2, sheet 7) and LTK4 (schematic FO-2, sheet 8). All four indicating plungers should stay in until PB18 is released.

CORRECTIVE ACTION

If some, but not all, of the plungers go in, skip next two Malfunctions and proceed to Malfunction regarding light test PB18.
If none of the plungers go in, skip next four Malfunctions and proceed to the last Malfunction within this Symptom.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Locate faulty light(s) and remove neutral and power leads to it. Check resistance across pilot light terminals which should be zero or near zero.

CORRECTIVE ACTION

If pilot light assembly shows infinity (open), replace assembly (WP 0027 00).

Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to faulty light. Repeat procedure from T1(X2) to faulty light.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0025 00).
If circuit breaker shows open, replace circuit breaker (WP 0025 00).
If switch shows open, replace switch (WP 0027 00).
If LTK relay contact will not close when indication plunger on that relay is manually depressed, replace relay (WP 0028 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity point-to-point, from light test PB18 to relay that is not working. Check continuity from T1(X2) to faulty relay. Remove K1 and K2 wires (schematic FO-2, sheet 6) from any relay being tested.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Check resistance of faulty relay coil by measuring across K1 and K2 terminals with wires removed. Resistance should be zero or near zero.

CORRECTIVE ACTION

If coil is faulty, replace relay (WP 0028 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity point-to-point, from transformer T1(X1) to all four relays. Check continuity from T1(X2) to four relays. Remove K1 and K2 wires from any relay being tested.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0025 00).
If circuit breaker shows open, replace circuit breaker (WP 0028 00).
If switch shows open, replace switch (WP 0027 00).

TROUBLESHOOTING PROCEDURE**POWER SUPPLY****SYMPTOM**

Heater power supply does not run on AC power (schematic FO-1, sheet 11, line 1129).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T2(1C) (schematic FO-2, sheet 10) to J17F (schematic FO-2, sheet 9). Repeat procedure from T2(2C) to J17G.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J17, if faulty (WP 0026 00).
Replace relay K27 (schematic FO-2, sheet 8) if A4 contacts are open (WP 0029 00).
Replace heater switch SS8 if faulty (schematic FO-2, sheet 13) (WP 0029 00).

NOTE

Circuit breaker 11 (schematic FO-2, sheet 8) is a ground fault breaker. High humidity or moisture around devices controlled by this breaker may occasionally cause problems. Check that atmospheric moisture is not causing tripping by keeping all related devices dry, including wire connections.

CORRECTIVE ACTION

Replace circuit breaker CB11 if faulty (WP 0028 00).

SYMPTOM

Power supply has input power but low or no output power (schematic FO-1, sheet 11, lines 1129 and 1131 – 1132).

NOTE

Wire must be disconnected to check for continuity.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Disconnect connector P2 (schematic FO-2, sheet 14) at power supply. Open power supply electrical access panel. Check MOV connectors (schematic FO-2, sheet 16) for damage or signs of shorting. Remove MOV connectors and check for continuity across terminals.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0073 00).
Replace any MOV connector which is damaged or shows continuity problems between terminals (WP 0073 00).

Disconnect power supply output cable assemblies. Check each cable, point-to-point for continuity on each wire.

CORRECTIVE ACTION

Replace/repair any faulty cable (WP 0073 00 and WP 0026 00).

WARNING

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power be connected. Always take proper measures to ensure personal safety.

Connect power supply output cable assemblies and connector P2. Power up ROWPU (WP 0008 00, TM 10-4610-232-12). Turn on heater power supply switch. Check for 24 – 28 VDC across the positive (+) power supply terminals.

CORRECTIVE ACTION

Replace power supply if output voltage is less than 24VDC (WP 0059 00).

TROUBLESHOOTING PROCEDURE**ALARM CIRCUITS****SYMPTOM**

Alarm test does not work (schematic FO-1, sheet 10, lines 1002 and 1013).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point from transformer T1(X1) (schematic FO-2, sheet 10) to J12A (schematic FO-2, sheet 9), T1(X1) to J12F and T1(X2) to J12J.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 or CB10 (schematic FO-2, sheet 8) if either breaker is open, but normally closed (WP 0028 00).
Replace switch PB3 (schematic FO-2, sheet 11) or PB17 (schematic FO-2, sheet 12) if either is open (WP 0027 00).
Replace/repair connector J12 if faulty (WP 0026 00).

SYMPTOM

Alarm(s) will not reset (schematic FO-1, sheet 6, line 636; schematic FO-1, sheet 9, line 902 – 936).

NOTE

Alarm will not reset if conditions, which cause alarm, have not been corrected. Chemical tanks and clean/flush tank must have sufficient solution in order to raise level switches. Operating pressure must be below set-point of pressure switches or switches will not reset. Check operating pressure of ROWPU against set-points shown on electrical schematic before troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Open control panel and close main circuit breaker CB1 (schematic FO-2, sheet 10). Pull out emergency stop pushbutton. Watch relay K6 (schematic FO-2, sheet 7) and push alarm reset. Indicating plunger on relay should go in and then come out when reset button is released. All alarm lights should turn off (if alarm conditions noted are met) with the exception of low feed pressure light.

CORRECTIVE ACTION

If indicating plunger does not go in, proceed to next Malfunction.
If plunger goes in but does not come out and results are not as noted above, proceed to last Malfunction of this Symptom.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove K1 and K2 wires (schematic FO-2, sheet 6) from K6. Check continuity point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to K6(K1) wire. Push alarm reset during testing. Repeat procedure from T1(X2) to relay K6(K2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace switch PB3 or PB15 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace relay K6 if continuity checks are good (WP 0028 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Locate alarm(s) that did not turn off and note K6 contacts for those alarm(s) (e.g., product high pressure K6 contacts are A3X/A3Y). Disconnect those wires from K6 relay. Test continuity across disconnected contacts by depressing K6 indicating plunger.

CORRECTIVE ACTION

If relay contacts show continuity when plunger is pushed in, refer to pressure switch troubleshooting.
If there is no continuity between contacts when plunger is pushed in, replace relay K6 (WP 0028 00).

NOTE

K6 contacts A1X/A1Y, B3X/B3Y and B4X/B4Y are used to reset level switches and feed low pressure switch. Test all three contacts when checking continuity on relay K6 for those items.

If control panel is powered up, power off and then on. Watch relay K20 (schematic FO-2, sheet 6) when alarm reset is pushed. Indicating plunger should go in and stay in. All level switch alarms should turn off if tanks have enough solution in them to raise level switch. All alarm lights should be off; only feed low pressure light should be lit.

CORRECTIVE ACTION

If indicating plunger does not go in, proceed to next Malfunction.
If indicating plunger goes in, but results are not as noted, proceed to Malfunction regarding K20 contacts.
If indicating plunger goes in and comes back out, proceed to Malfunction regarding A3 contacts.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove K1 and K2 wires from K20. Check continuity, point-to-point, from transformer T1(X1) to wire K20(K1). Push alarm reset during testing. Repeat procedure from T1(X2) to relay K20(K2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 if open (WP 0028 00).
Replace circuit breaker CB10 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace switch PB3 if open (WP 0027 00).
Replace relay K20 if continuity checks are good (WP 0028 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Locate alarm(s) that did not turn off and note K20 contacts for that particular alarm (e.g., chlorine low level K20 contacts are B1X/B1Y). Disconnect those wires from K20 relay. Test continuity between disconnected contacts by depressing K20 indicating plunger.

CORRECTIVE ACTION

If relay contacts show continuity when plunger is pushed in, refer to individual level switch troubleshooting.

If there is no continuity across contacts when plunger is pushed in, replace relay K20 (WP 0028 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Disconnect wires from A3 contact on relay K20. Depress indicating plunger on K20 and check continuity across A3 contacts.

CORRECTIVE ACTION

If there is no continuity across A3 contact, replace relay K20 (WP 0028 00).

Reconnect wires on A3 contact of K20. Check continuity, point-to-point, from transformer T1(X1) to TDK5 (terminal 9) (schematic FO-2, sheet 8). Push in indicating plunger of K20 during testing. Check continuity from TDK5 (terminal 10) to K20(K1). Check continuity from T1(X2) to K20(K2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

If all continuity checks are good, replace TDK5 (WP 0028 00).

SYMPTOM

Alarm horns turn on when initiate is pushed.

MALFUNCTION

Refer to alarm circuit troubleshooting Malfunction regarding alarm not resetting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires on contacts A2Y/A2X and A1X/A1Y of relay K20. Check that continuity is broken on each contact when K20 indicating plunger is pushed in.

CORRECTIVE ACTION

Replace relay K20 if either contact does not open (WP 0028 00).

SYMPTOM

Alarm horn did not sound and ROWPU is shut down. Alarm horns did not sound and chemical tanks ran dry.

NOTE

This situation is normal whenever alarm reset has been pushed and any chemical tank, clean/flush tank or feed low pressure switch has not been satisfied. Clear those alarms before troubleshooting this symptom.

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12) and open control panel. Watch TDK5 as alarm reset is pushed. If inner dial marker reads zero prior to pushing reset, it should move to a reading of 5 seconds (full scale). If inner dial marker reads above zero, it should maintain that position. Indicating plunger of K20 should be pulled in. Start raw water pump (WP 0006 00, TM 10-4610-232-12). When feed low pressure light goes out, TDK5 will time down to zero which will then release K20 and indicating plunger will pop out.

CORRECTIVE ACTION

If situation is as noted, use mixing paddle and lightly push down one of the chemical tank floats. Alarm should come on; if not, proceed to Malfunction regarding removing wires on contacts A2Y/A2X and A1X/A1Y from relay K20.

If TDK5 times down and K20 did not de-energize, replace TDK5 (WP 0028 00).

If TDK5 did not time down, proceed to next Malfunction.

Check for 110-120 VAC across terminals 1 and 2 of TDK5.

CORRECTIVE ACTION

If there is no voltage, replace TDK5 (WP 0028 00).

If there is voltage across terminals but no alarm lights are lit on panel, one of the following switches is shorted: feed low pressure, chlorine low level, polyelectrolyte low level, sequestrant low level or clean/flush tank low. Refer to individual switch troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires on contacts A2Y/A2X and A1X/A1Y of relay K20. Check that continuity is broken on each contact when K20 indicating plunger is pushed in.

CORRECTIVE ACTION

Replace K20 if either contact does not open or if either contact stays open when indicating plunger is out (WP 0028 00).

Remove wires on B4Y/B4X and C1Y/C1X on relay K1. Remove wires on C2Y/C2X, C3Y/C3X and A2Y/A2X on relay K2. Remove wires on C3Y/C3X and C4Y/C4X on relay K3. Test each set of contacts except A2Y/A2X on K2 for continuity when indicating plunger on each relay is pushed in. K2 (A2Y/A2X) contact should have continuity when plunger is out.

CORRECTIVE ACTION

If any contact does not show continuity as noted, replace corresponding relay (WP 0028 00).

Remove wires A1Y/A1X and A3Y/A3X on relay K26. Test each set of contacts for continuity when K26 indicating plunger is out (schematic FO-2, sheet 7).

CORRECTIVE ACTION

If any contact does not show continuity, replace relay K26 (WP 0028 00).

MALFUNCTION

Remove wires A2Y/A2X on relay K5 (schematic FO-2, sheet 7). Test contact for continuity when K5 indicating plunger is out.

CORRECTIVE ACTION

If contact does not show continuity, replace relay K5 (WP 0028 00).

SYMPTOM

Alarm silence does not work (schematic FO-1, sheet 10, lines 1003 – 1013).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires K1 and K2 from K26. Check continuity, point-to-point, from transformer T1(X1) to wire K26(K1). Push alarm silence during testing. Repeat procedure from T1(X2) to relay K26(K2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 if open (WP 0028 00).
Replace circuit breaker CB10 if open (WP 0028 00).
Replace switch PB3 if open (WP 0027 00).

Remove wires from A2Y/A2X, A4Y/A4X, A1X/A1Y and A3Y/A3X contact on K26. Check A2 and A4 contacts for continuity when K26 indicating plunger is pushed in. Check A1 and A3 contacts for continuity when K26 indicating plunger is out.

CORRECTIVE ACTION

If any contact does not show continuity as noted, replace relay K26 (WP 0028 00).

Check wires that were disconnected in previous Malfunction for damage or looseness, back to its preceding connection.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
If all steps do not solve the problem, replace relay K26 (WP 0028 00).

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22 1/2 TON 8-WHEEL TANDEM
DIRECT SUPPORT TROUBLESHOOTING PROCEDURES**

INTRODUCTION TO TROUBLESHOOTING

The Troubleshooting Malfunctions list the common malfunctions, which you may find during the operation or maintenance of the ROWPU or its components. Perform the tests/inspections and corrective actions in the order described.

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

TROUBLESHOOTING PROCEDURES (continued)

PRESSURE SWITCHES

NOTE

All pressure switch troubleshooting should be done without any water or air pressure in system, unless otherwise noted.

SYMPTOM

High pressure pump pressure switch does not work (schematic FO-1, sheet 9, lines 902 – 903).

NOTE

High pressure pump pressure switch is factory-set to open at 950 psig.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from J24A to J24D (schematic FO-2, sheet 14) on pressure panel.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0034 00).
Replace/repair connector J24, if faulty (WP 0034 00).
Replace PSH5 (schematic FO-2, sheet 14), if it shows an open circuit (WP 0033 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J11A (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay K21(K2). Remove K1/K2 wires on K21 (schematic FO-2, sheet 6) before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).
Replace circuit breaker CB7 or CB10 (schematic FO-2, sheet 8) if either is open (WP 0034 00).
Replace emergency stop PB3 if open (schematic FO-2, sheet 11) (WP 0034 00).
Replace/repair connector J11 if faulty (schematic FO-2, sheet 9) (WP 0034 00).

MALFUNCTION

Check continuity, point-to-point, from J11D to K21(K1) (schematic FO-2, sheet 6). Depress K6 indicating plungers (schematic FO-2, sheet 7) and K21 when testing continuity across the contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).
Replace/repair connector J11, if faulty (WP 0034 00).
Replace relay K6 or K21 if set of contacts does not show continuity when indicating plunger is depressed (WP 0034 00).
Replace relay K21 if all steps fail to solve problems (WP 0034 00).

SYMPTOM

High pressure pump, high pressure light or horn does not work (schematic FO-1, sheet 9, lines 903 – 904; schematic FO-1, sheet 10, line 1011).

NOTE

Refer to first and next Symptom for additional troubleshooting.
Also, see light test and alarm circuit troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from A3X/A3Y and A2X/A2Y on relay K21 (schematic FO-2, sheet 6). Check for continuity across each contact with the indicating plunger out of K21. Push in indicating plunger and check that there is no continuity across contact.

CORRECTIVE ACTION

If continuity checks are not as noted, replace relay K21 (WP 0034 00).

Check wires removed in previous Malfunction for looseness or damage at connections.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).

SYMPTOM

Feed high pressure alarm is on below 900 psig or is not on and system pressure is above 960 psig.

MALFUNCTION

Test feed high pressure switch (PSH5) (schematic FO-2, sheet 14) for accuracy. Disconnect P24 (schematic FO-2, sheet 14) from pressure switch panel. Disconnect pressure sensing line from switch. Remove switch cover, tag and remove wires from pressure switch. Check for internal leakage. Set multimeter to Ohms x 1 scale and attach leads to switch terminals the wires were on. Connect a dead-weight tester or another known calibrated pressure control device to switch pressure (or inlet) port. Multimeter should read zero resistance with no pressure on inlet pressure port. Slowly apply pressure to switch. Switch should open on an increasing pressure of 940 to 960 psig.

CORRECTIVE ACTION

Replace switch if there is internal leakage (WP 0035 00).
Replace switch if testing indicates switch is actuating outside of listed limits (WP 0035 00).
Refer to pressure switch gauge troubleshooting if switch is actuating within listed limits.

SYMPTOM

Product high pressure switch does not work (schematic FO-1, sheet 9, lines 905 – 906).

NOTE

Product high pressure switch is factory-set to open at 40 psig.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from J24A to J24E (schematic FO-2, sheet 14).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0034 00).
Replace/repair connector J24, if faulty (WP 0034 00).
Replace PSH6 if it shows an open circuit (schematic FO-2, sheet 14) (WP 0032 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J11A (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay K22(K2) (schematic FO-2, sheet 6).
Remove wires K1/K2 on K22 before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).
Replace circuit breaker CB7 or CB10, if either is open (schematic FO-2, sheet 8) (WP 0034 00).
Replace emergency stop PB3 if open (schematic FO-2, sheet 11) (WP 0034 00).
Replace/repair connector J11 if faulty (WP 0034 00).

Check continuity, point-to-point, from J11E to K22(K1). Depress indicating plungers on K6 (schematic FO-2, sheet 7) and K22 when testing continuity across their contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).
Replace/repair connector J11 if faulty (WP 0034 00).
Replace relay K6 or K22 if the set of contacts does not show continuity when indicating plunger is depressed (WP 0034 00).
Replace relay K22 if all continuity checks are good (WP 0034 00).

SYMPTOM

Product high pressure light or horn does not work (schematic FO-1, sheet 9, lines 906 – 907; schematic FO-1, sheet 10, line 1012).

NOTE

Refer to previous and next Symptom for additional troubleshooting.
Also, see light test and alarm circuit troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from A3X/A3Y and A2X/A2Y on relay K22. Check for continuity across each contact with indicating plunger out on K22 (schematic FO-2, sheet 6). Push in indicating plunger and check that there is no continuity across contact, which is normally open when plunger is in.

CORRECTIVE ACTION

If continuity checks are not as noted, replace relay K22 (WP 0034 00).

Check wires that were removed in previous Malfunction for looseness or damage at connections.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).

SYMPTOM

Product high pressure alarm is on and product pressure is below 35 psig or alarm is not on and pressure is above 45 psig.

MALFUNCTION

Test product high pressure switch (PSH6) (schematic FO-2, sheet 14) for accuracy. Disconnect P24 (schematic FO-2, sheet 14) from pressure switch panel. Disconnect pressure sensing line from switch. Remove switch cover, tag and remove wires from pressure switch. Check for internal water leakage. Set multimeter to Ohms x 1 scale and attach leads to switch terminals wires were on. Connect dead-weight tester or another known calibrated pressure control device to switch pressure (or inlet) port. Multimeter should read zero resistance with no pressure on inlet pressure port. Slowly apply pressure to switch. Switch should open on an increasing pressure of 39 to 41 psig.

CORRECTIVE ACTION

Replace switch if there is internal leakage (WP 0035 00).
Adjust switch to correct setting if switch does not actuate as described. Remove adjustment cover and turn adjuster clockwise to increase actuation point, or turn adjuster counterclockwise to lower actuation point (WP 0035 00).

If switch is operating correctly, check gauge accuracy.

CORRECTIVE ACTION

Replace switch if it cannot be adjusted (WP 0035 00).

SYMPTOM

Strainer high differential switch does not work (schematic FO-1, sheet 9, lines 908 – 909).

NOTE

This pressure switch is factory-set to open at 15 psig.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from J24A to J24F (schematic FO-2, sheet 14).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).
Replace/repair connector J24, if faulty (WP 0034 00).
Replace PDSH1, if it shows an open circuit (WP 0034 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J11A (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay K23(K2) (schematic FO-2, sheet 7). Remove K1/K2 wires from K23 before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).
Replace circuit breaker CB7 or CB10 if open (schematic FO-2, sheet 8) (WP 0034 00).
Replace emergency stop PB3 if open (schematic FO-2, sheet 11) (WP 0033 00).
Replace/repair connector J11 if faulty (WP 0034 00).

Check continuity, point-to-point, from J11F to K23(K1). Depress indicating plungers on K6 and K23 when testing continuity across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).
Replace/repair connector J11 if faulty (WP 0034 00).
Replace relay K6 (schematic FO-2, sheet 7) or K23 if set of contacts does not show continuity when indicating plunger is depressed (WP 0034 00).
Replace relay K23 if all steps have not identified problem (WP 0034 00).

SYMPTOM

Strainer high differential light or horn does not work (schematic FO-1, sheet 9, lines 909 – 910; schematic FO-1, sheet 10, line 1006).

NOTE

Refer to previous and next Symptom for additional troubleshooting.
Also, see light test and alarm circuit troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from A3X/A3Y and A2X/A2Y on relay K23 (schematic FO-2, sheet 7). Check for continuity across each contact with indicating plunger of K23 out. Push in indicating plunger and check that there is no continuity across contact.

Check wires A3X/A3Y and A2X/A2Y for looseness or damage at their connections.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).

SYMPTOM

Basket strainer light is on and basket strainer is clean or light is not on and strainer is plugged.

MALFUNCTION

Test strainer differential switch (PDSH1) for accuracy. Disconnect J24 (schematic FO-2, sheet 14) from pressure switch panel. Disconnect pressure sensing lines from switch. Remove switch cover tag and remove wires from pressure switch. Check for internal water leakage. Set multimeter to Ohms x 1 scale and attach leads to switch terminals that wires were on. Connect dead-weight tester or another known calibrated pressure control device to switch high pressure (or inlet) port. Multimeter should read zero resistance with no pressure on inlet pressure port. Slowly apply pressure to switch. Switch should open on an increasing pressure of 14 to 16 psig.

CORRECTIVE ACTION

Replace switch if there is internal leakage (WP 0035 00).

Adjust switch to correct setting if switch does not actuate as described. Remove adjustment cover and turn adjuster clockwise to increase actuation point, turn counterclockwise to lower actuation point. Replace pressure switch if it cannot be adjusted (WP 0035 00).

Check gauge accuracy if switch is operating correctly.

SYMPTOM

Media filter high differential switch does not work (schematic FO-1, sheet 9, lines 911 – 912).

NOTE

This pressure switch is factory-set to open at 25 psig.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from J24A to J24N (schematic FO-2, sheet 14).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).

Replace/repair connector J24, if faulty (WP 0034 00).

Replace PDSH2 if it shows an open circuit (WP 0034 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J11A (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay K24(K2) (schematic FO-2, sheet 7). Remove K1/K2 wires on K24 before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 or CB10 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace emergency stop PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace/repair connector J11 if faulty (WP 0025 00).

Check continuity, point-to-point from J11N to K24(K1). Depress indicating plungers on K6 (schematic FO-2, sheet 7) and K24 when testing continuity across their contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J11, if faulty (WP 0025 00).
Replace relay K6 or K24 if set of contacts does not show continuity when indicating plunger is depressed (WP 0028 00).
Replace relay K24 if all steps have not identified problem (WP 0028 00).

SYMPTOM

Media filters high differential light or horn does not work (schematic FO-1, sheet 9, lines 912 – 913; schematic FO-1, sheet 10, line 1007).

NOTE

See light test and alarm circuit troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from A3X/A3Y and A2X/A2Y on relay K24 (schematic FO-2, sheet 7). Check for continuity across each contact with indicating plunger out of K24. Push in indicating plunger and check that there is no continuity across contact.

CORRECTIVE ACTION

If continuity checks are not as described, replace relay K24 (WP 0028 00).

Check wires A3X/A3Y and A2X/A2Y for looseness or damage at connections.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

SYMPTOM

Media filter plugged light is on at a differential below 20 psig or is not on at a pressure above 30 psig.

MALFUNCTION

Test media filter differential switch (PDSH2) for accuracy. Disconnect P24 (schematic FO-2, sheet 14) from pressure switch panel. Disconnect pressure sensing lines from switch. Remove switch cover, tag and remove wires from pressure switch. Check for internal water leakage. Set multimeter to Ohms x 1 scale and attach leads to switch terminals that wires were on. Connect dead-weight tester or another known calibrated pressure control device to switch high pressure (or inlet) port. Multimeter should read zero resistance with no pressure on inlet pressure port. Slowly apply pressure to switch. Switch should open on an increasing pressure of 24 to 26 psig.

CORRECTIVE ACTION

Replace switch if there is internal leakage (WP 0035 00).
Adjust switch if correct setting does not actuate as described. Remove adjustment cover and turn adjuster clockwise to increase actuation point; turn adjuster counterclockwise to lower actuation point (WP 0035 00).
Replace switch if switch cannot be adjusted (WP 0035 00).
If switch checks are okay, check gauge accuracy.

SYMPTOM

Cartridge filter high differential switch does not work (schematic FO-1, sheet 9, lines 914 – 915).

NOTE

This pressure switch is factory-set to open at 15 psig.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from J24A to J24H (schematic FO-2, sheet 14).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0034 00).
Replace/repair connector J24, if faulty (WP 0034 00). Replace PDSH3, if shows an open circuit (WP 0033 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J11A (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay K25(K2) (schematic FO-2, sheet 7). Remove K1/K2 wires from K25 before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J11, if faulty (WP 0026 00).
Replace relay K6 or K25 if set of contacts does not show continuity when indicating plunger is depressed (WP 0028 00).
Replace relay K25 if all continuity checks are good (WP 0028 00).

SYMPTOM

Cartridge filter high differential light or horn does not work (schematic FO-1, sheet 9, lines 915 – 916; schematic FO-1, sheet 10, line 1008).

NOTE

See light test and alarm circuit troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from A3X/A3Y and A2X/A2Y on relay K25 (schematic FO-2, sheet 7). Check for continuity across each contact with indicating plunger out of K25. Push in indicating plunger and check that there is no continuity across contact.

CORRECTIVE ACTION

If continuity checks are not as described, replace relay K25 (WP 0031 00).

Check wires A3X/A3Y and A2X/A2Y for looseness or damage at their connections.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

SYMPTOM

Cartridge filter plugged light is on at a differential pressure below 12 psig or is not on and differential pressure is greater than 20 psig.

MALFUNCTION

Test cartridge filter differential switch (PDSH3) for accuracy. Disconnect P24 (schematic FO-2, sheet 14) from pressure switch panel. Disconnect pressure sensing lines from switch. Remove switch cover and tag/remove wires from pressure switch. Check for internal water leakage. Set multimeter to Ohms x 1 scale and attach leads to switch terminals that wires were on. Connect dead-weight tester or another known calibrated pressure control device to switch high pressure (or inlet) port. Multimeter should read zero resistance with no pressure on inlet pressure port. Slowly apply pressure to switch. Switch should open on an increasing pressure of 14 to 16 psig.

CORRECTIVE ACTION

Replace switch if there is internal leakage (WP 0035 00).

Adjust switch to correct setting if switch does not actuate as described. Remove adjustment cover and turn adjuster clockwise to increase actuation point; turn adjuster counterclockwise to lower actuation point (WP 0038 00).

Replace switch if it cannot be adjusted (WP 0035 00).

If switch checks are okay, check gauge accuracy.

SYMPTOM

Feed pressure low switch does not work (schematic FO-1, sheet 9, lines 917 – 918).

NOTE

This pressure switch is set to open at 5–7 psig decreasing pressure.
Pressure switch closes at 5–7 psig increasing pressure.

NOTE

Be sure feed pressure is at zero before troubleshooting.

MALFUNCTION

Remove connectors P12 (schematic FO-2, sheet 15) and P11 (schematic FO-2, sheet 14) from control panel. Check for 110–120 VAC across J11A and J12J (schematic FO-2, sheet 9).

CORRECTIVE ACTION

If voltage is not present, proceed to Malfunction regarding transformer T1(X1).

Check for continuity across P11A and P11K.

CORRECTIVE ACTION

If continuity check is good, proceed to next Malfunction.

If continuity check is not good, proceed to Malfunction regarding connector P24.

Remove cover from PSL4 (schematic FO-2, sheet 14) and insert a nonmetallic tool into switch arm. Apply light pressure until switch transfers to closed position. Check for continuity across pins P11A and P11J.

CORRECTIVE ACTION

If continuity check is good, proceed to Malfunction regarding transformer T1(X1).

Remove connector P24 (schematic FO-2, sheet 14) from switch panel. Check for continuity across J24A and J24J (schematic FO-2, sheet 14) with switch set in closed position (see previous Malfunction). Remove tool and check for continuity across J24A and J24K.

CORRECTIVE ACTION

If continuity check is good, replace or repair the cable between P11 and P24 (WP 0025 00).

Check continuity, point-to-point, from J24A to J24K.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).

Replace/repair connector J24, if faulty (WP 0034 00).

Replace PSL4 if it shows an open circuit (WP 0031 00).

MALFUNCTION

Check continuity, point-to-point, from J24A to J24J with tool inserted with light pressure in pressure switch until switch transfers to closed position.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).
Replace/repair connector J24, if faulty (WP 0034 00).
Replace PSL4, if it shows an open circuit (WP 0033 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J11A (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay K15(K2) (schematic FO-2, sheet 7). Remove wires K1/K2 from K15 before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 or CB10 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace emergency stop PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace/repair connector J11 if faulty (WP 0026 00).

Check continuity, point-to-point, from J11J to K15 (K1). Depress indicating plungers on K20 (schematic FO-2, sheet 6) and K15 when testing continuity across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J11 if faulty (WP 0025 00).
Replace relay K20 or K15 if set of contacts does not show continuity when indicating plunger is depressed (WP 0028 00).
Replace relay K15 if above checks are good (WP 0028 00).

Check continuity, point-to-point, from J11K to TDK5 (terminal 4) (schematic FO-2, sheet 8) and to relay K6(B3X) (schematic FO-2, sheet 7).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J1 if open (schematic FO-2, sheet 14) (WP 0026 00).

SYMPTOM

Feed pressure low light or horn does not work (schematic FO-1, sheet 9, line 920; schematic FO-1, sheet 10, line 1009).

NOTE

See light test and alarm circuit troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from A2Y/A2X and A4Y/A4X on relay K15 (schematic FO-2, sheet 7). Check for continuity across each contact with indicating plunger out of K15. Push in indicating plunger and check that there is no continuity across contact.

CORRECTIVE ACTION

If continuity checks are not as described, replace relay K15 (WP 0028 00).

MALFUNCTION

Check wires A2Y/A2X and A4Y/A4X for looseness or damage at connections.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

SYMPTOM

Feed pressure low light is not on and feed pressure is 13 psig or lower, or light is on and feed pressure is 10 psig or higher.

MALFUNCTION

Test feed pressure low switch (PSL4) for accuracy. Disconnect P24 (schematic FO-2, sheet 14). Disconnect pressure sensing line from switch. Remove switch cover, tag and remove wires from pressure switch. Check for internal water leakage. Set multimeter to Ohms x 1 scale and attach leads to switch terminals that wires #324 and #330 (N/O) were on. Connect dead-weight tester or another known calibrated pressure control device to switch pressure (or inlet) port. Multimeter should read infinity with no pressure on inlet pressure port. Slowly apply pressure to switch. Switch should close on an increasing pressure of 5 to 7 psig. Take pressure up to 20 psig and then slowly relieve it. Switch should open at 5 to 7 psig on decreasing pressure. If adjustment is necessary, decreasing pressure actuation point takes precedence. Increasing pressure actuation point can be slightly outside given range without causing problems to ROWPU.

CORRECTIVE ACTION

Replace pressure switch if there is internal leakage (WP 0035 00).
Adjust switch to correct setting if switch does not actuate as described. Remove adjustment cover and turn adjuster clockwise to increase actuation point; turn adjuster counterclockwise to lower actuation point (WP 0035 00).
Replace switch if it cannot be adjusted (WP 0035 00).
If switch is actuating correctly, check gauge accuracy.

SYMPTOM

Air compressor pressure switch does not work (schematic FO-1, sheet 8, line 824).

NOTE

This pressure switch is set to open at about 1775 psig. It stays open until pressure drops to about 1550 psig and then closes.

MALFUNCTION

Remove connectors P12 (schematic FO-2, sheet 15) and P11 (schematic FO-2, sheet 14) from control panel. Check for 110–120 VAC across J11B and J12J (schematic FO-2, sheet 9). Compressor switch SS5 (schematic FO-2, sheet 11) must be on.

CORRECTIVE ACTION

If voltage is not present, proceed to last Malfunction within this Symptom.

MALFUNCTION

Check for continuity across P11B and P11C.

CAUTION

Bleed off air pressure until it is below 1400 psig before testing or damage to equipment could result.

CORRECTIVE ACTION

If there is continuity across P11B and P11C, proceed to last Malfunction within this symptom.

MALFUNCTION

Remove connector P24 (schematic FO-2, sheet 14) from switch panel. Check for continuity across J24B and J24C.

CORRECTIVE ACTION

If there is continuity, replace/repair cable between P11 and P24 (WP 0033 00).

Check continuity, point-to-point, from J24A to J24C.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0033 00).

Replace or repair connector P24 if faulty (WP 0034 00).

Replace PSH7 if it shows an open circuit (schematic FO-2, sheet 14) (WP 0034 00).

Open cover PSH7 and insert a nonmetallic tool into switch arm. Press tool lightly until the switch transfers to open position. Check that continuity is broken between J24B and J24C.

CORRECTIVE ACTION

If switch does not open, replace PSH7 (WP 0034 00).

Refer to Symptom regarding air compressor not starting control circuit for additional troubleshooting.

SYMPTOM

Air compressor is on and above 1850 psig or is not on and below 1400 psig.

WARNING

Open a drain valve on air manifold in order to relieve all system air pressure before opening any air tubing line or personal injury or equipment damage could result.

MALFUNCTION

Test product air compressor pressure switch (PSH7) for accuracy. Disconnect P24 (schematic FO-2, sheet 14). Disconnect P24 (schematic FO-2, sheet 14) from pressure switch panel. Disconnect pressure sensing line from switch. Remove switch cover, tag and remove wires from pressure switch. Check for internal water leakage. Set multimeter to Ohms x 1 scale and attach leads to switch terminals that wires were on. Connect dead-weight tester or another known calibrated pressure control device to switch pressure (or inlet) port. Multimeter should read zero resistance with no pressure on inlet pressure port. Slowly apply pressure to switch. Switch should close on an increasing pressure of 1750 to 1800 psig. Slowly relieve pressure. Switch should close at 1500 to 1550 psig.

CORRECTIVE ACTION

Replace switch if there is internal leakage (WP 0035 00).
Replace switch if testing shows it is actuating above listed limits (WP 0035 00).
Refer to pressure gauge troubleshooting if switch is actuating above listed limits.

TROUBLESHOOTING PROCEDURE**LEVEL SWITCHES****SYMPTOM**

Chlorine low level switch does not work (schematic FO-1, sheet 9, lines 920 – 921).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X2) (schematic FO-2, sheet 10) to J12C (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay K16(K2) (schematic FO-2, sheet 17). Remove wires K1/K2 from K16 before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 or CB10, if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace emergency stop PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace/repair connector J12 if faulty (schematic FO-2, sheet 9) (WP 0026 00).

Check continuity, point-to-point, from J12D to K16(K1). Depress indicating plungers on K20 (schematic FO-2, sheet 6) and K16 when testing continuity across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J11 if faulty (schematic FO-2, sheet 9) (WP 0026 00).
Replace relay K20 or K16 if the set of contacts does not show continuity when indicating plunger is depressed (WP 0028 00).
Replace relay K16 if all checks fail to solve problem (WP 0028 00).

Check continuity, point-to-point, from J12E to TDK5 (terminal 4) (schematic FO-2, sheet 8) and to relay K6(B3X) (schematic FO-2, sheet 7).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J12 if faulty (WP 0026 00).

SYMPTOM

Chlorine level low light or horn does not work (schematic FO-1, sheet 9, line 923; schematic FO-1, sheet 10, line 1003).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X2) (schematic FO-2, sheet 10) to J12C (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay K16(K2) (schematic FO-2, sheet 17). Remove wires K1/K2 from K16 before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 or CB10 if open (schematic FO-2, sheet 8) (WP 0025 00).
Replace emergency stop PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace/repair connector J12 if faulty (schematic FO-2, sheet 9) (WP 0026 00).

Check continuity, point-to-point, from J12D to K16(K1). Depress indicating plunger on K20 (schematic FO-2, sheet 6) and K16 when testing continuity across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J11 if faulty (schematic FO-2, sheet 9) (WP 0026 00).
Replace relay K20 or K16 if the set of contacts does not show continuity when indicating plunger is depressed (WP 0025 00).
Replace relay K16 if above checks do not solve problem (WP 0025 00).

Check continuity, point-to-point, from J12E to TDK5 (terminal 4) (schematic FO-2, sheet 8) and to relay K6(B3X) (schematic FO-2, sheet 7).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J12, if faulty (WP 0026 00).

SYMPTOM

Chlorine level low light or horn does not work (schematic FO-1, sheet 9, line 923; schematic FO-1, sheet 10, line 1003).

NOTE

Refer to light testing and alarm troubleshooting for additional test procedures.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from A1Y/A1X and A3Y/A3X on relay K16 (schematic FO-2, sheet 7). Check for continuity across each contact with indicating plunger out of K16. Push in indicating plunger and check that there is no continuity across contact.

CORRECTIVE ACTION

If continuity checks are not as described, replace relay K16 (WP 0025 00).

Check wires A1Y/A1X and A3Y/A3X for looseness or damage at connections.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

SYMPTOM

Polyelectrolyte level low switch does not work (schematic FO-1, sheet 9, lines 920 – 921).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J15C (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay K17(K2) (schematic FO-2, sheet 7). Remove wires K1/K2 from K17 before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace circuit breaker CB7 or CB10 if open (schematic FO-2, sheet 8) (WP 0025 00).

Replace emergency stop PB3 if open (schematic FO-2, sheet 11) (WP 0025 00).

Replace/repair connector J15 if faulty (WP 0026 00).

Check continuity, point-to-point, from J15F to K17(K1). Depress indicating plungers on K20 and K17 when testing continuity across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace/repair connector J15, if faulty (WP 0026 00).

Replace relay K20 (schematic FO-2, sheet 6) or K17 if the set of contacts does not show continuity when indicating plunger is depressed (WP 0025 00).

Replace relay K17 if steps do not solve problem (WP 0025 00).

Check continuity, point-to-point, from J15D to TDK5 (terminal 4) (schematic FO-2, sheet 8) and to relay K6(B3X) (schematic FO-2, sheet 7).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace/repair connector J15, if faulty (WP 0026 00).

SYMPTOM

Polyelectrolyte level light or horn does not work (schematic FO-1, sheet 9, line 926; schematic FO-1, sheet 10, line 1004).

NOTE

Refer to light testing and alarm troubleshooting for additional test procedures.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from A1Y/A1X and A3Y/A3X on relay K17 (schematic FO-2, sheet 7). Check for continuity across each contact with indicating plunger out of K17. Push in indicating plunger and check that there is no continuity across contact.

CORRECTIVE ACTION

If continuity checks are not as noted, replace relay K17 (WP 0025 00).

MALFUNCTION

Check wires A1Y/A1X and A3Y/A3X for looseness or damage at their connections.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

SYMPTOM

Sequestrant level low switch does not work (schematic FO-1, sheet 9, lines 924, 926 – 927).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J15C (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay K18(K2) (schematic FO-2, sheet 8). Remove wires K1/K2 from K18 before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace circuit breaker CB7 or CB10 if open (schematic FO-2, sheet 8) (WP 0025 00).

Replace emergency stop PB3 if open (schematic FO-2, sheet 11).

Replace/repair connector J15 if faulty (WP 0026 00).

Check continuity, point-to-point, from J15E to K18(K1). Depress indicating plungers on K20 (schematic FO-2, sheet 6) and K18 when testing continuity across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace/repair connector J15 if faulty (WP 0026 00).

Replace relay K20 or K18 if the set of contacts does not show continuity when indicating plunger is depressed (WP 0025 00).

Replace relay K18 if all continuity checks are good (WP 0025 00).

MALFUNCTION

Check continuity, point-to-point, from J15D to TDK5 (terminal 4) (schematic FO-2, sheet 8) and to relay K6 (B3X).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J15 if faulty (WP 0026 00).

SYMPTOM

Sequestrant level low light or horn does not work (schematic FO-1, sheet 9, line 929; schematic FO-1, sheet 10, line 1005).

NOTE

Refer to light testing and alarm troubleshooting for additional test procedures.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from A1Y/A1X and A3Y/A3X on relay K18 (schematic FO-2, sheet 8). Check for continuity across each contact with indicating plunger out of K18. Push in indicating plunger and check that there is no continuity across contact.

CORRECTIVE ACTION

If continuity checks are not as noted, replace relay K18 (WP 0028 00).

Check wires A1Y/A1X and A3Y/A3X for looseness or damage at connections.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

SYMPTOM

Clean/flush tank level low switch does not work (schematic FO-1, sheet 9, lines 924, 929 – 930).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J15C (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay K19(K2) (schematic FO-2, sheet 6). Remove wires K1/K2 from K19 before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 or CB10 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace emergency stop PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace/repair connector J15 if faulty (WP 0026 00).

Check continuity, point-to-point, from J15G to K19(K1). Depress indicating plungers on K20 (schematic FO-2, sheet 6) and K19 when testing continuity across the contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J15 if faulty (WP 0026 00).
Replace relay K20 or K19 if the set of contacts does not show continuity when indicating plunger is depressed (WP 0028 00).
Replace relay K19 if above checks do not solve problem (WP 0028 00).

MALFUNCTION

Check continuity, point-to-point, from J15D to TDK5 (terminal 4) (schematic FO-2, sheet 8) and to relay K6(B3X) (schematic FO-2, sheet 7).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J15 if faulty (WP 0026 00).

SYMPTOM

Clean/flush tank level low light or horn does not work (schematic FO-1, sheet 9, line 932; schematic FO-1, sheet 10, line 1010).

NOTE

Refer to light testing and alarm troubleshooting for additional test procedures.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from A1X/A1Y and A3Y/A3X on relay K19 (schematic FO-2, sheet 6). Check for continuity across each contact with indicating plunger out of K19. Push in indicating plunger and check that there is no continuity across contact.

CORRECTIVE ACTION

If continuity checks are not as noted, replace relay K19 (WP 0028 00).

Check wires A1X/A1Y and A3Y/A3X for looseness or damage at their connections.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

TROUBLESHOOTING PROCEDURE**VAN FAN****SYMPTOM**

Van fan does not work (schematic FO-1, sheet 10, line 1023).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J12C (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to relay J12J.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace breakers CB7 or CB10, if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace emergency stop PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace/repair connector J12 if faulty (WP 0026 00).

TROUBLESHOOTING PROCEDURE**CHEMICAL PUMPS****SYMPTOM**

Chemical pump(s) do not run (schematic FO-1, sheet 6, lines 621 – 627).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restart unit. Push RESET, select system ON and NORMAL mode. Push CHEMICAL PUMP start. Look at indicating plungers on relays K3 (schematic FO-2, sheet 6), K4, K21, and K22 (schematic FO-2, sheet 6). Plungers K4, K21 and K22 should be in; plunger K3 should be out.

CORRECTIVE ACTION

If relay plungers are as noted, proceed to next Malfunction.
If plunger K3 is in, refer to control circuits operation mode troubleshooting.
If plunger K4 is out, refer to control circuits system on/system standby troubleshooting.
If plunger K21 or K22 is out, refer to product high pressure switch and feed high pressure switch troubleshooting.

Start raw water pump and watch motor starter MS3 (schematic FO-2, sheet 10).

CORRECTIVE ACTION

If starter MS3 energizes (pulls in), skip next Malfunction and proceed to the following Malfunction.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to PB6(1B2) (schematic FO-2, sheet 11). Push in indicating plungers on K4, K21 and K22 when checking contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace switch PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace relay K3 if its contact is open (WP 0028 00).
Replace relay K4, K21 or K22 if the contact does not show continuity when indicating plunger is depressed (WP 0028 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from K1 and K2 contacts (schematic FO-2, sheet 6) of relay K7 (schematic FO-2, sheet 7). Check continuity, point-to-point, from PB6(1B2) (schematic FO-2, sheet 11) and K4(A2X) to K7(K1). Push in pushbutton PB9 (schematic FO-2, sheet 11) when checking continuity across it. Repeat procedure from transformer T1(X2) to K7(K2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB8 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace switch PB8 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace switch PB9 if it does not close when pushed in (WP 0027 00).

MALFUNCTION

Check continuity, point-to-point, from PBB(1B1) and PB9(1A4) to K7(K1). Push in indicating plungers on K1 and K7 when testing across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace K1 or K7 if contacts do not close when plunger is pushed in (WP 0028 00).

Check continuity, point-to-point, from K7(K1) to J12L, J12R and J16A (schematic FO-2, sheet 9).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair J12 or J16 if either assembly is faulty (WP 0040 00).
Replace relay K7 if all continuity checks have not solved problem (WP 0028 00).

SYMPTOM

Chemical pumps run but light does not come on; light test okay (schematic FO-1, sheet 6, lines 610 – 611).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #2B from PL9 (schematic FO-2, sheet 11). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to PL9 (wire 237). Push in indicating plunger on relay K7 (schematic FO-2, sheet 7) when checking its contact. Check continuity from T1(X2) to PL9 (wire #2B).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K7 if its contact does not close (WP 0028 00).
Replace PL9 if all continuity checks are satisfactory (WP 0027 00).

TROUBLESHOOTING PROCEDURE

AUTOMATIC VALVES

CAUTION

(Model WTA-060 ONLY) When an automatic valve assembly (valve and actuator) is removed from piping, it must be reinstalled with valve disc open. Attach air tubing and electrical connector after valve assembly is installed in piping. If actuator is removed from valve, it must be reinstalled with its air and electrical connection removed. Maintainer must determine that valve is open by removing valve from piping for evaluation or by looking at valve housing bottom and noting groove position on valve stem end. Groove is in alignment with inner valve disc. Turn square end of valve stem a quarter turn to make groove point toward inlet/outlet openings on valve, then install actuator. Failure to follow these procedures will result in valve malfunction.

CAUTION

(Model ROWPU-1 ONLY) When an automatic valve assembly (valve and actuator) is removed from piping, it must be reinstalled with valve disc open. Attach air tubing and electrical connector after valve assembly is installed in piping. If actuator is removed from valve, it must be reinstalled with its air and electrical connection removed. Maintainer must determine that valve is open. Actual valve position is determined by looking at position indicator at bottom of actuator. Failure to follow these procedures will result in valve malfunction.

NOTE

(Model WTA-060 ONLY) Automatic valves on ROWPU are spring-loaded open and air-pressure closed. Electrical system controls whether air is or is not supplied to valve. If electrical circuit or air system fails, valves will open automatically. Actual valve position can be determined by removing plastic valve cap and observing stem position; if stem is extended out from actuator housing, valve is closed. If stem is sitting on top of actuator housing, valve is open.

NOTE

(Model ROWPU-1 ONLY) Automatic valves on ROWPU are spring-loaded open and air-pressure closed. Electrical system controls whether air is or is not supplied to valve. If electrical circuit or air system fails, valves will open automatically. Actual valve position can be determined by observing position indicator at bottom of actuator.

SYMPTOM

Media filter inlet valve does not open (system normal); valve light off (schematic FO-1, sheet 7, line 715).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and power up panel to the point of starting pumps in NORMAL mode. Indicating plungers on relays K3 and K11 (schematic FO-2, sheet 6) should be out.

CORRECTIVE ACTION

If plunger on K3 is in, refer to control circuits operation mode troubleshooting.

If plunger on K11 is in, refer to backwashing circuit troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from relay K3 (terminal C2X) and K11 (terminal A2Y). Check continuity across K3 (C2Y/C2X) and K11 (A2X/A2Y).

CORRECTIVE ACTION

Replace relay K3 or K11 if they show continuity (WP 0028 00). Both should be open.

SYMPTOM

Media filter inlet valve will not close (system backwash position on system clean position); valve light on (schematic FO-1, sheet 7, line 715).

MALFUNCTION

Check valve for actual position. Refer to automatic valve general notes.

CORRECTIVE ACTION

If valve is closed, refer to following Symptom.

Turn off raw water pump circuit breaker CB4, booster pump circuit breaker CB5 (schematic FO-2, sheet 10), and high pressure pump breaker CB6 (schematic FO-2, sheet 10). Disconnect backwash chlorine pump, connector J45 (schematic FO-2, sheet 15). Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and power back up. Set control panel up in system CLEAN and push INITIATE. Indicating plunger on relay K3 (schematic FO-2, sheet 6) should go in.

CORRECTIVE ACTION

If plunger does not go in, refer to control circuits operating mode troubleshooting.

Set control panel up in system BACKWASH and push INITIATE. Indicating plunger on relay K11 (schematic FO-2, sheet 6) should go in when backwash air valve light (PL17) (schematic FO-2, sheet 12) comes on.

CORRECTIVE ACTION

If light does not come on or if light comes on but K11 plunger does not go in, refer to media filter backwashing circuit troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to relay K3(C2Y) and to K11(A2X). Repeat procedure from T1(X2) to J14S (schematic FO-2, sheet 9).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breakers CB7 or CB9 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace switch PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace or repair connector J14 if faulty (WP 0026 00).

MALFUNCTION

Check continuity from relay K3(C2Y) to J14R. Depress indicating plunger on K3 during test which should be open. Check continuity from relay K11(A2X) to J14R. Depress indicating plunger on K11 when testing its contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J14 if faulty (WP 0026 00).
Replace relays K3 or K11 if the contact shows an open circuit when plunger is pushed (WP 0028 00).

SYMPTOM

Media filter inlet light does not work; light test okay. Media filter inlet light does not show actual valve position (schematic FO-1, sheet 7, line 715).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove #2A wire from PL15 (schematic FO-2, sheet 12). Check continuity, point-to-point, from CB9 (schematic FO-2, sheet 8) to wire #280 on PL15.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair J14 if faulty (schematic FO-2, sheet 9) (WP 0026 00).
Replace/repair P14 or J39 if faulty (schematic FO-2, sheet 15) (WP 0025 00).
Replace LTK2 (schematic FO-2, sheet 7) if its contact is open (WP 0028 00).

SYMPTOM

Media filter outlet valve does not open (system running); valve light off (schematic FO-1, sheet 7, line 718).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and power up until starting pump in system NORMAL. Indicating plungers on relays K3 and K11 (schematic FO-2, sheet 6) should be out.

CORRECTIVE ACTION

If plunger on K11 is in, refer to backwashing circuit troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from relay K3 (terminal C2X) and K11 (terminal A2Y). Check continuity across K3(C2Y/C2X) and K11(A2X/A2Y).

CORRECTIVE ACTION

Replay relay contact K3 or K11 if it shows continuity (WP 0028 00).

SYMPTOM

Media filter outlet valve will not close (system backwash position or system clean position); valve light on (schematic FO-1, sheet 7, line 718).

MALFUNCTION

Check valve for actual position. Refer to automatic valve general notes.

CORRECTIVE ACTION

If valve is closed, refer to next Symptom.

Turn off raw water pump circuit breaker CB4, booster pump circuit breaker CB5 and high pressure pump breaker CB6 (schematic FO-2, sheet 10).

CORRECTIVE ACTION

Disconnect backwash chlorine pump, connector J45 (schematic FO-2, sheet 15).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and power back up. Set control panel up in system CLEAN and push INITIATE. Indicating plunger on relay K3 (schematic FO-2, sheet 6) should go in.

CORRECTIVE ACTION

If plunger does not go in, refer to control circuits operating mode troubleshooting.

Set control panel up in system BACKWASH and push INITIATE. Indicating plunger on relay K11 (schematic FO-2, sheet 6) should go in when backwash air valve light (PL17) (schematic FO-2, sheet 12) comes on.

CORRECTIVE ACTION

If light does not come on or if light comes on but K11 plunger does not go in, refer to media filter backwashing circuits troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to relay K3(C2Y) and to K11(A2X). Repeat procedure from T1(X2) to J14B (schematic FO-2, sheet 9).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace circuit breakers CB7 or CB9 if open (schematic FO-2, sheet 8) (WP 0028 00).

Replace switch PB3, if open (schematic FO-2, sheet 11) (WP 0027 00).

Replace/repair connector J14 if faulty (WP 0026 00).

Check continuity from relay K3(C2Y) to J14A. Depress indicating plunger on K3 during test. Check continuity from relay K11(A2X) to J14A. Depress indicating plunger on K11 when testing its contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J14 if faulty (WP 0026 00).
Replace relay K3 or K11 if the contact shows an open circuit when plunger is pushed (WP 0028 00).

SYMPTOM

Media filter outlet light does not work; light test okay. Media filter outlet does not show actual position (schematic FO-1, sheet 7, line 719).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove #2A wire from PL16 (schematic FO-2, sheet 12). Check continuity, point-to-point, from CB9 (schematic FO-2, sheet 8) to wire #282 on PL16.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair J14 if faulty (schematic FO-2, sheet 9) (WP 0026 00).
Replace/repair P14 or J41 (schematic FO-2, sheet 15) if faulty (WP 0020 00).
Replace LTK2 if its contact is open (schematic FO-2, sheet 7) (WP 0026 00).

SYMPTOM

Backwash inlet valve will not open (system backwash position); valve light off (schematic FO-1, sheet 7, line 709).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restore power to control panel. Turn off raw water pump circuit breaker CB4, booster pump circuit breaker CB5 and high pressure pump breaker CB6 (schematic FO-2, sheet 10). Disconnect backwash chlorine pump, connector J45 (schematic FO-2, sheet 15). Drain media filter down until water stops coming out of the top media filter drain valve. Set control panel up in system BACKWASH and push INITIATE. Indicating plunger on relay K11 (schematic FO-2, sheet 6) should go in when backwash air valve light (PL17) (schematic FO-2, sheet 12) comes on.

CORRECTIVE ACTION

If light does not come on or if light comes on but K11 plunger does not go in, refer to media filter backwashing circuits troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P14 (schematic FO-2, sheet 15) from side of control panel. Depress indicating plunger on relay K11 and check that there is no continuity across K11 contact A1X/A1Y.

CORRECTIVE ACTION

Replace relay K11 if there is no continuity across its contact with indicating plunger pushed in (WP 0028 00).

SYMPTOM

Backwash inlet valve will not close (system normal or system clean position); valve light on (schematic FO-1, sheet 7, line 709).

MALFUNCTION

Check valve for actual position. Refer to automatic valve general notes.

CORRECTIVE ACTION

If valve is closed, skip next Symptom and proceed to the following Symptom.

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and repower panel until starting pumps in system are NORMAL. Check indicating plunger is out of relay K11 (schematic FO-2, sheet 6).

CORRECTIVE ACTION

If plunger is in, refer to media filter backwash circuit troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from CB9 (schematic FO-2, sheet 8) to J14E (schematic FO-2, sheet 9). Repeat procedure from transformer T1(X2) (schematic FO-2, sheet 10) to J14F.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K11 if its contact is open (WP 0028 00).
Replace/repair connector J14 if faulty (WP 0026 00).

SYMPTOM

Backwash inlet valve does not work; light test okay. Backwash inlet valve does not show actual valve position (schematic FO-1, sheet 7, line 710).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove #2A wire from PL13 (schematic FO-2, sheet 12). Check continuity, point-to-point, from CB9 (schematic FO-2, sheet 8) to wire #275 on PL13.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair J14 if faulty (schematic FO-2, sheet 9) (WP 0026 00).
Replace/repair LTK2 if its contact is open (schematic FO-2, sheet 7) (WP 0028 00).
Replace/repair P14 or J40 if faulty (schematic FO-2, sheet 15) (WP 0020 00).

SYMPTOM

Backwash outlet valve will not open (system backwash position); valve light on (schematic FO-1, sheet 7, line 712).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restore power to control panel. Turn off raw water pump circuit breaker CB4, booster pump circuit breaker CB5 and high pressure pump breaker CB6 (schematic FO-2, sheet 10). Disconnect backwash chlorine pump, connector J45 (schematic FO-2, sheet 15). Drain media filter down until water stops coming out of the top media filter drain valve. Set control panel up in system BACKWASH and push INITIATE. Indicating plunger on relay K11 (schematic FO-2, sheet 6) should go in when backwash air valve light (PL17) (schematic FO-2, sheet 12) comes on.

CORRECTIVE ACTION

If light does not come on or if light comes on but K11 plunger does not go in, refer to media filter backwashing circuits troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P14 (schematic FO-2, sheet 15) from side of control panel. Depress indicating plunger on relay K11 and check that there is no continuity across K11 contact A1X/A1Y.

CORRECTIVE ACTION

Replace relay K11 if there is continuity across its contact with indicating plunger pushed in (WP 0028 00).

SYMPTOM

Backwash outlet valve will not close (system normal or clean); valve light on (schematic FO-1, sheet 7, line 712).

MALFUNCTION

Check valve for actual position. Refer to automatic valve general notes. When stem is in up position, valve should be closed.

CORRECTIVE ACTION

If valve is closed, skip next Symptom and proceed to the following Symptom.

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and repower panel until starting pumps in system NORMAL. Indicating plunger on relay K11 (schematic FO-2, sheet 6) should be out.

CORRECTIVE ACTION

If plunger is in, refer to media filter backwashing circuit troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from CB9 (schematic FO-2, sheet 8) to J14J. Repeat procedure from transformer T1(X2) (schematic FO-2, sheet 9) to J14K (schematic FO-2, sheet 10).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K11 if its contact is open (WP 0028 00).
Replace/repair connector J14 if faulty (WP 0026 00).

SYMPTOM

Backwash outlet valve light does not work; light test okay. Backwash outlet valve light does not show actual valve position (schematic FO-1, sheet 7, line 713).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove #2A wire from PL14 (schematic FO-2, sheet 12). Check continuity, point-to-point, from CB9 (schematic FO-2, sheet 8) to wire #277 on PL14.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair J14 if faulty (schematic FO-2, sheet 9) (WP 0026 00).
Replace/repair P14 or J38 if faulty (schematic FO-2, sheet 15) (WP 0020 00).
Replace LTK2 if its contact is open (schematic FO-2, sheet 7) (WP 0028 00).

SYMPTOM

Clean/flush tank valve does not open (system clean); valve light off (schematic FO-1, sheet 7, line 735).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and repower panel until starting pumps in system CLEAN. Indicating plunger on relay K3 (schematic FO-2, sheet 6) should be in.

CORRECTIVE ACTION

If plunger on K3 is out, refer to control circuits operation mode troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P15 (schematic FO-2, sheet 14) from side of control panel. Check for continuity across relay K3(B3X/B3Y) with indicating plunger depressed.

CORRECTIVE ACTION

If relay K3 contact shows continuity (should be infinity), replace relay (WP 0028 00).

SYMPTOM

Clean/flush tank valve does not open during last phase of media filter backwashing; light off (schematic FO-1, sheet 7, line 735).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and repower panel and INITIATE backwash cycle. Indicating plunger on relay K12 (schematic FO-2, sheet 6) should be in during last part of cycle.

CORRECTIVE ACTION

If K12 plunger stays out, refer to media filter backwashing circuit troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P15 (schematic FO-2, sheet 14) from side of control panel. Check for continuity across relay K12(A3X/A3Y) with indicating plunger depressed.

CORRECTIVE ACTION

Replace relay K12 if contact shows continuity (WP 0028 00).

SYMPTOM

Clean/flush tank valve does not open (system shutdown); valve light on (schematic FO-1, sheet 7, line 725).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and repower panel until starting pumps in system SHUTDOWN. Indicating plunger on relay K5 should be in.

CORRECTIVE ACTION

If plunger on K5 is out (schematic FO-2, sheet 7), refer to control circuits system on/system shutdown troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P15 (schematic FO-2, sheet 14) from side of control panel. Check for continuity across relay K5(A3Y/A3X) with indicating plunger depressed.

CORRECTIVE ACTION

Replace relay K5 if contact shows continuity (WP 0028 00).

SYMPTOM

Clean/flush tank valve does not close (system running normal). Clean/flush valve is not closed when it should be; valve light on (schematic FO-1, sheet 7, line 735).

MALFUNCTION

Check valve for actual position.

CORRECTIVE ACTION

If valve is closed, proceed to next Symptom.

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and repower panel until starting pumps in system NORMAL. Indicating plungers on relay K12, K3 (schematic FO-2, sheet 6) and K5 (schematic FO-2, sheet 7) should be out.

CORRECTIVE ACTION

If K12 plunger is in, refer to media filter backwash circuit troubleshooting.
If K3 plunger is in, refer to control circuits operation mode troubleshooting.
If K5 plunger is in, refer to control circuits system on/system shutdown troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from CB9 (schematic FO-2, sheet 8) to J15H (schematic FO-2, sheet 9). Repeat procedure from transformer T1(X2) (schematic FO-2, sheet 10) to J15I.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K12 if its contact is open (WP 0028 00).
Replace/repair connector J14 if faulty (normally closed) (WP 0026 00).
Replace relay K5 if its contact is open (WP 0028 00).

SYMPTOM

Clean/flush tank valve light does not work; light test okay. Clean/flush tank valve light does not show actual valve position (schematic FO-1, sheet 7, line 736).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove #2A wire from PL18 (schematic FO-2, sheet 12). Check continuity, point-to-point, from CB9 (schematic FO-2, sheet 8) to wire #307 on PL18.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair J15 if faulty (schematic FO-2, sheet 9) (WP 0026 00).
Replace/repair P15 (schematic FO-2, sheet 7) or J33 (schematic FO-2, sheet 14) if faulty (WP 0028 00).
Replace LTK3 (schematic FO-2, sheet 7) if its contact is open (WP 0028 00).

SYMPTOM

Media filter flush valve light does not work; light test okay. Media filter flush valve light does not show actual valve position (schematic FO-1, sheet 7, line 707).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove #2A wire from PL2 (schematic FO-2, sheet 11). Check continuity, point-to-point, from CB9 (schematic FO-2, sheet 8) to wire #272 on PL12 (schematic FO-2, sheet 12).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair J14 if faulty (schematic FO-2, sheet 9) (WP 0028 00).
Replace/repair P14 or J48 if faulty (schematic FO-2, sheet 15) (WP 0028 00).
Replace LTK2 (schematic FO-2, sheet 7) if its contact is open (WP 0028 00).

SYMPTOM

Media filter flush valve will not open in filter backwash or when flush valve switch is pushed; pilot light off (schematic FO-1, sheet 7, lines 706 – 707).

MALFUNCTION

Refer to media filter backwash Phase 1 circuit troubleshooting.

SYMPTOM

Media filter flush valve will not close in filter backwash or when flush valve switch is pushed; pilot light on (schematic FO-1, sheet 7, line 708).

MALFUNCTION

Check valve for actual position.

CORRECTIVE ACTION

If valve is closed, refer to valve light does not show correct valve position troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X2) (schematic FO-2, sheet 10) to J14D (schematic FO-2, sheet 9).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J14 if faulty (WP 0026 00).
If above checks have not isolated the problem, refer to media filter backwash Phase 1 circuit troubleshooting.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22 1/2 TON 8-WHEEL TANDEM
DIRECT SUPPORT TROUBLESHOOTING PROCEDURES**

INTRODUCTION TO TROUBLESHOOTING

The Troubleshooting Malfunctions list the common malfunctions, which you may find during the operation or maintenance of the ROWPU or its components. Perform the tests/inspections and corrective actions in the order described.

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

TROUBLESHOOTING PROCEDURES (continued)

AIR BLOWDOWN SOLENOID

SYMPTOM

Air blowdown solenoid valve does not work (schematic FO-1, sheet 8, lines 826 – 827).

NOTE

If unit maintenance troubleshooting indicates that control panel portion of air blowdown solenoid circuits is okay, proceed directly to third Malfunction. Check air blowdown solenoid valve connector P28 for damage or loose pins.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove #2A wire from TDK1 (schematic FO-2, sheet 8) and disconnect P13 connector (schematic FO-2, sheet 14) on control panel. Check continuity from terminal 1-23 to relay TDK1 (terminal 11) and to TDK1 (terminal 4). Check continuity from transformer T1(X2) (schematic FO-2, sheet 10) to TDK1 (wire #2A) and to connector J13U (schematic FO-2, sheet 9).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J13 if faulty (WP 0026 00).

Check continuity from TDK1 (terminal 1) to J13T.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J13 if faulty (WP 0026 00).
Replace TDK1 if checks done are good (WP 0028 00).

Check air blowdown solenoid valve connector P28 for damage or loose pins (schematic FO-2, sheet 14).

CORRECTIVE ACTION

Repair connector P28 if necessary (WP 0026 00).

Check for resistance across pins P28A and P28B of air blowdown solenoid valve connector.

CORRECTIVE ACTION

If multimeter reads infinity or a short circuit, replace air blowdown solenoid valve (WP 0057 00).

TROUBLESHOOTING PROCEDURE**VAN LIGHTS****SYMPTOM**

Van lights do not work (schematic FO-1, sheet 10, lines 1026 – 1030).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J12C (schematic FO-2, sheet 9). Repeat procedure from T1(X2) to connector J10B (schematic FO-2, sheet 9). Check continuity from J13I (schematic FO-2, sheet 9) to J10A. Check continuity from J12G to J13N and from J12H to J13P.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breakers CB7 or CB10 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace/repair connectors J12, J13 or J10 if faulty (WP 0026 00).

TROUBLESHOOTING PROCEDURE**HEAT TRACE****SYMPTOM**

Heat trace does not work (schematic FO-1, sheet 11, lines 1102 – 1104).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T2(1D) (schematic FO-2, sheet 10) to panel connector of non-operating heat trace. Repeat procedure from T2(2D) to panel connector of non-operating heat trace.

CORRECTIVE ACTION

Replace/repair electrical connector if faulty (WP 0026 00).
Test switch SS6 (schematic FO-2, sheet 12); replace if faulty (WP 0027 00).
Test circuit breaker CB12 (schematic FO-2, sheet 8); replace if faulty (WP 0028 00).
Replace relay K27 (schematic FO-2, sheet 8) if A2 contacts are open (WP 0028 00).

TROUBLESHOOTING PROCEDURE**UTILITY CIRCUITS****SYMPTOM**

Utility receptacle, panel light or control panel receptacle does not work (schematic FO-1, sheet 11, lines 1117 – 1126).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T2(1C) (schematic FO-2, sheet 10) to non-working receptacle or panel light connections. Repeat procedure from T2(2C) to non-working receptacle or panel light connections.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair any electrical connector which is damaged (WP 0026 00).
Replace receptacle SR9 (schematic FO-2, sheet 13) if not working (WP 0029 00).
Replace panel light receptacle if faulty (WP 0027 00).
Replace panel light switch PB10 if faulty (schematic FO-2, sheet 12) (WP 0027 00).
Replace relay K27 (schematic FO-2, sheet 8) if it shows open across A2 contacts (WP 0028 00).

NOTE

Circuit breaker 11 is a ground fault breaker. High humidity or moisture around devices controlled by this breaker may cause problems. Dry out devices controlled by this breaker in order to make sure atmospheric moisture does not cause tripping.

Replace circuit breaker CB11 if faulty (schematic FO-2, sheet 8) (WP 0028 00).

TROUBLESHOOTING PROCEDURE**AUXILIARY POWER****SYMPTOM**

Heater power supply, utility outlet or panel light does not work on auxiliary power (schematic FO-1, sheet 11, lines 1137 – 1138).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Open control panel door, plug a powered extension cord into auxiliary input of van. Check operation of relay K27 (schematic FO-2, sheet 8).

CORRECTIVE ACTION

If relay K27 indicating plunger pulls in, proceed to last Malfunction in this Symptom.

MALFUNCTION

Disconnect power and disconnect connector P17 (schematic FO-2, sheet 14) from control panel. Disconnect wires K1 and K2 (schematic FO-2, sheet 6) from relay K27. Check continuity, point-to-point, from J17A (schematic FO-2, sheet 9) to end of K1 wire. Repeat procedure from J17B to end of K2 wire.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J17 if faulty (WP 0026 00).
If continuity checks are good, replace relay K27 (WP 0028 00).

Disconnect power and check continuity, point-to-point, from P17A to PB10(2A3) (schematic FO-2, sheet 12), panel light switch. Repeat procedure from P17B to CB11(LN) (schematic FO-2, sheet 8).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K27 if contacts A1 and A3 do not show continuity when indicating plunger on K27 is manually depressed when checking continuity (WP 0028 00).
If above checks indicate auxiliary power circuit is functioning, refer to heater power supply, utility outlet or panel light troubleshooting.

WARNING

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power be connected. Always take proper measures to ensure personal safety.

NOTE

Make sure all circuit breakers are set. Refer to electrical drawings.

SYMPTOM

Raw water pump will not start (system NORMAL) (schematic FO-1, sheet 6, lines 619 – 621). Control circuits (schematic FO-1, sheet 5, lines 532 – 537) power circuits.

MALFUNCTION

Start ROWPU in system NORMAL (WP 0008 00, TM 10-4610-232-12). Observe MS3 (schematic FO-2, sheet 10) when raw water pump start switch is pushed. Indicating plunger should go in and remain in, indicating control circuits are working properly.

CORRECTIVE ACTION

If indicating plunger goes in and remains in, proceed to Malfunction regarding checking generator voltage on all three phases.
If indicating plunger goes in but comes out when start button is released, proceed to Malfunction regarding indicating plunger on K1.

Push chemical pump start pushbutton.

CORRECTIVE ACTION

If chemical pumps start running (as indicated by relay K7 pulling in [schematic FO-2, sheet 7]) or a pulsing noise comes from pumps, proceed to malfunction regarding indicating plunger on K12.

MALFUNCTION

Observe indicating plungers on following relays: K3 should be out, K4, K21 and K22 (schematic FO-2, sheet 6) should be in.

CORRECTIVE ACTION

If K3 is in, refer to operation mode troubleshooting.
If K4 is out, refer to system on/system standby circuit troubleshooting.
If K21 or K22 is out, refer to pressure switch troubleshooting, first and fourth Symptoms.

Indicating plunger on K12 (schematic FO-2, sheet 6) should be out.

CORRECTIVE ACTION

If plunger K12 is in, refer to backwash circuit troubleshooting.
If chemical pumps ran in second Malfunction, shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12) and proceed to Malfunction regarding removing wire #231 from MS3.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to PB6(1B2) (schematic FO-2, sheet 11). Push in indicating plungers on relays K4, K21 and K22 when checking across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace switch PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace switch PB4 if open (schematic FO-2, sheet 12) (WP 0027 00).
Replace relay K3 if contact is open (WP 0028 00).
Replace relay K4, K21 or K22 if contacts do not close when indicating plunger is pushed in (WP 0028 00).

Remove #231 wire from MS3. Check continuity, point-to-point, from PB6(1B2) (schematic FO-2, sheet 11) to #231 wire from MS3, push in PB7 (schematic FO-2, sheet 11) when checking across terminals.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace PB6 if open (WP 0027 00).
Replace PB7 if it does not close when pushed in (WP 0027 00).
Replace K12 if open (WP 0028 00).

Check continuity, point-to-point, from transformer T1(X2) to MS3 neutral side.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
If all checks and repairs are satisfactory, replace/repair MS3.

MALFUNCTION

Indicating plunger on K1 should be in.

CORRECTIVE ACTION

If indicating plunger is out, refer to operation mode circuit troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from PB7(1A4) to PB7(1A3) and K12(A1Y). Depress indicating plungers on MS3 and K1 when checking across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K1 if contact does not show continuity when indicating plunger is depressed (WP 0028 00).
Replace/repair MS3 if contact does not show continuity.

Make sure generator voltage on all three phases is 435 – 445 VAC on each phase.

CORRECTIVE ACTION

Adjust to correct voltage.
If voltage is not correct on all three phases, refer to generator troubleshooting.

Check system air pressure. Use an air manifold drain valve to lower it below 1400 psig. Turn air compressor switch on and note if air compressor runs. Turn on both switches for distribution pump and note if pump runs.

CORRECTIVE ACTION

If the three phase motors listed do not operate, proceed to last Malfunction.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from power distribution block (PDB) to J21 (schematic FO-2, sheet 16) on following lines: AL1 to J21E, AL2 to J21F and AL3 to J21G. Depress operating plunger on MS3 (schematic FO-2, sheet 10) when checking across contacts. Disconnect J21 connector when testing.

NOTE

When checking continuity in power circuits, it is important to note wire numbers on each phase. Each wire is tagged identically on both ends, but in some instances, a #1 phase wire will enter the top of a starter or circuit breaker and come out the bottom of the device as a #2 phase wire. This is done to change the rotation of a motor so that the associated pump will turn in the correct direction. Any two wires may be interchanged to accomplish this rotational change.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB4 if open at any phase (schematic FO-2, sheet 10) (WP 0031 00).
If MS3 shows open on any phase, replace/repair MS3 (WP 0031 00).
Replace/repair J21 if faulty (WP 0025 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Disconnect cable from ROWPU to generator at generator end. Check continuity, point-to-point, from generator end of cable to power distribution block (PDB) on each phase.

CORRECTIVE ACTION

Replace main power cable if open on any phase (WP 0022 00).
Replace circuit breaker CB1 if open (schematic FO-2, sheet 10) (WP 0030 00).
Repair any loose or damaged wires (WP 0026 00).
If checks have not revealed problem, refer to generator troubleshooting.

SYMPTOM

Raw water pump above overload heaters burned out (schematic FO-1, sheet 5, lines 532 – 537).

MALFUNCTION

Check each lead, 2T1, 3T2 and 3T3 from the outlet side of MS3 (schematic FO-2, sheet 10) to connector J21 (schematic FO-2, sheet 16) for tightness and damage.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Repair terminal strip if damaged (WP 0028 00).
Repair connector J21 if damaged (WP 0026 00).
Replace MS3 overload heaters (WP 0028 00).

SYMPTOM

Raw water pump starts but stops when start button is released (schematic FO-1, sheet 6, lines 619 – 620).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restart ROWPU (WP 0008 00, TM 10-4610-232-12). If indicating plunger on relay K1 (schematic FO-2, sheet 6) is out, refer to operation mode circuit troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from PB7(1A4) to PB7(1A3) (schematic FO-2, sheet 11) and K12(A1Y) (schematic FO-2, sheet 6). Depress indicating plungers on MS3 (schematic FO-2, sheet 10) and K1 when checking across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K1 if contact does not show continuity when indicating plunger is depressed (WP 0028 00).
Replace/repair MS3 if contact does not show continuity (WP 0030 00).

SYMPTOM

Raw water pump motor hums but will not turn (schematic FO-1, sheet 5, lines 532 –533).

MALFUNCTION

Check with operator.

CORRECTIVE ACTION

If other motors do not operate, proceed to next Malfunction.
If other motors operate well, proceed to last Malfunction within this Symptom.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Disconnect cable from ROWPU to generator at generator end. Check continuity, point-to-point, from generator end of cable to power distribution block (PDB) on each phase.

CORRECTIVE ACTION

Replace main power cable if open on any phase (WP 0022 00).
Replace circuit breaker CB1 if open (schematic FO-2, sheet 10) (WP 0030 00).
Repair any loose or damaged wires (WP 0026 00).
If checks have not revealed problem, refer to generator troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from power distribution block (PDB) to J21 (schematic FO-2, sheet 16) on following lines: AL1 to J21E, AL2 to J21F and AL3 to J21G. Depress operating plunger on MS3 (schematic FO-2, sheet 10) when checking across contacts. Disconnect J21 connector when testing.

NOTE

When checking continuity in power circuits, it is important to note wire numbers on each phase. Each wire is tagged identically on both ends, but in some instances a #1 phase wire will enter the top of a starter or circuit breaker and come out the bottom of the device as a #2 phase wire. This is done to change the rotation of a motor so that the associated pump will turn in correct direction. Any two wires may be interchanged to accomplish this rotational change.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace breaker CB4 if open at any phase (schematic FO-2, sheet 10) (WP 0030 00).
Replace MS3 overload if it shows open (WP 0030 00) and proceed to next Symptom to identify cause.
Replace/repair MS3 if it shows open on any phase (WP 0030 00).
Refer to raw water pump mechanical Symptom for more troubleshooting.

SYMPTOM

Raw water pump will not start in system backwash (schematic FO-1, sheet 1, line 163).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel. Power up ROWPU (WP 0008 00, TM 10-4610-232-12), set control panel for backwash and push INITIATE. There will be a delay as media filter drains and pressure comes down. Delay time is dependent on how much water and pressure is in media filter. After drain is down, indicating plunger on relays K11 and K13 (schematic FO-2, sheet 6) will pull in and raw water pump should start.

CORRECTIVE ACTION

If K11 or K13 relays do not pull in, refer to media filter backwash troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #230 from relay K12(A1Y) (schematic FO-2, sheet 6). Check continuity, point-to-point, from PB6(1B1) and PB7(1A4) (schematic FO-2, sheet 11) to end of disconnect wire #230. Depress indicating plunger on K13 when testing across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K13 if contact does not show continuity when plunger is depressed (WP 0028 00).

SYMPTOM

Raw water pump circuit breaker open when pump is started; ROWPU shuts down when raw water pump is started (schematic FO-1, sheet 5, lines 532 – 533).

MALFUNCTION

Check for short circuits.

CORRECTIVE ACTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12).
Refer to electrical drawings.
Refer to troubleshooting regarding raw water pump not starting.

SYMPTOM

Raw water pump circuit breaker repeatedly trips; raw water ground fault repeatedly trips (schematic FO-1, sheet 5, lines 532 – 537).

NOTE

This symptom is difficult to troubleshoot because the two circuit breakers are electrically tied together, so what affects one will usually trip the other breaker, although each senses different levels of short circuit. Direct-acting circuit breaker only trips when overcurrents exceed its setpoint, such as a direct bolted short circuit. By contrast, an arcing short circuit may amount to only a fraction of direct-acting circuit breaker setpoint and not cause it to trip. Arcing faults are typically caused by loose connections, presence of vermin, rodents and insects in equipment or insulation deterioration resulting from mechanical damage, heat, aging, moisture, dust and other contaminants. Since arcing type fault usually involves a flow of current in ground path, the ground fault circuit breaker monitors the ground circuit for current flow. When the breaker senses current in ground circuit, it trips itself and the pump circuit breaker. Under other circuit conditions, balanced, unbalanced or single-phase load currents or single or three phase short circuits not involving ground, it will not trip although the pump breaker does. For these reasons, the following troubleshooting steps are very general and success in isolating the problem relies on the electrician to carefully inspect all cables, connectors and connections for signs of damage or moisture intrusion. In some cases, only the substitution of known reliable components identifies cause.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check all connections on ground fault interrupt (GFI 1) (schematic FO-2, sheet 13), current sensor (CS1) (schematic FO-2, sheet 10), and CB4 (schematic FO-2, sheet 10) shunt wires for tightness.

CORRECTIVE ACTION

Tighten any loose wires.
Test ground fault relay (WP 0029 00).

If checks do not reveal problem, do the following, in the order shown.

CORRECTIVE ACTION

Replace GFI 1 and CS1 (WP 0030 00).
Replace CB4 (WP 0029 00).

SYMPTOM

Raw water pump circuit breaker will not reset; raw water pump ground fault will not reset (schematic FO-1, sheet 5, lines 532 – 537).

MALFUNCTION

Check raw water pump ground fault reset switch.

CORRECTIVE ACTION

Reset ground fault and reset raw water pump circuit breaker.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Replace circuit breaker CB4 (schematic FO-2, sheet 10) if breaker will not stay set.

CORRECTIVE ACTION

Reset raw water pump circuit breaker.

MALFUNCTION

Remove wires #204 and #2B from GFI 1 (schematic FO-2, sheet 13). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to wire #204. Repeat procedure from T1(X2) to wire #2B.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace switch PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
If all checks are good, replace GFI 1 (WP 0029 00).

SYMPTOM

Raw water pump runs but light does not come on; light test okay (schematic FO-1, sheet 1, line 163).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #2B from PL8 (schematic FO-2, sheet 11). Remove wire #231 from MS3 (schematic FO-2, sheet 10). Check continuity, point-to-point, from K12(A1X) (schematic FO-2, sheet 6) to PL8 (wire #269). Check continuity from T1(X2) (schematic FO-2, sheet 10) to PL8 (wire #2B).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace LTK1 (schematic FO-2, sheet 7) if contact is open (WP 0028 00).
Replace PL8 if all continuity checks are good (WP 0027 00).

SYMPTOM

Raw water pump motor starter (MS3) does not pull in (schematic FO-1, sheet 6, lines 619 – 621, control circuits; schematic FO-1, sheet 5, lines 532 – 534, power circuits).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove motor starter coil wires. Use multimeter to check resistance across coil connections. It should be near zero.

CORRECTIVE ACTION

Replace coil if resistance is infinity (open) or shorted (WP 0030 00).

SYMPTOM

Raw water pump motor starter (MS3) pulls in but does not run (schematic FO-1, sheet 6, lines 619 – 621, control circuits; schematic FO-1, sheet 5, lines 532 – 534, power circuits).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Turn circuit breaker CB4 (schematic FO-2, sheet 10) off and disconnect connector P21 (schematic FO-2, sheet 16) from control panel. Use multimeter to check continuity across each pair of motor control contactors. Manually engage starter contacts during testing. The reading should be zero.

CORRECTIVE ACTION

Replace motor starter contactor if any pair is open (WP 0030 00).

Remove contactor block from starter and check for burned, arced-over contacts.

CORRECTIVE ACTION

Replace motor starter contactor if damaged (WP 0030 00).

SYMPTOM

Raw water pump motor starter auxiliary contact does not operate correctly (schematic FO-1, sheet 6, line 620; schematic FO-1, sheet 11, line 1107).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from auxiliary contact. Use multimeter to check for correct operation when starter contacts are manually engaged and open.

CORRECTIVE ACTION

If hold-in contact (line 620) does not operate correctly, replace starter (WP 0030 00).

If control contact (line 1107) does not operate correctly, replace auxiliary contact block (WP 0030 00).

TROUBLESHOOTING PROCEDURE**CIRCUIT BREAKERS 440 VAC****SYMPTOM**

Circuit breaker will not reset.

NOTE

This procedure does not apply to distribution or raw water pump circuit breakers. Refer to individual troubleshooting for those breakers.

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Reset circuit breaker.

CORRECTIVE ACTION

Replace circuit breaker if it will not stay set (WP 0029 00).
Refer to individual circuit troubleshooting for breaker if it stays set with no power on system.

SYMPTOM

Air blanket does not work (schematic FO-1, sheet 8, lines 804 – 808).

NOTE

Air blanket circuits only supply air to top of media filter when ROWPU is operating in system NORMAL and high pressure pump is running. Level assembly on media filter controls cycling of air blanket solenoid valve. When water level rises to height of top switch on assembly, air blanket solenoid valve opens. Valve stays open until water level drops to middle switch on level assembly; valve then closes until water level rises again.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from relay K1(B3X) (schematic FO-2, sheet 6) to J16R (schematic FO-2, sheet 9). Repeat procedure from transformer T1(X2) (schematic FO-2, sheet 10) to J16S. Remove P16 (schematic FO-2, sheet 15) during testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J16 if faulty (WP 0026 00).

Check continuity from P16R to J47A (schematic FO-2, sheet 15) and from P16S to J47B.

CORRECTIVE ACTION

Replace/repair connectors and cable assembly if faulty (WP 0063 00, TM 10-4610-232-12).
Return ROWPU to service after checks and repairs. Check air blanket for correct operation.

CAUTION

Be careful when removing bottom of level assembly chamber and float. Float drops out as soon as chamber bottom is removed and damage to equipment could occur.

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Drain media filter until water stops coming out of media filter upper drain valve. Disconnect J37 and J36 (schematic FO-2, sheet 15) from media filter level assembly. Remove bottom of level assembly chamber and remove float. Check for continuity across P36A (schematic FO-2, sheet 15) and P36B.

CORRECTIVE ACTION

If there is no continuity, replace LSL5 (schematic FO-2, sheet 15) (WP 0092 00, TM 10-4610-232-12).

MALFUNCTION

Reinsert float into chamber with arrow pointing up and push up float slowly with a nonmetallic rod. LSL5(P36A/B) should open (and stay open) as float passes it. Push float to top of chamber and then let float descend. LSL5 should close as float passes by it.

CORRECTIVE ACTION

Replace LSL5 if it does not open/close as noted (WP 0092 00, TM 10-4610-232-12).

Check for continuity across P37A (schematic FO-2, sheet 15) and P37B.

CORRECTIVE ACTION

Replace LSH (schematic FO-2, sheet 15) if there is continuity (WP 0092 00, TM 10-4610-232-12)

Reinsert float into chamber with arrow pointing up. Push float up slowly with nonmetallic rod. LSH(P37A/B) should close (and stay closed) as float passes. Push float to top of chamber and then let it descend. LSH should open as float passes.

CORRECTIVE ACTION

Replace LSH if it does not open or close as noted (WP 0093 00, TM 10-4610-232-12).

Check continuity from P14X (schematic FO-2, sheet 15) to J37A, from P14Z to J37B, from P14V to J36A and from P14W to J36B.

CORRECTIVE ACTION

Replace/repair cable and connectors if any open circuits are found (WP 0063 00, TM 10-4610-232-12).

Shut down generator (WP 0008 00, TM 10-4610-232-12). Remove wires #315, #316 and #317 from relay K28 (schematic FO-2, sheet 6). Check continuity, point-to-point, from wire #315 to J14X (schematic FO-2, sheet 9), from wire #317 to J14W and from wire #316 to J14Z and J14V.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair J14 if faulty (WP 0026 00).

Remove wire #2A from K28. Check continuity, point-to-point, from CB9 (schematic FO-2, sheet 8) to wire #264 on K28 and from transformer T1(X2) to wire #2A on K28.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Check continuity, point-to-point, from K28 (load wire #312) to relay K1(B3X). Depress indicating plunger on relay K1 and starter MS8-1M when checking across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K1 if its contact is open (WP 0028 00).
Repair starter MS8-1M (schematic FO-2, sheet 10) if contact does not close when testing (WP 0030 00).
Replace K28 (WP 0028 00).

SYMPTOM

Air blanket works but air blanket light does not come on; light test okay (schematic FO-1, sheet 8, line 607).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Remove wire #2A from PL19 (schematic FO-2, sheet 12). Check continuity, point-to-point, from relay K1(B3X) (schematic FO-2, sheet 6) to PL19 (wire #318). Repeat procedure from transformer T1(X2) (schematic FO-2, sheet 10) to PL19 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace LTK4 (schematic FO-2, sheet 8) if its contact is open (WP 0028 00).
Replace PL19 if checks are good (WP 0027 00).

SYMPTOM

Media filter needs to be drained manually to start backwash.

MALFUNCTION

Media filter needs to be drained due to a lack of air blanket on media filter prior to initiating backwash.

CORRECTIVE ACTION

Refer to air blanket troubleshooting if air blanket cannot be established prior to backwashing.
Refer to media filter backwash Phase 1 troubleshooting.

SYMPTOM

Backwash air solenoid valve works but pilot light does not come on; light test okay (schematic FO-2, sheet 7, lines 727 – 728).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #2A from pilot light PL17 (schematic FO-2, sheet 12) and remove connector P16 from control panel. Check continuity from TDK2 (terminal 10) (schematic FO-2, sheet 8) to pilot light PL17.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0025 00).
Replace LTK4 (schematic FO-2, sheet 8) if its contact is open (WP 0028 00).

SYMPTOM

Media filter backwash cycle works well until water starts filling filter during Phase 2 and backwash stops (schematic FO-1, sheet 7, line 705).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P14 (schematic FO-2, sheet 15) from control panel. Check continuity, point-to-point, from relay K15(B4X) (schematic FO-2, sheet 7) to relay K2(C1X) (schematic FO-2, sheet 6). Depress indicating plunger on relay K11 (schematic FO-2, sheet 6) when testing its contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K11 if contact does not close when plunger is pushed in (WP 0028 00).

SYMPTOM

Backwash cycle problems (Refer to automatic valve troubleshooting if valve cycling is a problem).

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

Be certain all circuit breakers are set. Refer to electrical drawings.

NOTE

There are four distinct electrical phases to media filter backwash cycle. Troubleshooting is broken down into phases to eliminate unnecessary steps. Since these phases are cascaded, each part of the cycle must be accomplished before the next one begins. Determine which part of the cycle is not operating correctly and then start troubleshooting at that cycle phase. If nothing happens when backwash is initiated, start at Phase 1.

- Phase 1: Media filter flush valve opens and pressure in media filter pushes water out until water level reaches bottom switch on media filter level assembly. Media filter pressure switch (PSL8) (schematic FO-2, sheet 14) located on back of control panel, monitors pressure in filter and closes when pressure is above 3 psig. Closing level and pressure switches allows Phase 2 to start.
- Phase 2: Raw water pump starts running and backwash air solenoid opens, placing air into bottom of media filter. Backwash chlorine pump starts pumping chlorine into media filter. Timer TDK2 (schematic FO-2, sheet 8) control length of time (1.5-2 min.) air is allowed to enter filter. When timed out, backwash air solenoid valve closes and Phase 3 begins. Typical air consumption during this phase is 300 – 500 lbs., as indicated on air system high pressure gauge.

Phase 3: Boost pump starts running and timer TDK3 (schematic FO-2, sheet 8) starts timing. When timed out (approx. 10 min.), raw water pump and backwash chlorine pump shut down and Phase 4 begins.

Phase 4: Clean/flush tank outlet valve opens and clean water is flushed through filter by boost pump. Timer TDK4 (schematic FO-2, sheet 8) starts timing length of clean water flush. When timed out (1.5-2 min.), boost pump shuts down and backwash complete alarm sounds. Clean/flush tank level switch (LSL1) (schematic FO-2, sheet 14) monitors water level in tank during this cycle phase and shuts boost pump down if clean/flush tank water level drops too low. Optimal time setting on TDK4 shuts boost pump down just prior to level switch (LSL1) shutting down boost pump.

SYMPTOM

Timer problems.

MALFUNCTION

Check that times are set properly before doing backwash cycle troubleshooting. Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel. Outer pointer on TDK2 should read 1 min., 36 seconds. TDK3 should read 10 min. TDK4 should read 1.5 min. Inner pointer on each timer should read the same as outer pointer.

CORRECTIVE ACTION

If outer pointers do not read as listed, adjust by turning time adjustment knob to correct setting.

If inner pointer on any timer does not match outer pointer, replace timer (WP 0027 00).

SYMPTOM

Backwash cycle Phase 1 (drain down) (schematic FO-1, sheet 8, lines 802 – 804; schematic FO-1, sheet 7, lines 702 – 706).

MALFUNCTION

Open media filter vent valve and start raw water pump in system NORMAL. Run pump until media filter is full of water. Turn off raw water pump, disconnect connector J48 (schematic FO-2, sheet 15) from filter flush valve, initiate filter BACKWASH, and open media filter top drain valve. Check for 110–120 VAC across pins J48D and J48E.

CORRECTIVE ACTION

If voltage is present, close media filter drain valve (be sure filter is full of water). Skip next Malfunction and proceed to the following Malfunction.

Reconnect J48 and make sure operating stem on filter flush valve is in.

CORRECTIVE ACTION

If stem is not in, refer to media filter flush valve troubleshooting.

If stem is in, close media filter drain valve. Be sure media filter is full of water. Proceed to Malfunction regarding opening media filter top drain valve.

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restore power to panel. Turn off raw water pump circuit breaker CB4 and boost pump circuit breaker CB5 (schematic FO-2, sheet 10). Disconnect backwash chlorine pump, connector J45 (schematic FO-2, sheet 15). Set control panel up in system BACKWASH and push INITIATE. Check that indicating plunger on relay K2 (schematic FO-2, sheet 6) is in.

CORRECTIVE ACTION

If plunger on relay K2 is not in, refer to operation mode circuit troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from CB9 (wire #264) (schematic FO-2, sheet 8) to relay K2(C1X) (schematic FO-2, sheet 8, line 702). Depress indicating plunger on K2 when checking B3Y/B3X contact. Push PB16 (schematic FO-2, sheet 12) during testing to make sure contact is open at one position and closed at the other end.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K2 if B3Y/B3X contact is open with plunger out or closed with plunger in (WP 0028 00).
Replace PB16 if closed or open in both switch positions (WP 0027 00).

Check continuity, point-to-point, from CB9 (wire #264) to J14B (schematic FO-2, sheet 9). Depress indicating plunger on K3 (schematic FO-2, sheet 6) when testing contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K3 if C1Y/C1X contact is open with plunger in or closed with plunger out (WP 0028 00).
Replace/repair connector J14 if faulty (WP 0026 00).

MALFUNCTION

Check continuity, point-to-point, from CB9 (wire #264) to relay K15(B4X) (schematic FO-2, sheet 7). Depress indicating plunger on K2 when testing contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K2 if B4Y/B4X contact is open with plunger in or closed with plunger out (WP 0028 00).

Check continuity, point-to-point, from relay K15(B4X) to connector J14B. Depress indicating plunger on relay K11 (schematic FO-2, sheet 6) when testing contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K11 if contact is closed with plunger out or open with plunger in (WP 0028 00).

Check continuity, point-to-point, from CB9 (wire #264) to J14B (line 706). Depress indicating plunger on MS8-1M (schematic FO-2, sheet 10) when testing contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Repair starter MS8-1M if contact is closed with plunger out or open with plunger in (WP 0030 00).
Return ROWPU to service; check Phase 1 of backwash cycle.

MALFUNCTION

Open media filter top drain valve and watch that media filter pressure drops below 5 psig. Make sure indicating plunger on relay K15 is out.

CORRECTIVE ACTION

If plunger on K15 is in, refer to feed low pressure switch troubleshooting.

Level assembly on media filter should turn white as water level drops in media filter. Relay K10S (schematic FO-2, sheet 6) indicating plunger should go in when white flags reach bottom switch on level assembly. Relay K11 should pull in shortly after K10 pulls in.

NOTE

Time delay between relays K10 and K11 is dependent upon how much pressure is in filter. If PSL8 (schematic FO-2, sheet 14) is still sensing pressure, it will keep K11 de-energized until pressure drops low enough to allow switch to close.

CORRECTIVE ACTION

If flags do not turn white on level assembly and water has stopped draining from media filter top drain, refer to media filter level assembly plugged troubleshooting (TM 10-4610-232-12).
If K10 does not pull in and water level has reached bottom switch on level assembly (actuation point is midway through switch), proceed to next Malfunction.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Disconnect connector at bottom switch of media level assembly. Check continuity across J35A (schematic FO-2, sheet 15) and J35B.

CORRECTIVE ACTION

If there is continuity across J35A and J35B, proceed to Malfunction regarding reconnecting J35 and removing P16 from control panel.

CAUTION

Be careful when removing bottom of level assembly chamber and float. Float drops out as soon as chamber bottom is removed and damage to equipment could occur.

Remove bottom of level assembly and remove float. Check for continuity across J35A and J35B with float removed.

CORRECTIVE ACTION

If there is continuity across J35A and J35B, float is not dropping far enough to actuate switch. Clean out level chamber and lines to level assembly if plugged.

CAUTION

Clamp may crack if overtightened.

If lines and chamber are not plugged, switch may be loose and slightly out of position. Move switch up chamber and proceed to next Malfunction.

MALFUNCTION

Make sure J35A and J35B show continuity. Insert float into level chamber with arrow up. Slowly push float up chamber. Make sure multimeter shows switch opening as float passes opening. Switch should remain open. Slowly let float drop and make sure switch closes as float passes. Switch should now remain closed.

CORRECTIVE ACTION

Replace switch LSL (schematic FO-2, sheet 15) if it does not operate as noted (WP 0092 00, TM 10-4610-232-12).
Return ROWPU to operation and check Phase 1 operation.

Reconnect J35 and remove P16 (schematic FO-2, sheet 15) from control panel. Check for continuity across P16T and P16U.

CORRECTIVE ACTION

If there is no continuity, replace/repair cable and connectors between control panel and LSL switch (WP 0026 00).

Check continuity, point-to-point, from LK1(SW2) (schematic FO-2, sheet 6) to J16T. Repeat procedure from LK1(SW1) to J16U.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J16, if faulty (WP 0026 00).

Remove wire #2A from K10. Check continuity, point-to-point, from CB9 (wire #264) to LK1(AC) and from LK1(LOAD) to relay K10(K1). Check continuity, point-to-point, from transformer T1(X2) (schematic FO-2, sheet 10) to relay K10 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Make sure resistance across coil K10 (K1-K2) is close to zero.

CORRECTIVE ACTION

If resistance is infinity or zero, replace relay K10 (WP 0028 00).
If resistance check on K10 is good, replace relay LK1 (WP 0028 00).
Return ROWPU to service and check operation of Phase 1.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #2A from K11. Check continuity, point-to-point, from CB9 (wire #264) to relay K10(A1X) (line 704). Depress indicating plunger on relay K2 during contact testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K2 if contact is closed when indicating plunger is out or open when plunger is in (WP 0028 00).
Replace relay K15 if contact is open (WP 0028 00).
Replace pressure switch PSL8 if open (WP 0025 00).

Check continuity, point-to-point, from relay K10(A1X) to relay K11(K1). Repeat procedure from transformer T1(X2) to relay K11 (wire #2A). Depress indicating plunger on relays K10 and K2 when checking individual contacts. Remove wire #268 from PB16 before testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K10 if contact is closed when indicating plunger is out or open when plunger is in (WP 0028 00).
Replace relay K2 if contact is closed when indicating plunger is out or open when plunger is in (WP 0028 00).
Replace relay K11 if checks in previous and this Malfunction are good (WP 0028 00).

SYMPTOM

Backwash cycle Phase 2 (schematic FO-1, sheet 7, lines 721 – 729) (TDK2 timer setting 1 minute, 36 seconds).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restore power to panel. Turn off raw water pump circuit breaker, CB4, and boost pump circuit breaker, CB5 (schematic FO-2, sheet 10). Disconnect backwash chlorine pump, connector J45 (schematic FO-2, sheet 15). Set control panel in system BACKWASH and push INITIATE. Make sure indicating plunger on relay K11 (schematic FO-2, sheet 6) goes in at end of Phase 1 of backwash cycle.

CORRECTIVE ACTION

If plunger on K11 is not in, refer to backwash circuit Phase 1 troubleshooting.

Make sure inner pointer on timer TDK2 (schematic FO-2, sheet 8) is moving toward zero.

CORRECTIVE ACTION

If pointer is not moving, proceed to Malfunction regarding removing connector P16 and wires from terminal 2 of TDK2 from control panel.

Remove connector J46 (schematic FO-2, sheet 15) from backwash air solenoid valve. Check for 110–120 VAC across J46A and J46B.

CORRECTIVE ACTION

If voltage is not present, skip next Malfunction and proceed to the following Malfunction.

MALFUNCTION

Check P46 (schematic FO-2, sheet 15) and cable for damage.

CORRECTIVE ACTION

Replace/repair connector P46 if damaged (WP 0026 00).
Replace backwash air solenoid valve SV6 (schematic FO-2, sheet 15) if no connector damage exists (WP 0091 00, TM 10-4610-232-12).

Remove connector P16 (schematic FO-2, sheet 15) from control panel. Check for 110–120 VAC across J16N and J16P (schematic FO-2, sheet 9).

CORRECTIVE ACTION

If no voltage is present, proceed to Malfunction for removing connector P16 from control panel and depressing plunger on relay K11.

Check for continuity and shorts from P16N to J46A and from P16P to J46B.

CORRECTIVE ACTION

Replace/repair connectors and cable as necessary (WP 0026 00).

Check that indicating plunger on K13 (schematic FO-2, sheet 6) is in.

CORRECTIVE ACTION

If plunger is out, proceed to Malfunction for removing wire #2A from K13.

Check for 110–120 VAC across J16D and J16E.

CORRECTIVE ACTION

If voltage is not present, proceed to Malfunction for removing connector P16 from control panel and depressing plunger on relay K13.

Reconnect J/P16 and check for 110–120 VAC at chlorine backwash pump connector J45A and J45B.

CORRECTIVE ACTION

If voltage is not present, proceed to Malfunction for checking continuity and shorts from P16D to J45A and from P16E to J45B.

Inspect backwash pump connector P45 and cable for damage. If no damage is evident, replace backwash chlorine pump (WP 0072 00, TM 10-4610-232-12).

Check for continuity and shorts from P16D to J45A and from P16E to J45B.

CORRECTIVE ACTION

Replace/repair connectors as necessary (WP 0026 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #2A from K13. Remove connector P16 from side of control panel. Check continuity, point-to-point, from CB9 (wire #284) (schematic FO-2, sheet 8) to relay K13(K1) (line 721). Depress indicating plunger on relay K11 when testing contact. Check continuity, point-to-point, from transformer T1(X2) (schematic FO-2, sheet 10) to relay K13 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K11 if contact does not close when indicating plunger is depressed (WP 0028 00).
Replace timer TDK3 (schematic FO-2, sheet 8) if terminals 9-10 do not show continuity (WP 0028 00).
Replace relay K13 if checks do not identify problem (WP 0028 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P16 from side of control panel. Check continuity, point-to-point, from CB9 (wire #264) to J16N (lines 721 – 728). Depress indicating plunger on relay K11 when testing contact. Check continuity, point-to-point, from transformer T1(X2) to J16P.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K11 if contact does not close when indicating plunger is depressed (WP 0028 00).
Replace timer TDK2 if terminals 9-10 do not show continuity (WP 0028 00).
Replace/repair J16 if faulty (WP 0026 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P16 from side of control panel. Check continuity, point-to-point, from CB9 (wire #264) to J16D (line 730). Depress indicating plunger on relay K13 when testing contact. Check continuity, point-to-point, from transformer T1(X2) to J16E.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K13 if contact does not close when indicating plunger is depressed (WP 0028 00).
Replace/repair J16 if faulty (WP 0026 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P16 from side of control panel and wires from terminal 2 of TDK2. Check continuity, point-to-point, from CB9 (wire #264) to TDK2 (terminal 1) (line 722). Depress indicating plunger on relay K11 when testing contact. Check continuity, point-to-point, from transformer T1(X2) to TDK2 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K11 if contact does not close when indicating plunger is depressed (WP 0028 00).

Check continuity from TDK2 (terminal 1) to TDK2 (terminal 8).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace TDK2 if checks in previous and current Malfunctions have not revealed problem (WP 0028 00).

SYMPTOM

Backwash cycle Phase 3 (schematic FO-1, sheet 7, lines 724 – 727) (TDK3 timer setting 10 minutes).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restore power to panel. Turn off raw water pump circuit breaker CB4 and boost pump circuit breaker CB5 (schematic FO-2, sheet 10). Disconnect backwash chlorine pump, connector J45 (schematic FO-2, sheet 15). Set control panel up in system BACKWASH and push INITIATE. Make sure backwash air inlet valve pilot light goes out at end of Phase 2 of backwash cycle. Make sure inner pointer on TDK2 (schematic FO-2, sheet 8) is on zero.

CORRECTIVE ACTION

If valve light has not gone off or if timer inner dial is not on zero, refer to backwash Phase 2 troubleshooting.

Make sure inner dial on TDK3 (schematic FO-2, sheet 8) starts moving toward zero.

CORRECTIVE ACTION

If dial is not moving, skip next Malfunction and proceed to the following Malfunction.

MALFUNCTION

Make sure that indicating plunger on K14 (schematic FO-2, sheet 7) pulls in.

CORRECTIVE ACTION

If plunger does not go in, proceed to Malfunction for removing connector P16 from control panel and wires from K2.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P16 (schematic FO-2, sheet 15) from side of control panel and wires from terminal 2 of TDK3. Check continuity, point-to-point, from CB9 (wire #264) (schematic FO-2, sheet 8) to TDK2 (terminal 9, line 727). Depress indicating plunger on relay K11 (schematic FO-2, sheet 6) when testing contact. Check continuity, point-to-point, from transformer T1(X2) (schematic FO-2, sheet 10) to TDK3 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K11 if contact does not close when indicating plunger is depressed (WP 0028 00).

Check continuity from TDK2 (terminal 8) to TDK3 (terminal 1).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

MALFUNCTION

Check continuity from TDK2 (terminal 1) to TDK3 (terminal 8).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace timer TDK3 if checks have not identified problem (WP 0028 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P16 from side of control panel and wires from K2 (schematic FO-2, sheet 6) of K14. Check continuity, point-to-point, from CB9 (wire #264) to TDK2 (terminal 9, line 727). Depress indicating plunger on relay K11 when testing contact. Check continuity, point-to-point, from transformer T1(X2) to K14 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace relay K11 if contacts do not close when indicating plunger is depressed (WP 0028 00).

Check continuity, point-to-point, from TDK2 (terminal 8) to relay K14(K1).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace timer TDK4 (schematic FO-2, sheet 8) if terminals 9–10 do not show continuity (WP 0028 00).

Replace relay K14 if checks have not identified problem (WP 0028 00).

SYMPTOM

Backwash cycle Phase 4 (schematic FO-1, sheet 7, lines 721 and 732) (TDK4 timer setting 1.5 minutes).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restore power to panel. Turn off raw water pump circuit breaker CB4 and boost pump circuit breaker CB5 (schematic FO-2, sheet 10). Disconnect backwash chlorine pump, connector J45 (schematic FO-2, sheet 15). Set control panel in system BACKWASH and push INITIATE. Make sure indicating plunger on relay K13 (schematic FO-2, sheet 6) comes out at end of Phase 3 of backwash cycle. Make sure inner pointer on TDK3 (schematic FO-2, sheet 8) is on zero.

CORRECTIVE ACTION

If plunger on K13 does not come out or if timer inner dial is not on zero, refer to backwash Phase 3 troubleshooting.

Make sure inner dial on TDK4 (schematic FO-2, sheet 8) starts moving toward zero.

CORRECTIVE ACTION

If dial does not move, proceed to Malfunction regarding removing wires from terminal 2 of TDK4.

MALFUNCTION

Make sure indicating plunger on K12 (schematic FO-2, sheet 6) pulls in.

CORRECTIVE ACTION

If plunger does not pull in, skip next Malfunction and proceed to the following Malfunction.

Make sure indicating plunger on relay K14 pulls out and alarm turns on when inner pointer on TDK4 reaches zero.

CORRECTIVE ACTION

If alarm does not turn on, proceed to last Malfunction within this Symptom.
If plunger on K14 does not come out or if TDK4 does not go to zero, proceed to Malfunction regarding removing wires from terminal 2 of TDK4.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove #2A wire from relay K12 and K13 (schematic FO-2, sheet 6). Disconnect connector P16 from control panel. Check continuity, point-to-point, from CB9 (wire #264) (schematic FO-2, sheet 8) to TDK3 (terminal 9). Depress indicating plunger on relay K11 (schematic FO-2, sheet 6) when testing contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K11 if contact does not close when indicating plunger is pushed (WP 0028 00).

Check continuity from TDK3 (terminal 8) to relay K12(K1). Check continuity, point-to-point, from transformer T1(X2) (schematic FO-2, sheet 10) to relay K12 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K12 if checks do not identify problem (WP 0028 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from terminal 2 of TDK4. Check continuity, point-to-point, from CB9 (wire #264) to TDK4 (terminal 1, line 732). Depress indicating plunger on relay K12 when testing contact. Check continuity, point-to-point, from transformer T1(X2) to TDK4 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K12 if contact does not close when indicating plunger is depressed (WP 0028 00).

Check continuity from TDK4 (terminal 1) to TDK4 (terminal 8).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace TDK4 if checks do not identify problem (WP 0028 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity from TDK4 (terminal 8) to terminal strip 1-22.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Refer to first Symptom in alarm circuit troubleshooting (TM 10-4610-232-12).

TROUBLESHOOTING PROCEDURE**CONTROL CIRCUITS****SYMPTOM**

System on/system standby circuit does not work; system standby starts when SS2 is in system standby position (schematic FO-1, sheet 6, lines 602 – 603, 604 – 605).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Place SS2 (schematic FO-2, sheet 15) in system on position. Remove K1 and K2 wires (schematic FO-2, sheet 6) from K4 (schematic FO-2, sheet 6). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to relay K4 (K1). Repeat procedure from T1(X2) to relay K4 (K2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace switch PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace switch SS2 if open (WP 0027 00).
If checks do not solve problem, replace relay K4 (WP 0028 00).

MALFUNCTION

Remove wires from A1X/A1Y on relay K4. Check for continuity across A1 contact when indicating plunger on K4 is pushed in.

CORRECTIVE ACTION

Replace K4 if there is no continuity (WP 0028 00).

Check wires A1X/A1Y for continuity and damage to the next connection point.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Remove wires from 2A3 and 2A4 on SS2. Make sure this part of switch is open when SS2 is in system on position.

CORRECTIVE ACTION

Replace SS2 if contact is closed (WP 0027 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Place SS2 in system standby position. Remove K1 and K2 wires from K5 (schematic FO-2, sheet 7). Check continuity, point-to-point, from transformer T1(X1) to relay K5 (K1). Repeat procedure from T1(X2) to relay K5 (K2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 if open (WP 0028 00).
Replace switch PB3 if open (WP 0027 00).
Replace switch SS2 if open (WP 0027 00).
Replace relay K5 if continuity checks are good but problem still exists (WP 0028 00).

Remove wires from A1Z/A1Y on relay K5. Check for continuity across A1 contact when indicating plunger on K5 is pushed in.

CORRECTIVE ACTION

Replace K5 if there is no continuity (WP 0028 00).

Check wires A1Z/A1Y for continuity and damage to the next connection point.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Remove wires from 1B2 and 1B1 on SS2. Make sure this part of switch is open when SS2 is in system standby position.

CORRECTIVE ACTION

Replace SS2 if contact is closed (WP 0027 00).

SYMPTOM

Operation mode circuits do not work; backwash mode starts when SS3 is in backwash position (schematic FO-1, sheet 6, lines 613 – 618, 607 – 609).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Place SS3 (schematic FO-2, sheet 12) in system normal position. Remove K1 and K2 wires from K1 (schematic FO-2, sheet 6). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to relay K1(K1). Push INITIATE PB4 (schematic FO-2, sheet 12) when checking continuity across it. Repeat procedure from T1(X2) to relay K1 (K2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace switch PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace switch SS3 if open (WP 0027 00).
Replace PB4 if it does not show continuity when pressed (WP 0027 00).

MALFUNCTION

Check continuity, point-to-point, from PB4 (3A4) to relay K1(K1). Depress indicating plunger on K1 when checking across its contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace K1 if contact does not show continuity when plunger is depressed (WP 0028 00).
Replace K2 if contact is open (WP 0028 00).
Replace K3 (schematic FO-2, sheet 6) if contact is open (WP 0028 00).

Remove wires from A2X/A1Y on relay K1. Check for continuity across A1 contact when indicating plunger on K1 is pushed in.

CORRECTIVE ACTION

Replace K1 if there is no continuity (WP 0028 00).

Check wires A2X/A1Y for continuity and damage to the next connection point.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace K1 if all checks are good (WP 0028 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Place SS3 in backwash position. Remove K1 and K2 wires from K2. Check continuity, point-to-point, from transformer T1(X1) to relay K2(K1). Push INITIATE PB4 when checking continuity across it. Repeat procedure from T1(X2) to relay K2(K2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 if open (WP 0028 00).
Replace switch PB3 if open (WP 0027 00).
Replace switch SS3 if open (WP 0027 00).
Replace PB4 if it does not show continuity when pressed (WP 0027 00).

MALFUNCTION

Check continuity, point-to-point, from PB4(1A4) to relay K2(K1). Depress indicating plunger on K2 when checking across contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace K2 if contact does not show continuity when plunger is depressed (WP 0028 00).
Replace K1 if contact is open (WP 0028 00).

MALFUNCTION

Remove wires from A1X/A1Y on relay K2. Check for continuity across A1 contact when indicating plunger on K2 is pushed in.

CORRECTIVE ACTION

Replace K2 if there is no continuity (WP 0028 00).

Check wires A1X/A1Y for continuity and damage to the next connection point.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace K2 if all checks are good (WP 0028 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Place SS3 in clean position. Remove K1 and K2 wires from K3. Check continuity, point-to-point, from transformer T1(X1) to relay K3(K2). Repeat procedure from T1(X2) to relay K3(K2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB7 if open (WP 0028 00).
Replace switch PB3 if open (WP 0027 00).
Replace switch SS3 if open (WP 0027 00).
Replace PB4 if it does not show continuity when pressed (WP 0027 00).

Check continuity, point-to-point, from PB4(2A3) to relay K3(K1). Depress indicating plunger on K3 when checking across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace K3 if contact does not show continuity when plunger is depressed (WP 0028 00).
Replace K1 if contact is open (WP 0028 00).

Remove wires from A1X/A1Y on relay K3. Check for continuity across A1 contact when indicating plunger on K3 is pushed in.

CORRECTIVE ACTION

Replace K3 if there is no continuity (WP 0028 00).

Check wires A1X/A1Y for continuity and damage to the next connection point.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace K3 if all checks are good (WP 0028 00).

SYMPTOM

ROWPU control circuits do not work (schematic FO-1, sheet 5, lines 513 – 525).

MALFUNCTION

Make sure generator voltage is 435–445 VAC on all three phases.

CORRECTIVE ACTION

Adjust to correct voltage.

Refer to generator troubleshooting if voltage cannot be adjusted.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove H1, H2, X1 and X2 wires from transformer T1 (schematic FO-2, sheet 10). Check continuity, point-to-point, from power distribution block (PDB) (schematic FO-2, sheet 10) to transformer T1, wires AL1 to T1(H1) and AL2 to T1(H2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace circuit breaker CB15 (schematic FO-2, sheet 10) if open on either phase (WP 0030 00).

Check continuity, point-to-point, from T1(X1) to PB3(1B1) and to PB3(2B2) (schematic FO-2, sheet 11). Repeat procedure from T1(X2) to terminals 1-80 and 1-73.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace circuit breaker CB7 (schematic FO-2, sheet 8) if either side is open (WP 0028 00).

Replace switch PB3 if either side is open (WP 0027 00).

Replace transformer T1 if checks do not solve problem (WP 0030 00).

SYMPTOM

ROWPU utility circuits do not work (schematic FO-1, sheet 5, lines 529 – 537).

MALFUNCTION

Make sure generator voltage is 435–445 VAC on all three phases.

CORRECTIVE ACTION

Adjust to correct voltage.

Refer to generator troubleshooting if voltage cannot be adjusted.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove H1, H2, X1 and X2 wires from transformer T2 (schematic FO-2, sheet 10). Check continuity, point-to-point, from power distribution block (PDB) (schematic FO-2, sheet 10) to transformer T2, wires AL2 to T2(H1) and AL3 to T2(H2).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace circuit breaker CB16 (schematic FO-2, sheet 10) if open on either phase (WP 0030 00).

MALFUNCTION

Check continuity, point-to-point, from T2(X1) to CB13 (schematic FO-2, sheet 8) and to relay K27(A2X) (schematic FO-2, sheet 8). Repeat procedure from T2(X2) to terminals 1-84 and 1-82.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace transformer T2 if checks do not solve problem (WP 0030 00).

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22 1/2 TON 8-WHEEL TANDEM
DIRECT SUPPORT TROUBLESHOOTING PROCEDURES**

INTRODUCTION TO TROUBLESHOOTING

The Troubleshooting Malfunctions list the common malfunctions, which you may find during the operation or maintenance of the ROWPU or its components. Perform the tests/inspections and corrective actions in the order described.

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

TROUBLESHOOTING PROCEDURES (continued).

FLOWMETERS

SYMPTOM

Flowmeters do not show any flow (schematic FO-1, sheet 8, lines 815 – 819).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel door and power up panel. Check power supply PS1 (schematic FO-2, sheet 8) for 110–120 VAC power on input side.

CORRECTIVE ACTION

If voltage is correct, skip next Malfunction and proceed to the following Malfunction.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from circuit breaker CB9 (schematic FO-2, sheet 8) to PS1 (wire #264). Repeat procedure from transformer T1(X2) (schematic FO-2, sheet 10) to PS1 (wire #2A). Remove wire #2A from PS1 during testing.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Check PS1 output for 12 VDC.

CORRECTIVE ACTION

Replace PS1 if output voltage is below 11.5 VDC (WP 0028 00).

Check that flowmeter is inoperative for 12 VDC on flowmeter voltage input terminals.

CORRECTIVE ACTION

Replace/repair wires from PS1 +/- terminals on flowmeter if voltage is not present (WP 0026 00).

Remove flow sensor for inoperative meter from piping. Feed flow sensor is located on front wall piping, waste sensor is located on ceiling next to control panel and product sensor is on back wall piping behind control panel. Check paddle wheel for debris and ease of rotation.

CORRECTIVE ACTION

Use a stiff brush to remove debris that may be on wheel.
Replace paddle wheel if it cannot be cleaned or spin very easily (WP 0022 00).

MALFUNCTION

Disconnect black and red low sensor leads at flowmeter and attach multimeter. Set meter to 0-1 VAC scale. Spin paddle wheel vigorously. Be sure multimeter needle shows voltage reading.

CORRECTIVE ACTION

Replace flow sensor if meter does not indicate voltage (WP 0022 00).
Return ROWPU to service and check flowmeter for operation. Replace flowmeter and adjust new flowmeter if old one does not work (WP 0027 00).

SYMPTOM

Flowmeter is inaccurate; flowmeter needs adjustment.

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel door and remove access panels from back of flowmeters. Restart ROWPU (TM 10-4610-232-12).

CORRECTIVE ACTION

Adjust feed flowmeter to read 102 GPM by turning adjustable pot located in flowmeter access panel. Turn pot clockwise to increase reading; turn counterclockwise to lower reading (WP 0028 00).

Attach auxiliary flowmeter to product out hose and read the flow.

CORRECTIVE ACTION

Adjust product flowmeter to correct reading (WP 0028 00).

Subtract product flow rate from feed flow rate to obtain waste rate.

CORRECTIVE ACTION

Adjust waste flowmeter (WP 0028 00).

TROUBLESHOOTING PROCEDURE

DIESEL FUEL HEATER (Figure 1)

SYMPTOM

Fan fails to go to high speed during burning cycle.

MALFUNCTION

Use a condenser tester and check for faulty capacitor. Capacitors are rated at 0.68 microfarad (mfd).

CORRECTIVE ACTION

Replace capacitor if faulty (WP 0059 00).
Replace motor (WP 0059 00).

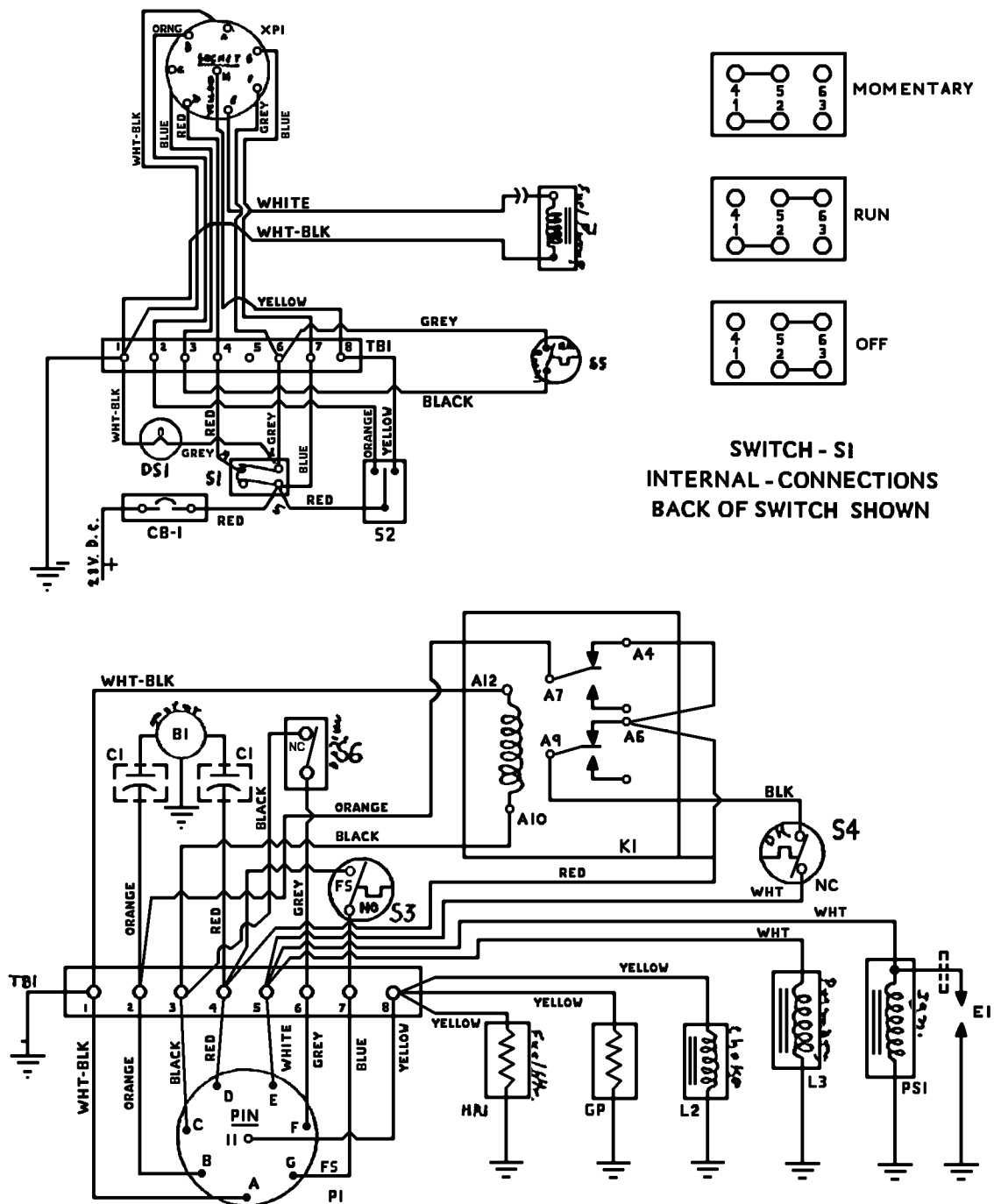


Figure 1. Diesel Heater Wiring Diagram

SYMPTOM

Heater fails to start (motor fails to run).

MALFUNCTION

Use a condenser tester and check for faulty capacitor. Capacitors are rated at 0.68 mfd.

CORRECTIVE ACTION

Replace capacitor, if faulty (WP 0059 00).
Replace motor (WP 0059 00).

SYMPTOM

Heater has excessive backfiring or popping.

MALFUNCTION

Check carburetor.

CORRECTIVE ACTION

Disassemble, clean and repair carburetor as necessary (WP 0059 00).

MALFUNCTION

Check solenoid valves.

CORRECTIVE ACTION

Disassemble, clean and repair solenoid valves as necessary (WP 0059 00).

MALFUNCTION

Check mixer housing.

CORRECTIVE ACTION

Disassemble, clean and repair mixer housing as necessary (WP 0059 00).

SYMPTOM

Heater remains on burner cycle after heat demands are met.

MALFUNCTION

Check hold-fire thermostat assembly and temperature control switch for operation. Check temperature control switch for sticking.

CORRECTIVE ACTION

Disassemble, clean and repair temperature control switch as necessary (WP 0059 00).

MALFUNCTION

Check primary fuel solenoid.

CORRECTIVE ACTION

Disassemble, clean and repair primary fuel solenoid as necessary (WP 0059 00).

SYMPTOM

Heater shuts down when heat demands are met and then needs to be restarted. Heater does not stay on low-fire until heat is required.

MALFUNCTION

Check hold-fire thermostat assembly and temperature control switch for operation and sticking.

CORRECTIVE ACTION

Disassemble, clean and repair hold-fire thermostat and temperature control switch as necessary (WP 0059 00).

SYMPTOM

Heater leaks fuel.

MALFUNCTION

Isolate fuel leak.

CORRECTIVE ACTION

Disassemble leaking component and replace gaskets as required (WP 0059 00).

SYMPTOM

Heater leaking fumes into ROWPU van.

MALFUNCTION

Check heat exchanger.

CORRECTIVE ACTION

Remove and inspect heat exchanger thoroughly for cracks, holes, broken welds and other damage. Replace heat exchanger if damaged. Always use new gaskets and exhaust connector when installing heat exchanger (WP 0059 00).

TROUBLESHOOTING PROCEDURE**CARBON MONOXIDE (CO) MONITOR****SYMPTOM**

Monitor setpoints do not adjust.

MALFUNCTION

Perform test and adjustment procedure and adjust zero and span pots (WP 0061 00).

CORRECTIVE ACTION

If unit will not adjust, replace sensor and readjust unit (WP 0061 00).
If unit does not perform correctly after replacing sensor, replace main board (WP 0061 00).

SYMPTOM

Monitor does not display.

MALFUNCTION

Visually check that monitor is functioning.

CORRECTIVE ACTION

Replace display board (WP 0061 00).
If problem still is not corrected, replace main board (WP 0061 00).

TROUBLESHOOTING PROCEDURE**AIR COMPRESSOR****WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power be connected. Always take proper measures to ensure personal safety.

NOTE

Make sure all circuit breakers are set before troubleshooting.

SYMPTOM

Air compressor will not start (schematic FO-1, sheet 8, lines 824 – 829; schematic FO-1, sheet 5, lines 518 – 521).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and make sure overload reset button on MS1 is in by pushing it.

CORRECTIVE ACTION

If reset button is in, skip next Malfunction and proceed to following Malfunction.
If reset button is out and will not reset, replace overload heaters on MS1 (schematic FO-2, sheet 10). Refer to WP 0030 00 and proceed to next Malfunction.

If reset button is out but resets when pushed, adjust door reset assembly for MS1. Refer to WP 0029 00 and proceed to next Malfunction.

MALFUNCTION

Check each lead, 1T1, 1T2 and 1T3 from MS1 to J20 (schematic FO-2, sheet 16) for damage and tightness.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Power up control panel (TM 10-4610-232-12). Observe MS1 when air compressor start switch is turned on. Be sure system air pressure is below 1400 psig before turning on air compressor. Indicating plunger should go in and stay in which indicates control circuits are working properly.

CORRECTIVE ACTION

If indicating plunger goes in and stays in, proceed to Malfunction regarding checking generator voltage on all three phases.

Disconnect P11 (schematic FO-2, sheet 14) from control panel and check continuity across P11B and P11C which should read zero.

CORRECTIVE ACTION

If it does not read zero, refer to pressure switch troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Turn on air compressor switch. Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to J11B (schematic FO-2, sheet 9).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0025 00).
Replace circuit breakers CB7 and CB10, if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace switch PB3, if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace switch SS5, if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace/repair connector J11, if open (WP 0026 00).

Remove wire #326 and #2A from MS1 coil. Check continuity from J11C to MS1 (wire #326) and from transformer T1(X2) to MS1 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair J11 if open (WP 0026 00).
Replace/repair MS1 if all checks are satisfactory (WP 0030 00).

MALFUNCTION

Check generator voltage on all three phases which must be 435–445 VAC on each phase.

CORRECTIVE ACTION

Adjust to correct voltage.

If voltage is not correct on all three phases, refer to generator troubleshooting.

Check for correct voltage by starting raw water pump. Turn on both switches for distribution pump and note if it runs.

CORRECTIVE ACTION

If Phase 3 motors listed do not operate, skip next Malfunction and proceed to the following Malfunction.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from power distribution block (PDB) (schematic FO-2, sheet 10) to J20 (schematic FO-2, sheet 16) on following lines: AL1 to J20A, AL2 to J20B and AL3 to J20C. Depress operating plunger MS1 when checking across its contacts. Disconnect J20 connector when testing.

NOTE

When checking continuity in power circuits, it is important to note wire numbers on each phase. Each wire is tagged identically on both ends, but in some instances, a #1 phase wire will enter the top of a starter or circuit breaker and come out the bottom of the device as a #2 phase wire. This will change the rotation of a motor so the associated pump will turn in correct direction. Any two wires may be interchanged to accomplish the rotational change.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace circuit breaker CB2 if open at any phase (schematic FO-2, sheet 10) (WP 0030 00).

Replace/repair MS1 if open on any phase (WP 0030 00).

Replace/repair J20 if faulty (WP 0026 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Disconnect cable from ROWPU to generator, at generator end. Check continuity, point-to-point, from generator end of cable to power distribution block (PDB) on each phase.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace main power cable if open on any phase (WP 0026 00).

Replace circuit breaker CB1 if open (schematic FO-2, sheet 10) (WP 0030 00).

If checks have not identified problem, refer to generator troubleshooting.

SYMPTOM

Air compressor motor hums but will not turn (schematic FO-1, sheet 5, lines 518 – 521).

MALFUNCTION

Make sure generator voltage on all three phases is 435–445 VAC.

CORRECTIVE ACTION

Adjust to correct voltage.

If voltage is not correct on all three phases, refer to generator troubleshooting.

Check for correct voltage by starting raw water pump. Turn on both switches for distribution pump and note if it runs.

CORRECTIVE ACTION

If Phase 3 motors listed do not operate, proceed to last Malfunction within this Symptom.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from power distribution block (PDB) (schematic FO-2, sheet 10) to J20 (schematic FO-2, sheet 16) on following lines: AL1 to J20A, AL2 to J20B and AL3 to J21C (schematic FO-2, sheet 16). Depress operating plunger MS1 (schematic FO-2, sheet 10) when checking across contacts. Disconnect J20 connector when testing.

NOTE

When checking continuity in power circuits, it is important to note wire numbers on each phase. Each wire is tagged identically on both ends, but in some instances, a #1 phase wire will enter the top of a starter or circuit breaker and come out the bottom of the device as a #2 phase wire. This is done to change the rotation of a motor so the associated pump will turn in correct direction. Any two wires may be interchanged to accomplish this rotational change.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace circuit breaker CB2 if open at any phase (schematic FO-2, sheet 10) (WP 0030 00).

Replace MS1 if overload is open (WP 0030 00) and troubleshoot to identify cause.

Replace/repair J20 if faulty (WP 0026 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Disconnect cable from ROWPU to generator at generator end. Check continuity, point-to-point, from generator end of cable to power distribution block (PDB) on each phase.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace main power cable if open on any phase (WP 0026 00).

Replace circuit breaker CB1 if open (schematic FO-2, sheet 10) (WP 0030 00).

If checks have not identified problem, refer to generator troubleshooting.

SYMPTOM

Air compressor runs but hourmeter does not accumulate hours (schematic FO-1, sheet 8, line 825).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check for loose or damaged wires to hourmeter.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace hourmeter if checks do not solve problem (WP 0029 00).

SYMPTOM

Air compressor runs but air compressor light does not come on; light test okay (schematic FO-1, sheet 8, line 829).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove #2A wire from pilot light PL20 (schematic FO-2, sheet 11). Check continuity, point-to-point, from terminal 1-46 to PL20 (wire #328) and from transformer T1(X2) (schematic FO-2, sheet 10) to PL20 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace LTK1 if contact is open (schematic FO-2, sheet 14) (WP 0028 00).

Replace PL20 if continuity checks are incorrect (WP 0027 00).

SYMPTOM

Air compressor motor starter (MS1) does not pull in (schematic FO-1, sheet 8, lines 824 – 827, control circuits; schematic FO-1, sheet 5, lines 518 – 520, power circuits).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove motor starter coil wires. Use multimeter to check resistance across coil connections which should be near zero.

CORRECTIVE ACTION

Replace motor starter if resistance is infinity (open) or zero (shorted) (WP 0030 00).

SYMPTOM

Air compressor motor starter (MS1) pulls in but air compressor motor does not run (schematic FO-1, sheet 8, lines 824 – 827, control circuits; schematic FO-1, sheet 5, lines 518 – 520, power circuits).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Turn off circuit breaker CB2 (schematic FO-2, sheet 10) and disconnect connector P20 (schematic FO-2, sheet 16) from control panel. Use multimeter to check continuity across each pair of motor control contactors. Manually engage starter contacts during testing; reading should be zero.

CORRECTIVE ACTION

Replace motor starter if any pair is open (WP 0030 00).

Remove contactor block from starter and check for burned, arced-over contacts.

CORRECTIVE ACTION

Replace motor starter if contacts are damaged (WP 0030 00).

TROUBLESHOOTING PROCEDURE**BOOSTER PUMP****WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power be connected. Always take proper measures to ensure personal safety.

NOTE

Make sure all circuit breakers are set before troubleshooting.

NOTE

Some of the following procedures require ROWPU set up in NORMAL operating mode to ensure pump is operates properly. If pump operates properly in that mode, it is not necessary to recheck.

SYMPTOM

Booster pump will not start; system running normal (schematic FO-1, sheet 6, lines 625 – 632, control circuits; schematic FO-1, sheet 5, lines 540 – 542, power circuits).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel. Be sure overload reset button on MS7 (schematic FO-2, sheet 10) is in by pushing it.

CORRECTIVE ACTION

If reset button is in, skip next Malfunction and proceed to following Malfunction.
If reset button is out and will not reset, replace overload heaters on MS7 (WP 0030 00) and proceed to next Malfunction.
If reset button is out but resets when pushed, adjust door reset assembly for MS7 (WP 0029 00). Proceed to next Malfunction.

MALFUNCTION

Check each lead, 7T1, 7T2 and 7T3 from MS7 to J21 (schematic FO-2, sheet 16) for damage and tightness.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Start ROWPU in system NORMAL (TM 10-4610-232-12). Observe MS7 when booster pump start switch is pushed. Indicating plunger should go in and stay in which indicates control circuits are working properly.

CORRECTIVE ACTION

If indicating plunger goes in and stays in, proceed to Malfunction for checking generator voltage on all three phases.

If indicating plunger goes in but comes out when start button is released, proceed to Malfunction for indicating plungers on relays K2 and K3.

MALFUNCTION

Indicating plungers on relays K15 (schematic FO-2, sheet 7), K21 and K22 (schematic FO-2, sheet 6) should be in.

CORRECTIVE ACTION

If plunger on K15 is out, refer to feed low pressure troubleshooting.

If plunger on K21 is out, refer to high pressure pump high pressure troubleshooting, first Symptom.

If plunger on K22 is out, refer to product high pressure troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #243 from MS7 coil. Check continuity, point-to-point, from transformer T1(X1) to wire #243 on MS7. Repeat procedure from T1(X2) (schematic FO-2, sheet 10) to wire #2B on MS7. Depress switch PB12 (schematic FO-2, sheet 11) when checking across contact. Push in indicating plungers on relays K15, K21 and K22 when checking continuity across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace circuit breaker CB7 if open (schematic FO-2, sheet 8) (WP 0028 00).

Replace switch PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).

Replace switch PB4 (schematic FO-2, sheet 12), PB11 or PB12 (schematic FO-2, sheet 11) if open (WP 0027 00).

Replace relays K15, K21 or K22 if contact does not show continuity (WP 0028 00).

Replace or repair booster pump starter MS7 if checks and repairs are good (WP 0030 00).

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and repower panel. Indicating plungers on relays K2 and K3 (schematic FO-2, sheet 6) should be out. Indicating plunger on K4 (schematic FO-2, sheet 6) should be in.

CORRECTIVE ACTION

If plungers K2 or K3 are in, refer to operating mode circuit troubleshooting (control circuits).

If plunger on K4 is out, refer to system on/system off circuit troubleshooting (control circuits).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from PB12(1A4) to relay K22(A4Y). Push indicating plungers on relay K4 and on booster pump starter MS7 when testing continuity across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace relays K2, K3 or K4 if contact does not show continuity (WP 0028 00).

Replace/repair starter MS7 if contact does not show continuity (WP 0030 00).

MALFUNCTION

Make sure generator voltage on all three phases is 435 – 445 VAC.

CORRECTIVE ACTION

Adjust to correct voltage.

If voltage is not correct on all three phases, refer to generator troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from power distribution block (PDB) to J21 on following lines: AL1 to J21A, AL2 to J21B and AL3 to J21C. Depress operating plunger MS7 when checking across its contacts. Disconnect J21 connector when testing.

NOTE

When checking continuity in power circuits, it is important to note wire numbers on each phase. Each wire is tagged identically on both ends, but in some instances, a #1 phase wire will enter the top of a starter or circuit breaker and come out the bottom of the device as a #2 phase wire. This is done to change the rotation of a motor so the associated pump will turn the correct direction. Any two wires may be interchanged to accomplish this rotational change.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace circuit breaker CB5 if open on any phase (schematic FO-2, sheet 10) (WP 0030 00).

Replace/repair MS1 (schematic FO-2, sheet 10) if it shows open on any phase (WP 0030 00).

Replace/repair J21 if faulty (WP 0025 00).

SYMPTOM

Booster pump will not run in system NORMAL when flushing media filter (schematic FO-1, sheet 6, line 625).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #243 from booster pump starter MS7 (schematic FO-2, sheet 10). Check continuity, point-to-point, from relay K21(A4Y) (schematic FO-2, sheet 6) to wire #243 on MS7. Push in PB16 (schematic FO-2, sheet 12), media filter flush switch, when testing its contact for continuity.

NOTE

PB16 is a "push on/push off" switch. If continuity is not obtained in one position, push switch again and check for continuity.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace PB16 if there is no continuity after pushing switch twice during test (WP 0027 00).
Replace contact MS8-2M (schematic FO-2, sheet 10) if open (WP 0030 00).

SYMPTOM

Booster pump circuit breaker opens whenever booster pump is started; ROWPU shuts down when booster pump is started (schematic FO-1, sheet 5, lines 540 – 542).

MALFUNCTION

Check for short circuits.

CORRECTIVE ACTION

Refer to circuit breaker troubleshooting.

SYMPTOM

Booster pump motor hums but will not turn (schematic FO-1, sheet 5, lines 540 – 542).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from power distribution block (PDB) (schematic FO-2, sheet 10) to J21 (schematic FO-2, sheet 16) on following lines: AL1 to J21A, AL2 to J21B and AL3 to J21C. Depress operating plunger MS7 (schematic FO-2, sheet 16) when checking across its contacts. Disconnect J21 connector when testing.

NOTE

When checking continuity in power circuits, it is important to note wire numbers on each phase. Each wire is tagged identically on both ends, but in some instances, a #1 phase wire will enter the top of a starter or circuit breaker and come out the bottom of the device as a #2 phase wire. This is done to change the rotation of a motor so the associated pump will turn the correct direction. Any two wires may be interchanged to accomplish rotational change.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB5 if open on any phase (schematic FO-2, sheet 10) (WP 0030 00).
Replace MS7 if overload is open (WP 0030 00) and continue troubleshooting to identify cause.
Replace or repair starter MS1 (schematic FO-2, sheet 10) if it shows open on any phase (WP 0030 00).
Replace or repair J21 if faulty (WP 0026 00).

SYMPTOM

Booster pump does not run in system BACKWASH position (schematic FO-1, sheet 6, lines 627 – 628).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restore power to panel. Turn off raw water pump circuit breaker CB4 and boost pump circuit breaker CB5 (schematic FO-2, sheet 10). Disconnect backwash chlorine pump, connector J45 (schematic FO-2, sheet 15). Drain media filter down until water stops coming out top of media filter drain valve. Set control panel in system BACKWASH and push INITIATE. Make sure indicating plunger on relays K2 and K19 (schematic FO-2, sheet 6) go in.

CORRECTIVE ACTION

If plunger K2 is out, refer to operating mode circuit troubleshooting (control circuits).
If plunger on K19 is out, make sure clean/flush tank is full; refer to clean/flush tank level switch troubleshooting.

When PL17 (schematic FO-2, sheet 12) backwash air inlet valve light turns off, it indicates plunger on relay K14 (schematic FO-2, sheet 7) should go in. Relay K14 turns booster pump on during backwash.

CORRECTIVE ACTION

If PL17 light does not go off or if light goes off and plunger on relay K14 does not go in, refer to media filter backwashing circuit troubleshooting.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from switch PB11(1B1) (schematic FO-2, sheet 11) to relay K22(A4Y) (schematic FO-2, sheet 6). Depress indicating plungers on K14 and K19 when testing across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K14 or K19 if either has open contact during testing (WP 0028 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #243 from MS7 coil (schematic FO-2, sheet 10) and wire #299 from PB16 (schematic FO-2, sheet 12) before testing. Check continuity, point-to-point, from relay K21(A4Y) (schematic FO-2, sheet 6) to wire #243 on MS7 coil. Depress indicating plunger on relay K2 when testing contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K2 if contact is open during testing (WP 0028 00).

SYMPTOM

Booster pump does not start in system CLEAN (schematic FO-1, sheet 6, lines 626 – 629).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restore power to panel. Set unit up in system CLEAN and push INITIATE. Make sure indicating plungers on relays K3 and K19 (schematic FO-2, sheet 6) are in.

CORRECTIVE ACTION

If plunger on K3 is out, refer to operating mode circuit troubleshooting (control circuits).
If plunger on K19 does not go in, check that clean/flush tank is full; refer to clean/flush tank level switch troubleshooting.

Push booster pump START switch and watch relay K9 (schematic FO-2, sheet 8). Indicating plunger should go in and stay in after booster pump start switch is released.

CORRECTIVE ACTION

If indicating plunger on K9 does not go in, skip next Malfunction and proceed to the following Malfunction.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from switch PB11(1B1) (schematic FO-2, sheet 11) to relay K5(A4Y). Depress indicating plungers on K15 (schematic FO-2, sheet 7) and K9 when testing across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace K15 or K9 if either contact is open when plunger is depressed (WP 0028 00).

Remove wire #251 from relay K9(K1). Check continuity, point-to-point, from relay K5(A4Y) to wire #251 on K9. Depress indicating plunger on K19 when checking its contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace K19 if contact does not close when plunger is depressed (WP 0028 00).

MALFUNCTION

Check continuity, point-to-point, from relay K19(A4Y) to relay K22(A4Y) (schematic FO-2, sheet 6). Depress indicating plungers on relays K3 and K19 when checking across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relays K3 or K19 if either of the contacts is open when plunger is depressed (WP 0028 00).

Check continuity, point-to-point, from transformer T1(X2) (schematic FO-2, sheet 10) to wire #2B on relay K9.

CORRECTIVE ACTION

Replace relay K9 if checks are good and plunger on K9 did not go in (WP 0028 00).

Remove wire #2B from PL10 (schematic FO-2, sheet 11). Remove wire #243 from coil on MS7 (schematic FO-2, sheet 10). Check continuity, point-to-point, from relay K21(A4Y) (schematic FO-2, sheet 6) to wire #243 on MS7. Depress indicating plunger on relay K3 when testing its contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K3 if contact is open when plunger is depressed (WP 0028 00).
Repair starter MS8-1M (schematic FO-2, sheet 10) if contact is open (WP 0030 00).

SYMPTOM

Booster pump starts in system CLEAN, but will not stay running.

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restore power to panel. Set unit up in system CLEAN and push INITIATE. Start booster pump and make sure indicating plungers on relay K15 (schematic FO-2, sheet 7) is in when pump starts running.

CORRECTIVE ACTION

If plunger on K15 does not go in, refer to feed low pressure switch troubleshooting.

Make sure booster pump runs well in system NORMAL.

CORRECTIVE ACTION

If pump does not run in system NORMAL, refer to corresponding troubleshooting procedure.

If pump runs in system NORMAL, refer to booster pump not running in system CLEAN troubleshooting. Problem may be in circuit controlling relay K9 (schematic FO-2, sheet 8).

SYMPTOM

Booster pump will not start in system STANDBY (schematic FO-2, sheet 6, line 629).

MALFUNCTION

Make sure pump runs in system NORMAL.

CORRECTIVE ACTION

Refer to first Symptom within this Troubleshooting Procedure.

Make sure pump runs in system CLEAN.

CORRECTIVE ACTION

Refer to previous Symptom within this Troubleshooting Procedure.

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restore power to panel. Push INITIATE and select system STANDBY. Make sure indicating plunger on relay K5 (schematic FO-2, sheet 7) is in.

CORRECTIVE ACTION

If plunger on K5 is out, refer to system on/system standby circuit troubleshooting (control circuits).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from relay K9(A1Y) (schematic FO-2, sheet 8) to relay K19(A2X) (schematic FO-2, sheet 6). Check continuity, point-to-point, from relay K21(A4Y) to relay K3(B4X) (schematic FO-2, sheet 6). Depress indicating plunger on K5 (schematic FO-2, sheet 7) when testing contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace relay K5 if contacts do not close when testing (WP 0028 00).

SYMPTOM

Booster pump runs but pilot light does not work; light test okay (schematic FO-1, sheet 6, line 629).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #243 from MS7 coil (schematic FO-2, sheet 10). Check continuity, point-to-point, from wire #243 on MS7 to pilot light PL10 (schematic FO-2, sheet 11), wire #244.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace LTK1 (schematic FO-2, sheet 7) if contact is open (WP 0028 00).

SYMPTOM

Booster pump motor starter MS7 does not pull in (schematic FO-1, sheet 6, lines 626 – 631, control circuits; schematic FO-1, sheet 5, lines 540 – 542, power circuits).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove motor starter coil wires. Use multimeter to check resistance across coil connections, which should be near zero.

CORRECTIVE ACTION

Replace coil if resistance is infinity (open) or zero (shorted) (WP 0030 00).

SYMPTOM

Booster pump motor starter MS7 pulls in but does not run (schematic FO-1, sheet 6, lines 626 – 631, control circuits; schematic FO-1, sheet 5, lines 540 – 542, power circuits).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Turn off circuit breaker CB5 (schematic FO-2, sheet 10) and disconnect connector panel. Use multimeter to check continuity across each pair of motor control contactors. Manually engage starter contacts during testing. Reading should be zero.

CORRECTIVE ACTION

Replace contactor if any pair is open (WP 0030 00).

MALFUNCTION

Remove contactor block from starter and check for burned, arced-over contacts.

CORRECTIVE ACTION

Replace contactor if damaged (WP 0030 00).

SYMPTOM

Booster pump motor starter auxiliary contact does not operate correctly (schematic FO-1, sheet 6, lines 627 and 632).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from auxiliary contact. Use multimeter and check for correct operation when starter contacts are manually engaged and open.

CORRECTIVE ACTION

If hold-in contact (line 627) or control contact (line 832) does not operate correctly, replace auxiliary contact block (WP 0030 00).

TROUBLESHOOTING PROCEDURE**HIGH PRESSURE PUMP****WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power be connected. Always take proper measures to ensure personal safety.

NOTE

Make sure all circuit breakers are set before troubleshooting.

SYMPTOM

High pressure pump will not start or respond to jog switch (schematic FO-1, sheet 6, lines 632 – 637, control circuits; schematic FO-1, sheet 5, lines 502 – 510, power circuits).

MALFUNCTION

High pressure pump motor uses a wye-delta method to reduce starting current and torque. It is considered a closed transition system because it incorporates a resistor connected in series with each motor phase, winding during the switch from wye to delta. This eliminates opening the circuit and prevents transfer currents which may occur during an open transition. The complete starter consists of: one three-pole 1M contactor with overloads, one three-pole 2M contactor, one three-pole 1S contactor, one three-pole 2S transition contactor, one timer auxiliary contact block on the 1M contactor and three transition resistors. Pushing start button energizes contactor 1S which shorts together motor leads 8T4, 8T5 and 8T6. When 1S contactor is energized, it connects motor windings in a wye configuration and allows contactor 1M to energize which connects motor to power source. Timer on contactor 1M starts timing as motor accelerates in its wye configuration. After a time delay as set on 1M timer, timed contact closes and energizes the 2S transition contactor, momentarily placing transition resistors in circuit. The 2S control contact opens which drops the 1S contactor out. The motor wye-point is now open with each end connected to the power source through contactor 2S and the resistors. Reconnection to delta is accomplished immediately when the 1S control contact closes which energizes the 2M contactor. In addition to the 1S electrical interlock, which prevents the 2M contactor from energizing, there is a mechanical interlock between the 1S and 2M contactors as a further safeguard against energizing the two contactors at the same time.

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel. Make sure overload reset button MS8-1M (schematic FO-2, sheet 10) is in by pushing it.

CORRECTIVE ACTION

If reset button is in, skip to Malfunction for circuit breakers CB6 and CB5.
Replace overload heaters on MS8-1M if button is out and will not reset (WP 0030 00).
Adjust door rest assembly for MS8-1M if button is out but resets when pushed (WP 0029 00). Proceed to next Malfunction.

MALFUNCTION

Shut down generator (WP 0008 00, TM 10-4610-232-12). Set multimeter to Ohms x 1000 scale. Check each lead, 8T1, 8T2 and 8T3 from outlet side of MS8-1M to ground. Check each lead 8T4, 8T5 and 8T6 from outlet side of MS8-2M (schematic FO-2, sheet 10) to ground. Reading should be infinity for each lead.

CORRECTIVE ACTION

A short circuit is present if meter reading is zero. Refer to power circuit troubleshooting.

Set multimeter to Ohms x 1 scale and check for continuity between all pairs of motor leads: T1 (schematic FO-2, sheet 10) and T4, T2 and T5, T3 and T6. Readings should be zero or near zero.

CORRECTIVE ACTION

An open circuit exists if reading is infinity. Refer to power circuit troubleshooting.

Check each lead, 8T1, 8T2 and 8T3 from MS8-1M for damage, shorts or tightness. Check each lead, 8T4, 8T5 and 8T6 from outlet side of MS8-2M for damage and tightness.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Check connectors J/P63 (schematic FO-2, sheet 16) and J/P69 for loose pins and signs of arcing.

CORRECTIVE ACTION

Replace/repair any connector that shows damage (WP 0026 00).
Return ROWPU to operation after checks and repairs (TM 10-4610-232-12).

MALFUNCTION

Shut down ROWPU (WP 0008 00, TM 10-4610-232-12). Open control panel and restore power to panel. Open circuit breakers CB6 and CB5 (schematic FO-2, sheet 10). Start raw water pump and booster pump (booster pump will not actually start, but starter will pull in as if started). Make sure indicating plunger on MS7 (schematic FO-2, sheet 10) pulls in and plunger on relay K2 (schematic FO-2, sheet 6) is out when booster pump starts.

CORRECTIVE ACTION

If plunger on relay K2 is in, refer to operating mode circuit troubleshooting (control circuits).
If MS7 does not pull in, refer to booster pump troubleshooting.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from PB3(2B2) to PB14(1A3) (schematic FO-2, sheet 11). Push in indicating plunger on MS7 and push in PB14 when checking across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K2 if contact is open (WP 0028 00).
Repair starter MS7 if contact does not close (WP 0030 00).
Replace PB13 (schematic FO-2, sheet 11) or PB14 if contacts do not close (WP 0027 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #257 from MSD8-1S contactor coil (schematic FO-2, sheet 10). Check continuity, point-to-point, from PB14(1A3) to MS8-1S (wire #257).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace MS8-26 auxiliary contact if open (WP 0030 00).
Replace MS8-2M auxiliary contact if open (WP 0030 00).

Check continuity, point-to-point, from transformer T1(X2) to MS8-1S coil. Use a multimeter set to Ohms x 1 to check continuity across MS8-1S coil terminals which should read zero or near zero.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace MS8-1S coil if open (WP 0030 00).

Remove wire #258 from MS8-1M coil, wire #258 from ETM2 and wire #262 from PL11. Check continuity, point-to-point, from PB14(1A3) to MS8-1M (wire #258). Manually engage contactor MS8-1S when checking across contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace MS8-1S auxiliary contact if it does not close when contactor MS8-1S is manually engaged (WP 0030 00).

MALFUNCTION

Check continuity, point-to-point, from transformer T1(X2) to MS8-1M coil. Use a multimeter set to Ohms x 1 and check continuity across MS8-1M coil terminals, which should read zero or near zero.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace MS8-1M coil, if open (WP 0030 00).

Check continuity from MS8-1S auxiliary contact wire #258 to MS8-1M auxiliary timer contact wire #258.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

MALFUNCTION

Remove wire #260 from MS8-2M contactor coil. Remove wire #261 from MS8-2S contactor coil. Check continuity, point-to-point, from MS8-1M auxiliary timer contact (wire #259) to MS8-2M (wire #260) and from MS8-1M auxiliary timer contact (wire #259) to MS8-2S (wire #261).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace MS8-1S auxiliary contact if open (WP 0030 00).
Replace MS8-2M auxiliary contact if open (WP 0030 00).

Check continuity, point-to-point, from transformer T1(X2) to MS8-2M coil. Use a multimeter set to Ohms x 1 to check continuity across MS8-2M coil terminals which should be zero or near zero.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace MS8-2M coil if open (WP 0030 00).

Check continuity, point-to-point, from transformer T1(X2) to MS8-2S coil. Use a multimeter set to Ohms x 1 to check continuity across MS8-2S coil terminals which should be zero or near zero.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace MS8-2S coil if open (WP 0030 00).

Check continuity across MS8-1M auxiliary timer contact, wires #258 and #259, which should be open. Manually engage MS8-1M contactor. Timer contact should close a few seconds after MS8-1M starter is engaged.

CORRECTIVE ACTION

Replace auxiliary timer block on MS8-1M if not operating as noted (WP 0030 00).

MALFUNCTION

Check continuity, point-to-point, from PB14(1A4) to MS8-1S auxiliary contact (wire #258). Manually engage contactor MS8-1M when checking across contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace MS8-1M auxiliary contact if not closing when contactor is engaged (WP 0030 00).

Power up ROWPU (TM 10-4610-232-12). Turn off circuit breaker CB6 (schematic FO-2, sheet 10). Start raw water and boost pumps. Start high pressure pump.

CORRECTIVE ACTION

Watch high pressure pump contactors to ensure they are operating as noted.

MALFUNCTION

Check for defective HIGH PRESSURE PUMP jog switch.

CORRECTIVE ACTION

Use a multimeter to make sure circuits on jog switch open and close properly during jog switch activation. Replace jog switch if defective.

SYMPTOM

High pressure pump starts but shuts down when start button is released (schematic FO-1, sheet 6, lines 633 and 635).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #257 from MS8-1S coil, wire #259 from MS8-1M coil (schematic FO-2, sheet 10), #258 from ETM2 (schematic FO-2, sheet 13) and #262 from PL11 (schematic FO-2, sheet 11). Check continuity, point-to-point, from PB14(1A3) (schematic FO-2, sheet 11) to MS8-1M (wire #258). Manually engage contactor MS8-1S when testing across its contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace MS8-1S auxiliary contact if no continuity is shown when MS8-1S is engaged (WP 0030 00).

Check continuity, point-to-point, from PB14(1A4) to MS8-1M (wire #258). Manually engage contactor MS8-1M when testing across its contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace MS8-1M auxiliary contact if no continuity is shown when MS8-1M is engaged (WP 0030 00).

SYMPTOM

Control circuits operate correctly but high pressure pump does not start (schematic FO-1, sheet 5, lines 502 – 510).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Make sure all wires for high pressure pump motor contactors in control panel are tight. Check continuity, point-to-point, and check each lead for shorts to ground in following circuits: CB6(8L1) through MS8-1M (schematic FO-2, sheet 10) to J69A 8T1 (schematic FO-2, sheet 16), CB6(8L1) through MS8-2M (schematic FO-2, sheet 10) to J68C 8T6 (schematic FO-2, sheet 16), CB6(8L2) through MS8-1M to J69B 8T2, CB6(8L2) through MS8-1M to J68A 8T4, CB6(8L3) through MS8-1M to J69C 8T3, and CB6(8L3) through MS8-2M to J69B 8T5. Manually engage motor contacts when testing across contacts.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair any cable or connector that shows open or short (WP 0026 00).
Replace any overloads on MS8-1M that show open (WP 0030 00).
Replace contacts on MS8-1M or MS8-2M that show open when contactor is manually engaged (WP 0030 00).
Replace MOVs (schematic FO-2, sheet 16) in high pressure pump assembly junction box if damaged or grounded from power terminal (WP 0073 00).

MALFUNCTION

Check each resistor for damage and resistance.

CORRECTIVE ACTION

Replace any damaged or open resistor (WP 0030 00).

Check for continuity across MS8-2S and MS8-1S (schematic FO-2, sheet 10) contactors when manually engaged.

CORRECTIVE ACTION

Replace contacts on MS8-2S and MS8-1S when manually engaged.
Replace open contacts on MS8-2S or MS8-1S when manually engaged (WP 0030 00).

Tag and disconnect motor leads T1, T2, T3, T4, T5 and T6. Set multimeter to Ohms x 1000 scale and connect test leads between each motor lead and motor frame. Readings should be infinity for each step.

CORRECTIVE ACTION

Replace motor if any reading is zero (WP 0081 00).

Set multimeter to Ohms x 1 scale and check for continuity between all pairs of motor leads: T1 and T4, T2 and T5, T3 and T6. Reads should be zero or near zero.

CORRECTIVE ACTION

Replace motor if any reading is infinity (WP 0081 00).

MALFUNCTION

Check each motor cable for continuity on each wire and for shorts between wires in each cable.

CORRECTIVE ACTION

Replace/repair cables if open or shorted (WP 0082 00).

SYMPTOM

High pressure pump motor hums but will not turn (schematic FO-1, sheet 5, lines 502 – 510).

MALFUNCTION

Tag and disconnect motor leads T1, T2, T3, T4, T5 and T6. Set multimeter to Ohms x 1000 scale and connect test leads between each motor lead and motor frame. Readings should be infinity for each step.

CORRECTIVE ACTION

Replace motor if any reading is zero (WP 0081 00).

MALFUNCTION

Set multimeter to Ohms x 1 scale and check for continuity between all pairs of motor leads: T1 and T4, T2 and T5, T3 and T6. Reads should be zero or near zero.

CORRECTIVE ACTION

Replace motor if any reading is infinity (WP 0081 00).

Refer to previous Symptom.

SYMPTOM

High pressure pump circuit breaker trips when pump is started; ROWPU shuts down when high pressure pump is started (schematic FO-1, sheet 5, lines 502 – 510).

MALFUNCTION

Check for a short circuit.

CORRECTIVE ACTION

Refer to Symptom controls okay but pump will not turn.

SYMPTOM

High pressure pump starts but does not come up to full speed.

MALFUNCTION

Refer to first Symptom of this Troubleshooting Procedure.

SYMPTOM

High pressure pump is started but generator bogs down (also refer to mechanical troubleshooting).

MALFUNCTION

Adjust wye to delta timing.

CORRECTIVE ACTION

Adjust timer on MS8-1M (schematic FO-2, sheet 10) ¼ second from its present time to better synchronize with generator horsepower/torque curves (WP 0030 00).

SYMPTOM

High pressure pump runs but hourmeter does not operate (schematic FO-1, sheet 6, line 636).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #2B from high pressure pump hourmeter. Check continuity, point-to-point, from MS8-1M (schematic FO-2, sheet 10) (wire #258) to ETM2 (schematic FO-2, sheet 13) (wire #258). Check continuity, point-to-point, from transformer T1(X2) (schematic FO-2, sheet 10) to wire #2B on ETM2.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace hourmeter, ETM2, if checks are good (WP 0029 00).

SYMPTOM

High pressure pump runs but pilot light does not come on; light test okay (schematic FO-1, sheet 6, line 637).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wire #2B from PL11 (schematic FO-2, sheet 11). Check continuity, point-to-point, from MS8-1M (schematic FO-2, sheet 10) (wire #258) to PL11 (schematic FO-2, sheet 11) (wire #258). Check continuity, point-to-point, from transformer T1(X2) (schematic FO-2, sheet 10) to wire #2B on PL11.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay LTK2 (schematic FO-2, sheet 7) if contact is open (WP 0027 00).
Replace pilot light PL11 if checks are good (WP 0027 00).

TROUBLESHOOTING PROCEDURE**STARTER OVERLOAD HEATERS****SYMPTOM**

Starter overload heaters continually burn out.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Locate problem motor in electrical drawings and check power cables from starter to motor for damage or loose connections. Check motor for high resistance in windings. Problem is related to high current draw.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace any damaged terminals in control panel (WP 0030 00).
Repair any damaged cables or connections (WP 0026 00).
Replace any motor with very high resistance.

TROUBLESHOOTING PROCEDURE**DISTRIBUTION PUMP****WARNING**

Electrical high voltage can cause serious injury or death. Some tests performed in troubleshooting require power be connected. Always take proper measure to ensure personal safety.

NOTE

Make sure circuit breakers are set before troubleshooting.

SYMPTOM

Distribution pump will not run (schematic FO-1, sheet 8, lines 832 – 837 control; schematic FO-1, sheet 5, lines 524 – 529, power).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Open control panel. Make sure overload reset button on MS2 (schematic FO-2, sheet 10) is in by pushing it.

CORRECTIVE ACTION

If reset button is in, skip next Malfunction and proceed to the following Malfunction.
If reset button is out and will not reset, replace overload heaters on MS2 (WP 0030 00). Proceed to next Malfunction.
If reset button is out but resets when pushed, adjust door reset assembly for MS2 (WP 0030 00). Proceed to next Malfunction.

Check each lead 2T1, 2T2 and 2T3 from MS2 to J19 (schematic FO-2, sheet 16) for damage and tightness.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J29 if damaged (WP 0026 00).
Replace any damaged terminals (WP 0030 00).

MALFUNCTION

Power up control panel (TM 10-4610-232-12). Turn on selector switch on distribution pump. Push distribution pump on switch at back door. Make sure indicating plunger on MS2 goes in and stays in, which indicates control circuits are working properly.

CORRECTIVE ACTION

If distribution pump POWER ON light at back door is on, but MS2 indicating plunger did not go in, skip to Malfunction for black wire on PSK1 to J61A.
If indicating plunger goes in but comes out when distribution pump on switch at back door is released, proceed to next Malfunction.
If indicating plunger on MS2 goes in and stays in, skip to Malfunction for checking generator voltage on all three phases.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to connector J13D (schematic FO-2, sheet 9) and from T1(X2) to relay K8 (schematic FO-2, sheet 7) (wire #2A). Remove #2A wire from K8 before testing. Disconnect P13 (schematic FO-2, sheet 14) from side of control panel.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace breakers CB7 or CB10 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace/repair connector J13 if faulty (WP 0026 00).
Replace switch PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).

MALFUNCTION

Remove wire #106 from MS2. Remove wire #2A from PSK1 (schematic FO-2, sheet 8). Check continuity, point-to-point, from J13F to K8(K1). Repeat procedure from J13E to K8(K1), depress indicating plunger on K8 while testing across contact.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace relay K8 if contact will not close when testing continuity (WP 0028 00).
Replace/repair connector J13 if faulty (WP 0026 00).
Replace relay K8 if checks are good and problem still exists (WP 0028 00).
Return ROWPU to service (TM 10-4610-232-12). Test distribution pump for operation.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from black wire on PSK1 to J61A (schematic FO-2, sheet 16) and from white wire on PSK1 to J61B. Check each wire for a short to ground.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair connector J61, if faulty (WP 0028 00).
Replace MOVs (schematic FO-2, sheet 16) if fault is traced to MOV (WP 0073 00).

Remove wire #105 from PSK1. Check continuity from J13F and relay K8(A1X) to PSK1 (wire #105).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

MALFUNCTION

Remove wire #2A from PSK1. Check continuity, point-to-point, from transformer T1(X2) to PSK1 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace PSK1 if checks are good and problem still exists (WP 0028 00).

MALFUNCTION

Remove wire #108 from MS2. Check continuity from PSK1 (wire #108) to MS2 (wire #108), and from transformer T1(X2) to MS2 (wire #2A).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace/repair starter MS2 if checks are good (WP 0030 00).

Make sure generator voltage on all three phases is 435 – 440 VAC on each phase.

CORRECTIVE ACTION

Adjust to correct voltage.
If voltage is not correct on all phases, refer to generator troubleshooting.

Check system air pressure and use an air manifold drain valve to lower it below 1400 psig. Turn on air compressor switch and note if air compressor runs.

CORRECTIVE ACTION

If air compressor does not operate, skip next Malfunction and proceed to the following Malfunction.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from power distribution block (PDB) (schematic FO-2, sheet 10) to J19 on following lines: AL1 to J19A, AL2 to J19B and AL3 to J19C. Depress operating plunger on MS2 when checking across its contacts. Disconnect J19 connector when testing.

NOTE

When checking continuity in power circuits, it is important to note wire numbers on each phase. Each wire is tagged identically on both ends, but in some instances, a #1 phase wire will enter the top of a starter or circuit breaker and come out the bottom of the device as a #2 phase wire. This is done to change the rotation of a motor so the associated pump turns the correct direction. Any two wires may be interchanged to accomplish this rotational change.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace circuit breaker CB3 if open at any phase (schematic FO-2, sheet 10) (WP 0028 00).
Replace/repair MS1 (schematic FO-2, sheet 10) if shown open (WP 0030 00).
Replace/repair J19 if faulty (WP 0026 00).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Disconnect cable from ROWPU to generator at generator end. Check continuity, point-to-point, from generator end of cable to power distribution block (PDB) on each phase.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace main power cable if open at any phase (WP 0022 00).
Replace circuit breaker CB1 if open (schematic FO-2, sheet 10) (WP 0030 00).
If checks have not revealed problem, refer to generator troubleshooting.

SYMPTOM

Distribution pump motor hums but will not turn (schematic FO-1, sheet 5, lines 524 – 526).

MALFUNCTION

Make sure other three phase motors operate.

CORRECTIVE ACTION

If other motors do not operate, skip to last Malfunction.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check continuity, point-to-point, from power distribution block (PDB) (schematic FO-2, sheet 10) to J19 (schematic FO-2, sheet 16) on following lines: AL1 to J19A, AL2 to J19B and AL3 to J19C. Depress operating plunger on MS2 (schematic FO-2, sheet 10) when checking across contacts. Disconnect J19 connector when testing.

NOTE

When checking continuity in power circuits, it is important to note wire numbers on each phase. Each wire is tagged identically on both ends, but in some instances, a #1 phase wire will enter the top of a starter or circuit breaker and come out the bottom of the device as a #2 phase wire. This is done to change the rotation of a motor so the associated pump turns the correct direction. Any two wires may be interchanged to accomplish the rotational change.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace breaker CB3 if open at any phase (schematic FO-2, sheet 10) (WP 0030 00).
Replace MS2 if overload is open (WP 0030 00). Troubleshoot to find cause.
Replace/repair MS2 if shown open at any phase (WP 0030 00).
Replace/repair J19 if faulty (WP 0026 00).

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Disconnect cable from ROWPU to generator at generator end. Check continuity, point-to-point, from generator end of cable to power distribution block (PDB) at each phase.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace main power cable if open at any phase (WP 0052 00, TM 10-4610-232-12).
Replace circuit breaker CB1 if open (schematic FO-2, sheet 10) (WP 0030 00).
If checks have not identified problem, refer to generator troubleshooting.

SYMPTOM

Distribution pump circuit breaker opens whenever distribution pump is started; ROWPU shuts down when distribution pump is started. (schematic FO-2, sheet 5, lines 524 – 526).

MALFUNCTION

Check for short circuits.

CORRECTIVE ACTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Refer to distribution pump troubleshooting (pump will not start).

SYMPTOM

Distribution pump circuit breaker trips open repeatedly; distribution pump ground fault trips open repeatedly (schematic FO-1, sheet 5, lines 524 – 530).

NOTE

This symptom is difficult to troubleshoot. The two circuit breakers are electrically tied together, so what affects one will usually trip the other, although each senses different levels of short circuit. Direct-acting circuit breaker only trips when overcurrents exceed its setpoint, such as a direct bolted short circuit. By contrast, an arcing short circuit may amount to only a fraction of direct-acting circuit breaker setpoint and not cause it to trip. Arcing faults are typically caused by loose connections, presence of vermin, rodents and insects in equipment or insulation deterioration as a result of mechanical damage, heat, aging, moisture, dust and other contaminants. Since arcing type fault usually involves a flow of current in ground path, the ground fault circuit breaker monitors the ground circuit for current flow. When the breaker senses current in ground circuit, it will trip itself and the pump circuit breaker. Under other circuit conditions, balanced, unbalanced or single-phase load currents or single or three phase short circuits not involving ground, it will not trip although pump breaker does. For these reasons, the following troubleshooting steps are very general and success in isolating the problem relies on the electrician carefully inspecting all cables, connectors and connections for signs of damage or moisture intrusion. In some cases, only the substitution of known reliable components identifies cause.

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Check all connections on ground fault interrupt (GFI2) (schematic FO-2, sheet 13), current sensor (CS2) (schematic FO-2, sheet 10) and CB3 (schematic FO-2, sheet 10) shunt wires for tightness.

CORRECTIVE ACTION

Tighten any loose wires.
Test ground fault relay (WP 0029 00).

MALFUNCTION

If checks do not identify problem, do the following corrective action in order shown.

CORRECTIVE ACTION

Replace GFI2 and CS2 (WP 0029).
Replace CB3 (WP 0030 00).

SYMPTOM

Distribution pump circuit breaker trips open repeatedly; distribution pump ground fault trips open repeatedly (schematic FO-1, sheet 5, lines 524 – 530).

MALFUNCTION

Check distribution pump ground fault reset switch.

CORRECTIVE ACTION

Reset ground fault and reset distribution pump circuit breaker.

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Reset distribution pump circuit breaker.

CORRECTIVE ACTION

Replace breaker CB3 if it will not stay set (schematic FO-2, sheet 10) (WP 0030 00).

Remove wire #324 and #2A from GFI2 (schematic FO-2, sheet 13). Check continuity, point-to-point, from transformer T1(X1) (schematic FO-2, sheet 10) to wire #324A. Repeat procedure for T1(X2) to wire #2A.

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).
Replace breakers CB7 or CB10 if open (schematic FO-2, sheet 8) (WP 0028 00).
Replace switch PB3 if open (schematic FO-2, sheet 11) (WP 0027 00).
Replace GFI2 if checks are good (WP 0029 00).

SYMPTOM

Distribution pump motor starter auxiliary contact does not operate correctly (schematic FO-1, sheet 11, line 1112).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove wires from auxiliary contact. Use multimeter to check for correct operation when starter contacts are manually engaged and open.

CORRECTIVE ACTION

If control contact (line 1112) does not operate correctly, replace starter (WP 0030 00).

SYMPTOM

Distribution pump motor starter MS2 does not pull in (schematic FO-1, sheet 8, lines 831 – 836, control circuits; schematic FO-1, sheet 5, lines 524 – 526, power circuits).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove motor starter coil wires. Use multimeter to check resistance across coil connections which should be near zero.

CORRECTIVE ACTION

Replace motor starter if resistance is infinity (open) or shorted (WP 0030 00).

SYMPTOM

Distribution pump motor starter MS2 pulls in but does not run (schematic FO-1, sheet 8, lines 831 – 836, control circuits; schematic FO-1, sheet 5, lines 524 – 526, power circuits).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Turn off circuit breaker CB3 (schematic FO-2, sheet 10) and disconnect PI9 connector (schematic FO-2, sheet 16) from control panel. Use multimeter to check continuity across each pair of motor control connectors. Manually engage starter contacts during testing. Reading should be zero.

CORRECTIVE ACTION

Replace motor starter if any pair is open (WP 0030 00).

Remove contactor block from starter and check for burned, arced-over contacts.

CORRECTIVE ACTION

Replace motor starter if damaged (WP 0030 00).

SYMPTOM

Distribution pump runs but pilot light does not come on; light test okay (schematic FO-1, sheet 8, lines 836 – 837).

MALFUNCTION

Shut down ROWPU and generator (WP 0008 00, TM 10-4610-232-12). Remove connector P13 (schematic FO-2, sheet 14) from control panel. Check continuity, point-to-point, from TBI-17 to TBI-47 (schematic FO-2, sheet 9).

CORRECTIVE ACTION

Repair any loose or damaged wires (WP 0026 00).

Replace relay LTK4 (schematic FO-2, sheet 8) if contact shows open (WP 0028 00).

END OF WORK PACKAGE

CHAPTER 3
DIRECT SUPPORT
MAINTENANCE PROCEDURES

**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
PMCS INTRODUCTION**

GENERAL

Preventive Maintenance Checks and Services (PMCS) are performed to keep Reverse Osmosis Water Purification Unit (ROWPU) in operating condition. These checks are used to find, correct or report problems. Crew members and Unit Maintenance personnel perform PMCS procedures as shown in the PMCS tables in TM 10-4610-232-12. PMCS should be done every day the ROWPU is operated.

OPERATOR PMCS

Operator PMCS is performed in accordance with TM 10-4610-232-12, WP 0018 00.

UNIT PMCS

Unit level PMCS is performed in accordance with TM 10-4610-232-12, WP 0042 00.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
STUD AND THREAD
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Screw Thread Repair Kit (TM 10-4610-232-12)
Tap and Die Kit (TM 10-4610-232-12)
Micrometer (TM 10-4610-232-12)
Vernier Caliper (TM 10-4610-232-12)
Hand Drill (TM 10-4610-232-12)
Screw Extractor Kit (TM 10-4610-232-12)

Materials/Parts:

Transmission Oil
WD40 (Item 78, WP 0102 00)
Dry Cleaning Solvent (Item 33, WP 0102 00)
Wiping Rags (Item 61, WP 0102 00)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12)

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repairing Studs or Screws Broken Flush

1. Center punch broken stud or screw (1).

CAUTION

Do not drill into component when repairing studs or screws or equipment damage could result.

2. Drill into broken stud or screw (1) using drill bit (2) 1/16 in. less the diameter of stud or screw (1).
3. Remove broken stud or screw (1) with a screw extractor.

Removing Studs or Screws That Have Not Broken Flush

1. Spray broken stud or screw (1) with WD40 and allow it to penetrate.
2. Use pliers (3) to clamp broken stud or screw (1).
3. Tap broken stud or screw (1) and back it out.

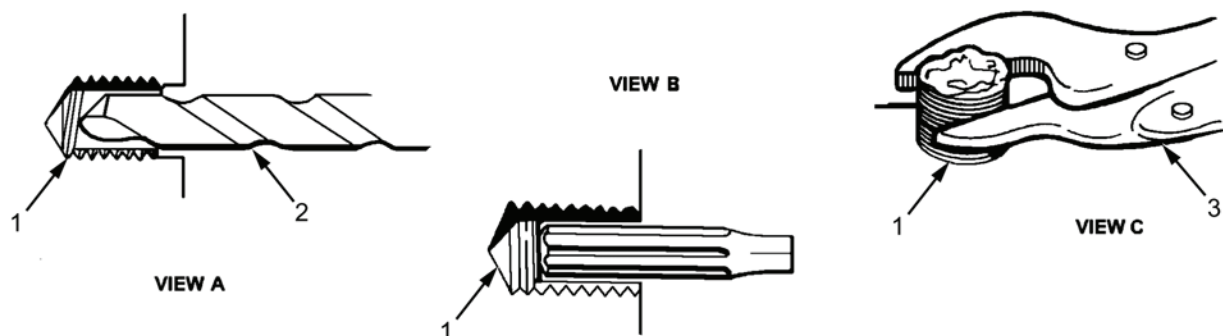


Figure 1. Removing/Repairing Studs or Screws.

4. Repair stud or screw (1) if it cannot be removed.

Repair Damaged Threaded Insert

1. Chase insert threads using proper tap and lubricant.
2. Replace damaged inserts if threads cannot be restored or excessive damage exists.

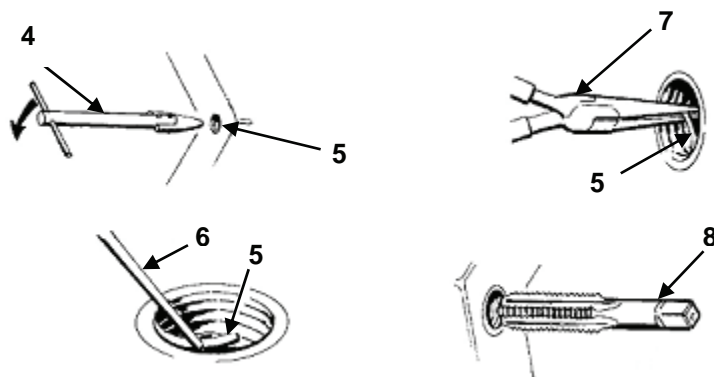
Removing Damaged Threaded Insert

CAUTION

Do not damage threads of tapped hole when using extraction tool. Remove inserts from end of tapped hole closest to insert. Threads in tapped hole may be damaged.

NOTE

All tool and threaded insert sizes depend on original size.



1. Place extraction tool (4) in insert (5). Tap top of extraction tool (4).
2. Turn tool (4) left while maintaining a steady downward pressure. Remove insert (5).
3. If insert (5) does not come out of tapped hole, proceed to next step. If insert (5) does come out of tapped hole, go to step 8.
4. Insert scribe (6) between end of insert (5) and tapped hole.

5. Pull insert (5) from tapped hole. Form a tang equal in length to diameter of insert (5).
6. Grasp tang with needle nose pliers (7).
7. Turn insert (5) left until out of tapped hole.
8. Lubricate finishing tap (8).

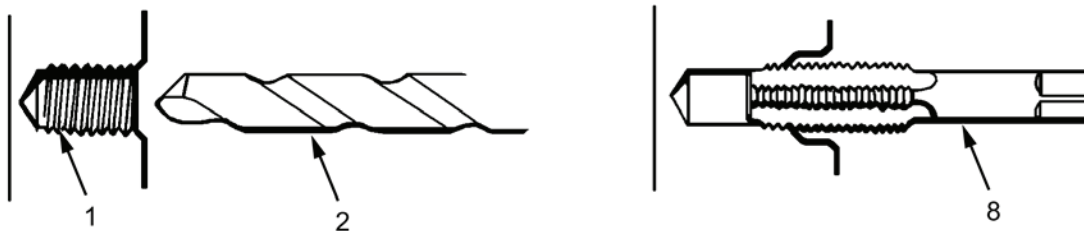


Figure 2. Removing Damaged Threaded Insert.

9. Slowly thread tap in and out of tapped hole with finishing tap (8) and handle.

WARNING

Compressed air may blow dust into eyes. Wear eye protection and never exceed 30 psi (207 kPa) air pressure.

10. Blow out dirt and loose metal chips in tapped hole with compressed air.

WARNING

Dry cleaning solvent, AA711, Types I and II, are highly toxic and can ignite organic materials, carbides and chlorates. Always wear eye, skin and respiratory protection and be in a well-ventilated area when using.

11. Clean tapped hole with dry cleaning solvent and wiping rag.
12. If threads cannot be restored or if there is excessive damage, proceed to next section. If threads are not damaged, proceed to instructions about installing threaded inserts.

Oversizing Insert Pilot Holes

NOTE

All tool and threaded insert sizes depend on original bolt size. Refer to repair kit for proper drill and tap sizes.

1. Use drill (2) to bore out damaged threads (1) to original depth.

WARNING

Compressed air may blow dust into eyes. Wear eye protection and never exceed 30 psi (207 kPa) air pressure.

2. Clean bored hole with compressed air.
3. Lubricate thread cutting tap (8).

4. Cut threads with tap handle and tap.

WARNING

Compressed air may blow dust into eyes. Wear eye protection and never exceed 30 psi (207 kPa) air pressure.

5. Blow out dirt and loose metal chips in tapped hole with compressed air.

WARNING

Dry cleaning solvent, AA711, Types I and II, are highly toxic and can ignite organic materials, carbides and chlorates. Always wear eye, skin and respiratory protection and be in a well ventilated area when using.

6. Clean tapped hole with dry cleaning solvent and wiping rag.



Figure 3. Insert Pilot Hole

Installing Threaded Inserts

1. Loosen setscrew (9) and slide backstop collar (10).
2. Turn insertion tool handle (11) until shaft (12) extends past tip of insertion tool (13) slightly longer than length of insert (14).
3. Screw insert (14) on shaft (12) until insert tang (15) goes into shaft notch (16).
4. Adjust distance between insert end (17) and tip (18). Turn insertion tool handle (11) until distance is equal to installation depth below surface of tapped hole.
5. Push down stop collar (10) until it contacts body of insertion tool (13).
6. Tighten setscrew (9).
7. Remove insert (14) from shaft (12).
8. Turn insertion tool handle (11) until insert (14) can be slipped into tool barrel.
9. Thread insert (14) onto shaft (12) while inside tool barrel until shaft notch (16) engages insert tang (15).
10. Turn insertion tool handle (11) until insert tang (15) is even with insertion tool (13) tip.

CAUTION

Insertion tool must be straight and not wobbling when installing insert or equipment damage may result. Do not force insert into tapped holes or threads may be damaged.

11. Place insertion tool tip (18) against tapped hole. Make sure insertion tool (13) is straight.

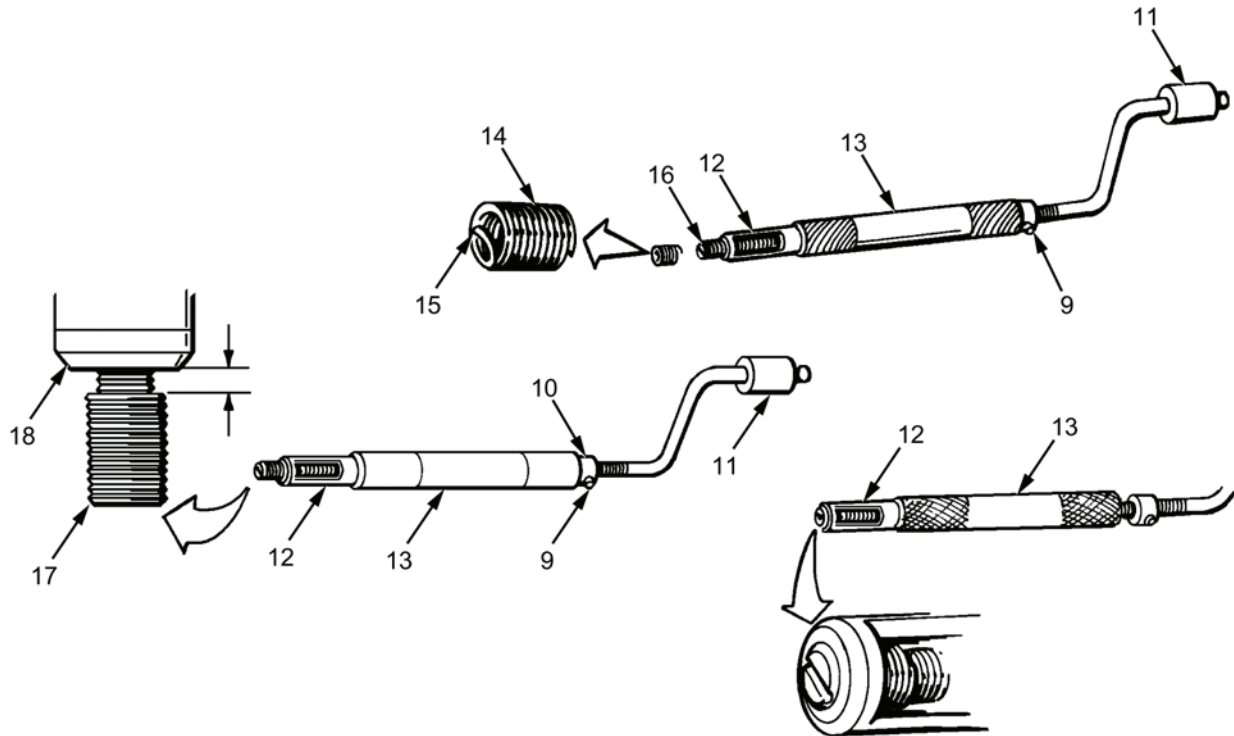


Figure 4. Installing Threaded Insert.

12. Slowly turn insertion tool handle (11) to the right until backstop collar (10) contacts insertion tool (13).
13. Turn insertion tool handle (11) to the left until insertion tool (13) can be removed.
14. Place tang break-off tool (19) in tapped hole with installed insert (14).
15. Push down end of break-off tool (19) until insert tang (15) breaks off of insert (14).

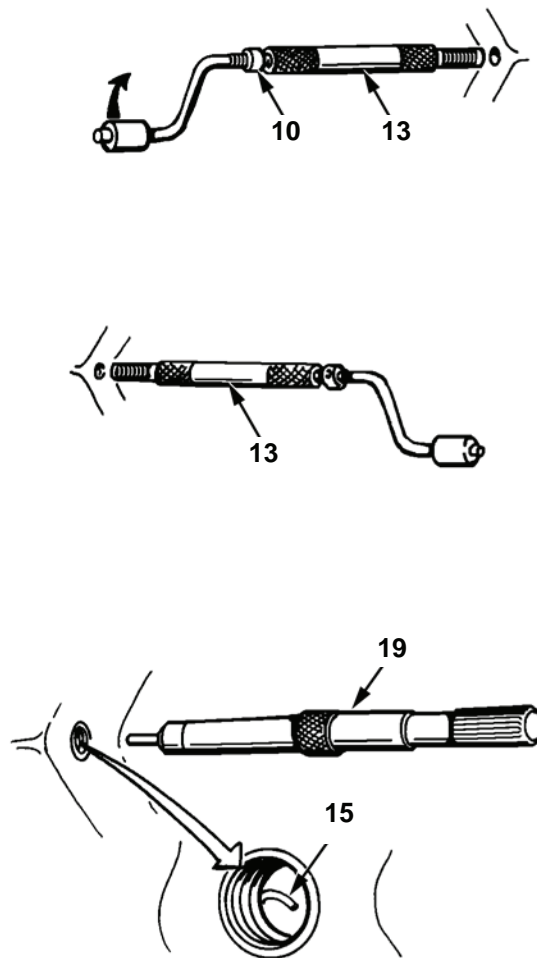


Figure 5. Installing Threaded Insert.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
CABLE AND CONNECTOR
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12)
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replaced with new.

Splice Wires**NOTE**

A four-wire cable is illustrated in Figure 1. Regardless of number of wires, all wires are spliced as instructed.

1. Remove 6 in. (15.24 cm) of insulation (1) from both sides of damaged wire (2) in cable (3).
2. Cut off 3 in (7.62 cm) length from damaged wire (2), keeping damaged area in center.
3. Measure and cut piece of wire (4) to replace damaged wire (2).
4. Strip both ends of wire (4) and damaged wire (2).

NOTE

When crimping, make sure there is a good electrical and mechanical connection between terminal and wire.

5. Install and crimp splice (5) on each end of wire (4).

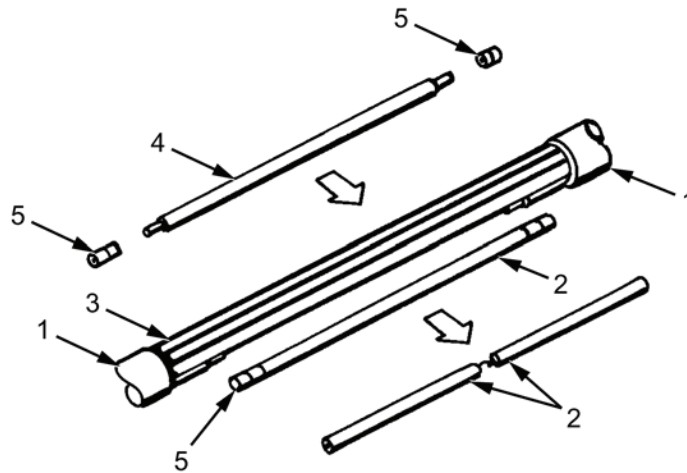


Figure 1. Splice Wires

6. Install and crimp wire splices (5) on stripped end of damaged wire (2).
7. Wrap two splices with electrical tape approximately 1 in. (2.54 cm) on each side of each splice (5).

NOTE

Make sure electrical tape overlaps insulation on both ends of repair area.

8. Use electrical tape to completely wrap entire length of cable (3) where external insulation was removed. When possible, install heat shrink tubing.

Replace Connectors

NOTE

This procedure applies to both straight and 90° connectors and is applicable regardless of number of wires in cable.

1. Cut boot (6) off of cable (7).
2. Unscrew backshell (8) from connector (9).

NOTE

Tag all wires before disconnecting. Contact numbers are marked in connector interior.

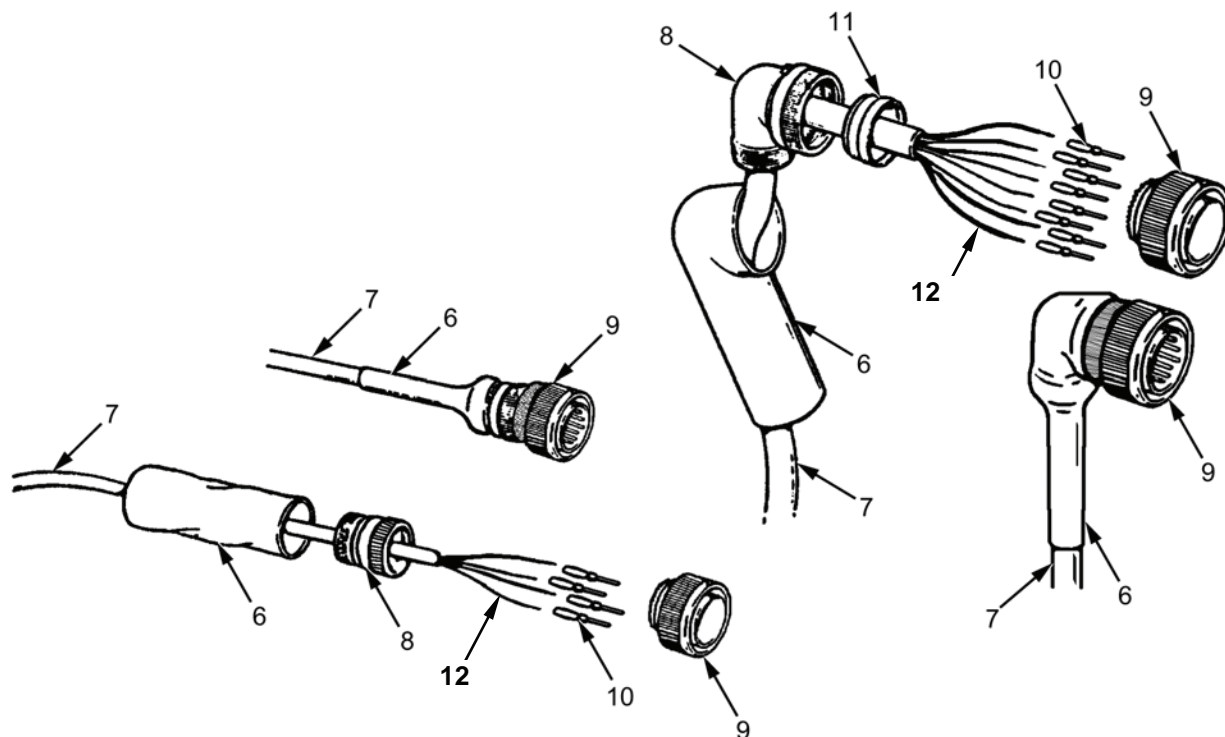


Figure 2. Connectors.

3. Insert pin removal tool through front of connector (9) and push all contacts (10) out of connector (9), while attached to their respective wires.
4. Remove connector backshell (8). Remove insulator (11) from 90° connectors (9).
5. Install heat shrink boot (6) on cable (7).
6. Place connector backshell (8) on cable (7). Install insulator (11) on 90° connectors (9).
7. If any contacts (10) have been removed, crimp replacement contacts (10) on wires (12).

CAUTION

Installing contacts in wrong connector sockets will result in malfunctions or equipment damage. Make sure contacts are installed in correct sockets.

8. Using insertion tool, install all contacts (10) in connector (9), making sure contacts (10) are returned to original location.
9. Attach connector (9) on connector backshell (8).
10. Slide heat shrink boot (6) over end of backshell (8).

11. Use heat gun to shrink heat shrink boot (6) over end of connector backshell (8) and on cable (7).
12. Apply adhesive at cable end of heat shrink boot (6).
13. Check cable (7) for continuity.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
TESTS FOR CONTINUITY AND SHORT CIRCUITS**

TESTING ARRANGEMENTS

Testing arrangements for continuity checks and short circuits are used for the ROWPU electrical motors.

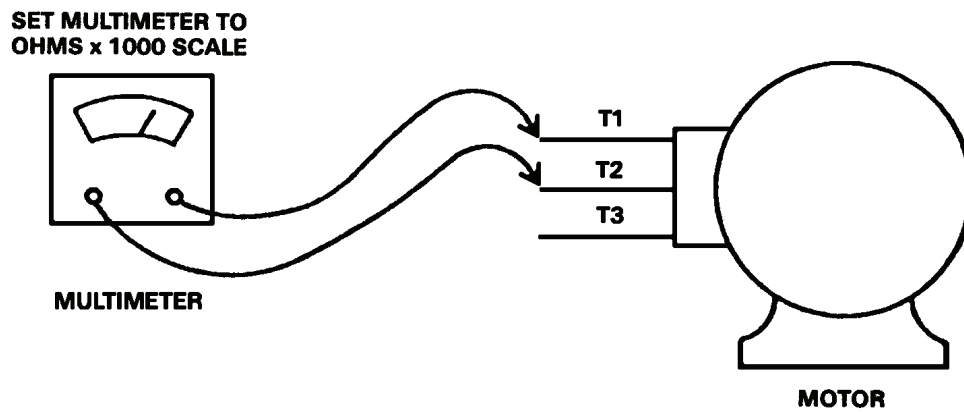


Figure 1. Continuity Test Arrangement.

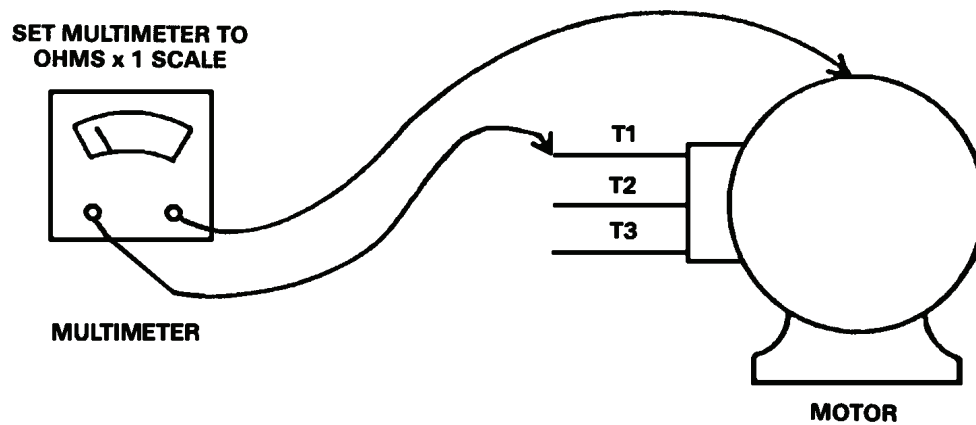


Figure 2. Short Circuit Test Arrangement.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
RAW WATER PUMP POWER CABLE
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12)
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replaced with new.

Repair cables (1) as described in WP 0010 00.

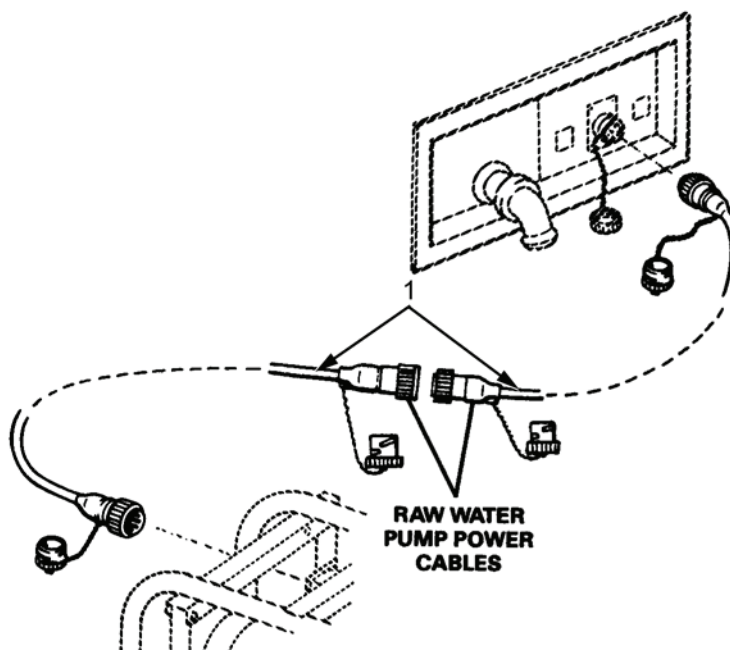


Figure 1. Raw Water Pump Power Cables.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
RAW WATER PUMP AND MOTOR ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12)
Cable removed

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cable (1) as described in WP 0010 00.

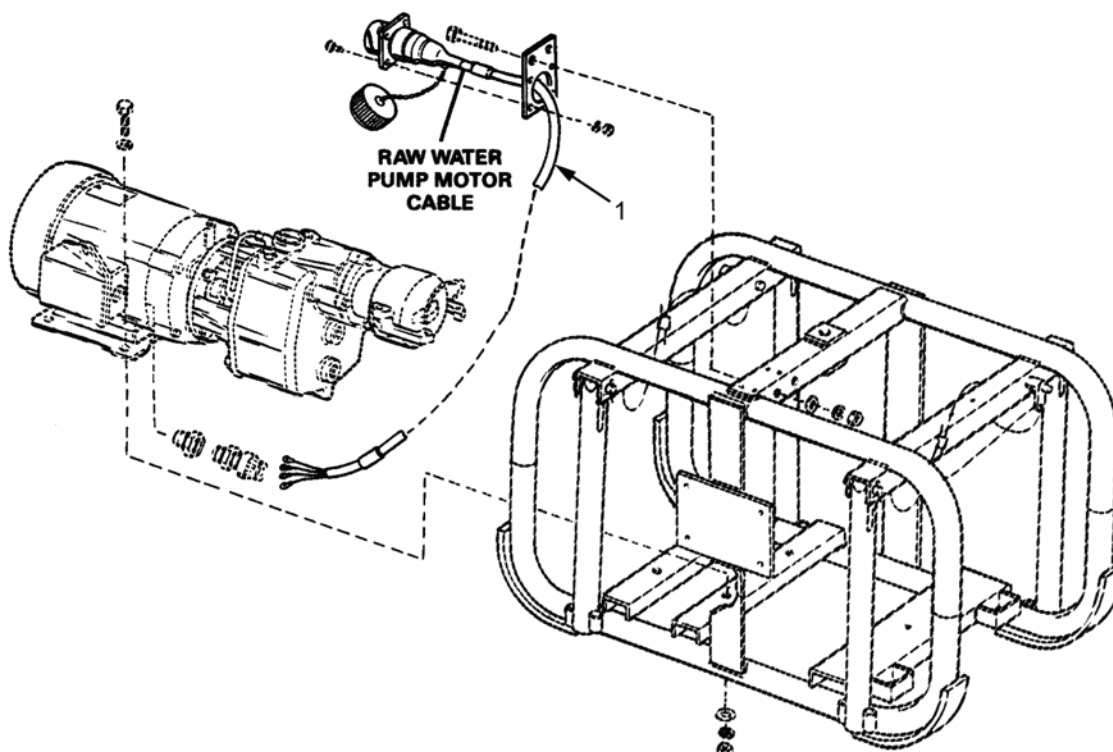


Figure 1. Raw Water Pump Motor Cable.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
RAW WATER PUMP
INSPECTION, DISASSEMBLY, REPAIR, REASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:

Raw water pump and motor assembly removed from frame (WP 0049 00, TM 10-4610-232-12)

Materials/Parts:

Gasket (TM 10-4610-232-24P)

Lockwasher (TM 10-4610-232-24P)

Lubricating Oil (Item 53, WP 0102 00)

Preformed Packing (TM 10-4610-232-24P)

Wiping Rags (Item 61, WP 0102 00)

Seal Assembly (TM 10-4610-232-24P)

Washer (TM 10-4610-232-24P)

References:

TB 43-0218

INSPECTION

1. Inspect raw water pump assembly for visible exterior damage.
2. Inspect raw water pump assembly for signs of leakage.
3. When pump is disassembled, inspect all preformed packings, gaskets, and seals.

DISASSEMBLY**NOTE**

Raw water pump cannot be removed from pump motor as an assembly.
Pump must be disassembled from motor and installed in the same manner.

1. Remove four capscrews (1) and pump case (2) from pump assembly (3).
2. Remove preformed packing (4) from adapter (5).
3. Remove two nuts (6), lockwashers (7) and diffuser (8) from pump case (2).
4. Remove preformed packing (9) from diffuser (8).
5. Remove nut (10), impeller (11), spring plate (12), seal spring (13) and key (14) from diffuser (8).
6. Remove four capscrews (15), adapter (5) and carbon disc (16) from pump case (2).
7. Remove two dowels (17), studs (18) and seal seat (19) from adapter (5).
8. Remove stud (20) from adapter (5).
9. Loosen two jam nuts (21) and remove two setscrews (22) and jam nuts (21) from stub shaft (23).
10. Drive out roll pin (24) from stub shaft (23). Remove stub shaft (23) and slinger (25) from adapter (5).

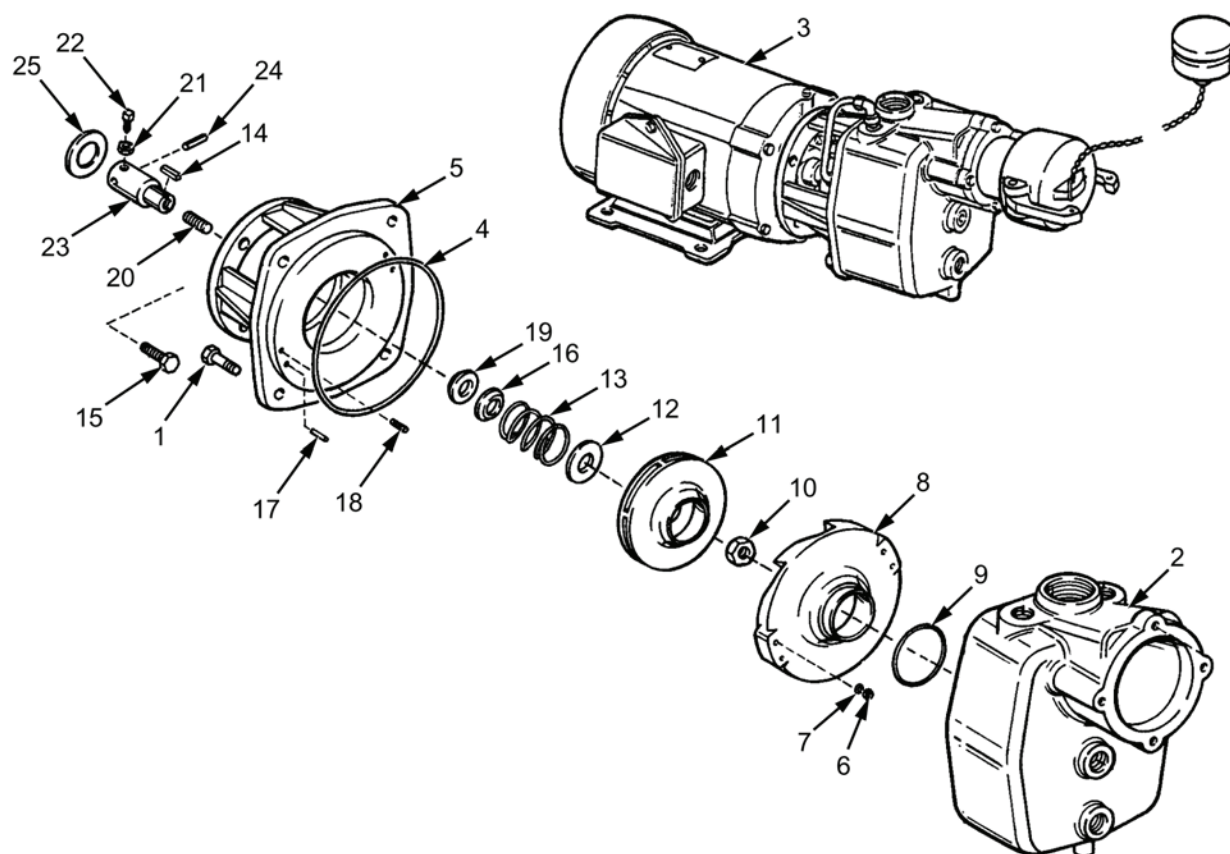


Figure 1. Raw Water Pump Repair.

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace seal assembly (12, 13, 16, and 19) and all damaged gaskets and preformed packing.
2. Replace damaged or unserviceable parts.
3. Clean gasket, flange face, and seal cavity of adapter (5). Clean stub shaft (23).
4. Replace impeller (11) and diffuser (8) if clearance between them exceeds 0.04 in (0.1 cm).

CAUTION

Do not scratch the lapped face of seal, or equipment damage may result.

5. Lubricate seal seat (19) and seal cavity in adapter (5) with soapy water solution. Press seal seat (19) into seal cavity of adapter (5) evenly and squarely.

REASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install two dowels (17), studs (18) and seal seat (19) in adapter (5).
2. Install slinger (25) on adapter (5).
3. Install stub shaft (23) on adapter (5) and secure with two setscrews (22), jam nuts (21) and roll pin (24). Install stud (20) on adapter (5).

CAUTION

Use care to ensure seal is not damaged during assembly procedures.

4. With motor vertical (shaft up), install adapter (5) and four capscrews (15) on pump case (2).
5. Install carbon disc (16), seal spring (13), and spring plate (12) on diffuser (8). Place key (14) in key slot on stub shaft (23) and install impeller (11) and nut (10) on stub shaft (23).
6. Install diffuser (8), two dowels (17), studs (18), lockwashers (7), and nuts (6) on adapter (5). Install preformed packing (4 and 9) on diffuser (8).
7. Install pump case (2) and four capscrews (1) on pump assembly (3).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
RAW WATER PUMP MOTOR
REPLACE, DISASSEMBLY, TEST, REPAIR, REASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Puller Kit (TM 10-4610-232-12)
Brass Drift (TM 10-4610-232-12)
Growler (TM 10-4610-232-12)

Equipment Conditions:

Cable removed (WP 0046 00, TM 10-4610-232-12)

References:

TB 43-0128

REPLACE**NOTE**

When replacing the motor, the stub shaft may need replacement. Refer to WP 0014 00.

Raw water pump motor cannot be replaced as a unit before disassembling raw water pump. Refer to WP 0014 00, disassemble the raw water pump and replace motor. Reassemble the pump on the replacement motor.

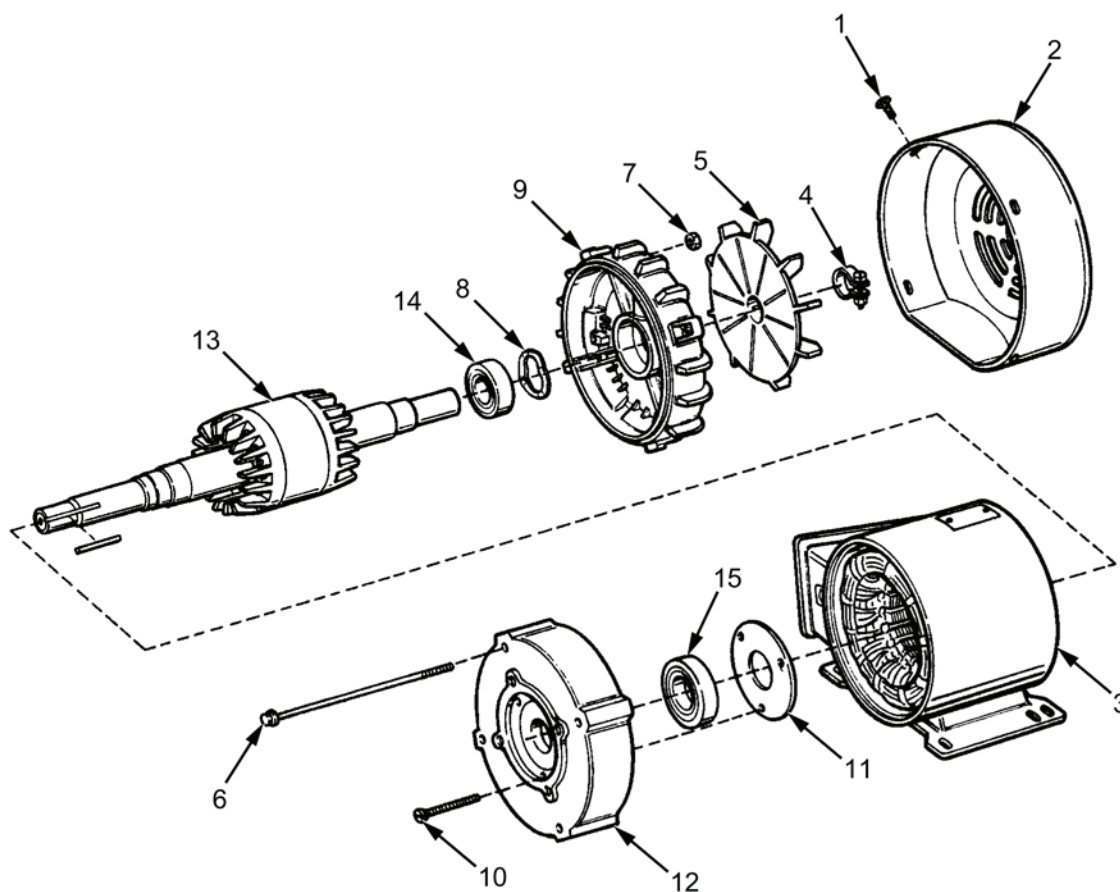


Figure 1. Raw Water Pump Motor.

DISASSEMBLY

1. Remove four screws (1) and fan cover (2) from stator housing (3).
2. Loosen and remove clamp (4) and fan (5) from stator housing (3).
3. Loosen and remove four through bolts (6), nuts (7), spring washer (8) and fan end housing (9) from stator housing (3).
4. Remove three screws (10), retainer (11), and front cover (12) from stator housing (3).
5. Remove rotor shaft (13) from stator housing (3).
6. Use a bearing puller to remove bearings (14 and 15) from rotor shaft (13).

TESTING**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.

Use growler to check rotor for shorts and open connections.

REPAIR

Replace faulty or nonserviceable components.

REASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install retainer (11) on stator housing (3). Install bearings (14 and 15) on rotor shaft (13).
2. Install rotor shaft (13) in stator housing (3).
3. Install front cover (12) on bearing (15) and secure by installing three screws (10) through front cover (12) and retainer (11).
4. Install spring washer (8) on fan end housing (9). Install fan end housing (9) on rotor shaft (13).
5. Install four through bolts (6) and nuts (7) on fan end housing (9).
6. Install fan (5) and clamp (4) on stator housing (3).
7. Install fan cover (2) and four screws (1) on stator housing (3).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
RAW WATER PUMP FRAME
REPAIR

INITIAL SETUP

Tools/Special Tools:

General Mechanic's Tool Kit (TM 10-4610-232-12)
Wire Brush (TM 10-4610-232-12)
Welding Equipment (TM 10-4610-232-12)

References:

TB 43-0218
TM 43-0139
TM 9-237
TM 9-450

Equipment Conditions:

Raw water pump frame disassembled
(WP 0051 00, TM 10-4610-232-12)

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Clean dirt and paint from area to be repaired.
2. Repair metal bodies (TM 9-450).
3. Weld as required (TM 9-237).
4. Paint all repaired areas (TM 43-0139).

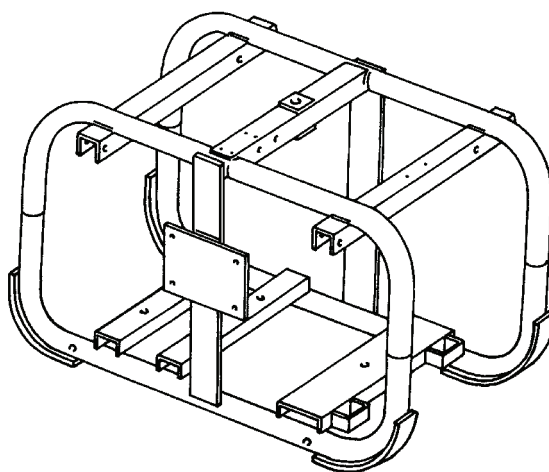


Figure 1. Raw Water Pump Frame.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MODEL NO. WTA-060, NSN 4610-01-219-8707
SEPARATOR
DISASSEMBLY, REPAIR, REASSEMBLY

INITIAL SETUP

Tools/Special Tools:

General Mechanic's Tool Kit (TM 10-4610-232-12)
 Ball Peen Hammer (TM 10-4610-232-12)

Equipment Conditions:

Separator and piping removed from mounting frame (WP 0053 00/WP 0055 00, TM 10-4610-232-12)

Materials/Parts:

Adhesive (Item 2, WP 0102 00)
 Dry Cleaning Solvent (Item 33, WP 0102 00)

References:

TB 43-0218

DISASSEMBLY

1. Remove six capscrews (1) and nuts (2). Remove mount plate (3) and cover liner (4).
2. Remove four capscrews (5) and nuts (6) and housing (7).
3. Remove four capscrews (8) and nuts (9) and housing (10).
4. Remove four capscrews (11), washers (12), nuts (13), and lockwashers (14) and bracket (15).

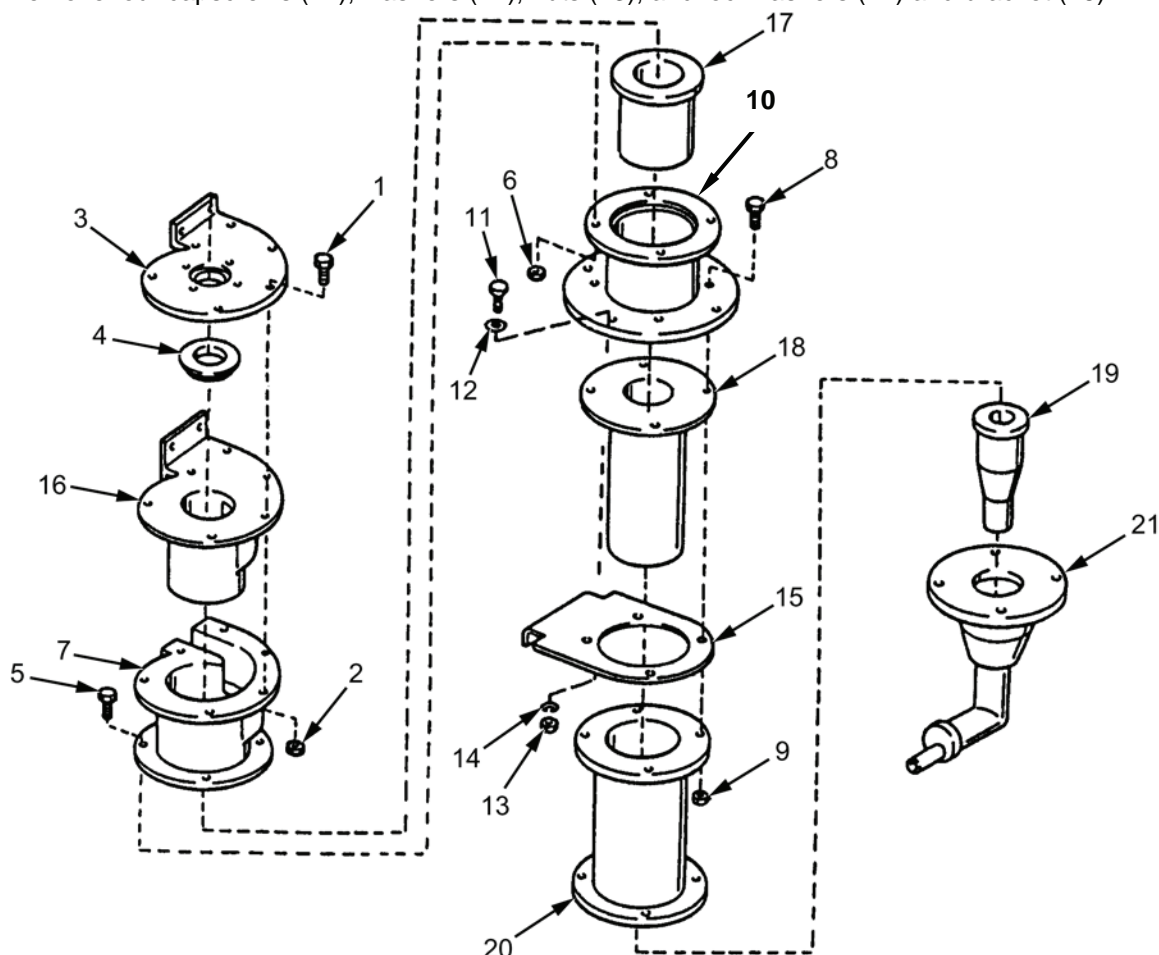


Figure 1. Separator Repair.
(Model WTA-060 Only)

0017 00-1

REPAIR**WARNING**

Dry cleaning solvent AA711, Types I and II, used to clean parts is potentially dangerous to personnel. Avoid nonporous gloves when handling solvent directly or with material soaked with solvent. Wash hands immediately with soap and water after exposure. Use a lanolin-based skin cream to prevent skin drying. Do not use solvent near open flame or excessive heat. Flash point of solvent is 100°F (38°C).

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

Liners may require working from both ends in order to loosen and remove.

1. Remove liners (16, 17, 18 and 19) from housings (7, 10 and 20) and waste housing (21) by applying dry cleaning solvent in liners (16, 17, 18 and 19) and housings (7, 10, 20 and 21). Remove old liners (16, 17, 18 and 19), grasping one end and peeling away from housings (7, 10, 20 and 21).
2. Remove all dirt and foreign material from each housing (7, 10, 20 and 21).
3. Clean housing interior thoroughly, using drycleaning solvent.
4. Liberally apply liner adhesive to exterior surfaces of liners (16, 17, 18 and 19) and to interior surfaces of housings (7, 10, 20 and 21).
5. Fold liners (16, 17, 18 and 19) in half and insert into their respective housings (7, 10, 20 and 21). Flatten out bulges and smooth liners (16, 17, 18 and 19) into place with liner flanges correctly positioned on housing flanges.
6. Use round end of a ball peen hammer to pound holes in liner flanges by striking liner directly above the mounting capscrew holes in housing flanges.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install bracket (15) on housing (10) with four capscrews (11), washers (12), nuts (13) and lockwashers (14).

2. Install housing (10) on housing (20) with four capscrews (8) and nuts (9).
3. Install housing (7) on housing (10) with four capscrews (5) and nuts (6).
4. Install cover liner (4) and mount plate (3) on housing (7) with six capscrews (1) and nuts (2).

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MODEL NO. WTA-060, NSN 4610-01-219-8707
SEPARATOR FRAME
REPAIR**

INITIAL SETUP

Tools/Special Tools:

General Mechanic's Tool Kit (TM 10-4610-232-12)
Wire Brush (TM 10-4610-232-12)
Welding Equipment (TM 10-4610-232-12)

References:

TB 43-0218
TM 43-0139
TM 9-237
TM 9-450

Equipment Conditions:

Separator frame disassembled
(WP 0057 00, TM 10-4610-232-12).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Clean and paint areas to be repaired.
2. Repair metal bodies (TM 9-450).
3. Weld damaged areas (TM 9-237).
4. Paint all areas repaired (TM 43-0139).

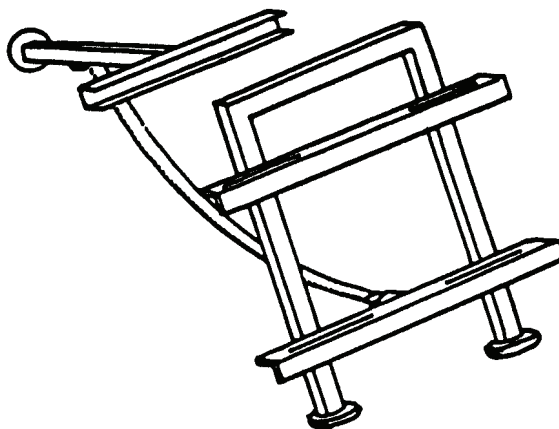


Figure 1. Separator Frame.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE AIR TUBING
DISASSEMBLY, REPAIR, REASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12)

Materials/Parts:

Sealant, Pipe Thread (Item 65, WP 0102 00)

Tape, Antiseize (Item 70, WP 0102 00)

Ties, Wire/Tubing (Item 74, WP 0102 00)

Tags

Seal Washers (TM 10-4610-232-24P)

References:

TB 43-0218

DISASSEMBLY**WARNING**

Air compressor must be shut off at control panel and air pressure must be bled from manifolds and air filter. Serious injury to personnel could result from high air pressure.

1. Turn compressor switch (1) to OFF.
2. Close air tank valve (2).
3. Open manifold bleed valves (3 and 4).
4. Open air filter bleed valve (5).
5. Make sure air pressure on manifold gauge (6) and tank gauge (7) reads zero.
6. Open union (8) and remove high pressure line (9) from tee (10). Remove remaining half union (8) from high pressure line (9), if necessary.
7. Remove other union half (8) and nipple (11) from air regulator (12).
8. Open union (13) and remove high pressure line (14) from check valve (15).
9. Remove union half (13) from tee (10). Remove tee (10) from high pressure line (14).
10. Remove remaining union half (13) and nipple (16) from tee (17).
11. Remove check valve (15) from nipple (18).
12. Remove nipple (18) from air filter base (19).
13. Disconnect connector (20) from pressure relief valve (21).
14. Cut and remove wire ties. Undo boot (WP 0010 00) and pull line into van.

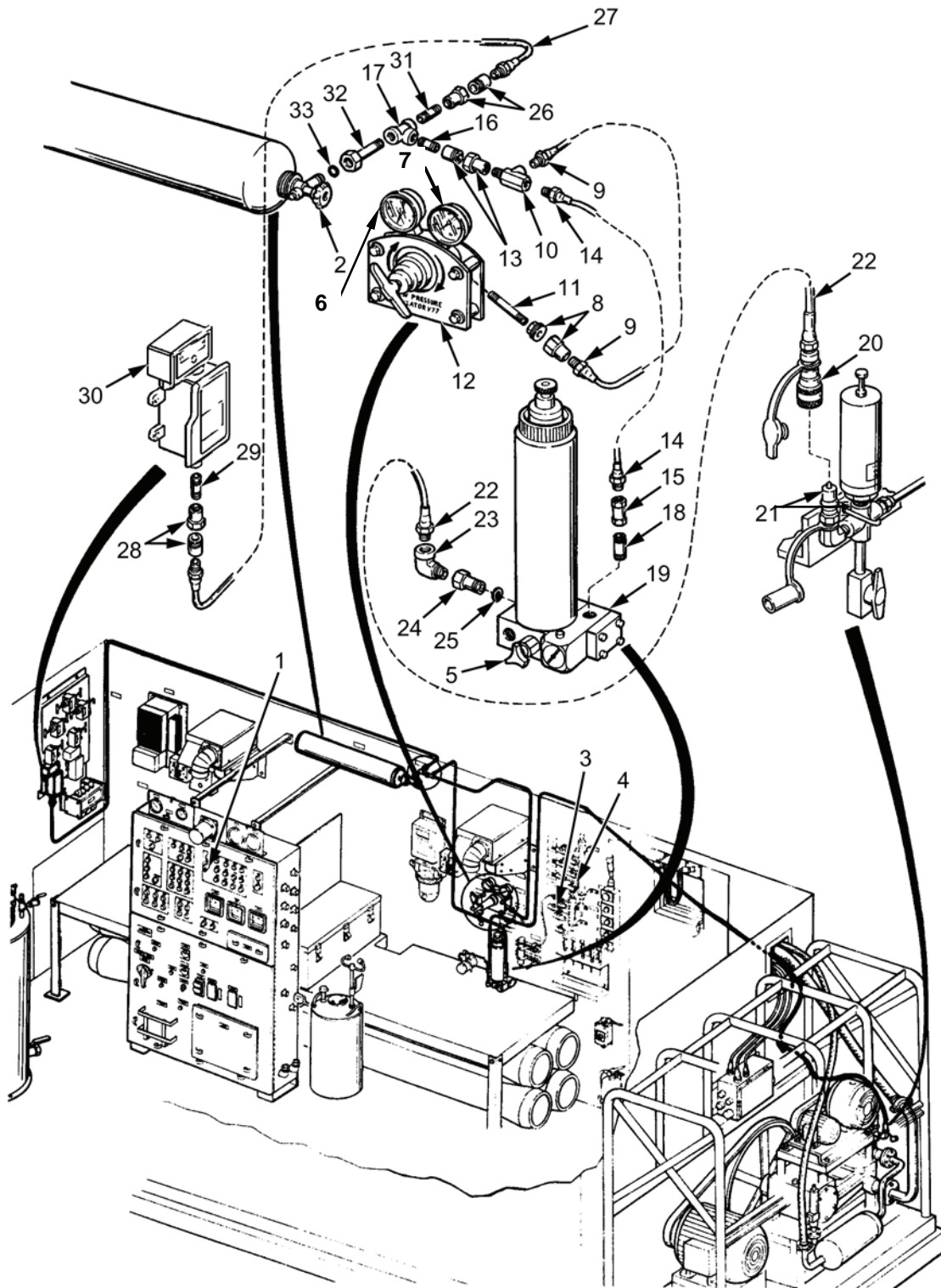


Figure 1. High Pressure Air Tubing Repair.

15. Remove high pressure line (22) from street elbow (23).
16. Remove street elbow (23) from fitting (24).

17. Remove fitting (24) from air filter base (19). Remove seal washer (25).
18. Open union (26) and remove from high pressure line (27).
19. Open union (28) and remove union half from high pressure line (27).
20. Cut wire ties and remove high pressure line (27) from unit wall.
21. Remove remaining half of union (28) from nipple (29).
22. Remove nipple (29) from pressure switch PSH7 (30).
23. Remove remaining half of union (26) from nipple (31).
24. Remove nipple (31) from tee (17).
25. Remove swivel fitting (32) from tank valve (2).
26. Remove seal washer (33) from swivel fitting (32).
27. Remove swivel fitting (32) from tee (17).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace all faulty components.
2. Repair leaking fittings with antiseize tape and pipe thread sealant.
3. Disassemble and clean out check valves (WP 0043 00, TM 10-4610-232-12).

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Apply antiseize tape and pipe thread sealant to all external pipe fitting threads.
2. Install swivel fitting (32) in tee (17).
3. Install seal washer (33) in swivel fitting (32).
4. Install swivel fitting (32) on air tank valve (2).

5. Install nipple (31) in tee (17) and union half (26) on nipple (31).
6. Install other union half (26) on high pressure line (27).
7. Install union half (28) on high pressure line (27).
8. Install other union half (28) on nipple (29). Install nipple (29) in pressure switch PSH7 (30).
9. Mount high pressure line (27) to unit wall and secure with wire ties (WP 0043 00, TM 10-4610-232-12). Close unions (26 and 28).
10. Install seal washer (25) on fitting (24) and install fitting (24) in air filter base (19).
11. Install street elbow (23) on fitting (24) and connect high pressure line (22) in street elbow (23).
12. Connect connector (20) with high pressure line (22) on pressure relief valve (21).
13. Install nipple (18) on air filter base (19) and install check valve (15) (WP 0043 00, TM 10-4610-232-12), with arrow up on nipple (18).
14. Install union half (13) on nipple (16) and install in tee (17).
15. Install high pressure line (14) on check valve (15).
16. Install high pressure line (14) on tee (10).
17. Install other union half (13) on tee (10).
18. Install nipple (11) in air regulator (12) and install other union half (8) on nipple (11).
19. Install high pressure line (9) on tee (10) and connect union (13).
20. Install union half (8) on high pressure line (9) and close union (8).
21. Close air filter bleed valve (5).
22. Close manifold bleed valves (4 and 3).
23. Open air tank valve (2).
24. Turn compressor switch (1) to ON.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE WATER PIPING AND HOSES
INSPECTION, REMOVAL, REPAIR, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:ROWPU shutdown and system drained of water
(TM 10-4610-232-12)**Materials/Parts:**

Victaulic Gaskets (TM 10-4610-232-24P)

Tags

Glycerin (Item 17, WP 0102 00)

References:

TB 43-0218

INSPECTION**NOTE**

This procedure is applicable to all high pressure inlet and outlet tubing. When removing more than one high pressure tube at a time, tag clamps and tubes for easier installation.

1. Visually check all hoses, tubing, and fittings for leaks.
2. If any leaks are detected, refer to repair procedure.

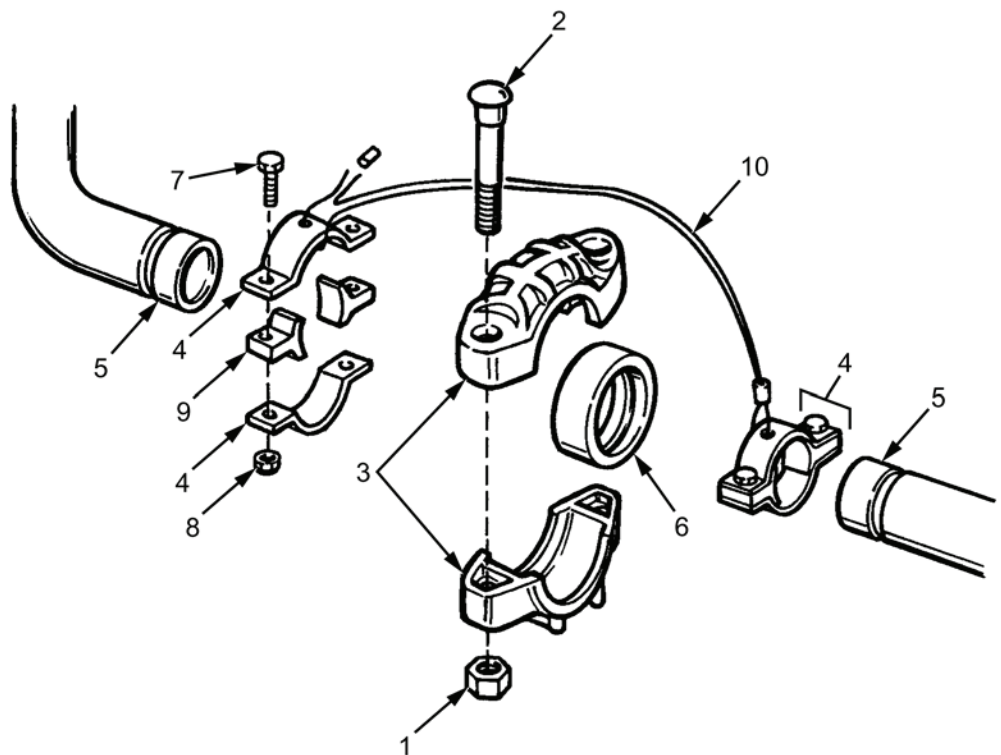


Figure 1. High Pressure Piping and Hose Connections.

REMOVAL

WARNING

Make sure that inline pressure is relieved from tubing before removal or death or injury to personnel could result.

1. Remove two nuts (1), bolts (2), and coupling halves (3).
2. Loosen snubber assembly (4). Slide assembly (4) toward coupling (3).
3. Separate tubing ends (5).
4. Remove victaulic gasket (6).
5. Remove snubber assembly (4).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Inspect victaulic gasket (6), coupling halves (3) and tubing ends (5) for damage.
2. If snubber assembly (4) is damaged, remove two capscrews (7), locknuts (8) and snubber gaskets (9).
3. Replace wire (10), if damaged. Cut wire to 18 in. (45.72 cm).
4. Replace any worn or damaged component.

INSTALLATION

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

For smooth and easy assembly, use glycerin on victaulic gasket.

1. Slide victaulic gasket (6) over tubing ends (5).
2. Align tube ends (5) together.
3. Center victaulic gasket (6) between tubing ends (5).

4. Position coupling halves (3) over tubing ends (5) and secure with two bolts (2) and nuts (1).

NOTE

Do not allow slack in wire.

5. If snubber assembly (4) was damaged, install snubber assembly (4), two snubber gaskets (9), capscrews (7) and locknuts (8).
6. Operate system and check for leaking.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE AUXILIARY HOSE VALVE
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Torque Wrench (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12)

Piping removed (TM 10-4610-232-12)

Materials/Parts:

Seals (TM 10-4610-232-24P)

Preformed Packing (TM 10-4610-232-24P)

References:

TB 43-0218

REMOVAL

1. Open valve lever (1).
2. Remove one nut (2) and bolt (3), then loosen three nuts (2).
3. Remove valve body (4) from end caps (5).

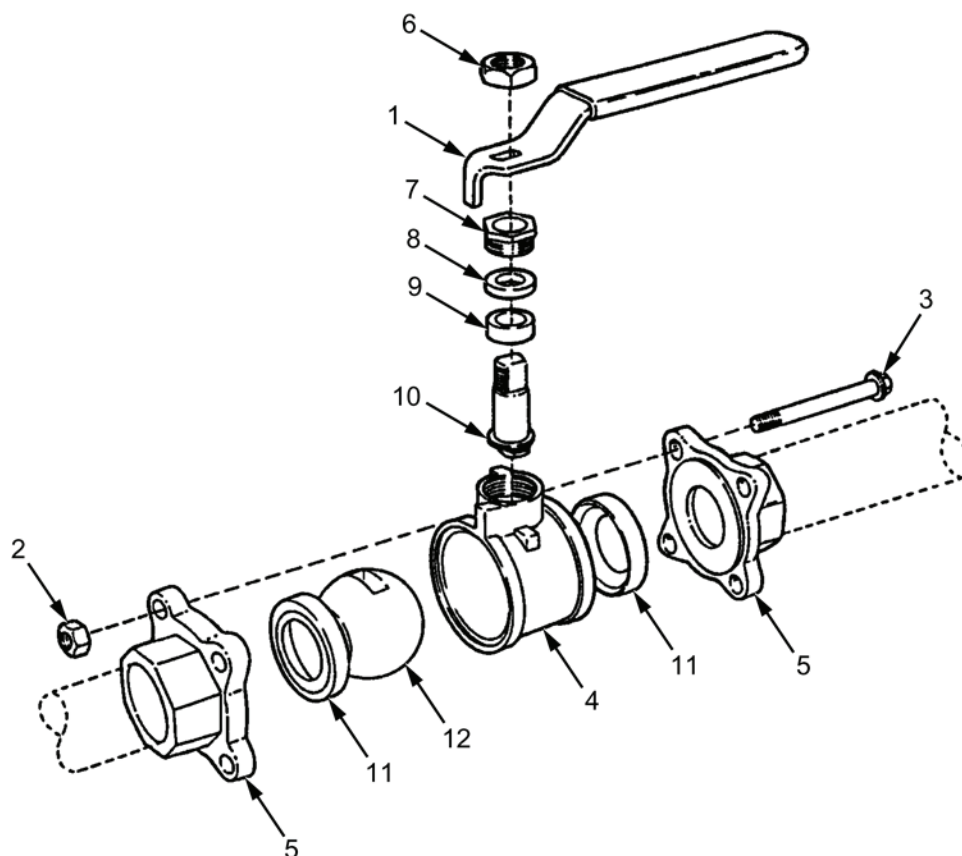


Figure 1. High Pressure Auxiliary Hose Valve

DISASSEMBLY

1. Remove nut (6), valve lever (1), packing gland screw (7), seal (8), preformed packing (9), and stem (10) from valve body (4).
2. Remove two seat seals (11) and ball (12).

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Replace all seals, preformed packing, and any worn or damaged components.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

Install ball so that slot is on top.

1. Install ball (12) and two seat seals (11) in valve body (4).

NOTE

Be sure that tab on bottom of stem fits into ball slot.

2. Install stem (10) into ball (12).
3. Install preformed packing (9), seal (8), packing gland screw (7), valve lever (1) and nut (6) into valve body (4).
4. Finger-tighten packing gland screw (7).

INSTALLATION**NOTE**

Valve body must be positioned so that valve handle is toward the RO vessels and so that valve can be closed (handle rotated 90° upward) (TM 10-4610-232-12).

1. Position valve body (4) within end caps (5).

2. Install one bolt (3) and nut (2) into end caps (5). Torque four nuts (2) to 265 in/lb.
3. Close valve lever (1).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
ELECTRICAL INSTALLATION
DISASSEMBLY, REPAIR, REASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)

Ties, Wire (Item 74, WP 0102 00)

Tags

Lockwashers (TM 10-4610-232-24P)

Washers (TM 10-4610-232-24P)

Gaskets (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU and generator shutdown (WP 0008 00, (TM 10-4610-232-12).

Auxiliary power input disconnected (TM 10-4610-232-12).

References:

TB 43-0218

DISASSEMBLY**WARNING**

Make sure electrical power is disconnected before working on equipment. Failure to do so could result in serious injury or death from electrical shock.

WARNING

Do not wear watches, rings or dog tags when working on electrical cables or components.

NOTE

Electrical assembly cables shown in phantom in Figure 1 are repairable at unit maintenance. Cables shown in heavy unbroken lines are repairable at direct support maintenance.

1. Tag and disconnect power leads (W1) from generator.
2. Tag and disconnect cable at main control panel (WP 0025 00).
3. Remove cable W1 as follows:
 - a. Remove nut (1) and slide rubber seal (2), elbow (3) and sealing ring (4) off cable W1 (5).
 - b. From outside ROWPU, remove nut (6) and slide rubber seal (7) back on cable W1 (5). Then, from inside ROWPU, remove conduit nut (8) and pull cable W1 (5) out through ROWPU exterior wall (9). Remove straight fitting (10) and sealing ring (11) from cable W1 (5).
4. Remove cables W38 and W39 as follows:
 - a. Tag and disconnect cable(s) to be removed at main control panel (WP 0025 00).
 - b. Cut tie wraps that secure cable to ROWPU.

- c. Remove screw (12), washer (13), nut (14), lockwasher (15) and washer (16) from cables W38 (17) and W39 (18).
- d. Slide clamp (19) out of channel (20) and remove clamp (19) from cables W38 (17) and W39 (18).
- e. Tag and unscrew cables W38 (17) and W39 (18) at cannon plug connector at the MOV junction box and remove cables (17 and 18) from ROWPU.

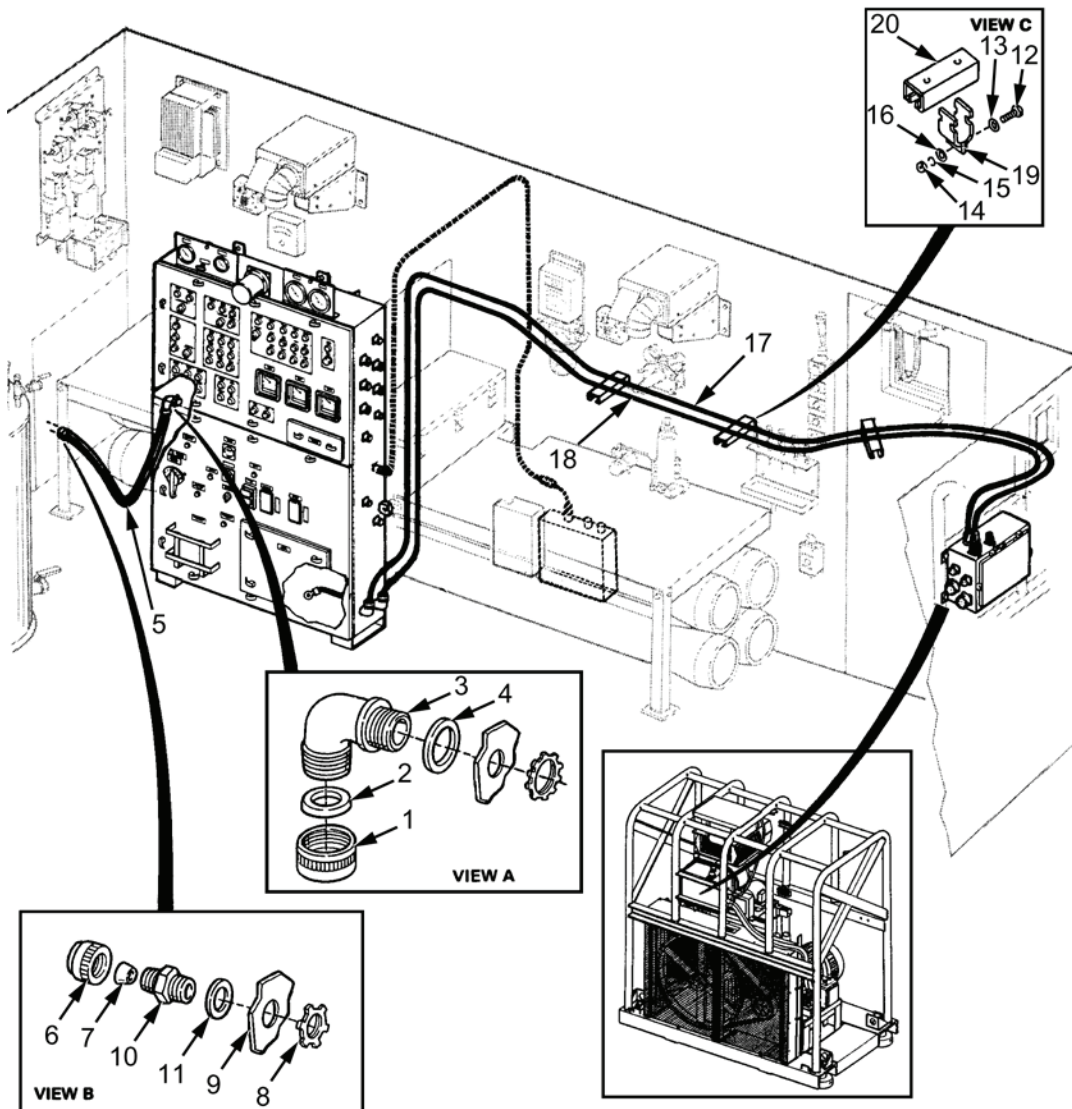


Figure 1. Electrical Installation (sheet 1 of 4).

5. Remove cables W31, W32, and W30 as follows:
 - a. Tag and disconnect cable(s) to be removed at main control panel (WP 0025 00).
 - b. Cut tie wraps that secure cable to ROWPU walls and ceiling.
 - c. Remove four capscrews (21), eight washers (22), sensor (23) and gasket (24) from pipe (25).
 - d. Remove cables W31 (26), W32 (27), and W30 (28) from ROWPU.

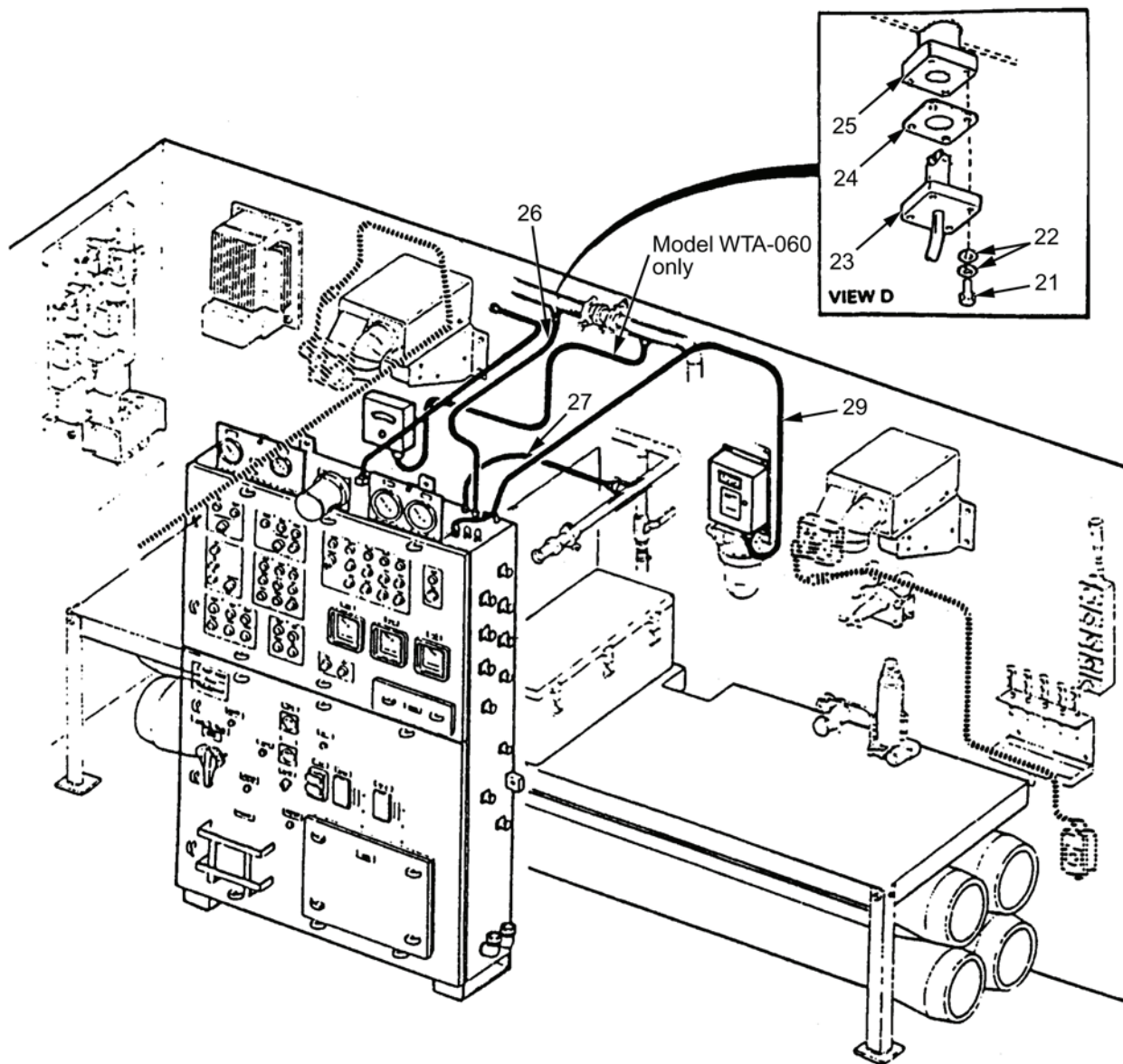


Figure 1. Electrical Installation (sheet 2 of 4).

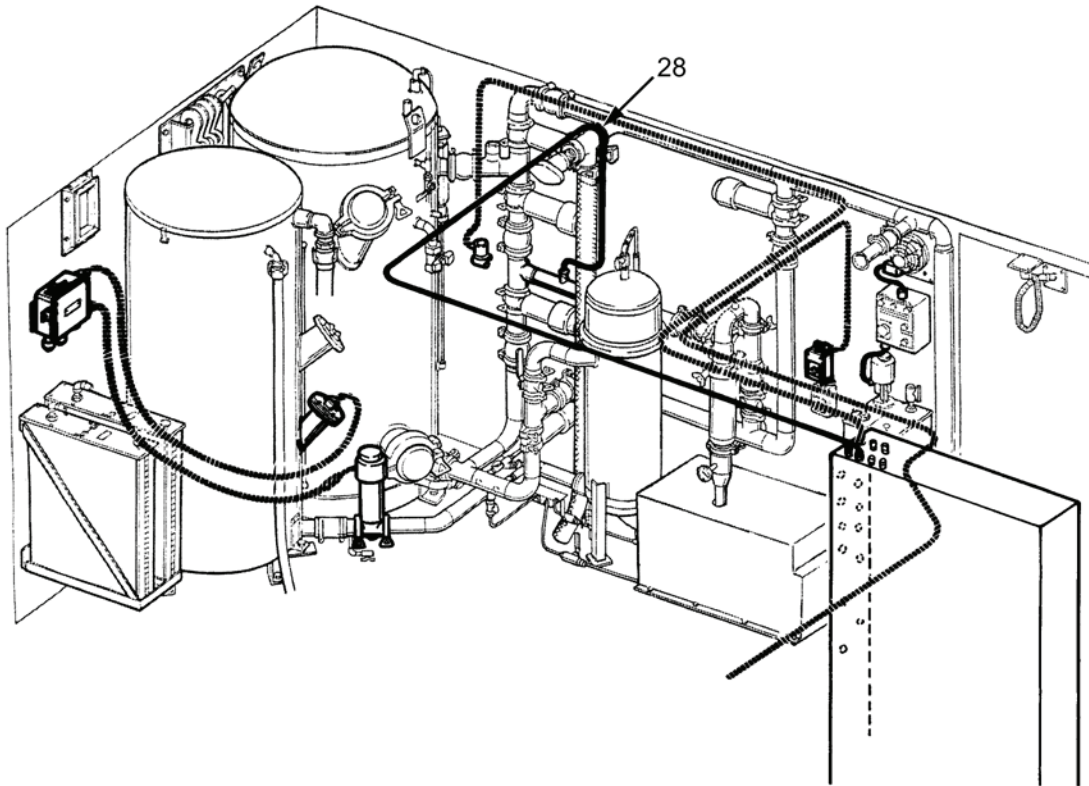


Figure 1. Electrical Installation (sheet 3 of 4).

6. Remove cable W69 as follows:
 - a. Tag and disconnect cable W69 at main control panel (WP 0025 00).
 - b. Remove tie wraps that secure cable to ROWPU walls.
 - c. Tag and disconnect cable W69 (29) at CO monitor by opening CO monitor door, tagging and disconnecting all wires (WP 0061 00).
7. Remove cable W70 as follows:
 - a. Tag and disconnect cable W70 at the 24 VDC power supply (WP 0058 00).
 - b. Cut tie wraps that secure cable to ROWPU ceiling and walls.
 - c. Tag and disconnect cable W70 (30) at CO monitor by opening CO monitor door, tagging and disconnecting all wires (WP 0061 00).

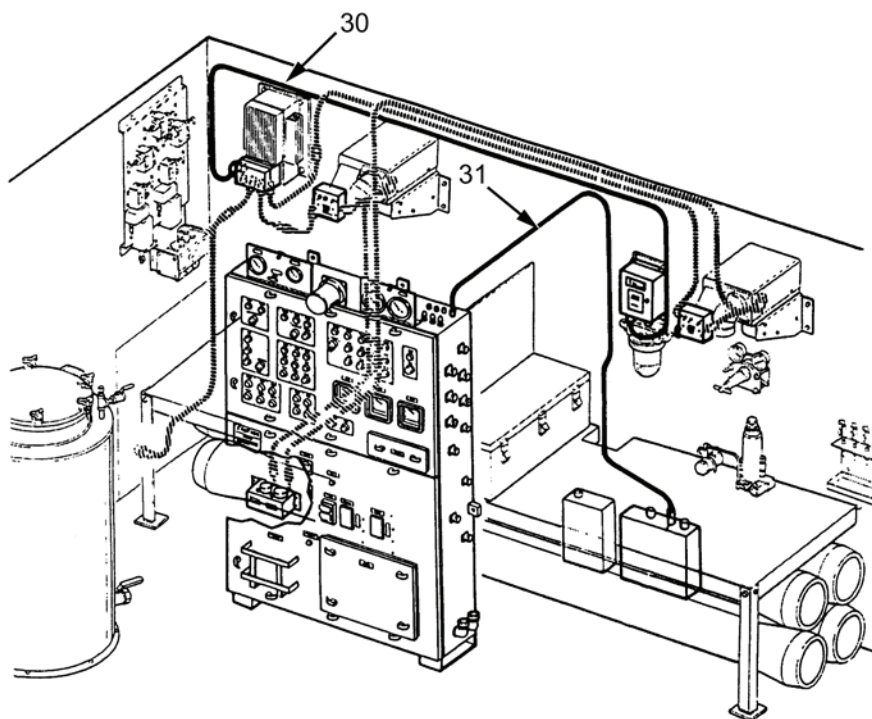


Figure 1. Electrical Installation (sheet 4 of 4).

8. Remove cable W29 as follows:
 - a. Tag and disconnect cable W29 at main control panel (WP 0025 00).
 - b. Cut tie wraps that secure cable to ROWPU.
 - c. Disconnect cable W29 (31) at distribution pump external electrical panel assembly (WP 0071 00, TM 10-4610-232-12).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace cables if damaged or if connectors have loose or burned pins.
2. Replace all damaged or missing components.

3. Replace wire markers, if necessary (WP 0043 00, TM 10-4610-232-12).
4. Replace loose or missing ring tongue connectors (WP 0043 00, TM 10-4610-232-12).
5. Repair cables and connectors (WP 0010 00).

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install cable W29 as follows:
 - a. Connect cable W29 (31) at distribution pump external electrical panel assembly (WP 0071 00, TM 10-4610-232-12).
 - b. Install tie wraps on cable W29 (31) (WP 0043 00, TM 10-4610-232-12).
 - c. Connect cable W29 (31) at main control panel (WP 0026 00).
2. Install cable W70 as follows:
 - a. Open CO monitor door and connect cable W70 (30) into CO monitor (WP 0062 00).
 - b. Install tie wraps on cable W70 (30) (WP 0043 00, TM 10-4610-232-12).
 - c. Connect cable W70 (30) at 24 VDC power supply (WP 0058 00).
3. Install cables W30, W31, and W32 as follows:
 - a. Install sensor (23) and gasket (24) into pipe (25), securing with four capscrews (21) and eight washers (22).
 - b. Install tie wraps on cables W31 (26), W32 (27) and W30 (28) (WP 0043 00, TM 10-4610-232-12).
 - c. Connect cables W31 (26), W32 (27) and W30 (28) at main control panel (WP 0025 00).
4. Install CO monitor cable W69 as follows:
 - a. Open CO monitor door and install cable W69 (29) on CO monitor (WP 0061 00).
 - b. Install tie wraps on cable W69 (29) (WP 0043 00, TM 10-4610-232-12).
 - c. Connect cable W69 (29) at main control panel (WP 0025 00).

5. Install cables W38 and W39 as follows:
 - a. Connect cables W38 (17) and W39 (18) at main control panel (WP 0025 00).
 - b. Route cables through ROWPU exterior wall and screw cables W38 (17) and W39 (18) into cannon plug connector at MOV junction box.
 - c. Place clamp (19) on cable W38 (17) and W39 (18) and in channel (20).
 - d. Install screw (12), washer (13), nut (14), lockwasher (15) and washer (16) on clamp (19).
 - e. Install tie wraps on cables W38 (17) and W39 (18) (WP 0043 00, TM 10-4610-232-12).
6. Install cable W1 as follows:
 - a. From outside ROWPU, slide nut (6) and rubber seal (7) on cable W1 (5).
 - b. Install straight fitting (10) with sealing ring (11) in ROWPU exterior wall (9).
 - c. Push cable W1 (5) through straight fitting (10) and install conduit nut (8) on cable W1 (5).

NOTE

Push cable W1 far enough into ROWPU to be sure cable can be connected to main control panel.

- d. Tighten conduit nut (8) and nut (6).
- e. Slide another nut (6) and rubber seal (7) on control panel end of cable and connect cable W1 (5) to main control panel (WP 0025 00).
- f. Connect power leads (W1) to generator as follows: Lead L1 to stud L1, lead L2 to stud L2, lead L3 to stud L3 and lead L0 to stud L0.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MODEL NO. WTA-060, NSN 4610-01-219-8707
PRESSURE GAUGES AND ASSEMBLIES
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Dead Weight Tester (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12)

Materials/Parts:

Tape, Antiseize (Item 70, WP 0102 00)
Washers (TM 10-4610-232-24P)

References:

TB 43-0218

REMOVAL**WARNING**

Do not disassemble gauges when ROWPU is operating. Pressurized water can cause serious injury to personnel.

1. Remove Panel A as follows:

- a. Tag and disconnect three high pressure lines (1) from selector switch (2).
- b. Tag and disconnect two plastic tubes (3) from tee (4).
- c. Remove nut (5) and flatwasher (6) from support rod (7).
- d. Remove two capscrews (8), lockwashers (9) and washers (10).
- e. Remove self-locking nut (11), four washers (12), two nuts (13), washer (14), support rod (7) and eyebolt (15).

2. Remove Panel B as follows:

- a. Tag and disconnect all plastic tubing (16) from tees (17).
- b. Remove nut (18) and washer (19) from support rod (20).
- c. Remove two capscrews (21), lockwashers (22) and washers (23).
- d. Remove self-locking nut (24), four washers (25), two nuts (26), washer (27), support rod (20) and eyebolt (28).

DISASSEMBLY

1. Remove Panel A as follows:
 - a. Remove stainless steel tubing (29) from high pressure gauge (30) and selector switch (2).
 - b. Loosen setscrew (31) and remove handle (32).
 - c. Remove nut (33) and selector switch (2).
 - d. Remove elbow (34), fitting (35) and street elbow (36) from selector switch (2).
 - e. Remove tee (37) from street elbow (36).
 - f. Remove two nuts (38), two brackets (39) and product gauge (40).
 - g. Remove tee (4) from product gauge (40).
 - h. Remove two nuts (41), brackets (42) and high pressure gauge (30) from panel (43).
 - i. Remove fitting (44) from high pressure gauge (30).
 - j. Remove three screws (45) and self-locking nuts (46), six washers (47) and hinge (48) from panel (43).

NOTE

Disassembly of cartridge filter differential pressure gauge and media filter differential pressure gauges are the same.

2. Remove Panel B as follows:
 - a. Remove bezel (49) to gain access to screws (50).
 - b. Remove three screws (50), nuts (51), lockwashers (52) and washers (53).
 - c. Remove gauge (54) from panel (55).
 - d. Remove tees (17) from gauge (54).
 - e. Remove three screws (56) and self-locking nuts (57), six washers (58) and hinge (59) from panel (55).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Check gauges with dead weight tester and replace, if necessary.

2. Replace worn or leaking components as necessary.

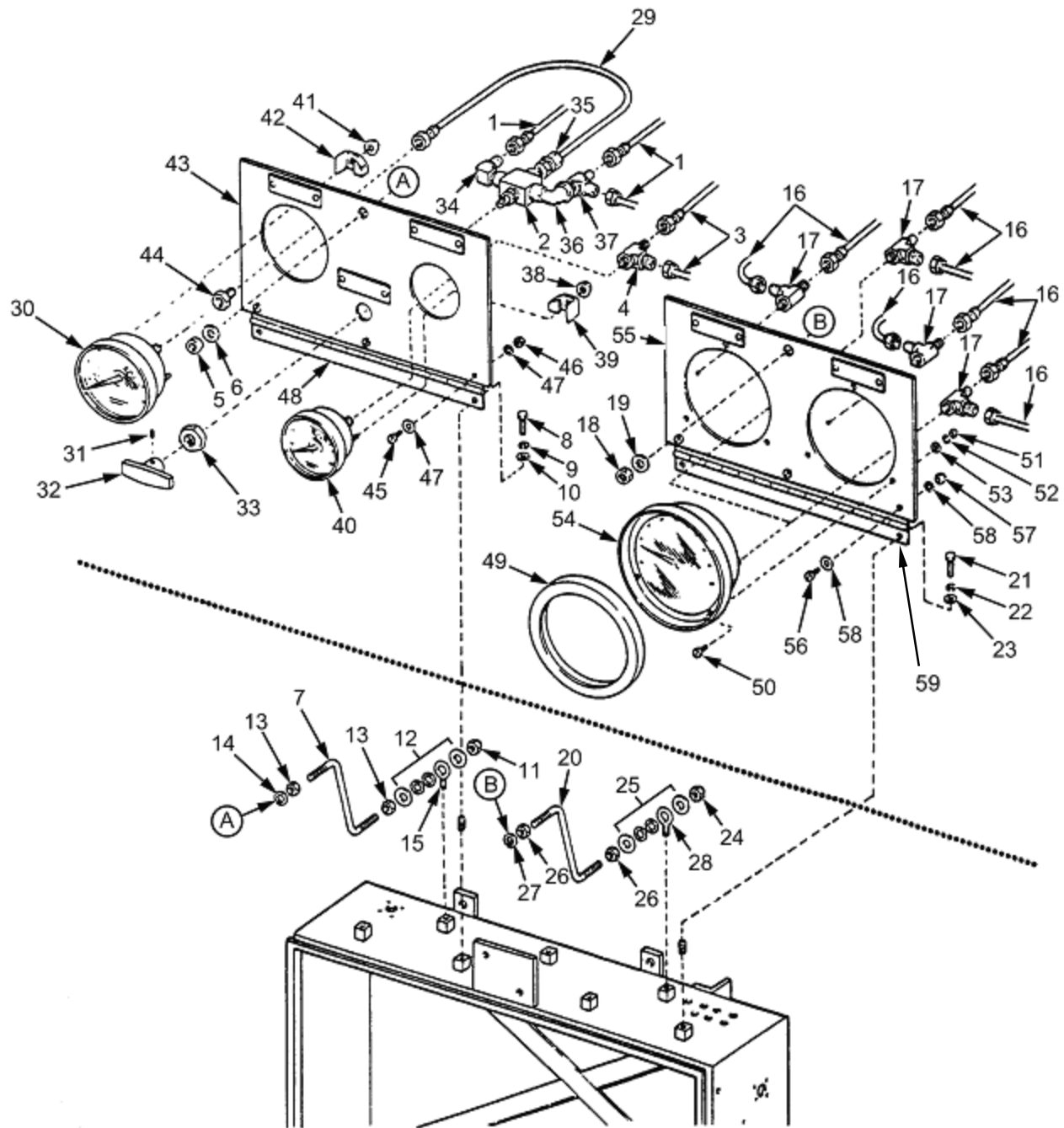


Figure 1. Pressure Gauges and Assemblies.
(Model WTA-060 Only)

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

Apply antiseize tape to pipe threads before assembling components.

1. Assemble Panel B as follows:
 - a. Install hinge (59) with three screws (56), self-locking nuts (57) and six washers (58).
 - b. Install tees (17) on gauges (54).
 - c. Install gauges (54), three screws (50), nuts (51), lockwashers (52) and washers (53) in panel (55).
 - d. Mount bezel (49) on front of gauge (54).
2. Assemble Panel A as follows:
 - a. Install hinge (48) with three screws (45), self-locking nuts (46) and six washers (47).
 - b. Install fitting (44) on high pressure gauge (30).
 - c. Install high pressure gauge (30) in panel (43). Secure with two brackets (42) and nuts (41).
 - d. Install tee (4) on product gauge (40).
 - e. Install product gauge (40) in panel (43). Secure with two brackets (39) and nuts (38).
 - f. Install tee (37) in street elbow (36).
 - g. Install street elbow (36), fitting (35) and elbow (34) on selector switch (2).
 - h. Mount selector switch (2) on panel (43) and secure with nut (33).
 - i. Install handle (32) and secure with setscrew (31).
 - j. Mount stainless steel tubing (29) on high pressure gauge (30) and selector switch (2).

INSTALLATION

1. Install Panel B as follows:
 - a. Install eyebolt (28), support rod (20), nut (26), four washers (25) and self-locking nut (24).
 - b. Mount panel on top of control cabinet and secure with two capscrews (21), lockwashers (22) and washers (23).

- c. Mount panel on support rod (20) and secure with nut (26), washer (27), washer (19) and nut (18).
 - d. Connect all plastic tubes (16) as tagged on tees (17).
2. Install Panel A as follows:
- a. Install eyebolt (15), support rod (7), washer (14), nuts (13), four washers (12) and self-locking nut (11).
 - b. Mount panel on top of control cabinet and secure with two capscrews (8), lockwashers (9) and washers (10).
 - c. Mount panel on support rod (7). Secure with flatwasher (6) and nut (5).
 - d. Connect two plastic tubes (3) on tee (4).
 - e. Connect three high pressure lines (1) to selector switch (2).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MODEL NO. ROWPU-1, NSN 4610-01-371-1790
PRESSURE GAUGES AND ASSEMBLIES
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Dead Weight Tester (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12)

References:

TB 43-0218

Materials/Parts:

Tape, Antiseize (Item 70, WP 0102 00)
Washers (TM 10-4610-232-24P)

REMOVAL**WARNING**

Do not disassemble gauges when ROWPU is operating. Pressurized water can cause serious injury to personnel.

NOTE

Relieve pressure from Panel A by turning selector to REVERSE OSMOSIS PRESSURE SELECT to OUT and open valve. Then turn selector valve to REVERSE OSMOSIS PRESSURE SELECT to IN and open valve.

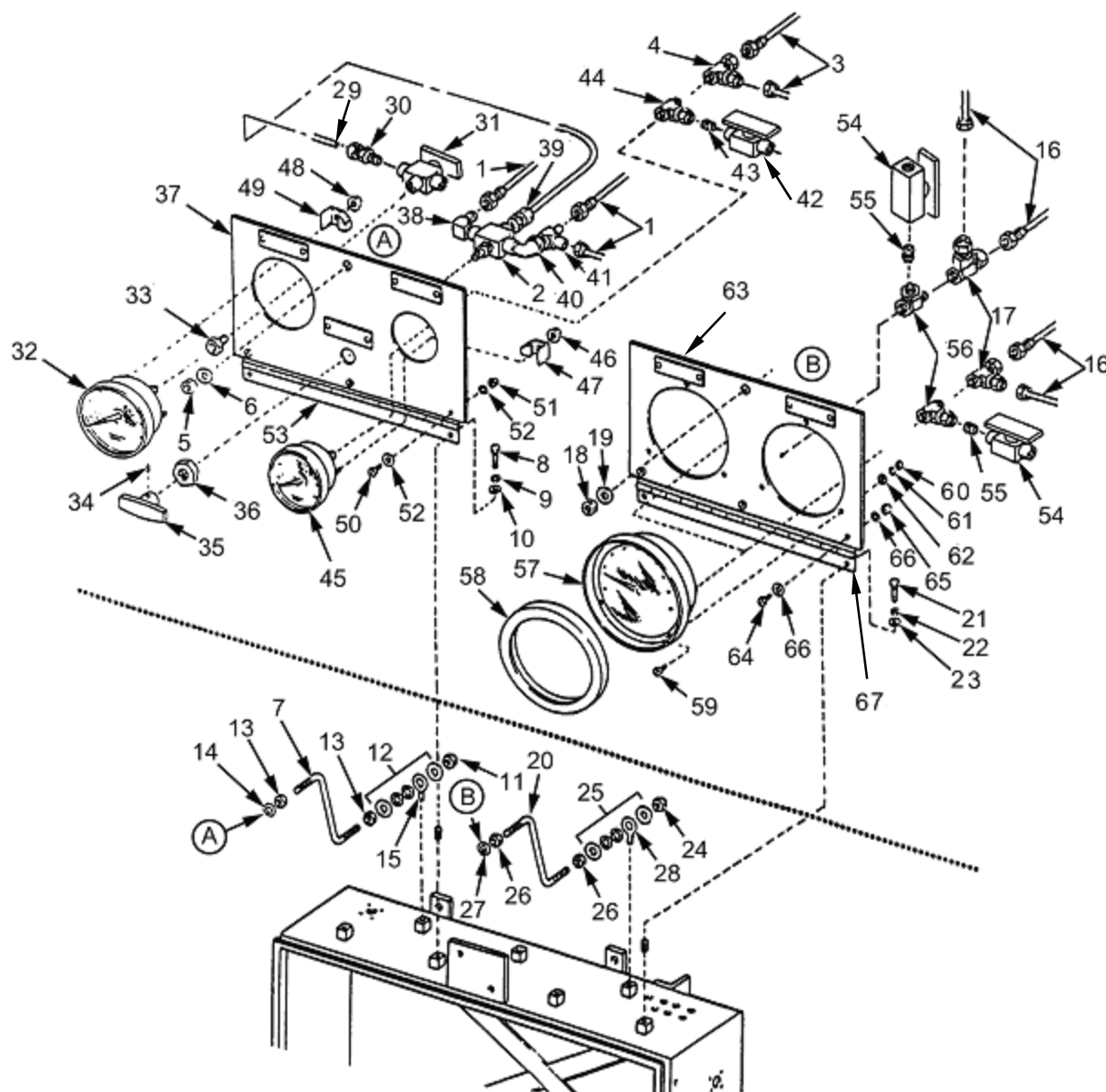
1. Remove Panel A as follows:
 - a. Tag and disconnect three high pressure lines (1) from selector switch (2).
 - b. Tag and disconnect two plastic tubes (3) from tee (4).
 - c. Remove nut (5) and flatwasher (6) from support rod (7).
 - d. Remove two capscrews (8), lockwashers (9), and washers (10).
 - e. Remove self-locking nut (11), five washers (12), two nuts (13), washer (14), support rod (7) and eyebolt (15).

NOTE

Relieve pressure from Panel B by opening drain valve, allowing pressure to bleed from lines.

2. Remove Panel B as follows:
 - a. Tag and disconnect all plastic tubing (16) from tees (17).
 - b. Remove nut (18) and washer (19) from support rod (20).
 - c. Remove two capscrews (21), lockwashers (22) and washers (23).

- d. Remove self-locking nut (24), five washers (25), two nuts (26), washer (27), support rod (20) and eyebolt (28).



**Figure 1. Pressure Gauges and Assemblies.
(Model ROWPU-1 Only)**

DISASSEMBLY

1. Disassemble Panel A as follows:
 - a. Remove stainless steel tubing (29), adapter (30), valve (31), REVERSE OSMOSIS SYSTEM PRESSURE gauge (32) and adapter (33).
 - b. Loosen setscrew (34) and remove handle (35).
 - c. Remove nut (36) and selector switch (2) from panel (37).

- d. Remove elbow (38), fitting (39) and street elbow (40) from selector switch (2).
- e. Remove tee (41) from street elbow (40).
- f. Remove valve (42), nipple (43) and tees (44 and 4) from PRODUCT WATER PRESSURE gauge (45).
- g. Remove two nuts (46), brackets (47) and PRODUCT WATER PRESSURE gauge (45) from panel (37).
- h. Remove two nuts (48), brackets (49) and REVERSE OSMOSIS SYSTEM PRESSURE gauge (32) from panel (37).
- i. Remove three screws (50), self-locking nuts (51), six washers (52) and hinge (53) from panel (37).

NOTE

Disassembly of CARTRIDGE INLET/OUTLET PRESSURE gauge and MEDIA INLET/OUTLET PRESSURE gauge is the same.

2. Disassemble Panel B as follows:

- a. Remove two valves (54), nipples (55), tees (56) and tees (17) from CARTRIDGE INLET/OUTLET PRESSURE gauge (57).
- b. Remove bezel (58) to gain access to screws (59).
- c. Remove three slotted screws (59), nuts (60), lockwashers (61) and washers (62).
- d. Remove CARTRIDGE INLET/OUTLET PRESSURE gauge (57) from panel (63).
- e. Remove three screws (64), self-locking nuts (65), six washers (66) and hinge (67) from panel (63).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Check gauges with dead weight tester and replace, if necessary.
2. Replace any worn or leaking components.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

Apply antiseize tape to pipe threads before assembling components.

NOTE

Assembly of CARTRIDGE INLET/OUTLET PRESSURE gauge and MEDIA INLET/OUTLET PRESSURE gauge is the same.

1. Assemble Panel B as follows:
 - a. Install hinge (67) with three screws (64), self-locking nuts (65) and six washers (66).
 - b. Install CARTRIDGE INLET/OUTLET PRESSURE gauge (57) in panel (63) and secure with three slotted screws (59), nuts (60), lockwashers (61) and washers (62).
 - c. Mount bezel (58) on front of CARTRIDGE INLET/OUTLET PRESSURE gauge (57).
 - d. Install two tees (56), nipples (55), valves (54) and tees (17) on CARTRIDGE INLET/OUTLET PRESSURE gauge (57).
2. Assemble Panel A as follows:
 - a. Install hinge (53) with three screws (50), self-locking nuts (51) and six washers (52).
 - b. Install REVERSE OSMOSIS SYSTEM PRESSURE gauge (32) in panel (37). Secure with two brackets (49) and nuts (48).
 - c. Install PRODUCT WATER PRESSURE gauge (45) in panel (37). Secure with two brackets (47) and nuts (46).
 - d. Install adapter (33) on REVERSE OSMOSIS SYSTEM PRESSURE gauge (32).
 - e. Install tee (44), nipple (43), valve (42) and tee (4) on PRODUCT WATER PRESSURE gauge (45).
 - f. Install tee (41) in street elbow (40).
 - g. Install street elbow (40), fitting (39) and elbow (38) on selector switch (2).
 - h. Mount selector switch (2) on panel (37) and secure with nut (36).
 - i. Install handle (35) and secure with setscrew (34).
 - j. Install valve (31), adapter (30) and stainless steel tubing (29).

INSTALLATION

1. Install Panel B as follows:

- a. Install eyebolt (28), support rod (20), washer (27), two nuts (26), five washers (25) and self-locking nut (24).
- b. Mount panel (63) on top of control cabinet and secure with two capscrews (21), lockwashers (22) and washers (23).
- c. Mount panel (63) on support rod (20), and secure with nut (26), washer (27), washer (19) and nut (18).
- d. Connect all plastic tubing (16) as tagged on tees (17) on CARTRIDGE INLET/OUTLET PRESSURE gauge (57). Repeat for MEDIA INLET/OUTLET PRESSURE gauge.

2. Install Panel A as follows:

- a. Install eyebolt (15), support rod (7), washer (14), two nuts (13), five washers (12) and self-locking nut (11).
- b. Mount panel (37) on top of control cabinet and secure with two capscrews (8), lockwashers (9) and washers (10).
- c. Mount panel (37) on support rod (7). Secure with flatwasher (6) and nut (5).
- d. Connect two plastic tubes (3) on tee (4).
- e. Connect three high pressure lines (1) to selector switch (2).

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MAIN CONTROL PANEL
INSPECTION**

INITIAL SETUP

Equipment Conditions:
ROWPU shutdown (TM 10-4610-232-12)

INSPECTION**WARNING**

Do not wear watches, rings or dog tags when working on main control panel.

Inspect main control panel for cracks in frame, mounting brackets, and door hinge welds.

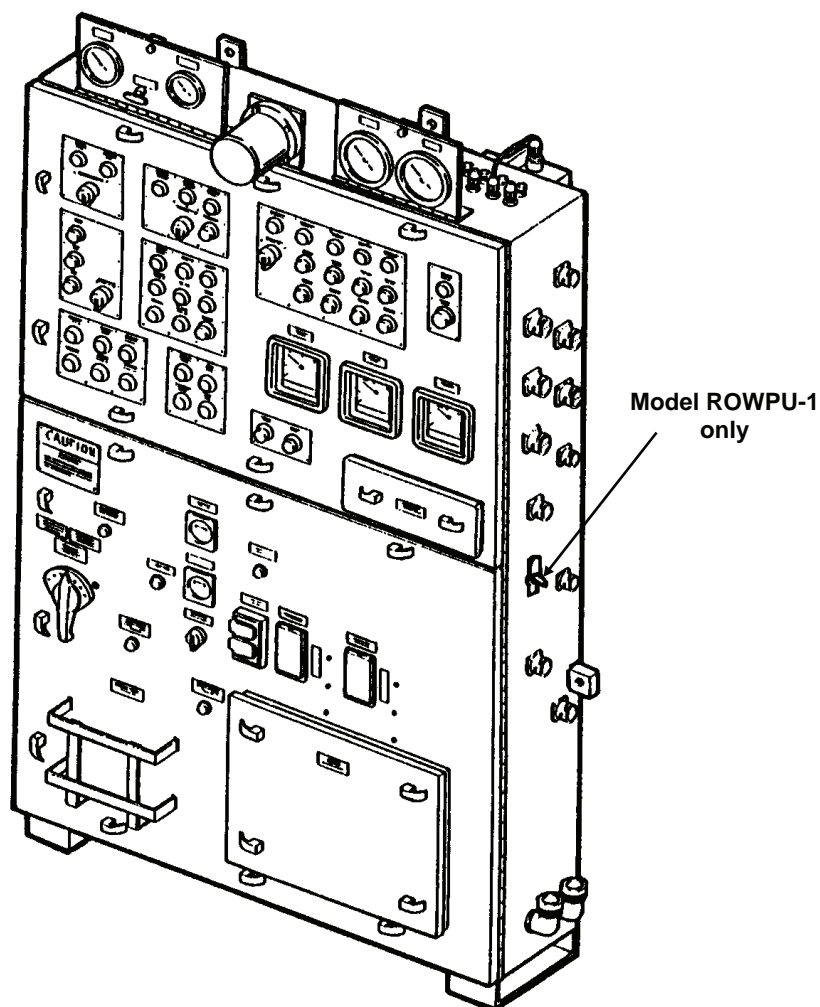


Figure 1. Main Control Panel.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MAIN CONTROL PANEL CABLES, CONNECTORS, AND WIRING
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Electrical Connector Repair Kit (TM 10-4610-232-12)
Terminal Strip Tool (TM 10-4610-232-12)
Crimper, Hand Terminal (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown and main power cable
disconnected from control panel
(TM 10-4610-232-12)

References:

TB 43-0218

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Tags
Tie, Wire (Item 74, WP 0102 00)

WARNING

Do not wear watches, rings, or dog tags when working on main control panel.

WARNING

Make sure electrical power is disconnected before working on unit. Failure to do so could result in serious injury or death from electrical shock.

NOTE

Tag all wires before disconnecting.

INSPECTION

1. Unlatch upper and lower exterior panel doors and swing open doors.
2. Visually inspect for loose, frayed, cut, or scratched cables, wires, and connectors.
3. Check for loose mounting hardware and tighten as required.

REMOVAL

1. Disconnect three wires (L1, L2, and L3) of cable (1) at top of main circuit breaker (2) and ground connection of cable (1) at ground strap (3).
2. Remove conduit nut (4), elbow (5) and sealing washer (6).
3. Disconnect three wires (8T1, 8T2, and 8T3) of cable (7) at motor starter (8) and ground connection of cable (7) at ground strap (3). Cut tie wraps holding wires in control cabinet.
4. Remove conduit nut (9), elbow (10) and sealing washer (11).
5. Disconnect three wires (8T4, 8T5, and 8T6) of cable (12) at motor starter (13). Cut tie wraps holding wires in control cabinet.

6. Remove conduit nut (14), elbow (15) and sealing washer (16).

NOTE

Removal process for each of the twelve cable harnesses is identical.

7. Remove cable harnesses (17) as follows:
 - a. Remove four screws (18), nuts (19), lockwashers (20) and washers (21).
 - b. Tag and disconnect all cable harness wires from components of control cabinet.
 - c. Remove cable harness (17) and gasket (22).

NOTE

Removal process for all four connector assemblies is identical. Connector assemblies are used to connect cables to control cabinet.

8. Tag and disconnect all wires from cable (23). Loosen cap (24).
9. Pull cable (23) out of cabinet and slide bushing (25), body (26) and cap (24) off cable (23). Remove conduit nut (27), sealing washer (28) and connector end (29) from control panel.
10. Tag and disconnect all wires from cable (30) and remove conduit nut (31).
11. Remove cap of two-part connector (32), then remove lower half of connector (32), sealing washer (33) and washer (34). Cable (30) is now free.
12. Tag and disconnect individual wire runs as necessary.
13. (Model ROWPU-1 only) Remove nut (35), locking ring (36), preformed packing (37) and toggle switch (38).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace any faulty components.
2. Repair damaged or worn cables and connectors (WP 0010 00).
3. Replace any damaged or worn wires.

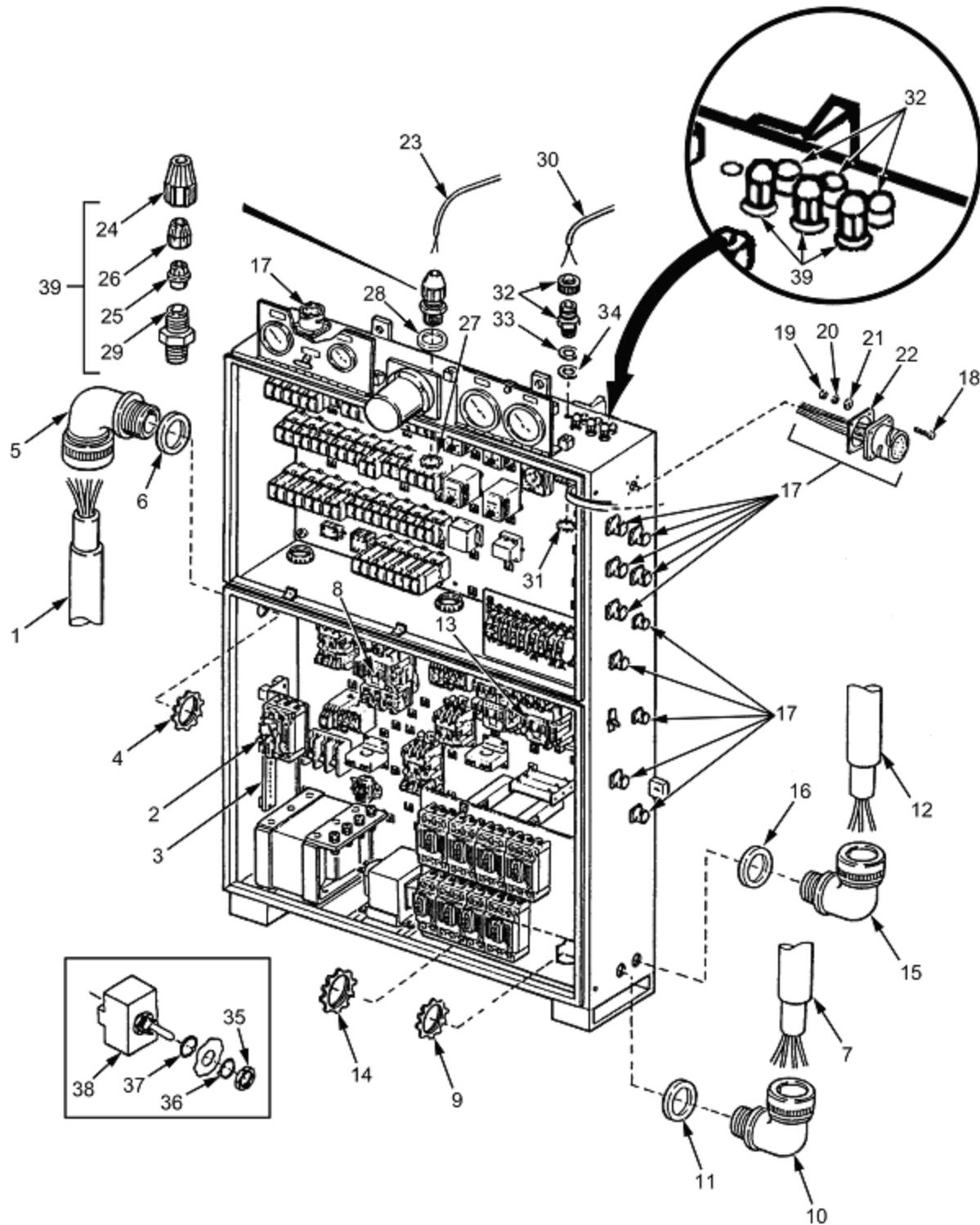


Figure 1. Main Control Panel Cables, Wiring Harnesses and Connectors.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Connect individual wire runs as tagged.
2. Place connector (32), sealing washer (33) and washer (34) on cable (30).
3. (Model ROWPU-1 only) Install toggle switch (38), preformed packing (37), locking ring (36) and nut (35).
4. Install cable (30) through hole in control panel top and secure with conduit nut (31).
5. Connect cable (30) wires as tagged during removal and reinstall tie wraps as necessary.
6. Install four connector assemblies (39)
 - a. Slide cap (24), body (26) and bushing (25) on cable (23).
 - b. Install sealing washer (28) and connector end (29) in top of control panel and secure assembly with conduit nut (27).
 - c. Install cable (23) through connector end (29).
 - d. Connect cable (23) wires as tagged during removal. Install tie wraps, as necessary.
7. Install twelve cable harnesses (17) by placing gasket (22) on cable harness (17) and inserting wires from cable harness (17) through appropriate hole in control panel.
8. Install cable harness (17) with four screws (18), nuts (19), lockwashers (20) and washers (21).
9. Connect wires from cable harness (17) as tagged and secure wires with tie wraps, as required.
10. Install three wires from cable (12) through elbow (15) and secure elbow (15) with conduit nut (14).

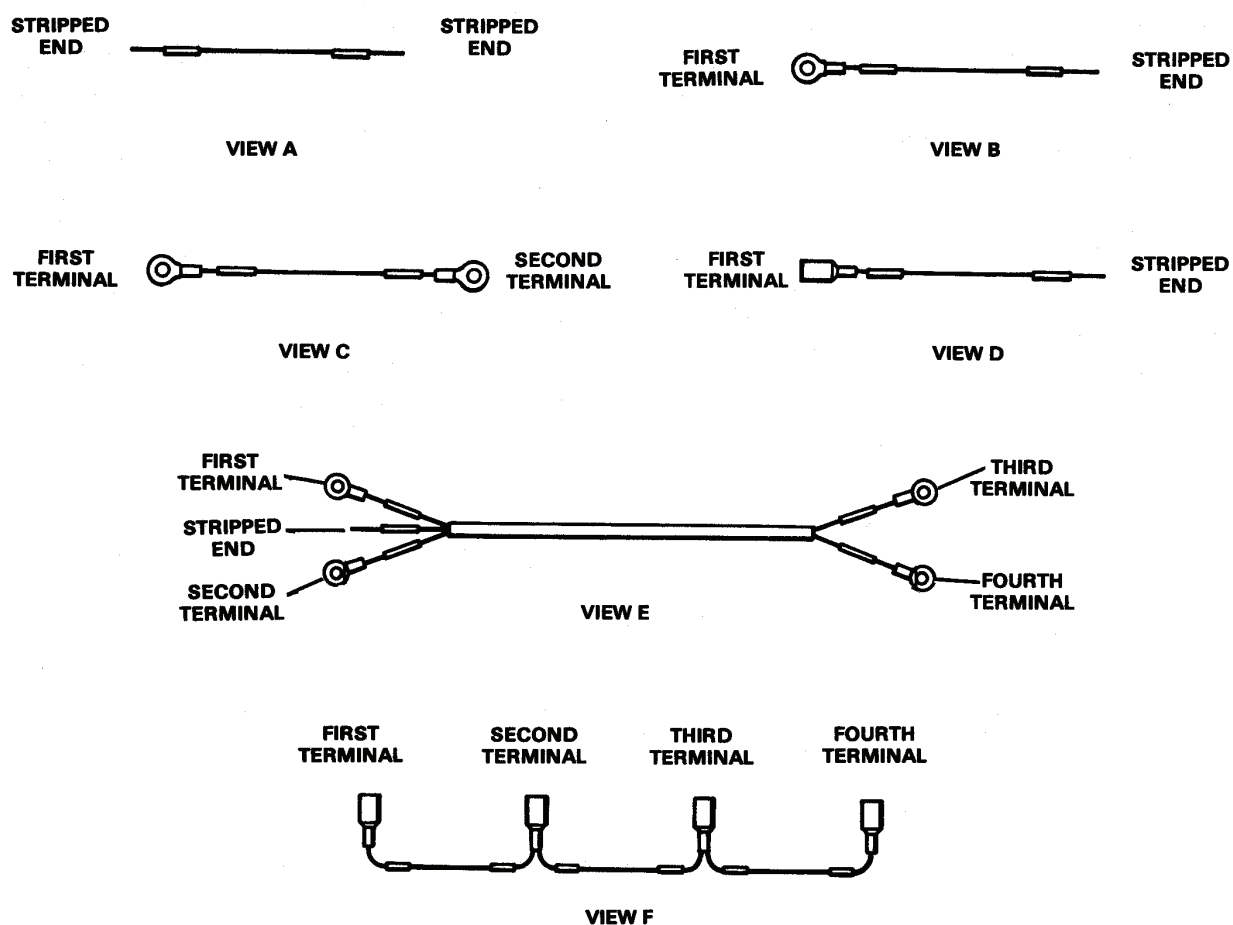


Figure 2. Wire Run Connections (sheet 1 of 2).

11. Connect three wires (8T4, 8T5 and 8T6) from cable (12) at motor starter (13), being careful to connect as tagged during removal.
12. Install four wires from cable (7) through elbow (10) and secure elbow (10) with sealing washer (11) and conduit nut (9).
13. Connect three wires (8T1, 8T2 and 8T3) of cable (7) at motor starter (8) and ground connection of cable (7) at ground strap (3). Secure with tie wraps, as required.
14. Install four wires from cable (1) through elbow (5) and secure elbow (5) with conduit nut (4) and sealing washer (6).
15. Connect three wires (L1, L2 and L3) of cable (1) at top of main circuit breaker (2), being sure to connect as tagged during removal. Connect ground connection of cable (1) at ground strip (3).

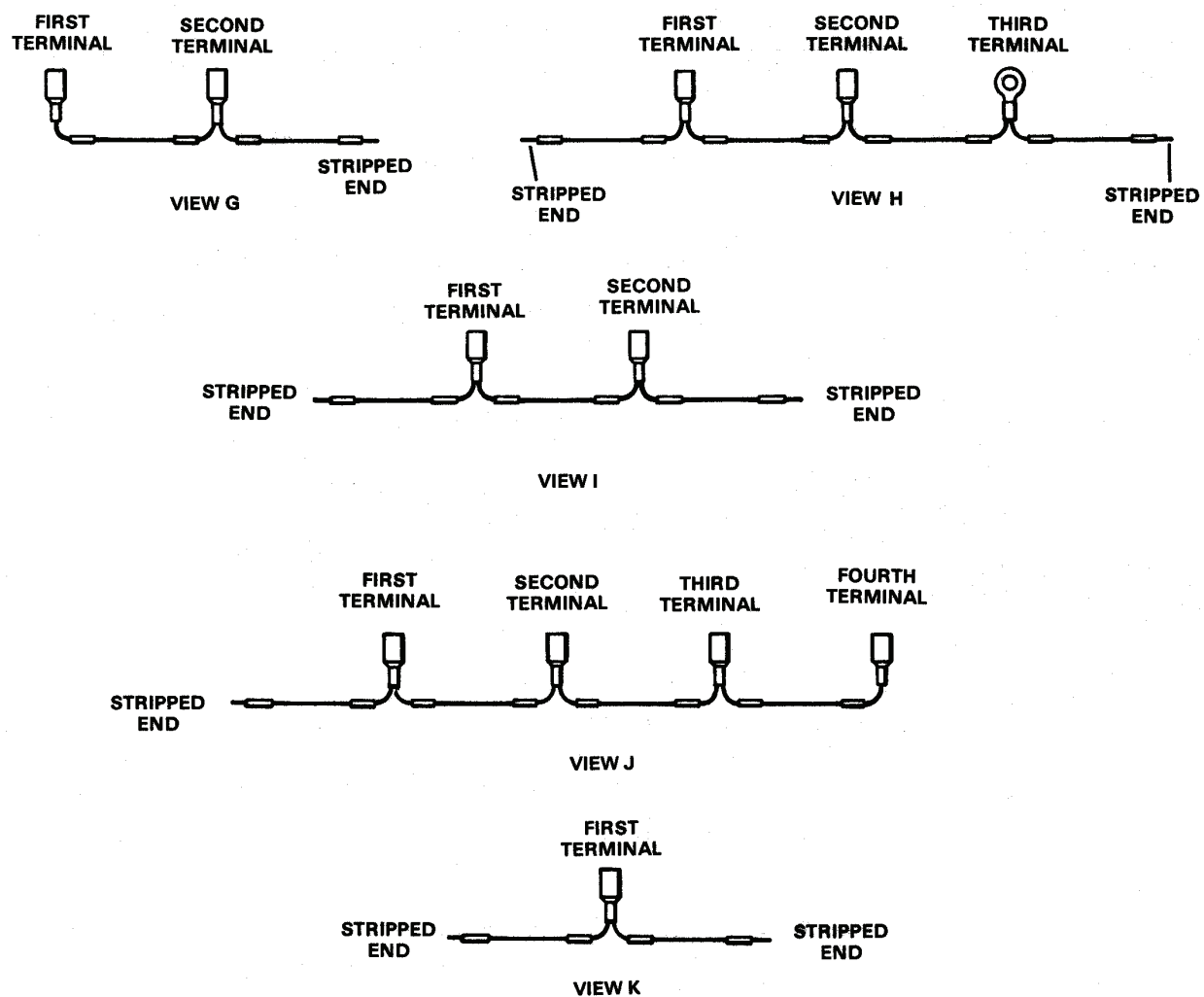


Figure 2. Wire Run Connections (sheet 2 of 2).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MAIN CONTROL PANEL UPPER EXTERIOR PANEL
INSPECTION, DISASSEMBLY, REPAIR, ASSEMBLY, ADJUST

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Flowmeter, Auxiliary (7) (TM 10-4610-232-12)

Equipment Conditions:

Testing and adjusting; ROWPU operating normally.

Inspection, disassembly and assembly: ROWPU and generator shutdown. (TM 10-4610-232-12)

Materials/Parts:

Lamps (TM 10-4610-232-24P)
Markers, Wire (Item 56, WP 0102 00)
Terminals, Ring (TM 10-4610-232-24P)
Varnish (Item 76, WP 0102 00)
Tags
Lockwashers (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

References:

TB 43-0218

INSPECTION**WARNING**

Do not wear watches, rings, or dog tags when working on main control panel.

WARNING

Make sure electrical power is disconnected before working on unit. Failure to do so could result in serious injury or death from electrical shock.

NOTE

Main circuit breaker (CB1) must be OFF, and lower exterior panel door must be unlatched and opened before upper exterior panel door can be opened.

NOTE

Tag all wires before disconnecting.

1. Unlatch door latches and open upper exterior panel door.
2. Visually check components for signs of damage or looseness.
3. Check for loose or damaged wires.

DISASSEMBLY OF INDICATOR LAMPS**WARNING**

Make sure electrical power is disconnected before working on unit.
Failure to do so could result in serious injury or death from electrical shock.

1. Open control panel door.
2. Unscrew lens (1), depress lamp (2) and turn lamp (2) counterclockwise.
3. Tag and disconnect wires from contact block (3).
4. Remove nut (4), lockwasher (5) and three washers (6). Remove contact block (3) from panel assembly.

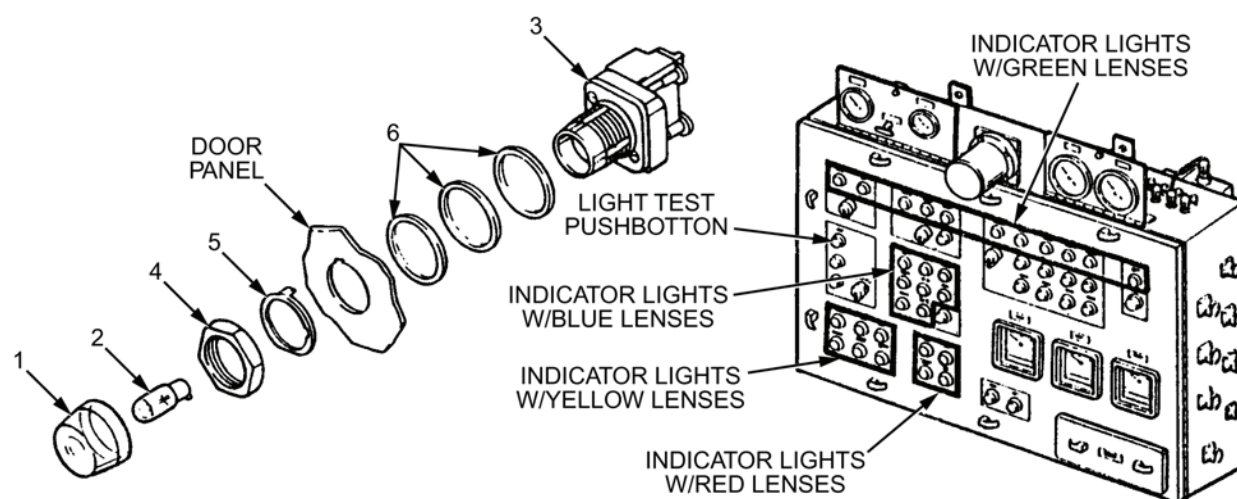


Figure 1. Upper Exterior Panel, Indicator Lamps.

DISASSEMBLY OF PUSHBUTTON SWITCHES

1. Open control panel door.
2. Tag and disconnect electrical wires from switch (7).
3. Remove nut (8) and lockwasher (9).
4. Remove switch (7) and three washers (6).
5. Unscrew EMERGENCY STOP pushbutton (10) from switch (11).
6. Loosen nut (12) and remove lockwasher (13).
7. Remove three spacers (14) and switch (11).

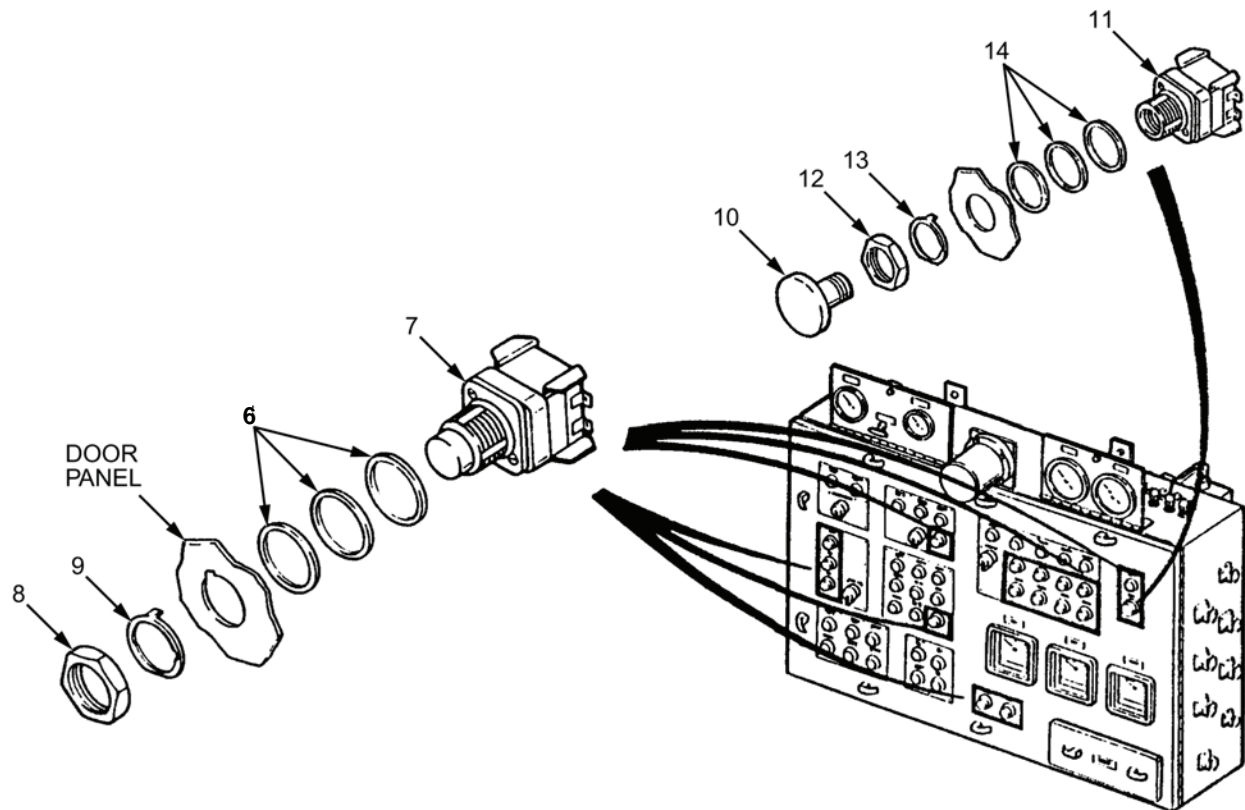


Figure 2. Upper Exterior Panel, Pushbutton Switches.

DISASSEMBLY OF SELECTOR SWITCHES

1. Open control panel door.
2. Tag and disconnect electrical wires from switch (15).
3. Unscrew nut on knob (16), remove lockwasher (17) and remove switch (15) and three washers (18) from panel.

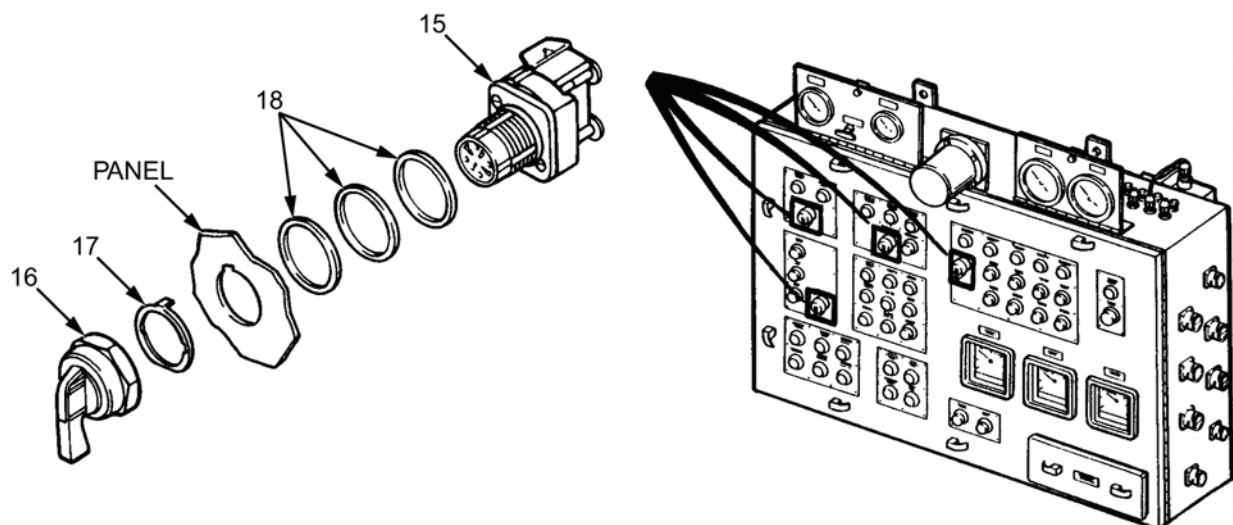


Figure 3. Upper Exterior Panel, Selector Switches.

DISASSEMBLY OF FLOWMETERS

1. Open control panel door.
2. Remove terminal board cover (19). Cover “snaps” on terminal board at rear of flowmeter (20).
3. Tag and disconnect electrical wires from terminal board on flowmeter (20).
4. Loosen two mounting screws (21) and remove bracket (22) and jack screws (23).
5. Remove flowmeter (20) through front of control panel.
6. If necessary, remove pads (24), which are glued to flowmeter (20).

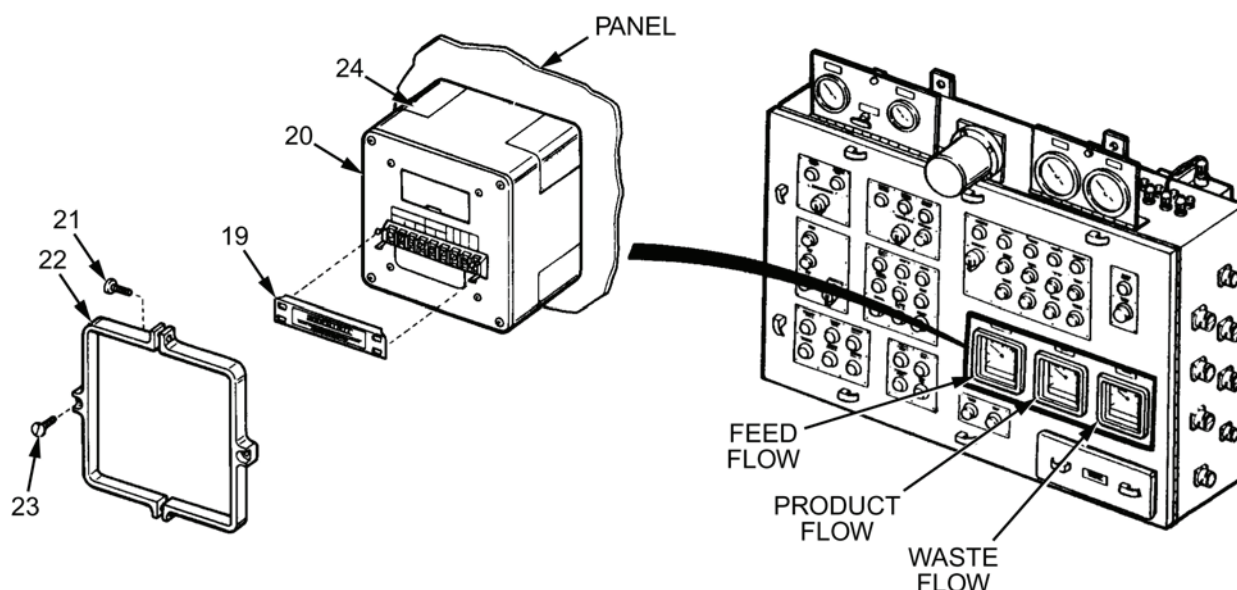


Figure 4. Upper Exterior Panel, Flowmeters.

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace faulty upper exterior panel components as determined by inspection or troubleshooting.
2. Replace damaged or loose ring tongue terminals (WP 0043 00, TM 10-4610-232-12).
3. Replace wire markers (WP 0043 00, TM 10-4610-232-12).

NOTE

Be sure to varnish all connections that were removed.

ASSEMBLY OF INDICATOR LAMPS

1. Place three washers (6) on contact block (3) and install contact block (3) on panel.
2. Secure contact block (3) with lockwasher (5) and nut (4).
3. Connect electrical wires to contact block (3), as tagged during disassembly.
4. Install lamp (2) and lens (1).

ASSEMBLY OF PUSHBUTTON SWITCHES

1. Place three spacers (14) on switch (11) and insert switch (11) in hole in panel.
2. Install lockwasher (13) and secure with nut (12).
3. Screw EMERGENCY STOP pushbutton (10) into switch (11) and tighten.
4. Place three washers (6) on switch (7) and insert switch (7) in hole in panel.
5. Secure switch with lockwasher (9) and nut (8).
6. Connect wires to switch (7), as tagged during disassembly.

ASSEMBLY OF SELECTOR SWITCHES

1. Place three washers (18) on switch (15) and insert switch (15) in hole in panel.
2. Secure switch (15) with lockwasher (17) and nut on knob (16).
3. Connect wires to switch (15), as tagged during disassembly.

ASSEMBLY OF FLOWMETERS

1. If necessary, install four pads (24) on flowmeter.
2. Insert flowmeter (20) through opening in control panel from front of panel.
3. Slide bracket (22) over end of flowmeter (20) until tight against panel then install mounting screws (21).

CAUTION

Do not overtighten jack screws. Bracket may break.

4. Tighten two jack screws (23).
5. Connect wires to terminal board on rear of flowmeter (20) as tagged during removal.
6. Install terminal board cover (19) by snapping in place.

ADJUSTMENT

WARNING

Adjustment must be conducted with power applied to main control panel. Be extremely careful to avoid electrical shock. Failure to do so could result in serious injury or death from electrical shock.

NOTES

- FEED FLOW flowmeter reads raw water input flow. If it does not read 102 gpm, +/- 1 gpm, it must be adjusted before installation is done. High pressure pump is a positive displacement pump and will always demand a flow of 102 gpm or the ROWPU will shut down due to low pressure of raw water input flow.

- PRODUCT FLOW flowmeter reads product water flow. WASTE FLOW flowmeter reads waste water flow.

- The sum of PRODUCT FLOW and WASTE FLOW must always equal FEED FLOW. Therefore, it is necessary to know how much product water (in gpm) is being delivered to storage tanks. Once this is known, the rest of the water is known to be going through WASTE FLOW flowmeter and adjustment of all three flowmeters can be checked.

1. To determine flow, use portable flowmeter attached to product hose.
 - a. If amount of product water produced is 80 gpm, amount of water waste was 22 gpm (102 gpm feed water, minus 80 gallons product = 22 gallons waste).
 - b. Check flowmeters to see that they read correctly. If FEED FLOW flowmeter reads between 101 and 103 gpm, PRODUCT FLOW flowmeter reads between 79 and 81 gpm and WASTE FLOW flowmeter reads between 21 and 23 gpm, then all three meters are known to be accurate.
 - c. If two of the three meters read correctly, but the third meter does not, the third meter is known to be improperly adjusted.

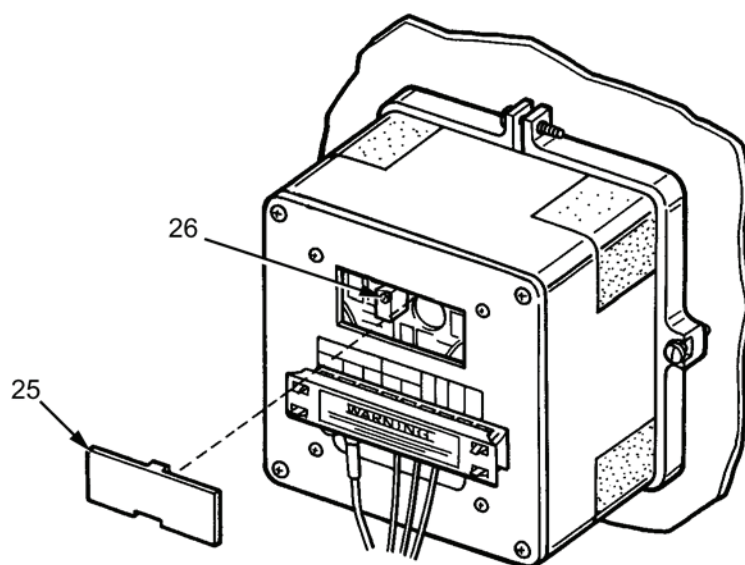


Figure 5. Adjusting Flowmeters.

2. Adjust flowmeter as follows:

- a. Remove cover (25) from rear of flowmeter.
- b. While ROWPU is running, turn adjusting screw (26) clockwise to increase flow rate reading or counterclockwise to decrease reading.
- c. Stop adjusting when reading equals correct reading.
- d. Install cover (25).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MAIN CONTROL PANEL UPPER INTERIOR PANELS
INSPECTION, DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown and main power cable disconnected from control panel (TM 10-4610-232-12).

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)

Varnish (Item 76, WP 0102 00)

Lockwashers (TM 10-4610-232-24P)

References:

TB 43-0218

INSPECTION**WARNING**

Make sure electrical power is disconnected before working on unit. Failure to do so could result in serious injury or death from electrical shock.

NOTE

Upper exterior door panel cannot be opened unless lower exterior doors are opened first. Main circuit breaker must be in OFF position.

1. Unlatch door latches and open both exterior panel doors.
2. Visually check components for signs of scorching.
3. Check for loose or damaged wires.

DISASSEMBLY**NOTE**

Tag all wires before disconnecting.

NOTE

Removal procedures for all relays are identical.

1. Remove relays (1) as follows:
 - a. Unlatch door latches and open both exterior doors.
 - b. Disconnect electrical wires from relay to be removed (WP 0026 00).
 - c. Remove relay (1) by removing two screws (2) and washers (3).
2. Remove timers (4) as follows:
 - a. Unlatch door latches and open both exterior doors.

- b. Tag and disconnect electrical wires from timer (4) (WP 0026 00).
 - c. Remove timer (4) by removing two screws (5) and washers (6).
3. Remove power supplies (7 and 8) as follows:
 - a. Unlatch door latches and open both exterior doors.
 - b. Disconnect electrical wires from power supplies (7 and 8) (WP 0026 00).
 - c. Remove screws (9), washers (10) and power supplies (7 and 8).

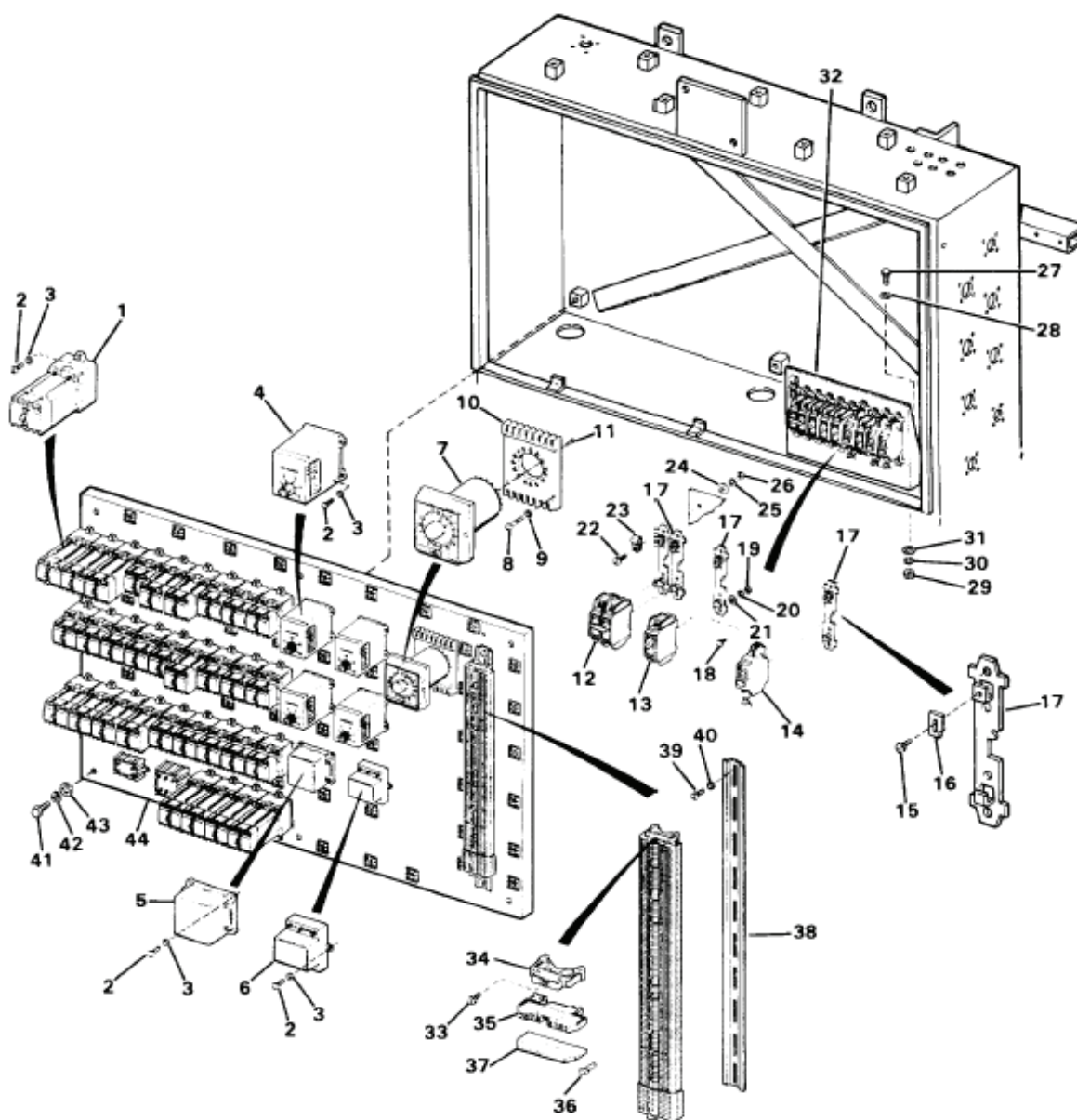


Figure 1. Main Control Panel, Upper Interior Panel

4. Remove cycle timer (11) as follows:
 - a. Unlatch door latches and open both exterior doors.
 - b. Tag and disconnect electrical leads from cycle timer (11) (WP 0026 00).
 - c. Remove four screws (12) and star washers (13). Adapter (14) and cycle timer (11) will come off as a unit.
 - d. Remove screws (15) and adapter (14) from cycle timer (11).
5. Remove circuit breakers (16, 17 and 18) as follows:
 - a. Unlatch door latches and open both exterior doors.
 - b. Tag and disconnect electrical leads from circuit breakers (16, 17, and 18) (WP 0026 00).
 - c. Loosen screw (19) and slide retainer (20) to allow room for circuit breakers to be removed. Remove circuit breakers (16, 17 and 18).
 - d. Remove adapters (21), by removing screws (22), nuts (23), lockwashers (24) and washers (25).
 - e. Remove screw (26), clamp (27), washer (28), lockwasher (29) and nut (30).
 - f. Remove panel (31) by removing screws (32), washers (33 and 34), lockwashers (35) and nuts (36).
6. Remove terminal board (37) as follows:
 - a. Unlatch door latches and open both exterior doors.

NOTE

It is not necessary to remove entire terminal board assembly for replacement of individual terminal. Any individual terminal can be removed and replaced without disturbing any other terminal.

- b. Remove screw (38), end strip (39), terminal (37), jumper (40) and end plate (41) (WP 0043 00, TM 10-4610-232-12).
 - c. If all terminals are removed, rail (42) can be removed by removing screw (43) and washer (44).
7. Remove upper interior panel (45) as follows:
 - a. Remove six capscrews (46), lockwashers (47) and washers (48).
 - b. Remove upper interior panel (45) from main control panel.

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Replace damaged components.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

Varnish all electrical connections that were removed.

1. Install upper interior panel (45) as follows:
 - a. Position upper interior panel (45) on main control panel.
 - b. Secure upper interior panel (45) with six washers (48), lockwashers (47) and capscrews (46).
2. Install terminal board (37) as follows:
 - a. Install rail (42) and secure with screw (43) and washer (44).
 - b. Install all end plate (41), terminal (37), jumper (40), end strip (39) and secure with screw (38). Terminals snap on rail (42) (WP 0043 00, TM 10-4610-232-12).
 - c. Close and latch control panel doors.
3. Install circuit breakers (16, 17 and 18) as follows:
 - a. Install panel (31) with screws (32), washers (33 and 34), lockwashers (35) and nuts (36).
 - b. Install clamp (27) with screw (26), washer (28), lockwasher (29) and nut (30).
 - c. Install adapter (21) on panel (31) with screws (22), nuts (23), lockwashers (24) and washers (25).
 - d. Install circuit breakers (16, 17 and 18) on adapters (21) with screws (19) and slide retainer (20).
 - e. Connect electrical leads to circuit breakers (16, 17, and 18) as tagged.
 - f. Close and latch control panel doors.

4. Install cycle timer (11) as follows:
 - a. Install adapter (14) on cycle timer (11) and secure with screws (15).
 - b. Install cycle timer (11) with screws (12) and star washers (13).
 - c. Install electrical leads on cycle timer (11) as tagged.
 - d. Close and latch control panel doors.
5. Install power supplies (7 and 8) as follows:
 - a. Install power supplies (7 and 8) and secure with screws (9) and washers (10).
 - b. Connect electrical wires as tagged.
 - c. Close and latch control panel doors.
6. Install timers (4) as follows:
 - a. Install timers (4) and secure with two screws (5) and washers (6).
 - b. Connect electrical wires as tagged.
 - c. Close and latch control panel doors.
7. Install relays (1) as follows:
 - a. Install relays (1) and secure with two screws (2) and washers (3).
 - b. Connect electrical wires as tagged.
 - c. Close and latch control panel doors.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MAIN CONTROL PANEL LOWER EXTERIOR PANEL
INSPECTION, DISASSEMBLY, REPAIR, ASSEMBLY, TESTING, ADJUST

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown and main power cable disconnected from control panel (TM 10-4610-232-12).

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Gaskets (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)
Lockwashers (TM 10-4610-232-24P)
Preformed Packing (TM 10-4610-232-24P)

References:

TB 43-0218

INSPECTION**WARNING**

Make sure electrical power is disconnected before working on unit. Failure to do so could result in serious injury or death from electrical shock.

NOTE

Tag all wires before disconnecting.

1. Unlatch door latches and open both exterior panel doors.
2. Visually check components for signs of scorching.
3. Check for loose or damaged wires.

DISASSEMBLY

1. Disassemble the main circuit breaker handle assembly as follows:
 - a. Unlatch and open lower exterior door.
 - b. Remove four screws (1), lockwashers (2), retainer (3) and handle (4). Discard lockwashers.
 - c. Remove two screws (5) and bracket (6).
 - d. (Model WTA-060 only) Remove two screws (7), lockwashers (8), nuts (9) and lockplate (10). Discard lockwashers.
 - e. (Model ROWPU-1 only) Drill out two rivets (11) and remove lockplate (10).
 - f. Remove three screws (12), nuts (13), and lockwashers (14), gasket (15) and mounting plate (16). Discard lockwashers.
2. Disassemble the two hourmeters (17) as follows:

- a. Unlatch and open lower exterior door.
 - b. Tag and disconnect electrical wires to hourmeter (17) (WP 0026 00).
 - c. Remove four screws (18), nuts (19) and lockwashers (20). Discard lockwashers.
 - d. Remove hourmeter (17) and gasket (21).
3. Disassemble the electrical power outlet socket (22) as follows:
- a. Unlatch and open lower exterior door.
 - b. Tag and disconnect all electrical wires to outlet socket (22) (WP 0026 00)-.
 - c. Open outlet covers on cover (23) and remove screw (24), cover (23) and gasket (25).
 - d. Remove two screws (26), nuts (27), lockwashers (28), washers (29) and outlet socket (22). Discard lockwashers.
4. Disassemble the two ground fault relays (30) as follows:
- a. Unlatch and open lower exterior door.
 - b. Tag and disconnect all electrical wires to ground fault relays (30) (WP 0026 00).
 - c. Remove four screws (31), nuts (32), lockwashers (33), washers (34) and ground fault relay (30). Discard lockwashers.
 - d. Remove two screws (35), nuts (36), lockwashers (37), washers (38), cover (39) and gasket (40). Discard lockwashers.
 - e. Remove four screws (41), sealing washer (42), nuts (43), lockwashers (44), washers (45) and bracket (46). Discard lockwashers.
5. Disassemble the selector switch (47) as follows:
- a. Unlatch and open lower exterior door.
 - b. Tag and disconnect electrical wires to selector switch (47) (WP 0026 00).
 - c. Unscrew nut on knob (48), remove lockwasher (49), selector switch (47) and three washers (50) from door panel. Discard lockwashers.
6. Disassemble the five motor starter resets as follows:
- a. Unlatch and open lower exterior door.
 - b. Unscrew contactor (51).
 - c. Hold reset button (52) and unscrew pushrod assembly (53), but do not disassemble. Reset button (52) is now free. Remove preformed packing (54) and spring (55).
 - d. Remove nut (56). Bracket (57) and threaded bushing (58) are now free.
7. Disassemble six loop clamps (59) as follows:
- a. Unlatch and open lower exterior door.

- b. Remove nut (60), lockwasher (61), two sealing washers (62), loop clamps (59), and screw (63). Discard lockwashers.

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Replace any faulty or non-serviceable components.

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Assemble the five motor starter resets as follows:
 - a. Install threaded bushing (58) through door panel and install bracket (57) and nut (56). Install pushrod assembly (53).
 - b. Place preformed packing (54) and spring (55) on reset button (52) and screw button (52) on pushrod (53). Install contactor (51).
2. Assemble the selector switch (47) as follows:
 - a. Place three washers (50) on selector switch (47) and insert switch (47) through panel door.
 - b. Install new lockwasher (49) and knob (48).
 - c. Connect electrical leads to selector switch (47) as tagged.
3. Assemble the two ground fault relays (30) as follows:
 - a. Install bracket (46) and four screws (41), sealing washer (42), nuts (43), new lockwashers (44) and washers (45).
 - b. Install two ground fault relays (30), four screws (31), nuts (32), new lockwashers (33) and washers (34).
 - c. Install gasket (40), cover (39), two screws (35), nuts (36), new lockwashers (37) and washers (38).
 - d. Connect electrical wires to ground fault relays (30) as tagged.

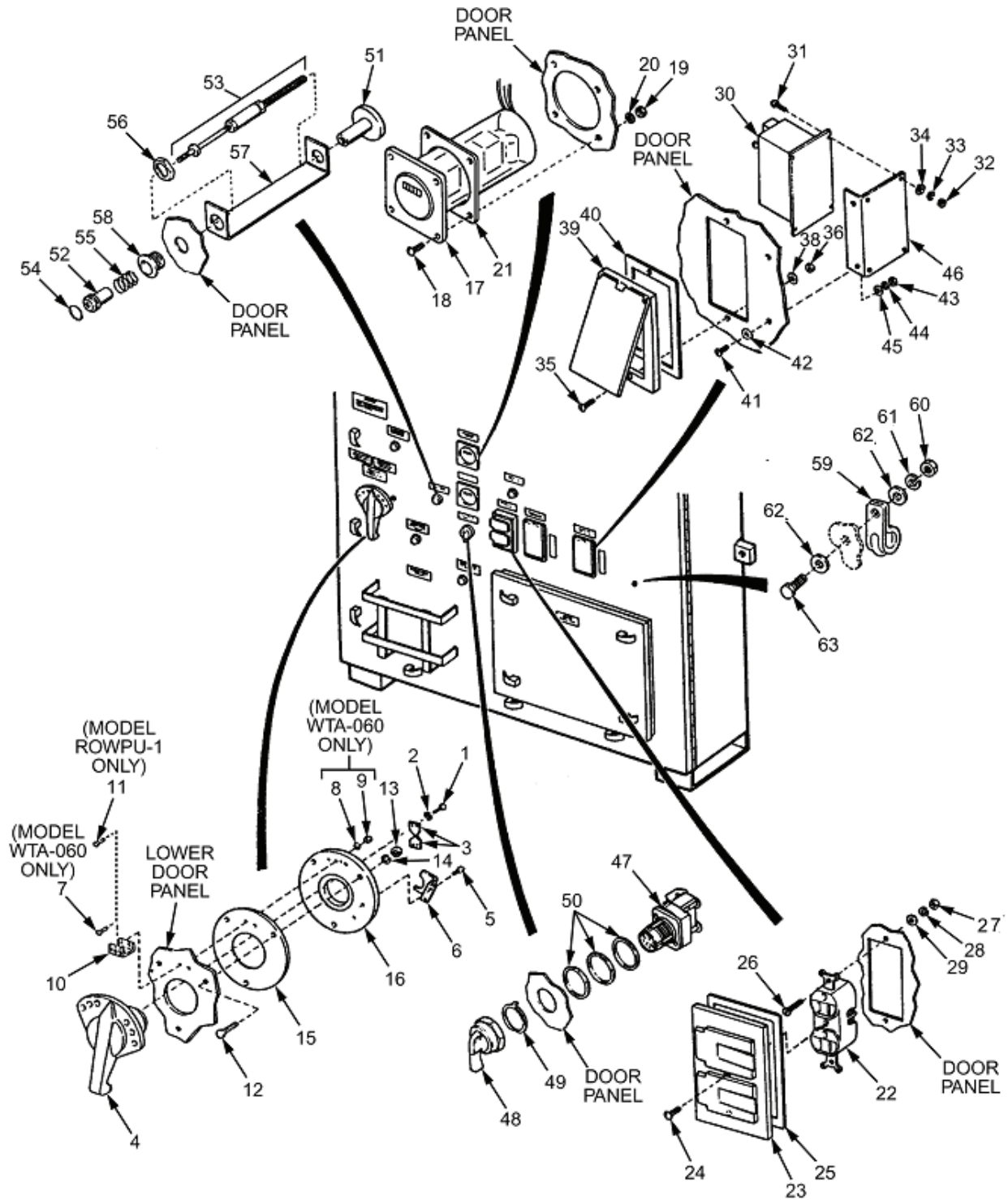


Figure 1. Main Control Panel, Lower Exterior Panel.

4. Assemble the electrical outlet socket (22) as follows
 - a. Place socket (22) on two screws (26) and secure with nuts (27), new lockwashers (28) and washers (29).
 - b. Install gasket (25), cover (23), screw (24) and outlet socket (22) on panel door.
 - c. Connect electrical wires to outlet socket (22) as tagged.
5. Assemble the two hourmeters (17) as follows:
 - a. Install gasket (21), hourmeter (17), four screws (18), new lockwashers (20) and nuts (19).
 - b. Connect electrical wires to hourmeter (17) as tagged.
6. Assemble the main circuit breaker handle assembly as follows:
 - a. Install gasket (15) and mounting plate (16) on inner lower panel door and secure with three screws (12), new lockwashers (14) and nuts (13).
 - b. Install handle (4) in hole in lower panel door with retainer (3), new lockwashers (2) and four screws (1).
 - c. Install bracket (6) and two screws (5).
 - d. (Model WTA-060 only) Install lockplate (10), two screws (7), nuts (9) and new lockwashers (8).
 - e. (Model ROWPU-1 only) Install lockplate (10) and secure with two rivets (11).
 - f. Close and latch lower exterior door.
7. Assemble six loop clamps (59) as follows:
 - a. Open main control panel door.
 - b. Insert screw (63) with two sealing washers (62) through hole in door. Assemble loop clamp (59) with sealing washer (62), new lockwasher (61) and nut (60).

TESTING

1. Disconnect power to main control panel and open panel doors.
2. Note position of pickup current adjustment potentiometer screw (64).
3. Loosen locknut (65) and rotate potentiometer counterclockwise (using screwdriver) to test position. Additional turning force is required to pass detent into test position.
4. Close main control panel doors and reapply power. Relay should trip, actuating shunt trip (66) and appropriate circuit breaker on front of panel.
5. Verify that panel circuit breaker has tripped by visual inspection.
6. Disconnect power to main control panel and open panel door.
7. Return pickup current adjustment potentiometer screw (64) to previously noted position, tighten locknut (65), and reset shunt trip (66) to ON position.

8. Reset appropriate circuit breaker (raw water or product water) on front of main control panel.

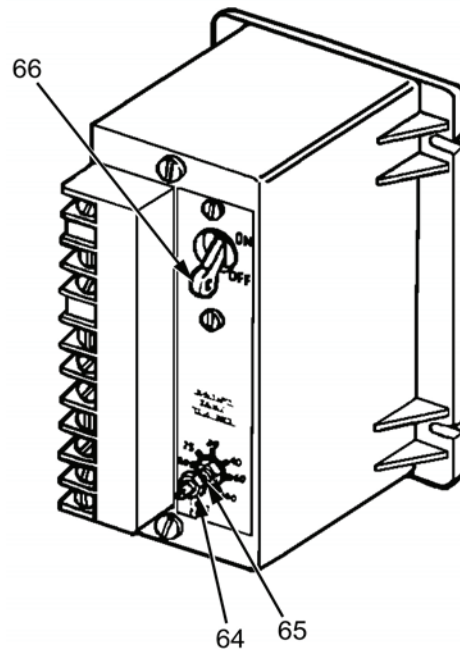


Figure 2. Testing Ground Fault Indicator.

ADJUST

NOTE

Length is measured from inside panel door to outside of contactor face.

1. To shorten, rotate threaded bushing (67) counterclockwise, then rotate threaded shaft (68) counterclockwise to match length in Table 1.
2. To extend, rotate threaded bushing (67) clockwise, then rotate threaded shaft (68) clockwise until correct dimension is met in Table 1.

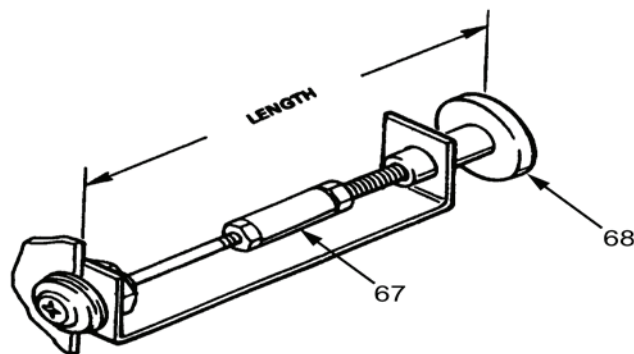


Figure 3. Reset Mechanism Adjustment.

Table 1. Motor Starter Resets.

Used for MS1	Length \pm .25 in (.635 cm)
Compressor MS3	8 in. (20.3 cm)
Raw Water Pump MS8	7.5 in. (19.1 cm)
High Pressure Pump	6 in. (15.2 cm)
MS7 Booster Pump	7.25 in (18.4 cm)
MS2 Distribution Pump	8.25 in (21 cm)

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MAIN CONTROL PANEL LOWER INTERIOR PANELS
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).

Main power cable disconnected (WP 0026 00)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)

Washers (TM 10-4610-232-24P)

References:

TB 43-0218

INSPECTION**WARNING**

Do not wear watches, rings, or dog tags when working on main control panel in order to avoid injury.

WARNING

Make sure electrical power is disconnected before working on unit. Failure to do so could result in serious injury or death from electrical shock.

NOTE

Tag all wires before disconnecting.

1. Unlatch door latches and open lower exterior panel door.
2. Visually check components for signs of scorching.
3. Check for loose or damaged wires.

DISASSEMBLY**WARNING**

When lower exterior door is open, it is possible to turn operating shaft and turn on power to main control panel. If this is done, there is extreme danger of electrical shock sufficient to cause serious injury or death to personnel within the ROWPU.

1. Remove the main circuit breaker (1) as follows:
 - a. Unlatch and open lower exterior door.

NOTE

Wires are attached to circuit breaker by screws, which can be accessed through openings in front of circuit breaker.

- b. Tag and disconnect all electrical wires to main circuit breaker (1).

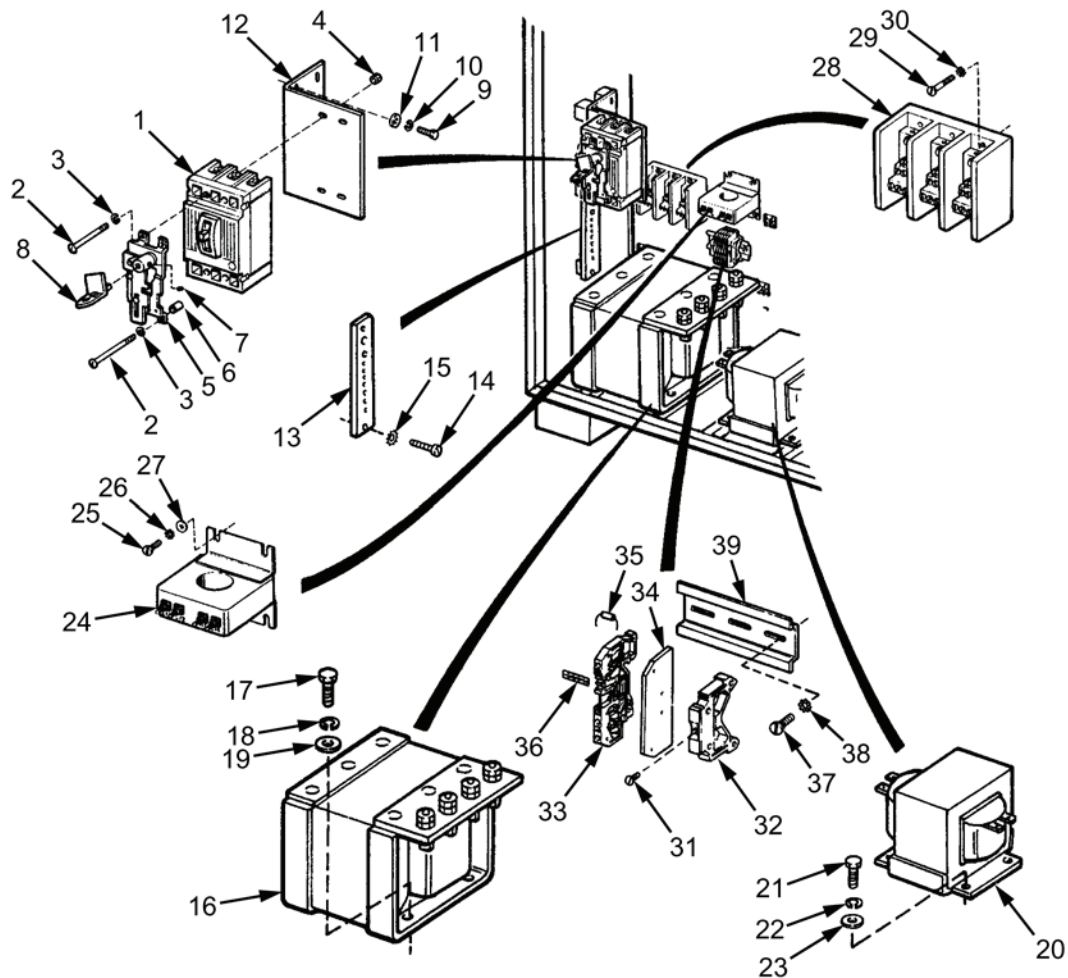


Figure 1. Main Control Panel, Lower Interior Panel (Sheet 1 of 2).

- c. Remove four screws (2), washers (3) and nuts (4). Safety latch (5), spacer (6) and circuit breaker (1) are now free.
 - d. Remove setscrew (7) and operating shaft (8).
 - e. If necessary, remove four capscrews (9), lockwasher (10), washer (11) and bracket (12).
2. Remove ground bus (13) as follows:
 - a. Unlatch and open lower exterior door.
 - b. Tag and disconnect all electrical wires to ground bus (13) (WP 0043 00, TM 10-4610-232-12).
 - c. Remove two screws (14), washers (15) and ground bus (13).

3. Remove transformer (16) as follows:
 - a. Unlatch and open lower exterior door.
 - b. Tag and disconnect all electrical wires to transformer (16) (WP 0043 00, TM 10-4610-232-12).
 - c. Remove four capscrews (17), lockwashers (18), washers (19) and transformer (16).
4. Remove transformer (20) as follows:
 - a. Unlatch and open lower exterior door.
 - b. Tag and disconnect all electrical wires to transformer (20) (WP 0043 00, TM 10-4610-232-12).
 - c. Remove four capscrews (21), lockwashers (22), washers (23), and transformer (20).
5. Remove two ground fault sensors (24) as follows:

NOTE

Ground fault sensors are shown on Sheets 1 and 2, Figure 1.

- a. Unlatch and open lower exterior door.
 - b. Tag and disconnect electrical leads to two ground fault sensors (24) (WP 0043 00, TM 10-4610-232-12).
 - c. Tag and disconnect one end of three electrical leads which pass through the circular hole in each ground fault sensor (WP 0043 00, TM 10-4610-232-12).
 - d. Remove screws (25), lockwashers (26), washers (27) and ground fault sensors (24).
6. Remove power distribution block (28) as follows:
 - a. Unlatch and open lower exterior door.
 - b. Tag and disconnect all electrical wires to distribution block (28) (WP 0043 00, TM 10-4610-232-12).
 - c. Remove screws (29), washers (30) and power distribution block (28).
 7. Remove the two terminal boards as follows:

NOTE

Ground terminal sensors are shown on Sheets 1 and 2, Figure 1.

- a. Unlatch and open lower exterior door.
- b. Tag and disconnect all electrical wires to the terminal board.
- c. Remove screw (31), end stop (32), terminal (33), end plate (34) and jumpers (35). Do not remove marker (36) unless necessary. For removal procedures, refer to WP 0043 00, TM 10-4610-232-12.
- d. Remove screws (37), washers (38) and rail (39).

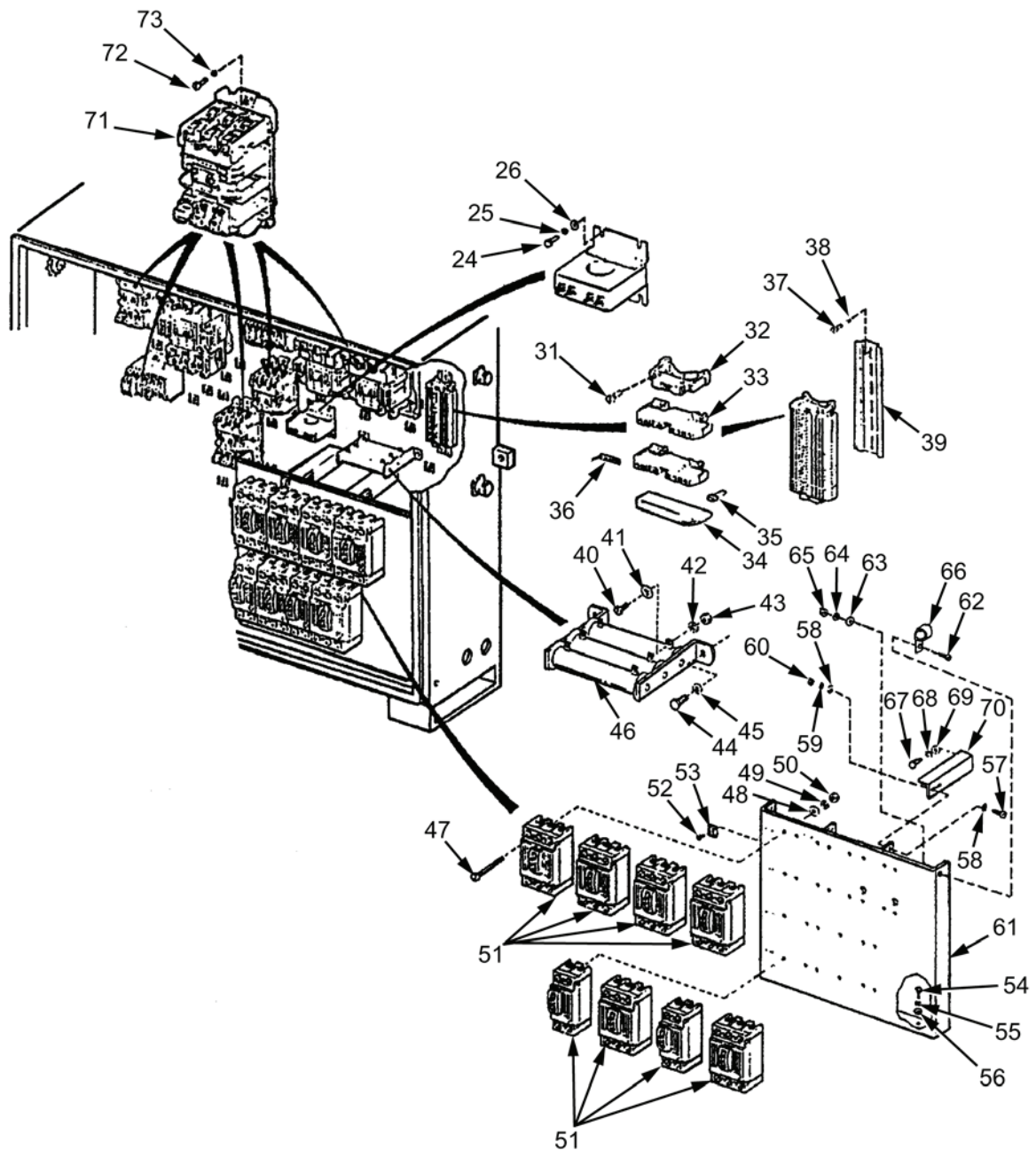


Figure 1. Main Control Panel, Lower Interior Panel (Sheet 2 of 2).

8. Remove resistors (46) as follows:
 - a. Unlatch and open lower exterior door.
 - b. Tag and disconnect all electrical wires to the resistors remove screws (40), washers (41), lockwashers (42) and nuts (43).

- c. Remove capscrews (44), washer (45) and resistors (46).

9. Remove circuit breakers (51) and panel (61) as follows:

- a. Unlatch and open lower exterior door.
- b. Tag and disconnect all electrical wires to circuit breakers (51) (WP 0043 00, TM 10-4610-232-12).
- c. Remove screws (47), washers (48), lockwashers (49) and nuts (50).
- d. Remove circuit breakers (51).

NOTE

Do not disassemble further unless necessary.

- e. Remove screw (52) and tie mount (53).
- f. Remove capscrews (54), lockwashers (55) and washers (56).
- g. Remove four capscrews (57), eight washers (58), four lockwashers (59), four nuts (60) and panel (61).

NOTE

Step h. only applies to Model ROWPU-1.

- h. Remove screw (62), flat washer (63), lockwasher (64), nut (65) and clamp (66).
- i. Remove panel (61).
- j. Remove capscrews (67), lockwashers (68), washers (69) and channel (70).

10. Remove the five "typical" motor starters (71) as follows:

- a. Unlatch and open lower exterior door.
- b. Tag and disconnect all electrical wires to motor starters (71) (WP 0043 00, TM 10-4610-232-12).
- c. Remove screws (72), lockwashers (73) and motor starters (71)

11. Disassemble motor starter MS8-1M as follows:

- a. Loosen four captive screws (74) and remove jumper wire (75).
- b. Loosen lug captive screws (76) and press down and "snap out" auxiliary contacts (77 and 78).
- c. Remove time delay contact (79) from the balance of the motor starter (80).
- d. Loosen four captive screws (76) and remove coil cover (81).

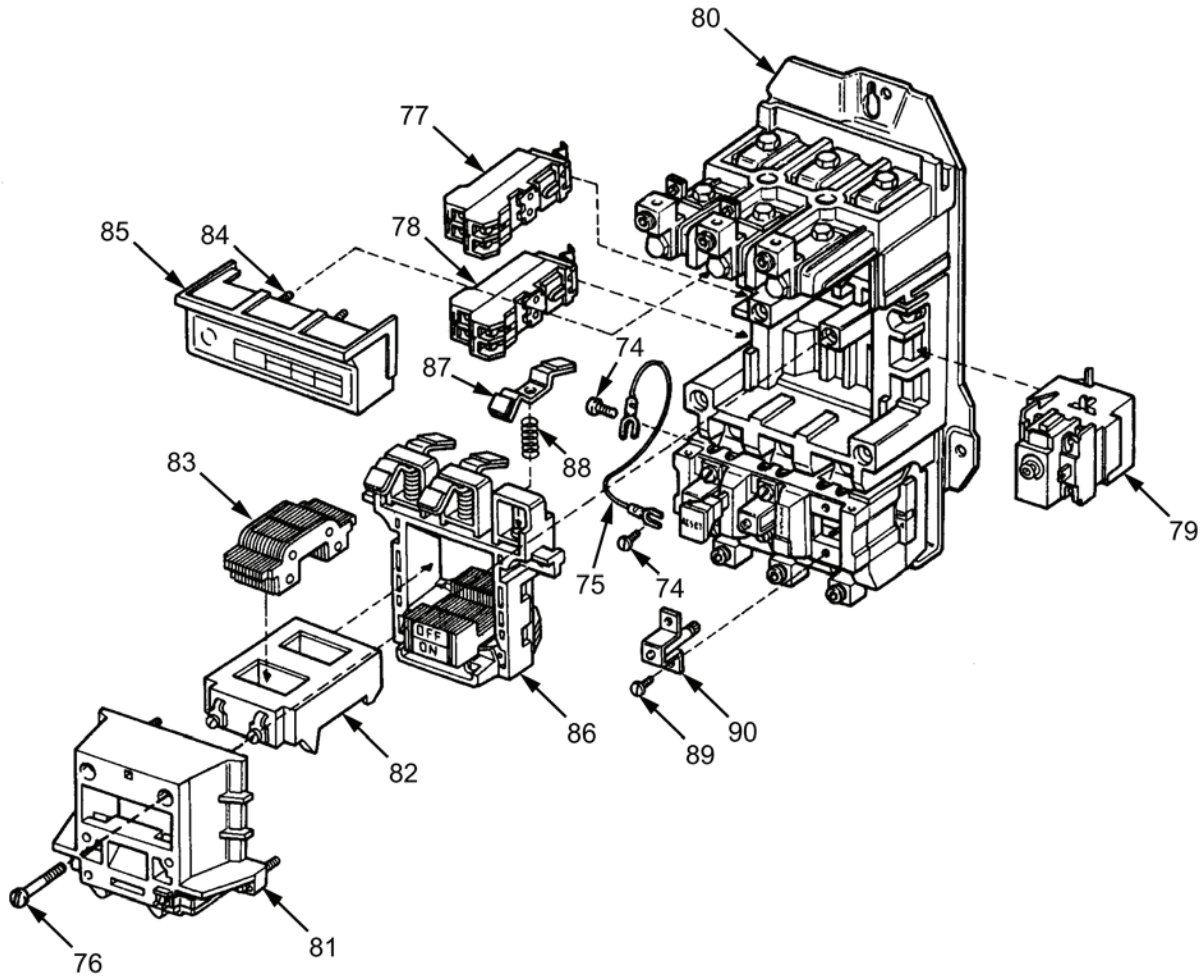


Figure 2. Motor Starter MS8-1M.

- e. Remove coil (82) and pole piece (83).
- f. Loosen two captive screws (84) and remove contact cover (85).
- g. Remove moveable contact assembly (86).
- h. Press down on moveable contacts (87), remove springs (88) and contacts (87).
- i. Remove two screws (89) and overload heater (90).

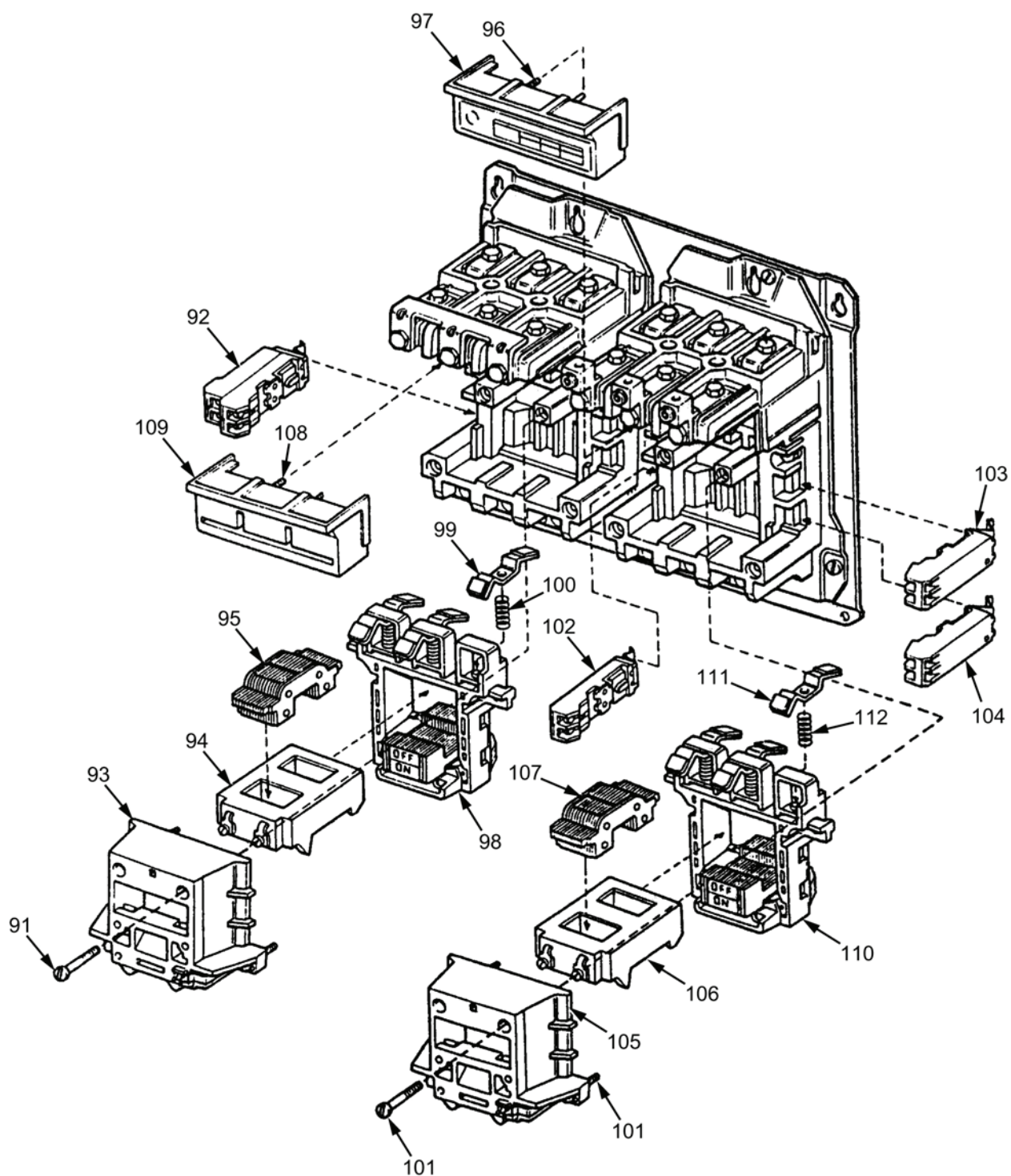


Figure 3. Motor Starters MS8-1S and MS8-2M.

12. Disassemble motor starters MS8-1S and MS8-2M as follows:

- a. Loosen captive screws (91), press down and snap out auxiliary contact (92).
- b. Remove four captive screws (91) and remove coil cover (93).
- c. Remove coil (94) and pole piece (95).
- d. Loosen two captive screws (96) and remove contact cover (97).
- e. Remove moveable contact assembly (98).
- f. Press down on moveable contacts (99), remove springs (100) and contacts (99).
- g. Loosen captive screws (101), press down and snap out auxiliary contacts (102, 103 and 104).
- h. Remove captive screws (101) and remove coil cover (105).
- i. Remove coil (106) and pole piece (107).
- j. Loosen captive screws (108) and remove contact cover (109).
- k. Remove moveable contact assembly (110). Press down on moveable contacts and remove moveable contacts (111) and springs (112).

13. Disassemble motor starters MS7 and MS3 as follows:

- a. Loosen two screws (113) and remove jumper (114).
- b. Loosen captive screws (115), press down and snap out auxiliary contacts (116 and 117).
- c. Remove four captive screws (115) and remove coil cover (118).
- d. Remove coil (119) and pole piece (120). Remove pole piece (120) from coil (119).
- e. Loosen two captive screws (121) and remove contact cover (122).
- f. Remove contact assembly (123), press down on moveable contacts (124) and remove springs (125) and contact assembly (123).
- g. Remove screws (126) and overload heater (127).

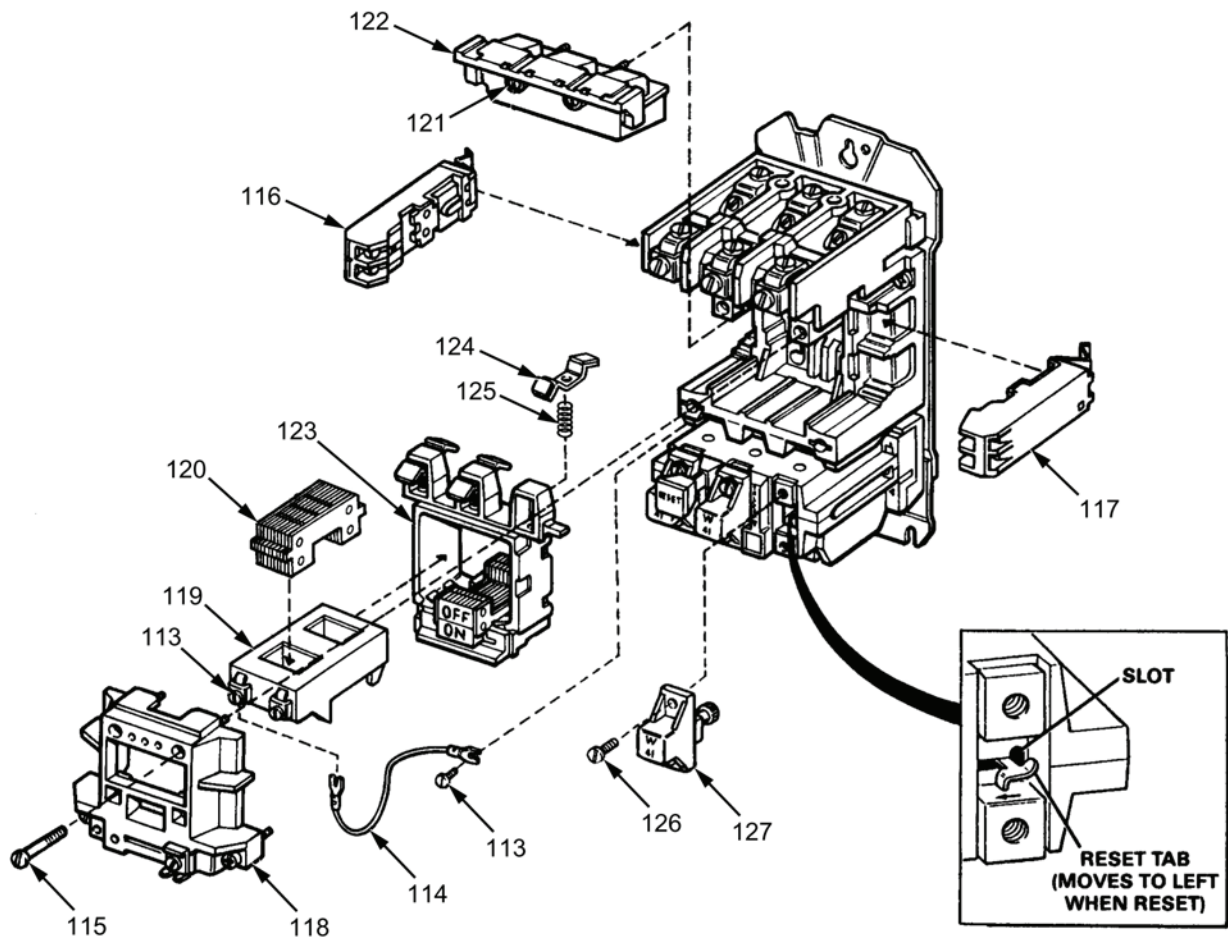


Figure 4. Motor Starters MS7 and MS3.

14. Disassemble motor starter MS8-2S as follows:

- a. Loosen captive screws (128). Press down and snap out auxiliary contacts (129).
- b. Remove four captive screws (128) and remove coil cover (130).
- c. Remove coil (131) and pole piece (132).
- d. Loosen two captive screws (133) and remove contact cover (134).

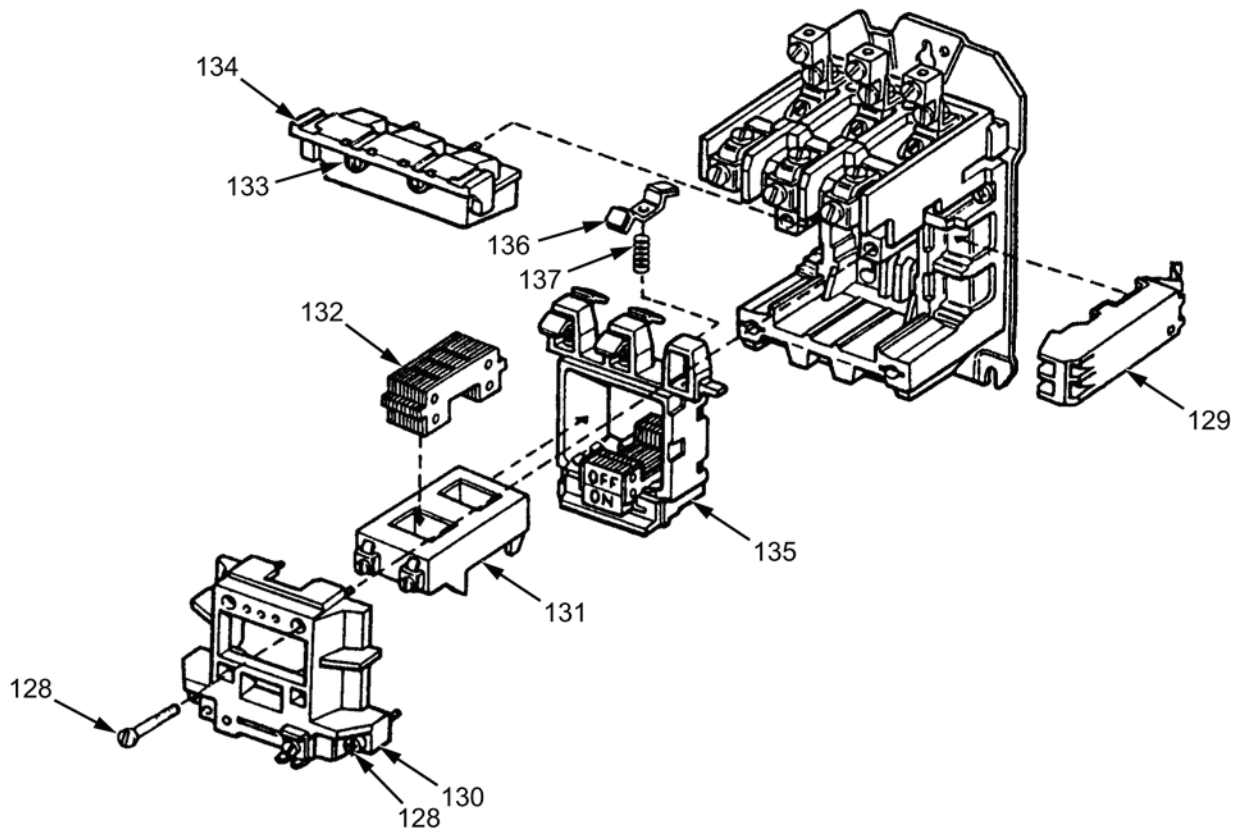


Figure 5. Motor Starter MS8-2S.

- e. Remove moveable contact assembly (135).
 - f. Press down on moveable contacts (136), remove springs (137) and contacts (136).
15. Disassemble motor starters MS1 and MS2 by removing two screws (138) and overload heater (139).
16. Remove reset (140) on motor starter MS2 by pressing tab (141) and pulling reset up and out.

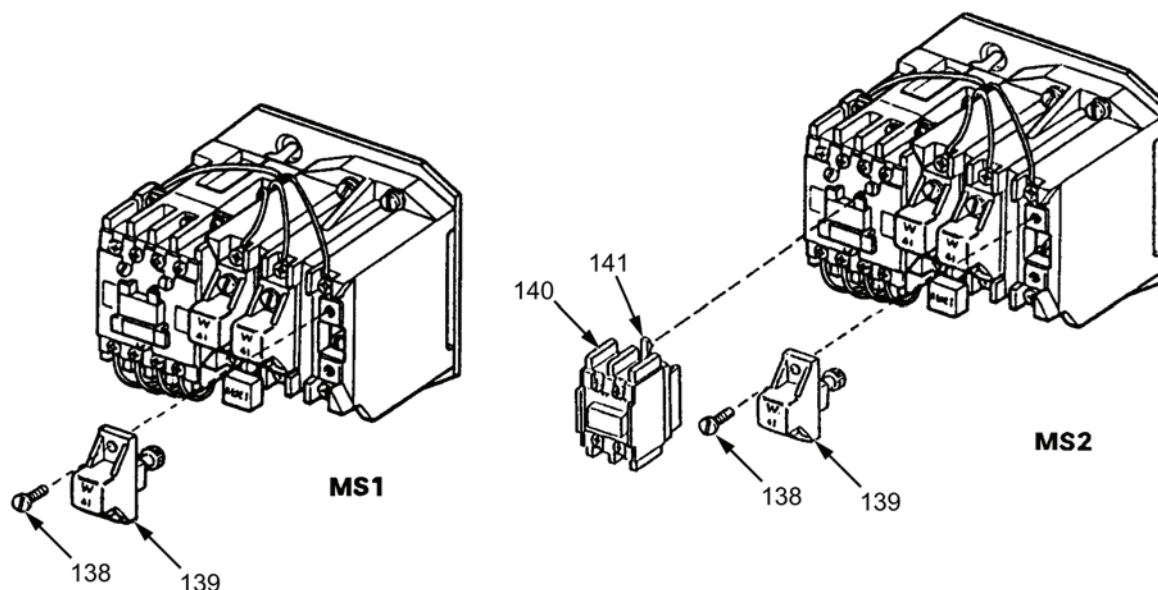


Figure 6. Motor Starters MS1 and MS2.

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Replace any faulty or non-serviceable components.

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

CAUTION

When installing heater assembly, be careful not to bend metal tab on reset assembly.

1. Assemble motor starter MS1 and MS2 as follows:
 - a. Install overload heaters (139) and secure with screws (138).
 - b. Position rest (140) on motor starter MS2 and secure with tab (141).

2. Assemble motor starter MS8-2S as follows:

- a. Install moveable contacts (136) and springs (137) in moveable contact assembly (135).
- b. Install contact assembly (135).
- c. Install pole piece (132) in coil (131) and install as an assembly in contact assembly (135).
- d. Install contact cover (134) and secure with two captive screws (133).

CAUTION

Contact assembly must be in the open (OFF) position to install cover.

- e. Install coil cover (130) and secure with four captive screws (128).
- f. Install auxiliary contacts (129) by pushing down and snapping in.

CAUTION

When installing heater assembly, be careful not to bend metal tab on reset assembly.

3. Assemble motor starters MS7 and MS3 as follows:

- a. Install moveable contacts (124) and springs (125) in moveable contactor assembly (123) and install contactor assembly (123) in contactor.
- b. Install pole piece (120) in coil (119) and install as an assembly in contactor assembly (123).
- c. Install overload heater (127) and secure with two screws (126).
- d. Install contact cover (122) and secure with captive screws (121).

CAUTION

Contact assembly must be in the open (OFF) position to install cover.

- e. Install coil cover (118) and secure with four captive screws (115).
- f. Install auxiliary contacts (116 and 117) by pushing down and snapping in.
- g. Install jumper (114) and secure with two screws (113).

4. Assemble motor starters MS8-1S and MS8-2M as follows:

- a. Install moveable contacts (111) and springs (112) and install contactor assembly (110).
- b. Install pole piece (107) in coil (106) and install as an assembly.
- c. Install contact cover (109) and secure with captive screws (108).

CAUTION

Contact assembly must be in the open (OFF) position to install cover.

- d. Install coil cover (105) and secure with four captive screws (101).
- e. Install auxiliary contacts (104, 103 and 102) by pushing down and snapping in.
- f. Install springs (100) and contacts (99) and install contact assembly (98).
- g. Install pole piece (95) in coil (94) and install as an assembly.
- h. Install contact cover (97) and secure with two captive screws (96).

CAUTION

Contact assembly must be in the open (OFF) position to install cover.

- i. Install coil cover (93) and secure with four captive screws (91).
 - j. Install auxiliary contact (92) by pushing down and snapping in.
5. Assemble motor starter MS8-1M as follows:
- a. Install contacts (87) and springs (88) and install moveable contact assembly (86).
 - b. Place pole piece (83) in coil (82) and install as an assembly.
 - c. Install contact cover (85) and secure with captive screws (84).
 - d. Install overload heater (90) and secure with screws (89).

CAUTION

Contact assembly must be in the open (OFF) position to install cover.

- e. Install coil cover (81) and secure with four captive screws (76).
 - f. Install auxiliary contacts (77 and 78) by pressing down and snapping in.
 - g. Install time delay contact (79) on motor starter (80) by pressing down and snapping in.
 - h. Install jumper wire (75) and secure with four captive screws (74).
6. Install the five "typical" motor starters (71) as follows:
- a. Install motor starters (71) and secure with lockwashers (73) and screws (72).
 - b. Connect all wires to motor starters (71) as tagged. (WP 0026 00).
 - c. Close and latch lower exterior door.
7. Install circuit breakers (51) and panel (61) as follows:
- a. Install channel (70), secure with washers (69), lockwashers (68) and capscrews (67).

NOTE

Step b. only applies to Model ROWPU-1.

- b. Install clamp (66) with screw (62), flat washer (63), lockwasher (64) and nut (65) on to panel (61).
 - c. Install panel (61), secure with capscrews (54), lockwashers (55) and washers (56). Install four capscrews (57), eight washers (58), four lockwashers (59) and four nuts (60).
 - d. Mount tie mount (53) and secure with screw (52).
 - e. Install circuit breaker (51), secure with screws (47), washers (48), lockwashers (49) and nuts (50).
 - f. Connect all wires to circuit breakers (51) as tagged. (WP 0026 00).
 - g. Close and latch lower exterior door.
8. Install resistors (46) as follows:
- a. Install resistors (46) and secure with capscrews (44) and washers (45).
 - b. Connect all electrical wires to resistors (46) as tagged, by securing with screws (40), washers (41), lockwashers (42) and nuts (43).
 - c. Close and latch lower exterior door.
9. Install two terminal boards as follows:
- a. Install rail (39) and secure with screws (37) and washers (38).
 - b. Install end plates (34), terminals (33), end stops (32), screws (31) and jumpers (35). (WP 0043 00, TM 10-4610-232-12).
 - c. Connect all electrical wires to terminal board as tagged. (WP 0026 00).
 - d. Close and latch lower exterior door.
10. Install power distribution block (28) as follows:
- a. Install power distribution block (28). Secure with screws (29) and washers (30).
 - b. Connect all electrical wires to distribution block (28) as tagged. (WP 0026 00).
 - c. Close and latch lower exterior door.
11. Install two ground fault sensors (24) as follows:

NOTE

One ground fault sensor is shown on sheet 1 of Figure 1 and the other is shown on sheet 2.

- a. Install two ground fault sensors (24) with screws (25), lockwashers (26) and washers (27).
- b. Connect all electrical leads which pass through the circular hole in each sensor. (WP 0026 00).

- c. Connect all electrical wires to ground fault sensor (24) as tagged. (WP 0026 00).
- d. Close and latch lower exterior door.

12. Install transformer (20) as follows:

- a. Install transformer (20). Secure with four capscrews (21), lockwashers (22) and washers (23).
- b. Connect all electrical wires to transformer (20) as tagged. (WP 0026 00).
- c. Close and latch lower exterior door.

13. Install transformer (16) as follows:

- a. Install transformer (16). Secure with four capscrews (17), lockwashers (18) and washers (19).
- b. Connect all electrical wires to transformer (16) as tagged. (WP 0026 00).
- c. Close and latch lower exterior door.

14. Install ground bus (13) as follows:

- a. Install ground bus (13). Secure with two screws (14) and washers (15).
- b. Connect all electrical wires to ground bus (13). (WP 0026 00).
- c. Close and latch lower exterior door.

15. Install main circuit breaker (1) as follows:

- a. Install bracket (12). Secure with four capscrews (9), lockwashers (10) and washers (11).
- b. Install operating shaft (8) and secure with setscrew (7).
- c. Install circuit breaker (1), spacer (6), safety latch (5). Secure with four screws (2), washers (3), and nuts (4).
- d. Connect all electrical wires to the main circuit breaker (1) as tagged. (WP 0026 00).
- e. Close and latch lower exterior door.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MAIN CONTROL PANEL HOUSING
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Wire Brush (TM 10-4610-232-12)
Welding Equipment (TM 10-4610-232-12)

References:

TB 43-0218
TM 43-0139
TM 9-237
TM 9-450

Equipment Conditions:

Main control panel cables, connectors and wiring removed (WP 0026 00).
Main control panel upper exterior panel removed (WP 0027 00).
Main control panel upper interior panels removed (WP 0028 00).
Main control panel lower exterior panel removed (WP 0029 00).
Main control panel lower interior panels removed (WP 0030 00).
Main control panel housing removed (WP 0031 00).

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

CAUTION

Welding is limited to brackets only, otherwise damage to panel may occur.

1. Weld brackets as required, refer to TM 9-237.
2. Repair metal bodies, refer to TM 9-450.
3. Clean dirt and paint from area to be repaired.
4. Paint all areas repaired, refer to TM 43-0139.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MODEL NO. WTA-060, NSN 4610-01-219-8707
PRESSURE SWITCH PANEL ASSEMBLY
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)

Preformed Packing (TM 10-4610-232-24P)

Tags

Tape, Antiseize (Item 70, WP 0102 00)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).

Pressure switch panel junction box removed
(WP 0034 00).

Main circuit breaker (CB1) turned OFF.

References:

TB 43-0218

REMOVAL**WARNING**

Do not wear watches, rings, or dog tags when working on main control panel.

WARNING

Make sure electrical power is disconnected before working on unit. Failure to do so could result in serious injury or death from electrical shock.

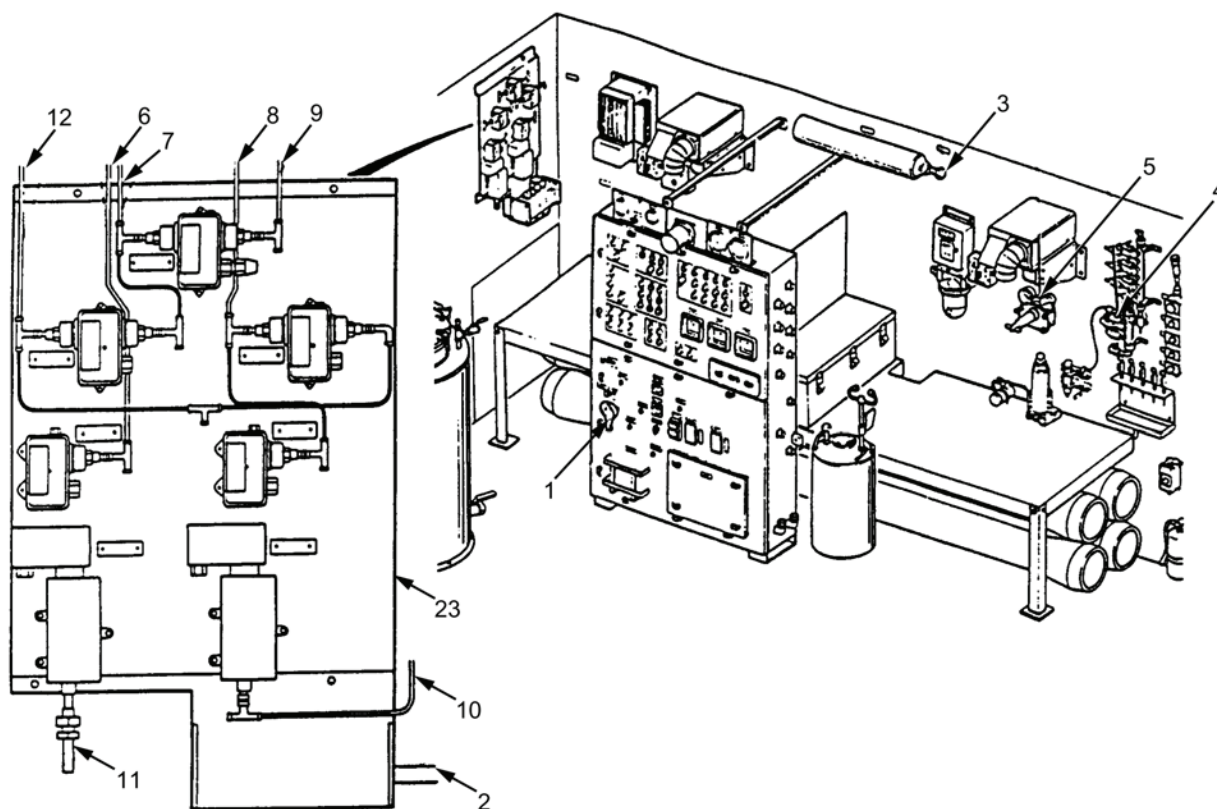
WARNING

Make sure air pressure is vented from manifolds before working on switch panel assembly. Failure to do so could result in serious injury from pressurized air.

NOTE

Tag all wires before disconnecting.

1. Shut off electrical power by turning main circuit breaker CB1 (1) to the OFF position. Disconnect cable P24 (2).
2. Close air tank valve (3) and open manifold bleed valve (4) to drain air pressure in the system.
3. Check air pressure gages (5) to ensure that air pressure in the system is at zero.
4. Tag and disconnect seven hoses (6 thru 12) by unscrewing hose nuts at the points where they connect to their respective pressure switches (13 thru 19).
5. Remove four captive screws (20), lockwashers (21) and washers (22). Remove the pressure switch panel assembly (23).



**Figure 1. Pressure Switch Panel Assembly.
(Model WTA-060 Only)**

DISASSEMBLY

1. Unscrew the hose nuts on each end of tube (24) and remove the tube. Remove tubes (25 thru 27) the same way.
2. Remove seven pressure switches (13 thru 17) as follows:
 - a. Remove capscrews (28), lockwashers (29) and washers (30).
 - b. Remove capscrews (31), lockwashers (32), washers (33) and pressure switches (18 and 19) from switch panel (23).
3. Disassemble the components mounted on the pressure switches as follows:
 - a. If one end of tee is plugged, remove plug (37).
 - b. Unscrew tees (34) and unscrew straight adapters (35) from the valve body. Remove preformed packings (36) from straight adapter (35). Tube nuts will remain on the adapters.
 - c. Remove adapters (39) and nipples (38) from pressure switches (18 and 19).

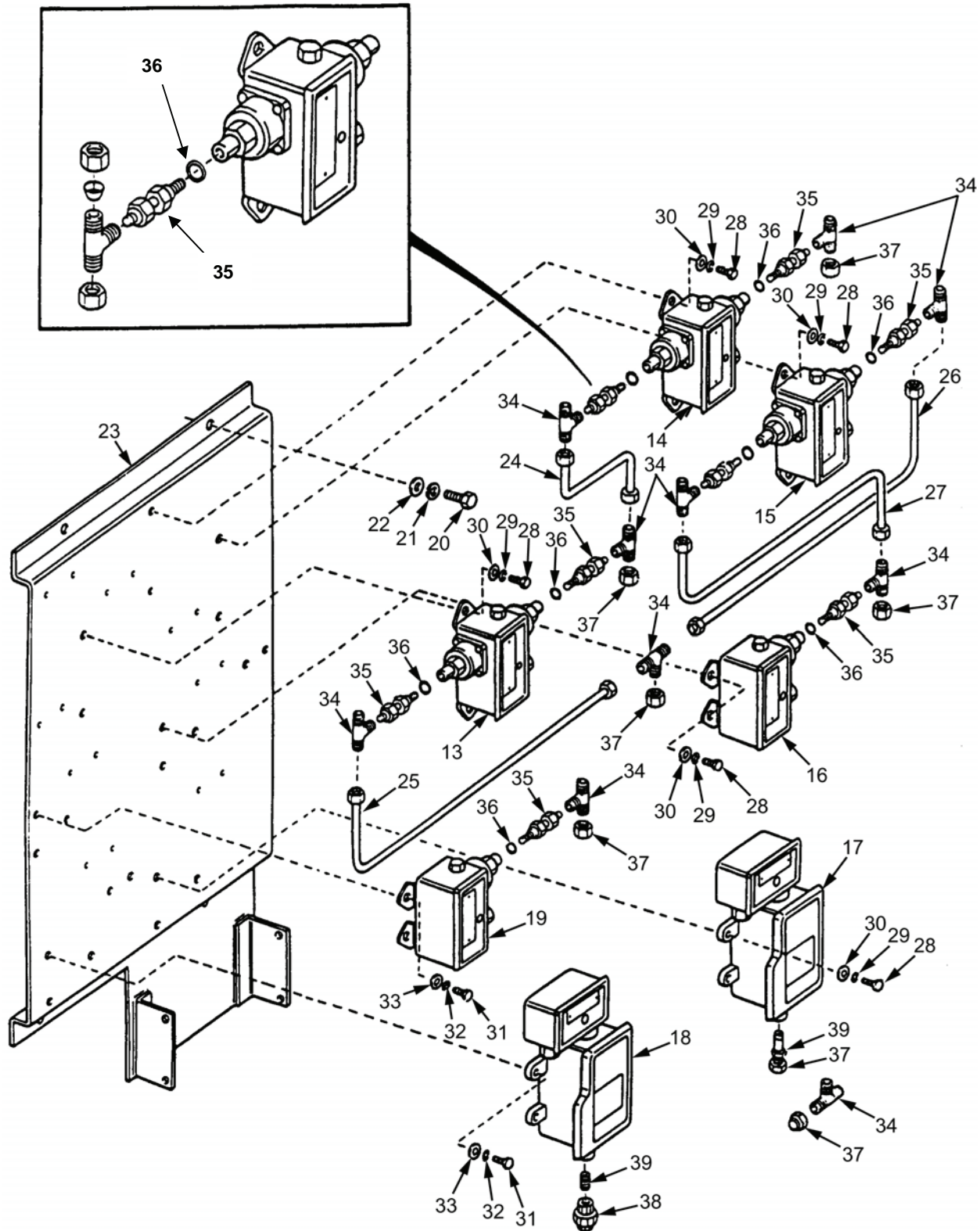


Figure 2. Pressure Switch Panel Assembly.
(Model WTA-060 Only)

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Repair leaks at male fittings using antiseize tape.
2. Replace damaged nameplates (WP 0043 00, TM 10-4610-232-12).
3. Replace leaking preformed packings or damaged components.
4. Repair tubing if necessary (WP 0060 00, TM 10-4610-232-12).
5. Replace damaged or missing tube markers (WP 0043 00, TM 10-4610-232-12).

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Reinstall parts on pressure switches as follows:
 - a. Install nipple (38), adapter (39) on pressure switch (18).
 - b. Install preformed packing (36) on straight adapter and screw straight adapter (35) into pressure switches (13 thru 17, and 19).

NOTE

One tee is used to connect tubes (25 and 26).

- c. Secure tees (34) to straight adapters (35) using the tube nuts on the straight adapters.
 - d. Install plugs (37) on the ends of all tees.
2. Install pressure switches (18 and 19), washers (33), lockwashers (32) and capscrews (31) to switch panel (23).
3. Install five pressure switches (13 thru 17), washers (30), lockwashers (29) and capscrews (31) to switch panel (23).
4. Connect tubes (25 and 26) using tee (34).
5. Install tubes (24 thru 27) and secure with hose nuts.

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install pressure switch panel assembly (23) on the ROWPU wall using washers (22), lockwashers (21) and captive screws (20).

CAUTION

To avoid damage to ROWPU, check air pressure gages to ensure that air pressure in the system is zero.

2. Connect seven hoses (6 thru 12) by connecting with hose nuts to the respective air pressure gages (5) as tagged.
3. Close manifold bleed valve (4) and open air tank valve (3).
4. Connect cable P24 (2) and restore electrical power by turning main circuit breaker CB1 (1) to the ON position.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MODEL NO. ROWPU-1, NSN 4610-01-371-1790
PRESSURE SWITCH PANEL ASSEMBLY
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)

Tape, Antiseize (Item 70, WP 0102 00)

Tags

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).

Pressure switch panel junction box removed
(WP 0034 00).

Main circuit breaker (CB1) turned OFF.

References:

TB 43-0218

REMOVAL**WARNING**

Do not wear watches, rings, or dog tags when working on main control panel.

WARNING

Make sure electrical power is disconnected before working on unit. Failure to do so could result in serious injury or death from electrical shock.

WARNING

Make sure air pressure is vented from manifolds before working on switch panel assembly. Failure to do so could result in serious injury from pressurized air.

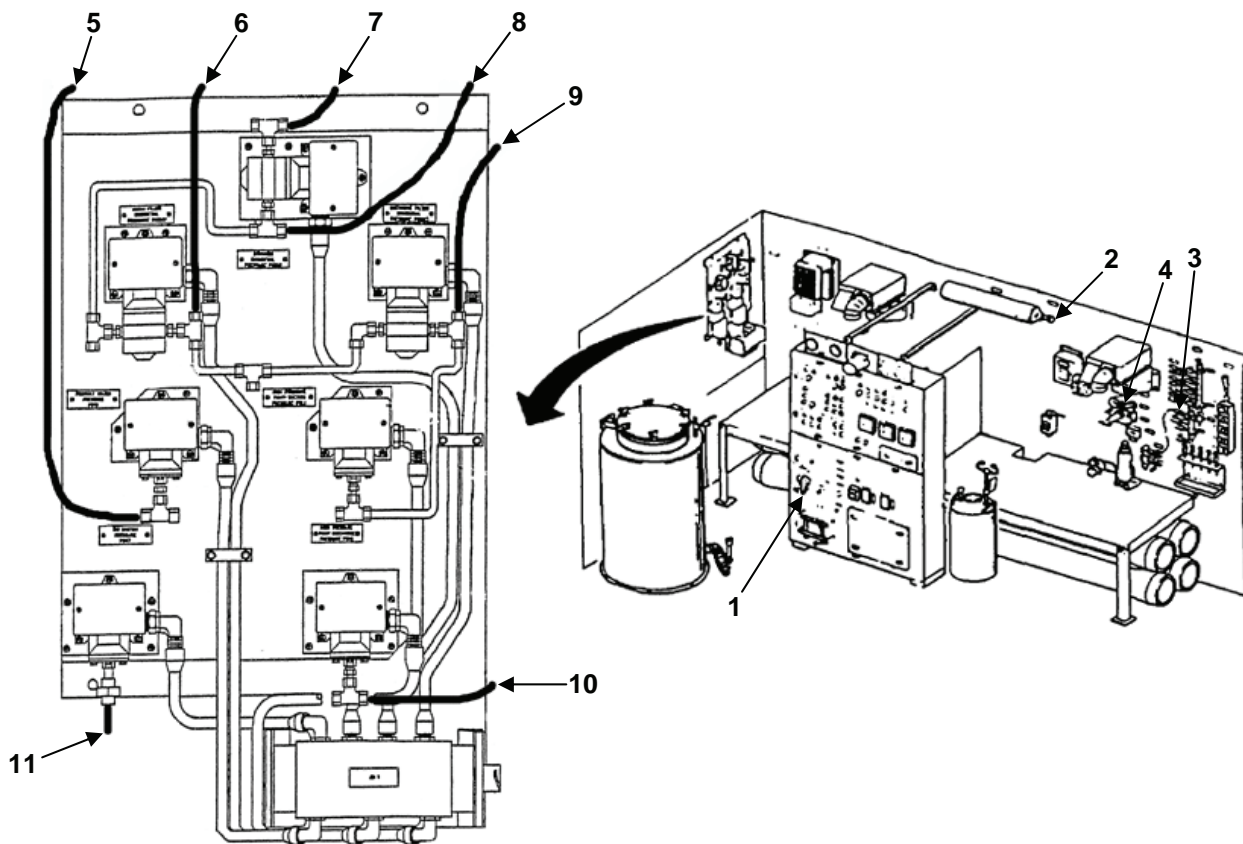
NOTE

Tag all wires before disconnecting.

1. Shut off electrical power by turning main circuit breaker CB1 (1) to the OFF position. Disconnect cable P24.
2. Close air tank valve (2) and open manifold bleed valve (3) to drain air pressure in the system.
3. Check air pressure gages (4) to ensure that air pressure in the system is at zero.
4. Tag and disconnect seven hoses (5 thru 11) by unscrewing hose nuts at the points where they connect to the respective pressure switches.
5. Remove four screws (12), lockwashers (13) and washers (14) and remove the pressure switch panel (33) as an assembly. Discard lockwashers.

DISASSEMBLY

1. Unscrew the hose nuts on each end of tube (15) and remove the tube. Remove tubes (16, 17 and 18) in the same way. Tees (19) and elbow (20) are now free.
2. Remove seven pressure switches (21 thru 27) as follows:
 - a. Remove screws (28), lock washers (29) and flat washers (30).
 - b. Remove pressure switches (21 thru 27) and mounting plates (31) from switch panel.
 - c. Remove screws (32), flat washers (33), lockwashers (34) and nuts (35). Discard lockwashers.
 - d. Remove pressure switches (21 thru 27) from mounting plates (31).



**Figure 1. Pressure Switch Panel Assembly (Sheet 1 of 4).
(Model ROWPU-1 Only)**

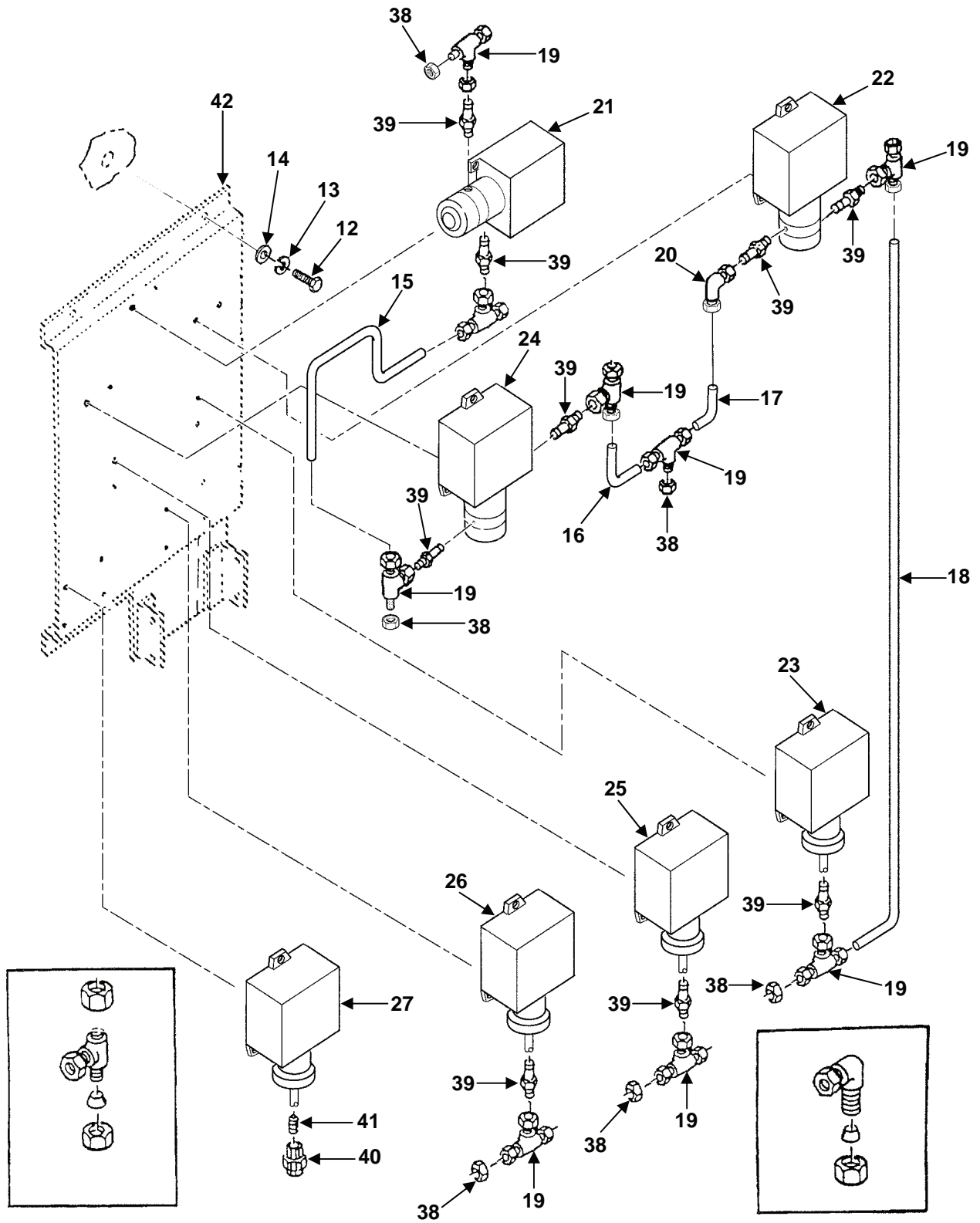


Figure 1. Pressure Switch Panel Assembly (Sheet 2 of 4).
(Model ROWPU-1 only)

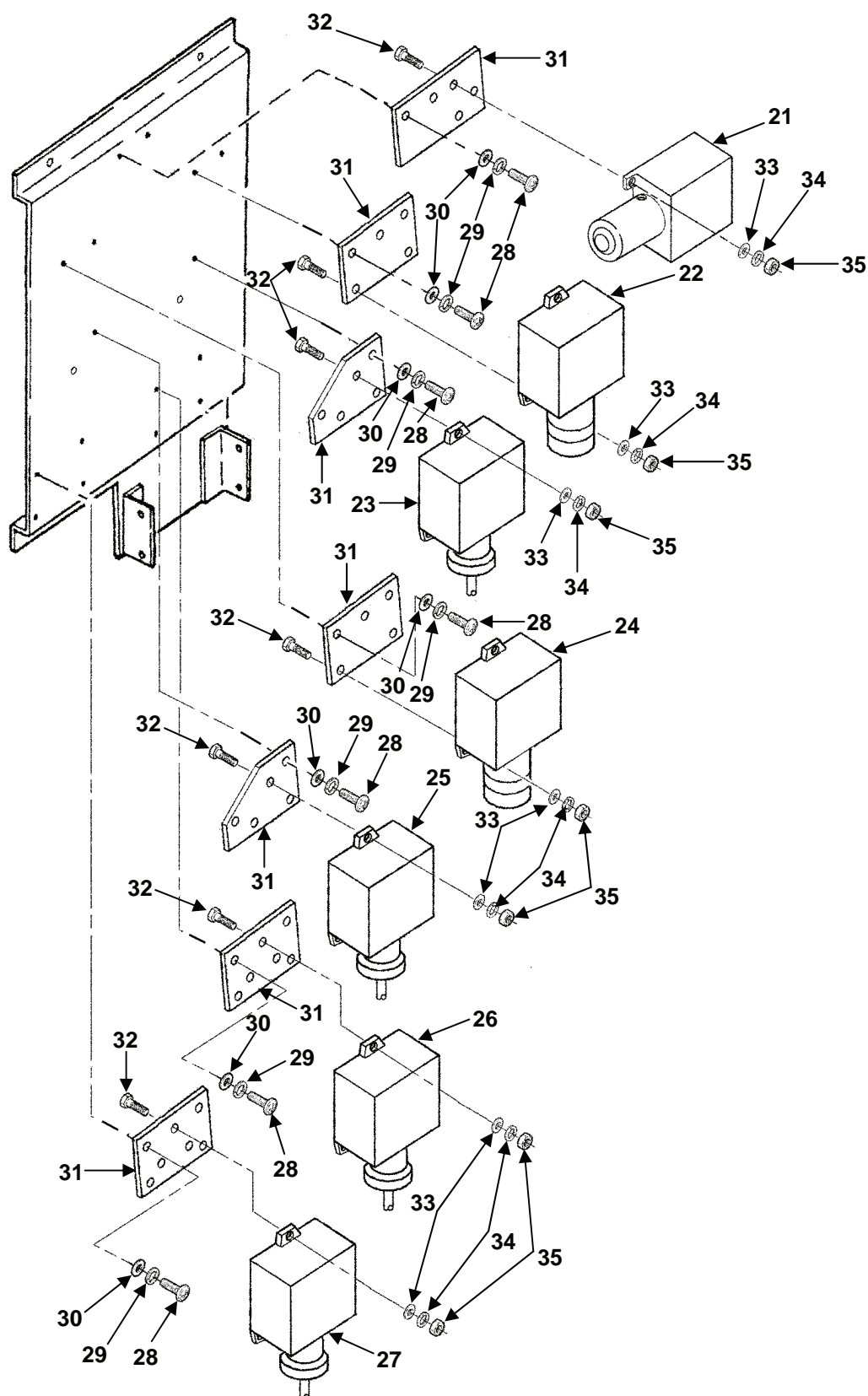


Figure 1. Pressure Switch Panel Assembly (Sheet 3 of 4).
(Model ROWPU-1 only)

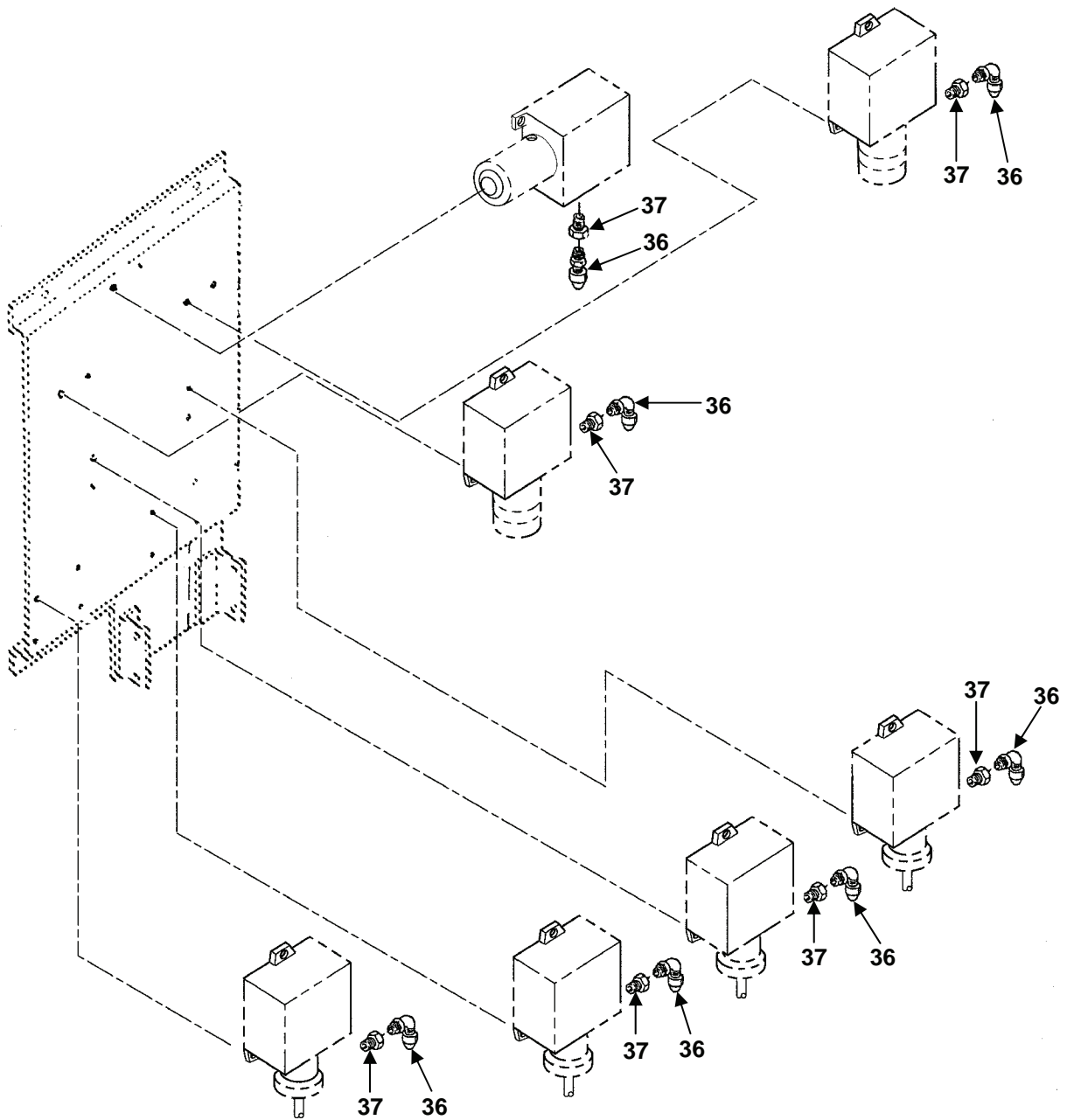


Figure 1. Pressure Switch Panel Assembly (Sheet 4 of 4).
(Model ROWPU-1 only)

3. Disassemble the components mounted on the pressure switches (21 thru 27) as follows:
 - a. Remove stuffing tubes (36) and pipe bushings (37).
 - b. If one end of tee (19) is plugged, remove plug (38).
 - c. Unscrew tees (19) and elbow (20) and unscrew straight adapters (39) from pressure switches (21 thru 26). Tube nuts will remain on the adapters.
 - d. Remove pipe union (40) and nipple (41) from pressure switch (27).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Repair leaks at male fittings using antiseize tape.
2. Replace damaged nameplates (WP 0043 00, TM 10-4610-232-12).
3. Replace leaking preformed packings or damaged components.
4. Repair tubing if necessary (WP 0060 00, TM 10-4610-232-12).
5. Replace damaged or missing tube markers (WP 0043 00, TM 10-4610-232-12).

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Reinstall parts on pressure switches (21 thru 27) as follows:
 - a. Install nipple (41) and pipe union (40) on pressure switch (27).
 - b. Install straight adapters (39) into pressure switches (21 thru 27).

NOTE

One tee is used to connect tubes (16 and 17).

- c. Secure tees (19) and elbow (20) to straight adapters (39) using the tube nuts on the straight adapters (39).

- d. Install all plugs (38) on the ends of all tees (19)
 - e. Install pipe bushings (41) and stuffing tubes (40).
2. Install pressure switches (21 thru 27) as follows:
 - a. Place pressure switches (21 thru 27) into position on mounting plates (31). Install screws (32), flat washers (33), new lockwashers (34) and nuts (35).
 - b. Place pressure switch with mounting plate into position on pressure switch panel (42) and install flat washers (30), new lockwashers (29) and screws (28).
 3. Connect tubes (16 and 17) using tees (19) and elbow (20).
 4. Install tubes (15 and 18) and secure with tube nuts.

INSTALLATION

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install panel (42) on the ROWPU wall using washers (14), new lockwashers (13) and screws (12).

CAUTION

To avoid damage to ROWPU, check air pressure gages to ensure that air pressure in the system is zero.

2. Refer to Figure 1, sheet 1, and connect seven hoses (11 thru 5) by connecting with tube nuts to the respective pressure switches as tagged.
3. Close manifold bleed valves (3) and open air tank valve (2).
4. Connect cable P24.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
PRESSURE SWITCH PANEL JUNCTION BOX (JB1)
DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Stripper, Wire (TM 10-4610-232-12)
Crimper (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Main circuit breaker (CB1) Turned OFF.

Materials/Parts:

Gasket (TM 10-4610-232-24P)
Gasket (TM 10-4610-232-24P)
Lockwashers (TM 10-4610-232-24P)
Tape, Electrical (Item 71, WP 0102 00)
Tags
Preformed Packing (TM 10-4610-232-24P)

References:

TB 43-0218

DISASSEMBLY

1. Disconnect cable P24 (1).
2. Loosen two screws (2) on clamp (3) and open the cover on junction box (4). Do not remove screws (2).

NOTE

There are seven cables entering the junction box. Three of the seven have straight body connectors and are identical. Four of the cables have elbow bodies and are identical. A typical procedure for each is described below.

NOTE

Each of the seven pressure switch cables is connected to its switch in the same manner and has a black and white wire.

3. Tag and disconnect wiring harness wires (5) and cable wires (6) from terminal strip. (WP 0043 00, TM 10-4610-232-12)

NOTE

Removal of cover plate on all pressure switches is similar to the following procedures.

4. If necessary, remove one or more cables (6) from the appropriate pressure switch (12). Proceed as follows:
 - a. If the cable is secured by clamps (7) (some have clamps, some do not) remove capscrews (8), lockwashers (9), washers (10) and remove clamps (7).
 - b. Loosen screw (11) on the front of pressure switch (12) and remove cover (13).
 - c. Tag and disconnect cable wire (6) connections within pressure switch (12).

- d. Loosen and slide nut (14), retainer (15) and bushing (16) back on cable wires (6). Remove cable wires (6) from pressure switch connector (17) and slide nut (14), retainer (15) and bushing (16) off cable wires (6). If necessary, remove connector (17).
5. Unscrew and slide nuts (18), retainers (19) and bushing (20) back on cable wires (6).
6. Remove conduit nut (21) from inside box (4) for each cable wire (6) to be removed and remove body connectors (22). Remove sealing washers (23) and cable wires (6) from body connectors (22).
7. Remove from each end of box (4), two capscrews (24), washers (25), nuts (26), lockwashers (27), washers (28) and washers (29), securing box (4) to bracket (30).
8. Remove from each end of box (4), two capscrews (31), washers (32), nuts (33), lockwashers (34) and washers (35). Remove cover (36), gasket (37), cover (38) and gaskets (39).
9. Remove four capscrews (40), nuts (41), lockwashers (42), wiring harness assembly wires (5) and gasket (43).
10. Remove screw (44), stop plate (45), end plate (46), terminals (47), jumpers (48) and markers (49). (WP 0043 00, TM 10-4610-232.12).
11. Remove two screws (50), nuts (51), lockwashers (52), washers (53) and rail (54) from box (4).

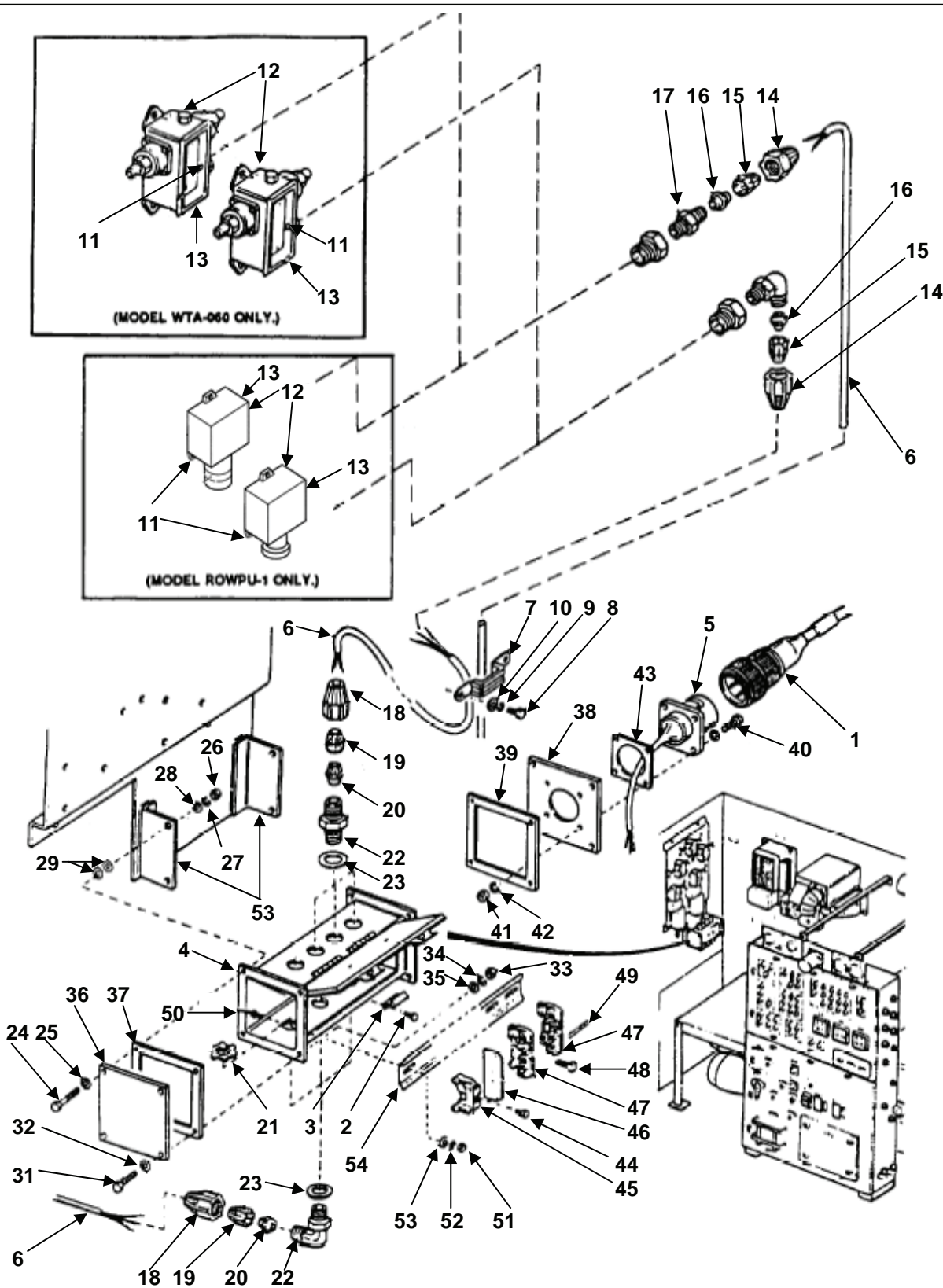


Figure 1. Pressure Switch Panel Junction Box.

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace defective components.
2. Repair cable assemblies (WP 0043 00, TM 104610 -232-12).
3. Repair damaged or missing wire markers (WP 0043 00, TM 10-4610 -232-12).
4. Repair loose or damaged ring tongue connectors (WP 0043 00, TM 10-4610-232-12).

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install rail (54) in box (4) and secure with screws (50), nuts (51), lockwashers (52) and washers (53).
2. Install screw (44), stop plate (45), end plate (46), terminals (47), jumpers (48) and markers (49) on rail (54) (WP **0128** 00, TM 10-4610-232-12).
3. Place gasket (43) on wiring harness assembly wires (5) and install harness assembly (5) on cover (38) using capscrews (40), nuts (41) and lockwashers (42).
4. Position box (4) on bracket (30) and install cover (38), gasket (39), cover (36) and gasket (37) and secure with capscrews (31), washers (32), nuts (33), lockwashers (34), washers (35), capscrews (24), washers (25), nuts (26), lockwashers (27) and washers (28) and washers (29).
5. Connect all cables to the box as follows:
 - a. Slide nuts (18), retainers (19), and bushings (20) on cable wires (6) to be installed.
 - b. Place sealing washer (23) on body connectors (22) (either elbow or straight) and secure the body in box (4) with conduit nut (21).
 - c. Insert the cable wires (6) from cable being installed through body (22) just installed. Connect wires to the terminal strip as tagged. If the marking tags are lost or illegible refer to Figure 2. Refer to (WP 0043 00, TM10-4610-232-12) for procedures.
 - d. Connect wiring harness wires (5) as tagged. (WP 0043 00, TM 10-4610-232-12).
 - e. Tighten nut (18).

6. Reinstall cables on pressure switches as follows:
 - a. Install pressure switch connector (17).
 - b. Slide nut (14), retainer (15) and bushing (16) on cable wires (6) and insert the two wires from cable wires (6) into appropriate pressure switch (12).

NOTE

If the marking tags are lost or illegible refer to Figure 2

Connect wires as tagged. Refer to (WP 0043 00, TM10-4610-232-12) for procedures.

- c. Tighten nut (14), install cover (13) and secure with screw (11). Install clamp (7) and secure with capscrews (8), lockwashers (9) and washers (10).
7. Connect cable P24 (1).
8. Close junction box (4) cover and secure the cover with clamps (3) and two screws (2).

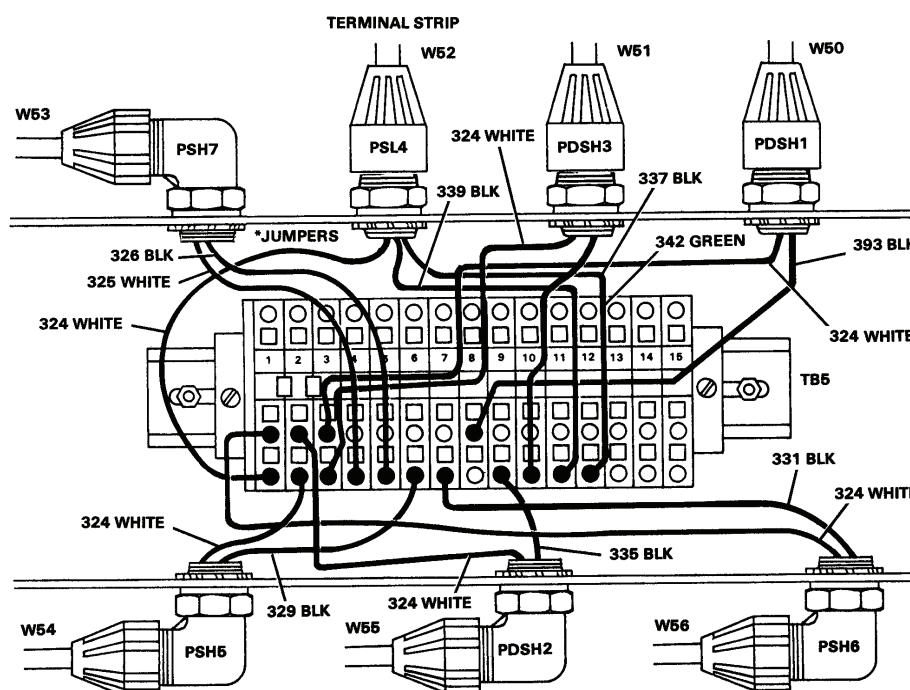


Figure 2. Pressure Switch Panel junction Box.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
LOW PRESSURE SWITCHES
INSPECTION, TESTING, ADJUSTMENT**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Electrical power disconnected

Materials/Parts:

Soap (Item 68, WP 0102 00)
Tags
Tape, Electrical (Item 71, WP 0102 00)

References:

TB 43-0218

INSPECTION**WARNING**

Do not wear watches, rings, or dog tags when working on electrical components.

WARNING

Make sure electrical power is disconnected before working on unit. Failure to do so could result in serious injury or death from electrical shock.

WARNING

High pressure switches PSH-5 and PSH-7 are not to be adjusted. Injury or death may occur if improperly adjusted.

1. Apply water, soap mixture at all line fittings and tubes. Inspect points where air bubbles are detected.
2. Inspect individual pressure switches for scorched or burned paint.
3. Remove cover screws and open pressure switch cover.
4. Inspect inside box for signs of moisture, rust and/or corrosion.
5. Inspect for frayed or burned insulation or missing mounting terminal screws.

TESTING (Model WTA-060 only)**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Find known value of switches in Tables 1 and 2.
2. Remove cover (1) and gasket (2) by loosening screw (3). Use multimeter to test for continuity.
3. Apply pressure to see if closed contacts open or open contacts close. If contacts do not open or close and if there is no visible sign of moisture or damage present, then adjustment will be required.

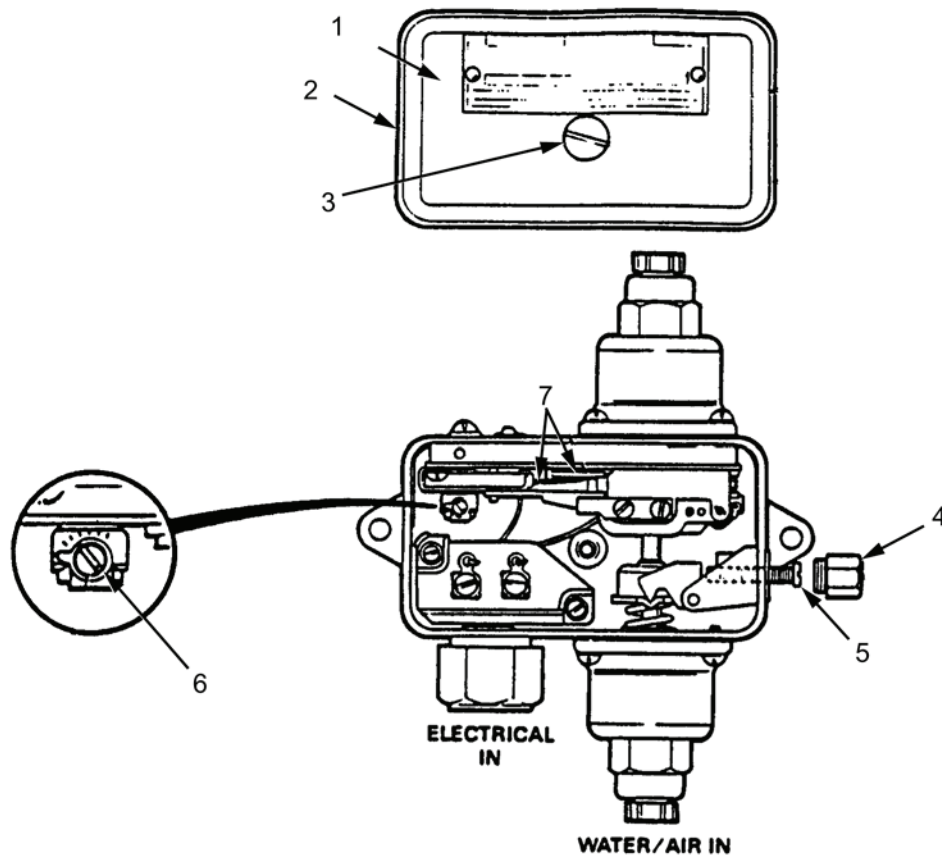


Figure 1. Differential Switch.
(Model WTA-060 only)

ADJUSTMENT (Model WTA-060 only)**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Differential Switch**NOTE**

System must be operating to make adjustment

NOTE

Contacts can either be visually checked for opening and closing or checked with a multimeter.

1. Remove differential adjustment cap (4).
2. Turn the differential screw (5) clockwise to widen the pressure difference.
3. Turn the differential screw (5) counterclockwise to lower the pressure difference.
4. Table 1 gives the desired differential pressure setting.
5. Gages on top of control panel show differential pressures (between black and red arrow pointers on dial face).
6. The sensitivity adjustment (6) governs the point at which the contacts (7) open. This should not be adjusted unless a more sensitive differential of less than 5 psig is desired.
 - a. Maximum sensitivity is the largest spread between on and off operations of the controls (± 1 psig).
 - b. Minimum sensitivity is the smallest spread between on and off operations of the controls (± 1 psig).
7. The control opens an electrical circuit on a change in the difference between two pressures. Reference Table 1 for difference.
8. Install cover (1), gasket (2) and secure with screw (3).

Table 1. Differential Switch Settings

Switch No.	Description	Pressure Setting	Contacts Open or Close With Increasing Pressure
PDSH1	Strainer High Differential	15 psig	Open
PDSH2	Media Filter High Differential	25 psig	Open
PDSH3	Cartridge High Differential	15 psig	Open

Pressure Switch

NOTE

Contacts can be visually checked for opening and closing or checked with a multimeter.

1. Remove range adjustment protective cap (8).
2. The switch is adjustable over the entire range of the control. For the desired set point, reference Table 2.
3. The adjustment procedure will be described for pressure switches which open on increasing pressure.
4. Turn cover screw (9) counterclockwise until cover (10) is loose.
5. Remove cover (10) and gasket (11).
6. Using a multimeter, check for continuity across contacts (12).
7. If there is continuity, switch is closed.
8. If no continuity is present, switch is open.

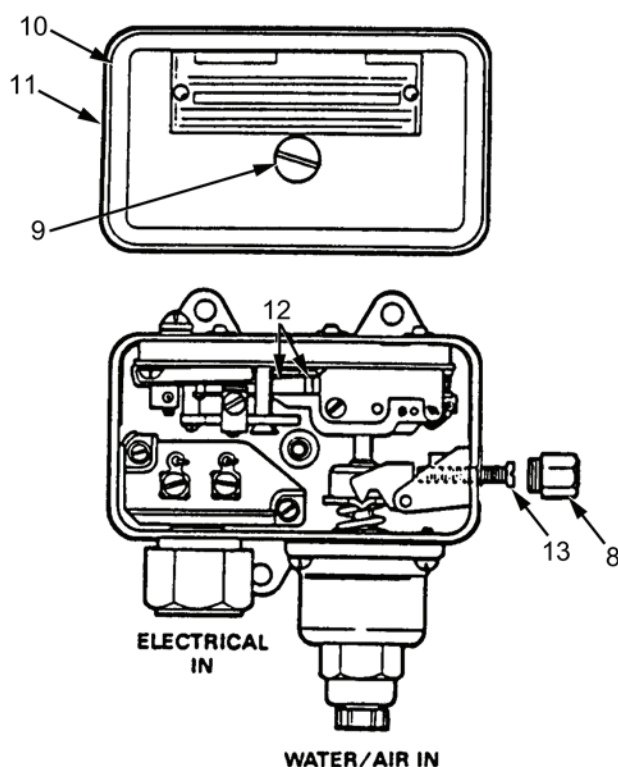


Figure 2. Pressure Switch.
(Model WTA-060 only)

9. Bring pressure in ROWPU to point where contacts (12) close, Table 2.
10. Turn range screw (13) slowly clockwise until contacts just open.
11. This sets the opening point from Table 2 to desired psi.
12. If set point pressure is reached and contacts remain open, replace switch.
13. For switch that closes on increasing pressure, follow same adjustment procedure except in **step 18**, turn clockwise until contacts just close; and in **step 19**, this sets the closing point from Table 2.
14. Install cover (10), gasket (11) and secure with screw (9).

Table 2. Pressure Switch Settings

Switch No.	Description	Pressure Setting	Contacts Open or Close With Increasing Pressure
PSH6	Product Water Pressure	40 psig	Open
PSL4	High Pressure Pump Suction Pressure	5-7 psig	Close

TESTING (Model ROWPU-1 only)**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Remove screws (14) and cover (15) from switch housing (16).
2. Use a multimeter to check that power is being applied to the input power connection points inside the switch housing (16).
3. If power is being applied to the terminals and the gages on top of the control panel indicate that the pressure switch should be activated, adjust the switch in accordance with the following steps.

ADJUSTMENT (Model ROWPU-1 only)**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. To adjust differential switch do the following:
 - a. Remove two screws (17) and cover (18).
 - b. Locate the adjustment screw (19) on the bottom of the switch housing (16).
 - c. Turn the adjustment screw (19) on the bottom of the switch housing (16) clockwise to increase the pressure difference.
 - d. Turn the adjustment screw (19) counterclockwise to decrease the pressure difference.
 - e. Gages on top of the control panel show the differential pressures (between black and red arrows on the dial face).
 - f. The control opens a circuit on a change in the difference between two pressures. See Table 1 for correct settings.
 - g. Install cover (18) and two screws (17).

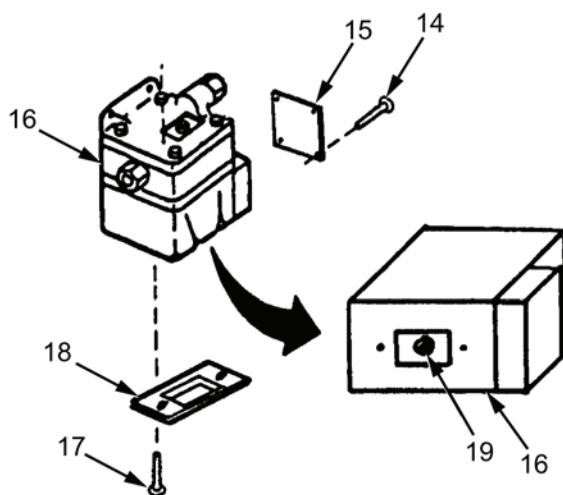
2. To adjust pressure switch do the following
 - a. Remove two screws (20) and cover (21).

NOTE

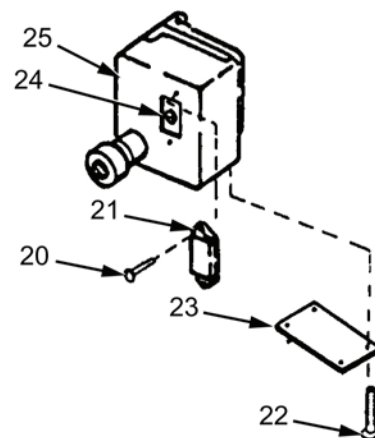
The switches are adjustable over the entire range of control. The adjustment procedure will be described for pressure switches that open on increasing pressure.

- b. Remove four screws (22) and cover (23).
 - c. Locate the adjustment screw (24) on the side of the switch housing (25).
 - d. Use a multimeter to check for continuity across contacts. If continuity is found, switch is closed. If no continuity is found, switch is open.
 - e. Start the ROWPU and bring pressure in ROWPU to pressures shown on Table 2.
3. To adjust the Product Water Pressure Switch, do the following;
 - a. If contacts are not closed, turn adjustment screw counterclockwise until contacts close.
 - b. Turn adjustment screw clockwise until contacts just open. This sets the opening point from Table 2 to the desired psi.
 - c. If contacts remain open or closed regardless of position of adjustment screw, switch is defective and must be replaced.
4. To adjust the High Pressure Suction Pump Pressure switch do the following;
 - a. If contacts are not open, turn adjustment screw clockwise until contacts open.
 - b. Turn adjustment screw counterclockwise until contacts just close. This sets the closing point from Table 2 to the desired psi.
 - c. If contacts remain open or closed regardless of position of adjustment screw, switch is defective and must be replaced.
5. Install cover (21) and two screws (20).

6. Install cover (23) and four screws (22).



Differential Switch



Pressure Switch

Figure 3. Pressure Switch Adjustment.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
SWITCH PANEL NO. 1 CABLE ASSEMBLY
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Heat shrink tubing (TM 10-4610-232-24P)
Tape, Electrical (Item 71, WP 0102 00)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cable (1) as described in WP 0010 00.

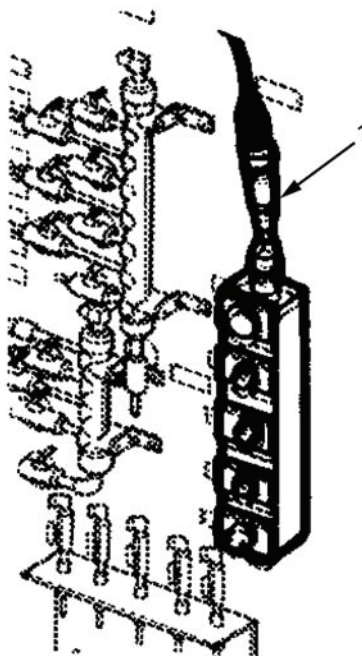


Figure 1. Cable.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
SWITCH PANEL NO. 2 CABLE ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Heat Shrink Tubing (TM 10-4610-232-24P)
Tape, Electrical (Item 71, WP 0102 00)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cable (1) as described in WP 0010 00.

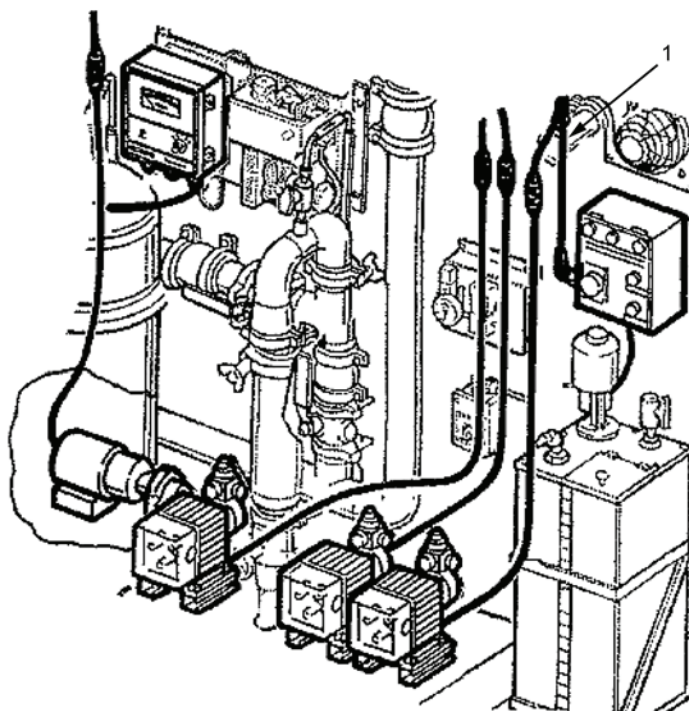


Figure 1. Cable.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
JUNCTION BOX NO. 3 CABLE ASSEMBLY
REPAIR

INITIAL SETUP

Tools/Special Tools:

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cable (1) as described in WP 0010 00.

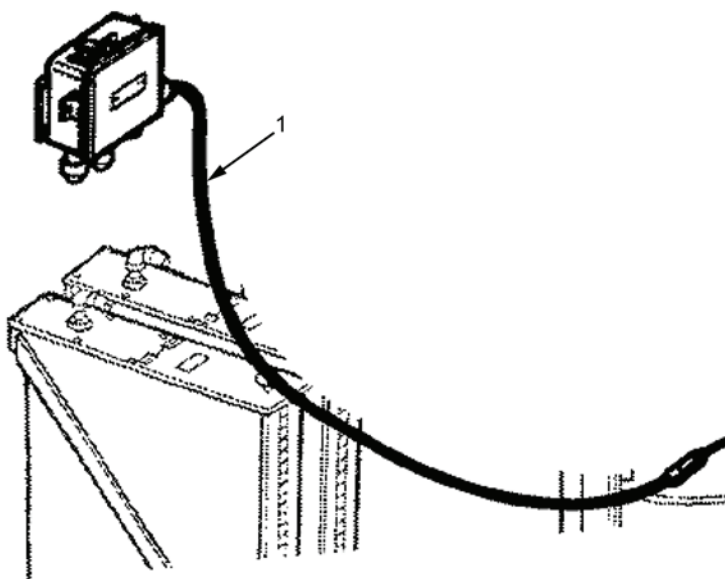


Figure 1. Cable.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
EXTERNAL ELECTRICAL PANEL CABLE ASSEMBLIES
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cables (1, 2, and 3) as described in WP 0010 00.

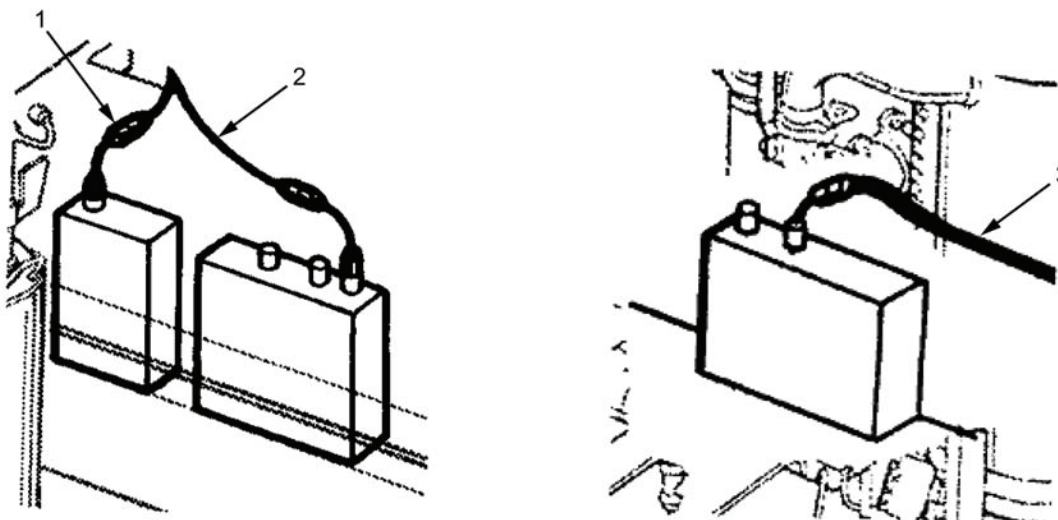


Figure 1. Cable.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
CHEMICAL INJECTION PUMP CABLE ASSEMBLIES
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cables (1, 2 and 3) as described in WP 0010 00.

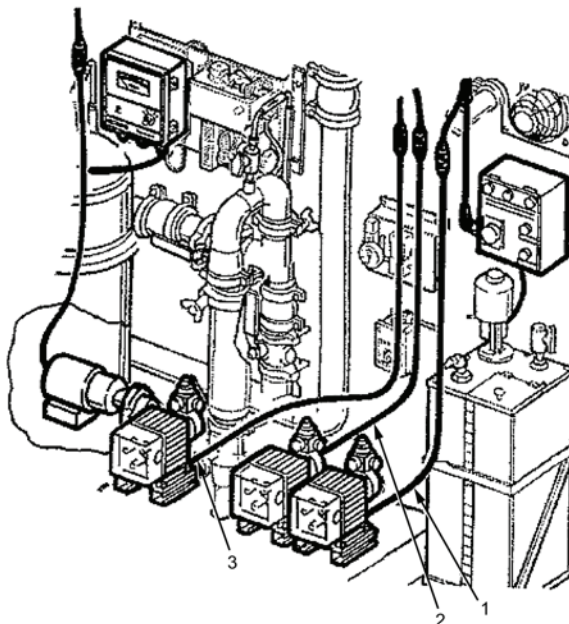


Figure 1. Cable.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
BACKWASH HYPOCHLORITE PUMP CABLE ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12)
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cable (1) as described in WP 0010 00.

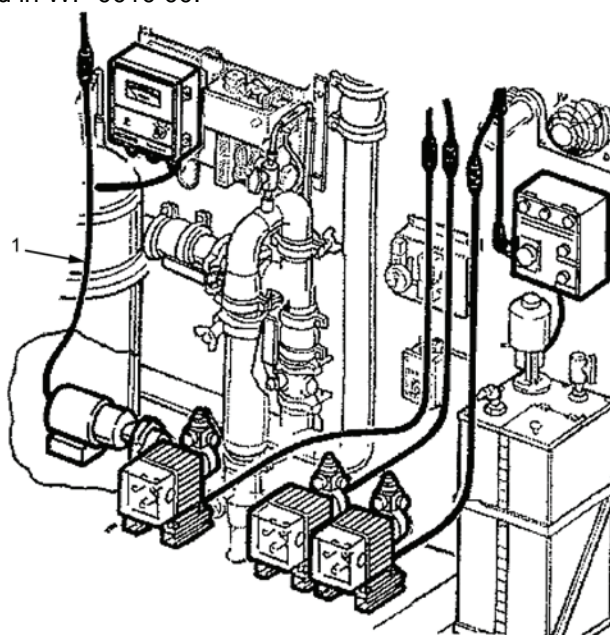


Figure 1. Cable.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HYPOCHLORITE TANK MIXER CABLE ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cable (1) as described in WP 0010 00.

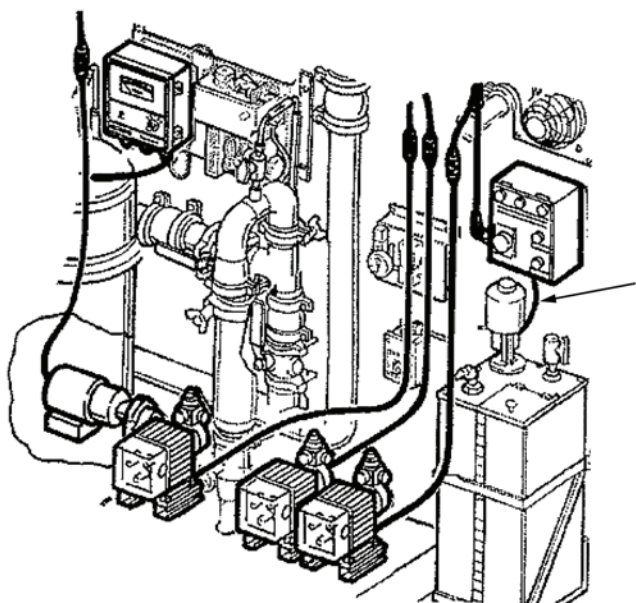


Figure 1. Cable.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HYPOCHLORITE TANK FRAME
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Wire Brush (TM 10-4610-232-12)
Welding Equipment (TM 10-4610-232-12)

Equipment Conditions:

Frame disassembled
(WP 0077 00, TM 10-4610-232-12).

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Tags
Soap (Item 68, WP 0102 00)

References:

TB 43-0218
TM 9-450
TM 9-237
TM 43-0139

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Clean dirt and paint from area to be repaired.
2. Repair metal bodies, refer to TM 9-450.
3. Weld damaged areas. For welding procedures, refer to TM 9-237.
4. Paint all areas repaired. Refer to TM 43-0139.

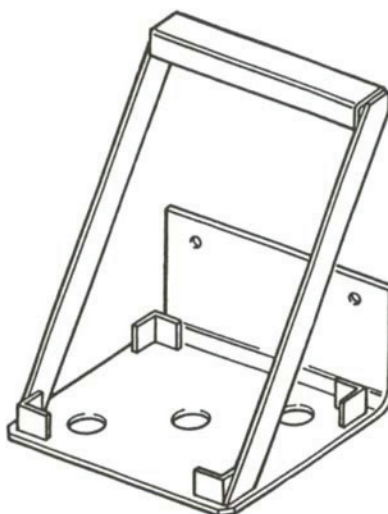


Figure 1. Hypochlorite Tank Frame.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
BOOSTER PUMP CABLE ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cable (1) as described in WP 0010 00.

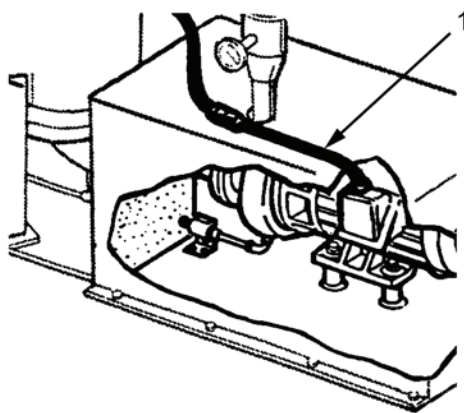


Figure 1. Booster Pump Cable Assembly.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
BOOSTER PUMP
INSPECTION, DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:

Booster pump and motor removed
(WP 0079 00/0080 00, TM 10-4610-232-12)

Materials/Parts:

Glycerin (Item 17, WP 0102 00)
Lubricating Oil (Item 53, WP 0102 00)
Seals (TM 10-4610-232-24P)
Gaskets (TM 10-4610-232-24P)
Preformed Packing (TM 10-4610-232-24P)

References:

TB 43-0218

INSPECTION

When the pump is disassembled, inspect preformed packing, gaskets and seals. Replace all worn or faulty parts.

NOTE

The booster pump cannot be removed from the booster pump motor as an intact assembly. The pump must be disassembled from the motor and reinstalled in the same way.

DISASSEMBLY

1. Remove eight capscrews (1) and remove casing (2). Remove gasket (3).
2. Inspect wear ring (4). The ring is a press fit in casing. If necessary, remove by cutting through two sides, releasing the pressure of the press fit. This may be accomplished by drilling a hole as shown on Figure 1, then cracking the remaining ring wall. Use drill size "A".

NOTE

It may be necessary to use two pinch bars between impeller and cover to remove impeller.

3. Remove impeller screw (5), gasket (6), impeller (7) and key (8).
4. If necessary, lubricate motor shaft with lubricating oil and slide shaft sleeve (9) off motor shaft. Preformed packing (10) will come off on shaft sleeve (9). Seal (11) will also come off with shaft sleeve (9). It may be necessary to cut or soak the seal off the sleeve.
5. Remove cover (12). Press seal (13) out of cover (12).
6. Remove slinger (14).
7. Remove four socket head screws (15) and adapter (16),
8. Remove splash plate (17).

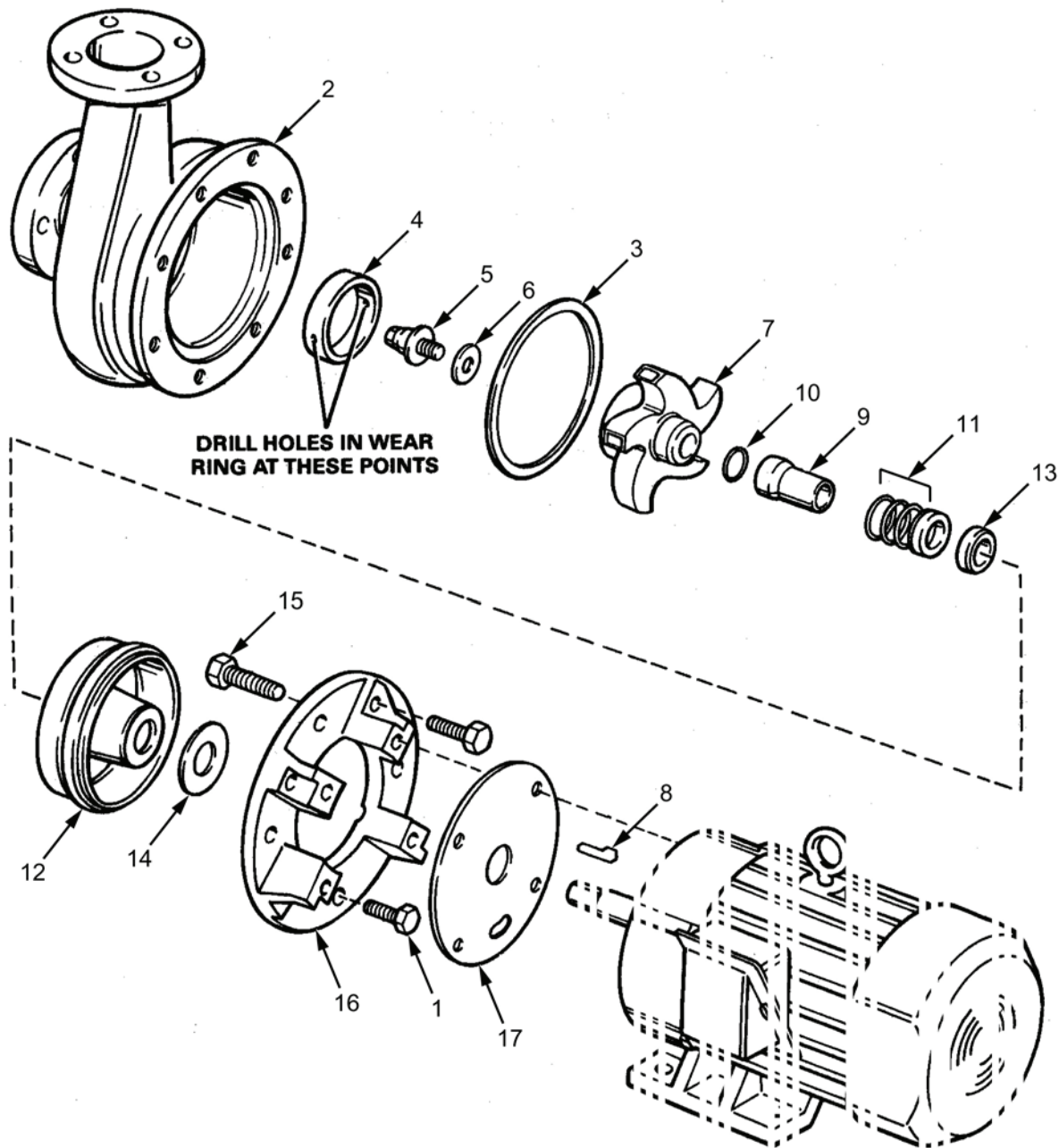


Figure 1. Booster Pump Disassembly and Assembly.

REPAIR

NOTE

Inspect all gaskets and preformed packings and replace if necessary.

1. Replace any damaged components.
2. When clearance between wear ring (4) and impeller (7) exceeds 0.020", replace wear ring and/or impeller.
3. Replace both seals (11) and (13).

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install splash plate (17).
2. Install slinger (14).
3. Install adapter (16) and secure with four socket head screws (15).

CAUTION

The seal is fragile. Do not force it into place.

4. Lightly oil bore and finger press seal (13) into cavity in cover (12)

CAUTION

Do not use grease on seals. This would prevent the adhesive film, which holds the seal on the sleeve, from setting and the seal not functioning properly.

5. Apply glycerin and hand fit seal (11) (the rotating part) onto shaft sleeve (9).

NOTE

The carbon end of the seal must face the small end of the sleeve.

6. Slip cover (12) onto motor shaft, being careful to avoid damaging seal (13). Guide cover into position.
7. Lightly lubricate the inner diameter of the sleeve and lubricate the motor shaft. Slide shaft sleeve (9) with seal (11) onto motor shaft. Continue to push sleeve until it passes through the rear of cover (12) and nears its final position.
8. Install preformed packing (10) on end of shaft sleeve (9).
9. Install key (8) on motor shaft, align impeller (7) with keyway and install impeller (7).
10. Install gasket (6) and impeller screw (5) and tighten impeller screw. This will push impeller (7) and seal (11) into final position. Hold impeller (7) with a screwdriver while tightening.
11. Install wear ring (4) in casing (2). Be sure matching surfaces are clean and press the ring in place.
12. Install gasket (3) on cover (12) and install casing (2) on adapter (16) with eight capscrews (1).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
BOOSTER PUMP MOTOR
DISASSEMBLY, TESTING, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Brass Drift (TM 10-4610-232-12)
Growler (TM 10-4610-232-12)
Puller Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)

Equipment Conditions:

Booster pump and motor assembly removed
(WP 0079 00/0080 00, TM 10-4610-232-12).
Booster pump disassembled and booster pump
motor replaced (WP 0045 00).

Materials/Parts:

Gasket (TM 10-4610-232-24P)
Lockwashers (TM 10-4610-232-24P)

References:

TM 9-214
TB 43-0218

DISASSEMBLY**NOTE**

The booster pump motor cannot be replaced as a unit without first disassembling the booster pump. Then, reassemble the booster pump on the replacement motor.

1. Remove two setscrews (1) and ring (2).
2. Remove four screws (3), lockwashers (4) and fan shroud (5).
3. Loosen two capscrews (6), lockwashers (7), nuts (8) and fan (9) from motor shaft.
4. Remove key (10).

NOTE

Spring washer should come off with housing. Be careful not to lose spring washer.

5. Remove four nuts (11), through bolts (12), fan end housing (13) and spring washer (14). If necessary, lightly tap housing with hammer.
6. Using a suitable puller, remove bearing (15).
7. Remove drive end housing (16) and rotor (17) as an assembly.
8. Remove three screws (18), lockwashers (19), drive end housing (16), and horseshoe-shaped backing ring (20).
9. Bend tab of lock ring (21) and remove retaining nut (22).
10. Using a suitable puller, remove bearing (23).

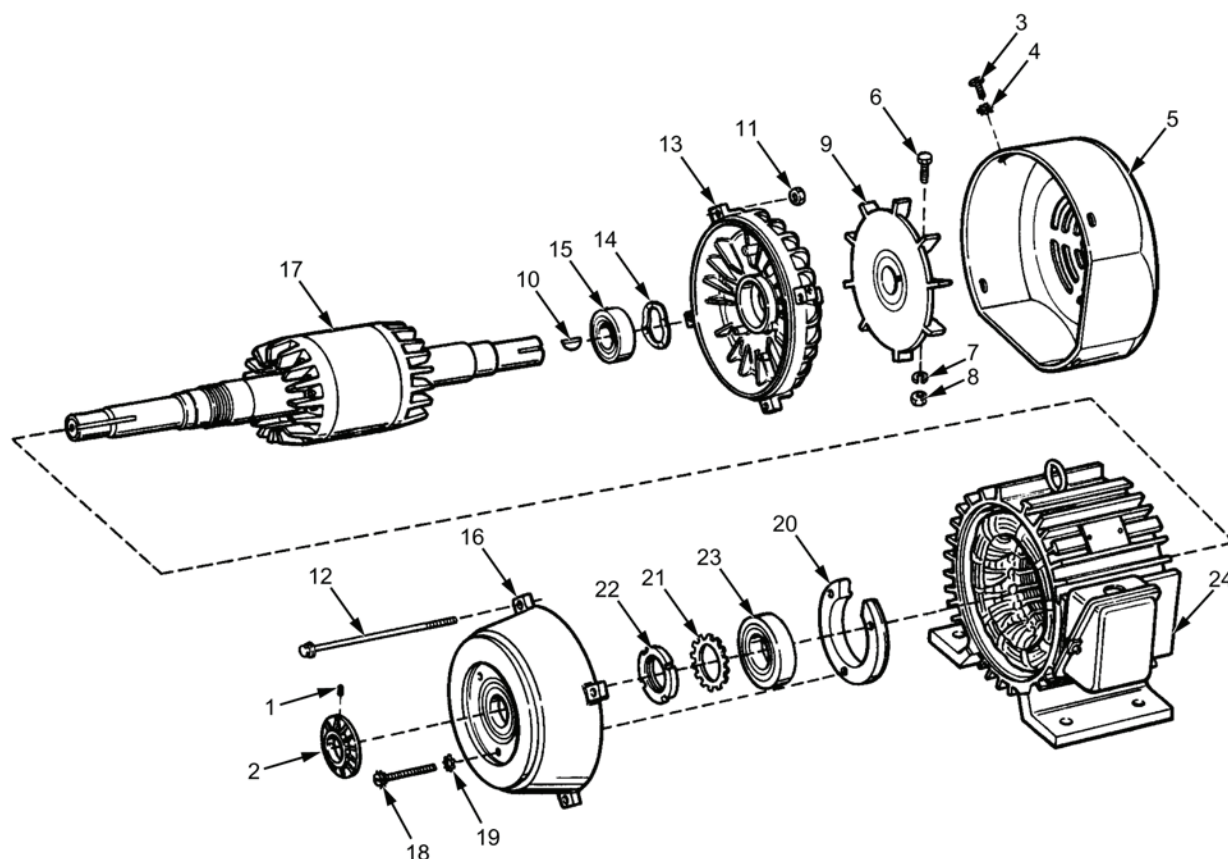


Figure 1. Booster Pump Motor.

TESTING**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.

Place rotor in growler and test for shorts and open connections.

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. If either bearing (15 or 23) is replaced, replace both bearings to prevent early failure. Refer to TM 9-214 for bearing repair.
2. Replace any damaged parts.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install bearings (23) and (15) on respective ends of rotor shaft. Use a brass drift to seat bearing (15).
2. Place lock ring (21) with internal tab in keyway on rotor shaft (17). Install retaining nut (22). Tighten retaining nut (22) snugly against lock ring (21) and then back off one tab on lock ring (21). Bend a tab on lock ring (21) into the slot provided on retaining nut (22) to ensure the nut does not loosen in service.
3. Reinstall subassembled rotor shaft (17) front end in drive end housing (16), install horseshoe-shaped backing ring (20) and secure with three screws (18) and lockwashers (19).
4. Install subassembled rotor shaft (17) and drive end housing (16) in stator housing (24).
5. Install spring washer (14) in fan end housing (13) and install fan end housing (13) in stator housing (24) and bearing (15). Secure with through bolts (12) and nuts (11).
6. Install key (10).
7. Install fan (9) on motor shaft and tighten two capscrews (6), lockwashers (7) and nuts (8) to secure the fan to the shaft.
8. Install fan shroud (5) to fan end housing (13) with four screws (3) and lockwashers (4).
9. Install ring (2) and tighten two setscrews (1).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
CARTRIDGE FILTER ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Tap and Die Set (TM 10-4610-232-12)
Wire Brush (TM 10-4610-232-12)
Welding Equipment (TM 10-4610-232-12)

Equipment Conditions:

Cartridge filter disassembled.
(WP 0081 00, TM 10-4610-232-12)

References:

TB 43-0218
TM 43-0139
TM 9-237

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Clean dirt and paint from area to be repaired.
2. Weld damaged areas. For welding procedures, refer to TM 9-237.
3. Paint all areas repaired. Refer to TM 43-0139.
4. Repair threads as needed.

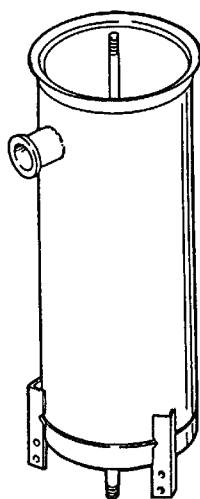


Figure 1. Cartridge Filter.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MODEL NO. WTA-060, NSN 4610-01-219-8707
BUTTERFLY VALVE WITH ACTUATOR (LOWER SECTION)
DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Arbor Press (TM 10-4610-232-12)
Pliers, Retaining Ring, Internal (TM 10-4610-232-12)
Pliers, Retaining Ring, External (TM 10-4610-232-12)
Tool, Valve, Actuator (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Butterfly valve and upper section of valve
actuator removed. (WP 0087 00,
TM 10-4610-232-12)

Materials/Parts:

Lockwasher (TM 10-4610-232-24P)
Tape, Antiseize (Item 70, WP 0102 00)
Preformed Packing (TM 10-4610-232-24P)

References:

TB 43-0218

DISASSEMBLY**WARNING**

Do not attempt to disassemble spring and piston assembly to a greater extent than directed below. The spring is very powerful. If released, it can cause injury or death.

1. Disassemble the lower section of the actuator valve to the extent indicated.
2. Attach and secure the valve actuator tool to cylinder cover (1) with the socket head screw located in the center of the tool.

NOTE

The bent end of wire retainer fits into the hole in cover.

3. Using the valve actuator tool, turn the cylinder cover (1) counterclockwise to push the end of wire retainer (2) out of the slot in cylinder (3). Continue turning until wire retainer (2) can be removed from cylinder cover (1).

WARNING

When removing actuator tool there may be spring tension on cover, which may cause injury.

4. Remove cylinder cover (1) and preformed packings (4 and 5).

WARNING

The snap ring is under pressure. Remove with care to avoid injury.

5. To remove snap ring (6), use arbor press to apply pressure to cap (7).
6. Cap (7) and teflon bearing (8) can now be removed.

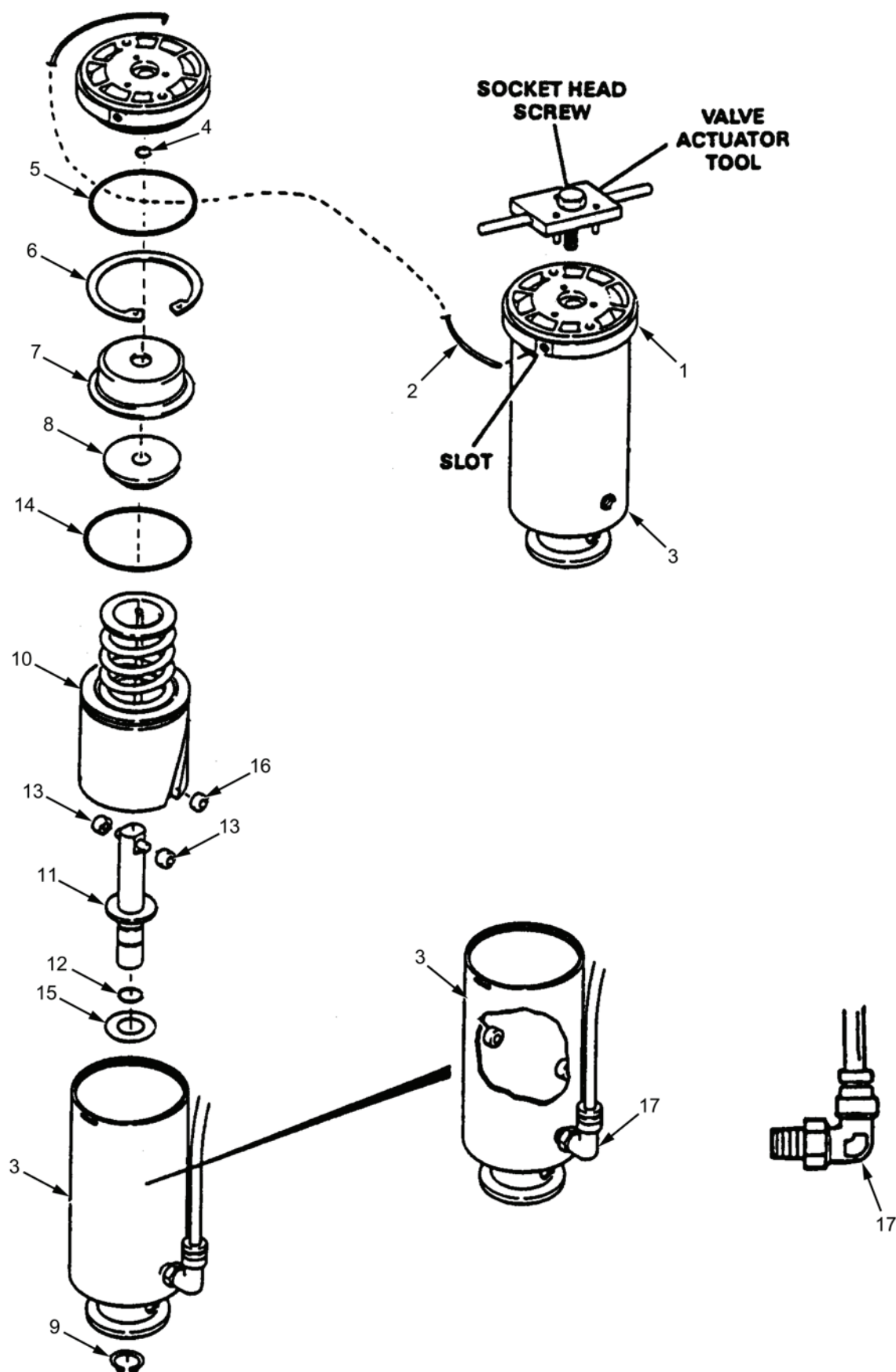


Figure 1. Butterfly Valve w/Actuator Lower Section.

WARNING

Do not disassemble spring and piston assembly. Further disassembly of spring and piston assembly can release spring tension with explosive force, causing possible serious injury or death to personnel.

7. Remove snap ring (9).
8. Push spring and piston assembly (10) upward from bottom of cylinder (3) until completely removed.
9. Parts (11-13) will come out with spring and piston assembly (10).
10. Remove preformed packing (14) from spring and piston assembly (10).
11. Remove teflon bearing (15).
12. Remove stem (11) from spring and piston assembly (10).
13. Remove preformed packing (12) and rollers (13) from stem (11).
14. Remove rollers (16) from cylinder (3).
15. Remove elbow (17) from cylinder (3).

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace all damaged, missing or unserviceable parts.
2. Replace damaged preformed packing and snap rings.
3. Repair leaks at fittings with antiseize tape.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install elbow (17) on cylinder (3).
2. Install rollers (16) in cylinder (3).
3. Install rollers (13) and preformed packing (12) on stem (11).

4. Install stem (11) into spring and piston assembly (10).
5. Install preformed packing (14) on spring and piston assembly (10).

NOTE

Be sure grooves in piston line up with rollers in cylinders.

6. Install teflon bearing (15) in cylinder (3) and install spring and piston assembly (10).
7. Install snap ring (9) around stem (11).
8. Install teflon bearing (8) on spring.
9. Install cap (7).
10. Install snap ring (6) by applying enough pressure, with an arbor press, so that cap rim is below snap ring cylinder groove.
11. Install preformed packings (4 and 5) on cylinder cover (1).

NOTE

Align holes in cover and cylinder.

12. Install cylinder cover (1) and mount valve actuator valve tool and socket head screw.
13. Install wire retainer (2) bent end into cover (1) and turn clockwise until all of wire retainer (2) is completely in.
14. Remove socket head screw and valve actuator tool from cylinder cover (1).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MODEL NO. ROWPU-1, NSN 4610-01-371-1790
BUTTERFLY VALVE WITH ACTUATOR (LOWER SECTION)
DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Arbor Press (TM 10-4610-232-12)
Pliers, Retaining Ring, External (TM 10-4610-232-12)
Pliers, Retaining Ring, Internal (TM 10-4610-232-12)
Tool, Valve, Actuator (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Butterfly valve and upper section of valve
actuator removed.
(WP 0088 00, TM 10-4610-232-12).

References:

TB 43-0218

Materials/Parts:

Tape, Antiseize (Item 70, WP 0102 00)
Preformed Packing (TM 10-4610-232-24P)

DISASSEMBLY

1. Place a sleeve around rising stem (1) so that all pressure from the press will be applied to the surface of the mounting adapter (2).

WARNING

Severe injury or death may occur from releasing internal parts of the actuator which are under spring pressure inside the actuator. Do not attempt to disassemble the actuator unless it is securely and properly placed within a press.

2. Place the actuator in place into a press with the ram of the press centered on the actuator. When placing the actuator in the press, be sure the coupler (3) is free to rotate.
3. Match mark mounting adapter (2) with actuator cylinder (4) for use during reassembly.
4. Slowly push the mounting adapter (2) into the actuator cylinder (4) until the split wire retaining ring (5) is accessible.
5. Remove the split wire retaining ring (5) from its groove in the actuator cylinder (4).
6. Slowly release the ram of the press until the springs inside the actuator stop pushing against the ram. The piston assembly (6) will rise about 2.00 inch above the actuator cylinder (4) before the springs reach free length and stop pushing.
7. Remove split wire retaining ring (5), seal retainer (7), vee packing (8), mounting adapter (2), o-ring (9), piston assembly (6), outer spring (10), inner spring (11), thrust drive (12) and thrust bearing (13).
8. Match mark coupler (3) to actuator cylinder (4) and then remove spring pin (14), coupler (3), drive assembly (15), thrust bearing (16) and o-ring (17) from actuator cylinder (4).
9. Remove two bearings (18) and two bearings (19) from drive assembly (15) and actuator cylinder (4).

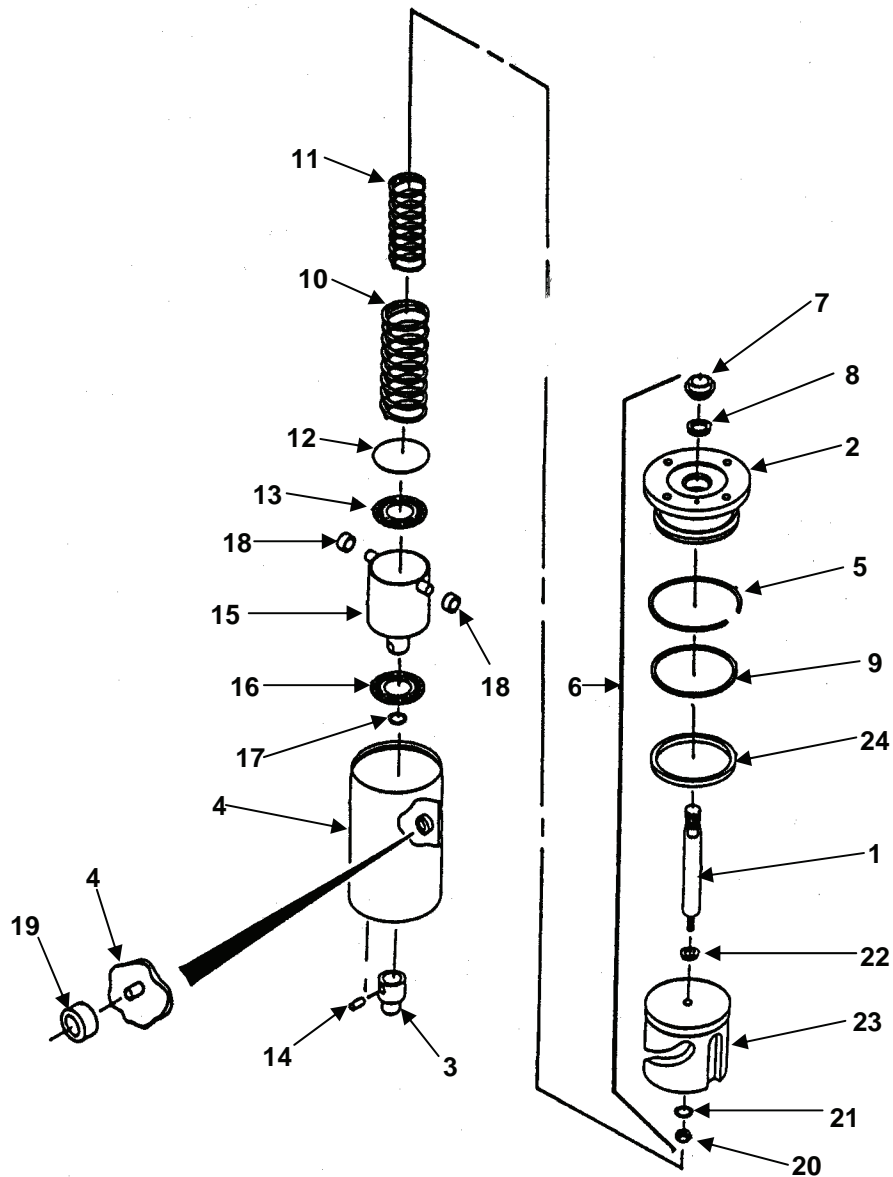


Figure 1. Butterfly Valve w/Actuator Lower Section.
(Model ROWPU-1 only)

CAUTION

Damage to the smooth surface of rising stem will cause the actuator to fail. When removing the rising stem, do not scar the smooth surface of the stem. Use flat surfaces near top of the stem at threads at the wrench gripping area.

10. Remove nut (20), lockwasher (21), gasket (22) and rising stem (1) from piston (23).
11. Remove o-ring (24) from piston (23).

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace all damaged, missing or unserviceable parts.
2. Replace damaged preformed packing and snap rings.

ASSEMBLY

1. Lubricate and install o-ring (24) onto piston (23).
2. Lubricate and install two bearings (19) onto actuator cylinder (4) and two bearings (18) onto drive assembly (15).
3. Lubricate and install thrust bearing (13) into drive assembly (15). Place thrust drive (12) onto top of thrust bearing (13).
4. Lubricate and install o-ring (17) onto drive assembly (15).
5. Install thrust bearing (16) into bottom of actuator cylinder (4).

CAUTION

Damage to smooth surface of rising stem will cause the actuator to fail. When removing the rising stem, do not scar the smooth surface of the stem. Use flat surfaces near the top of the stem at threads at the wrench gripping area.

6. Assemble rising stem (1), gasket (22), lockwasher (21) and nut (20) onto piston (23).
7. Install vee packing (8), seal retainer (7), O-ring (9) and split retaining ring (5) onto mounting adapter (2) and rising stem (1) as follows:
 - a. Cover the threads of rising stem (1) with tape.
 - b. Slide the vee packing (8) over the rising stem (1) with the "V" side facing down (toward the piston).
 - c. Partially insert the vee packing (8) into the smallest counterbore on the top of the mounting adapter (2) using a flat tool to assist the outer lip of the vee packing.
 - d. Slide the seal retainer (7) over the rising stem (1) and onto the vee packing (8).
 - e. Complete the installation of the vee packing (8) by pushing the seal retainer (7) into place.
 - f. Remove masking tape from rising stem (1).
8. Place inner spring (11) and outer spring (10) into drive assembly (15).

CAUTION

Damage to the actuator will occur or the actuator will not function properly if internal bearings are not correctly aligned. Be sure that all bearings on the drive assembly are aligned with the grooves on the sides of the piston.

9. Before pressing piston assembly (6) and mounting adapter (2) into the actuator cylinder (4), the bearings in the cylinder and on the drive assembly (15) must be properly aligned with the grooves in the piston (23). To align bearings, do the following:
 - a. Look inside the cylinder and mark the outside surface of actuator cylinder (4) to indicate the locations of center line bearings (19) inside the cylinder.
 - b. Place the piston assembly (6) onto the inner and outer springs (11) and (10) which have been placed into drive assembly (15).
 - c. Align the vertical bearing groove of the piston (23) with the mark made on the outside of the cylinder in step a.
 - d. Place another mark on the outside surface of cylinder (4) to indicate where the centerline of the curved bearing groove is when the vertical groove is aligned with the mark made in step a.
 - e. Remove the piston assembly (6) from actuator cylinder (4).
 - f. Rotate the drive assembly (15) inside actuator cylinder (4) until the bearings on drive assembly (15) line up with the mark made on the outside of the cylinder in step d. to align the bearings on the drive assembly with the curved groove of the piston.
 - g. Hold drive assembly (15) into position and place the piston assembly (6) onto the inner (11) and outer (10) springs being careful not to let the drive assembly (15) move inside actuator cylinder (4).
 - h. Align the vertical groove of the piston (23) with the mark on the outside of actuator cylinder (4) indicating the centerline of bearings (19) and place the entire actuator assembly into a press while carefully maintaining the alignment of the drive assembly (15), actuator cylinder (4) and piston assembly (6).
10. Place mounting adapter (2) onto the top of piston assembly (6) aligning mounting adapter (2) with both marks made on actuator cylinder (4) during disassembly.
11. Place a sleeve around rising stem (1) so that all pressure from the press will be applied to the surface of the mounting adapter (2).

CAUTION

Internal parts of the actuator can be damaged if excessive force is used to install parts. Mounting adapter should be slowly pressed into actuator cylinder with minimal force. If the force needed to press adapter mounting into cylinder seems great, slowly release press and check that all internal parts are properly aligned with the grooves of the piston.

12. Slowly press the mounting adapter (2) inside the actuator cylinder (4) far enough to install the split wire retaining ring (5) and then install the split wire retaining ring.
13. Slowly release the press.

CAUTION

**Misalignment of coupler will cause possible failure to actuator.
Be sure to align coupler with match mark on cylinder.**

14. Install coupler (3) and spring pin (14) onto actuator cylinder (4).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
PRODUCT RELIEF VALVE
REMOVAL, TESTING, ADJUST, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Dead Weight Tester (TM 10-4610-232-12)

Materials/Parts:

Gaskets (TM 10-4610-232-24P)

References:

TB 43-0218

REMOVAL

1. Loosen two thumbscrews (1) connecting valve assembly (2) to piping.
2. Open two clamps (3) and remove valve assembly (2)
3. Remove two gaskets (4).

TESTING

1. Connect the product relief valve to a dead weight tester with a source of hydraulic pressure.
2. Increase the pressure until the valve "relieves" and note the pressure. The pressure should be between 44 and 46 psi.
3. If it is not within the above limits, adjust the valve.

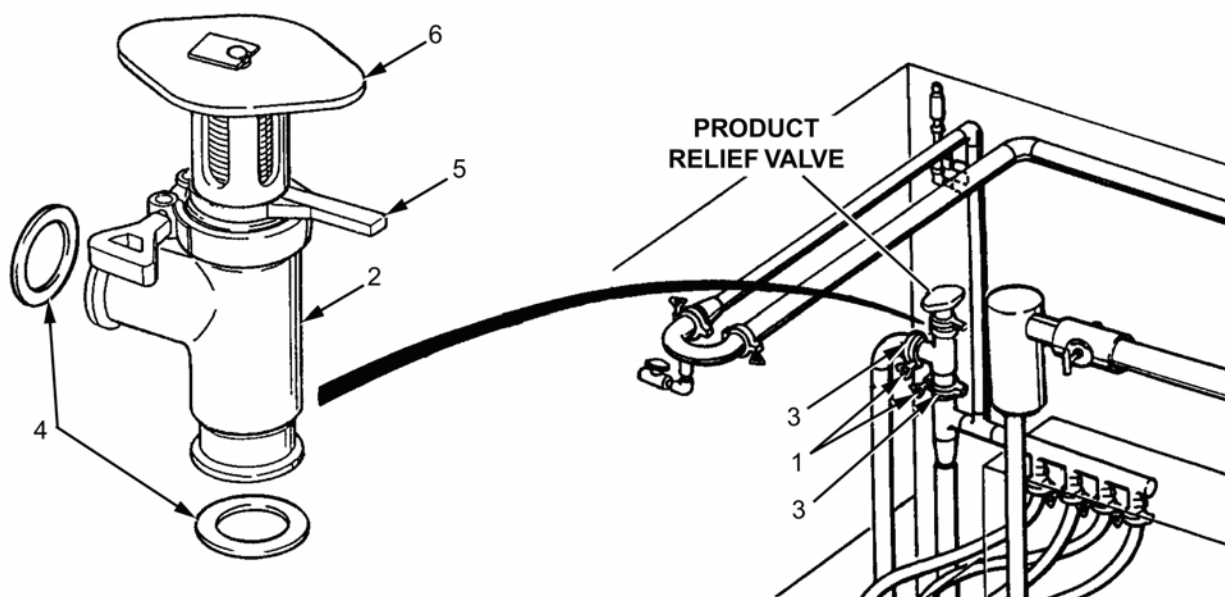


Figure 1. Product Relief Valve.

ADJUSTMENT

1. Turn lock handle (5) clockwise to unlock handle assembly (6).
2. Turn handle assembly (6) clockwise to increase relief valve pressure setting. Turn handle assembly (6) counter clockwise to decrease relief valve pressure setting. Adjust so valve relieves at 45 psi \pm 1 psi.
3. Turn lock handle (5) counter clockwise to lock handle assembly (6) in place.

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install two gaskets (4) and valve assembly (2) on piping.
2. Secure with two clamps (3). Tighten with two thumbscrews (1).

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
WASTE RELIEF VALVE
REMOVAL, TESTING, ADJUST, INSTALLATION**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Dead Weight Tester (TM 10-4610-232-12)

Materials/Parts:

Gaskets (TM 10-4610-232-24P)

References:

TB 43-0218

REMOVAL

1. Loosen two thumbscrews (1) connecting valve assembly (2) to hose and piping.
2. Open two clamps (3) and remove valve assembly (2) from hose (4) and piping.
3. Remove two gaskets (5).

TESTING

1. Connect the waste relief valve to a dead weight tester with a source of hydraulic pressure.
2. Increase the pressure until the valve "relieves" and note the pressure. The pressure should be between 29 and 31 psi.
3. If it is not within the above limits, adjust the valve.

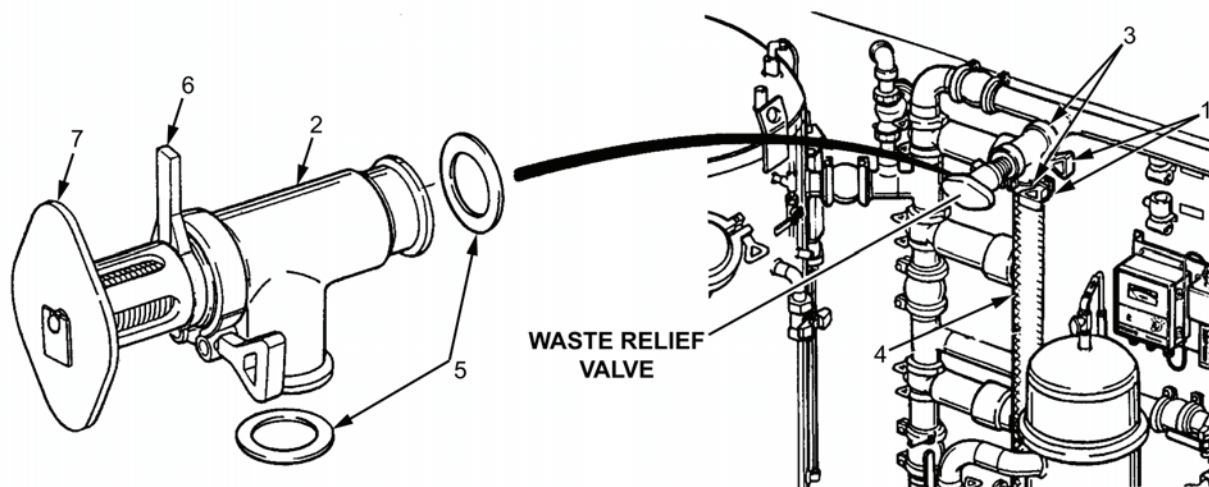


Figure 1. Waste Relief Valve.

ADJUSTMENT

1. Turn lock handle (6) clockwise to unlock handle assembly (7).
2. Turn handle assembly (7) clockwise to increase relief valve pressure setting. Turn handle assembly (7) counter clockwise to decrease relief valve pressure setting. Adjust so valve relieves at 30 psi \pm 1 psi.

3. Turn lock handle (6) counter clockwise to lock handle assembly (7) in place.

INSTALLATION

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install two gaskets (5) and valve assembly (2) on piping.
2. Secure with two clamps (3). Tighten with two thumbscrews (1).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
LOW PRESSURE SOLENOID VALVES CABLE ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cable (1) as described in WP 0010 00.

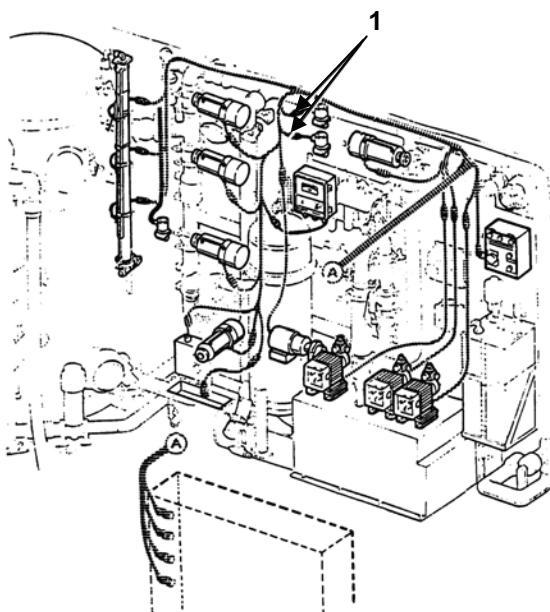


Figure 1. Low Pressure Solenoid Valve Cables.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MEDIA FILTER AIR BLANKET LEVEL INDICATOR CABLE ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cables (1) as described in WP 0010 00.

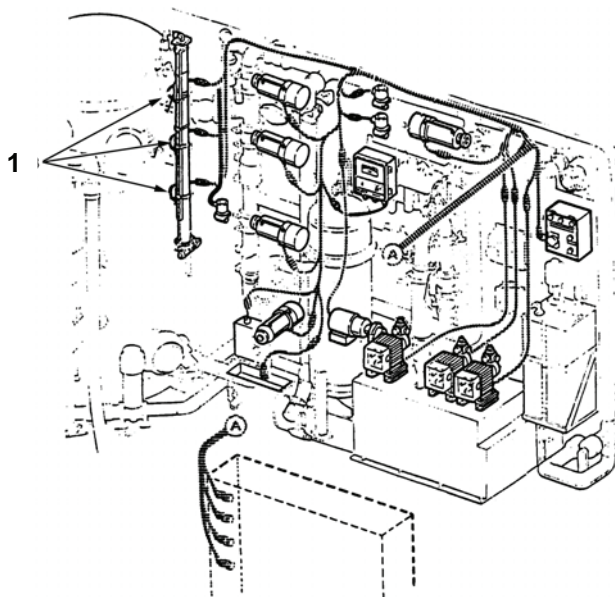


Figure 1. Meter Filter Air Blanket Level Indicator Cables.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MEDIA FILTER ASSEMBLY
REMOVAL, SERVICE, INSTALLATION**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Lifting Equipment (TM 10-4610-232-12)
20' Ladder (TM 10-4610-232-12)

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)
Media Gravel (Item 57/58, WP 0102 00)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Media filter air blanket level indicator removed
(WP 0092 00, TM 10-4610-232-12).
Media filter disassembled
(WP 0093 00, TM 10-4610-232-12).
High pressure pump frame/skid removed
(WP 0072 00).

References:

TB 43-0218

REMOVAL**WARNING**

The media filter is very heavy. Use extreme care to ensure the filter is properly rigged for removal and lifting equipment and slings are adequate to support the weight of the filter. Personnel should stand clear during the removal or installation of the filter. Serious injury could result if these precautions are not observed.

1. Unlock 32 fasteners (1) and remove front access panel (2).
2. On Model WTA-060, remove 72 capscrews (3), lockwashers (4), flat washers (5) and top panel (6). Discard lockwashers.
3. On Model ROWPU-1, remove 71 capscrews (3), lockwashers (4), flat washers (5) and top panel (6). Discard lockwashers.
4. Loosen and remove four turnbuckles (7) from "D" rings (8) and lifting brackets (9).
5. Remove four capscrews (10) (two at each end), lockwashers (11) and flat washers (12) from support crossbeam (13) and remove support crossbeam. Discard lockwashers.
6. Remove six capscrews (14), lockwashers (15) and flat washers (16). Media filter (17) is now free. Discard lockwashers.

CAUTION

Do not exert any pressure on or allow clean/flush tank to be bumped. Equipment could be damaged.

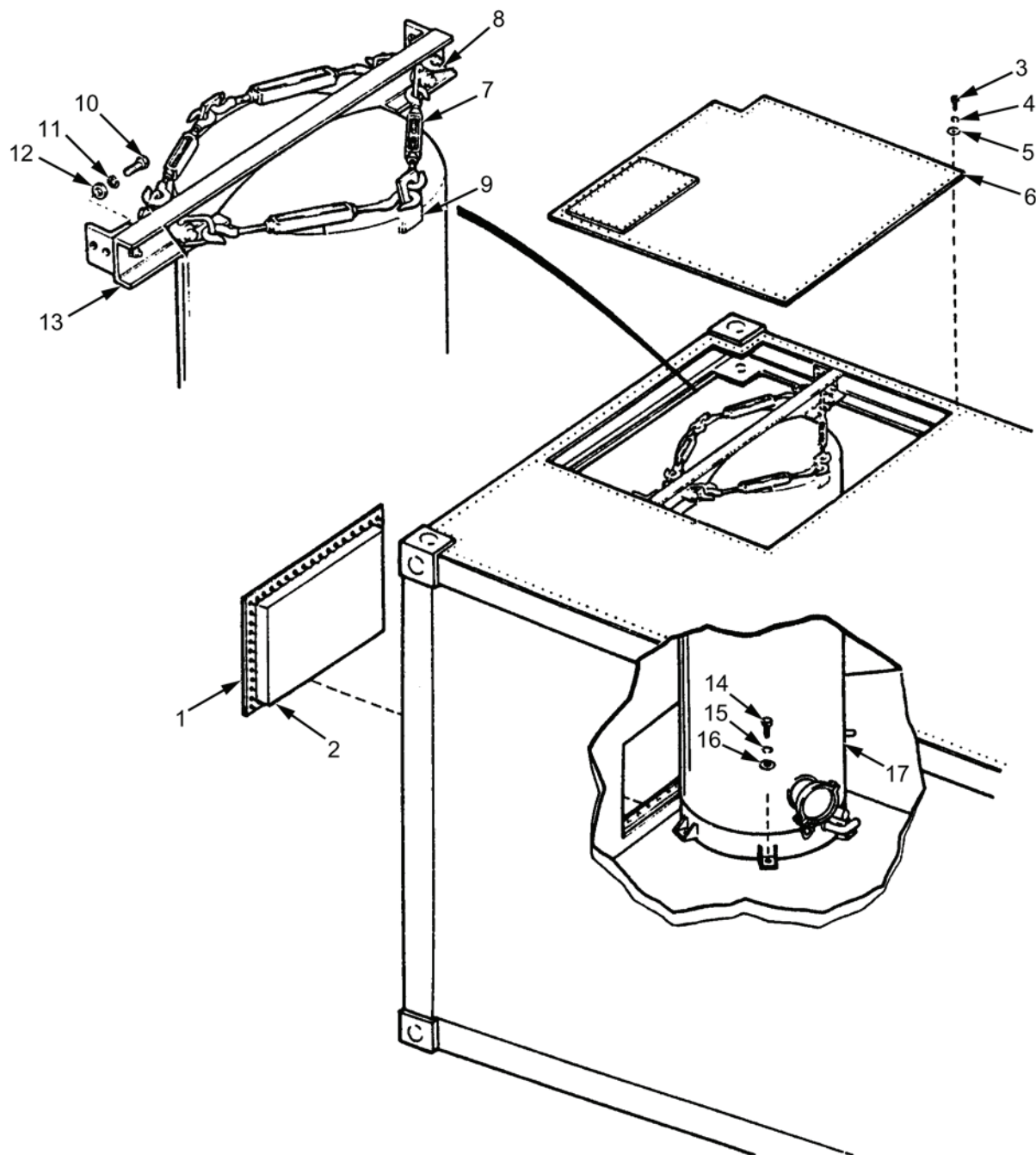
CAUTION

Filter must be turned as it is lifted to allow pipe stub ends and flanges to clear van opening to avoid equipment damage.

7. Attach a suitable lifting sling to the lifting brackets (9) on the top of the media filter (17) and lift the filter straight up and out of the ROWPU.

SERVICE

1. Tip tank on side at about a 30° angle, and using hose, wash out gravel through bottom flange.
2. After hosing out tank, drain tank and stand upright.
3. Replace media gravel.

**Figure 1. Media Filter.**

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

When installing gravel, level each layer before installing next layer.

1. Attach a suitable sling to brackets (9). Lift and lower media filter (17) through the ROWPU top access panel opening.

NOTE

Ensure all piping connections align to media filter before tightening capscrews.

2. Position media filter (17) over mounting holes on base of ROWPU and install flat washers (16), new lockwashers (15) and capscrews (14).
3. Install support crossbeam (13) and secure with flat washers (12), new lockwashers (11) and capscrews (10).
4. Attach turnbuckles (7) to "D" rings (8) and brackets (9). Tighten turnbuckles hand tight.

CAUTION

Turnbuckles must be tightened equally. Otherwise the tank or container may be damaged.

5. Tighten turnbuckles (7) an additional half turn in quarter turn increments.
6. On Model WTA-060, position top panel (6) and secure with 72 flat washers (5), new lockwashers (4) and capscrews (3).
7. On Model ROWPU-1, position top panel (6) and secure with 71 flat washers (5), new lockwashers (4) and capscrews (3).
8. Install front access panel (2) and secure with 32 fasteners (1).

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
CLEAN/FLUSH TANK
REMOVAL, REPAIR, INSTALLATION**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Welding Equipment (TM 10-4610-232-12)
Lifting Equipment (TM 10-4610-232-12)

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)

References:

TB 43-0218
TM 9-237

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Clean/flush tank disassembled
(WP 0094 00, TM 10-4610-232-12).
Polyelectrolyte and sequestrant tank assemblies
removed (WP 0095 00, TM 10-4610-232-12).
Chemical tank frame removed
(WP 0096 00, TM 10-4610-232-12).
Hoses removed (WP 0072 00).
Cables removed (WP 0022 00).

REMOVAL

1. Remove four nuts (1), four lockwashers (2), eight flat washers (3) and four capscrews (4). Discard lockwashers.

WARNING

To avoid injury, three people are required to lift the tank.

CAUTION

**The clean/flush tank is a fiberglass tank and can be easily damaged.
Avoid sharp corners or edges; pay particular attention to the pedestal
base corners.**

2. Remove clean/flush tank lid (5) and remove clean/flush tank (6) out of ROWPU.
3. Remove four capscrews (7), four lockwashers (8) and washers (9). Discard lockwashers.
4. Remove pedestal base (10).

REPAIR

1. Replace damaged components.
2. Weld pedestal base, if required, in accordance with TM 9-237.

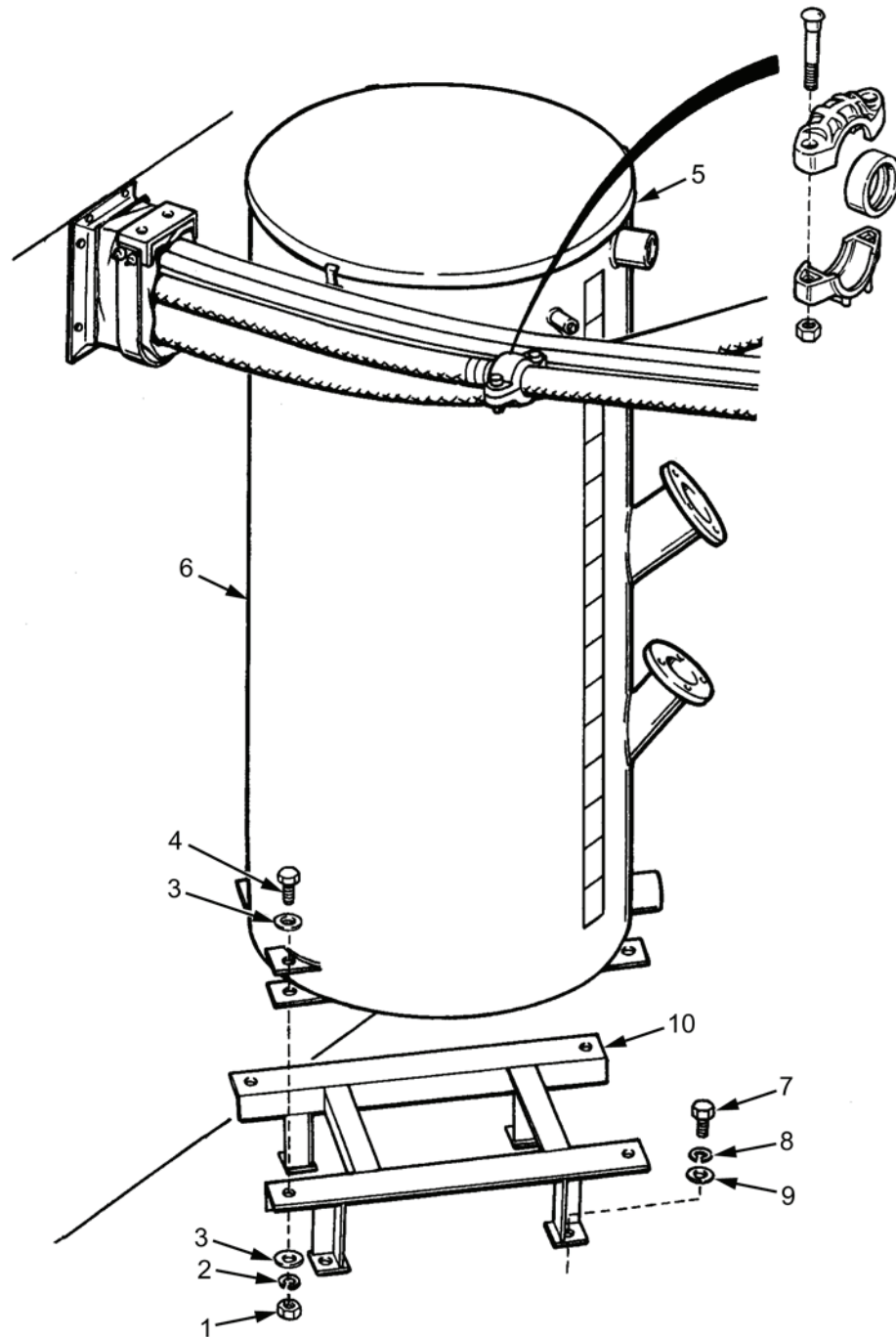


Figure 1. Clean/Flush Tank.

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Position pedestal base (10) and secure with four capscrews (7), four new lockwashers (8), and four washers (9).

WARNING

To avoid injury, three people are required to lift the tank.

CAUTION

The clean/flush tank is a fiber tank and can be easily damaged. Avoid sharp corners or edges; pay particular attention to the pedestal base corners.

2. Install clean/flush tank (6) and secure with four capscrews (4), eight flat washers (3), four new lockwashers (2) and four nuts (1). Install clean/flush tank lid (5).

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
CHEMICAL TANK FRAME
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Welding Equipment (TM 10-4610-232-12)

References:

TB 43-0218

TM 9-450

TM 9-237

TM 43-0139

Equipment Conditions:

Frame disassembled

(WP 0096 00. TM 10-4610-232-12).

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Clean dirt and paint from area to be repaired.
2. Repair metal bodies, refer to TM 9-450.
3. Weld damaged areas. For welding procedures, refer to TM 9-237.
4. Paint all areas repaired. Refer to TM 43-0139.

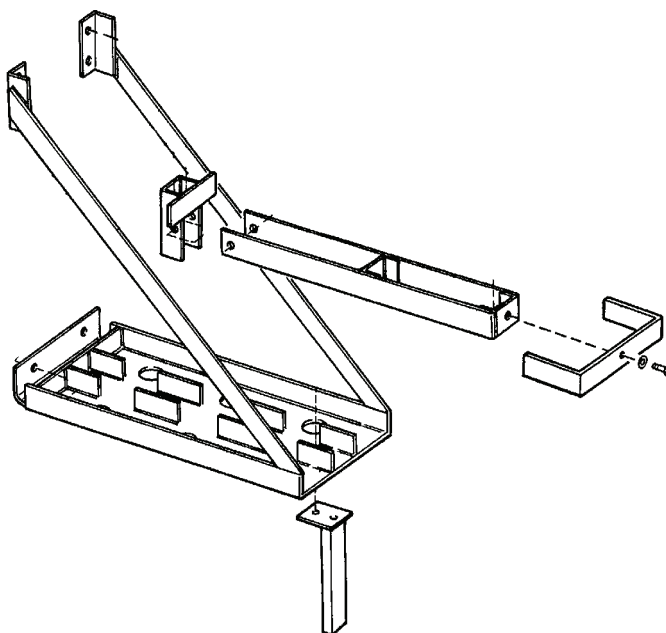


Figure 1. Chemical Tank Frame.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE SOLENOID VALVE
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Electrical Connector Repair Kit (TM 10-4610-232-12)
Stripper, Wire (TM 10-4610-232-12)

References:

TB 43-0218

Equipment Conditions:

Compressor ON/OFF switch in OFF position.

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)
Sealant (Item 65, WP 0102 00)
Soap (Item 68, WP 0102 00)
Tape, Antiseize (Item 70, WP 0102 00)
Washers (TM 10-4610-232-24P)

REMOVAL

1. Turn compressor ON/OFF switch to OFF.
2. Close air tank valve (1).

WARNING

The air filter blowdown valve and solenoid block valve must be bled (open) before removing the solenoid valve. Failure to do so could result in serious injury from high pressure air.

3. Open air filter blowdown valve (2) and solenoid block valve (3) to release air pressure — LEAVE OPEN.
4. Remove table panel (4) as follows:
 - a. Remove four nuts (5) and washers (6).
 - b. Remove four capscrews (7) and two tie down brackets (8).
 - c. Remove four screws (9) from panel (4).
 - d. Slide panel (4) from under storage box (10).
5. Unscrew tubing nuts on elbows (11) and (12) and remove tubing (13).
6. Unscrew tubing nut on fitting (14) and remove tubing (15).
7. Disconnect electrical cable P28 (16) from main harness J28.
8. Remove nuts (17), lockwashers (18) and flat washers (19) from U-clamp (20). Remove U-clamp (20). Discard lockwashers.
9. Remove solenoid valve (21).

DISASSEMBLY

1. Unscrew fitting (14) from solenoid valve (21).
2. Unscrew block valve (3), nipple (22), and elbow (11) from solenoid valve (21).
3. Disassemble front of solenoid valve (21).
 - a. Loosen and remove screw (23), identification plate (24) and preformed packing (25).
 - b. Remove heat shrink tubing and cable connector as described in WP 0010 00.
 - c. Loosen nut (26), bushing (27), adapter body (28) and sealing washer (29).
 - d. Remove coil cover (30), preformed packing (31), electrical coil (32), lower end plate (33) and preformed packing (34).
4. Disassemble back of solenoid valve (21).
 - a. Loosen and unscrew cylinder cap (35) from valve body (36). Remove preformed packing (37) and return spring (38).
 - b. Unscrew stem stop (39) and remove stem (40) and stem spring (41) from detent plunger (42).
 - c. Remove seat screw (43) and spacer (44) from valve body (36).

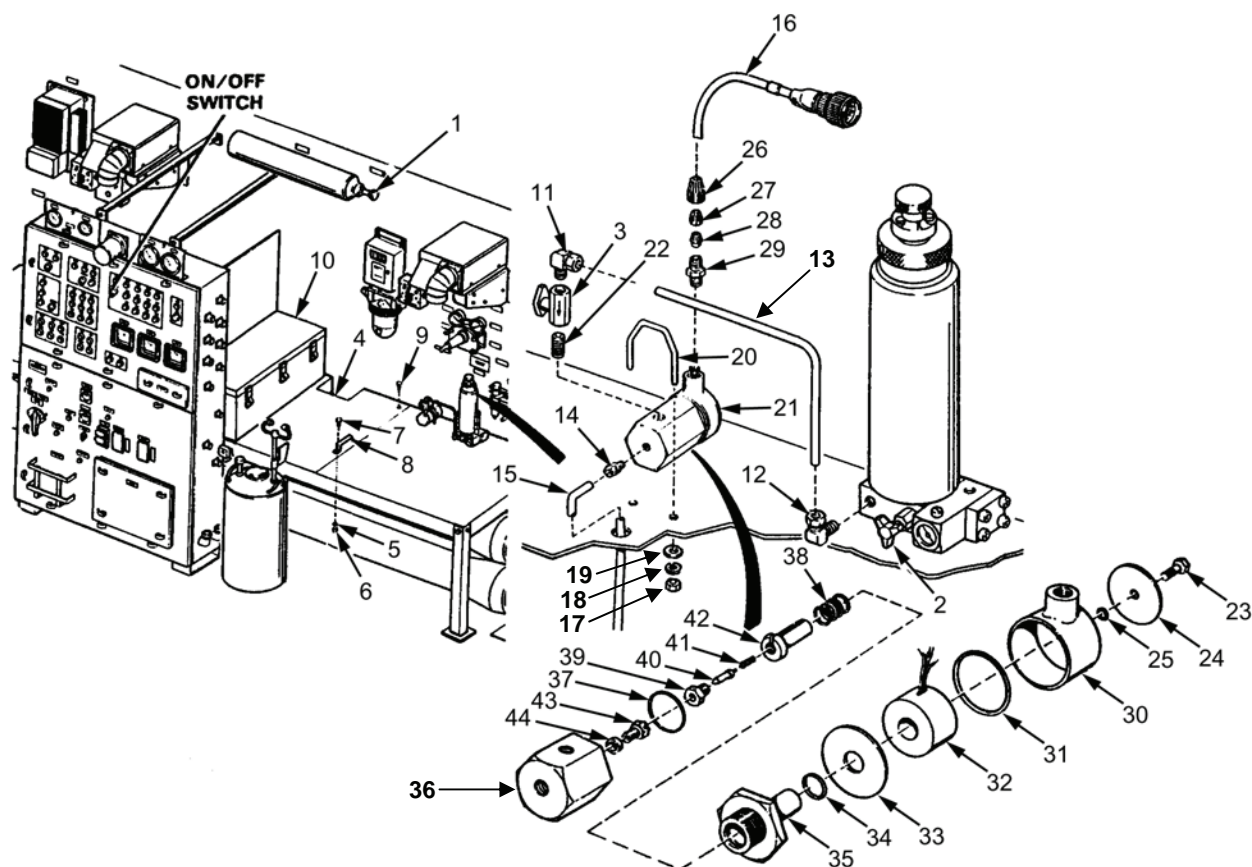


Figure 1. High Pressure Solenoid Valve.

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace damaged components.
2. Repair cable (16) as described in WP 0010 00.
3. Repair leaks at pipe threads with anti-seize tape and pipe thread sealant.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

When installing block valve, make sure arrow is pointing down.

1. Install nipple (22) and block valve (3) on solenoid valve (21).
2. Install fitting (14) on solenoid.
3. Assemble back of solenoid valve (21).
 - a. Assemble seat screw (43) and spacer (44) into valve body (36). Tighten screw to secure.
 - b. Screw stem stop (39) with stem (40) and stem spring (41) and install into detent plunger (42). Tighten screw to secure.
 - c. Install spring (38) on detent plunger (42). Install preformed packing (37) and detent plunger (42) into valve body (36).
 - d. Screw cylinder cap (35) into valve body (36). Tighten to secure.
4. Assemble front of solenoid valve (21).
 - a. Install preformed packing (34) and lower end plate (33) on cylinder cap (35).
 - b. Install heat shrink tubing on coil wires as described in WP 0010 00.

NOTE

When installing coil cover on cylinder cap, ensure that coil wires are aligned with air inlet port.

- c. Install electrical coil (32) and preformed packing (31) into coil cover (30). Install onto cylinder cap (35).
- d. Install preformed packing (25) and identification plate (24) with screw (23) into cylinder cap (35). Tighten screw to secure.
- e. Install sealing washer (29), adapter body (28), bushing (27) and nut (26) onto solenoid valve (21).
- f. Install cable connector as described in WP 0010 00.

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

- 1. Install solenoid valve (21) and secure with U-clamp (20), flat washers (19), new lockwasher (18) and nut (17).
- 2. Connect cable P28 (16) to main harness J28.
- 3. Install "OUT" tubing line (15) to fitting (14).
- 4. Install "IN" tubing line (13) to elbows (11) and (12) and secure with tubing nuts.
- 5. Place table panel (4) into position by sliding it under edge of storage box (10).
 - a. Install and secure four screws (9).
 - b. Insert four capscrews (7) into two tie down brackets (8) and insert into position
 - c. Secure by installing washers (6) and nuts (5). Tighten securely.
- 6. Close air filter blowdown valve (2) and solenoid block valve (3).
- 7. Turn compressor to "ON".
- 8. Open air tank valve (1).
- 9. Check for air leaks. Tighten fittings if necessary using soapy water.
- 10. Check for leaks through the solenoid valve when it IS closed.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
24 VDC POWER SUPPLY
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Socket Head Wrench (TM 10-4610-232-12)
Stripper, Wire (TM 10-4610-232-12)
Electrical Connector Repair Kit
(TM 10-4610-232-12)
Crimper, Hand Terminal (TM 10-4610-232-12)

References:

TB 43-0218

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Power turned off.
Cable disconnected at CO monitor (WP 0061 00)

Materials/Parts:

Markers, Wire (Item 56, WP 0102 00)
Tags
Tape, Electrical (Item 71, WP 0102 00)
Terminal, Ring (Item 73, WP 0102 00)
Ties, Wire/Tubing (Item 74, WP 0102 00)

REMOVAL**WARNING**

**Make sure electrical power is disconnected before working on unit.
Failure to do so could result in injury or death.**

1. Disconnect cables (1, 2, 3 and 4) and cut tie wraps.
2. Cut tie wraps (5) and remove cable as follows:
 - a. Loosen four captive screws (6) and remove cover (7).
 - b. Loosen nut (8) and slide it down cable (9).
 - c. Tag and disconnect the wires from cable (9) going to terminal board (10). Loosen screws in the front of the terminal board to allow wires to be disconnected from the terminal board.
 - d. Remove conduit nut (11).
 - e. Pull cable (9) out of power supply (12) and remove sealing washer (13) and elbow (14). Slide bushing (15), retainer (16) and nut (8) off cable (9).

WARNING

The power supply is heavy. Two people are required to lift it.

3. Remove four capscrews (17), lockwashers (18) and washers (19) and remove power supply (12). Discard lockwashers.
4. If necessary, remove two socket head screws (20) and mounting bar (21).

DISASSEMBLY**NOTE**

Only one set of cable connectors is shown for all cables. All connectors are the same and all removal procedures are the same.

1. Remove cables (1, 2, 3 and 4) as follows:
 - a. Loosen nut (22) and slide it down on the cable being removed.
 - b. Tag and disconnect the wires removed from terminal board (10).
 - c. Remove conduit nut (23).
 - d. Pull the cable being removed out of power supply (12) and remove connector body (24) and sealing washer (25). Slide bushing (26), retainer (27) and nut (22) off the cable being removed.

NOTE

Wires in EMP (30) are molded and cannot be removed from EMP.

2. Tag and disconnect all wires (28) which go from terminal board (10) to EMP modules (29) and (30). Remove the wires at EMP modules (29) and (30) by removing screws (31).
3. Remove EMP modules (29) and (30) by removing four screws (32).
4. Remove screws (33) and remove terminal board (10).

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace any damaged or missing components.
2. Replace loose or damaged ring tongue connectors (WP 0043 00, TM 10-4610-232-12)
3. Replace missing or damaged wire markers (WP 0043 00, TM 10-4610-232-12).
4. Repair cables in accordance with WP 0010 00.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install terminal board (10) and secure with screws (33).
2. Install EMP modules (29) and (30) and secure with screws (32).
3. Install all wires (28) at terminal board (10) and EMP modules (29) and (30) as tagged.

NOTE

Only one set of cable connectors is shown for all cables. All connectors are the same and all assembly procedures are the same.

4. Install cables (1, 2, 3, and 4) as follows:
 - a. Slide nuts (22), retainers (27) and bushing (26) on each cable.
 - b. Place sealing washer (25) on each connector body (24) and secure in terminal board (10) with conduit nuts (23).
 - c. Insert the cable through connector body (24) into the power supply (12). Tighten nut (22) to secure the cable to the power supply.
 - d. Connect the wires from each cable to terminal board (10) as tagged.
5. Slide nut (8), retainer (16) and bushing (15) onto cable (9). Install sealing washer (13) onto elbow (14) and into power supply (12). Secure with conduit nut (11).
6. Insert cable (9) through elbow (14). Tighten nut (8).
7. Connect cable wires to terminal board (10) as tagged.
8. Install cover (7) and secure with captive screws (6).

INSTALLATION

1. Install mounting bar (21) and secure with socket head screws (20) if removed.

WARNING

The power supply is heavy. Two people are required to lift it.

2. Using two people, lift terminal board (10) and secure it to mounting bar (21) with four capscrews (17), new lockwashers (18) and washers (9).

WARNING

Make sure electrical power is disconnected to the unit. Failure to do so could result in serious injury or death.

3. Connect cable (9) to power supply (12) as follows:
 - a. Slide nut (8), retainer (16) and bushing (15) onto cable (9). Install sealing washer (13) onto elbow (14) and into power supply (12). Secure with conduit nut (11).
 - b. Insert cable (9) through elbow (14). Tighten nut (8).
 - c. Connect cable wires to terminal board (10) as tagged.
 - d. Install cover (7) and secure with captive screws (6).
4. Reconnect cable (9) to the CO monitor (WP 0062 00, TM 10-4610-232-12).
5. Reinstall all tie wraps (5) which were removed (WP 0043 00, TM 10-4610-232-12).
6. Reconnect cables (1 thru 4).

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
DIESEL HEATERS
DISASSEMBLY, REPAIR, ASSEMBLY**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:Heater assembly removed from ROWPU
(WP 0098 00, TM 10-4610-232-12)**Materials/Parts:**

Tags

Banding and Clamps (TM 10-4610-232-12)

Gaskets (TM 10-4610-232-12)

Lockwashers (TM 10-4610-232-12)

References:

TB 43-0218

DISASSEMBLY

1. Remove blower assembly (2) as follows:

NOTE

Tag all electrical leads to ensure correct installation.

- a. Remove clamp (1) from blower assembly (2).
 - b. Remove clamp (3) and disconnect hose (4)
 - c. Tag and disconnect electrical leads (5) and (6) from junction block (7).
 - d. Remove four screws (8) and lift blower assembly (2) straight up and out.
2. Remove ignition pack assembly (13) as follows:
 - a. Remove two nuts (9), lockwashers (10) and capscrews (11) and junction block (7). Discard lockwashers.
 - b. Disconnect electrical lead (12) from ignition pack assembly (13).
 - c. Remove two screws (14), ignition pack assembly (15) and ground wire (16).
 3. Remove burner head assembly (30) follows:
 - a. Disconnect fuel hose (17) from carburetor (18).
 - b. Tag and disconnect electrical leads (19, 20 and 21) from junction block (7).

CAUTION

The carburetor is connected to the burner head by tubing. When removing carburetor, take care not to damage tubing.

- c. Remove four screws (22) and remove carburetor (18) and disconnect tube (23).
- d. Remove nut (24). Tag and disconnect electrical lead (25) from glow plug (26) and junction box (7).
- e. Remove clamp (27) and remove hose (4).

- f. Remove five screws (28), washers (29) and burner head assembly (30).
- g. Remove gasket (31).
- h. Remove glow plug (26) from burner head assembly (30).

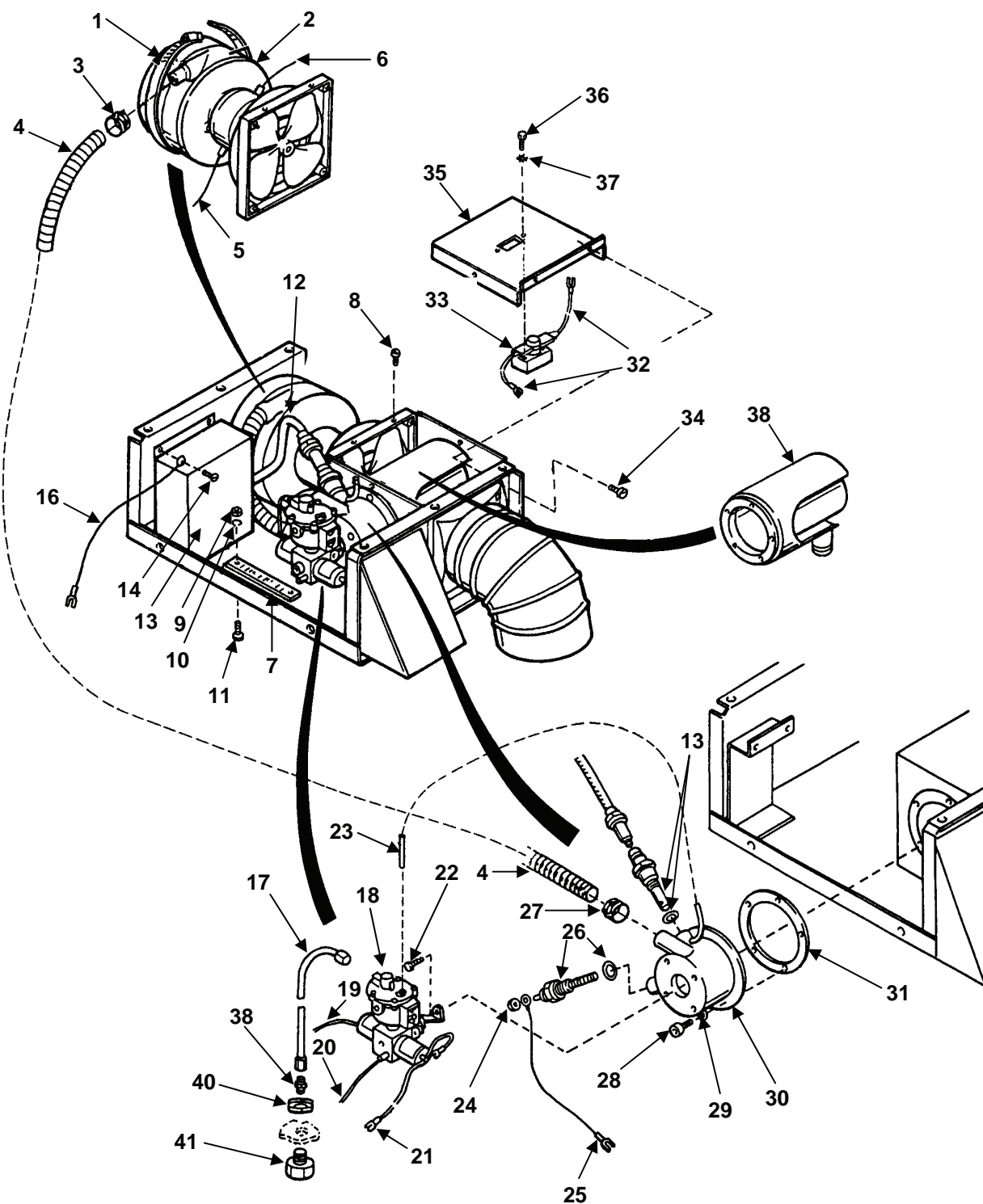


Figure 1. Diesel Heaters.

- i. Remove ignition pack assembly (13) from burner head assembly (30).
4. Remove heat exchanger (38) as follows:
 - a. Tag and disconnect electrical leads (32) from sensor (33) and junction block (7).
 - b. Remove four screws (34) and heat exchanger housing cover (35).
 - c. Remove two screws (36), lockwashers (37) and sensor (33) from heat exchanger housing cover (35). Discard lockwashers.
 - d. Remove heat exchanger (38).
5. Remove fuel line bulhead fitting (41) as follows:
 - a. Remove fuel hose (17) from fitting (39).
 - b. Remove nut (40) and bulkhead fitting (41).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair by replacing worn or damaged components.

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install fuel line bulkhead fitting (41) as follows:
 - a. Install bulkhead fitting (41) and secure with nut (40).
 - b. Install fuel hose (17) on fitting (39).
2. Install heat exchanger (38) as follows:
 - a. Position heat exchanger (38) in heater housing.
 - b. Install sensor (33) on heat exchanger housing cover (35) and secure with two new lockwashers (37) and screws (36).
 - c. Install heat exchanger cover (35) and secure with four screws (34). Connect electrical leads (32) to sensor (33) and junction block (7) as tagged.

3. Install burner head assembly (30) as follows:
 - a. Install igniter assembly (13) and glow plug (26) in burner head assembly (30).
 - b. Install burner head assembly (30), gasket (31) and secure with screws (28) and washers (29).
 - c. Install hose (4) on burner head assembly (30) and secure with clamp (27).
 - d. Install electrical lead (25) as tagged to glow plug (26) and secure with nut (24). Attach lead (25) to junction block (7).

CAUTION

The carburetor is connected to the burner head by tubing. When installing carburetor, take care not to damage tubing.

- e. Install carburetor (18) and tube (23) and secure with screws (22).
 - f. Connect electrical leads (19, 20 and 21) to junction block (7) as tagged.
 - g. Connect fuel hose (17) to carburetor (18).
4. Install ignition pack assembly (13) as follows:
 - a. Install ignition pack assembly (15), ground wire (16) and two screws (14).
 - b. Connect electrical lead (12) to ignition assembly (13).
 - c. Install junction block (7) and secure with two capscrews (11), new lockwashers (10) and nuts (9).
5. Install blower assembly (2) as follows:
 - a. Install blower assembly (2) and secure with four screws (8).
 - b. Install electrical leads (5) and (6) to junction block (7) as tagged.
 - c. Install hose (4) on blower assembly (2) and secure with clamp (3).
 - d. Install clamp (1).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
THERMOSTAT CABLE ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12)
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

This Procedure applies to both thermostats.

Repair cable (1) as described in WP 0010 00.

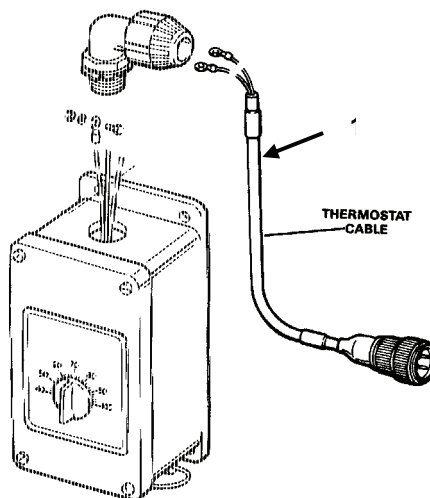


Figure 1. Thermostat Cable.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
CARBON MONOXIDE MONITOR
TESTING, ADJUST, REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Calibration Kit, CO Monitor (TM 10-4610-232-12)

References:

TB 43-0218

Equipment Conditions:

Power supplied to CO monitor (TM 10-4610-232-12).

Materials/Parts:

Tags
Gaskets (TM 10-4610-232-24P)
Lockwashers (TM 10-4610-232-24P)
Preformed Packing (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

TESTING**WARNING**

Inhalation of carbon monoxide can cause serious illness or death.

1. Turn screw (1) 1/4 turn clockwise and open the door.
2. Turn power switch (2) momentarily to off, then on. Verify that main display (3) momentarily lights and displays 8.8.8 and ALARM 2 indicator (4) and SYSTEM OK indicator (5) momentarily light.
3. If after performing the above display test, the green SYSTEM OK indicator (5) goes out and the main display (3) reads P-1 or P-2, refer to adjusting procedure below.
4. If the audible alarm goes on, press the alarm reset button (6) located on the bottom of the case.
5. Press the ALARM 1 button (7). The main display (3) should read 25. If display does not read 25, refer to adjusting procedure below.
6. Push ALARM 2 button (8). The main display (3) should read 50. If display does not read 50, refer to the following adjusting procedure below.

ADJUST

1. Install sensor zero cap (9) into the sensor (10) inlet.
2. Wait approximately 1-1/2 minutes or until a stable reading is displayed.

NOTE

Pot turns clockwise to increase reading.

3. Adjust the zero pot (11) for a reading of 0 on the main display (3).
4. Remove the sensor zero cap (9) and install the calibration adapter (12).
5. Attach flow control (13) to calibration gas tank.
6. Attach tubing (14) to calibration adapter (12) and flow control (13).

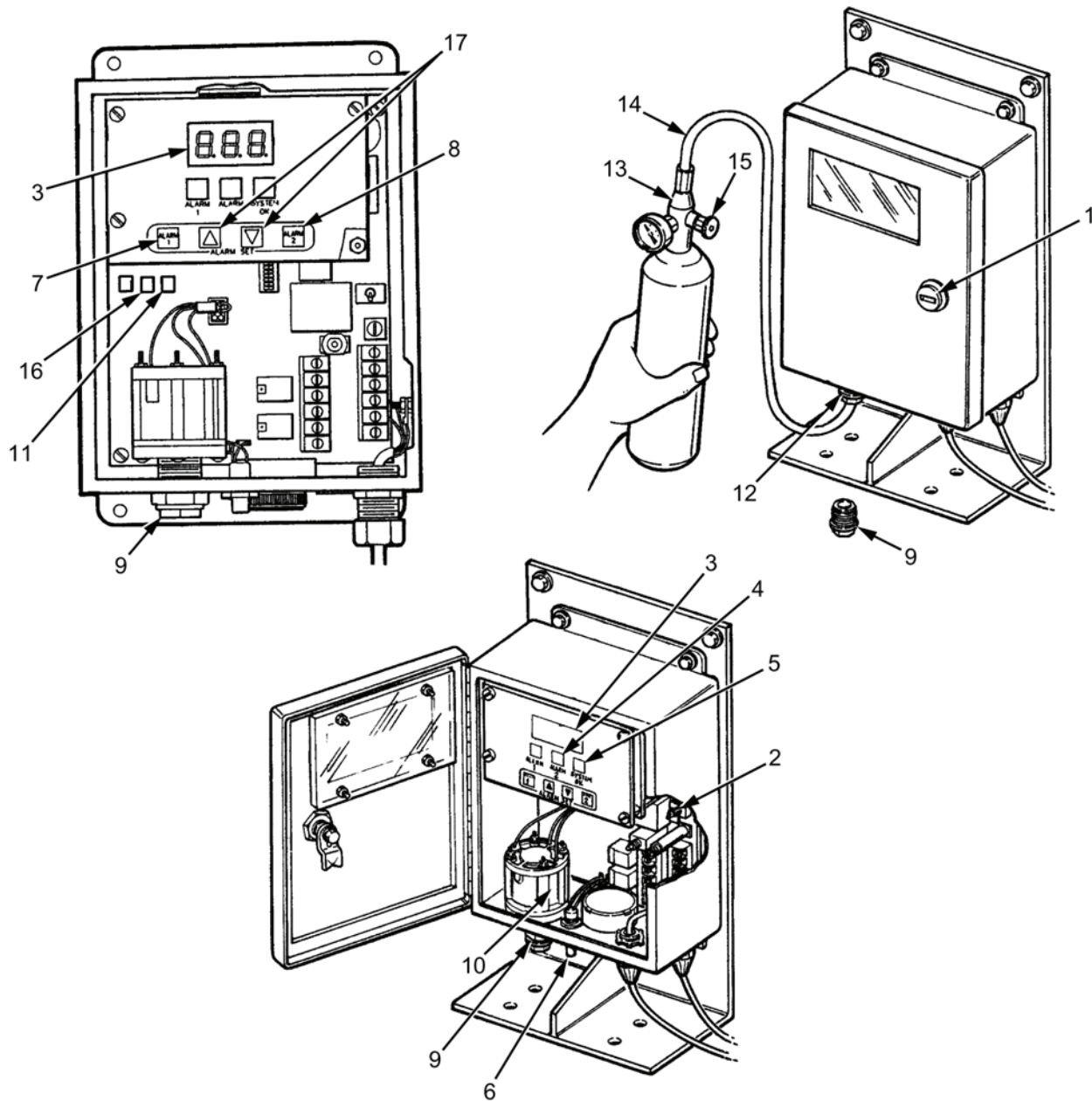


Figure 1. Carbon Monoxide Monitor.

7. Open the flow control valve (15) on the flow control (13) and apply gas for approximately 1-1/2 minutes or until a stable reading is displayed. Then close flow control valve.

NOTE

Pot turns clockwise to increase reading.

8. Adjust the span pot (16) until a reading of 60 is displayed on the main display (3).
9. Remove calibration adapter (12) and allow sensor to return to zero.

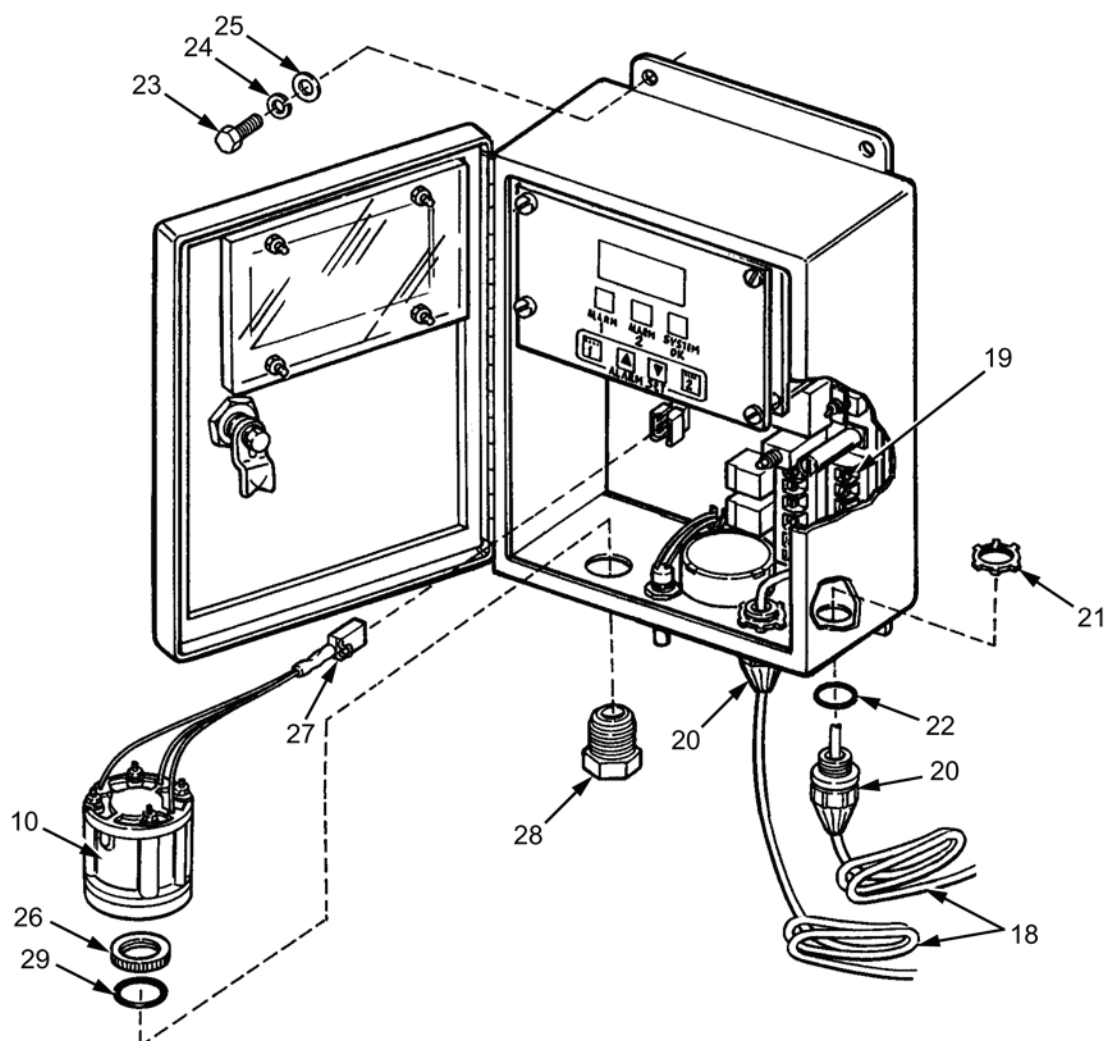


Figure 2. Carbon Monoxide Monitor.

WARNING

Make sure the zero or calibration plugs are not left on the sensor inlet fitting at the end of the calibration procedure, otherwise the sensor cannot sample the atmosphere for carbon monoxide and death may occur.

10. If alarms require adjustment, proceed as follows:
 - a. Press and hold the ALARM 1 button (7). The main display (3) will display the ALARM 1 value, Press up/down arrows (17) as required so that the main display (3) shows a value of 25, Release ALARM 1 button (7).
 - b. Press and hold the ALARM 2 button (8). The main display (3) will display the ALARM 2 value. Press up/down arrows (17) as required so that the main display (3) shows a value of 50. Release ALARM 2 button (8).
11. Close the door and turn the coin slot in screw (1) 1/4 turn counterclockwise to lock the door.

REMOVAL

1. Turn screw (1) 1/4 turn clockwise and open door.

WARNING

Electrical power must be removed from ROWPU or electrical shock can result in injury or death.

2. Shut off all electrical power to ROWPU control panel (AC and DC).
3. Tag and disconnect power supply leads (18) from terminal board (19).
4. Remove cable connectors (20) by removing connector nuts (21) and gaskets (22) and cables.
5. Remove CO monitor by removing four capscrews (23), lockwashers (24) and washers (25). Discard lockwashers.

ASSEMBLY**WARNING**

The sensor is a sealed unit which contains an electrolyte. If the sensor leaks, take care that the electrolyte does not contact skin, eyes or clothing. In case of contact with eyes, immediately flush eyes with plenty of water for at least 15 minutes and seek medical attention.

CAUTION

To avoid shorting circuit board, do not allow electrolyte to contact it.

1. Loosen lock ring (26).
2. Disconnect connector plug (27) from the circuit board.
3. Remove bushing (28), preformed packing (29), lock ring (26) and sensor body (10).
4. Replace main circuit board (43) as follows:
 - a. Remove four screws (30), lockwashers (31) and washers (32). Alarm set board (33) will now be free. Discard lockwashers.
 - b. Disconnect ribbon cable (34) from LED board (35).
 - c. Remove four capscrews (36). LED board (35) will now be free.
 - d. Disconnect wiring harness (44) from LED board (35).
 - e. Remove reset button (6) by removing jam nut (37) and washer (38).

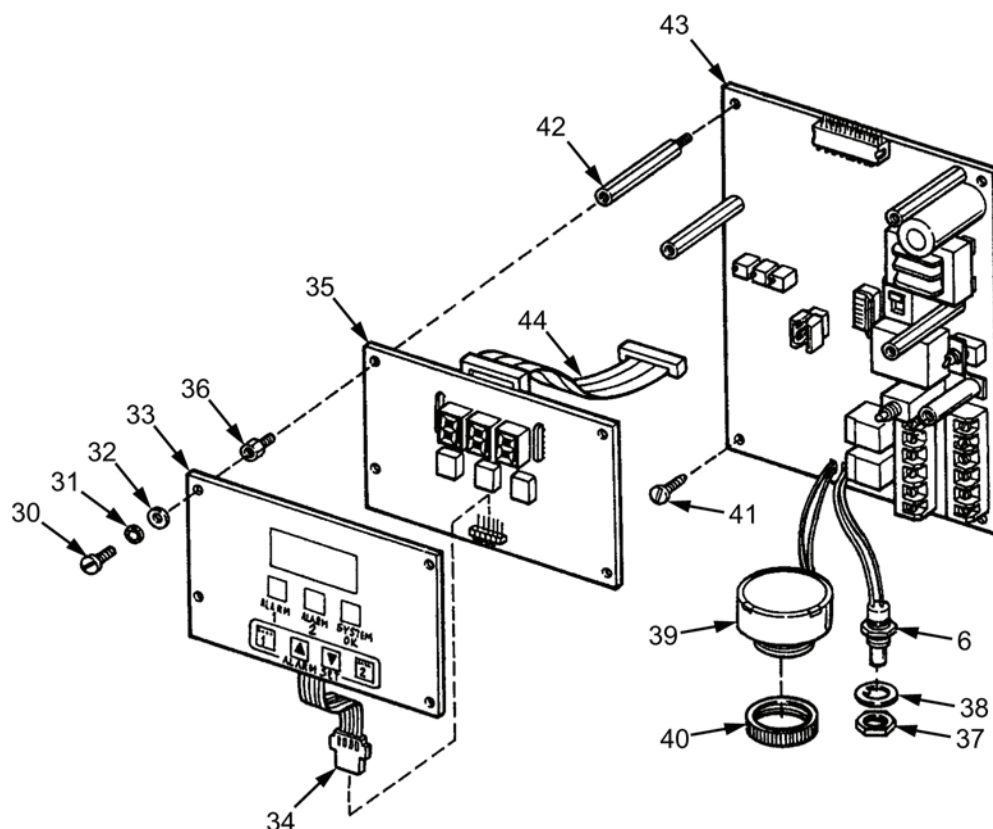


Figure 3. Carbon Monoxide Monitor.

- f. Remove alarm horn (39) by removing nut (40) and lift the horn out of CO monitor.

CAUTION

When removing circuit board, be careful not to break wiring from reset button to alarm horn. It is small and fragile.

- g. Remove three screws (41) and one extension (42), circuit board (43) will now be free.

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace damaged ring tongue connector (WP 0043 00, TM 10-4610-232-12).
2. Replace missing or defective components.
3. Repair damaged cable (WP 0010 00).

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

CAUTION

When installing main circuit board, take care not to break wiring to the reset button or alarm horn.

1. Install circuit board (43) and secure with three screws (41) and one extension (42).
2. Install alarm horn (39) and secure with nut (40).
3. Install reset button (6) and secure with jam nut (37) and washer (38).
4. Connect wiring harness (44) to LED board (35).
5. Mount LED board (35) with four capscrews (36).
6. Connect ribbon cable (34) to LED board (35).
7. Mount alarm set board (33) on capscrews (36) with screws (30), new lockwashers (31) and washers (32).
8. Install sensor body (10), lock ring (26), preformed packing (29) and bushing (28).
9. Tighten lock ring (26).
10. Connect connector plug (27) to circuit board (43).

INSTALLATION

1. Install the CO monitor. Secure with washers (25), new lockwashers (24) and capscrews (23).
2. Install cable connectors (20) and secure with gasket (22) and connector nuts (21).
3. Connect power supply leads (18) on terminal board (19) as tagged.
4. Close CO monitor box door and turn coin slot 1/4 turn counterclockwise to lock the door.
5. Turn on electrical power to ROWPU (AC and DC).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
RO PRESSURE VESSEL
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP

Tools/Special Tools:

General Mechanic's Tool Kit (TM 10-4610-232-12)
 Torque Wrench (TM 10-4610-232-12)
 Lifting Equipment (TM 10-4610-232-12)

Materials/Parts:

Gaskets (TM 10-4610-232-24P)
 Lockwashers (TM 10-4610-232-24P)
 Washers (TM 10-4610-232-24P)

Equipment Conditions:

RO unit Shutdown
 RO elements removed
 (WP 0030 00, TM 10-4610-232-12).
 Generator unit removed (WP 0093 00/0094 00)
 Accessory table top removed
 (WP 0112 00, TM 10-4610-232-12).

References:

TB 43-0218

REMOVAL

NOTE

Remove vessel closest to center of trailer first.

1. Remove RO vessels one at a time.
2. Remove four nuts (1), four lockwashers (2) and four "J" bolts (3) securing two holddown straps (4). Remove holddownstraps (4) and two protective gaskets (5). Discard lockwashers.

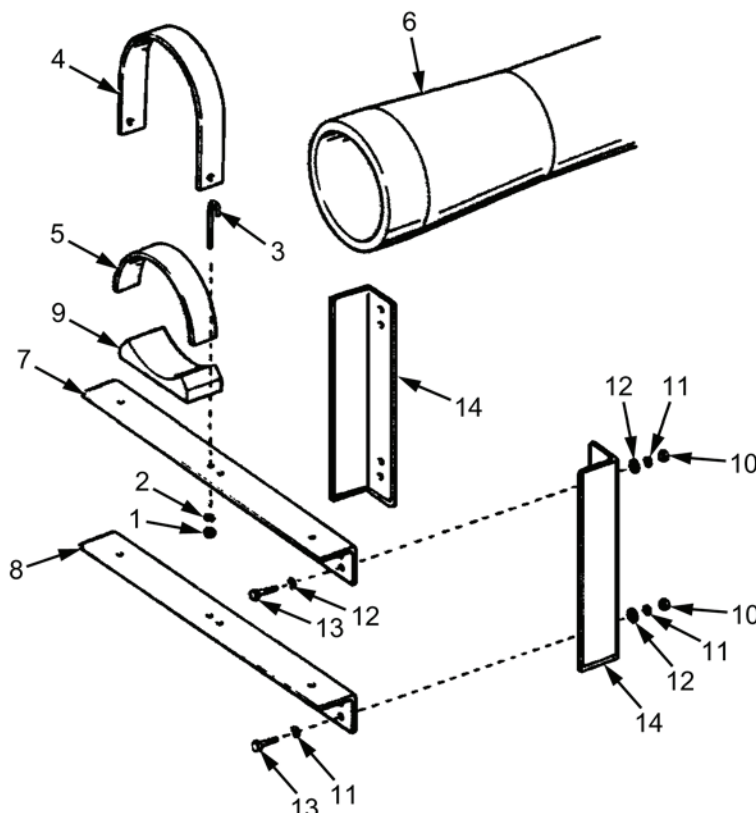


Figure 1. RO Vessel Mounting.

WARNING

Van is on a 4 foot high trailer. Be careful not to fall off or drop RO vessel.

WARNING

To prevent injury, two personnel are required to remove the RO vessel.

3. Lift RO vessel (6) and slide on rails (7) for upper vessels and rail (8) for lower vessels.

NOTE

Align hook of lifting equipment in the center of the RO vessel where the center of gravity would be located as shown on Figure 2.

4. Lift and slide RO vessel (6) out of access opening far enough to attach a sling to remove completely.

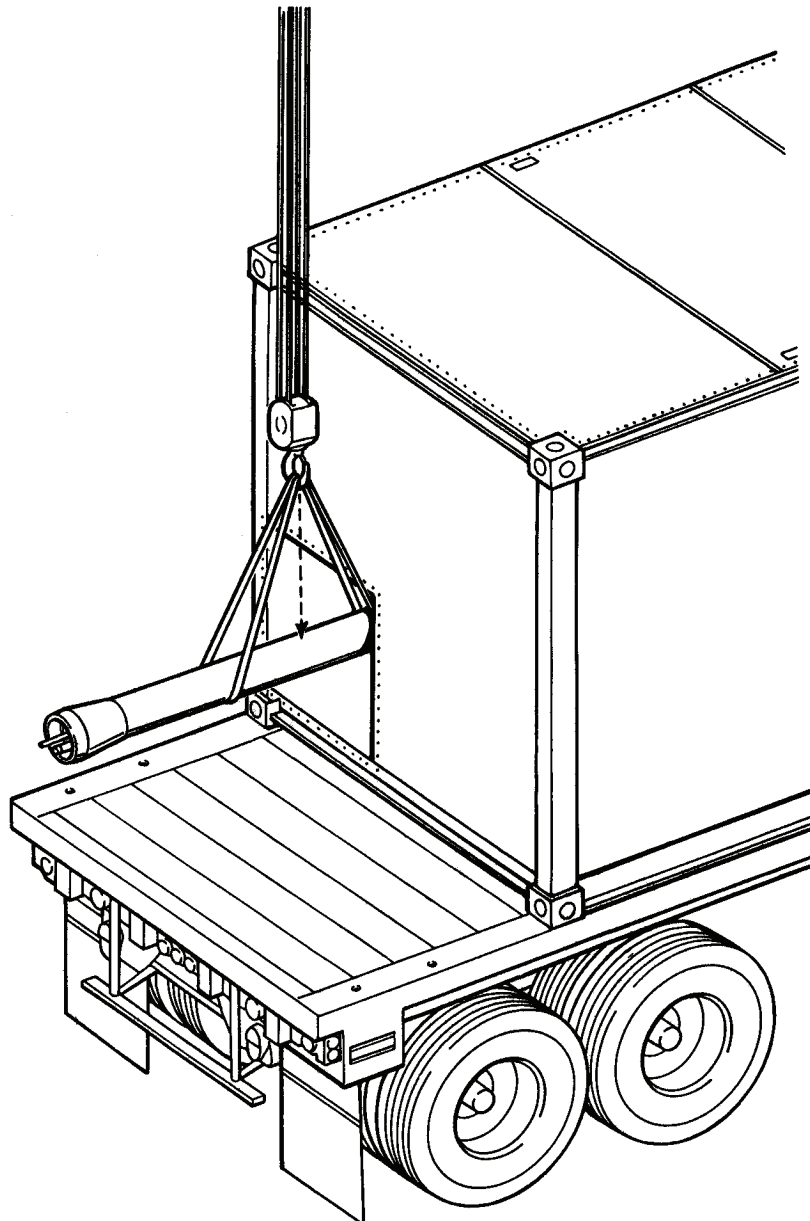


Figure 2. RO Vessel Removal.

5. Remove saddles (9).

NOTE

Remove vessel closest to the center of the trailer first.

6. Repeat steps 1 through 4 for remaining upper vessel.
7. Remove eight nuts (10), eight lockwashers (11), sixteen washers (12) and eight capscrews (13), two upper RO vessel rails (7) from vertical brackets (14). Discard lockwashers.
8. Repeat steps 1 through 5 for lower RO vessels and lower rails (8).

DISASSEMBLY

1. Remove preformed packing (15).

NOTE

Nut has left hand threads.

2. Remove nut (16) by turning clockwise.
3. Remove preformed packing (17) from port permeator (18).
4. Remove sealing plate (19) from feed port (20).
5. Remove preformed packing (21) from sealing plate (19).
6. Remove retainer rings (22) and pull feed port (20) through bearing plate (23).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Repair of RO vessels is limited to replacement of any worn or damaged components.
2. Replace preformed packings.

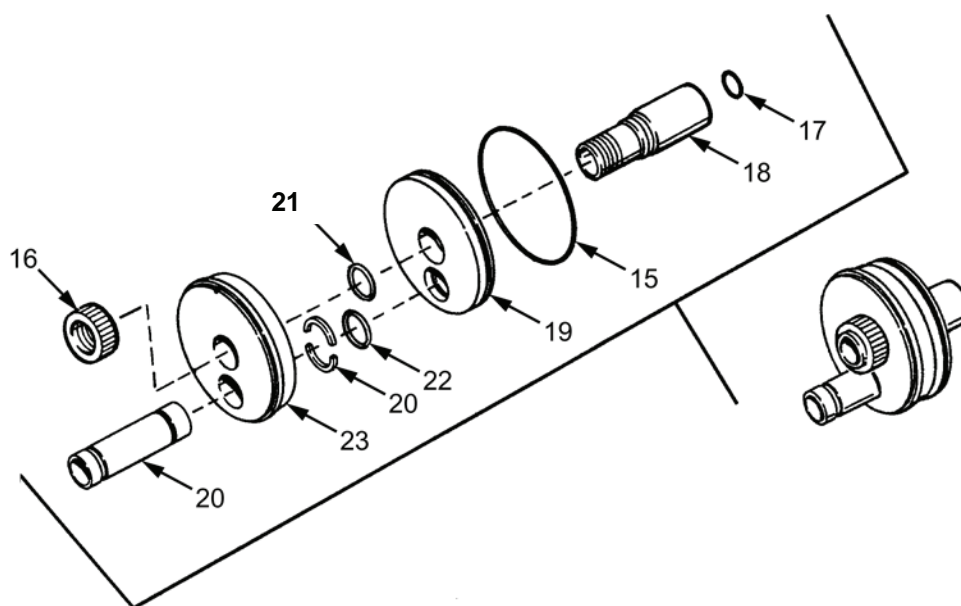


Figure 3. RO Vessel Disassembly.

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install feed port (20) through bearing plate (23) and secure with retainer rings (22).
2. Install preformed packing (21) into sealing plate (19).
3. Mount sealing plate (19) on short end of feed port (20).
4. Install preformed packing (17) in port permeator (18).

NOTE

Nut has left hand thread.

5. Install port permeator (18) through sealing plate (19), bearing plate (23) and secure with nut (16) by turning counterclockwise.
6. Install preformed packing (15) on sealing plate (19).

INSTALLATION

1. Position lower RO vessel rail (8) on vertical bracket (14) and secure with eight capscrews (13), sixteen washers (12), eight new lockwashers (11) and eight nuts (10).

WARNING

To prevent injury, two personnel are required to install the RO vessels.

WARNING

Van is on a 4 foot high trailer. Be careful not to fall off trailer when loading RO vessels.

NOTE

There is a drain hole in the shell at each end of the RO vessel. The hole must be at the 6 o'clock position (down) when installing.

NOTE

Install lower vessel furthest from center of trailer first.

2. Install the lower RO vessels one at a time.
3. Using lifting equipment, install RO vessel through RO vessel access opening. Slide RO vessel (6) on rails (8).
4. Place saddles (9) on rail, position RO vessel (6) in saddle.
5. Position protective gaskets (5) and holddown straps (4) on vessels.
6. Secure holddown straps (4) in place with four new lockwashers (2) and four nuts (1).
7. Torque "J" bolt (3) nuts to 34 ft/lbs.
8. Repeat steps 3. through 5. for remaining lower level RO vessel.
9. Repeat step 1. for upper RO vessel brackets (7).

NOTE

Install upper vessel furthest from the center of the trailer first.

10. Repeat steps 3. through 5. for upper vessels.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
NBC FILTER
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Lifting Equipment (TM 10-4610-232-12)

Equipment Conditions:

Power shutdown.
NBC filter empty
(WP 0103 00, TM 10-4610-232-12).

Materials/Parts:

Tape Antiseize (Item 70, WP 0102 00)
Gaskets (TM 10-4610-232-24P)
Lockwashers (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)
Glue (Item 45, WP 0102 00)
Primer (Item 60, WP 0102 00)
Brush (Item 9, WP 0102 00)

References:

TB 43-0218

REMOVAL**WARNING**

If the NBC filter has been used to filter nuclear, biological or chemical agents, it must be decontaminated by specially equipped decontamination personnel and it must be certified safe for repair work to begin. Failure to observe this precaution could result in death to all who come in contact with NBC filter contents.

1. Remove five capscrews (1), lockwashers (2) and flat washers (3). Discard lockwashers.
2. Move the NBC filter (4) to the door in the ROWPU. Remove NBC filter (4) using suitable lifting equipment.

DISASSEMBLY

1. Remove nuts (5), lockwasher (6), washer (7) and U-bolt (8) from channel (9). Discard lockwasher.
2. Loosen nut (10) and slide it back on upper pipe assembly (11). Remove pipe assembly (11) from coupling (12).
3. Remove seal (13) and nut (10) from pipe assembly (11).
4. Loosen nut (14) and slide it back on inlet pipe (15). Remove coupling (12) from inlet pipe (15).
5. Remove seal (16) and nut (14) from inlet pipe (15).
6. Remove two capscrews (17), washer (18), lockwasher (19) and nut (20) and remove channel (9). Discard lockwasher.
7. Loosen nut (21) and slide it back on lower pipe assembly (22).
8. Loosen nut (23) and seal (24) and slide them back on pipe assembly (22). Remove pipe assembly (22).

9. Remove nuts (21 and 23) and seals (24 and 25) from pipe assembly (22).
10. Loosen nut (26) and seal (27), slide them back on pipe (28) and remove coupling (29).
11. Remove nut (26) and seal (27) from pipe (28).

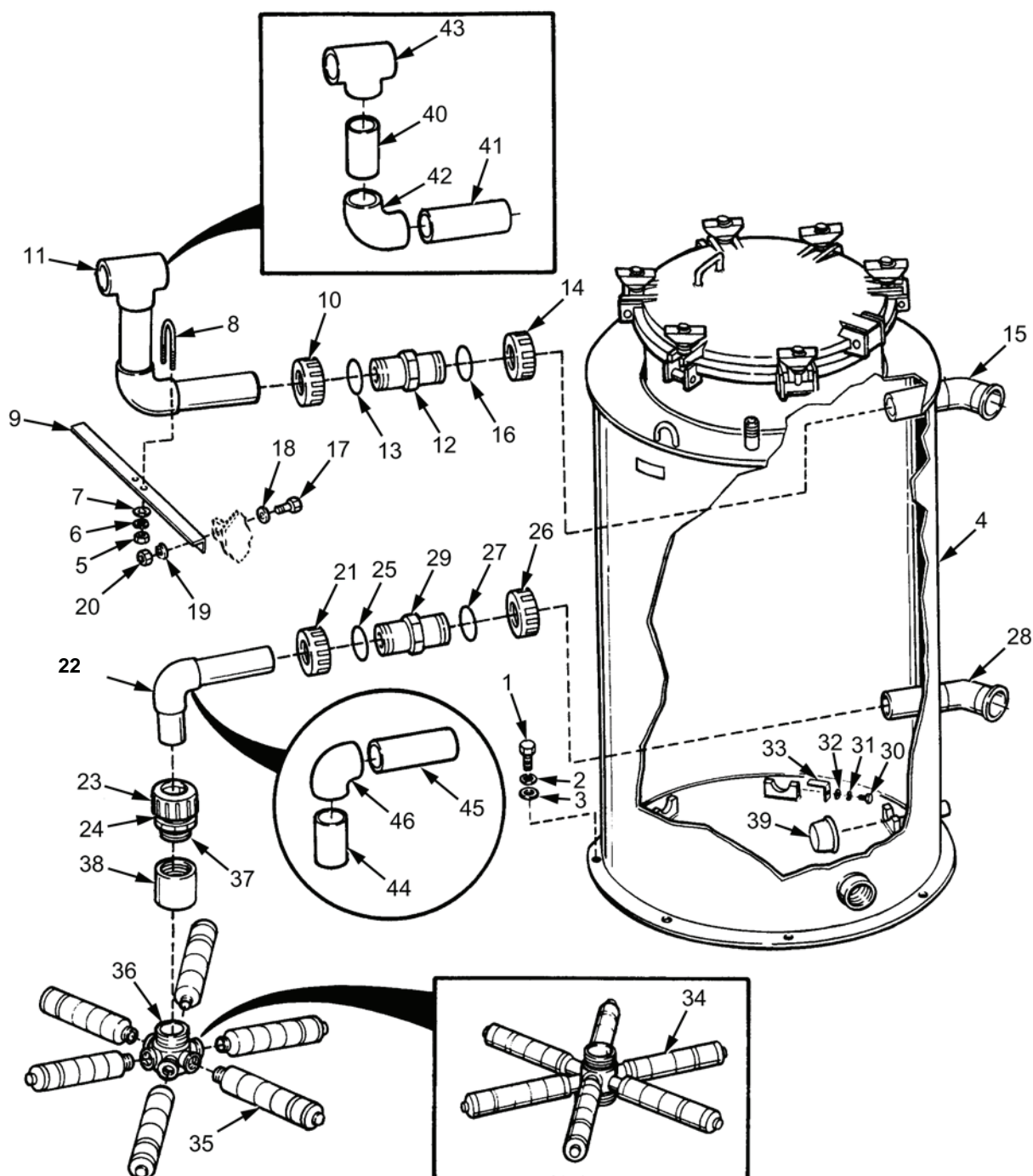


Figure 1. Repair NBC Filter.

12. Remove six each, capscrews (30), lockwashers (31), flatwashers (32) and angle bracket (33). Discard lockwashers.
13. Remove hub assembly (34) from NBC filter (4).
14. Unscrew distribution nozzles (35) from hub (36).
15. Remove adapter (37) from coupling (38).
16. Remove coupling (38) from hub assembly (34).
17. Remove filter nozzle (39) from NBC filter (4).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace damaged or unserviceable components.
2. Repair upper pipe assembly (11).
 - a. Using a file, put a 10° to 15° chamfer on both ends of pipe sectional (40) and on the end of pipe section (41) which will be fit into elbow (42).
 - b. Wipe the pipe surface (40 and 41), tee socket (43), and elbow socket (42) with a clean cloth to remove all dirt, moisture, and grease.
 - c. Check "dry fit" of pipe and fittings. Position pipe and fitting to assure alignment.

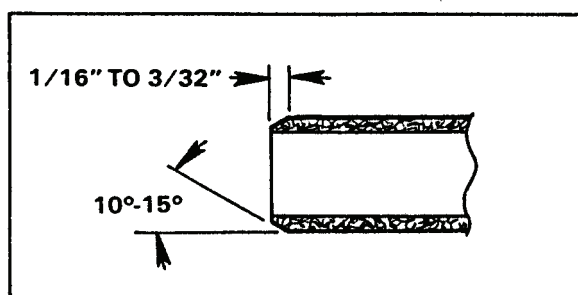


Figure 2. Chamfering of Pipe End.

NOTE

Time is not critical when priming and repeated applications may be necessary to accomplish a dissolving action.

- d. Using a bristle brush about 1/2 the size of pipe diameter, apply primer to the tee socket (43) and elbow (42) until surface begins to dissolve.
- e. Apply primer to pipe surfaces (40 and 41) equal to the depth of the fitting socket. Make sure surface begins to dissolve.
- f. Apply primer again to the tee socket (43) and elbow socket (42) surfaces, to be sure they are still damp.

NOTE

Complete steps g. through j. on one joint at a time.

NOTE

Apply glue to pipe and fitting and insert pipe into the fitting in less than one minute.

- g. Using a clean bristle brush about 1/2 the size of pipe diameter, apply a heavy coat of glue to the male end pipe surface (40 or 41).

NOTE

Use straight outward strokes to keep excess glue out of the socket.

- h. Apply a liberal coat of glue to the inside of the tee socket (43) or elbow socket (42).
- i. While the glue is still wet on both surfaces, insert pipe (40 or 41) into tee socket (43) or elbow socket (42) with a 1/4 turn twisting motion.

NOTE

Refer to Figure 1 for proper alignment.

- j. Hold joint together for approximately 30 seconds until both surfaces are firmly gripped. Allow proper cure time before disturbing joints. (Refer to Table 1.)

Table 1. Cure Time.

Temperature Range	Pipe Sizes 1-1/2 " to 3"
60-100F	30 min.
40-60F	2 hr.
0-40F	6 hr.

3. Repair lower pipe assembly (22).
 - a. Using a file, put a 10° to 15° chamfer on the ends of the pipe section (44 and 45), which will be fit into elbow (46).
 - b. Wipe the pipe surface (44 and 45) and elbow socket (46) with a clean cloth to remove all dirt, moisture and grease.

- c. Check "dry fit" of pipe and fittings. Position pipe (44 or 45) and elbow socket (46) to ensure alignment.

NOTE

Time is not critical when priming and repeated applications may be necessary to accomplish a dissolving action.

- d. Using a bristle brush about 1/2 the size of pipe diameter, apply primer to the elbow socket (46) until surface begins to dissolve.
- e. Apply primer to pipe surface (44 and 45) equal to the depth of the fitting socket. Make sure surface begins to dissolve.
- f. Apply primer again to the elbow socket (46) to be sure it is still damp.

NOTE

Complete steps g. through j. on one joint at a time.

NOTE

Apply glue to pipe and fitting and insert into the fitting in less than a minute.

- g. Using a clean bristle brush, about 1/2 the size of pipe diameter, apply a heavy coat of glue to the male end surface of pipe surface (44 or 45).

NOTE

Use straight outward strokes to keep excess glue out of the socket.

- h. Apply a liberal coat of glue to the inside of the elbow socket (46).
- i. While the glue is still wet on both surfaces, insert pipe (44 or 45) into elbow socket (46) with a 1/4 turn twisting motion.

NOTE

Refer to Figure 1 for proper alignment.

- j. Hold joint together for approximately 30 seconds until both surfaces are firmly gripped. Allow proper cure time before disturbing joints. (Refer to Table 1.)

ASSEMBLY

NOTE

Apply antiseize tape to pipe threads.

1. Install filter nozzle (39) inside NBC filter (4).
2. Install distribution nozzles (35) to hub (36).
3. Install adapter (37) in coupling (38) and mount on hub assembly (34).
4. Install hub assembly (34) in NBC filter (4). Secure with angle bracket (33), capscrew (30), new lockwasher (31) and flatwasher (32).

5. Install nut (26), seal (27), and coupling (29) on outlet pipe (28) and tighten nut (26).
6. Install nut (23) and seal (24) on pipe assembly (22).
7. Install nut (21) and seal (25) on pipe assembly (22).
8. Install pipe assembly (22) to hub assembly and coupling (29). Secure with nuts (21) and (23).
9. Install channel (9). Secure with capscrews (17), washers (18), new lockwashers (19) and nuts (20).
10. Install nut (14), seal (16) and coupling (12) on inlet pipe (15). Tighten nut (14),
11. Install nut (10) and seal (13) on pipe assembly (11).
12. Install pipe assembly (11) on coupling (12) and tighten nut (10).
13. Secure pipe assembly (11) with U-bolt (8), nut (5), new lockwasher (6) and washer (7).

INSTALLATION

Install NBC tank as follows:

- a. Using suitable lifting equipment, place the NBC filter (4) in the doorway of the ROWPU.
- b. Move the NBC filter to its final position in the ROWPU.
- c. Secure the filter in position using capscrews (1), new lockwashers (2) and flat washers (3).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
OUTLET AIR FILTER
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:

High pressure air tubing removed (WP 0019 00)

Solenoid valve line removed (WP 0057 00)

Materials/Parts:

Tape, Antiseize (Item 70, WP 0102 00)

Gaskets (TM 10-4610-232-24P)

Lockwashers (TM 10-4610-232-24P)

Preformed Packing (TM 10-4610-232-24P)

Washers (TM 10-4610-232-24P)

References:

TB 43-0218

REMOVAL

1. Remove two capscrews (1), lockwashers (2), and washers (3). Discard lockwashers.
2. Remove assembled filter (4).
3. Remove vent tube (5).

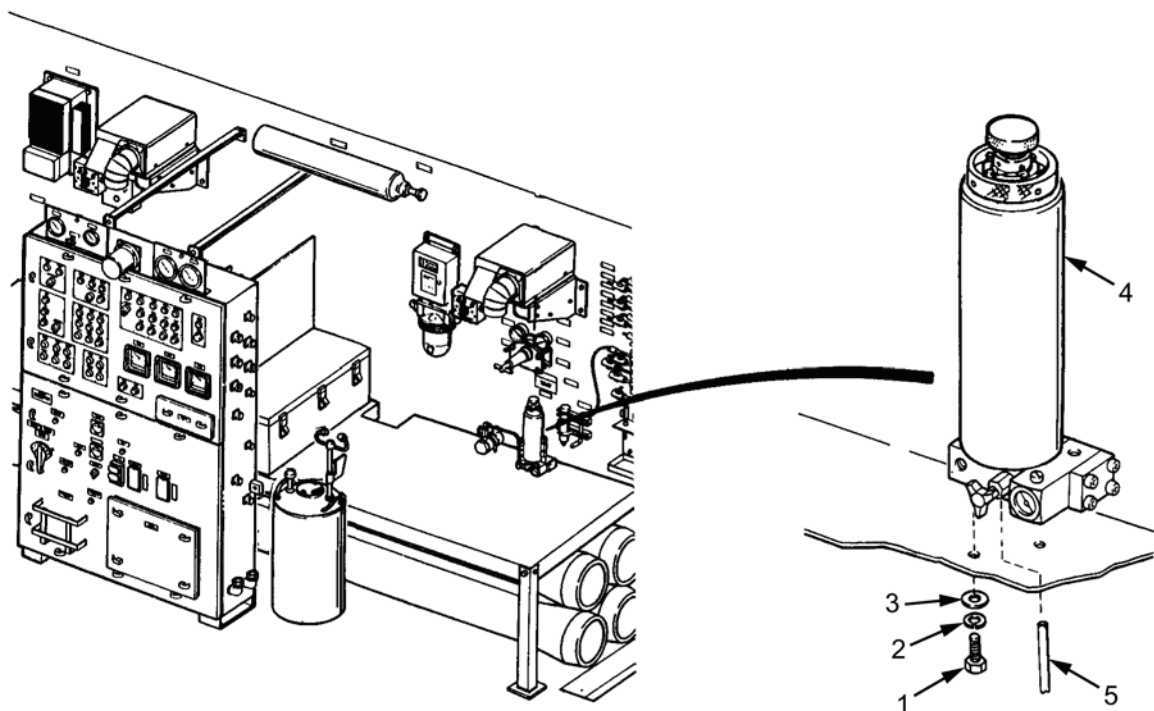


Figure 1. Outlet Air Filter (Sheet 1 of 2).

DISASSEMBLY

1. Remove safety valve (6).
2. Remove preformed packing (7).
3. Remove filter cartridge (8).
4. Unscrew filter housing (9) from filter base assembly (10).
5. Remove preformed packing (11) from filter base assembly (10).
6. Remove fitting (12) and sealing washer (13).
7. Remove plug (14) and sealing washer (15).
8. Remove valve handle (16) and gasket (17) from valve housing (18).
9. Remove valve housing (18) from filter base (10).
10. Remove four socket head screws (19) and remove cover (20).
11. Remove pressure valve (21) from filter base (10).
12. Remove two connecting pipes (22) from pressure valve (21).
13. Remove preformed packings (23) from connecting pipes (22).

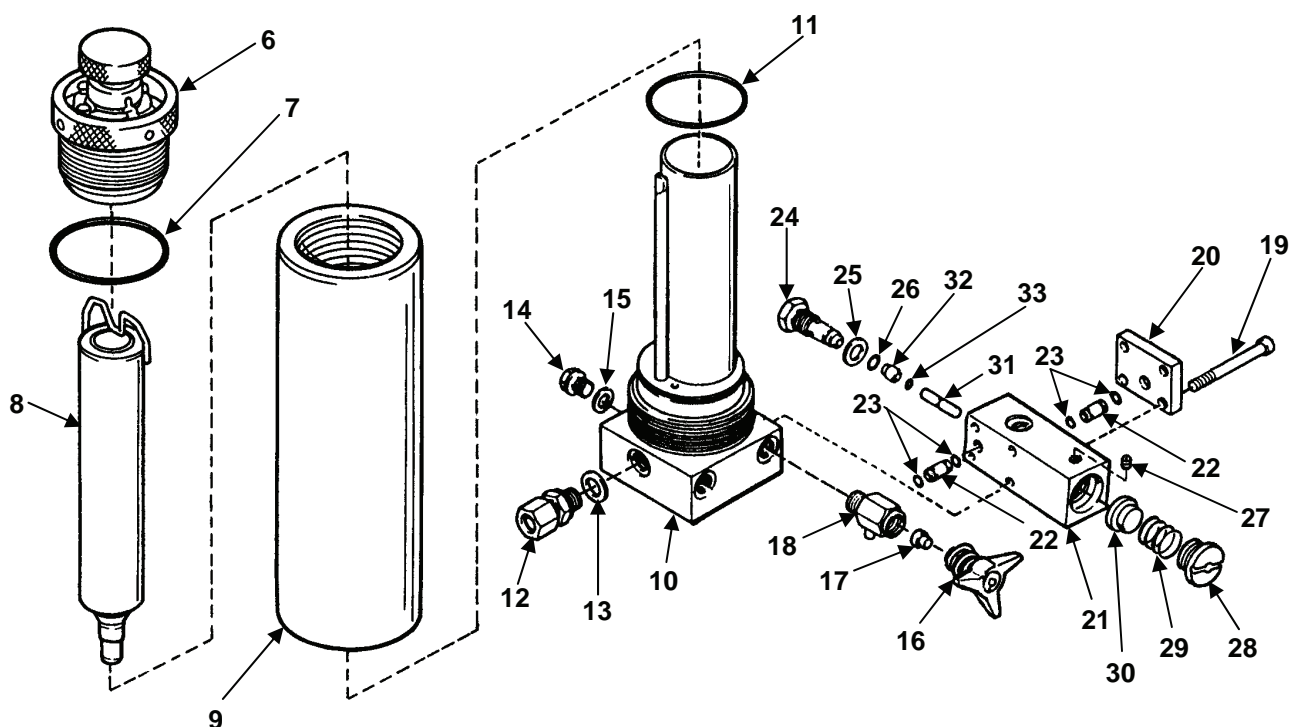


Figure 1. Outlet Air Filter (Sheet 2 of 2).

14. Remove pressure valve seat (24), sealing gasket (25) and remove preformed packing (26).

NOTE

Before removing cap, mark it so it can be reinstalled to the same position.

15. Remove setscrew (27). Unscrew cap (28). Spring (29) and spacer (30) are now free.
16. Using a small straight punch, push valve piston pin (31) and valve piston (32) out back of pressure valve (21).
17. Remove preformed packing (33) from valve piston pin (31).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Repair is limited to replacement of filter cartridge (8), air filter housing (9), vent tube (5) and sealing washers (13, 15, and 25).
2. Replace damaged or leaking preformed packings.
3. Repair by cleaning out oil/water sludge build up in center chamber.
4. Replace safety valve (6) if it bypasses air thru top relief valve

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install preformed packing (33) on valve piston pin (31).
2. Install valve piston pin (31) and valve piston in back of pressure valve (21).
3. Install spacer (30) and spring (29) in front of pressure valve (21) and secure with cap (28).

NOTE

When installing cap, turn it until you come to mark made during disassembly to ensure same setting.

4. Install setscrew (27) and tighten.

5. Install preformed packing (26) and sealing washer (25) on pressure valve seat (24) and install in pressure valve (21).
6. Install preformed packings (23) on connecting pipes (22) and install in pressure valve (21).
7. Mount pressure valve (21) on filter body (10).
8. Mount cover (20) on pressure valve (21) and secure with four socket head screws (19).
9. Install valve housing (18) on filter base (10).
10. Install gasket (17) in valve housing (18) and secure with valve handle (16).
11. Install sealing washer (15) and plug (14) in filter base (10).
12. Install sealing washer (13) and fitting (12) in filter base (10).
13. Install preformed packing (11) on filter base (10) and screw filter housing (9) into place on filter base (10).
14. Install filter cartridge (8),
15. Mount preformed packing (7) on safety valve (6) and install on filter housing (9).

INSTALLATION

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install vent tube (5) on valve housing.
2. Install filter assembly (4) and secure with two capscrews (1), new lockwashers (2) and washers (3) to table top.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
AIR TANK
REMOVAL, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:

High pressure air lines removed (WP 0019 00)

Materials/Parts:

Adhesive (Item 1, WP 0102 00)

Lockwashers (TM 10-4610-232-24P)

References:

TB 43-0218

REMOVAL**WARNING**

Tank is heavy. Two people are required to hold tank while a third person removes the hardware.

Remove air tank assembly (1) from ceiling by removing four capscrews (2), lockwashers (3), flat washers, (4), straps (5) and cushions (6 and 7). Discard lockwashers.

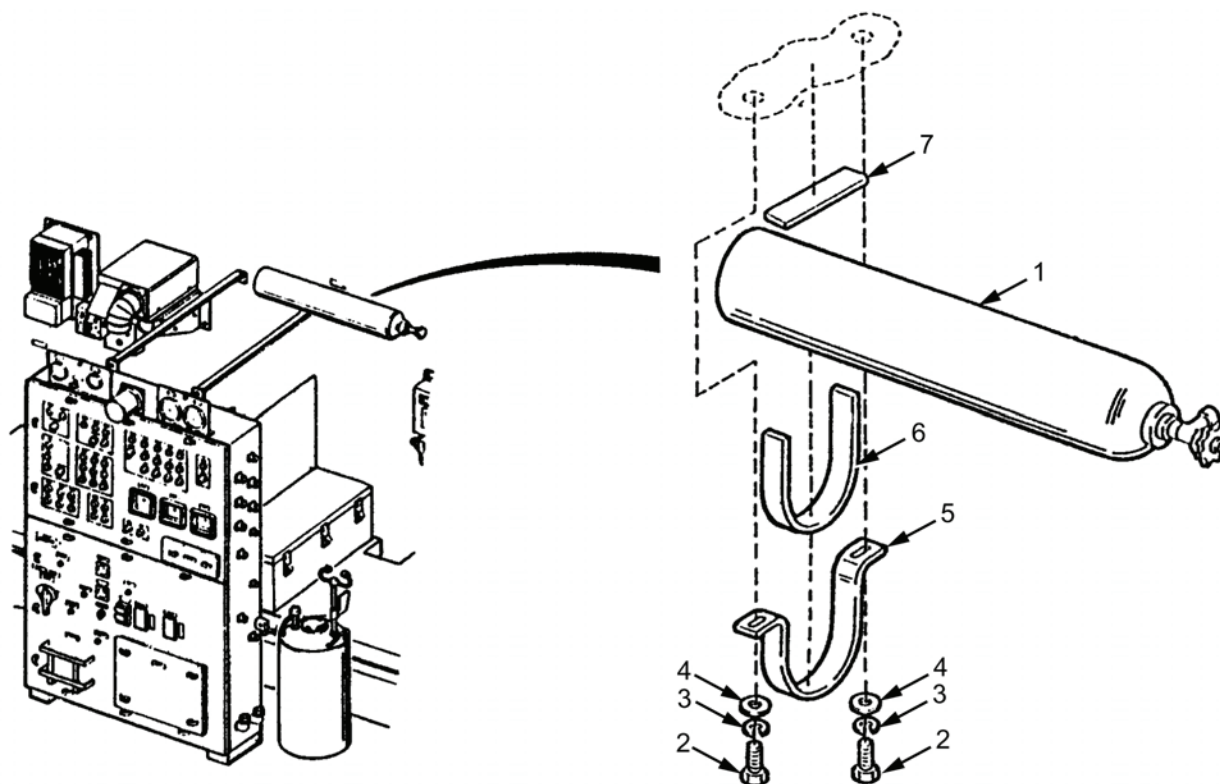


Figure 1. Air Tank Assembly.

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Install air tank assembly (1) with straps (5) and cushions (6 and 7). Secure with capscrews (2), new lockwashers (3) and flat washers (4).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
AIR REGULATOR
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP

Tools/Special Tools:

General Mechanic's Tool Kit (TM 10-4610-232-12)

Materials/Parts:

Sealant, Pipe Thread (Item 65, WP 0102 00)

Soap (Item 68, WP 0102 00)

Tape, Antiseize (Item 70, WP 0102 00)

Lockwashers (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).

Air compressor vented.

Air pressure in air manifolds vented to atmosphere.

References:

TB 43-0218

REMOVAL

1. Turn COMPRESSOR OFF/ON switch (1) to the OFF position.
2. Close air tank valve (2).

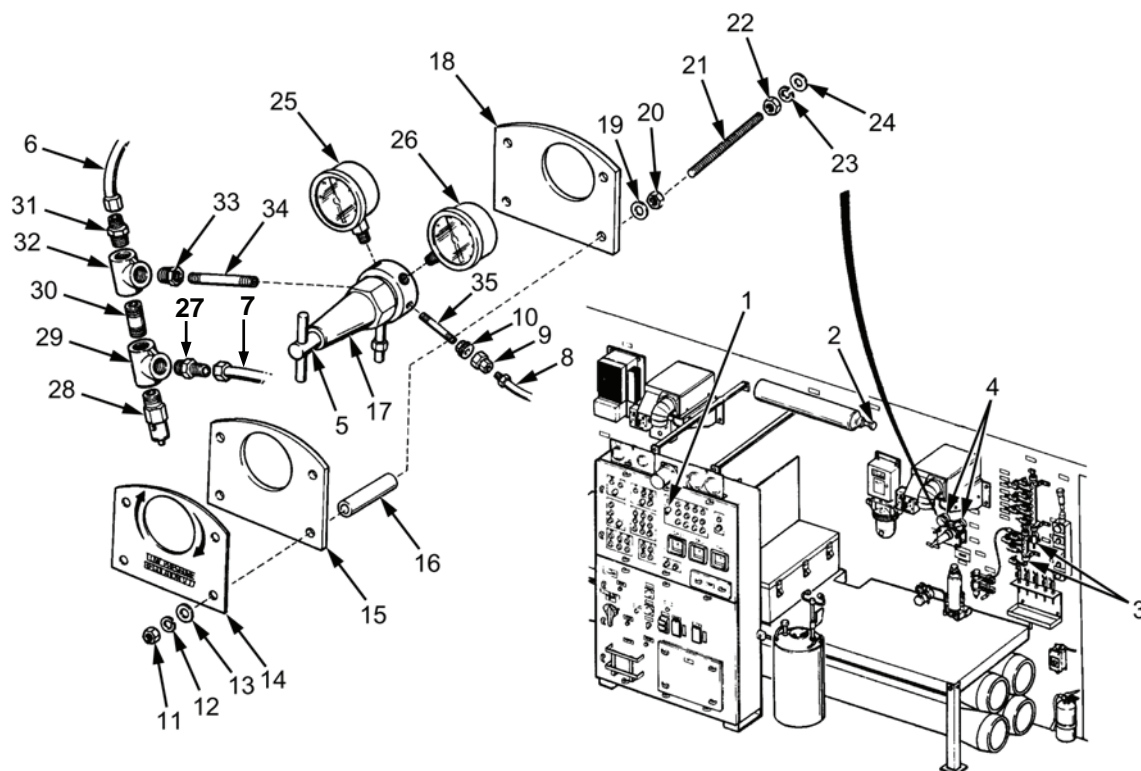


Figure 1. Air Regulator and Low Pressure Valve.

WARNING

Manifold pressure gage must read zero before removing any component.

3. Open manifold bleed valves (3) to release air pressure, until manifold pressure gages (4) read zero, before removing any component.
4. Turn the handle of air pressure regulator valve (5) fully counterclockwise.
5. Tag and disconnect air lines (6 and 7). Remove air line (8) by disconnecting coupling (9) from coupling (10).
6. Remove four nuts (11), lockwashers (12), washer (13), plates (14 and 15), and spacer (16). The regulator body (17), plate (18) and washer (19) will now be free. Discard lockwashers.
7. If necessary, remove nuts (20), studs (21), nuts (22), lockwashers (23) and washers (24) from wall. Discard lockwashers.

DISASSEMBLY

1. Remove gages (25 and 26) from regulator body (17),
2. Remove fitting (27) and relief valve (28) from tee (29).
3. Remove tee (29) from nipple (30).
4. Remove nipple (30) and fitting (31) from tee (32).
5. Remove tee (32) from adapter (33).
6. Remove adapter (33) from nipple (34).
7. Remove nipple (34) from regulator body (17).
8. Remove coupling (10) from nipple (35).
9. Remove nipple (35) from regulator body (17).

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace all damaged or unserviceable components.
2. Repair leaking fittings with antiseize tape and pipe thread sealant.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Apply antiseize tape and thread sealant on all pipe fittings.
2. Install nipple (35) into regulator body (17).
3. Install coupling (10) onto nipple (35).
4. Install nipple (34) into regulator body (17) and install adapter (33) to nipple (34).
5. Install adapter (33) into tee (32).
6. Install fitting (31) and nipple (30) into tee (32).
7. Install tee (29) on nipple (30).
8. Install relief valve (28) and fitting (27) into tee (29).
9. Install gages (25 and 26) into regulator body (17).

INSTALLATION

1. Install nuts (20), studs (21), nuts (22), new lockwashers (23) and washers (24) in wall if removed.
2. Install the regulator body in plate (18) and secure in position with spacer (16), plates (14 and 15), nuts (11), new lockwashers (12) and washers (13).
3. Connect air lines (6 and 7). Connect air line (8) by connecting coupling (9) to coupling (10).
4. Close manifold bleed valves (3).
5. Open air tank valve (2) at the air tank.
6. Turn air pressure regulator valve handle (5) clockwise to open the air supply.
7. Turn COMPRESSOR OFF/ON switch (1) to ON position.
8. Use soapy water solution to check for air leaks.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
VENT FAN CABLE ASSEMBLY
REPAIR

INITIAL SETUP

Tools/Special Tools:

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cable (1) as described in WP 0010 00.

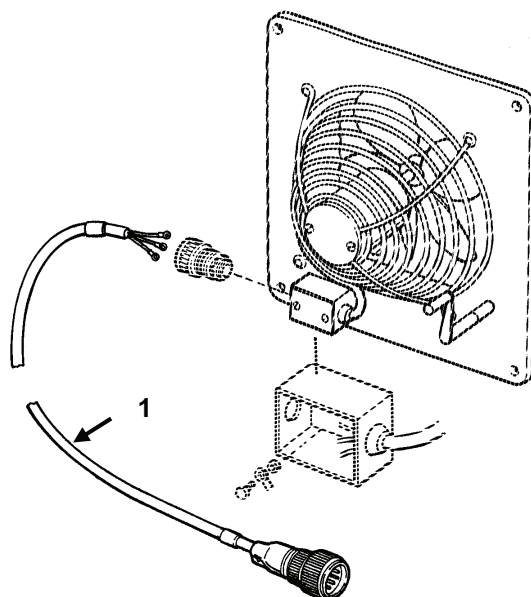


Figure 1. Vent Fan Cable.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
SUMP HEATERS CABLE ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cables (1) as described in WP 0010 00.

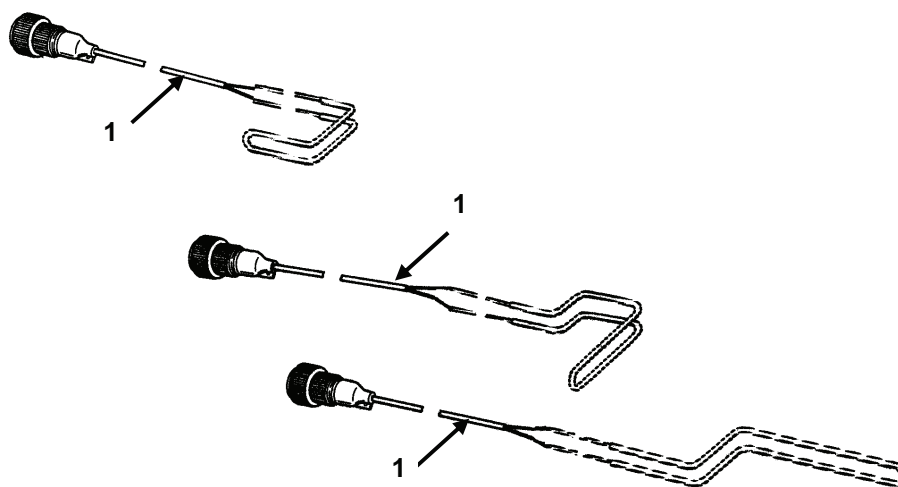


Figure 1. Sump Heater Cables.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
LADDER FRAME
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Welding Equipment (TM 10-4610-232-12)
Wire Brush (TM 10-4610-232-12)

Equipment Conditions:

Ladder removed

References:

TB 43-0218
TM 43-0139
TM 9-450
TM 9-237

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Clean dirt and paint from area to be repaired.
2. Repair metal bodies, refer to TM 9-450.
3. Weld damaged areas. For welding procedures, refer to TM 9-237.
4. Paint all repaired areas. Refer to TM 43-0139.

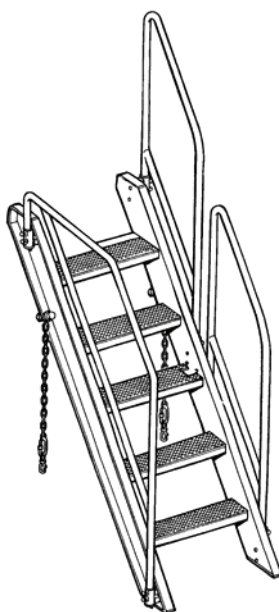


Figure 1. Ladders.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
ACCESSORY TABLE
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Welding Equipment (TM 10-4610-232-12)
Wire Brush (TM 10-4610-232-12)

Equipment Conditions:

High pressure solenoid (WP 0057 00).
Outlet air filter removed (WP 0064 00).

References:

TB 43-0218
TM 9-237
TM 43-0139

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

The right tabletop, right table supports and table are removed at Direct Support maintenance because the outlet high-pressure solenoid valve and air filter have to be removed at Direct Support maintenance.

1. Replace the right table top (1) by removing four screws (2).
2. Replace frame (3) by removing three screws (4), lockwashers (5) and washers (6). Discard lockwashers.
3. Replace right table support (7) by removing two capscrews (8), four washers (9), two lockwashers (10) and two nuts (11). Discard lockwashers.
4. Clean dirt and paint from area to be repaired.
5. Weld damaged areas. For welding procedures, refer to TM 9-237.
6. Paint all areas repaired. Refer to TM 43-0139.
7. Replace parts which cannot be repaired by welding.

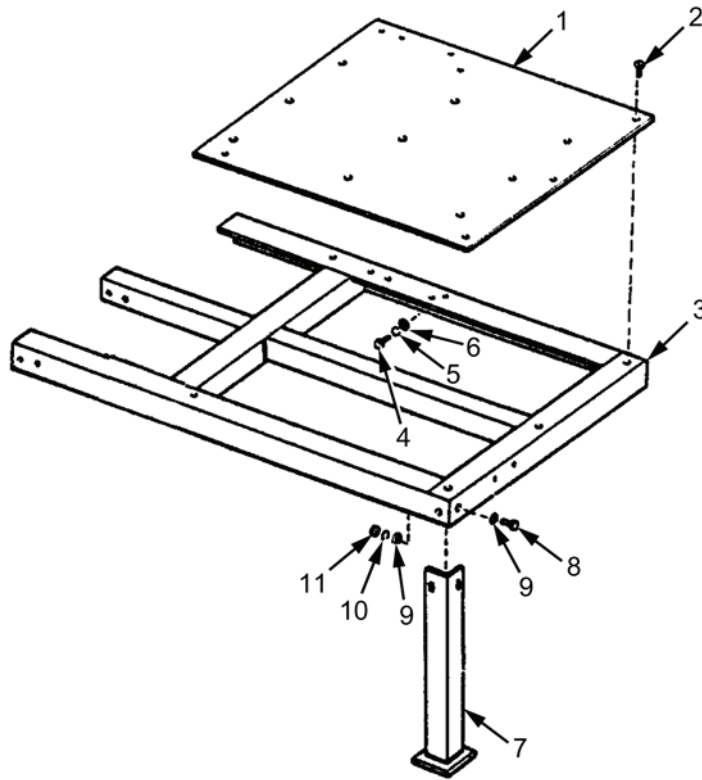


Figure 1. Accessory Table.

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
ACCESS PANELS AND SEALS
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Rivnut Repair Kit (TM 10-4610-232-12)

Equipment Conditions:

High pressure pump assembly removed
(WP 0072 00)

Materials/Parts:

Caulk (Item 10, WP 0102 00)
Insulation (TM 10-4610-232-24P)
Rivets (TM 10-4610-232-24P)

References:

TB 43-0218
TM 43-0139

REPAIR**WARNING**

Access panels cannot be welded. They contain insulation, which will give off deadly fumes when burned.

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

Covers can only be removed after the high-pressure pump assembly is removed. Procedures for removing other access and panels are covered in WP 0113 00 of TM 10-4610-232-12.

1. Remove covers (1 and 2) by loosening captive fasteners (3). Replace fasteners, if damaged, by removing keeper ring (4)
2. Replace fastener receptacles (5), if damaged, by removing nut (6).
3. Install covers (1 and 2) and tighten captive fasteners (3).
4. Patching interior and exterior panels or skins:

WARNING

Exterior panels cannot be welded. There is insulation behind the panels which will give off deadly fumes when burned.

- a. Cut away any sharp edges that will prevent patch from sealing properly.
- b. Cut a piece of 1/8 in. sheet aluminum, no less than 1 in. extending past each end of the tear or area to be repaired.

- c. If necessary, repair insulation by replacing with fiberglass insulation.
 - d. Place patch over area to be patched and drill holes for rivets.
 - e. Remove patch, place caulking around edges of patch and mount back over area that is to be patched.
 - f. Using rivets, secure patch into place (WP 0043 00, TM 10-4610-232-12).
 - g. Using a putty knife, remove excess caulking from patch.
8. Paint patched area. Refer to TM 43-0139.

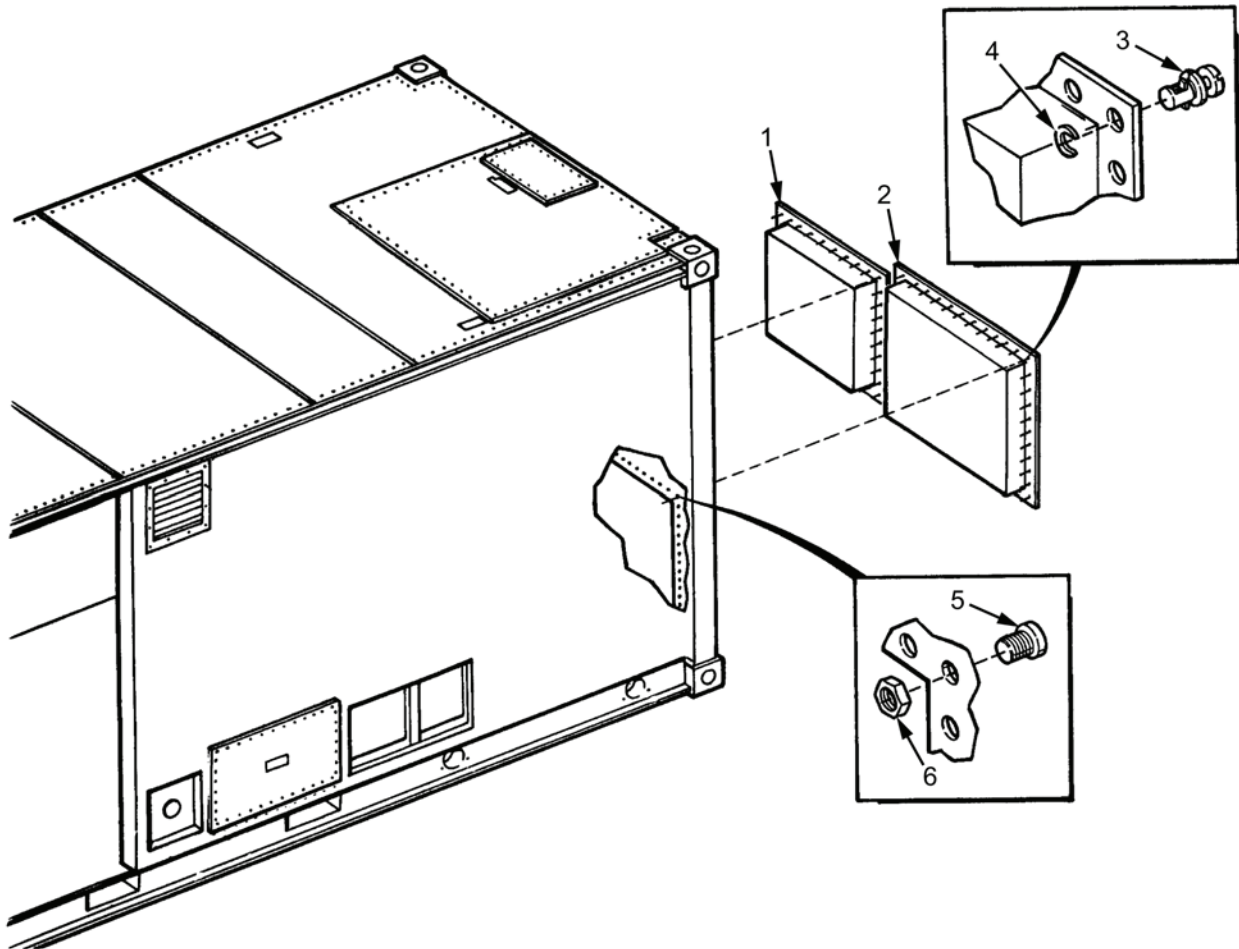


Figure 1. Access Panels.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE PUMP ASSEMBLY
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Lifting Device (5 Ton) (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown.
Water hoses drained.
High pressure air hoses vented.

Materials/Parts:

Glycerin (Item 17, WP 0102 00)
Banding and Clamps (TM 10-4610-232-24P)
Gaskets (TM 10-4610-232-24P)
Lockwashers (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

References:

TB 43-0218
FM 43-3

REMOVAL**WARNING**

Water hoses are under high pressure. Ensure water hoses are drained before starting work: otherwise serious injury or death could result.

WARNING

Do not work on air regulator or relief valve until air pressure in manifold is fully vented. Pressures in system can result in serious injury or death.

1. Disconnect low pressure hose (1) from low pressure pipe (2) by removing nuts (3), capscrews (4) clamps (5) and gasket (6).
2. Remove capscrew (7), washer (8), lockwasher (9), nut (10), washers (11), cushion (12) and remove hose (1) from clamp (13). Discard lockwasher.
3. Remove capscrew (14), washer (15), lockwasher (16), plate (17) from spring nut (18) in channel. Discard lockwasher.
4. Disconnect high pressure hose (19) from high pressure pipe (20) by removing nuts (21), capscrews (22), clamps (23) and gasket (24).
5. Disconnect other end of low pressure hose (1) from low pressure pipe (25) by removing nuts (26), capscrews (27), clamps (28) and gasket (29).
6. Remove screw (30), nut (31), clamp (32) and clamp (33).
7. Disconnect other end of high pressure hose (19) from high pressure pipe (34) by removing nuts (35), capscrews (36), clamps (37) and gasket (38).
8. Disconnect air hose (39) from air relief valve (40).
9. Remove air hose (39) from clamps (41) by removing nut (42), capscrews (43), two washers (44) and lockwashers (45). Discard lockwashers.

NOTE

Cover is removed for clarity.

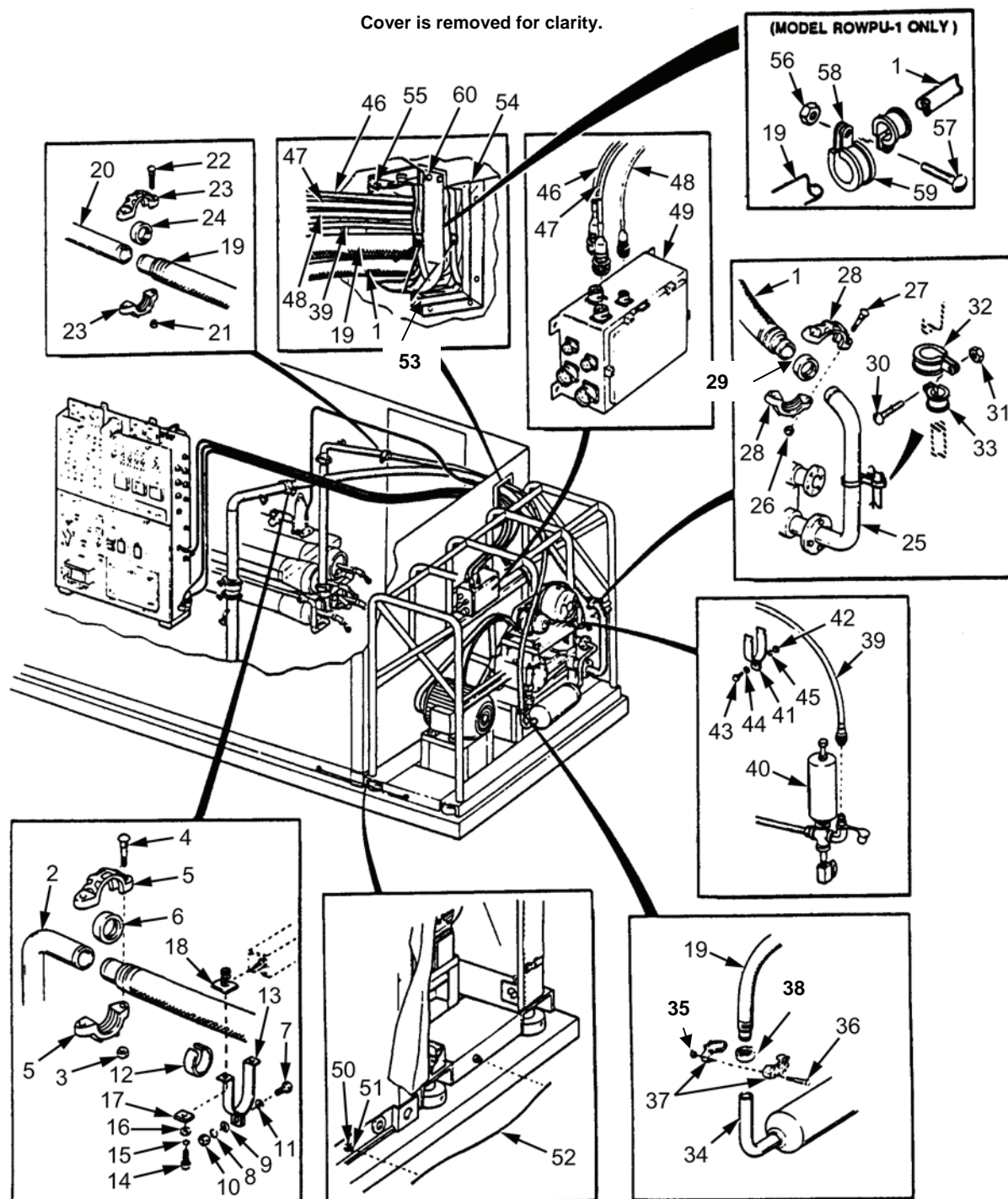


Figure 1. High Pressure Pump Assembly (Sheet 1 of 2).

WARNING

**Ensure electrical power is disconnected before working on unit.
Failure to do so may result in serious injury.**

10. Disconnect three power cables (46, 47 and 48) from junction box (49).
11. Loosen nuts (50) on grounding lugs (51) and remove grounding cable (52).
12. Loosen buckles (53) on outer canvas boot (54) and inner canvas boot (55).
13. Model ROWPU-1: Remove nut (56), screw (57), clamp (58), and clamp (59) from bracket (60).
14. Remove high pressure hose (19) by pulling into container.
15. Remove low pressure hose (1) by pulling into container.
16. Remove air hose (39) by pulling into container and coiling up out of the way.
17. Remove three power cables (46, 47 and 48) by pulling into container and coiling up out of the way.
18. Push canvas boot (54) out of container wall before removing high pressure pump skid (61).

NOTE

Ratchet handle is stored on pump skid.

19. Press in on ratchet lever (62) and lift ratchet handle (63) fully to the rear to release tension on the hold down strap (64).
20. Remove four clips (65) from trailer frame and slide out holddown straps (64).
21. Remove 24 capscrews (66), lockwashers (67), washers (68), access cover (69) and lifting straps (70). Discard lockwashers.

WARNING

Do not exceed load limits of lifting device. Do not operate lifting device without safety latches in position on sling hooks. Failure to observe these precautions could result in serious injury and damage to equipment.

22. Attach lifting sling hooks (70) to skid lifting ports (71).

CAUTION

When lifting high pressure pump skid, be careful not to damage air shock air hoses or cover.

23. Use suitable lifting device to lift high pressure pump skid (61) from trailer and set off on flat terrain.

DISASSEMBLY

- Unbuckle straps (72 and 73), internal straps and remove cover (74).

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Inspect and repair any damaged components.
2. Replace straps (72 and 73) and zipper (75) in accordance with FM 43-3.
3. Sew rips and tears in cover (74) in accordance with FM 43-3.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Attach cover (74) to high pressure pump skid (61) with straps (72 and 73).

WARNING

Do not exceed load limits of lifting device. Do not operate lifting device without safety latches on hooks. Failure to observe these precautions may result in serious injury and damage to equipment.

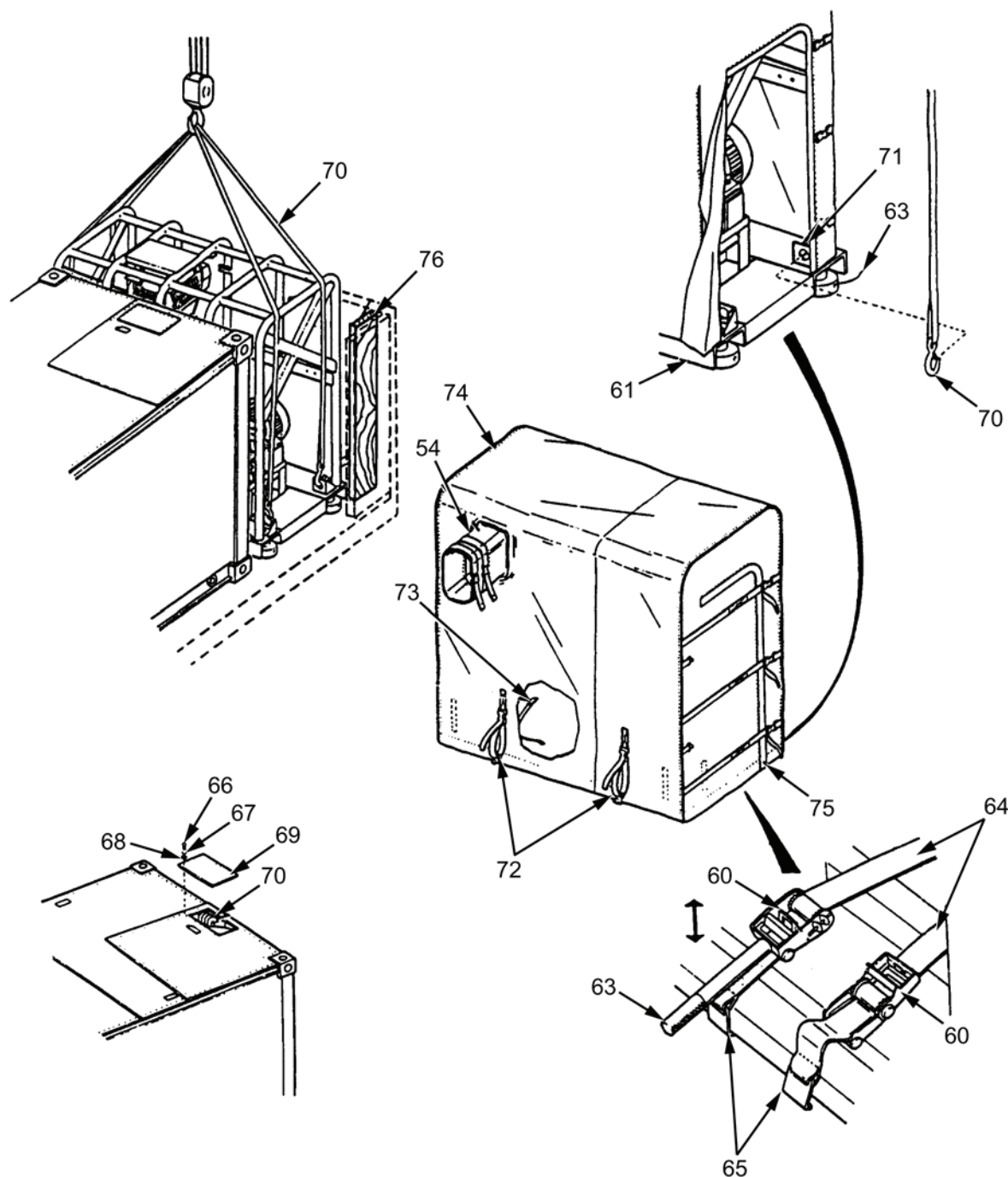


Figure 1. High Pressure Pump Assembly (Sheet 2 of 2).

INSTALLATION

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Attach lifting sling hooks (70) to skid lifting ports (71).

CAUTION

When positioning high pressure pump skid on trailer, be careful not to damage air shock air hoses.

2. For Model ROWPU-1, make a wooden brace (76). Refer to WP 0103 00, for manufacturing instructions.
3. On Model ROWPU-1, place wooden brace (76) into position between high pressure pump and trailer bulkhead.
4. Use suitable lifting device to lift high pressure pump skid (61) onto trailer. Remove and store sling (70) in container
5. Install access cover (69), capscrews (66), new lockwashers (67) and washers (68).
6. Install holddown straps (64) and clips (65).
7. Use ratchet handle (63) to move ratchet (62) up and down applying tension to strap to secure high pressure pump skid to trailer.
8. Install canvas boot (54) through container.
9. Push three power cables (46, 47 and 48) through container wall opening.
10. Push air hose (39) through container wall opening.
11. Push low pressure hose (1) through container wall opening.
12. Push high pressure hose (19) through container wall opening.
13. Install grounding cable (52) by tightening nuts (50) on grounding lugs (51).

WARNING

Make sure electrical power is disconnected before working on unit. Failure to do so could result in serious injury.

14. Connect three power cables (46, 47 and 48) to junction box (49).
15. Install air hose (39) to clamp (41) with new lockwashers (45), two washers (44), capscrews (43) and nuts (42).
16. Connect air hose (39) to air relief valve (40).

NOTE

Use glycerin on all gaskets for easier assembly.

17. Install high pressure hose (19) to high pressure pipe (34) with gasket (38), clamps (37), capscrews (36) and nuts (35).
18. Install clamp (33), clamp (32), nut (31) and screw (30).
19. Install low pressure hose (1) to low pressure pipe (25) with gasket (29), clamps (28), capscrews (27) and nuts (26).
20. Install high pressure hose (19) to high pressure pipe (20) with gasket (24), clamps (23), capscrews (22) and nuts (21).
21. Install capscrow (14), washer (15), new lockwasher (16), plate (17) to spring nut (18).
22. Install low pressure hose (1) to low pressure pipe (2) with gasket (6), clamps (5), capscrews (4) and nuts (3).
23. Secure low pressure hose (1) to clamp (13) with cushion (12), capscrow (7), washers (8), new lockwashers (9) and nut (10).
24. Position and fold outer canvas boot (54) around container wall flange and secure with buckle (53).
25. Model ROWPU-1 Only: Install clamp (59), clamp (58), nut (56), and screw (57) to secure hoses to container wall flange.
26. Pull inner canvas boot (55) through bracket (60) and secure to hoses (1 and 19), power cables (46, 47 and 48) and air hose (39) with buckle (53).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
METAL OXIDE VARISTOR (MOV) JUNCTION BOX CABLE AND HARNESS ASSEMBLIES
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown. (TM 10-4610-232-12)
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cables (1) as described in WP 0010 00.

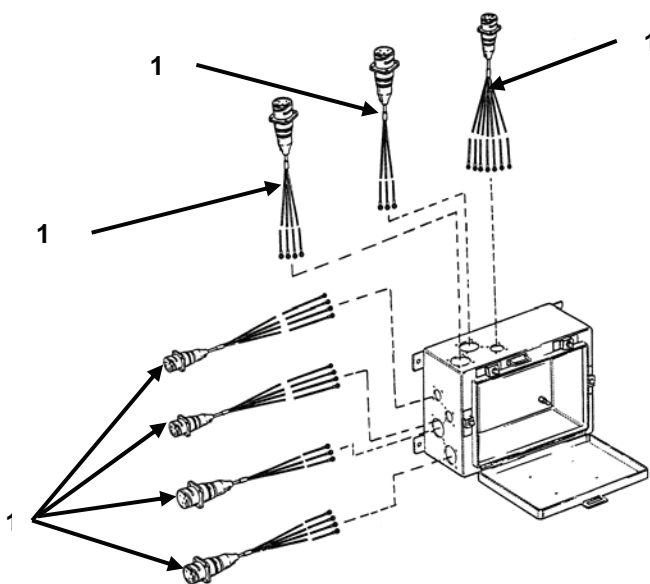


Figure 1. Metal Oxide Varistor (MOV) Junction Box Cables.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
ELECTRIC HEATER
DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Stripper, Wire (TM 10-4610-232-12)
Crimper, Hand, Connector (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Crimper, Hand Terminal (TM 10-4610-232-12)

Materials/Parts:

Markers, Wire (Item 56, WP 0102 00)
Tape, Electrical (Item 71, WP 0102 00)
Terminals, Ring (Item 73, WP 0102 00)
Ties, Wire/Tubing (Item 74, WP 0102 00)
Tags

Equipment Conditions:

Electric heater removed from ROWPU-1
(WP 0116 00, TM 10-4610-232-12)

References:

TB 43-0218

DISASSEMBLY**NOTE**

Heater is easier to work on when turned upside down. Figure 1 shows heater in the inverted position.

1. Remove four screws (1) and cover (2).
2. Turn two fasteners (3) and lift cover assembly (4).
3. Remove six screws (5), three screws (6) and cover (7).
4. Tag and disconnect two wires from toggle switch (8). Remove two screws (9) and toggle switch (8).
5. Tag and disconnect eleven wires from contactor (10). Remove two screws (11) and contactor (10).

NOTE

Thermostat probe is attached to the inlet air stream above the fan.

6. Pull knob (12) off thermostat (13).
7. Tag and disconnect thermostat wires from terminal board.
8. Remove two screws (14), two cable clamps (15), two screws (16) and thermostat (13).
9. Tag and disconnect four wires at transformer (17). Remove two screws (18) and remove transformer (17).
10. Tag and disconnect the wires from heater element (19). Also tag and disconnect wires from fan override (20).

11. Remove two screws (21) and remove heater element (19).
12. Remove retainer (22) and remove fan blade (23).
13. Remove six capscrews (24) and locknuts (25). Remove fan motor assembly (26) from cover (27).

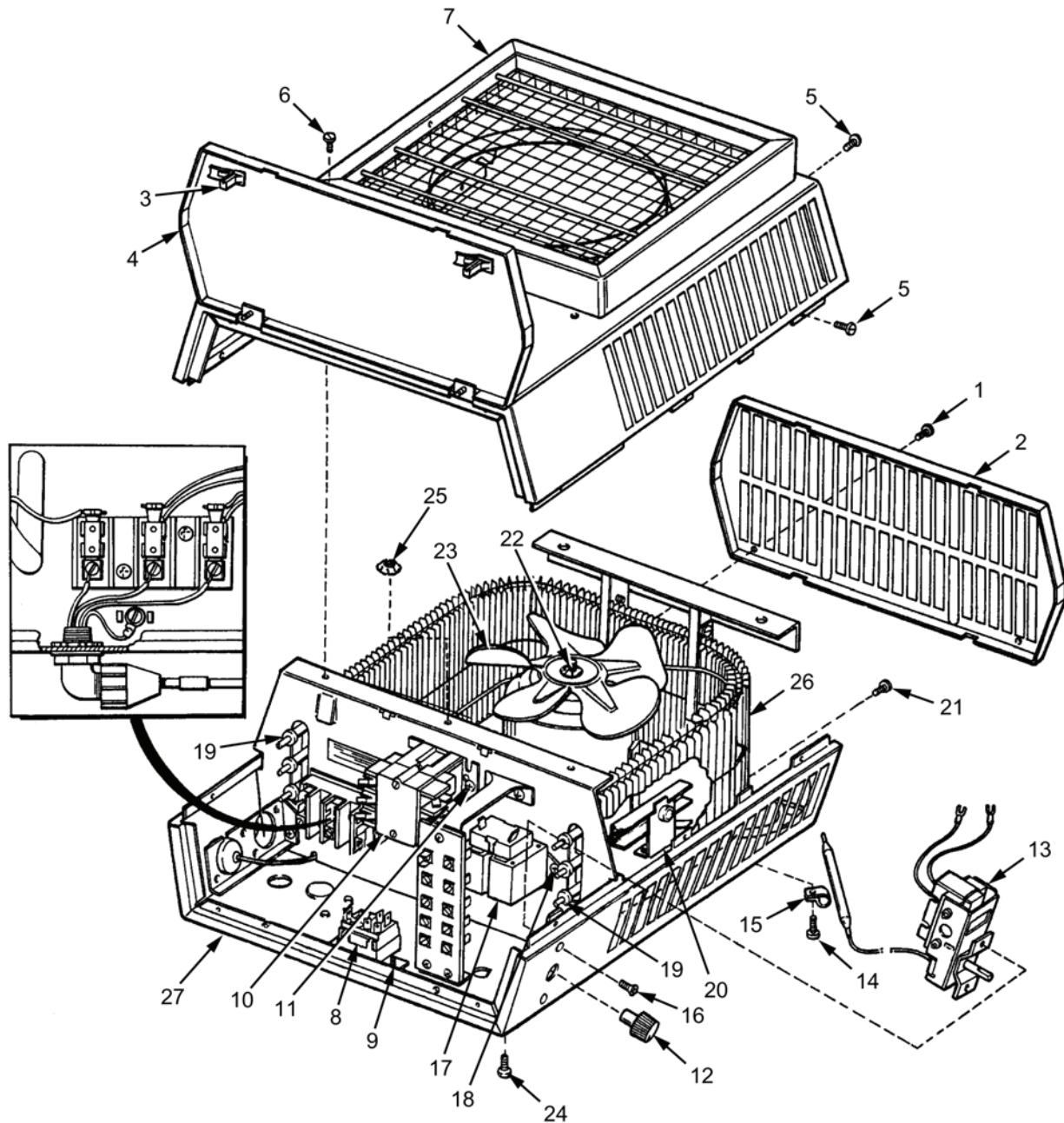


Figure 1. Electric Heater (Inverted View).

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Repair wire terminals as needed (WP 0043 00, TM 10-4610-232-12).
2. Replace cable assembly (WP 0010 00).
3. Replace other damaged components.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install fan motor assembly (26) in cover (27). Secure with six capscrews (24) and locknuts (25).
2. Install fan blade (23) on fan motor (26) and secure with retainer (22).
3. Install heater element (19) and secure with two screws (21).
4. Connect wires on fan override (20) and heater element (19) as tagged.
5. Install transformer (17) and secure with two screws (18). Connect wires as tagged.
6. Install thermostat (13). Secure with two screws (16). Secure thermostat probe with two cable clamps (15) and screws (14).
7. Install knob (12) on thermostat (13). Connect wires as tagged.
8. Install contactor (10) and secure with two screws (11). Connect eleven wires as tagged.
9. Install toggle switch (8) and secure with two screws (9). Connect wires as tagged.
10. Install cover (7) and secure with three screws (6) and six screws (5).
11. Close cover assembly door (4) and secure with fasteners (3).
12. Install cover (2) and secure with four screws (1).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
AIR COMPRESSOR (P/N PURUSP1-H) RELIEF VALVE
DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown. (TM 10-4610-232-12)

Electrical power disconnected from air compressor.

Materials/Parts:

Soap (Item 68, WP 0102 00)

Tape, Antiseize (Item 70, WP 0102 00)

Tags

Lockwashers (TM 10-4610-232-24P)

References:

TB 43-0218

DISASSEMBLY**WARNING**

Ensure electrical power is disconnected and switch is tagged before working on unit. Failure to do so could result in serious injury from electrical shock or moving parts.

WARNING

Ensure high pressure air line is vented. Failure to do so could result in serious injury or death.

1. Open safety relief valve (1) on high pressure relief valve (2) to relieve high pressure air.
2. Disconnect metal piping (3).
3. Disconnect quick disconnect (4).
4. Remove two nuts (5), lockwashers (6), washers (7) and U-bolt (8). Spacer (9) is now free. Discard lockwashers.
5. Unscrew safety relief valve (1).
6. Remove pipe nipple (10) and adapter (11) from cross (12).
7. Remove quick disconnect (4) and elbow (13). Dust cover (14) and cross (12) are now free.

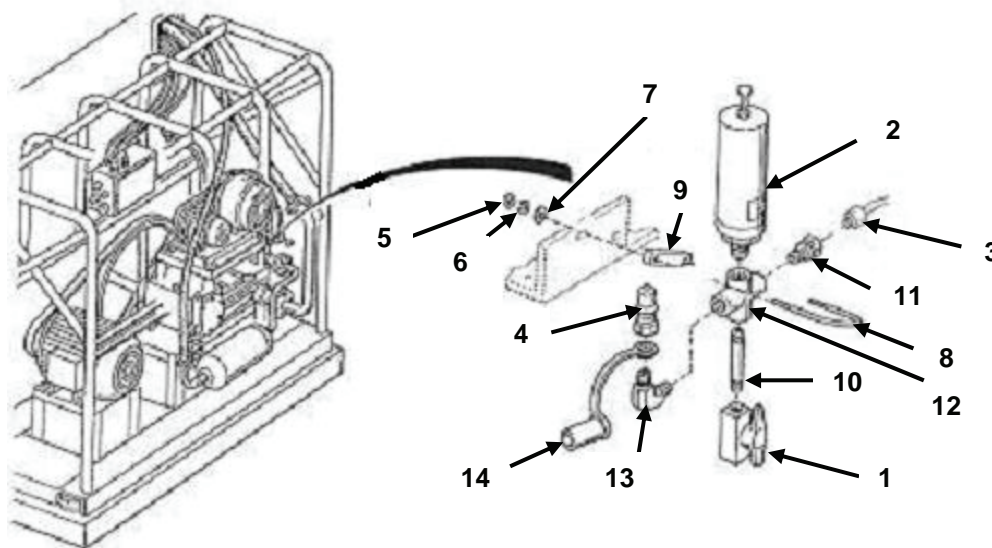


Figure 1. Air Compressor Relief Valve.

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace high pressure relief valve (2) if defective.
2. Replace any other damaged or defective part.

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Wrap antiseize tape on all pipe threads prior to installation.
2. Assemble high pressure relief valve (2), adapter (11), nipple (10), safety relief valve (1), elbow (13), dust cover (14) and quick disconnect (4) on cross (12).
3. Install the subassembly on bracket (9) and secure with U-bolt (8), new lockwashers (6), washers (7) and nuts (5).
4. Connect quick disconnect (4) and metal piping (3).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
AIR COMPRESSOR P/N 02141-001
AIR COMPRESSOR RELIEF VALVE
DISASSEMBLY, REPAIR, REASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown. (TM 10-4610-232-12)

Electrical power disconnected from air compressor.

Materials/Parts:

Soap (Item 68, WP 0102 00)

Tape, Antiseize (Item 70, WP 0102 00)

Tags

Lockwashers (TM 10-4610-232-24P)

References:

TB 43-0218

DISASSEMBLY**WARNING**

Ensure electrical power is disconnected and switch is tagged before working on unit. Failure to do so could result in serious injury from electrical shock or moving parts.

WARNING

Ensure high pressure air line is vented. Failure to do so could result in serious injury or death.

1. Open plug valve (1) on high pressure relief valve (2) to relieve high pressure air.
2. Disconnect J-tube assembly (3).
3. Remove adapter (4) and union (5) from J-tube assembly (3).
4. Disconnect quick disconnect (6).
5. Remove two nuts (7), lockwashers (8), washers (9) and U-bolt (10). Discard lockwashers. Gasket (11) is now free.
6. Unscrew plug valve (1).
7. Remove pipe nipple (12) and straight adapter (13) from cross (14).
8. Remove quick disconnect (6) and elbow (15). Dust cover (16) and cross (14) are now free.

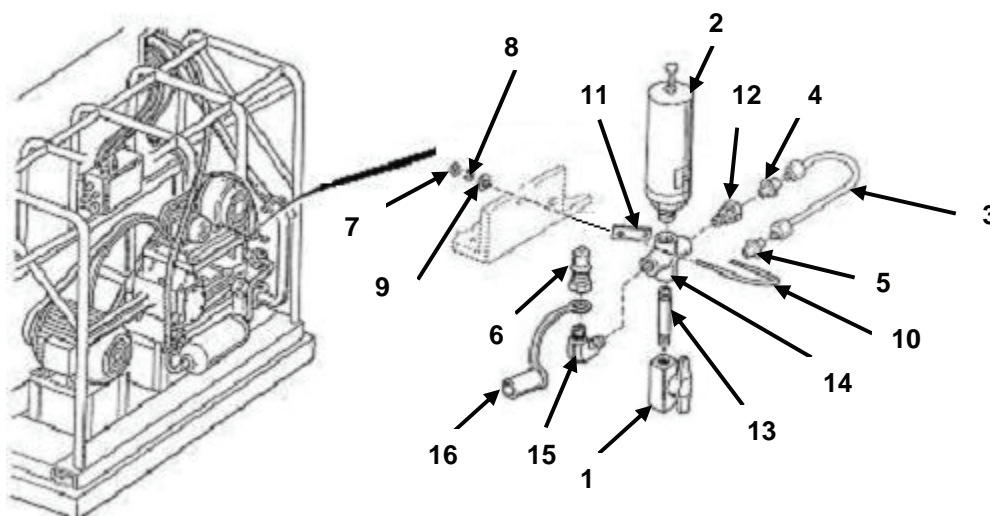


Figure 1. Air Compressor (P/N 02141-001) Relief Valve

REPAIR

1. Replace high pressure relief valve (2) if defective.
2. Replace any other damaged or defective part.

REASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Wrap antiseize tape on all pipe threads prior to installation.
2. Assemble high pressure relief valve (2), straight adapter (13), pipe nipple (12), plug valve (1), elbow (15), dust cover (16) and quick disconnect (6) on cross (14).
3. Install the subassembly to bracket on air compressor frame and secure with gasket (11), U-bolt (10), two new lockwashers (8), washers (9) and nuts (7).
4. Install adapter (4) and union (5) on J-tube (3).
5. Install J-tube assembly (3) to cross (14)
6. Connect quick disconnect (6).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
AIR COMPRESSOR MOTOR P/N 120-00793-001
DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP

Tools/Special Tools:

General Mechanic's Tool Kit (TM 10-4610-232-12)
Puller Kit (TM 10-4610-232-12)
Brass Drift (TM 10-4610-232-12)

Equipment Conditions:

Sheave removed.
Cable disconnected from motor
(TM 10-4610-232-12)

References:

TB 43-0218

DISASSEMBLY

1. Remove three screws (1) and remove fan cover (2).
2. Remove three nuts (3) and through bolts (4).

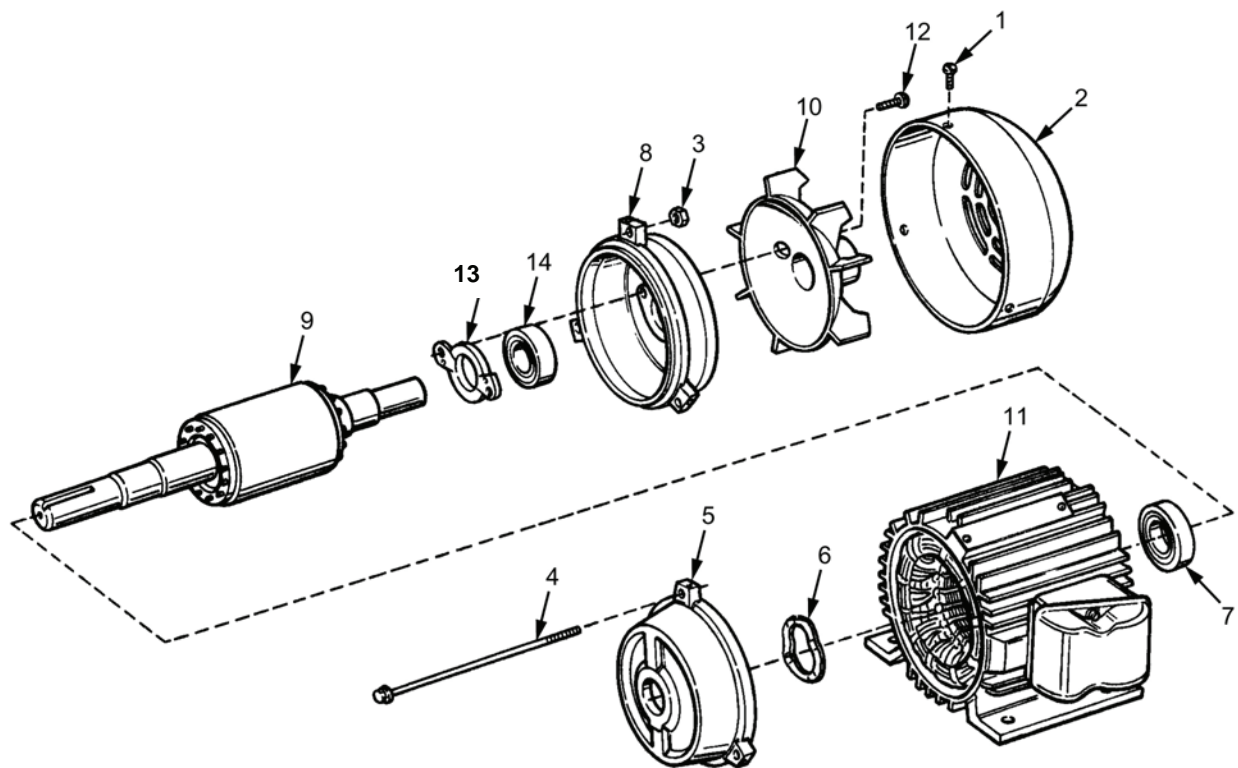


Figure 1. Air Compressor Motor P/N 120-00793-001.

NOTE

Be careful not to lose spring washer.

3. Remove drive end housing (5) and spring washer (6).
4. Using a suitable puller, remove bearing (7)

CAUTION

The fan is plastic. Handle carefully during removal to avoid damaging it.

5. Remove fan end housing (8), rotor (9) and fan (10) as an assembly from stator housing (11).
6. Disassemble housing, rotor and fan assembly as follows:

NOTE

There is one hole in fan. Rotate fan to remove second screw.

- a. Remove two screws (12), which attach bearing retainer (13).
- b. Using a suitable puller, remove fan (10) and end housing (8) as a unit. Bearing (14) will remain on motor shaft. Remove bearing (14) using a suitable puller.
- c. Remove bearing retainer (13).

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. If either bearing (7 or 14) is replaced, replace both bearings to prevent early failure.
2. Replace any damaged parts,

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Assemble housing, rotor and fan assembly as follows:
 - a. Place bearing retainer (13) on rotor shaft (9).
 - b. Install bearing (14) on rotor shaft (9), using a brass drift to seat bearing.

NOTE

There is one hole in fan. Rotate fan to install second screw.

- c. Install fan end housing (8) on rotor (9). Using screws (12), secure bearing retainer (13) to fan end housing (8).
2. Install fan (10).
3. Install the subassembly in stator housing (11).
4. Install bearing (7) on rotor shaft (9) using brass drift to seat bearing.
5. Place spring washer (6) in drive end housing (5) and install drive end housing. Secure with three through bolts (4) and nuts (3).
6. Install fan cover (2) and secure with three screws (1).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
AIR COMPRESSOR ASSEMBLY P/N PURUSP1-H
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Pliers, Snap Ring, External (TM 10-4610-232-12)
Pliers, Snap Ring, Internal (TM 10-4610-232-12)
Tool Kit, Compressor (TM 10-4610-232-12)

Equipment Conditions:

Air compressor motor removed.
(WP 0120 00, TM 10-4610-232-12).
Air compressor relief valve removed (WP 0075 00).
Oil drained from crankcase.
(WP 0117 00, TM 10-4610-232-12).

Materials/Parts:

Cleaning Solvent (Item 28, WP 0102 00)
Gaskets (TM 10-4610-232-24P)
Lockwashers (TM 10-4610-232-24P)
Preformed Packing (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

References:

TB 43-0218

REMOVAL

1. Remove four capscrews (1), lockwashers (2) and washers (3). Two brackets (4) and air compressor assembly (5) will now be free. If necessary, remove four spring nuts (6). Discard lockwashers.
2. Remove four capscrews (7), lockwashers (8) and washers (9) and remove plate (10). Discard lockwashers.
3. Remove four capscrews (11), lockwashers (12) and washers (13) and remove two channels (14). Discard lockwashers.
4. If necessary, remove four spring nuts (15) (into which capscrews (7) fit) from two channels (14).

DISASSEMBLY**NOTE**

Disassembly of air compressor is covered in the following four stages:

1. Air compressor external components.
2. Air compressor second stage components.
3. Air compressor third stage components.
4. Air compressor first stage components.

Air compressor crankcase components are repaired at General Support.

1. External Components:
 - a. Disconnect tubing (16) at four points by loosening nuts (17) and remove as an assembly.
 - b. Disassemble as follows:
 - (1) Remove capscrew (18), nut (19) and washer (20).
 - (2) Remove capscrew (21), nut (22) and washer (23). Remove clamps (24) and (25) and clip (26).

- (3) Remove capscrews (27), nut (28), washer (29) and clamps (30).
- (4) Remove capscrew (31), nut (32), washer (33) and clamps (34).
- (5) Remove capscrew (35), nut (36), washer (37) and clamps (38).

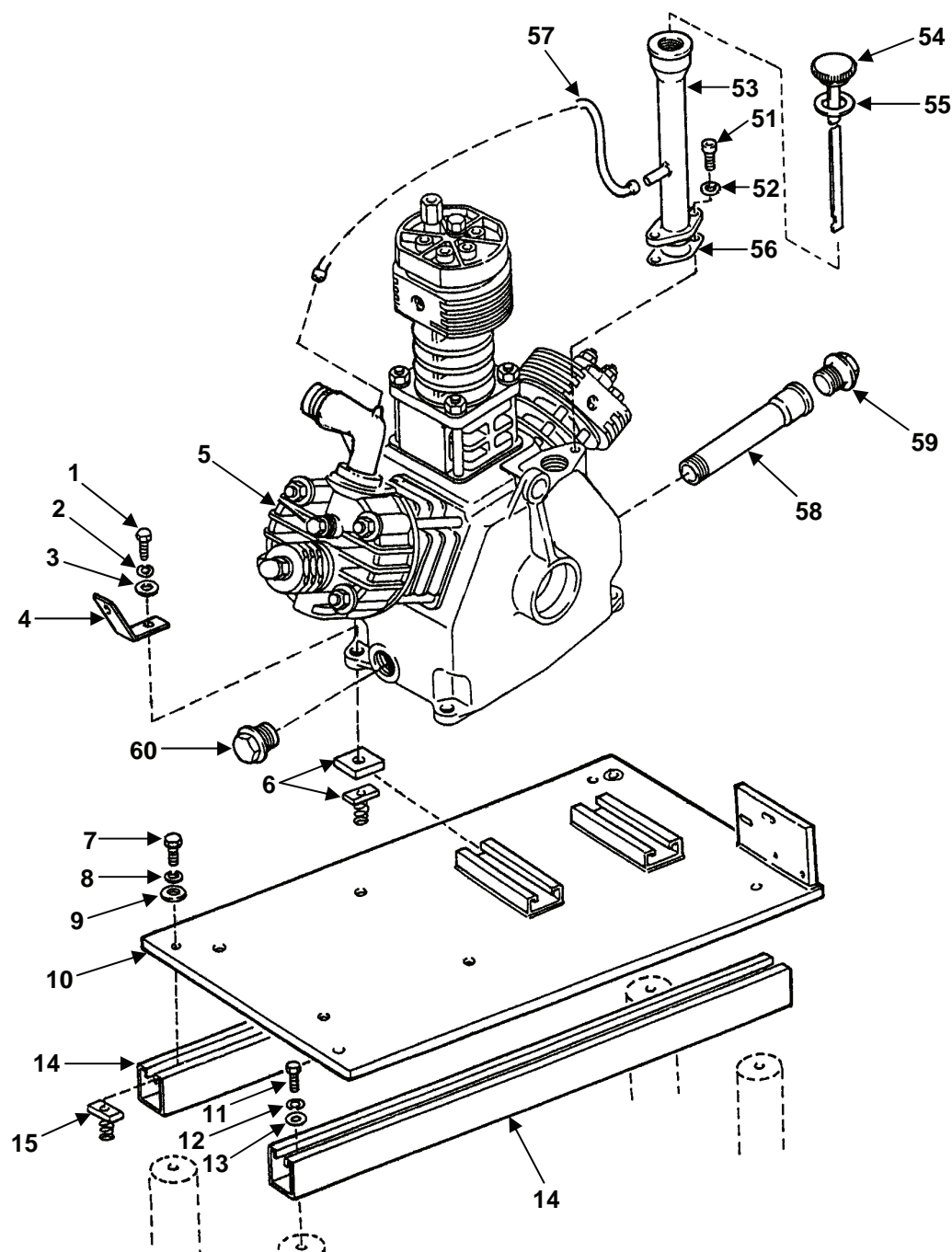


Figure 1. Air Compressor External Components (Sheet 1 of 2).

- c. Remove tube (39) by loosening nut (40).
- d. Remove valve (41), connector (42) and fitting (43).
- e. Remove connector (44) and preformed packing (45).
- f. Remove valve (46), gasket (47) and adapter (48). Remove connector (49) and elbow (50). Discard gasket.
- g. Remove two capscrews (51), washers (52), filler tube (53), dipstick (54), preformed packing (55) and gasket (56). Remove tube (57).
- h. Remove drain tube (58) if necessary. Remove plugs (59) and (60).

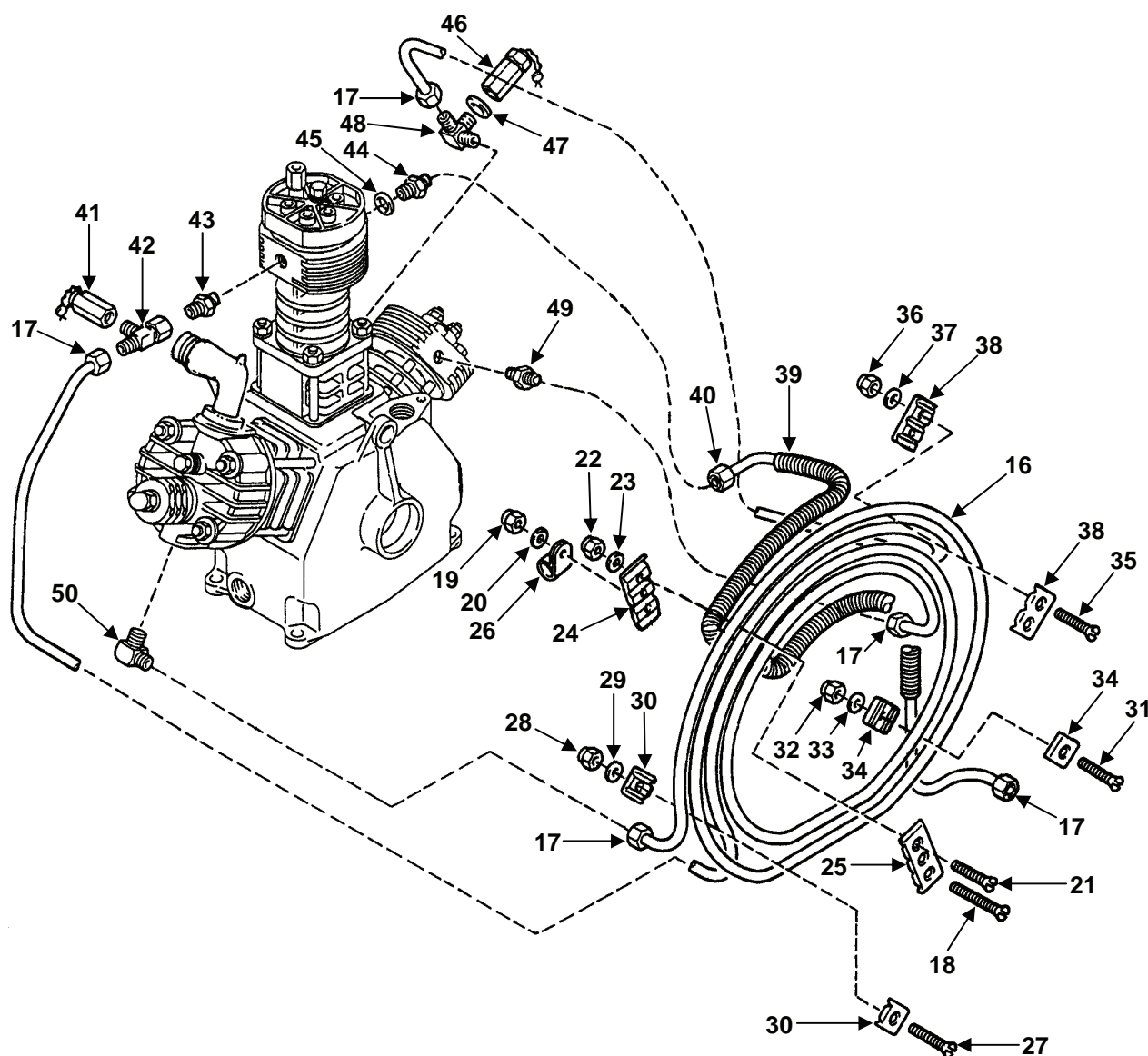


Figure 1. Air Compressor External Components (Sheet 2 of 2).

2. Second Stage Components:

- a. Remove five socket head screws (61) and extension nut (62).
- b. Remove locknut (63), gasket (64) and stud (65).
- c. Remove head cover (66) and head (67).
- d. Carefully remove discharge valve (68) and preformed packing (69) from head (67).
- e. Remove inlet valve (70) from underside of head (67) using valve key.
- f. Remove tube (71) and nozzle (72) from cylinder (73).
- g. Remove four nuts (74) and washers (75).
- h. Remove cylinder (73) and stud (76) if damaged.
- i. Remove the top part of floating piston assembly (77) and separate the bottom part from cylinder (73).
- j. Remove preformed packing (78) and stud (79), if damaged.

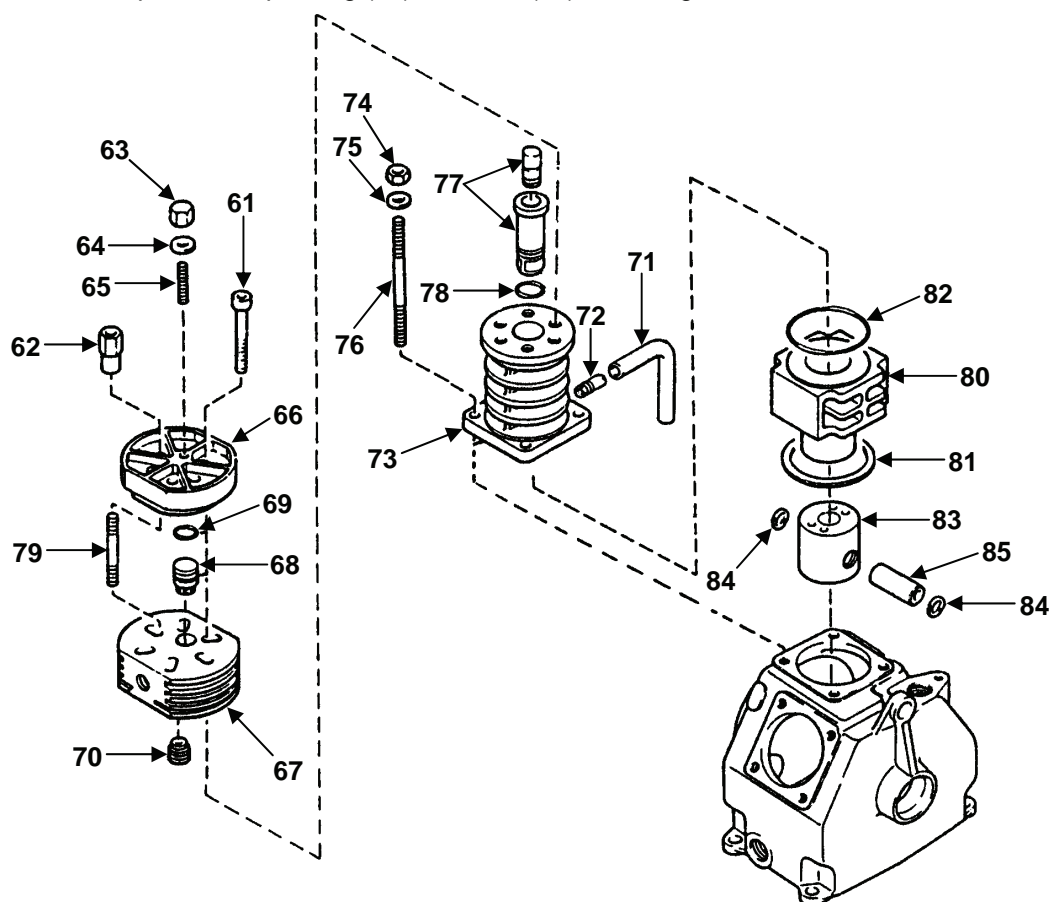


Figure 2. Air Compressor, Second Stage Components.

CAUTION

Do not use force when removing cylinder from crankcase. Do not allow pistons to fall against crankcase when cylinders are removed.

- k. Remove cylinder (80), gasket (81) and preformed packing (82).
 - l. Carefully rotate crankshaft by hand to bring piston (83) to its uppermost position. Remove snap rings (84) and piston pin (85) and remove piston (83).
3. Third Stage Components:
- a. Remove two nuts (86), two washers (87) and flange (88).
 - b. Remove two studs (89), if necessary.
 - c. Remove inlet valve (90) and discharge valve (91). Remove two preformed packings (92).
 - d. Remove four nuts (93), washers (94) and remove head (95).
 - e. Remove cylinder (96) and gasket (97).

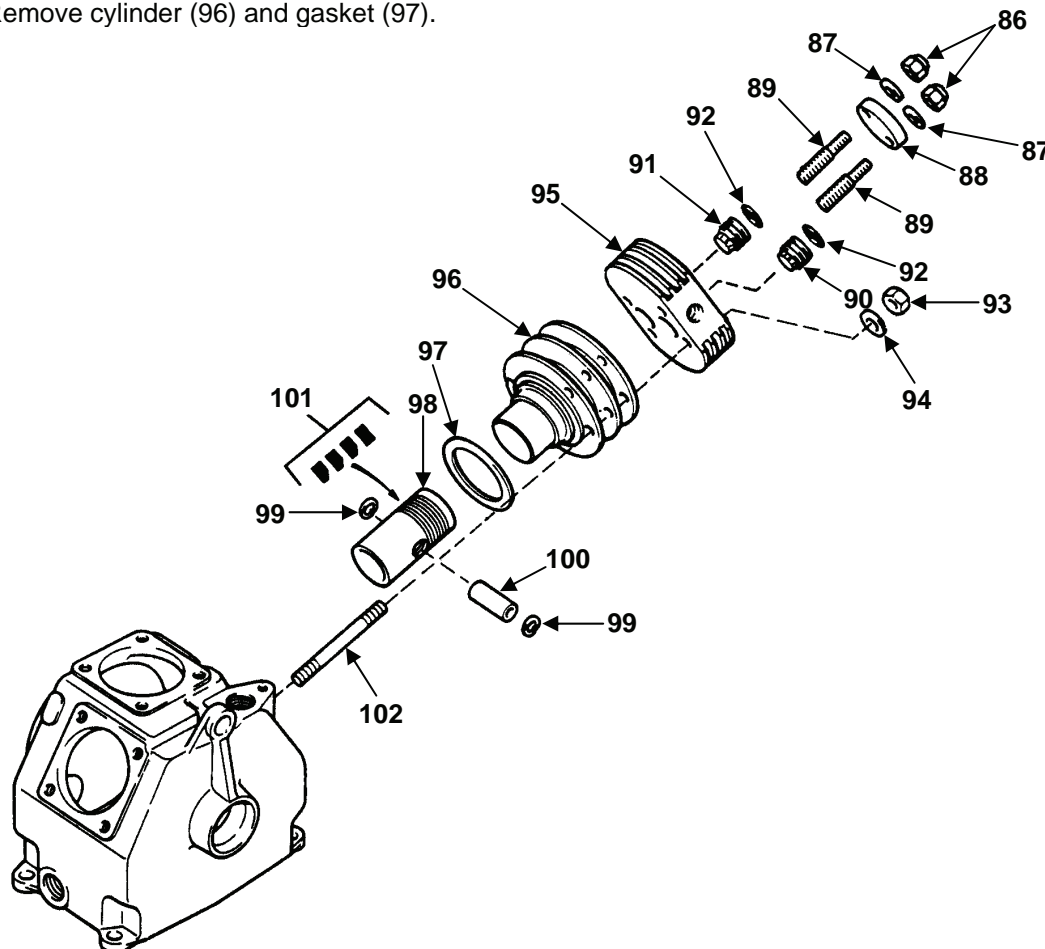


Figure 3. Air Compressor, Third Stage Component.

- f. Carefully rotate crankshaft by hand to bring piston (98) to its uppermost position. Using snap ring pliers, remove snap rings (99). Remove piston pin (100) and piston (98).
 - g. If necessary, remove rings (101) using a ring expander.
 - h. If necessary, remove studs (102).
4. First Stage Components:
- a. Remove four nuts (103), washers (104) and remove first stage head (105) and gasket (106).
 - b. Unscrew intake elbow (107) and remove preformed packing (108).
 - c. Clamp first stage head (105) securely in a vise with top facing upward.
 - d. Unscrew plug (109) from first stage head (105).
 - e. Remove preformed packing (110) and washer (111).
 - f. Remove pressure valve assembly (112) and discard. It is not reusable.

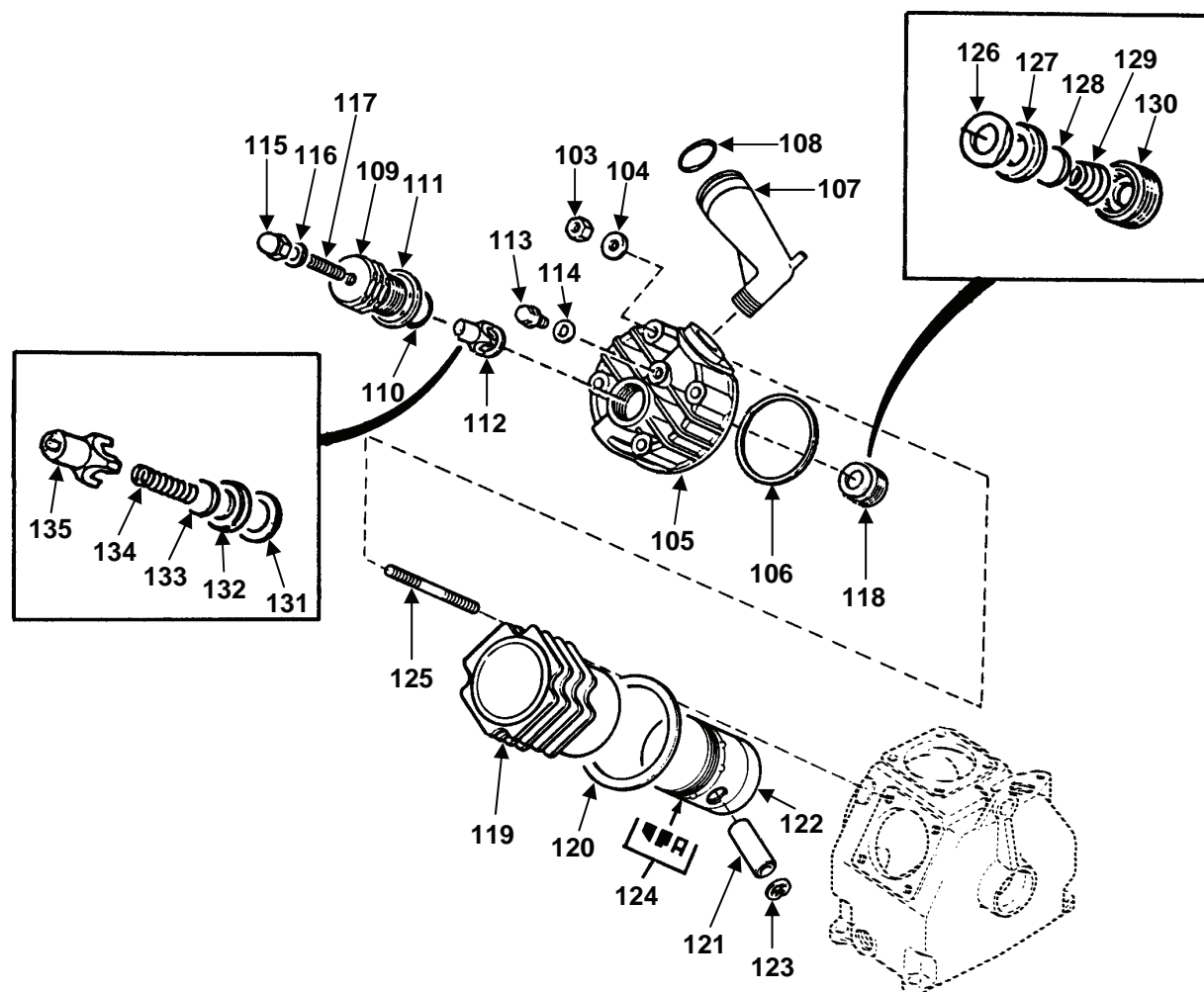


Figure 4. Air Compressor, First Stage Components.

- g. If necessary, remove plug (113), gasket (114), nut (115), washer (116) and stud (117).
- h. Turn head (105) over with top facing downward.
- i. Use valve key to remove discharge valve assembly (118) and discard. It is not reusable.
- j. Remove cylinder (119) and gasket (120).
- k. Carefully rotate crankshaft by hand so that the piston pin (121) of piston (122) is above the level of the crankcase.
- l. Remove two snap rings (123).
- m. Remove piston pin (121) and remove piston (122).
- n. Using a piston ring expander, remove piston rings (124). If necessary, remove studs (125).

REPAIR

WARNING

Provide adequate ventilation when using cleaning solvent. Avoid prolonged breathing of vapors and minimize skin contact. Solvent is highly flammable. Keep away from sources of heat and open flame.

WARNING

Do not use more than 30 psig (207 kPa) compressed air for parts cleaning. Keep other workers at a safe distance when cleaning parts with compressed air.

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

- 1. Clean all parts in solvent and blow dry with compressed air 30 psig (207 kPa) maximum.
- 2. Inspect pistons for scratches, broken areas between rings and general damage. Replace as necessary.
- 3. Inspect cylinders for internal scratches that could cause leaks and broken exterior fins. Replace as necessary.

NOTE

The piston and sleeve must be replaced as a set.

- 4. Check piston and sleeve assembly (122) for excessive wear or deep scratches. Replace as necessary.
- 5. Inspect heads and valves for pitting and corrosion. Corrosion in or around valve ports is cause for replacement.

6. Inspect intercooler and after cooler tubes for damage and evidence of leaks. Replace as necessary.
7. Inspect all threaded connectors for damage or stripped threads. Replace as necessary.
8. Inspect drive belts for cuts or cracking. Replace worn or damaged belts.
9. Inspect rubber grommets and mounting pads for distortion or deterioration. Replace as necessary.
10. Refer to WP 0097 00, Table 1. Replace any component(s) exceeding clearance or tolerance limits.

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

Reassembly of air compressor is covered in four stages as follows:

1. Air compressor first stage components.
2. Air compressor third stage components.
3. Air compressor second stage components.
4. Air compressor external components.

1. First Stage Components:

NOTE

Slotted ring goes in bottom groove. Ring with machined shoulder around diameter goes in middle groove (with shoulder facing bottom of piston). Solid ring goes in top groove.

NOTE

Be sure that TOP mark on piston rings is facing upwards and that gaps in piston rings are not directly above piston pins. Gaps in adjacent rings must be at least 90° apart.

- a. Use piston ring expander to install piston rings (124) on piston (122).
- b. Compress piston rings (124) and install piston (122) into cylinder (119), allowing clearance to install piston pin (121).
- c. Install studs (125) and position gasket (120) on crankcase.
- d. Turn the crankshaft to raise the connecting rod to its highest point in the crankcase and install piston (122) on the connecting rod, securing the piston with piston pin (121) and snap rings (123).

NOTE

With piston at top dead center, piston and cylinder should be flush.
Adjust with gaskets under cylinder as necessary.

- e. Clamp cylinder (119) to crankcase with a force of 9 ± 3 lb-ft (12 ± 4 N•m) and measure from top of piston (122) to top of cylinder (119).
- f. Clamp first stage head (105) in vise, top down.
- g. Install new discharge valve assembly (118) in cylinder head in the following order.
 - (1) Install gasket (126) in bottom of valve bore.
 - (2) Install valve seat (127) in bore, flat face down.

NOTE

Disk must be centered on raised portion of seat.

- (3) Place valve disk (128) in position on valve seat (127).

NOTE

Make sure spring is properly seated in plug.

- (4) Install wide diameter of spring (129) in plug (130).

NOTE

Use valve key tool to tighten plug until it bottoms out.

NOTE

Plug must be below surface of head when properly installed. If plug did not go in all the way, remove it and make sure valve disk is properly centered in bore.

- (5) Install plug (130) and spring (129) in first stage head (105).
- (6) To lock in place, center punch the plug and head in three places.
- h. Turn first stage head (105) over.
- i. Install new pressure valve assembly (112) in first stage head (105) in the following order:
 - (1) Install gasket (131) in bore.
 - (2) Install valve seat (132) flat face down.

NOTE

Valve disk must be centered on raised portion of valve seat.

- (3) Place valve disk (133) on top of valve seat (132).

NOTE

Spring and disk must be centered in bore.

- (4) Place spring (134) on top of valve disk (133).

NOTE

When properly installed, legs of valve insert will be free to contact valve seat with no interference from disk.

- (5) Place valve insert (135) over spring (134).
- j. Install preformed packing (110) on plug (109). Preformed packing must be in large groove.

NOTE

Check to be sure stud does not protrude into inner bore of plug.

- k. Install washer (111) on plug (109) and install stud (117), washer (116) and nut (115)

NOTE

Hand tighten plug until it bottoms.

- l. Install plug (109) into first stage head (105).
- m. Place gasket (114) on plug (113) and install plug in first stage head (105).
- n. Install intake elbow (107) on first stage head (105) and install preformed packing (108) on intake elbow (107).
- o. Position first stage head (105) on cylinder (119) so intake elbow (107) is toward the other cylinders.
- p. Install four washers (104) and nuts (103). Torque nuts to 9 ± 3 lb-ft (12 ± 4 N•m).
2. Third Stage Components:

NOTE

- Make sure that gaps in piston rings are not directly above piston pins. Gaps in adjacent rings must be at least 90° apart.
 - All four piston rings are identical and must be installed with the TOP mark facing upward.
- a. Use a piston ring expander to install piston rings (100) on piston (98). All four rings are identical and must be installed with the TOP mark facing upward.
- b. Compress rings (101) and install piston (98) into cylinder (96) allowing clearance to install piston pin (100).
- c. Install studs (102) and position gasket (114) on cylinder (113).
- d. Turn the crankshaft to expose piston (98) to the maximum distance above crankcase.
- e. Install piston (98) on connecting rod and secure with piston pin (100) and two snap rings (99).

- f. Clamp cylinder (113) to crankcase with a force of 6 to 12ft-lbs. (8 to 15 N•m) and measure from top of piston (98) to top of cylinder. With piston (98) at top dead center, piston should be between 0.005 and 0.007 in. (0.15 to 0.20 mm) below top of cylinder. Adjust with gaskets under cylinder as necessary.
 - g. Install cylinder head (112).
 - h. Install four washers (111) and nuts (110) and torque to 9 to 12 lb-ft (8 to 15 N•m).
 - i. Install preformed packing (109) on discharge valve (107).
 - j. Install discharge valve (107) in deeper of two bores in cylinder head (112).
 - k. Install preformed packing (109) on inlet valve (108) and install in other bore in head (112).
 - l. Install two studs (106), if removed.
 - m. Install flange (105) over studs (106).
 - n. Install two washers (104) and nuts (103) on studs (106). Torque to 4 ± 1 lb-ft (6 ± 2 N•m).
3. Second Stage Components:
- a. Carefully rotate crankshaft by hand to bring the second stage piston rod to its uppermost position. Install piston (83) and secure with piston pin (85) and snap rings (84).
 - b. Install gasket (81), cylinder (80) and preformed packing (82).
 - c. Install preformed packing (78) on sleeve (77) and install stud (79), if removed.
 - d. Assemble the two parts of floating piston assembly (77) and insert the bottom part in cylinder (73).
 - e. Install stud (76) and cylinder (73).
 - f. Install four nuts (74) and washers (75) and torque to 9 to 12 lb-ft (8 to 15 N•m).
 - g. Install nozzle (72) and tube (71).
 - h. Install inlet valve (70) to underside of head (67) using valve key.
 - i. Carefully install preformed packing (69) on discharge valve (68) and install both on head (67).
 - j. Install head cover (69) on head (67).
 - k. Install stud (65), gasket (64) and nut (63). Torque to 4 ± 1 lb-ft (6 ± 2 N•m).
 - l. Install five screws (61) and extension nut (62).
4. External Components:

CAUTION

Do not over tighten drain tube. The crankcase can crack if this is done.

- a. Install drain tube (58), plug (59) and plug (60).

- b. Install gasket (56), tube (53) with two washers (52) and capscrews (51) and breather hose (57)
- c. Install dipstick (54) and preformed packing (55).
- d. Install elbow (50).
- e. Install connector (49).
- f. Install adapter (48), gasket (47) and safety valve (46).
- g. Install preformed packing (45) and connector (44).
- h. Install fitting (43), connector (42) and valve (41).
- i. Connect tube (39).
- j. Assemble tubing(16) as follows:
 - (1) Install capscrew (35), nuts (36), washers (37) and clamps (38).
 - (2) Install capscrew (31), nut (32), washer (33) and clamps (34).
 - (3) Install capscrew (27), nut (28), washer (29) and clamps (30).
 - (4) Install capscrew (18), nut (19), washer (20) and clip (26) on clamp (24 and 25).
 - (5) Install capscrew (21), nut (22) and washer (23).
- k. Place assembled clamps and tubing (16) on air compressor and connect tubing (16) at the points shown and secure with nuts (17) and (40).

INSTALLATION

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. If they were removed, install four spring nuts (15) in channels (14) on the supporting posts and secure with four capscrews (11), new lockwashers (12) and washers (13).
2. Place plate (10) on channels (14) and secure with four capscrews (7), new lockwashers (8) and washers (9).

3. Install spring nuts (6) and place air compressor assembly (5) on the mounting brackets welded on the plate (10).
4. Place the air compressor directly over the spring nuts and secure the air compressor with capscrews (1), new lockwashers (2) and washers (3), keeping in mind that the two shroud brackets (4) must be installed as shown on the drive sheave end of the air compressor assembly (5).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
AIR COMPRESSOR ASSEMBLY P/N 02141-001
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
 Tool Kit, Compressor (TM 10-4610-232-12)

Materials/Parts:

Cleaning Solvent (Item 28, WP 0102 00)
 Gaskets (TM 10-4610-232-24P)
 Lockwashers (TM 10-4610-232-24P)
 Nuts, Self-Locking (TM 10-4610-232-24P0)
 O-rings (TM 10-4610-232-24P)
 Washers (TM 10-4610-232-24P)

References:

TB 43-0218

Equipment Conditions:

Air compressor motor removed. (WP 0121 00, TM 10-4610-232-12)
 Intake tube and intake filter removed. (WP 0035 00, TM 10-4610-232-12)
 Belt tensioner removed. (WP 0122 00, TM 10-4610-232-12)
 Air compressor relief valve removed. (WP 0076 00)
 Intermediate separator removed. (WP 0124 00, TM 10-4610-232-12)
 Cooling fan removed. (WP 0123 00, TM 10-4610-232-12)
 Oil drained from crankcase. (WP 0117 00, TM 10-4610-232-12)

REMOVAL

1. Remove four capscrews (1), lockwashers (2) and washers (3). Move plate (4) as needed and remove four bolts (5), isolators (6) and self-locking nuts (7). Remove frame (8) from plate (4). Discard lockwashers.
2. Remove oil drain assembly (9).
3. Remove four capscrews (10), lockwashers (11) and washers (12). Air compressor assembly (13) will now be free. Discard lockwashers.
4. Remove four capscrews (14), lockwashers (15) and washers (16) and remove two channels (17). Discard lockwashers.
5. If necessary, remove four spring nuts (18) (into which capscrews (1) fit) from channels (17).

DISASSEMBLY**NOTE**

Disassembly of air compressor is covered in four stages as follows:

1. Air compressor external components.
2. Air compressor first stage components.
3. Air compressor second stage components.
4. Air compressor third stage components.

Air compressor crankcase components are repaired at the General Support level.

1. External Components:

- a. Loosen two tube nuts (19) and remove first/second stage intercooler (20).
- b. Remove first stage safety valve (21) and gasket (22). Discard gasket (22).

- c. Remove tee (23) and two elbows (24).
- d. Loosen two tube nuts (25) and remove second stage intercooler assembly (26).
- e. Disassemble as follows:
 - (1) Remove three capscrews (26), self-locking nuts (27) and washers (28). Remove brackets (29).
 - (2) Remove two capscrews (30), self-locking nuts (31) and washers (32). Remove brackets (33) and (34).

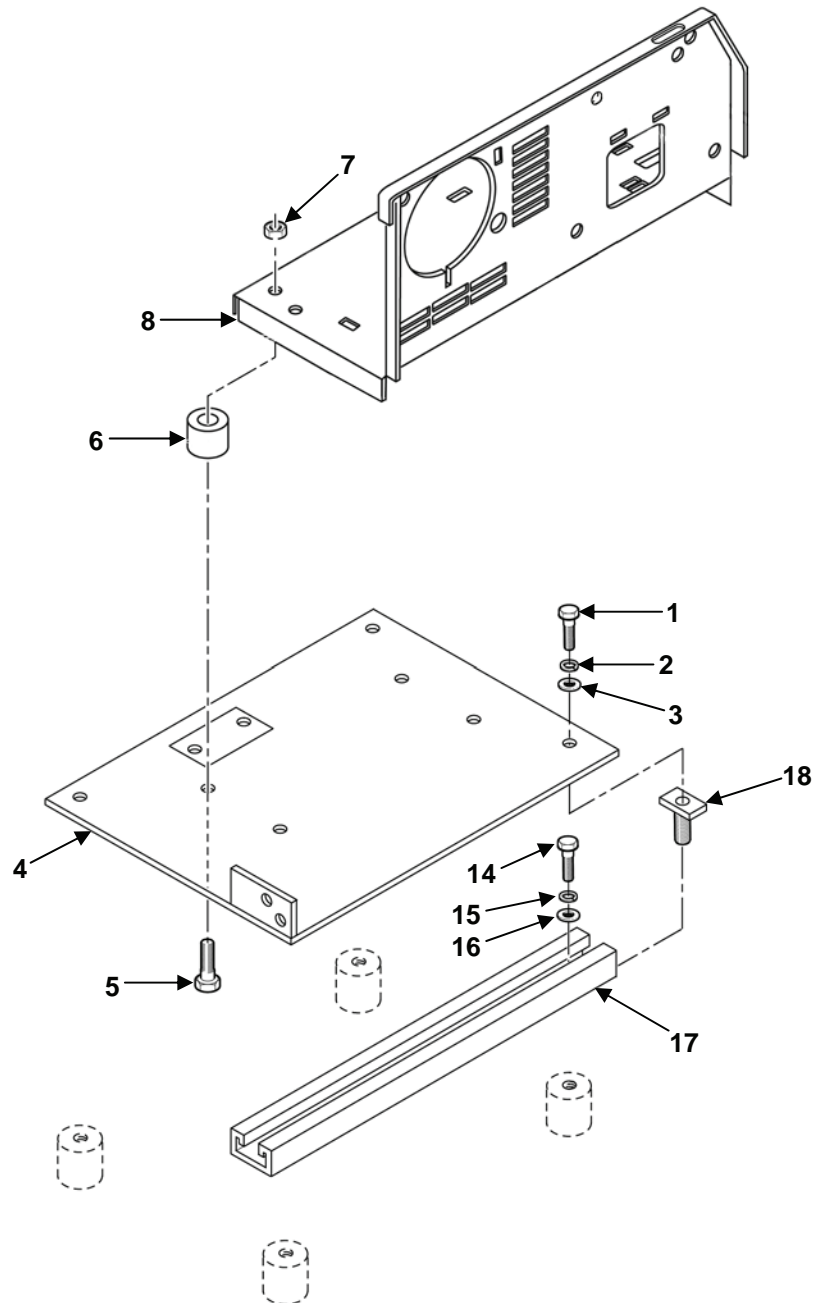


Figure 1. Air Compressor External Components.

- f. Remove two elbows (35).
- g. Loosen tube nut (36) and remove after-cooler (37).
- h. Disassemble as follows:
 - (1) Remove capscrew (38), two flat washers (39) and self-locking nut (40).
 - (2) Remove self-locking nut (41), flat washers (42), stud (43) and bracket (44).

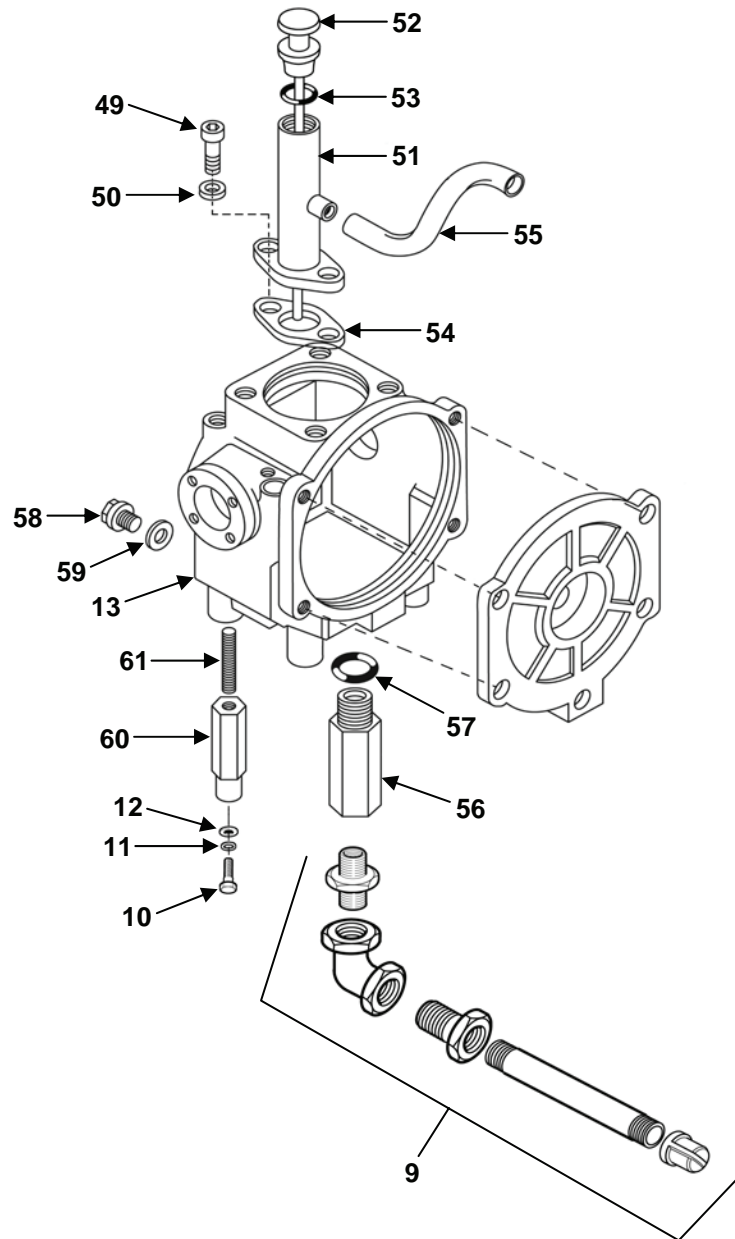


Figure 2. Air Compressor External Components.

- i. Remove elbow (45).
- j. Loosen two tube nuts (46) and remove tubing (47).
- k. Remove two connectors (48).
- l. Remove two capscrews (49), washers (50), oil filler (51), dipstick (52), o-ring (53) and gasket (54). Remove hose (55).
- m. Remove drain extension (56) and gasket (57). Discard gasket. Remove plug (58) and gasket (59). Discard gasket.
- n. Remove four spacers (60) and studs (61), if necessary.

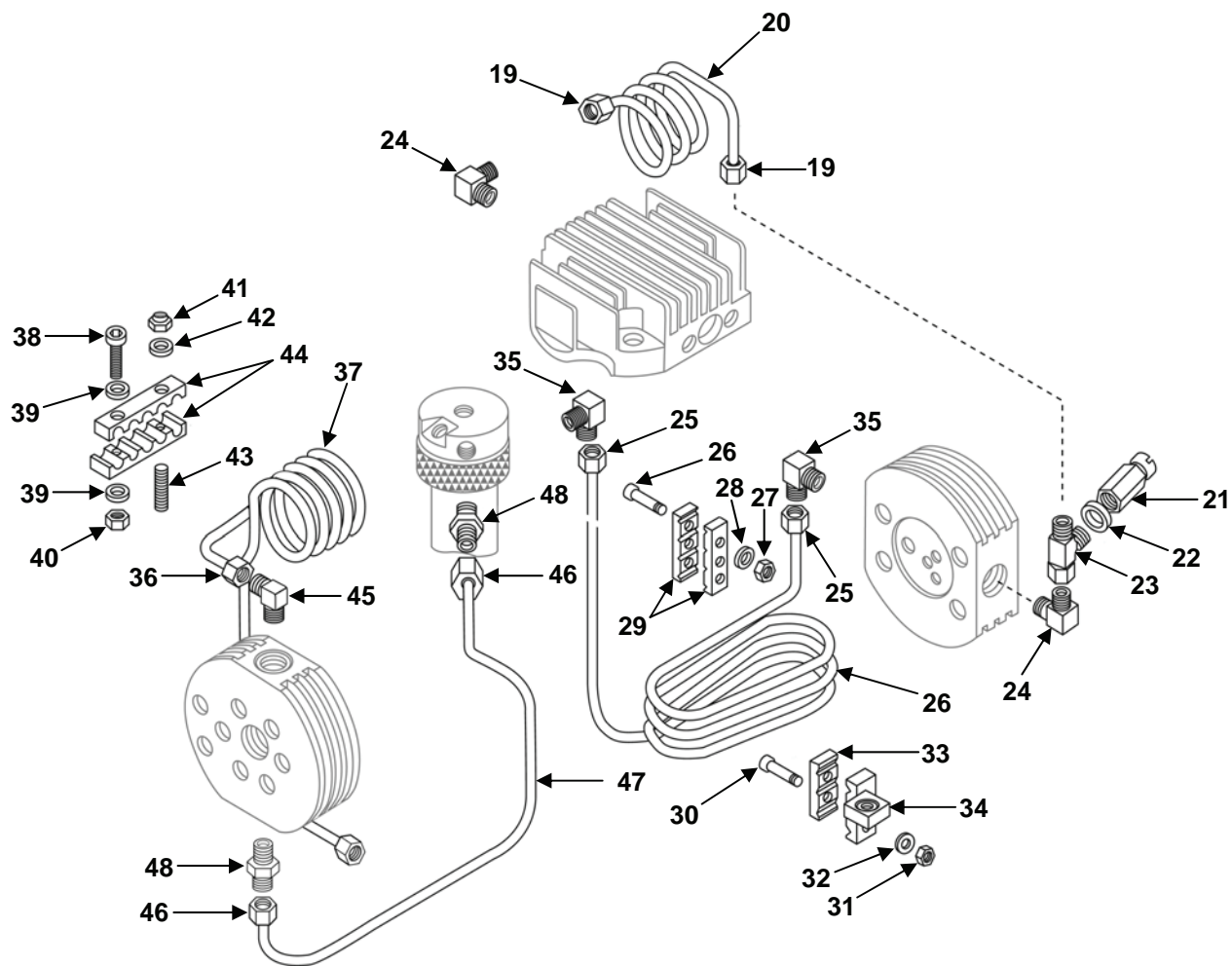


Figure 3. Air Compressor External Components.

2. First Stage Components:

- a. Remove two self-locking nuts (62) and washers (63). Remove two hex bushings (64) and washers (65). Remove first stage head (66), gasket (67), reed valve (68) and o-ring (69). Discard gasket (67) and o-ring (69).

CAUTION

**Do not use force when removing cylinder from crankcase.
Do not allow piston to fall against crankcase when cylinder is removed.**

- b. Remove cylinder (70) and o-ring (71). Discard o-ring (71).
- c. Remove four studs (72), if necessary.
- d. Carefully rotate crankshaft by hand to bring piston (73) to its uppermost position. Remove two circlips (74) and piston pin (75) and remove piston (73).
- e. Using a piston ring expander, remove piston rings (76).

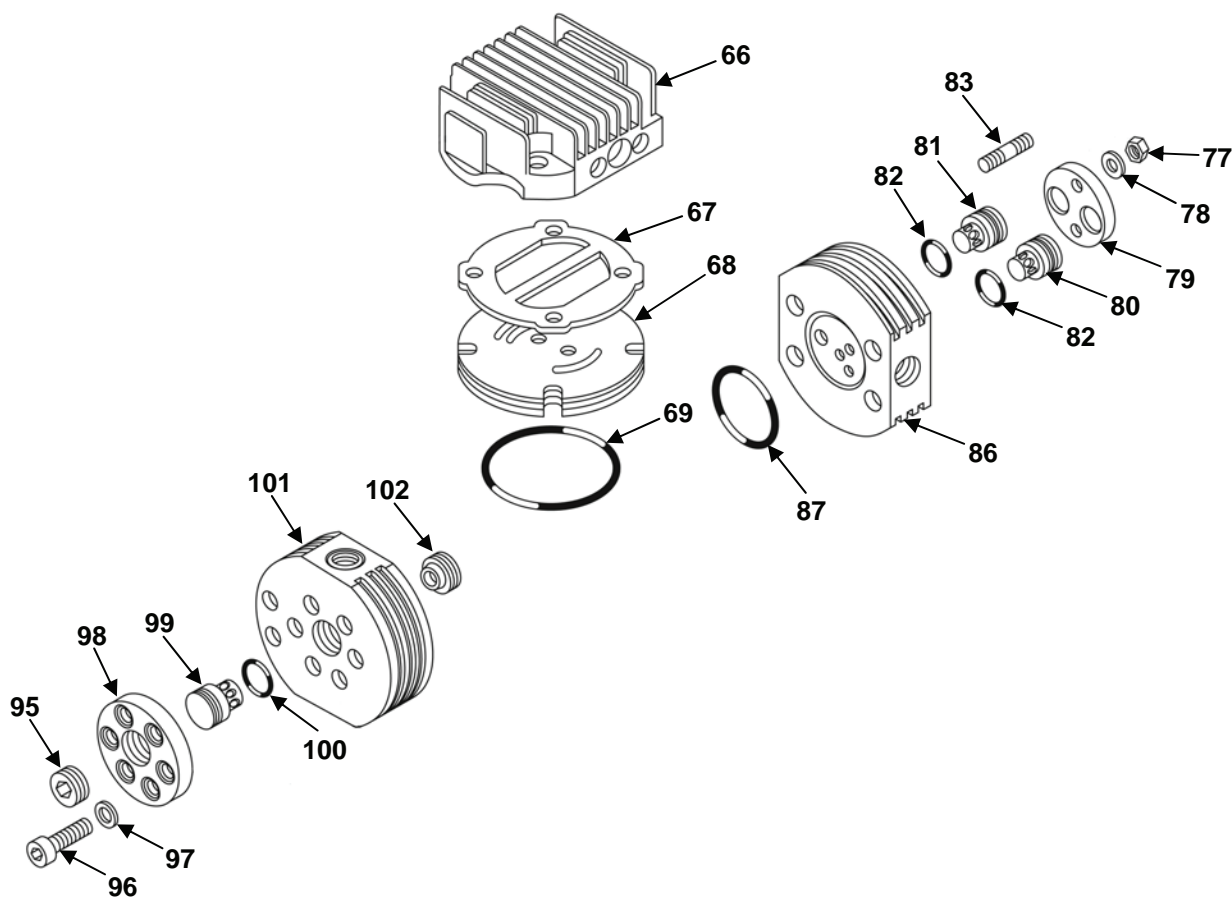


Figure 4. Disassemble Air Compressor, First, Second and Third Stage Components.
(Sheet 1 of 2)

3. Second Stage Components:

- a. Remove two self-locking nuts (77) and spring washers (78). Remove second stage valve cover (79).
- b. Remove inlet valve assembly (80) and discharge valve assembly (81) using two screwdrivers.
- c. Remove two o-rings (82) and discard.
- d. Remove two studs (83), if damaged.
- e. Remove four self-locking nuts (84) and washers (85) and remove second stage valve head (86)..
- f. Remove o-ring (87) and discard.
- g. Remove four studs (88), if necessary.

CAUTION

Do not use force when removing cylinder from crankcase. Do not allow piston to fall against crankcase when cylinder is removed.

- h. Remove cylinder (89) and preformed packing (90).
- i. Carefully rotate crankshaft by hand to bring piston (91) to its uppermost position. Remove two circlips (92) and piston pin (93) and remove piston (91).
- j. Using a piston ring expander, remove piston rings (94).

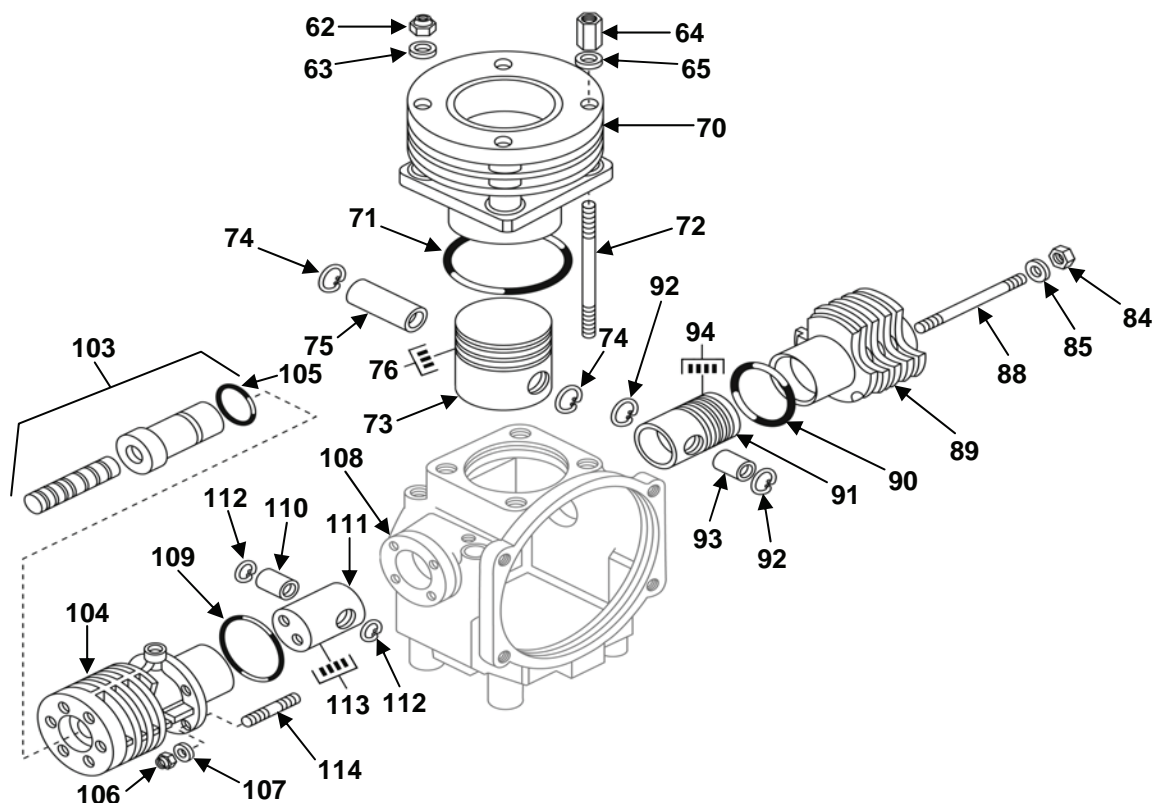


Figure 4. Disassemble Air Compressor First, Second and Third Stage Components.
(Sheet 2 of 2)

4. Third Stage Components:

CAUTION

Always change the intake and discharge valves at the same time.

NOTE

The discharge valve is merely inserted into the valve head. It is sealed by the o-ring and fixed to the valve head by the torque plug.

- a. Loosen plug (95) a couple of turns.
- b. Remove six capscrews (96) and washers (97) and remove valve head cover (98).
- c. Lift out discharge valve (99) with two screwdrivers. Remove o-ring (100) and discard.
- d. Remove third stage valve head (101). Remove intake valve (102) from valve head (101) using valve removal tool and triplex wrench.

CAUTION

**Do not use force when removing cylinder from crankcase.
Do not allow pistons to fall against crankcase when cylinder is removed.**

- e. Remove piston and sleeve assembly (103) from cylinder (104). Remove o-ring (105) and discard.
- f. Remove four self-locking nuts (106) and washers (107). Remove cylinder (104) from crankcase (108).
- g. Remove o-ring (109).
- h. Carefully rotate crankshaft by hand so that the piston pin (110) of piston (111) is above the level of the crankcase.
- i. Remove two circlips (112).
- j. Remove the piston pin (110) and remove piston (111).
- k. Using a piston ring expander, remove piston rings (113). If necessary, remove studs (114).

REPAIR**WARNING**

Provide adequate ventilation when using cleaning solvent. Avoid prolonged breathing of vapors and minimize skin contact. Solvent is highly flammable. Keep away from sources of heat and open flame.

WARNING

Do not use more than 30 psig (207 kPa) compressed air for parts cleaning. Keep other workers at a safe distance when cleaning parts with compressed air.

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Clean all parts in solvent and blow dry with compressed air 30 psig (207 kPa) maximum.
2. Inspect pistons for scratches, broken areas between rings and general damage. Replace as necessary.
3. Inspect cylinders for internal scratches that could cause leaks and broken exterior fins. Replace as necessary.
4. Inspect heads and valves for pitting and corrosion. Corrosion in or around valve ports is cause for replacement.
5. Inspect intercooler and aftercooler tubes for damage and evidence of leaks. Replace as necessary.
6. Inspect all threaded connectors and studs for damage or stripped threads. Replace parts as necessary.
7. Inspect drive belts for cuts or cracking. Replace worn or damaged belts.
8. Inspect rubber isolators for distortion or deterioration. Replace as necessary.

REASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

Reassembly of air compressor is covered in four stages as follows:

1. Air compressor third stage components.
2. Air compressor second stage components.
3. Air compressor first stage components.
4. Air compressor external components.

1. Third Stage Components:

NOTE

- Make sure that gaps in piston rings are not directly above piston pins. Gaps in adjacent rings must be at least 90° apart.
 - All four piston rings are identical and must be installed with the TOP mark facing upward.
- a. Use a piston ring expander to install piston rings (113) on piston (111). All four rings are identical and must be installed with the TOP mark facing upward.
 - b. Compress rings (113) and install piston (111) into cylinder (104) allowing clearance to install piston pin (110).
 - c. Install four studs (114) and position o-ring (109) on cylinder (104).
 - d. Turn the crankshaft to raise the connecting rod to its highest point in crankcase and install piston (111) on connecting rod, securing piston (111) with two circlips (112).
 - e. Align cylinder (104) on studs (114). Install four self-locking nuts (106) and washers (107).
 - f. Install o-ring (105) on piston and sleeve assembly (103). Install piston and sleeve assembly (103) into cylinder (104).
 - g. Install intake valve (102) in bottom side of valve head (101) using valve removal tool and triplex wrench.
 - h. Install o-ring (100) in valve head (101). Install discharge valve (99) in top side of valve head (101).
 - i. Align valve head (101) on cylinder (104). Position valve head cover (98) on valve head (101). Install six capscrews (96) and washers (97). Torque capscrews (96) to 7 ft-lbs (9.5 N•m).
 - j. Torque plug (95) to 14 ft-lbs (19 N•m).

2. Second Stage Components:

NOTE

- Make sure that gaps in piston rings are not directly above piston pins. Gaps in adjacent rings must be at least 90° apart.
 - All four piston rings are identical and must be installed with the TOP mark facing upward.
- a. Use a piston ring expander to install piston rings (94) on piston (91). All four rings are identical and must be installed with the TOP mark facing upward.
 - b. Compress rings (94) and install piston (91) into cylinder (89) allowing clearance to install piston pin (93).
 - c. Install four studs (88).
 - d. Turn the crankshaft to raise the connecting rod to its highest point in crankcase and install piston (91) on connecting rod, securing piston (91) with two circlips (92).
 - e. Install two studs (83) in top of valve head (86).

- f. Install two o-rings (82) in valve head (86).
- g. Install inlet valve assembly (80) and discharge valve assembly (81) in valve head (86).

NOTE

Make sure curved side of spring washers face up.

- h. Install cover (79) on head (86) with two self-locking nuts (77) and spring washers (78). Torque nuts (77) to 7 ft-lbs (9.5 N•m).
 - i. Align cylinder (89) on crankcase and position head (86) on studs (88).
 - j. Install four self-locking nuts (84) and washers (85). Torque nuts (84) to 7 ft-lbs (9.5 N•m).
3. First Stage Components:

NOTE

Slotted ring goes in bottom groove. Ring with machined shoulder around diameter goes in middle groove (with shoulder facing bottom of piston). Solid ring goes in top groove.

NOTE

Be sure that TOP mark on piston rings is facing upwards and that gaps in piston rings are not directly above piston pins. Gaps in adjacent rings must be at least 90° apart.

- a. Use piston ring expander to install piston rings (76) on piston (73).
- b. Install o-ring (71) on cylinder (70).
- c. Compress rings (76) and install piston (73) into cylinder (70), allowing clearance to install piston pin (75).
- d. Install four studs (72) on crankcase (108).
- e. Turn the crankshaft and raise the connecting rod to its highest point in the crankcase and install piston (73) on the connecting rod, securing the piston with piston pin (75) and two circlips (74).
- f. Position cylinder (70) on studs (72) and crankcase (108).

NOTE

When installing reed valve, make sure the mark "S" faces upward and towards the inlet filter side. The cross bar on the gasket provides a seal between the inlet and pressure opening of the reed valve.

- g. Install o-ring (69). Align reed valve (68) on cylinder (70).
- h. Install gasket (67) on studs (72) and reed valve (68).
- i. Install head (66) on studs (72).

4. External Components:

- a. Install four studs (61) on bottom of crankcase (108). Install four spacers (60) on studs (61).
- b. Install gasket (57) on oil drain extension (56). Install extension (56) on crankcase (108).
- c. Align oil filter (51) and gasket (54) on crankcase (108). Install two capscrews (49) and washers (50).
- d. Install hose (55) on oil filter (51).
- e. Install o-ring (53) on dipstick (52). Install dipstick (52) in oil filter (51).
- f. Install plug (58) and gasket (59).
- g. Install two connectors (48). Install tubing (47) on connectors (48) and tighten tube nuts (46).
- h. Install after-cooler (37) as follows:
 - (1) Position bracket (44) on after-cooler (37). Install stud (43), self-locking nut (41) and flat washer (42).
 - (2) Install capscrew (38), two flat washers (39) and self-locking nut (40).
- i. Install second stage intercooler assembly (26) as follows:
 - (1) Install two elbows (35).
 - (2) Position brackets (33) and (34) on intercooler assembly (26). Install two capscrews (30), self-locking nuts (31) and washers (32).
 - (3) Position brackets (29) on intercooler assembly (26). Install three capscrews (26), self-locking nuts (27) and washers (28).
 - (4) Install intercooler assembly (26) on elbows (35) and tighten two tube nuts (25).
- k. Install two elbows (24) and tee (23).
- l. Install gasket (22) and safety valve (21) on tee (23).
- m. Install first/second stage intercooler (20) on tee (23) and elbow (24). Tighten two tube nuts (19).

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. If they were removed, install four spring nuts (18) in channels (17) on the supporting posts and secure with four capscrews (14), new lockwashers (15) and washers (16).
2. Align air compressor assembly (13) on frame (8). Install four capscrews (10), new lockwashers (11) and washers (12).

3. Install oil drain assembly (9).
4. Align frame (8) and isolators (6) on plate (4). Install four bolts (5) and self-locking nuts (7).
5. Place plate (4) on channels (17) and secure with four capscrews (1), new lockwashers (2) and washers (3).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE PUMP BELT GUARD
DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Wire Brush (TM 10-4610-232-12)
Welding Equipment (TM 10-4610-232-12)
Lifting Equipment (TM 10-4610-232-12)

References:

TB 43-0218
TM 9-237
TM 43-0139

Equipment Conditions:

High pressure pump assembly and cover
removed from trailer (WP 0072 00)

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

DISASSEMBLY**NOTE**

Front belt guard screens are replaced at unit level.

1. Remove sixteen capscrews (1), lockwashers (2), washers (3), clamp (4) and rear screen (5). Discard lockwashers.
2. Remove neoprene trim (6) if necessary.
3. Remove straightedge (7).
4. Remove four capscrews (8), nuts (9), lockwashers (10), washers (11) and two fastener loops (12). Discard lockwashers.
5. Remove ten capscrews (13), lockwashers (14), washers (15), top panel (16) and rails (17). Discard lockwashers.
6. Remove four rivets (18) and name plate (19).
7. Remove sixteen capscrews (20), lockwasher (21), washers (22), panels (23) and channels (24). Discard lockwashers.
8. Remove six capscrews (25), lockwashers (26), washers (27) and supports (28). Discard lockwashers.
9. Remove two capscrews (30), lockwashers (31), washers (32) and support (29). Discard lockwashers.
10. Remove fifty-four spring nuts (33), if necessary, from channels (24) and supports (28) and (29).
11. Remove four capscrews (34), washers (35), nuts (36), lockwashers (37), washers (38) and remove guard plate (39) from pump skid (40). Discard lockwashers.

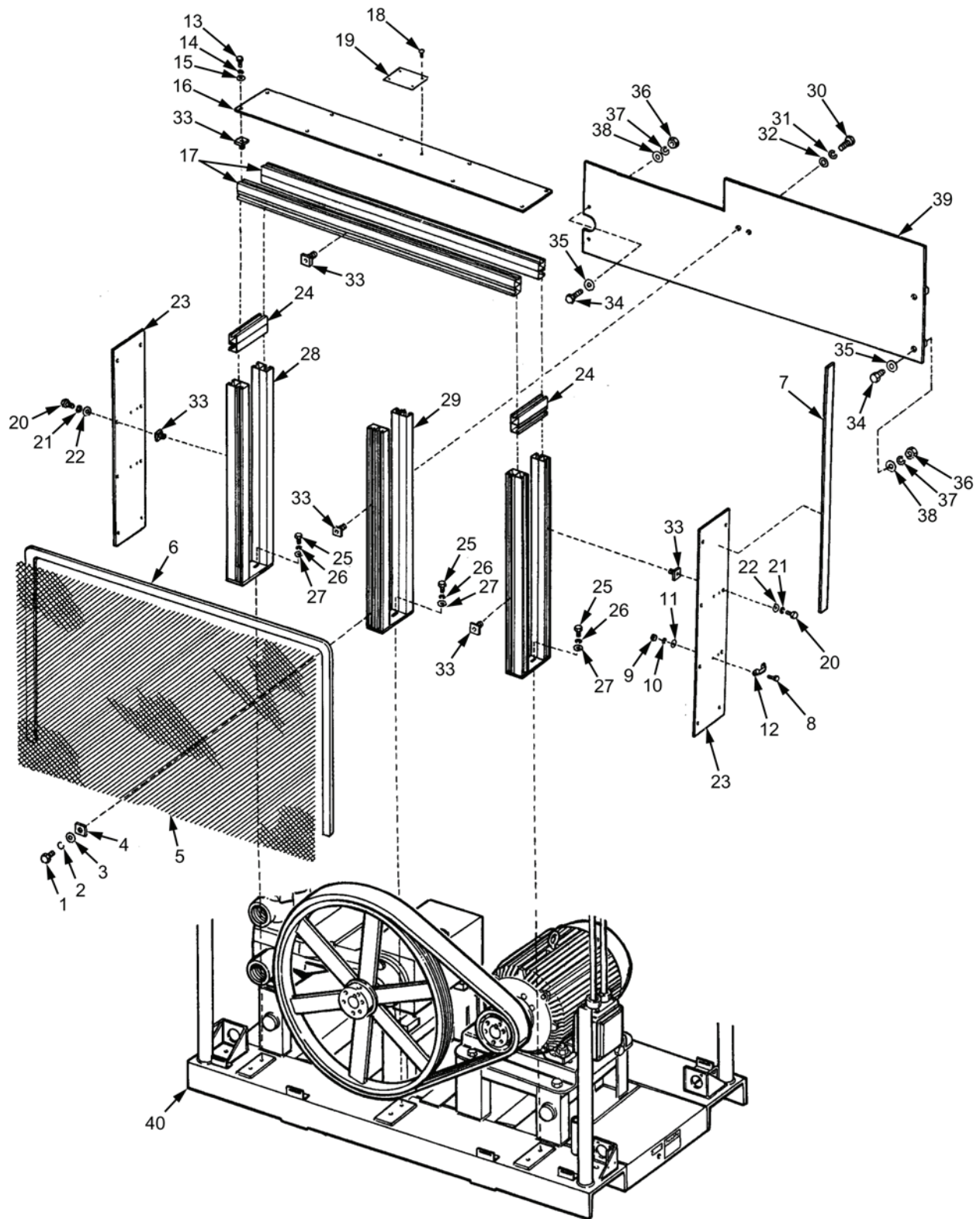


Figure 1. High Pressure Pump Belt Guard.

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace damaged or missing hardware.
2. Clean dirt and paint from area to be repaired.
3. Weld damaged areas. For welding procedures refer to TM 9-237.
4. Paint all areas repaired. Refer to TM 43-0139.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install guard plate (39) on pump skid (40). Secure with four capscrews (34), washers (35), nuts (36), new lockwashers (37) and washers (38).
2. If removed, install spring nuts (33), channels (24), and supports (28) and (29).
3. Install support (29). Secure with two capscrews (30), new lockwashers (31) and washers (32).
4. Install supports (28). Secure with capscrews (25), new lockwashers (26) and washers (27).
5. Install channels (24) and panels (23). Secure to supports (28) with capscrews (20), new lockwashers (21) and washers (22).
6. If removed, secure nameplate (19) with rivets (18) (WP 0043 00, TM 10-4610-232-12) to top plate (16).
7. Install rails (17) and top plate (16). Secure with ten capscrews (13), new lockwashers (14) and washers (15).
8. Install two fastener loops (12) on panel (23). Secure with four capscrews (8), nuts (9), new lockwashers (10) and washers (11). Install straightedge (7).
9. If removed, install neoprene trim (6) on screen (5).
10. Mount screen (5). Secure with sixteen capscrews (1), new lockwashers, (2), washers (3) and clamp (4).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE PUMP MOTOR
TESTING, REMOVAL, REPAIR, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Suitable Lifting Device (TM 10-4610-232-12)

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Generator power off.
Motor sheave removed
(WP 0128 00, TM 10-4610-232-12).

References:

TB 43-0218

TESTING**WARNING**

Electrical high voltage can cause serious injury or death. The test requires power to be connected. Always take proper measures to ensure personal safety.

Run unit and check for excessive noise, vibration or overheating.

REMOVAL**WARNING**

This motor is very heavy. Use care to avoid injury when attempting to lift or move the motor.

1. Remove four nuts (1), lockwashers (2) and washers (3). Motor is now free. Discard lockwashers.
2. Attach suitable lifting device to eyebolt (4) and remove motor (5).
3. Remove four capscrews (6), washers (7), nuts (8), lockwashers (9) and washers (10). Discard lockwashers.
4. Remove motor mounting base (11).

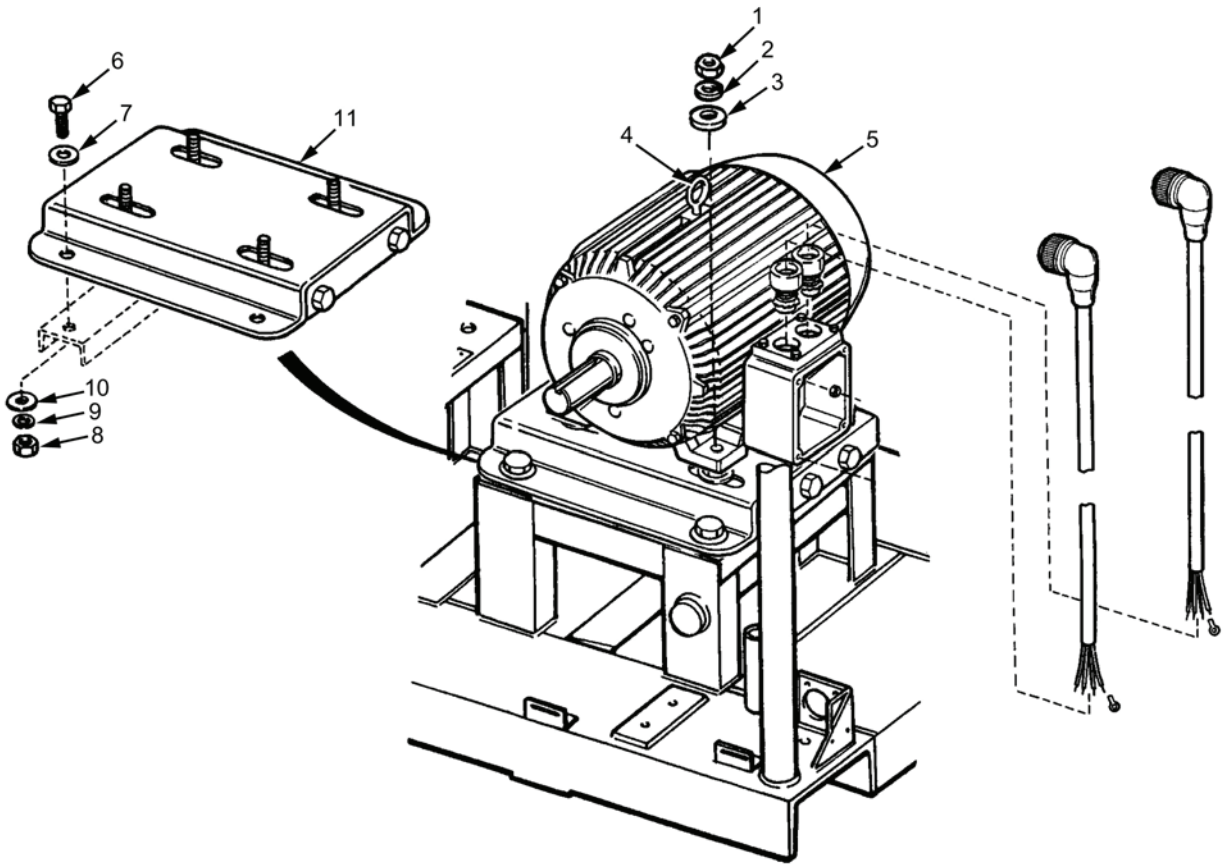


Figure 1. High Pressure Pump Motor.

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

Cable is removed at unit level but repaired at direct support.

1. Repair cable (WP 0010 00).
2. Repair of motor or base is by replacement.

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Mount motor mounting base (11). Secure with four capscrews (6), washers (7), nuts (8), new lockwashers (9) and washers (10).
2. Attach suitable lifting device to eyebolt (4) and mount motor (5) onto mounting base (11).
3. Secure with four washers (3), new lockwashers (2) and nuts (1).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE ASSEMBLY, PIPING, VALVES, AND HOSES
INSPECTION, DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Materials/Parts:

Gaskets (TM 10-4610-232-24P)

Washers (TM 10-4610-232-24P)

References:

TB 43-0218

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).

Electrical power disconnected from high pressure pump motor.

High pressure relief valve removed (WP 0083 00).

High and low pressure hoses removed.
(WP 0072 00)

INSPECTION**WARNING**

Make sure electrical power is disconnected before working on unit.
Failure to do so could result in serious injury from electrical shock
or moving parts.

Inspect the high pressure pump piping and components for leaky connections or damaged parts.

DISASSEMBLY

1. Remove four capscrews (1), washers (2) and (3), lockwashers (4) and nuts (5). Discard lockwashers.
2. Remove pipe (6) and gasket (7).
3. Remove valve (8) and nipple (9) from pulse dampener (10).
4. Remove eight capscrews (11), washers (12) and (13), lockwashers (14) and nuts (15). Discard lockwashers.
5. Remove four capscrews (16), lockwashers (17) and washers (18). Discard lockwashers.
6. Remove two straps (19).
7. Lift and remove pulse dampener (10) off support bracket (20).
8. Remove gasket (21).
9. Remove four capscrews (22), lockwashers (23), washers (24) and remove support bracket (20). Discard lockwashers.

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Replace any damaged parts.

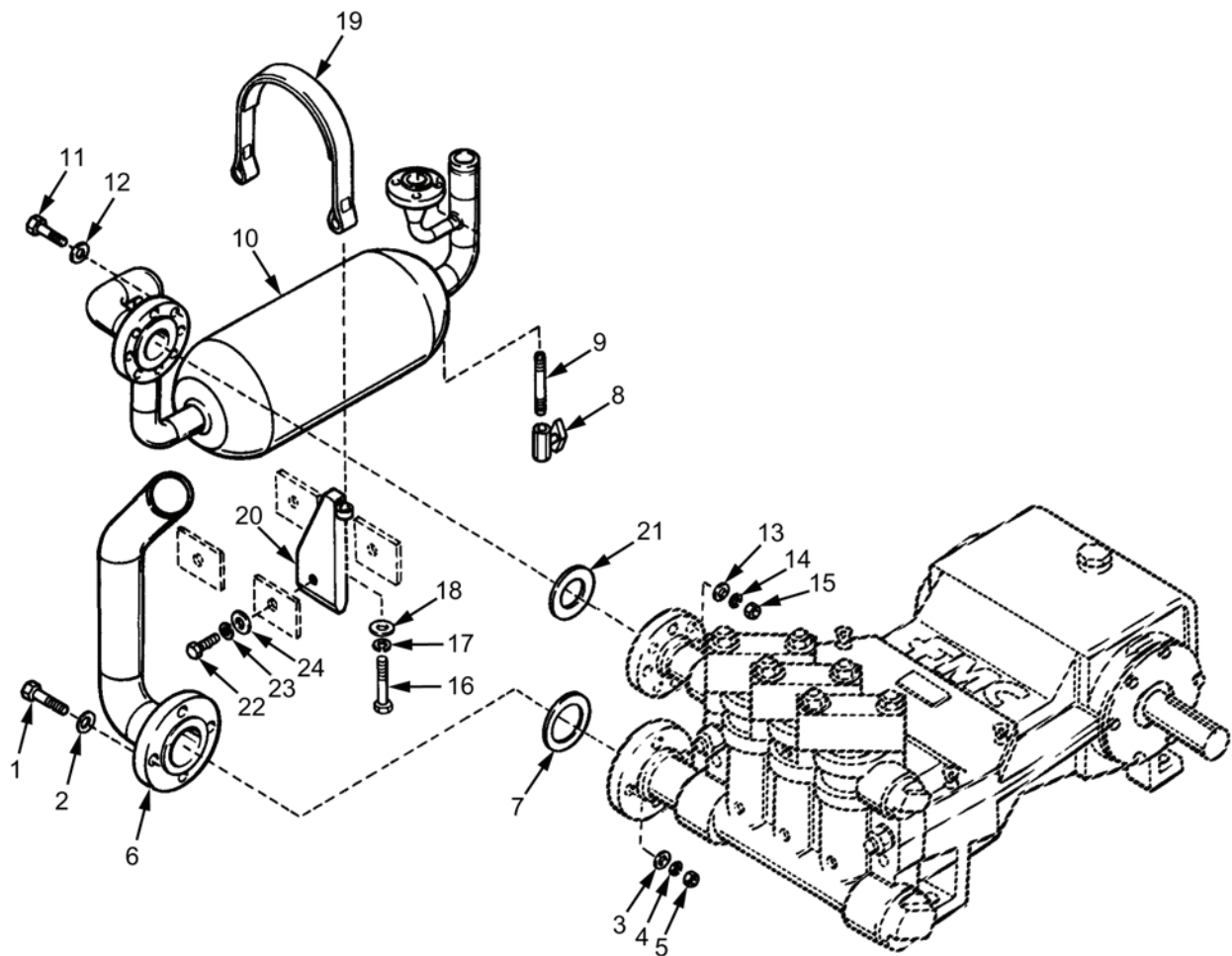


Figure 1. High Pressure Assembly, Piping, Valves and Hoses.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install support bracket (20) and secure with four capscrews (22), new lockwashers (23) and washers (24).
2. Position pulse dampener (10) on support brackets (20).
3. Install gasket (21), eight capscrews (11), washers (12) and (13), new lockwashers (14) and nuts (15).
4. Install two straps (19) to bracket (20) with four capscrews (16), new lockwashers (17) and washers (18).
5. Install nipple (9) and valve (8) to pulse dampener (10).
6. Install gasket (7) and pipe (6). Secure with four capscrews (1), washers (2) and (3), new lockwashers (4) and nuts (5).

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE RELIEF VALVE
REMOVAL, REPAIR, INSTALLATION**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Materials/Parts:

Gaskets (TM 10-4610-232-24P)

Lockwashers (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).

Electrical power disconnected from high pressure pump motor

Air pressure relieved.

References:

TB 43-0218

REMOVAL**WARNING**

Make sure electrical power is disconnected before working on unit. Failure to do so could result in serious injury or death from electrical shock or moving parts.

WARNING

The high pressure relief valve is factory adjusted and lock wired. Do not attempt to adjust.

1. Remove two nuts (1), lockwashers (2), washers (3) and U-bolt (4) that holds high pressure relief valve (5) to bracket (6). Discard lockwashers.
2. Remove four capscrews (7), washers (8), nuts (9), lockwashers (10) and washers (11). Remove high pressure relief valve (5) and gasket (12) from flange (13). Discard lockwashers.

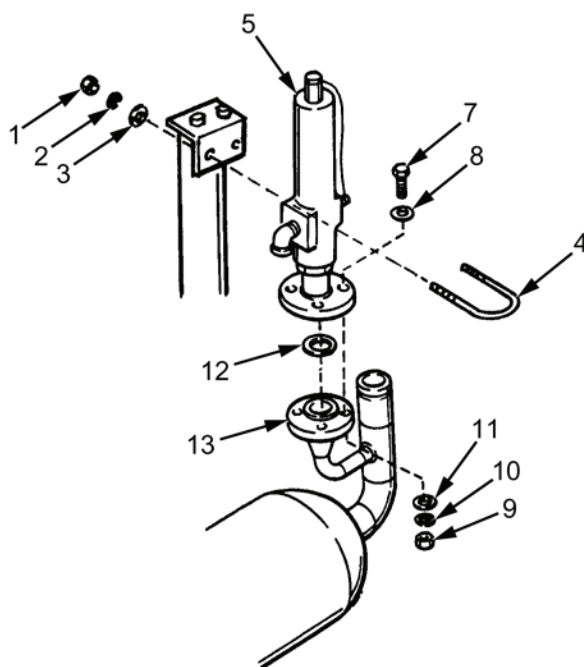


Figure 1. High Pressure Relief Valve.

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Replace high pressure relief valve (5) and gasket (12).

INSTALLATION

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install gasket (12) on flange (13) and install relief valve (5) using capscrews (7), washers (8), nuts (9), new lockwashers (10) and washers (11).
2. Install bracket (6), U-bolt (4), nuts (1), new lockwashers (2) and washers (3).

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE PUMP SHEAVE
REMOVAL, INSTALLATION**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Wrench, Torque (TM 10-4610-232-12)
Lifting Equipment (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
High pressure pump belt guard removed (WP 0080 00).
High pressure V-belt removed
(WP 0127 00, TM 10-4610-232-12).

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)

References:

TB 43-0218

Personnel Required: 2

REMOVAL**WARNING**

To avoid injury, do not wear jewelry or loose clothing while working on unit.

1. Scribe the motor shaft to indicate the position of the bushing (1) on the shaft.
2. Remove three capscrews (2) and lockwashers (3) from bushing (1). Discard lockwashers.
3. Reinstall capscrews (2) into threaded holes of bushing (1).

NOTE

It may be necessary to tap the sheave gently to break the parts loose.

4. Tighten the capscrews (2) evenly and alternately to push sheave (4) off bushing (1).
5. Loosen setscrew (5).

CAUTION

The bushing will split if screwdriver or chisel is tapped too hard.

6. Tap a screwdriver or chisel into the split line of the bushing (1) just far enough to allow removal of the bushing (1) from the motor shaft.

WARNING

To avoid injury, two personnel are required to remove sheave from pump shaft.

7. Remove pump shaft key (6) and slide sheave (4) off pump shaft.

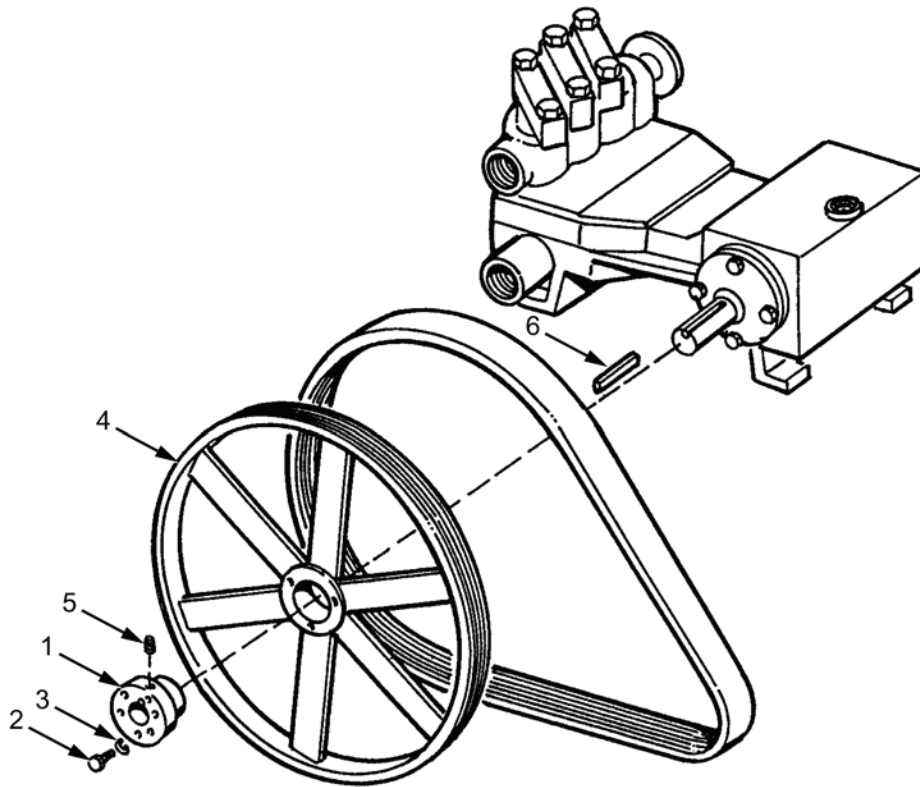


Figure 1. High Pressure Pump Sheave.

INSTALLATION

WARNING

To avoid injury, two personnel are required to install sheave on pump shaft.

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

CAUTION

To avoid damage to bolts, do not lubricate hub or sheave.

1. Slide sheave (4) on pump shaft and install pump shaft key (6).

CAUTION

The bushing will split if the screwdriver or chisel is tapped too hard.

2. Tap screwdriver or chisel into the split line of the bushing (1) just far enough to allow bushing to slide onto pump shaft. Align with scribed line on pump shaft.

NOTE

Ensure bushing and scribe marks on shaft align.

3. Tighten setscrew (5).
4. Remove capscrews (2) from bushing (1) and slide sheave (4) on bushing shoulder.
5. Reinstall capscrews (2) and new lockwashers (3) through bushing (1) into threads on sheave (4).
6. Tighten capscrews (2) evenly and alternately until all are tight.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE PUMP
REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Valve Seat Puller (TM 10-4610-232-12)
Spanner Wrench (TM 10-4610-232-12)
Torque Wrench (TM 10-4610-232-12)

Materials/Parts:

Gaskets (TM 10-4610-232-24P)
Glycerine (Item 17, WP 0102 00)
Lockwashers (TM 10-4610-232-24P)
Solvent (Item 33, WP 0102 00)
Tape, Antiseize (Item 70, WP 0102 00)
Washers (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Generator secured.
High pressure piping, valves and hoses removed (WP 0082 00).
Belt guard removed (WP 0080 00).
High pressure pump sheave removed (WP 0084 00).

References:

TB 43-0218

REMOVAL**WARNING**

The cleaning solvent used to clean parts can be dangerous to personnel and property. Wear rubber gloves when using cleaning solvent. Wash hands with soap and water and use a lanolin-based skin cream to prevent skin drying. Do not use solvent near open flames or other sources of heat. Do not work with solvent in a closed room. Be sure work area is well ventilated.

1. Remove four nuts (1), lockwashers (2), washers (3), washers (4) and capscrews (5). Discard lockwashers.

CAUTION

The drain valves and fittings on the fluid end housing are easily damaged. Either remove drain valves or use extreme care to prevent damage during removal.

2. Obtain a forklift or suitable lifting device. If necessary, rig a suitable lifting sling and lift the pump assembly out as a unit.

DISASSEMBLY

1. Remove two nuts (6) and flat washers (7). Remove clamp (8), cover (9) and preformed packing (10).

NOTE

Items (11 thru 15) comprise the discharge valve assembly.

2. Remove capscrew (11), retainer (12), springs (13) and (14) and valve plate (15).

NOTE

If seat does not come free by tightening nut on puller, install nut on top of the puller (all threaded rod) and tap firmly with hammer to free valve seat.

3. Remove valve seat (16) using valve seat puller.

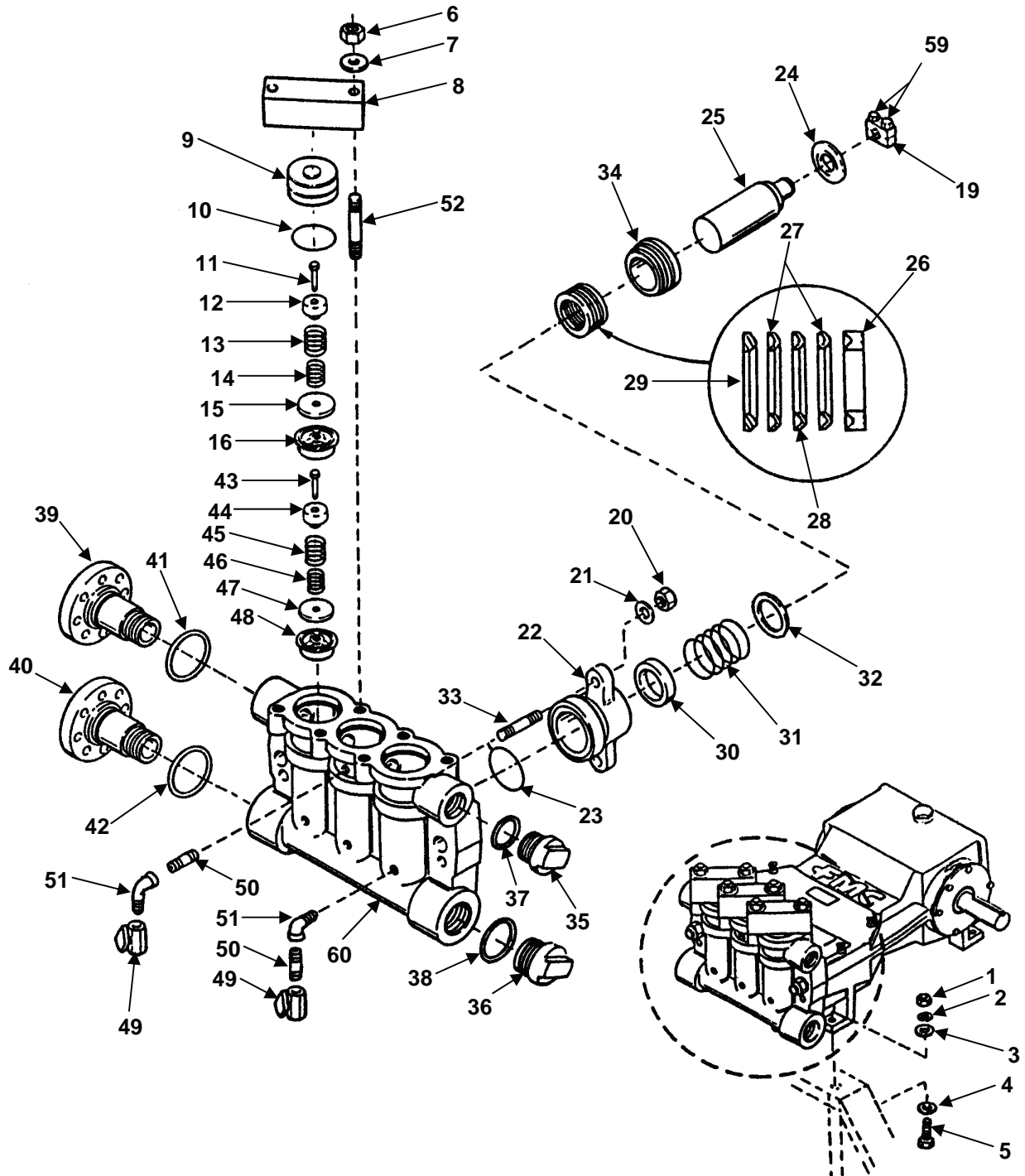


Figure 1. High Pressure Pump (Fluid and Valves) (Sheet 1 of 2).

4. Remove four thumbscrews (17) and access cover (18).
5. Remove clamp (19) by removing two capscrews (59).
6. Turn pump drive sheave (not shown) by hand until the plunger being worked on is as far forward as it will go. Then, turn the pump sheave in the opposite direction until the plunger rod is as far to the rear as it will go.
7. Remove two nuts (20) and washers (21) and remove stuffing box (22) as an assembly. Remove preformed packing (23).
8. Remove shield (24).
9. Push plunger (25) out of stuffing box (22). Items (26 thru 30) will come out on plunger (25).
10. Remove packing rings (26 thru 29).
11. Remove throat ring (30), spring (31) and ring (32).
12. Do not remove stud (33) or adjusting nut (34) unless they are damaged and must be replaced.
13. If necessary, remove plugs (35) and (36) and preformed packing (37) and (38).
14. If necessary, remove flanges (39) and (40) and preformed packing (41) and (42).

NOTE

Items (40 thru 44) comprise the suction valve assembly.

15. Remove capscrew (43), retainer (44), springs (45) and (46) and valve plate (47).
16. Remove valve seat (48) using valve seat puller.
17. Remove drain valves and fittings (49), (50) and (51) and stud (52).
18. Remove two capscrews (53).
19. Using two screwdrivers, pry seal holder (54) off drive housing (55).
20. Remove gasket (56).
21. Drive seals (57) and (58) out of seal holder (54).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Wash all metal parts in solvent and blow dry with compressed air (25 psig [172 kPa] maximum).

2. Inspect all parts for signs of wear or damage. Check springs for cracks or deformation, valve seats for distortion or wear, and all moving parts for damage. Check valve bores of housing (60) for wear or damage.
3. Replace packing (26 thru 29) and seals (57) and (58).

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install seal (58) in seal holder (54) with the seal lips facing upward. (Seal lips must face drive housing (55) when seal holder (54) is installed).
2. Press seal (58) in until it is flush with the surface of seal holder (54).
3. Place seal (57) on top of seal (58) with the seal lips facing upward, Press on seal (57) until seal (58) bottoms in seal holder (54).

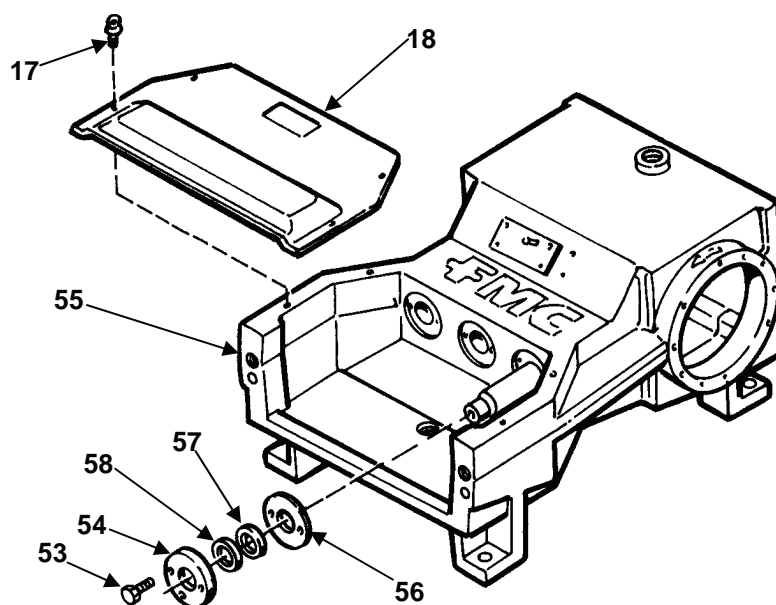


Figure 1. High Pressure Pump (Drive End Seals) (Sheet 2 of 2).

NOTE

Seal should extend 1/32 to 1/16 in. (0.79 to 1.58 mm) above the surface of holder when properly installed.

4. Install seal holder (54) on drive housing (55). Using gasket (56), secure with two cap screws (53).
5. Install elbows (51), nipples (50) and valves (49).

6. Close drain valves (49).
7. Install valve seat (48). The seat must be held above the bore in housing (60) and carefully dropped so that it enters its tapered bore in the housing and seats so it cannot be removed easily, by hand. Then, tap it into place with a brass bar and three or four light taps with a hammer.
8. Assemble valve plate (47), springs (45) and (46) and retainer (44).

CAUTION

The projection on the bottom of retainer must pass through springs and through the hole in plate. The valve will not operate if this is not done and maintained during assembly.

9. Install capscrew (43) and tighten to 35-40 lb-ft (47 to 54 N•m). If removed, install nut (34) in stuffing box (22).

NOTE

Do not tighten nut at this time.

10. Set stuffing box (22) on adjusting nut (34) so that the groove for preformed packing (23) is facing upward.
11. Place packing ring (26) in stuffing box (22), flat face down.

CAUTION

V-ring (smooth surface) must be placed between the two V-rings (textured surface) when installing the packing into stuffing box.

12. Lubricate a V-ring (27) with glycerine. Place it in stuffing box (22), open side up.
13. Place V-ring (28) in the stuffing box (22), open side up. Place the remaining black V-rings in the stuffing box (22).
14. Install packing ring (29) and ring (32).
15. Install spring (31) and throat ring (30).

CAUTION

Do not use excessive force to install plunger. Damage to packing or plunger could result.

16. Lubricate plunger (25) with glycerine. Insert plunger through adjusting nut (34). Approximately 2-1/2 in. (64 mm) of the plunger should extend past the end of throat ring (30) on the opposite end of stuffing box (22).
17. Wipe the stuffing box bores in valve housing (60) to be sure they are clean before installing stuffing box (22)
18. Install preformed packing (23) on stuffing box (22).

CAUTION

Do not force the stuffing box into the stuffing box counterbores in the housing. Stuffing box should slide in easily. Forcing the stuffing box could cause damage to the housing and stuffing box.

CAUTION

Be careful not to allow the preformed packing to slip out of its groove. Also, be careful not to damage the plunger while installing the stuffing boxes.

19. Install stuffing box (22) on studs (33) with the plunger rod as far to the rear as possible. This gives the maximum amount of room and simplifies assembly.
20. Secure the stuffing box (22) to valve housing (60) with washers (21) and nuts (20). Hand tighten nuts (20) at this time.
21. Install shield (24) on plunger (25).
22. Turn the pump by hand so the plunger rod (not shown) moves forward and touches plunger (25).
23. Install plunger clamp assembly (19). Be careful to keep the gap between the upper and lower parts of the clamp the same on both sides while tightening the two plunger clamp capscrews (59) to 5 lb-ft (7 N•m).
24. Tighten two nuts (20) in the following sequence:
 - a. Tighten both nuts to 10 lb-ft. (14 N•m).
 - b. Tighten both nuts to 40 lb-ft (54 N•m).
 - c. Tighten both nuts to 125 lb-ft (169 N•m).
25. Tighten adjusting nut (34) with spanner wrench until it bottoms out.
26. Install access cover (18) and secure with thumbscrews (17).
27. Install valve seat (16). The seat must be held above the bore in valve housing (60) and carefully dropped so that it enters its tapered bore in the housing and seats so that it cannot be removed easily, by hand. Then, tap it into place with a brass bar and three or four light taps with a hammer.

CAUTION

The projection on the bottom of retainer must pass through springs and through the hole in plate. The valve will not operate if this is not done and maintained during assembly.

28. Assemble valve plate (15), springs (13) and (14) and retainer (12).
29. Install capscrew (11). Tighten to 35-40 lb-ft (47-54 N•m).
30. Install preformed packing (10) in valve cover (9). Use glycerine to hold the preformed packing in place while installing cover.

CAUTION

Be careful to keep the valve cover clamp level on the valve covers by tightening each nut alternately and evenly the same amount.

31. Install valve cover clamp (8) with flat washers (7) and nuts (6). Tighten the nuts (6) to 200 lb-ft (271 N•m).

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

CAUTION

Use extreme care to avoid damage to drain valves during installation.

1. Using a suitable lifting device, rig a lifting sling and place the pump on its mounting brackets in the frame.
2. Install four capscrews (5), washers (4), washers (3), new lockwashers (2) and nuts (1).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE PUMP MOUNTING FRAME
DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Welding Equipment (TM 10-4610-232-12)
Rivnut Repair Kit (TM 10-4610-232-12)

Equipment Conditions:

High pressure pump removed from trailer
(WP 0072 00)
High pressure pump removed (WP 0085 00)
Air compressor removed (WP 0078 00/WP 0079 00)

Materials/Parts:

Gaskets (TM 10-4610-232-24P)
Lockwashers (TM 10-4610-232-24P)

References:

TB 43-0218
TM 9-237

DISASSEMBLY

1. Remove capscrews (1), washers (2), lockwashers (3), nuts (4) and straps (5). Discard lockwashers.
2. Remove capscrews (6), washers (7), lockwashers (8), nuts (9) and plate (10). Discard lockwashers.
3. Remove capscrews (11), washers (12), lockwashers (13), nuts (14) and straps (15). Discard lockwashers.
4. Remove capscrews (16), washers (17), lockwashers (18), nuts (19) and bracket (20). Discard lockwashers.
5. Remove ground lug (21).

NOTE

Air bags next to van do not have air lines.

6. Remove capscrews (22), lockwashers (23), washers (24), air bag (25), spacer (26) and air line (27). Discard lockwashers.

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace damaged or worn parts.
2. Weld damaged areas in accordance with TM 9-237.
3. Replace damaged data plates (WP 0043 00, TM 10-4610-232-12).

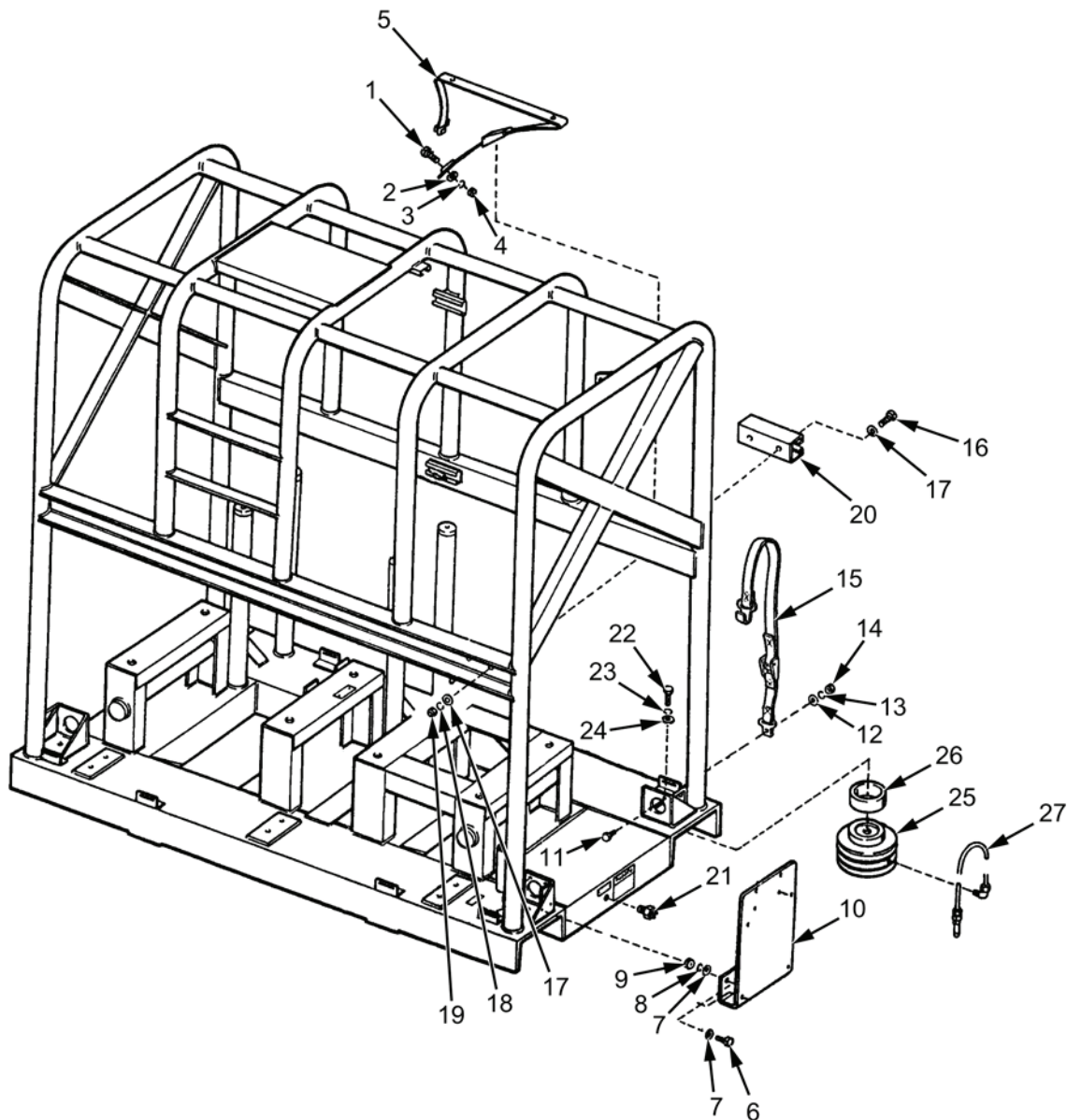


Figure 1. High Pressure Pump Mounting Frame.

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

Air bags next to van do not have air lines.

1. Install air line (27) on air bag (25).

2. Install spacer (26) on air bag (25) and secure with capscrews (22), new lockwashers (23) and washers (24).
3. Install ground lug (21).
4. Install bracket (20) and secure with capscrews (16), washers (17), new lockwashers (18) and nuts (19).
5. Install straps (15) and secure with capscrews (11), washers (12), new lockwashers (13) and nuts (14).
6. Install plate (10) and secure with capscrews (6), washers (7), new lockwashers (8) and nuts (9).
7. Install straps (5) and secure with capscrews (1), washers (2), new lockwashers (3) and nuts (4).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
DISTRIBUTION PUMP FRAME
INSPECTION, REPAIR

INITIAL SETUP

Tools/Special Tools:

General Mechanic's Tool Kit (TM 10-4610-232-12)

Welding Equipment (TM 10-4610-232-12)

Equipment Conditions:

Distribution pump and motor assembly removed from frame (WP 0131 00, TM 10-4610-232-12).

References:

TB 43-0218

TM 9-237

TM 43-0139

INSPECTION

Check for cracked or broken support members.

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. For welding procedures, refer to TM 9-237 to weld damaged areas.
2. For painting of repaired areas, refer to TM 43-0139.

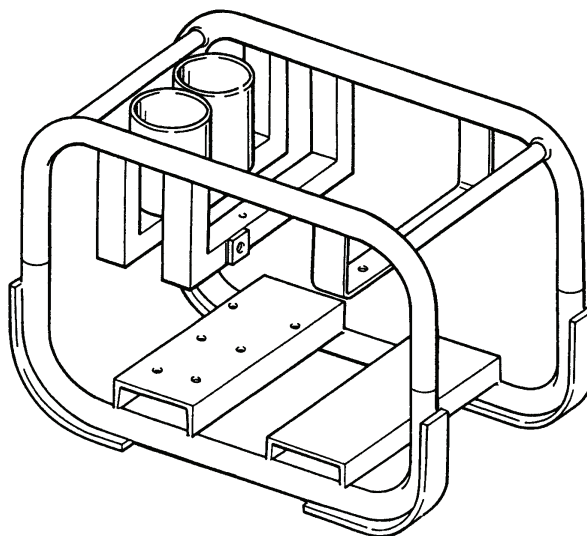


Figure 1. Distribution Pump Frame.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
DISTRIBUTION PUMP
DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Equipment Conditions:

Distribution pump and motor assembly removed from frame assembly
(WP 0131 00, TM 10-4610-232-12)

Materials/Parts:

Soap (Item 68, WP 0102 00)
Tape, Antiseize (Item 70, WP 0102 00)
Preformed Packing (TM 10-4610-232-24P)
Seal (TM 10-4610-232-24P)

References:

TB 43-0218

DISASSEMBLY

1. Remove three screws (1) and remove fan cover (2).
2. Remove four capscrews (3) and case (4).
3. Remove preformed packing (5).
4. Remove impeller retainer (6) and D-ring (7).

NOTE

Use a flat tip screwdriver to prevent the motor shaft from turning.

5. Unscrew impeller (8) by turning counterclockwise while facing the impeller.

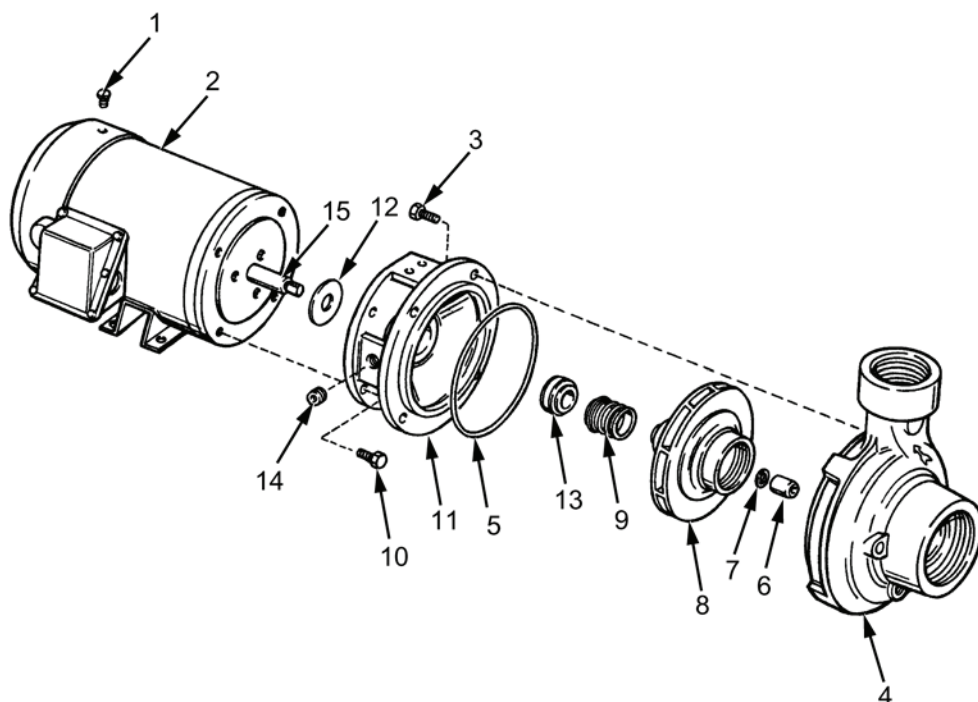


Figure 1. Distribution Pump.

6. Remove rotating section of seal (9).
7. Remove four capscrews (10), adapter (11) and slinger (12).
8. Place adapter (11) face down on the bench and press out the stationary section of seal (13). If necessary, remove plug (14).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Replace all worn or damaged parts.
2. If clearance between impeller (8) and case (4) exceeds 0.05", replace impeller and case.

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. If removed, install plug (14) in adapter (11) using antiseize tape to prevent leaks,

CAUTION

Mechanical seal must enter squarely and evenly. Seal will crack or break easily.

2. Press stationary section of seal (13) in adapter (11) seat cavity.
3. Install slinger (12) on motor shaft (15).

CAUTION

Be careful that the motor shaft does not dislodge or damage seal.

4. Install adapter (11) on motor shaft (15) and secure with four capscrews (10).

CAUTION

Be sure the seal faces stay in proper contact and be careful to avoid damage to seal surfaces.

5. Apply soapy solution to motor shaft (15) and seal (9) and place seal (9) on motor shaft.

NOTE

Use a flat tip screwdriver to prevent the motor shaft from turning.

6. Thread impeller (8) on motor shaft (15) until impeller (8) is tight against motor shaft shoulder.
7. Install D-ring (7) and impeller retainer (6).
8. Install preformed packing (5) and case (4) on adapter (11) and secure with capscrews (3).
9. Check for free shaft rotation.
10. Install fan cover (2) and secure with screws (1).

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
DISTRIBUTION PUMP MOTOR
DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Puller Kit (TM 10-4610-232-12)

Equipment Conditions:

Pump disassembled from motor (WP 0088 00).

Materials/Parts:

Gaskets (TM 10-4610-232-24P)

Seal (TM 10-4610-232-24P)

References:

TB 43-0218

DISASSEMBLY

1. Remove three capscrews (1) and fan shroud (2).
2. Remove retaining clip (3) and fan (4).
3. Remove four through bolts (5).
4. Remove fan end housing (6) and spring washer (7).
5. Remove drive end housing (8) and rotor shaft (9) as an assembly from stator housing (10).

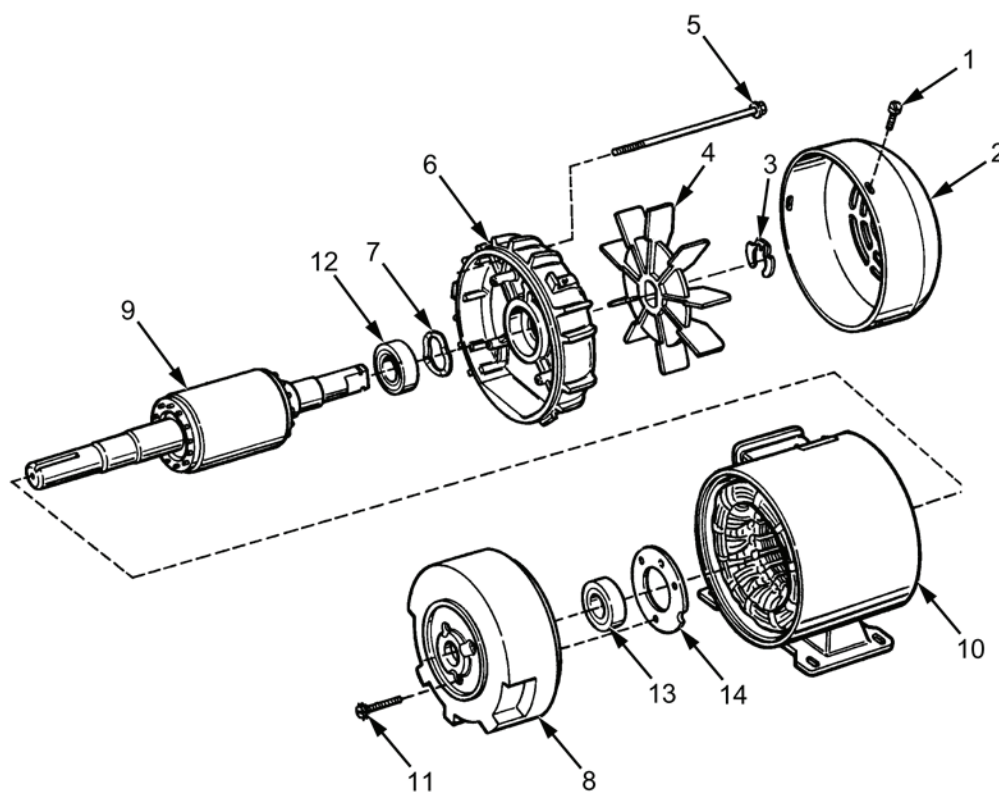


Figure 1. Distribution Pump Motor.

6. Remove three capscrews (11) and remove drive end housing (8) from rotor shaft (9).
7. Remove bearings (12) and (13) from rotor shaft (9).
8. Remove bearing retainer (14) from rotor shaft (9).

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

CAUTION

If either bearing is damaged, replace both to prevent early failure.

Replace any damaged parts.

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install bearing retainer (14) on rotor shaft (9).

NOTE

Use a brass drift to seat bearings.

2. Install bearings (12) and (13).
3. Install drive end housing (8) on rotor shaft (9). Secure with three capscrews (11).
4. Install drive end housing (8) and rotor shaft (9) as an assembly into stator housing (10).
5. Install fan end housing (6) with spring washer (7) in housing bore and secure with four through bolts (5).
6. Install fan (4) and secure with retaining clip (3).
7. Install fan shroud (2) and secure with three capscrews (1).

END OF WORK PACKAGE

**DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
PUMP COVERS
REPAIR**

INITIAL SETUP**Tools/Special Tools:**

Sewing Equipment (TM 10-4610-232-12)

Equipment Conditions:

Covers removed from pumps.

Materials/Parts:

Water Repellant Solution

References:

FM 43-3

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Refer to FM 43-3 and sew patches on tears.
2. Refer to FM 43-3 and sew loose rim strip or webbing straps.
3. Refer to FM 43-3 and replace damaged or missing grommets and worn or frayed laces.
4. Refer to FM 43-3 and apply water repellant solution.

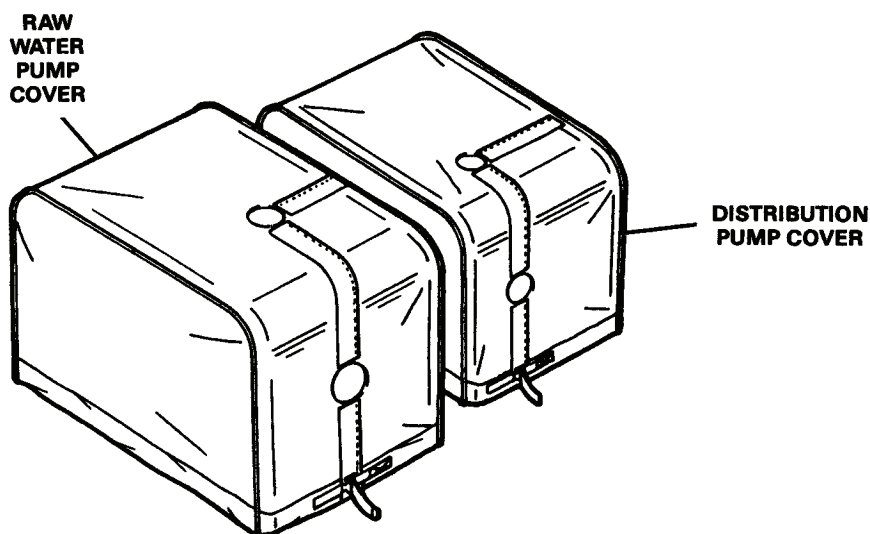


Figure 1. Pump Covers.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HEAT LAMP CABLE ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cable (1) as described in WP 0010 00.

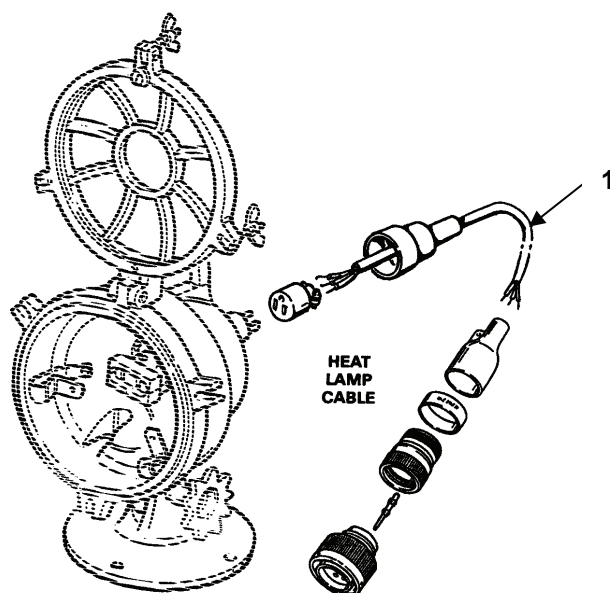


Figure 1. Heat Lamp.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
GENERATOR JUMPER CABLE ASSEMBLY
REPAIR

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Multimeter (TM 10-4610-232-12)
Wire Stripper (TM 10-4610-232-12)
Insertion Tool Kit (TM 10-4610-232-12)
Extractor Tool Kit (TM 10-4610-232-12)
Air Heater (TM 10-4610-232-12)
Guide Pin Kit (TM 10-4610-232-12)
Terminal Hand Crimper (TM 10-4610-232-12)

Materials/Parts:

Tape, Electrical (Item 71, WP 0102 00)
Straight Boot (TM 10-4610-232-24P)
90° Boot (TM 10-4610-232-24P)
Heat Shrink Tubing (TM 10-4610-232-24P)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Cable removed.

References:

TB 43-0218

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

Repair cable (1) as described in WP 0010 00.

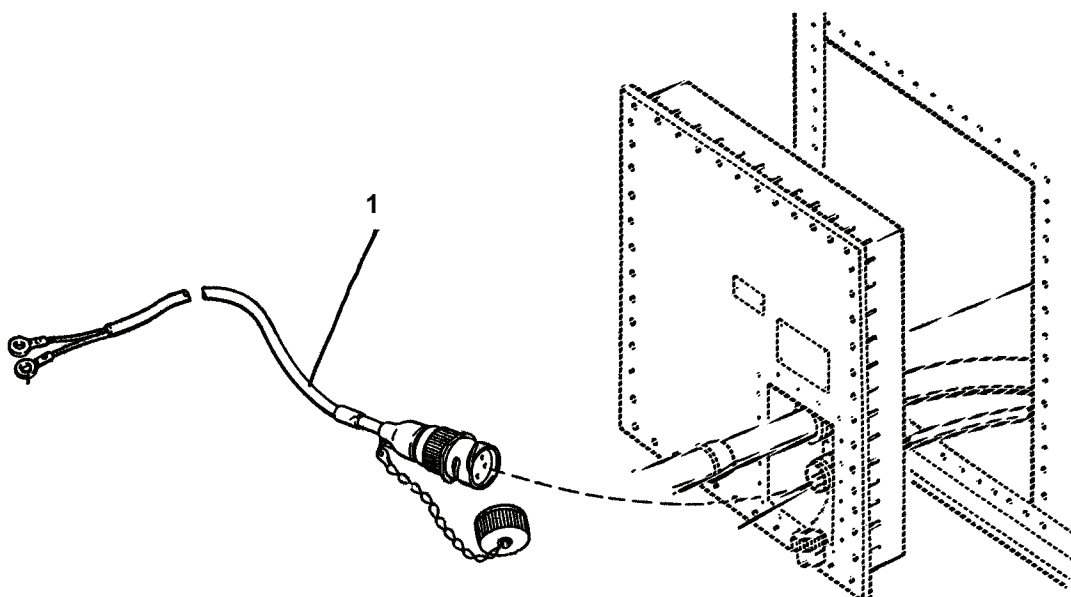


Figure 1. Generator Jumper Cable.

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
GENERATOR (MODEL MEP-006A)
REMOVAL, REPAIR, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Lifting Equipment (TM 10-4610-232-12)
Torque Wrench, ft. lbs. (TM 10-4610-232-12)

Equipment Conditions:

RO unit shutdown.
Generator shutdown.
Power cables disconnected.
Fuel lines disconnected.

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

References:

TB 43-0218
TM 5-6115-545-12
TM 5-6115-545-34

REMOVAL

1. Remove capscrews (1), lockwashers (2), washers (3) and nut insert (4). Discard lockwashers.
2. Remove nut (5), lockwasher (6), washer (7), bushing (8) and capscrew (9). Discard lockwashers.
3. Remove brackets (10) and (11) and vibration pads (12) and (13).

WARNING

The weight of the generator is 4300 lbs., do not exceed load limits of lifting device. Do not operate lifting device without safety latches on hooks. Failure to observe these precautions could result in serious injury and damage to equipment.

4. Using suitable lifting device, remove generator (14) and vibration pads (15).

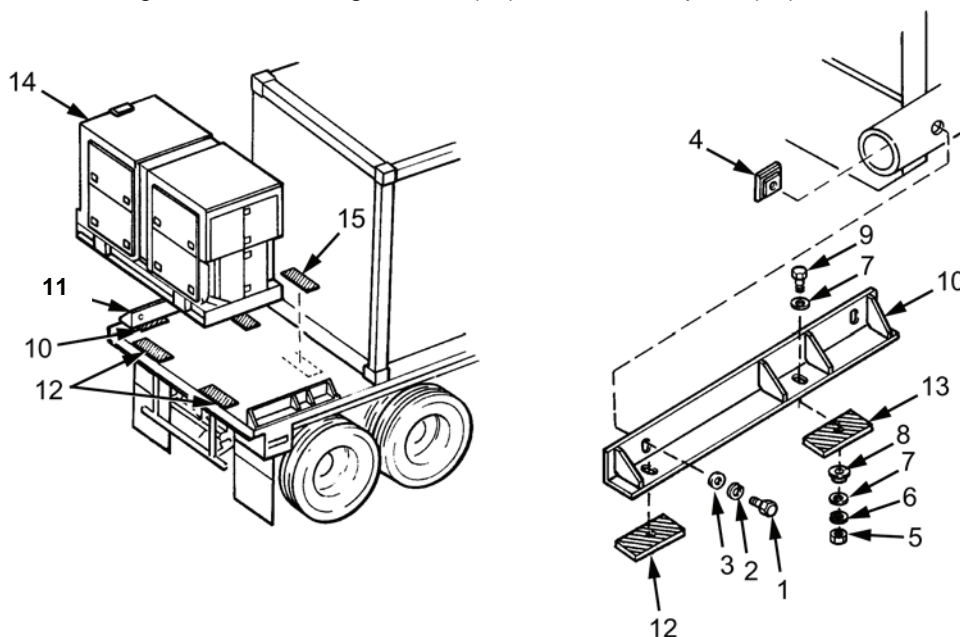


Figure 1. Generator Brackets.

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Inspect vibration pads for rips, tears and elasticity.
2. Replace any worn or damaged parts.
3. For repair of the generator, refer to TM 5-6115-545-12 and TM 5-6115-545-34.

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Position vibration pads (15) on trailer bed.

WARNING

The weight of the generator is 4300 lbs., do not exceed load limits of lifting device. Do not operate lifting device without safety latches on hooks. Failure to observe these precautions could result in serious injury and damage to equipment.

2. Using suitable lifting device, position generator (14) on vibration pads (15).
3. Install vibration pads (12) and (13) and brackets (10) and (11).
4. Secure brackets (10) and (11) to generator (14) using capscrews (1), lockwashers (2), washers (3) and nut insert (4). Torque to 180-200 lb-ft. (244-271 N•m)
5. Secure brackets (10) and (11) to trailer using capscrews (9), washers (7), bushing (8), lockwasher (6) and nuts (5). Torque to 180-200 lb-ft. (244-271 N•m)

END OF WORK PACKAGE

DIRECT SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
TACTICAL QUIET GENERATOR (MODEL MEP 806A)
REMOVAL, REPAIR, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Lifting Equipment (TM 10-4610-232-12)
Torque Wrench, ft. lbs. (TM 10-4610-232-12)

Equipment Conditions:

RO unit shutdown.
Generator shutdown.
Power cables disconnected.
Fuel lines disconnected.

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

References:

TB 43-0218
TM 5-6115-545-12
TM 5-6115-545-34

REMOVAL

1. Remove screws (1), flatwashers (2), lockwashers (3) and nut (4). Discard lockwashers.
2. Remove nuts (5), lockwashers (6), flatwashers (7), spacers (8) and screws (9). Discard lockwashers.
3. Remove brackets (10), backing plates (11) and vibration pads (12).

WARNING

The weight of the generator is 4300 lbs., do not exceed load limits of lifting device. Do not operate lifting device without safety latches on hooks. Failure to observe these precautions could result in serious injury and/or damage to equipment.

4. Using suitable lifting device, remove generator (13) and vibration pads (14).

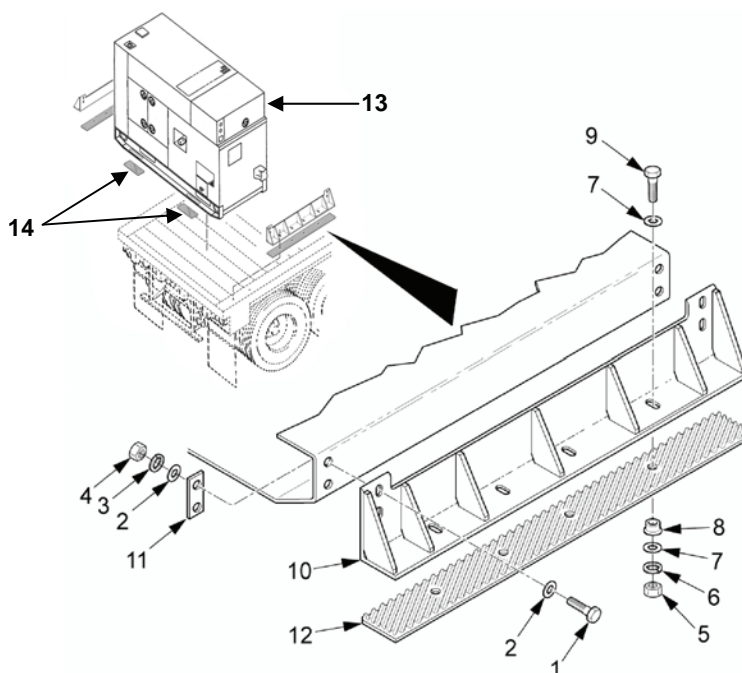


Figure 1. Generator Brackets.

REPAIR

1. Inspect vibration pads for rips, tears and elasticity.
2. Replace any worn or damaged parts.
3. For repair of the generator, refer to TM 5-6115-545-12 and TM 5-6115-545-34

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Position vibration pads (14) on trailer bed.

WARNING

The weight of the generator is 4300 lbs., do not exceed load limits of lifting device. Do not operate lifting device without safety latches on hooks. Failure to observe these precautions could result in serious injury and damage to equipment.

2. Using suitable lifting device, position generator (13).
3. Install vibration pads (12) and brackets (10).
4. Secure brackets (10) and vibration pads (12) to trailer using screws (9), flatwashers (7), spacers (8), new lockwashers (6) and nuts (5). Torque to 180-200 lb-ft. (244-271 N•m)
5. Secure brackets (10) and backing plates (11) to generator (13) using screws (1), flatwashers (2), new lockwashers (3) and nuts (4). Torque to 180-200 lb-ft. (244-271 N•m)

END OF WORK PACKAGE

CHAPTER 4
GENERAL SUPPORT
MAINTENANCE PROCEDURES

**GENERAL SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
MAIN CONTROL PANEL
REMOVAL, INSTALLATION**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Hand Riveter (TM 10-4610-232-12)
Lifting Equipment (TM 10-4610-232-12)

Materials/Parts:

Gaskets (TM 10-4610-232-24P)
Lockwashers (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

Equipment Conditions:

Main control panel light removed
(WP 0064 00, TM 10-4610-232-12).
Pressure gage assemblies removed (WP 0023/
0024).
Cables and connectors removed (WP 0026 00).
ROWPU shutdown (TM 10-4610-232-12).
Rubber floor mat removed from ROWPU.

References:

TB 43-0218

REMOVAL**WARNING**

The main control panel is heavy. Do not attempt to move it without adequate personnel and lifting equipment. Serious injury and damage to the equipment could result if this precaution is not observed.

1. Remove three capscrews (1), lockwashers (2), washers (3), connector (4) and eyebolt (5), which secure door holder (6) to the roof of the ROWPU. Open door. Discard lockwashers.
2. Remove the four floor-mounted tie down clamps (7) by removing rivets (8).
3. Disconnect tubing (9) from the bottom of pressure switch (10).
4. Remove the two control panel support bars (11) by removing two capscrews (12), nuts (13) and washers (14). Vibration pads (15) will now be free.
5. Remove three capscrews (16), washers (17), nuts (18), lockwashers (19) and washers (20), which connect the rear of the control panel to the divider panel of the accessory table. Discard lockwashers.
6. Remove capscrew (21), washer (22), nut (23), lockwasher (24) and washer (25) which connect the right hand side of the control panel to the accessory table. Discard lockwashers.
7. Remove four capscrews (26), lockwashers (27) and washers (28) which secure the main control panel to the floor of the ROWPU. Discard lockwashers.

WARNING

The main control panel is heavy. Do not attempt to move it without adequate personnel and lifting equipment. Serious injury and damage to the equipment could result if this precaution is not observed.

8. Position two personnel on each side of the main control panel and "walk" the panel toward the doorway, alternating from side to side.

9. Using a suitable lifting device, remove the control panel from ROWPU.
10. Remove vibration pads (29).

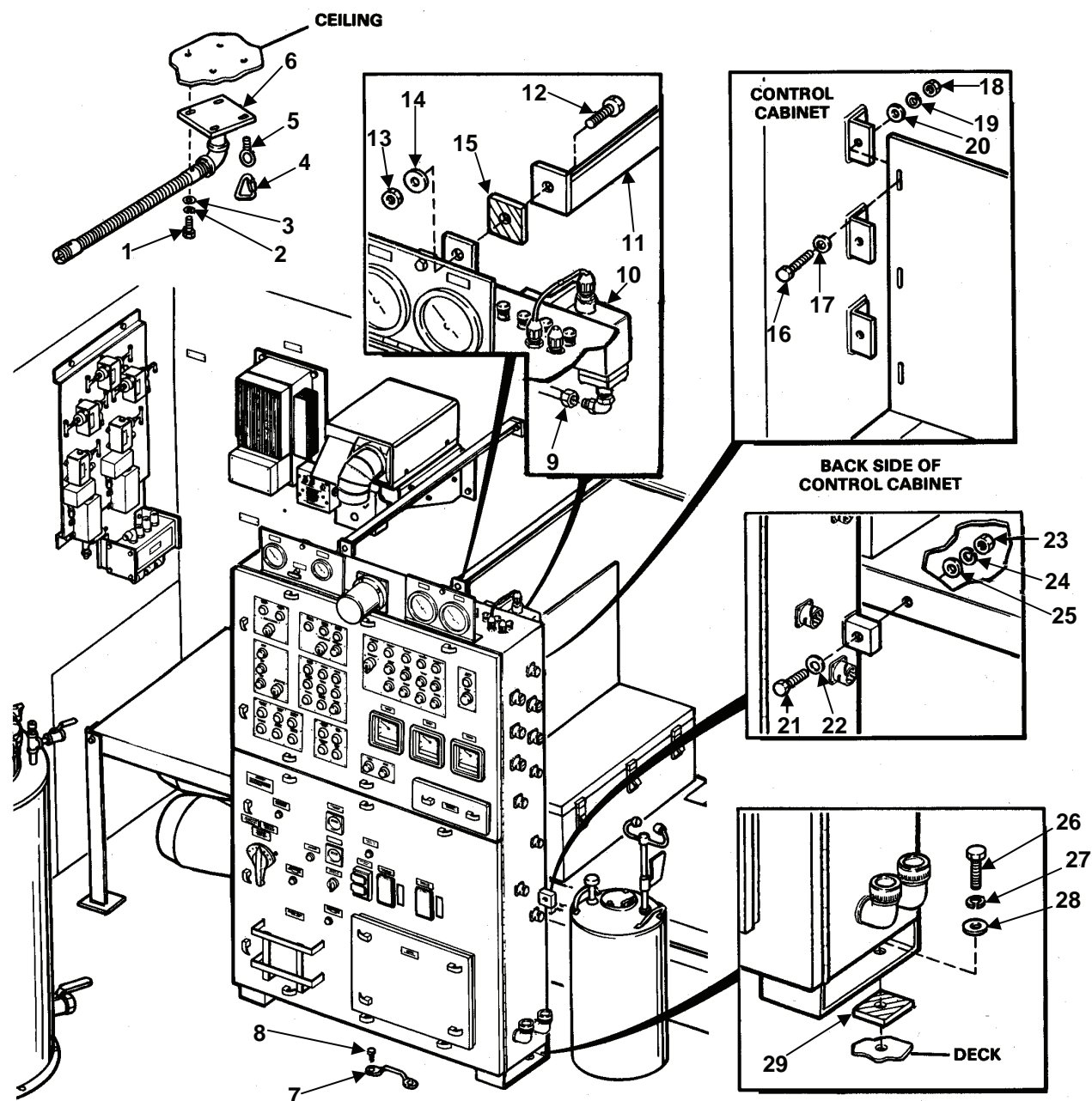


Figure 1. Main Control Panel.

INSTALLATION**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

WARNING

The main control panel is heavy. Do not attempt to move it without adequate personnel and lifting equipment. Serious injury and damage to the equipment could result if this precaution is not observed.

1. Using suitable lifting device, place the main control panel in the doorway to the ROWPU.
2. Position two personnel on each side of the control panel and "walk" the panel into position on the floor of the ROWPU.
3. Tilt the control panel as required and install vibration pads (29) beneath the panel.
4. Secure the control panel to the floor using four capscrews (26), new lockwashers (27) and washers (28).
5. Install capscrew (21), washer (22), nut (23), new lockwasher (24) and washer (25) to secure the right hand side of the control panel to the accessory table.
6. Install three capscrews (16), washers (17) and (20), new lockwashers (19) and nuts (18) to secure the control panel to the divider panel.
7. Install the two control panel support bars (11) and two vibration pads (15) with two capscrews (12), washers (14) and nuts (13).
8. Reconnect the tubing (9) to pressure switch (10).
9. Install four floor mounted tie down clamps (7) using pop rivets (8).
10. Install door holder (6) and secure with three capscrews (1), new lockwashers (2), washers (3), connector (4) and eyebolt (5).

END OF WORK PACKAGE

**GENERAL SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
ISO CONTAINER
REMOVAL, REPAIR, INSTALLATION**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Lifting Device (TM 10-4610-232-12)
Drill with Drill Bits (TM 10-4610-232-12)
Rivnut Repair Kit (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
High pressure pump assembly removed
(WP 0072 00).
Generator removed (WP 0093 00/0094 00).

Materials/Parts:

Caulk (Item 10, WP 0102 00)
Rivets (Item 62, WP 0102 00)
Lockwashers (TM 10-4610-232-12)
Washers (TM 10-4610-232-12)
Wire Ties (Item 74, WP 0102 00)

References:

TB 43-0218

REMOVAL

1. Remove 24 capscrews (1), lockwashers (2) and washers (3). Remove lifting sling access panel (4). Discard lockwashers.
2. Remove lifting sling (5) from mounting bracket in container.

WARNING

Do not operate lifting device without safety latches on hooks. Failure to do so may result in serious injury.

CAUTION

To avoid damage, do not twist straps on sling when hooking to van.

3. Connect sling hooks (6) to corner blocks (7) with hook facing out away from van.
4. Remove nylon wire tie (8) connecting shackle pin (9) to the van.
5. Turn shackle pin (9) one quarter turn clockwise and remove.

WARNING

Container weighs over 7 tons. Using an unsuitable lifting device may result in serious injury.

CAUTION

The container will not lift up evenly. The right front corner will be lower. Failure to be aware of this may result in serious damage.

6. Slowly lift container off trailer using two personnel to guide the van.
7. Push locking pin (10) up and turn mounting shackle (11) until tabs are lined up with mounting holes. Lift up and remove.

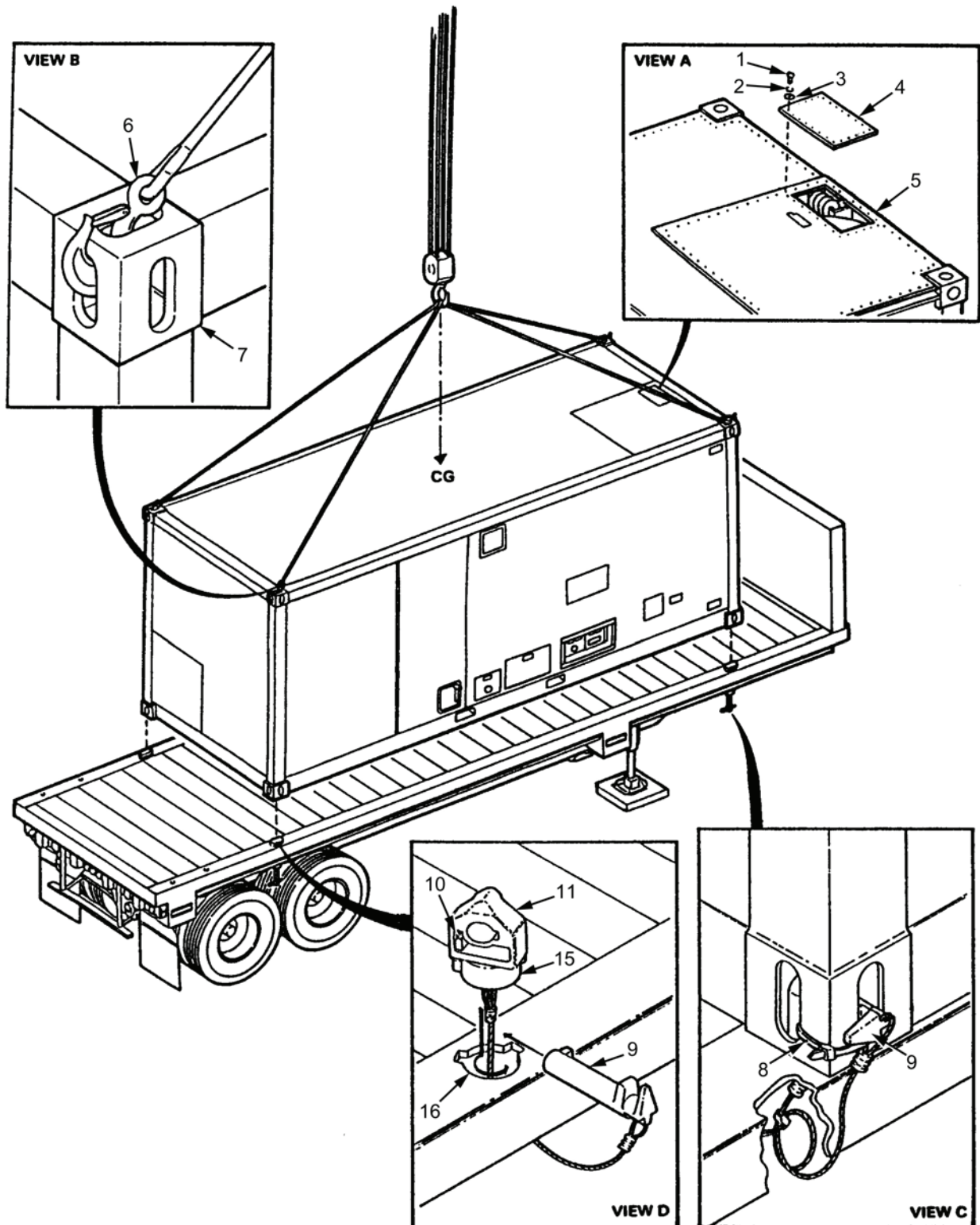


Figure 1. ISO Container.

REPAIR**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Locate rivets (12) under rain gutter (13) and mark location.

NOTE

Grind only enough to remove and install rivets.

2. Grind away rain gutter at location of rivet only.
3. Drill out rivets (12) and remove skin (14).
4. Remove old caulking.
5. Replace damaged insulation.
6. Place skin (14) on van to see if holes in skin align with holes in van, then remove.
7. Install caulking on frame.
8. Install skin (14) and secure with rivets (12) starting at the top and working down.
9. Repeat steps 3 through 8 for replacing skins on doors, access panels and roof.

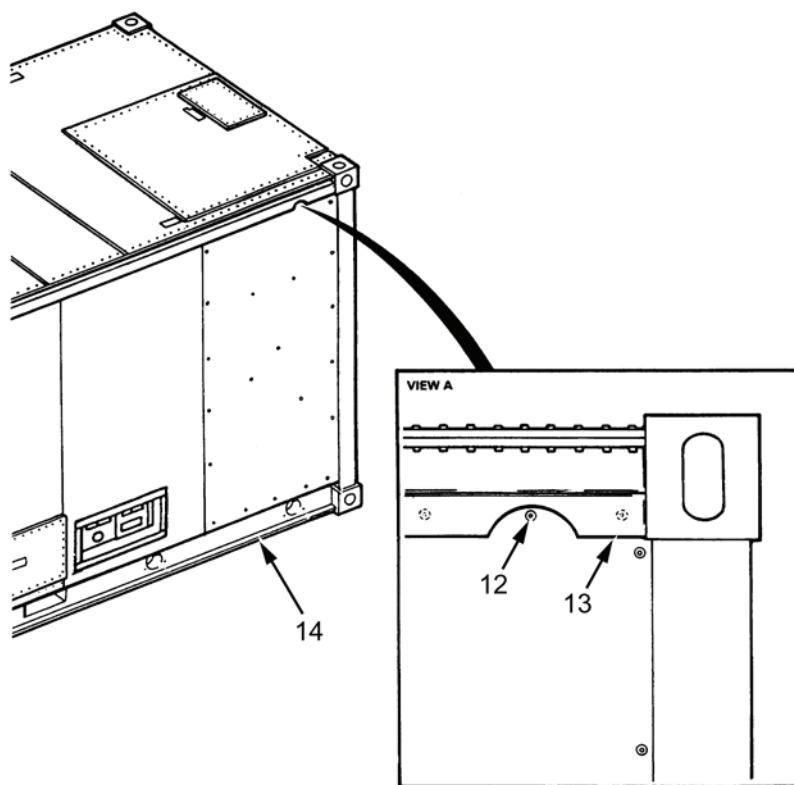


Figure 2. Skin Removal and Repair.

INSTALLATION

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

WARNING

Do not operate lifting device without safety latches on hooks. Failure to do so could result in injury or death.

CAUTION

To avoid damage, do not twist straps on sling when hooking to van.

1. Connect sling hooks (6) to corner blocks (7) with hook facing out away from van.
2. Line up mounting shackle teeth (15) with mounting hole (16) in trailer.
3. Insert mounting shackle (11) then make one quarter turn counterclockwise. Push locking pin (10) down to secure mounting shackle.

WARNING

Container weighs over 7 tons. Use a suitable lifting device to prevent serious injury.

CAUTION

The container will not lift up evenly. The right front corner will be lower. Failure to be aware of this may result in serious damage.

4. Using two personnel, guide container onto trailer. Slowly lower container into place on mounting shackle (11).
5. Take shackle pin (9) and insert into mounting shackle (11), then rotate one quarter turn counterclockwise
6. Secure shackle pin (9) to trailer with nylon wire tie (8).
7. Coil cable and secure underneath trailer frame with nylon wire tie (8).
8. Remove lifting sling hooks (6) from container corner blocks (7).
9. Store lifting sling (5) back in container on mounting bracket and secure with straps on storage rack.
10. Install lifting sling access panel (4) and secure with 24 capscrews (1), new lockwashers (2) and washers (3).

END OF WORK PACKAGE

GENERAL SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 20-1/2 TON 8-WHEEL TANDEM
AIR COMPRESSOR P/N PURUSP1-H
REMOVAL, REPAIR, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Press (TM 10-4610-232-12)
Tool Kit, Compressor (TM 10-4610-232-12)

Materials/Parts:

Locknut (TM 10-4610-232-24P)
Preformed Packings (TM 10-4610-232-24P)
Lockwashers (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

Equipment Conditions:

Air compressor assembly removed from ROWPU.
(WP 0118 00, TM 10-4610-222-12).
Air filter and shroud removed.
(WP 0117 00, TM 10-4610-222-12).
Air compressor external, first stage, second stage
and third stage components removed
(WP 0078 00)

References:

TB 43-0218

DISASSEMBLY

1. Remove socket head screw (1) and lockwasher (2). Discard lockwasher.
2. Using two screwdrivers or a suitable puller, remove sheave (3) and roll pin (4).
3. Remove three capscrews (5), flange (6), tensioning piece (7) and sheave (8).
4. Remove four capscrews (9), washers (10), end cover (11) and preformed packing (12).

WARNING

Connecting rod has an oil thrower pin on the bottom. This pin has a sharp point. To prevent injury, cover the point with a rag when working inside the crankcase or handling the crankshaft assembly.

CAUTION

Do not allow crankshaft assembly (phantom) to fall when end cover is removed.

5. Carefully slide the crankshaft assembly forward until it is free of the rear bearing (13) and oil seal (14). Rotate and maneuver the crankshaft assembly until all three connecting rods (15, 16 and 17) are outside crankcase (18). Carefully remove the crankshaft assembly from the crankcase.

NOTE

Mark spacers, connecting rods and counterweight so that these components can be installed in the exact locations and relative positions.

6. Remove ball bearing inner races (13) and (19) from each end of crankshaft. Outer races (13) and (19) will remain in end cover (11) and crankcase (18).
7. Press outer races (13) and (19) out of end cover (11) and crankcase (18). Seals (14) and (20) will come out with the outer bearing races.

8. Remove locknut (21), lockwasher (22) and socket head screw (23) and remove counterweight (24). Discard lockwasher.
9. Remove connecting rod (15) and spacer (25).
10. Remove connecting rod (16) and spacer (26).
11. Remove connecting rod (17).
12. Pull the inner races of bearings (27, 28 and 29) with spacers (30) off crankshaft (31).

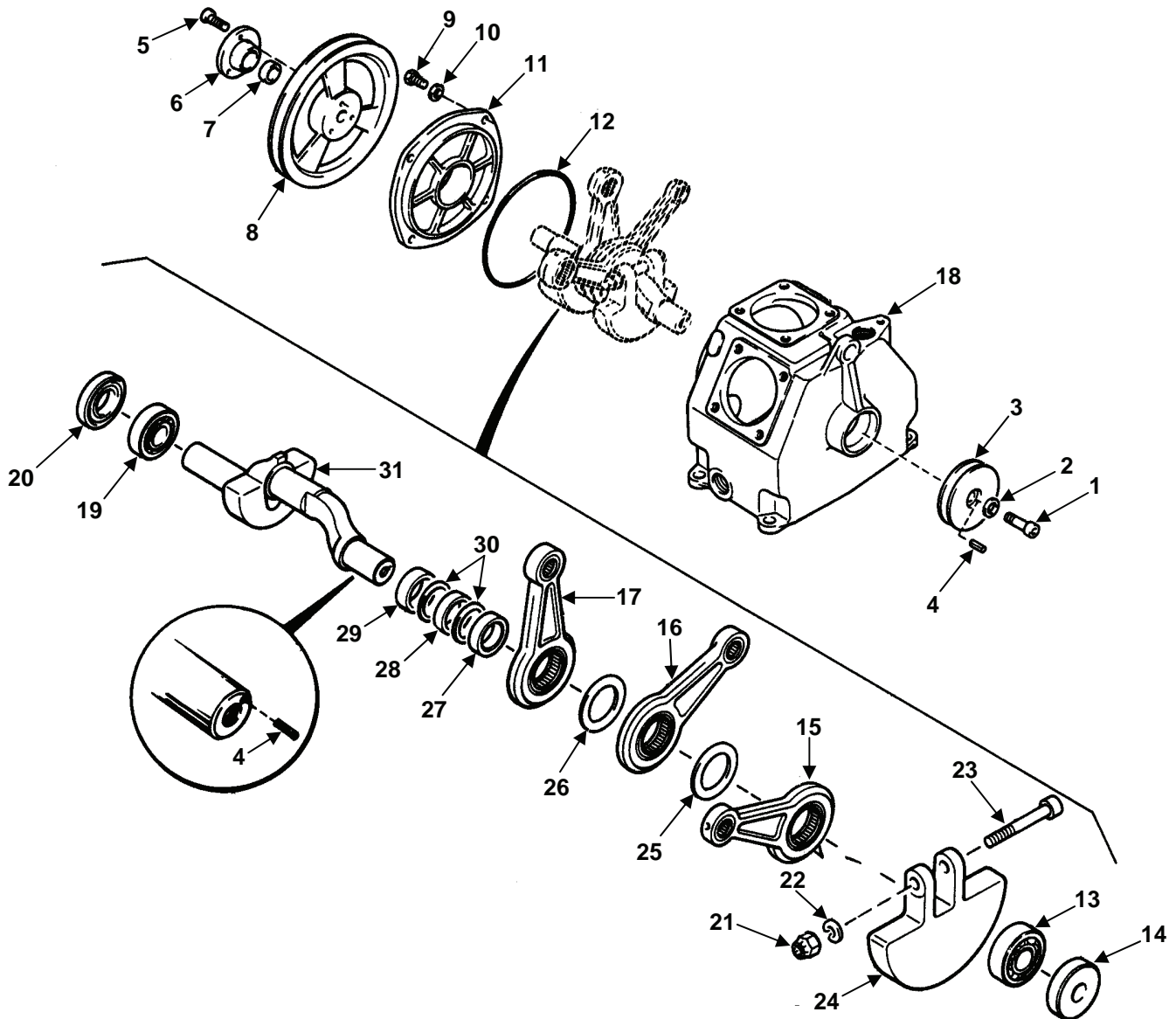


Figure 1. Air Compressor, Crankshaft Components.

REPAIR

WARNING

Provide adequate ventilation when using cleaning solvent. Avoid prolonged breathing of vapors and minimize skin contact. Solvent is highly flammable. Keep it away from sources of heat and open flame.

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Clean all parts in solvent and blow dry with low pressure compressed air (29 psi maximum).
2. Inspect crankshaft and connecting rods for wear and damage, particularly at bearing surfaces. Replace as necessary.
3. Replace damaged preformed packing (12) and always replace seals (14) and (20).
4. Replace bearings (13, 19, 27, 28 and 29).
5. Replace any other worn, damaged or unserviceable parts.
6. Refer to Table 1. Replace any component(s) exceeding clearance or tolerance limits.

Table 1. Compressor Clearance Tolerance Limits.

Piston diameter First 59.94+0/-0.024 Second 27.94+0/-0.024 Third 12.000±0.004	Wrist pin bore First.....20 -0.014/-0.024 Second..... 13 -0.01/-0.02 Third..... 19 -0.014/-0.024
Cylinder diameter First 60.01+0.01/-0 Second 27.92+0.03/-0 Third 12.000+0.008/+0.006	Crank throw diameter First.....24+0.020/+0.008 Second.....24+0.020/+0.008 Third.....24+0.020/+0.008
Ring diameter nominal First60 Second27 ThirdNA	Guide piston diameter First NA Second NA Third 35.96+0/-0.024
Ring wall First2.7±0.08 Second 1.3±0.08 ThirdNA	Guide piston cylinder diameter First..... NA Second..... NA Third..... 36.04+0/-0.01
Crank bore First 42 -0.03/-0.04 Second 42 -0.03/-0.04 Third 42 -0.03/-0.04	

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install seals (14) and (20) in crankcase (18) and end cover (11).
2. Using a suitable press, press outer races for bearings (13) and (19) into end cover (11) and crankcase (18).

WARNING

Use protective gloves when handling heated parts to avoid injury.

CAUTION

Do not heat bearings with a torch. Uneven or excessive heat will damage the bearings beyond use.

NOTE

Install inner race bearings in one continuous motion. Do not stop.

3. Heat and install inner race of bearing (29) onto crankshaft (31). Position it at the point marked during removal. Install spacer (30). Lubricate the outer race of bearing (29) (in connecting rod (17) bore) and install connecting rod (17) on the inner race of bearing (29).
4. Install spacer (26), connecting rod (16) and bearing (28).
5. Install spacer (25), connecting rod (15) and bearing (27).
6. Install counterweight (24) with machined surfaces facing the connecting rods and secure with socket head screw (23), new lockwasher (22) and locknut (21).

NOTE

Install inner race bearings in one continuous motion. Do not stop.

7. Install the inner races of bearings (13) and (19) on crankshaft, being careful to slide the heated races into their final position.
8. Install the outer race of bearing (13) in crankcase (18).
9. Install the outer race of bearing (19) in end cover (11).

NOTE

When installing crankshaft assembly, position connecting rods so that the front rod, when viewed from the open end of the crankcase, is in the center cylinder opening. The rear connecting rod goes through the large right hand opening and the middle rod goes through the small left hand opening.

10. Install the assembled crankshaft assembly in crankcase (18) being careful not to allow the connecting rods to bump against the crankcase.
11. Block the crankshaft assembly so it cannot fall, then install preformed packing (12) and seal (20) in end cover (11).

CAUTION

When installing cover, be careful not to damage seal.

12. Install end cover (11) with the stamped number down. Install four washers (10) and capscrews (9). Make sure the crankshaft rotates freely by hand.
13. Install seal (14) in the bore of crankcase (18).
14. Install sheave (8), tensioning piece (7), flange (6) and secure with three capscrews (5).
15. Install roll pin (4), sheave (3), new lockwasher (2) and secure with socket head screw (1).

END OF WORK PACKAGE

GENERAL SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 20-1/2 TON 8-WHEEL TANDEM
AIR COMPRESSOR P/N 02141-001
REMOVAL, REPAIR, INSTALLATION

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Press (TM 10-4610-232-12)
Tool Kit, Compressor (TM 10-4610-232-12)

Equipment Conditions:

Air compressor assembly removed from ROWPU.
(WP 0117 00, TM 10-4610-222-12).
Air compressor external, first stage, second stage
and third stage components removed
(WP 0079 00)

Materials/Parts:

O-rings (TM 10-4610-232-24P)
Seals (TM 10-4610-232-24P)

DISASSEMBLY

1. Remove socket head screw (1) and flat washer (2).
2. Using two screwdrivers or a suitable puller, remove v-belt pulley (3).
3. Remove socket head screw (4) and flat washer (5).
4. Using two screwdrivers or a suitable puller, remove counterweight (6).

CAUTION

Do not allow crankshaft assembly to fall when end cover is removed.

5. Remove five socket head screws (7), washers (8), end cover (9) and o-ring (10).

WARNING

Connecting rod has an oil thrower pin on the bottom. This pin has a sharp point. To prevent injury, cover the point with a rag when working inside the crankcase or handling the crankshaft assembly.

6. Carefully slide the crankshaft assembly (11) forward until it is free of rear bearing (12) and oil seal (13). Rotate and maneuver the crankshaft assembly (11) until all three connecting rods (14, 15 and 16) are outside crankcase (17). Carefully remove crankshaft assembly (11) from crankcase (17).
7. Remove ball bearing inner races (12) and (18) from each end of crankshaft (11). Outer races (12) and (18) will remain in cover (9) and crankcase (17).
8. Press outer races (12) and (18) out of cover (9) and crankcase (17). Seals (13) and (19) will come out with the outer bearing races.
9. Remove thrust washer (20).

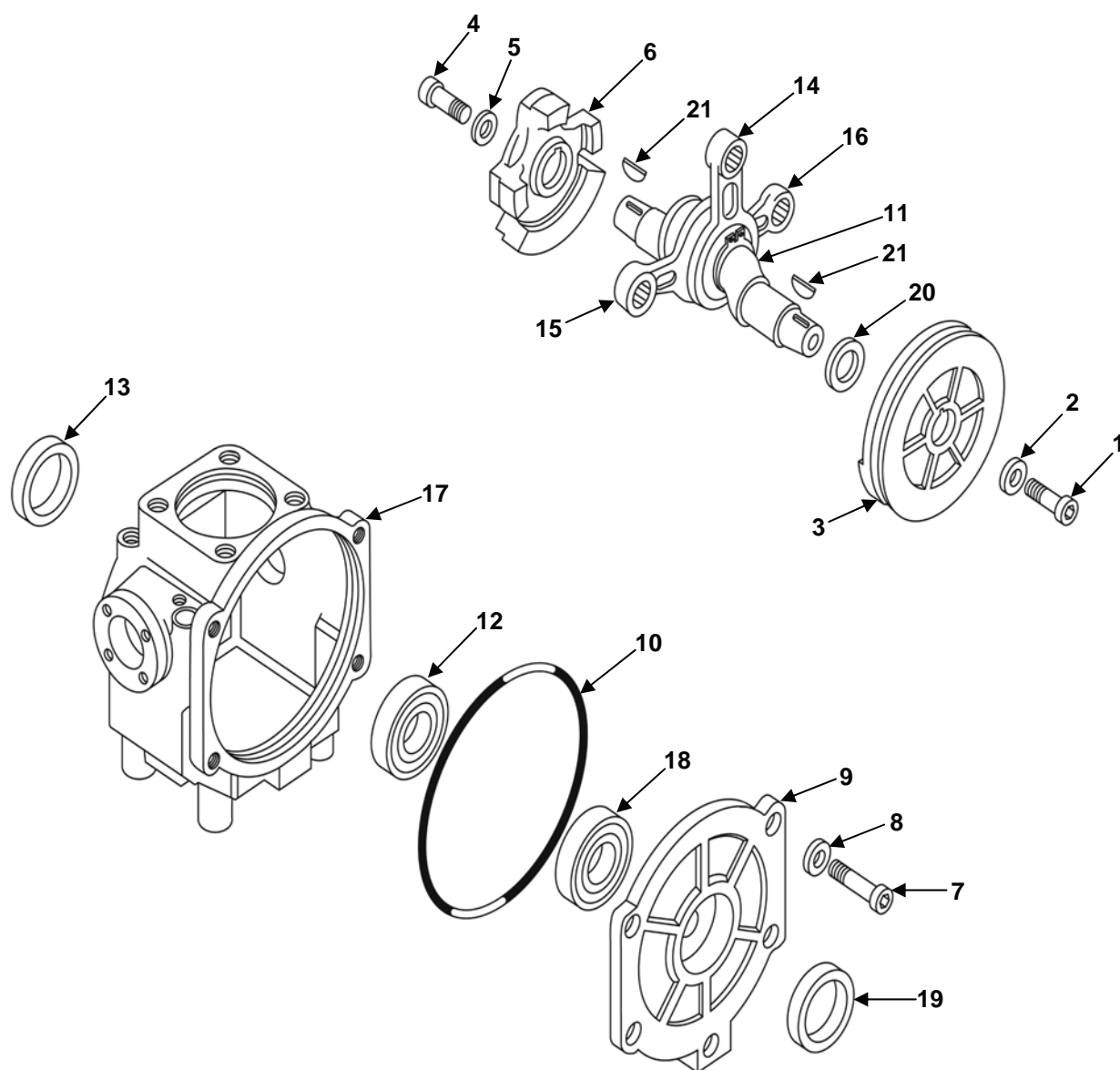


Figure 1. Air Compressor, Crankshaft Components.

REPAIR**WARNING**

Provide adequate ventilation when using cleaning solvent. Avoid prolonged breathing of vapors and minimize skin contact. Solvent is highly flammable. Keep it away from sources of heat and open flame.

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Clean all parts in solvent and blow dry with low pressure compressed air (29 psi maximum).
2. Inspect crankshaft (11), connecting rods (14, 15 and 16) and keys (21) for wear and damage. Replace as necessary.
3. Replace damaged o-ring (10) and always replace seals (13) and (19).
4. Replace bearings (12) and (18).
5. Replace any other worn, damaged or unserviceable parts.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install seals (13) and (19) in crankcase (17) and cover (9).
2. Install thrust washer (20) on crankshaft assembly (11).
3. Using a suitable press, press outer races for bearings (12) and (18) into cover (9) and crankcase (17).

WARNING

Use protective gloves when handling heated parts.

CAUTION

Do not heat bearings with a torch. Uneven or excessive heat will damage the bearings beyond use.

NOTE

Install inner race bearings in one continuous motion. Do not stop.

4. Heat and install the inner races of bearings (12) and (18) on crankshaft (11), using care when sliding the heated races into their final position.

NOTE

When installing crankshaft assembly, position the connecting rods so that the front rod, when viewed from the open end of the crankcase, is in the center cylinder opening. The rear connecting rod goes through the large right hand opening and the middle rod goes through the small left hand opening.

5. Install the assembled crankshaft assembly (11) in crankcase (17) being careful not to allow the connecting rods to bump against the crankcase (17).
6. Block the crankshaft assembly (11) so it cannot fall, then install o-ring (10) and seal (19) in cover (9).

CAUTION

When installing cover, be careful not to damage seal.

7. Install cover (9) on crankcase (17) and install five socket head screws (7) and washers (8). Make sure the crankshaft rotates freely by hand.
8. Install oil seal (13) in the bore of crankcase (17).
9. Install counterweight (6) and secure with socket head screw (4) and flat washer (5).
10. Install v-belt pulley (3) and secure with socket head screw (1) and flat washer (2).

END OF WORK PACKAGE

GENERAL SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE PUMP MOTOR
DISASSEMBLY, REPAIR, ASSEMBLY

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)
Bearing Puller (TM 10-4610-232-12)
Pneumatic Press (TM 10-4610-232-12)
Lifting Equipment (TM 10-4610-232-12)

Equipment Conditions:

ROWPU shutdown (TM 10-4610-232-12).
Generator secured.
High pressure pump assembly removed. (WP 0072 00).
Motor cables and motor sheave removed
(WP 0128 00, TM 10-4610-232-12).

Materials/Parts:

Lockwashers (TM 10-4610-232-24P)
Washers (TM 10-4610-232-24P)

References:

TB 43-0218

DISASSEMBLY

1. Remove three capscrews (1), lockwashers (2), washers (3) and cover (4). Discard lockwashers.
2. Remove snap ring (5) and fan (6).
3. Remove grease tube (7), if necessary. Do not disassemble tube further.
4. Remove four capscrews (8) and bearing cover (9).

NOTE

Bearing outer race is pressed into end shield.

5. Remove four capscrews (10), end shield (11) and bearing outer race (12).
6. Remove snap ring (13), bearing (14) and retainer (15) from motor shaft (16).

NOTE

If necessary, support the non-drive end of the motor shaft to prevent it from dropping and causing misalignment at the drive end while disassembling the drive end.

NOTE

It may be necessary to pry off the cover. A grease fitting is included on end cover. Do not remove the fitting unless replacement is required.

7. Remove four capscrews (17) and end cover (18).

NOTE

Bearing outer race is pressed into end shield.

8. Remove four capscrews (19), end shield (20) and bearing outer race (21).
9. Remove bearings (22) and retainer (23).

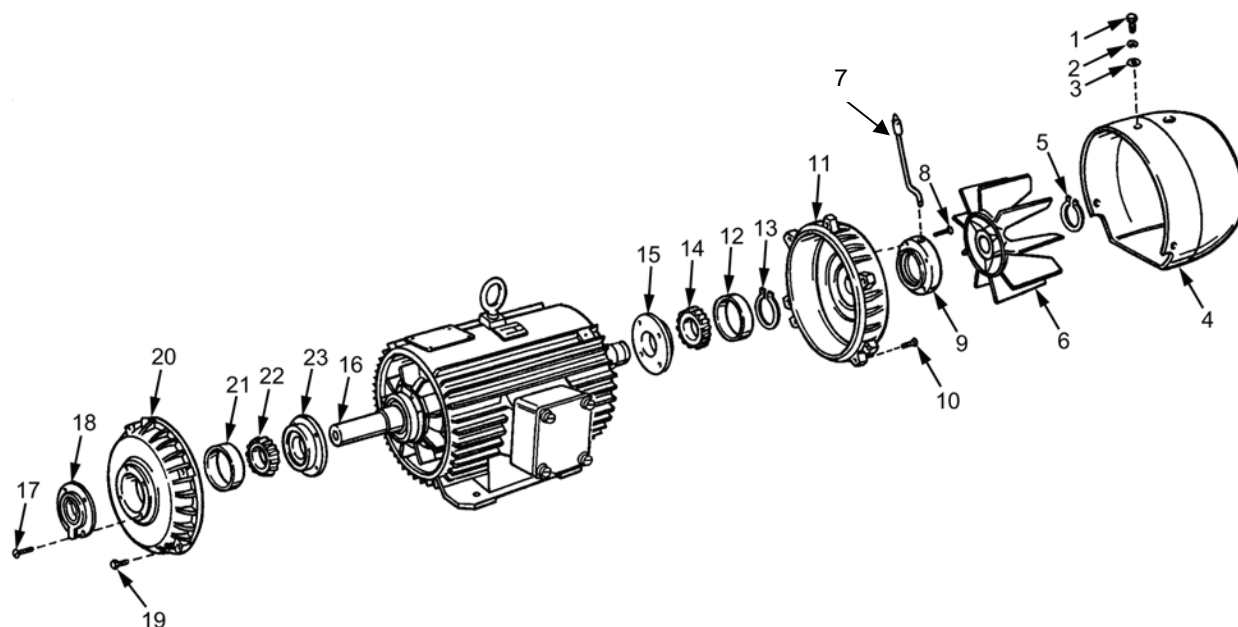


Figure 1. High Pressure Pump Motor.

REPAIR

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

NOTE

Replace bearings as a set.

Replace any damaged, cracked or worn components.

ASSEMBLY

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Install retainer (23) on motor shaft (16).
2. Install bearings (22) on motor shaft (16).
3. Install bearing outer race (21) into end shield (20).
4. Install end shield (20) and secure with four capscrews (19).

5. Install end cover (18) and secure with four capscrews (17).
6. Install retainer (15) on motor shaft (16).
7. Slide bearing (14) and snap ring (13) on motor shaft (16) until snap ring (13) falls in groove on motor shaft.

NOTE

When installing end shield, do not press tight against stator shell. Install bolt or use a straight piece of wire to align holes in end cover with retainer.

8. Install bearing outer race (12) in end shield (11).
9. Install end shield (11) and secure with four capscrews (10).
10. Install bearing cover (9) and secure with four capscrews (8).
11. If removed, replace grease tube (7).
12. Install fan (6) and secure with snap ring (5).
13. Place cover (4) on motor housing and secure with three capscrews (1), new lockwashers (2) and washers (3).

END OF WORK PACKAGE

**GENERAL SUPPORT
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
HIGH PRESSURE PUMP
DISASSEMBLY, REPAIR, ASSEMBLY**

INITIAL SETUP**Tools/Special Tools:**

General Mechanic's Tool Kit (TM 10-4610-232-12)

Materials/Parts:

Gasket (TM 10-4610-232-24P)

Oil Seal (TM 10-4610-232-24P)

Setscrews (TM 10-4610-232-24P)

Solvent, Cleaning (Item 33, WP 0102 00)

Rubber Gloves (Item 44, WP 0102 00)

Equipment Conditions:

High pressure pump removed from ROWPU.

Pump drive sheave removed (WP 0084 00).

Stuffing boxes removed from pump (WP 0085 00)

References:

TB 43-0218

DISASSEMBLY**NOTE**

To prevent unnecessary down time, valves, packings and other wear items should be replaced while doing drive end maintenance.

1. Remove oil level sight gage (1) and remove sixteen capscrews (2), cover (3) and gasket (4).

CAUTION

The caps and connecting rods are coded and must always be assembled as matched pairs.

2. Remove nuts (5) and caps (6) from connecting rods (7).
3. Remove sleeve bearings (8) from the connecting rods (7) and caps (6).

CAUTION

Be careful not to damage crankshaft or cross head bores when positioning connecting rods.

4. Position the connecting rods (7) at the top dead center to provide clearance for removal of the crankshaft (9).

CAUTION

Crankshaft should be handled carefully when removing bearing housing to keep from damaging or scarring the crankshaft or pump case.

NOTE

If necessary, tap bearing housings with a rubber mallet to ease removal. Keep shims with the respective housings for use at assembly.

5. Remove six capscrews (10) and (11), bearing housings (12) and (13), gaskets (14) and shims (15).

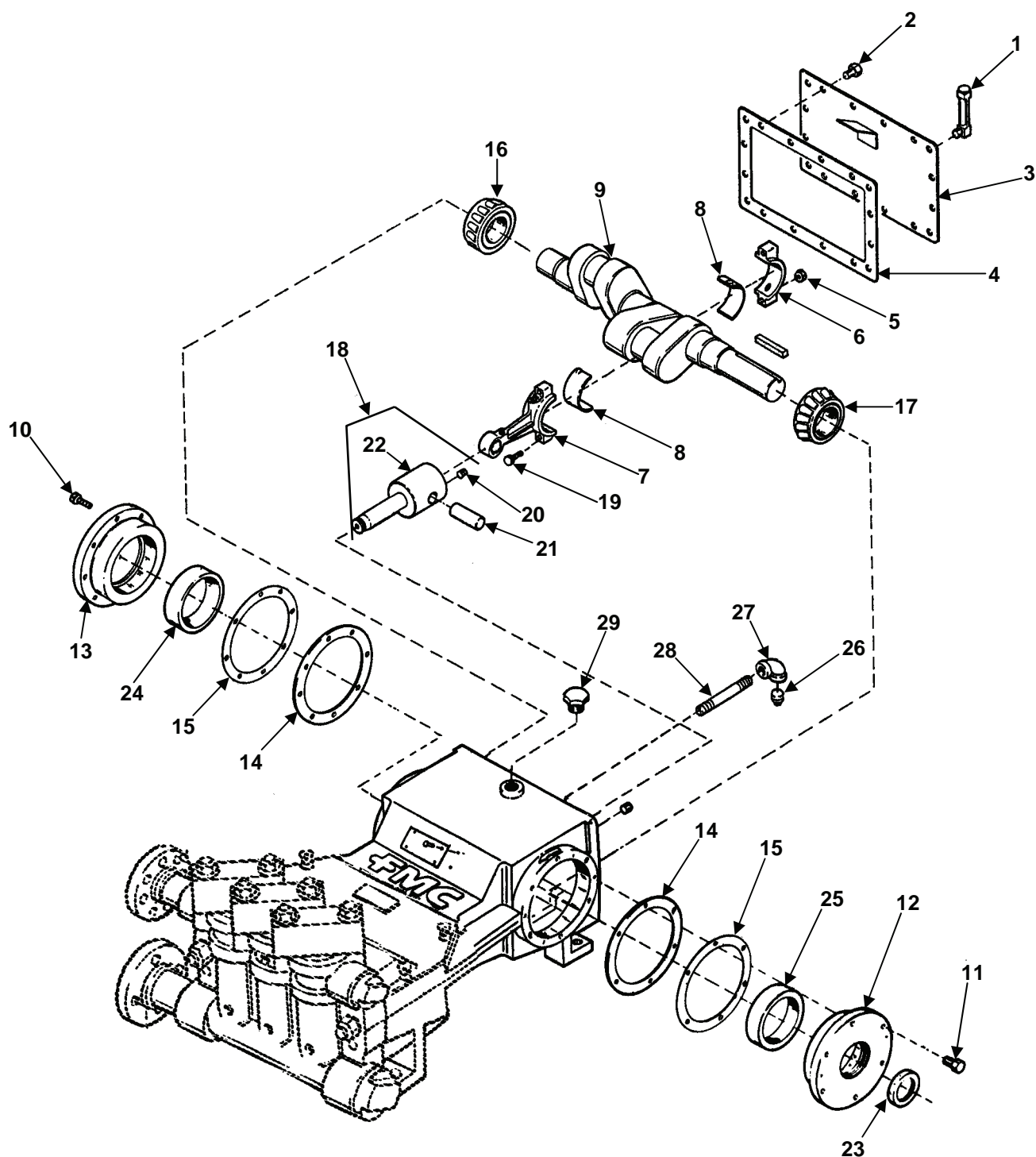


Figure 1. High Pressure Pump.

CAUTION

Be careful to prevent damaging crankshaft.

6. Carefully remove crankshaft (9) and bearing races (16) and (17), through opening in side of case.

CAUTION

Take care not to damage housing bore. Scars on the housing could cause premature wear on the bearings and oil seals.

NOTE

Tag parts to be reassembled into the same bore from which they were removed.

7. Tag and remove connecting rods (7) and cross head assemblies (18).
8. Remove connecting rod bolts (19) from connecting rod (7).
9. Remove setscrews (20) and wrist pins (21) from cross heads (22).
10. Remove oil seal (23) from bearing housing (12).
11. Remove bearing outer races (24) and (25) from end covers (12) and (13).
12. Remove magnetic drain plug (26), elbow (27) and pipe nipple (28).
13. Remove oil plug (29).

REPAIR**WARNING**

The cleaning solvent used to clean parts can be dangerous to personnel and property. Wear rubber gloves when using solvent. Wash hands with soap and water and use a lanolin-based skin cream to prevent skin drying. Do not use solvent near open flames or other sources of heat. Do not work with solvent in a closed room. Be sure to open windows and doors. Wear safety glasses when working with compressed air, to avoid injury to eyes.

WARNING

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

1. Wash all parts in cleaning solvent and blow dry with compressed air (30 psi max.).
2. Remove all metal particles from magnetic drain plug (26).
3. Inspect the crankshaft bearings (16) and (17) for cleanliness, visible wear or damage, and rough spots when rotated. Replace bearings that are worn or damaged.

NOTE

Replace both bearings if one is found to be faulty. Replace bearing outer races when replacing bearings.

4. Inspect the crankshaft, sleeve bearings, connecting rods, wrist pins, cross heads, and cylinder bores for visible damage, scoring or pitting. Replace parts that are worn or damaged.
5. Inspect bearing outer races (24) and (25) for the crankshaft bearings. Replace if damaged, scoring or pitting is evident.

ASSEMBLY**WARNING**

Never reuse locking hardware. Reuse of locking hardware, such as lockwashers, locking nuts, cotter pins and lock wire, can result in undetected loosening of fastening hardware causing component failure resulting in injury, death or damage to equipment. In accordance with TB 43-0218, ensure that all locking hardware is discarded upon removal and replace with new.

CAUTION

Lubricate all parts with clean oil at assembly to prevent damage to the pump.

1. Install pipe nipple (28), elbow (27) and plug (26).

NOTE

Cool the bearing cups before replacing.

2. Install bearing outer races (24) and (25) in bearing housings (12) and (13).
3. Install oil plug (29).

NOTE

The seal lips must face the inside of the pump case when assembled.

4. Lubricate oil seal (23) with oil and press oil seal into bearing housing (12).

NOTE

Press only on the inside face of the bearings.

5. Use a press to install bearing races (16) and (17) on crankshaft (9).

NOTE

Make sure that oil slot in cross heads is in alignment with oil pocket in connecting rods.

6. Assemble connecting rods (7), wrist pins (21) and setscrews (20) to cross heads (22).
7. Install sleeve bearings (8) on connecting rods (7).

NOTE

Make sure that oil slots and oil pockets are facing upward.

8. Install cross head assemblies (18) into the same bores from which they were removed.

CAUTION

Be careful not to damage cylinder bores or crankshaft during installation.

9. Install sleeve bearings (8) on connecting rods (7). Push connecting rods (7) and connecting rod bolts (19) all the way into cylinders for ease in crankshaft installation.
10. Install gasket (14), shim (15) and bearing housing (12) (in that sequence) on pump case. Install capscrews (10) and tighten to 55 lb-ft (75 N•m).
11. Carefully install crankshaft (9) in the pump case through the side bearing bore.
12. Carefully put crankshaft (9) in position against the bearing housing and install gasket (14), shim (15) and bearing housing (13).
13. Install capscrew (11) and tighten to 55 lb-ft (75 N•m). Spin crankshaft (9) to seat the bearings.
14. Measure the crankshaft end play.
 - a. Place a dial indicator on the pump case (1) (Figure 2) and against crankshaft (2).
 - b. Move the crankshaft fully to one side of pump case.
 - c. Set the dial indicator (3) to zero.
 - d. Push the crankshaft fully against bearings at opposite side of case.
 - e. The reading on the dial indicator is the crankshaft end play. End play must be 0.002 to 0.005 in. (0.05 to 0.12 mm).
 - f. Add or remove shims (15) (Figure 1) as necessary to obtain correct crankshaft end play. Tighten bolts (10) and (11) to 55 lb-ft (75 N•m).
15. Carefully push cross head assemblies (18) toward crankshaft (9) and position connecting rods (7) over crankshaft.
16. Install sleeve bearings (8) in caps (6).
17. Install caps (6) on crankshaft (9) and install nuts (5) on connecting rod bolts (19). Tighten connecting rod bolts (19) to 65-70 lb-ft (88-95 N•m).
18. Install gasket (4) and cover (3) on pump case. Tighten sixteen capscrews (2) to 15-25 lb-ft (20-34 N•m).
19. Install oil level sight gage (1).

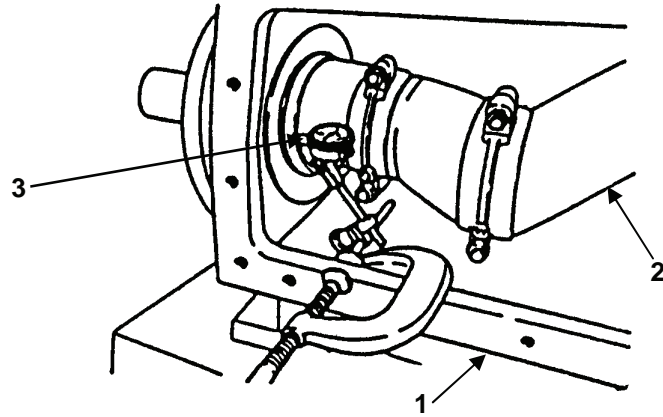


Figure 2. Crankshaft End-Play.

END OF WORK PACKAGE

CHAPTER 5

SUPPORTING INFORMATION

**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
REFERENCES**

SCOPE

This Work Package lists the Army regulations, common tables of allowances, field manuals, forms, pamphlets, technical bulletins and technical manuals referenced in this manual.

FORMS

DA Form 2404	Equipment Inspection and Maintenance Worksheet
SF 368	Product Quality Deficiency Report
DA Form 2028	Recommended Changes to Publications and Blank Forms
DA Form 2408-9	Warranty Information

TECHNICAL MANUALS

TM 38-230	Preservation, Packaging and Packing of Military Supplies and Equipment
TM 5-6115-545-12	Operator, Unit Maintenance Manual, Generator Set; Diesel Engine Driven, Tactical, 60 kW, 60 Cycle, AC, 120/208 V, 240/416 V, 3 Phase, Portable; Skid Mounted, NSN 6115-00-118-1243
TM 5-6115-545-34	Direct Support and General Support Maintenance Manual for Generator Set, Diesel Engine Driven, Tactical, 60 kW
TM 9-6115-645-10	Operator Manual, Generator Set, Skid Mtd., Tactical Quiet 60 kW, 50/60 and 400 HZ MEP-806A, MEP-816A
TM 9-2330-358-14&P or TM 9-2330-386-14&P	Military Trailer
TM 10-5430-237-12&P	Operator, Unit Maintenance Manual (Incl. Repair Parts and Special Tools List), Tank, Fabric, Collapsible, Water Storage, 3000 Gals.
TM 9-450	Repair of Metal Bodies
TM 9-237	Welding Theory and Application
TM 43-0139	Painting Instructions for Army Material
TM 9-214	Anti-Friction Bearings
TM 43-3	Canvas Repair
TM 740-90-1	Administrative Storage of Equipment
TM 743-200-1	Storage and Materials Handling
TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use
TM 10-4610-232-12	Operator's and Field Maintenance Manual, Water Purification Unit, Reverse Osmosis, 3000 GPH, Trailer Mtd.

TM 10-4610-232-24P

Field and Sustainment Repair Parts and Special Tool List
For Water Purification Unit, Reverse Osmosis, 3000 GPH**MISCELLANEOUS**

FM 4-25.11

First Aid Manual

DA PAM 738-750

Functional Users Manual for The Army Maintenance
Management System (TAMMS)

FM 10-52

Field Water Supply

TB MED 5-77

Occupational and Environmental Health Sanitary
Control and Surveillance of Field Water Supplies

TB 43-0218

Inspection, Use and Tightening of Metal Fasteners

TB 10-4610-232-24

Warranty for Water Purification Unit, Reverse Osmosis,
3000 GPH, Trailer Mtd.

LO 10-4610-232-12

Lubrication Order for Water Purification Unit, Reverse
Osmosis, 3000 GPH, Trailer Mtd.

CTA 50-970

Expendable/Durable Items (Except Medical Class V, Repair Parts)

CTA 8-100

Army Medical Department Expendable/Durable Items

AR 700-138

Army Logistics Readiness & Sustainability

SB 740-98-1

Storage Serviceability Standard

**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
EXPENDABLE AND DURABLE ITEMS LIST**

Scope

This work package lists expendable and durable items that you will need to operate and maintain the ROWPU. This list is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

Explanation of Columns in the Expendable/Durable Items List

Column (1) — Item Number. This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g., "Use cleaning compound (Item 27, WP 0097 00).).

Column (2) — Level. This column identifies the lowest level of maintenance that requires the listed item.

F — Direct Support Maintenance
H — General Support Maintenance

Column (3) — National Stock Number (NSN). This is the NSN assigned to the item which you can use to requisition the item.

Column (4) — Item Name, Description, Commercial and Government Entity Code (CAGEC) and Part Number (P/N). This column provides the other information you need to identify the item.

Column (5) — Unit of Measure (U/M). This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Table 1. Expendable and Durable Items List.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGEC, PART NUMBER	(5) U/M
1	F		ADHESIVE, Neoprene (09647) P/N 120-02086	RL
2	F	8040-01-268-5915	ADHESIVE, Separator Liner (1A9T3) P/N 62-4939-4930-9(IPA)	RL
3	C	8415-00-222-8074	APRON, Chemical Protective (97403) P/N 13229E0927	EA
4	C		BATTERY, Turbidity Meter, (97403) P/N 13229E0928	EA
5	C		BATTERY, TDS Meter (09647) P/N 120-00790-4	EA
6	C		BATTERY, Flashlight, D Size, BA 3030/V (09647) P/N 120-01647	EA
7	C	5110-01-456-7802	BLADE, Utility Knife, 1 Pack, 5 ea. (09847) P/N 120-02056-002	PK
8	C		BOTTLE, Color Comparator (09647) P/N 120-00706	EA
9	C	7920-00-959-3842	BRUSH, Scrub (58536) P/N A-A-359	EA
10	C		CAULK (09647) P/N 120-01962	PK
			CHEMICALS, Operation	
11	C		ACID, Citric, 2 Packets, 2.5 lbs. ea. (97403) P/N 13229E0956 (Shelf life 5 yrs.)	PK
12	C		BACTERIOSTATIC Additive, Eyewash, 2 Pk, 2 oz. ea. (97403) P/N 13229E1127	PK
13	C	6840-01-348-4336	CALCIUM Hypochlorite, 50 Pk, 1 lb. ea. (97403) P/N 13229E0923 (Shelf life indefinite)	PK
14	C	6810-01-354-4920	CARBON, Activated, 35 lb. (97403) P/N 13229E0245	PK
15	C	6665-01-358-9416	CARBON Monoxide, (97403) P/N 13229E1334	BL
16	C		DETERGENT, RO Element Cleaning, 12 lb. Pk (97403) P/N 13229E0952 (Shelf life indefinite)	LB
17	C	6810-00-222-2636	GLYCERIN, 250 CC Bottle, (97403) P/N 13229E0172 (Shelf life Indefinite)	BL
18	C		METHYL Parahydroxybenzoate (97403) P/N 13229E2127 (Shelf life 2 yrs)	PK
19	C		NTP-A RO Element Cleaner, (97403) P/N 13229E1228 (Shelf life 5 yrs.)	PK
20	C		POLYELECTROL, Type 1, 625 CC Bottle, Pk of 10, (Catfloc TL) (97403) P/N 13229E0921 (Shelf life 1 yr)	PK

Table 1. Expendable and Durable Items List (cont.).

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGEC, PART NUMBER	(5) U/M
21	C	4610-00-962-3507	RESIN, Ion Exchange, 35 Lb. (Order to Govt. Spec. 0112-79) (97403) (Shelf life 2 yrs.)	PK
22	C		SEQUESTANT, 300 CC Bottle, Pk of 10, (AC-1000) (97403) P/N 13229E0924 (Shelf life 1 yr)	PK
23	C		SODIUM Bisulfite (97403) P/N 13229E0922 (Shelf life indefinite)	PK
			CHEMICALS, Operation Test Kit (97403) P/N 13229E1328	EA
24	C	6810-01-362-8616	COLOR Reagent, Color Test Kit (53390) P/N G617318 (Shelf life 1 yr.)	EA
25	C		SULFAMIC Acid Reagent, Chlorine Test Kit (30053) P/N 2203 (Shelf life 1 yr)	PK
26	C		SULFITE Reagent, Chlorine Test Kit (30053) P/N 1055 (Shelf life 1 yr.)	PK
27	C	6810-01-358-4381	SODIUM Thiosulfate, Chlorine Test Kit (30053) P/N 24085-37 (Shelf life 1 yr.)	BL
28	O	6850-00-941-5054	CLEANING Compound, Solvent Fed. Spec. (81348) O-C-1889	GL
29	O	5350-00-161-9066	CLOTH, Emery, Fine (58536) P/N A-A1048	PK
30	C		COLOR Column, Color Test Kit (97403) P/N 13229E0231	EA
31	C		CUVETTE, Meter (09647) P/N 120-00783-004	PK
32	C	6850-01-384-5083	DESICCANT, Indicator Type, (97403) P/N 13229E1351	CN
33	C	6850-00-664-5685	DRY Cleaning Solvent, AA711, Types I and II (58536) P/N A-A-59601	GL
34	C	6515-00-137-6345	EAR Plug, Disposable, Box of 200 pr. (24268) P/N 28-00-08	BX
35	C	4610-01-449-6771	ELEMENT, Air Compressor Filter, (97403) P/N 13229E0157	EA
36	C		ELEMENT, Cartridge Filter, (97403) P/N 13229E0181	PK
37	C		ELEMENT, Reverse Osmosis, (97403) P/N 13229E0213	EA
38	C	6640-01-357-6716	EYE Dropper (53390) P/N 0219-01-5	EA
39	C	6640-00-935-4286	FLASK, Color Comparator (81348) P/N NNNF00240	EA
40	O	4310-01-447-5922	FILTER, Compressor Inlet (57328) P/N N4823	EA

Table 1. Expendable and Durable Items List (cont.).

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGEC, PART NUMBER	(5) U/M
41	C		FILTER, Compressor Outlet, (97403) P/N 13229E0926	EA
42	O	5920-00-199-9493	FUSE, CO Monitor, 5 Amp (81349) P/N FO2B250V1/2	EA
43	C	9150-00-190-0904	GAA Grease, Auto/Artillery, (81349) MIL-G-23827	LB
44	C		GLOVES, Chemical, (97403) P/N 13229E0925	EA
45	C	8040-00-774-8557	GLUE, ASTM D-2564 () P/N	BTL
46	O	5610-01-429-4402 5610-01-429-4403	GRAVEL, Coarse, 35 lb., Fine, 35 lb. (09647) P/N 13229E0307	PK PK
47	O		INHIBITOR, Corrosion (09647) P/N 120-02051	GL
48	C	6230-00-264-8261	LAMP, Flashlight (81349) P/N MIL-F-3747	EA
49	C		LAMP, Heat 500 watt, (97403) P/N 13229E1314	EA
50	C		LAMP, Incandescent, 100 Watt, (97403) P/N 13229E0209	EA
51	C		LAMP, Incandescent Indicator Light (09647) P/N 120-01635	EA
52	O		LAMP, Turbidity Meter (58177) P/N 51004	EA
53	C	9150-01-260-2534	LUBRICATING Oil, (81349) MIL-L-23398	GL
54	C	9150-00-181-9858	LUBRICATING Oil, Engine OE30, (81349) MIL-L-2104	GL
55	O		MARKERS, Tubing (09647) P/N 120-02456	PK
56	O		MARKERS, Wire (09647) P/N 120-02433	PK
57	O	5610-01-428-9667	MEDIA, Coarse, 35 lb. (09647) P/N 13229E0180	PK
58	C	5610-01-429-2434	MEDIA, Free, 35 lb. (09647) P/N 13229E0301	PK
59	C		PAPER, Looseleaf, 9-1/2x 6 (09647) P/N 120-02050	PK
60	C		PRIMER () P/N	GL
61	C	7920-00-140-0869	RAG, Wiping (03950) P/N 8722-0088	LB
62	O		RIVETS (09647) P/N 120-0118	PK
63	C	5610-01-407-3130	SAND, Garnet, 100 lb. (09647) P/N 13229E0300	PK
64	C	5350-00-027-3026	SANDPAPER, OD (81348) P/N P-P-121	PK

Table 1. Expendable and Durable Items List (cont.).

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGEC, PART NUMBER	(5) U/M
65	C		SEALANT, Pipe Thread, 0.25 m. wide (09647) P/N 120-01360	PK
66	O	8030-01-513-0319	SEALANT, Silicone (09647) P/N 120-01361	PK
67	O		SLEEVES, Tubing (09647) P/N 120-02456-40	RL
68	C	7930-00-282-9699	SOAP, GP, Liquid, A (81349) MIL-D-16791	GL
69	C		SILICONE Lubricant (09647) P/N 120-02508	PK
70	C	8030-00-889-3534	TAPE, Antiseize (81349) MIL-T-27730	RL
71	C	5970-01-174-5651	TAPE, Electrical (81165) P/N PREMIUM 37 ¾ YELLOW	RL
72	O		TAPE, Friction (09647) P/N 120-02439	RL
73	O	5940-00-557-4339	TERMINAL Rings (96906) MS25036	PK
74	O		TIES, Wire/Tubing (96906) MS3367	PK
75	O	4020-00-498-9565	TWINE, Ball (81349) MIL-T-713	RL
76	O	5970-00-056-3556	VARNISH, Electrical (09647) P/N 120-01970	CN
77	O		WATER Seal, Van (09647) P/N 120-01962	PK
78	O		WD40 () P/N 42060	PK
79	C		WIPES, Hand (09647) P/N 120-02112	BX

**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
ILLUSTRATED LIST OF MANUFACTURED ITEMS**

INTRODUCTION

This Work Package includes complete instructions for making items authorized to be manufactured or fabricated at **unit** maintenance level.

A part number index in alphabetical 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 the part number or specification in a tabular list on the illustration.

PART NUMBER INDEX		
Part Number to	Part Name Manufacturing	Manufacturing Figure
1322930000-20	Brace, Wooden	1

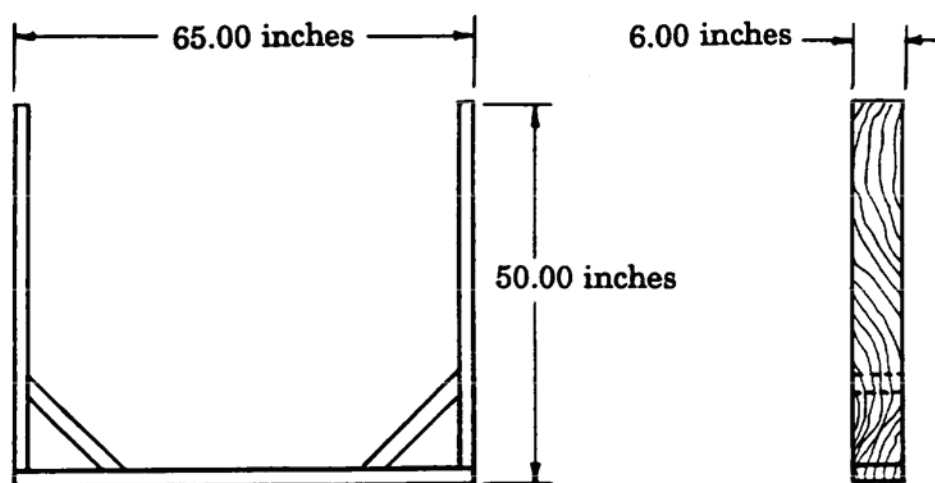


Figure 1.

Part Number: 1322930000-20

Material: Wood per MIL-STD-731, nominal size 2"x6"

Procedure: Cut wood as needed to meet specified dimensions and nail together with standard 8 penny galvanized commercial nails.

**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
SCHEMATICS AND INTERCONNECTING DIAGRAMS**

SCHEMATIC DIAGRAMS.

Pages FP-1 through FP-22 are reproductions of schematic diagrams packed with the ROWPU.

INTERCONNECTION DIAGRAMS.

Pages FP-23 through FP-54 are reproductions of interconnecting diagrams packed with the ROWPU.

**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 3,000 GPH
TRAILER MOUNTED, FLATBED CARGO, 22-1/2 TON 8-WHEEL TANDEM
GLOSSARY**

ABBREVIATIONS

A or amp	Amperes
ac	Alternating current
AG	Aggregate (filter material)
BC	Biological contamination
BE	Biological warfare
C	Celsius (centigrade)
CBR	Chemical-biological-radiological
CC	Chemical contamination
cm	Centimeter
cm-kg	Centimeter-kilogram
CR	Purge (position on backwash timer)
crs	Corrosion resistant steel
CW	Chemical warfare
DI	Dionizer
DIS	Discharge
DS	Direct support (maintenance)
EIR	Equipment improvement recommendation
emd	Electric motor driven
EMP	Electro magnetic pulse
F	Fahrenheit
FM	Field manual
ft	Foot
gal	Gallon
gph	Gallons per hour
gpm	Gallons per minute
GS	General support (maintenance)
HP	High pressure
hp	Horsepower
Hz	Hertz (cycles per second)
in	Inch
ID	Inside diameter
ISO	International Standards Organization
kg	Kilogram
kg/cm ²	Kilograms per square centimeter
kg/cm ² d	Kilograms per square centimeter (differential)
kg/cm ² g	Kilograms per square centimeter, gage
kg/sqm	Kilograms per square meter
kPa	KiloPascals(metric pressure)
Kw	Kilowatts (1,000 watts)
l	Liter
lph	Liters per hour
lpm	Liters per minute
MAC	Maintenance Allocation Chart
m-kg	Meter-kilograms
mg/l	Milligrams per liter
ml	Milliliter
MOV	Metallic oxide varistor
NBC	Nuclear, biological or chemical
NC	Nuclear contamination
NTU	Nephelometric turbidity units
OD	Outside diameter

pC	PicoCuries (radiation)
pC/l	PicoCuries per liter
pH	Potential for hydrogen (acidity)
ppm	Parts per million
POLY	Polyelectrolyte
PMCS	Preventive maintenance checks and services
pSi	pounds per square inch
psid	Pounds per square inch (differential)
psig	Pounds per square inch gravity (pressure)
RO	Reverse Osmosis
ROWPU	Reverse Osmosis Water Purification Unit
RPSTL	Repair Parts and Special Tools List
SF	Standard form
SR	Service (position on backwash timer)
tbc	Total biological count
TDS	Total dissolved solids
TM	Technical manual
Vat	Volts, alternating current
Vdc	Volts, direct current

DEFINITION OF UNUSUAL TERMS

Accumulator — A device to reduce pressure surges caused by the high pressure pump (a vibration dampener).

AG media — Lightweight filter material turning the top media layer in the media filter.

Backwash — Semi-automatic process of cleaning the media filter.

Brackish water— Slightly salty water such as that found where a river enters the ocean and the outlet of a bed or lagoon flooded by ocean tides.

Brine — Very salty rejected feedwater. Also called waste, concentrate and reject.

Biological warfare agents — These are removed in the carbon filter of the NBC system.

Calcium carbonate — (Lime) A type of dissolved salt found in the raw water which may form scale on the reverse osmosis elements.

Calcium hypochlorite — A form of chlorine used to control biological growth in water.

Calcium sulfate — A type of dissolved salt found in the raw water which may form scale on the reverse osmosis elements.

Chlorination — The addition of chlorine to product water to prevent growth of micro organisms.

Concentrate — See “brine.”

Conductivity — Salinity or amount of salt in solution.

Contaminants — Any foreign substance found in the raw water or in the ROWPU systems.

Creep — Gradual increase in outlet pressure

Cuvette — Glass test tubes that are matched exactly in all dimensions. Cuvettes must not be scratched or get dirty or results from chemical analyses will be inaccurate.

Cyclone separators — Devices which remove solids from a liquid through centrifugal action. The liquid is rotated at high speed by its own velocity forcing the heavier solids out of the liquid.

Deionizer — A device for removing any remaining nuclear radiation in the product water. The deionizer is part of the NBC filtration system.

Differential pressure — The difference between inlet and outlet pressures of a component. Also called pressure drop.

Dissolved solids — Solid substances that must be removed from the raw water during purification.

Electro Magnetic Pulse (EMP) — The electrical and magnetic pulse wave generated by a nuclear weapon.

Feed water — Water input to the Water Purification System of the ROWPU.

Free chlorine level — Amount of chlorine present in product water, measured in ppm or mg/l.

Fouling — The deposit of solids on the surface of the reverse osmosis (RO) elements. Fouling is caused by dissolved solids or biological growth.

Hypochlorite — Calcium hypochlorite (chlorine) used to destroy biological growth in water.

Inlet pressure — Pressure measured at the inlet of a component.

Nuclear, Biological, Chemical (NBC) — Filtration unit of the ROWPU used to filter out nuclear, biological, or chemical contaminants; includes carbon and deionizing filtration.

Neutralize — To counteract the effects of contaminants in the water or ROWPU.

Nephelometric Turbidity Unit (NTU). — A measurement of turbidity as determined by a turbidity meter.

Nuclear warfare agents. — These are removed in the deionizing (DI) filter of the NBC filtration unit.

Osmosis — Process in which water diffuses through a membrane from a less concentrated saline solution to a more concentrated saline solution.

Osmotic pressure — The pressure generated by the osmotic passage of water into a more saline water.

Outlet pressure — Pressure measured at the outlet of a component.

PicoCuries — A measurement of nuclear radiation.

Polyelectrolyte — Chemical mixed with water to produce floc particles.

Potable water — Water meeting military standards for drink ability.

Potential for hydrogen (pH) — Symbol used with a numeric value to indicate the relative acidity or alkalinity of a solution. The pH scale runs from 0-14 with number 7 being a neutral solution (pure water). The numbers 6 to 1 indicate increasing acidity and the numbers 8 to 14 indicate increasing alkalinity.

Product — Water produced by the Water Purification System of the ROWPU before adding hypochlorite.

Pulse dampener — Unit to smooth out regularly repeated variations in output of RO pump.

Raw water — Contaminated or untreated source of water for the Raw Water Intake System of the ROWPU.

Reagents — Chemicals used to cause a reaction or change.

Reject — See “brine.”

Reverse Osmosis (RO) — A reversal of the osmosis process brought about by applying a water pressure greater than osmotic pressure on water containing dissolved solids.

Reverse Osmosis (RO) Element — A device containing the membrane material which provides the reverse osmosis separation, a feed channel for water passage and a product channel and collector for gathering the purified water.

Reverse Osmosis (RO) Vessel — A high pressure cylinder which holds one or more RO elements.

Saline water — Water containing dissolved solids (salts).

Scale — A build up of salts such as calcium carbonate or calcium sulfate on the reverse osmosis elements.

Semi-automatic — A device or system which, when manually started, will continue to operate until an operational cycle is complete.

Sequestrant — A chemical used to prevent scale from building up in the reverse osmosis elements.

Silica - A hard glossy sandy material found in turbulent water sources

Sodium bisulfite — A chemical compound used for sanitized cleaning of the ROWPU to prevent bacterial growth within the reverse osmosis elements during long-term, secured shutdown. Sodium bisulfite is mixed with sequestrant.

Surges — Sudden, momentary increases in pressure.

Suspended solids — Particles of dirt and organics in water which do not rapidly settle out and cause the water to appear dark or cloudy.

Total biological count — A measure of biological contaminants.

Total Dissolved Solids (TDS) — The measure of the total dissolved solids (salts) in water measured in ppm or mg/l.

Turbidity — Mud and other suspended solids found in raw water which causes the water to appear cloudy.

Waste — See “brine.”

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By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:

A handwritten signature in dark ink, appearing to read "Joyce E. Morrow". The signature is fluid and cursive, with the first name "Joyce" being more prominent.

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army

0702314

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4. **City:** Hometown
5. **St:** MO
6. **Zip:** 77777
7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-1915-200-10
9. **Pub Title:** TM
10. **Publication Date:** 11-APR-88
11. **Change Number:** 12
12. **Submitter Rank:** MSG
13. **Submitter Fname:** Joe
14. **Submitter Mname:** T
15. **Submitter Lname:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem:** 1
18. **Page:** 1
19. **Paragraph:** 3
20. **Line:** 4
21. **NSN:** 5
22. **Reference:** 6
23. **Figure:** 7
24. **Table:** 8
25. **Item:** 9
26. **Total:** 123
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PUBLICATION/FORM NUMBER TM 10-4610-232-34						DATE 29 January 2007	TITLE Water Purification Unit, Reverse Osmosis, 3000 GPH
ITEM	PAGE	PARA- GRAPH	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON	
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PUBLICATION/FORM NUMBER						DATE		TITLE	
TM 10-4610-232-34						29 January 2007		Water Purification Unit, Reverse Osmosis 3000 GPH	
ITEM	PAGE	PARA- GRAPH	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON			
<i>* Reference to line numbers within the paragraph or subparagraph.</i>									
TYPED NAME, GRADE OR TITLE					TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION			SIGNATURE	

TO: (Forward direct to addressee listed in publication)				FROM: (Activity and location) (Include ZIP Code)			DATE	
PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS								
PUBLICATION NUMBER				DATE		TITLE		
PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION
PART III - REMARKS (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	

COMPONENT REFERENCE LIST			REVISIONS										
ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO.	DESCRIPTION	11	10	9	8	7	6	5	4	3	2	1
B1		BATTERY, PART OF GENERATOR SET, G1											
CB1	13229E1317-2	CIRCUIT BREAKER, MAIN POWER											
CB2	13229E1317-1	CIRCUIT BREAKER, AIR COMPRESSOR											
CB3	13229E1318-1	CIRCUIT BREAKER, DISTRIBUTION PUMP											
CB4	13229E1318-2	CIRCUIT BREAKER, RAW WATER PUMP											
CB5	13229E1317-3	CIRCUIT BREAKER, BOOSTER PUMP											
CB6	13229E1317-4	CIRCUIT BREAKER, HIGH PRESSURE PUMP											
CB7	13229E1315	CIRCUIT BREAKER, MAIN INTERNAL POWER											
CB8	13229E0717	CIRCUIT BREAKER, CHEMICAL PUMPS											
CB9	13229E0717	CIRCUIT BREAKER, SOLENOID VALVES, METERS											
CB10	13229E0717	CIRCUIT BREAKER, LIMIT & PRESSURE SWITCHES, FAN											
CB11	13229E1316	CIRCUIT BREAKER, A.C. OUTLETS, DIESEL HEATERS											
CB12	13229E0717	CIRCUIT BREAKER, SUMP HEATERS											
CB13	13229E1316	CIRCUIT BREAKER, RAW WATER PUMP HEATER											
CB14	13229E1316	CIRCUIT BREAKER, DISTRIBUTION PUMP											
CB15	13229E0718-2	CIRCUIT BREAKER, MAIN POWER, T1											
CB16	13229E0718-1	CIRCUIT BREAKER, MAIN POWER, T2											
CB17	13229E1317-1	CIRCUIT BREAKER, PUMP SKID HEATER, HTR3											
CM4	13229E1334	CARBON MONOXIDE MONITOR											
CS1, CS2	13229E1220	CURRENT SENSOR, GROUND FAULT											
ETM1, ETM2	13229E0215	ELAPSED TIME METER											
FM1	13229E0732-1	FLOWMETER, POWERED, FEED FLOW											
FM2	13229E0732-3	FLOWMETER, POWERED, PRODUCT FLOW											
FM3	13229E0732-2	FLOWMETER, POWERED, WASTE FLOW											
FS1	13229E0210-1	FLOW SENSOR, FEED FLOW											
FS2	13229E0210-2	FLOW SENSOR, PRODUCT FLOW											
FS3	13229E0210-3	FLOW SENSOR, WASTE FLOW											
G1	6115-00-118-1243	GENERATOR SET, 50/60 HERTZ											
GF1, GF2	13229E1219	GROUND FAULT RELAY											
GS1	13229E0244	GROUND STRIP											
HN1	13229E0090-2	HCRN, PULSING											
HN2	13229E0090-1	HCRN, CONTINUOUS											
HR1	13229E1270-1	SUMP HEATER, BACK WALL											
HR2	13229E1270-2	SUMP HEATER, BACK WALL											
HR3	13229E1270-3	SUMP HEATER, FRONT WALL											
HTR1	13229E0158-1	HEATER, MULTI-FUEL, INTERIOR											
HTR2	13229E0158-2	HEATER, MULTI-FUEL, INTERIOR											
HTR3	13229E0876	HEATER, ELECTRIC, PUMP SKID											
HTR4	13229E1271-1	HEATER, ELECTRIC, RAW WATER PUMP											
HTR5	13229E1271-2	HEATER, ELECTRIC, DISTRIBUTION PUMP											
J1	13229E1205-2	CONNECTOR, RECEPTACLE											
J2	13229E1206-10	CONNECTOR, RECEPTACLE											
J3, J4, J5	13229E1206-4	CONNECTOR, RECEPTACLE											
J6, J7, J28, J31, J37	13229E1206-1	CONNECTOR, RECEPTACLE											
J42, J45, J47, J49	13229E1206-1	CONNECTOR, RECEPTACLE											
J8	MS27144-2	CONNECTOR, PART OF HARNESS 13229E0158-1 ITEM 7											
J9	MS27144-2	CONNECTOR, PART OF HARNESS 13229E0158-2 ITEM 8											
J10	13229E1204-2	CONNECTOR, RECEPTACLE											
J11	13229E1204-11	CONNECTOR, RECEPTACLE											
J12	13229E1204-14	CONNECTOR, RECEPTACLE											
J13	13229E1204-16	CONNECTOR, RECEPTACLE											
J14	13229E1204-17	CONNECTOR, RECEPTACLE											
J15	13229E1204-13	CONNECTOR, RECEPTACLE											
J16	13229E1204-15	CONNECTOR, RECEPTACLE											
J17	13229E1204-5	CONNECTOR, RECEPTACLE											
J18, J20	13229E1204-8	CONNECTOR, RECEPTACLE											
J19, J57, J62, J67	13229E1204-3	CONNECTOR, RECEPTACLE											
J21	13229E1204-9	CONNECTOR, RECEPTACLE											
J22, J23, J34, J58	13229E1206-8	CONNECTOR, RECEPTACLE											
J24	13229E1204-10	CONNECTOR, RECEPTACLE											
J25, J44	13229E1206-5	CONNECTOR, RECEPTACLE											
J26, J43	13229E1206-6	CONNECTOR, RECEPTACLE											
J27	13229E1206-7	CONNECTOR, RECEPTACLE											
J44	13229E1206-8	CONNECTOR, RECEPTACLE											

(MODEL WTA-060 ONLY.)

(MODEL ROWPU-1 ONLY.)

NOTES:

- CAUTION: POWER MUST BE SHUT OFF BEFORE ATTEMPTING ANY ELECTRICAL TROUBLE SHOOTING.
- INTERCHANGE ANY TWO LEADS ON CB6 POWER SIDE TO CHANGE ROTATION OF 60 HP HIGH PRESSURE R.O. PUMP MOTOR (M8).
- INTERCHANGE ANY TWO LEADS ON RESPECTIVE MOTOR STARTERS POWER SIDE TO CHANGE ROTATION OF THE AIR COMPRESSOR (M1), DISTRIBUTION PUMP (M2), RAW WATER PUMP (M3), OR BOOSTER PUMP (M7) MOTORS.
- SET TIME DELAY RELAYS AS INDICATED:

LEGEND

- ☒ - TERMINAL, POWER DISTRIBUTION BLOCK
- - TERMINAL, HIGH VOLTAGE COMPARTMENT
- - TERMINAL, LOW VOLTAGE COMPARTMENT
- ⊗ - TERMINAL, REMOTE TERMINAL BLOCK
- ⚡ - MOV, TRANSIENT SUPPRESSOR
- ⬇ - CONTROL PANEL GROUND
- ⬇ - VAN (CONTAINER) GROUND
- ⚡ - HORN
- ⚡ - AC POWER OUTLET

CCB Approved
By: *[Signature]*
Date: *12/1/88*

U.S. ARMY MOBILITY EQUIPMENT
RESEARCH AND DEVELOPMENT COMMAND
FORT BELVOIR, VIRGINIA 22060

SCHEMATIC DIAGRAM,
ELECTRICAL,
3000 GPH ROWPU

DAAK70-88-C-0008

97403

13229E0081

1 OF 11

Figure FO-1 (Sheet 1 of 11)
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Figure FO-1 (Sheet 2 of 11)
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AQUA-CHEM PART NUMBER	COMPONENT REFERENCE LIST			REVISIONS			
	ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO.	DESCRIPTION	ZONE	DATE	APPROVED	
120-01153-1	MOV14, MOV15	13229E0326-1	SUPPRESSOR, TRANSIENT, RAW WATER PUMP HEATER	2	REVISED AND REDRAWN, NEW SHEET.	JNU	NO-4-18
120-01153-1	MOV16-MOV21	13229E0326-1	SUPPRESSOR, TRANSIENT, HIGH PRESSURE PUMP	5	REVISED PER ECE 2771 AND ECP 2006 (S)	WLN	NO-11-28
120-01153-1	MOV22-MOV24	13229E0326-1	SUPPRESSOR, TRANSIENT, AIR COMPRESSOR				
120-01153-1	MOV25-MOV27	13229E0326-1	SUPPRESSOR, TRANSIENT, PUMP SKID HEATER (HTR3)				
120-02315-14	P1	13229E1207-14	CONNECTOR, PLUG				
120-02315-13	P2	13229E1207-13	CONNECTOR, PLUG				
120-02315-5	P3, P4, P5	13229E1207-5	CONNECTOR, PLUG				
120-02315-1	P6, P7, P28, P31	13229E1207-1	CONNECTOR, PLUG				
120-02315-1	P32, P37, P42	13229E1207-1	CONNECTOR, PLUG				
120-02315-1	P45, P47, P49	13229E1207-1	CONNECTOR, PLUG				
120-02315-1	P53, P54, P61	13229E1207-1	CONNECTOR, PLUG				
120-00682-4	P8	MS27142-2	CONNECTOR, PART OF FUEL PUMP 13229E0158-1 ITEM 4				
120-00682-9	P9	MS27142-2	CONNECTOR, PART OF FUEL PUMP 13229E0158-2 ITEM 9				
120-0215-4	P10	13229E1207-4	CONNECTOR, PLUG				
120-02316-7	P11	13229E1208-7	CONNECTOR, PLUG				
120-02316-9	P12	13229E1208-9	CONNECTOR, PLUG				
120-02316-11	P13	13229E1208-11	CONNECTOR, PLUG				
120-02316-13	P14	13229E1208-13	CONNECTOR, PLUG				
120-02316-8	P15	13229E1208-8	CONNECTOR, PLUG				
120-02316-10	P16	13229E1208-10	CONNECTOR, PLUG				
120-02316-3	P17	13229E1208-3	CONNECTOR, PLUG				
120-02316-4	P18	13229E1208-4	CONNECTOR, PLUG				
120-02316-1	P19, P67	13229E1208-1	CONNECTOR, PLUG				
120-02316-4	P20	13229E1208-4	CONNECTOR, PLUG				
120-02315-9	P22, P23, P34	13229E1207-9	CONNECTOR, PLUG				
120-02315-9	P57, P58, P62	13229E1207-9	CONNECTOR, PLUG				
120-02315-15	P24	13229E1207-15	CONNECTOR, PLUG				
120-02315-6	P25, P44	13229E1207-6	CONNECTOR, PLUG				
120-02315-7	P26, P43	13229E1207-7	CONNECTOR, PLUG				
120-02315-8	P27	13229E1207-8	CONNECTOR, PLUG				
120-02315-16	P29	13229E1207-16	CONNECTOR, PLUG				
120-02315-12	P30	13229E1207-12	CONNECTOR, PLUG				
120-07549-4	P33, P38-P41, P48	13229E0700-1 ITEM 3	CONNECTOR, PLUG, PART OF VALVE 13229E0700-1				
120-02315-3	P35, P51	13229E1207-3	CONNECTOR, PLUG				
120-02315-2	P36, P46, P50	13229E1207-2	CONNECTOR, PLUG				
120-02316-12	P52	13229E1208-12	CONNECTOR, PLUG				
120-02315-10	P55, P56, P60	13229E1207-10	CONNECTOR, PLUG				
120-02315-11	P59	13229E1207-11	CONNECTOR, PLUG				
120-02316-16	P63	13229E1208-16	CONNECTOR, PLUG				
120-02316-17	P64	13229E1208-17	CONNECTOR, PLUG				
120-02316-6	P65	13229E1208-6	CONNECTOR, PLUG				
120-02316-2	P66	13229E1208-2	CONNECTOR, PLUG				
120-02316-15	P68	13229E1208-15	CONNECTOR, PLUG				
120-02316-14	P69	13229E1208-14	CONNECTOR, PLUG				
120-07622	PB1, PB6, PB8	13229E0733	PUSHBUTTON SWITCH				
120-07622	PB11, PB13	13229E0733	PUSHBUTTON SWITCH				
120-02377-1	PB2, PB7, PB9	13229E1242-1	PUSHBUTTON SWITCH				
120-02377-1	PB12, PB14	13229E1242-1	PUSHBUTTON SWITCH				
120-00352	PB3	13229E0108	PUSHBUTTON SWITCH				
120-02379	PB4	13229E1244	PUSHBUTTON SWITCH				
120-02378	PB5, PB17	13229E1243	PUSHBUTTON SWITCH				
120-07624	PB10, PB16	13229E0735	PUSHBUTTON SWITCH				
120-07624	PB19, PB20	13229E0735	PUSHBUTTON SWITCH				
120-02377-2	PB15, PB18	13229E1242-2	PUSHBUTTON SWITCH				
120-07620-1	PL1, PL4, PL23-PL25	13229E0731-1	PILOT LIGHT				
120-07620-1	PL27-PL29	13229E0731-1	PILOT LIGHT				
120-07620-3	PL2, PL3, PL5-PL11	13229E0731-3	PILOT LIGHT				
120-07620-3	PL20	13229E0731-3	PILOT LIGHT				
120-07620-4	PL12-PL19	13229E0731-4	PILOT LIGHT				
120-07620-2	PL21, PL22	13229E0731-2	PILOT LIGHT				
120-07620-2	PL26, PL30	13229E0731-2	PILOT LIGHT				
120-07615	PRA, PRB, PRC	13229E0730	POWER RESISTOR, FIXED RESISTANCE				
120-00337	PDB	13229E0098	POWER DISTRIBUTION BLOCK				
120-02316-5	PL1	13229E1208-5	CONNECTOR, PLUG				
120-02315-6	P44	13229E1207-6	CONNECTOR, PLUG				

(MODEL WTA-060 ONLY.)

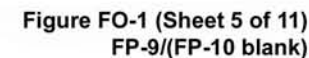
(MODEL ROWPU-1 ONLY.)

CHECKED (PREPARED BY) [Signature] DATE [Date] DESIGNED BY [Signature] DATE [Date] DRAWN BY [Signature] DATE [Date] FOR APPROVAL OF [Signature] DATE [Date]		U.S. ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND FORT BELVOIR, VIRGINIA 22060	
DAAK70-88-C-0008		SCHEMATIC DIAGRAM, ELECTRICAL, 3000 GPH ROWPU	
APPROVED FOR PROCUREMENT DATE [Date]		A1	97403
SCALE		SHEET 3	

Figure FO-1 (Sheet 3 of 11)
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COMPONENT REFERENCE LIST			REVISIONS	
ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO.	DESCRIPTION	ZONE	DATE
PL21, PL22	13229E0731-2	PILOT LIGHT	2	REVISED AND REDRAWN, NEW SHEET. JNU 80-4-18
PL26, PL30	13229E0731-2	PILOT LIGHT	2	REVISED FOR EOR 2814 & 2771 JNU 80-11-24
PRA, PRB, PRC	13229E0730	POWER RESISTOR, FIXED RESISTANCE	2	REVISED FOR GOV. COMMENTS AND EOP 5007 & 0088 JNU 81-11-13
PDB	13229E0C98	POWER DISTRIBUTION BLOCK		
PDSH1, PDSH3	13229E0105-2	PRESSURE DIFFERENTIAL SWITCH		
PDSH2	13229E0105-1	PRESSURE DIFFERENTIAL SWITCH		
PSH5	13229E0104	PRESSURE SWITCH (HIGH)		
PSH6	13229E0106	PRESSURE SWITCH (HIGH)		
PSH7	13229E0107	PRESSURE SWITCH (HIGH)		
PSL4	13229E0106-1	PRESSURE SWITCH (LOW)		
PSL8	13229E1115	PRESSURE SWITCH (LOW)		
PS1	13229E0754	POWER SUPPLY, 12VDC		
PS2	13229E1176	POWER SUPPLY, 28VDC		
PSK1	13229E1218	POWER SUPPLY, 9VDC		
R1, R2	MIL-R-39008/4E	RESISTOR, GROUND, 1.1 MEG		
SR2, SR4	13229E0151-2	RECEPTACLE, 120VAC, EXTERIOR		
SR5, SR6	13229E0151-1	RECEPTACLE, 120VAC, INTERIOR		
SR7	13229E0597	RECEPTACLE, 120VAC, PLUG		
SR9	13229E0187	RECEPTACLE, 120VAC, DUPLEX		
SS1	13229E0503	SELECTOR SWITCH, 2 POSITION		
SS2	13229E1245	SELECTOR SWITCH, 2 POSITION		
SS3	13229E1247	SELECTOR SWITCH, 3 POSITION		
SS4, SS5, SS7, SS8	13229E0736	SELECTOR SWITCH, 2 POSITION		
SS6	13229E1246	SELECTOR SWITCH, 2 POSITION		
SV1-SV5, SV7	13229E0700-1	SOLENOID VALVE		(MODEL WTA-060 ONLY.)
SV6	13229E0700-2	SOLENOID VALVE		(MODEL ROWPU-1 ONLY.)
SV1-SV3, SV5	13229E0700-1	SOLENOID VALVE		
SV7	13229E0700-2	SOLENOID VALVE		
SV8	13229E1269-3	SOLENOID VALVE ASSEMBLY		
SV9	13229E1269-1	SOLENOID VALVE ASSEMBLY		
SV10	13229E0445	SOLENOID VALVE ASSEMBLY		
T1	13229E0716	TRANSFORMER, 3KVA		
T2	13229E0840	TRANSFORMER, 3KVA		
TB1-1 THRU -91	13229E0093-1	TERMINAL, 15 AMP		
TB1-92 THRU -99	13229E0094-2	TERMINAL, GROUND, 20 AMP		
TB2-1 THRU -5	13229E0093-1	TERMINAL, 15 AMP		
TB3-1 THRU -22	13229E0093-2	TERMINAL, 20 AMP		
TB3-23 THRU -25	13229E0094-2	TERMINAL, GROUND, 20 AMP		
TB4-1, TB4-5	13229E0093-1	TERMINAL, 15 AMP		
TB4-2 THRU -4	13229E0094-1	TERMINAL, GROUND, 15 AMP		
TB5-1 THRU -12	13229E0093-1	TERMINAL, 15 AMP		
TB5-13 THRU -15	13229E0094-1	TERMINAL, GROUND, 15 AMP		
TB6-1 THRU -16	13229E0093-1	TERMINAL, 15 AMP		
TB6-17, TB6-18	13229E0094-1	TERMINAL, GROUND, 15 AMP		
TB7-1 THRU -13	13229E0093-1	TERMINAL, 15 AMP		
TB7-14	13229E0094-1	TERMINAL, GROUND, 15 AMP		
TBW	13229E0289	TURBIDITY METER		(MODEL WTA-060 ONLY.)
TDK1	13229E0109	TIMER, CYCLE		
TDK2	13229E0720-3	RELAY, TIME DELAY		
TDK3, TDK4	13229E0720-2	RELAY, TIME DELAY		
TDK5	13229E0720-1	RELAY, TIME DELAY		
TDS	13229E0413	TOTAL DISSOLVED SOLIDS METER (CONDUCTIVITY)		
TDS5	13229E0387	TOTAL DISSOLVED SOLIDS SENSOR (CONDUCTIVITY)		
SV4	13229E0061	SOLENOID		(MODEL ROWPU-1 ONLY.)
ST1	MS24425-27	SWITCH, TOGGLE, SP (ON) - OFF - (ON)		

UNDER PREPARE SPECIFIED THE FOLLOWING ARE: ONE PLACE (L) 2 TWO PLACE (L) 2 THREE PLACE (L) 2 FOUR PLACE (L) 2 FIVE PLACE (L) 2 SIX PLACE (L) 2 SEVEN PLACE (L) 2 EIGHT PLACE (L) 2 NINE PLACE (L) 2 TEN PLACE (L) 2 ELEVEN PLACE (L) 2 TWELVE PLACE (L) 2 THIRTEEN PLACE (L) 2 FOURTEEN PLACE (L) 2 FIFTEEN PLACE (L) 2 SIXTEEN PLACE (L) 2 SEVENTEEN PLACE (L) 2 EIGHTEEN PLACE (L) 2 NINETEEN PLACE (L) 2 TWENTY PLACE (L) 2 TWENTY ONE PLACE (L) 2 TWENTY TWO PLACE (L) 2 TWENTY THREE PLACE (L) 2 TWENTY FOUR PLACE (L) 2 TWENTY FIVE PLACE (L) 2 TWENTY SIX PLACE (L) 2 TWENTY SEVEN PLACE (L) 2 TWENTY EIGHT PLACE (L) 2 TWENTY NINE PLACE (L) 2 THIRTY PLACE (L) 2 THIRTY ONE PLACE (L) 2 THIRTY TWO PLACE (L) 2 THIRTY THREE PLACE (L) 2 THIRTY FOUR PLACE (L) 2 THIRTY FIVE PLACE (L) 2 THIRTY SIX PLACE (L) 2 THIRTY SEVEN PLACE (L) 2 THIRTY EIGHT PLACE (L) 2 THIRTY NINE PLACE (L) 2 FORTY PLACE (L) 2 FORTY ONE PLACE (L) 2 FORTY TWO PLACE (L) 2 FORTY THREE PLACE (L) 2 FORTY FOUR PLACE (L) 2 FORTY FIVE PLACE (L) 2 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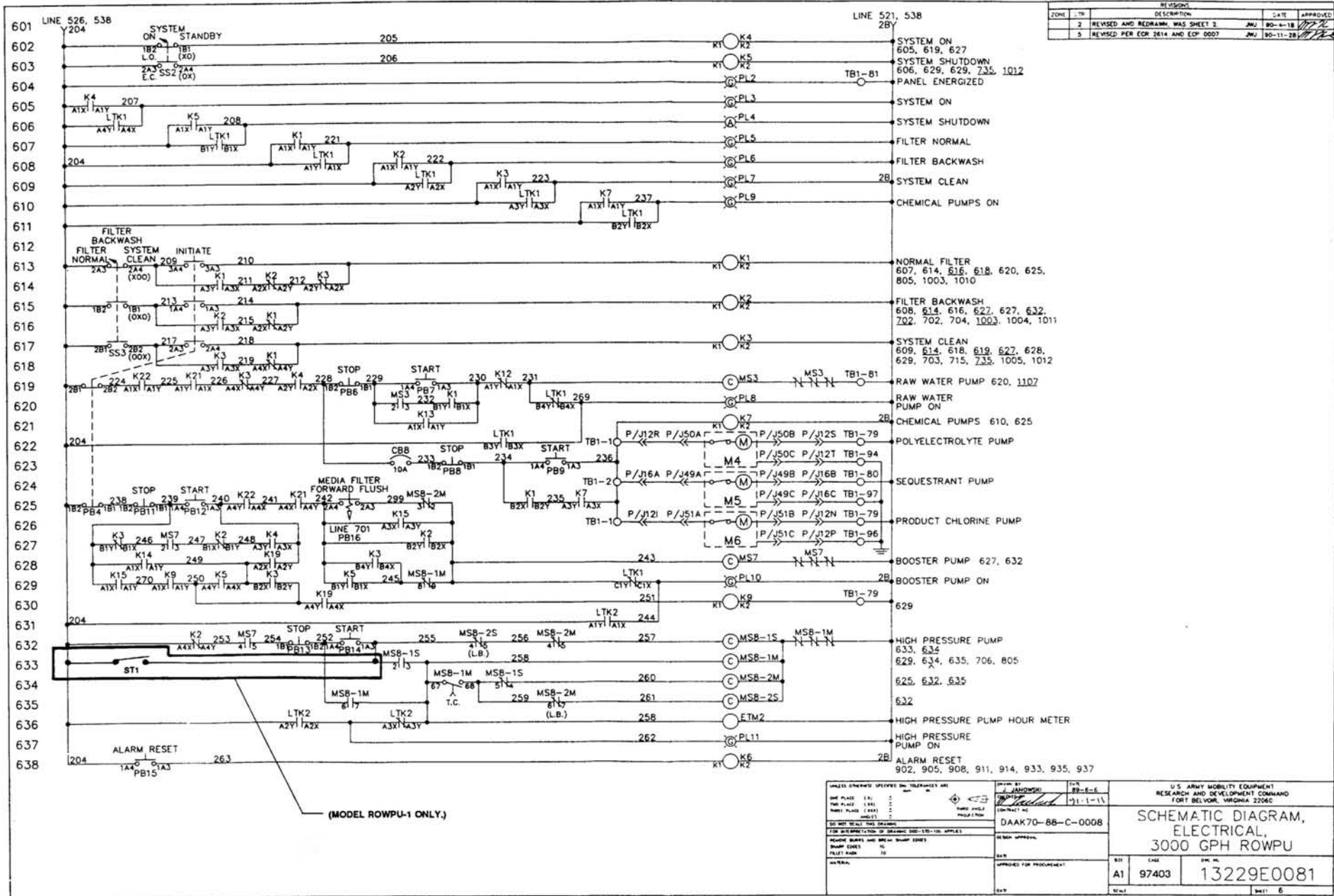


Figure FO-1 (Sheet 6 of 11)
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Figure FO-1 (Sheet 7 of 11)
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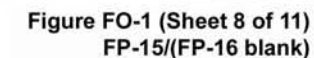
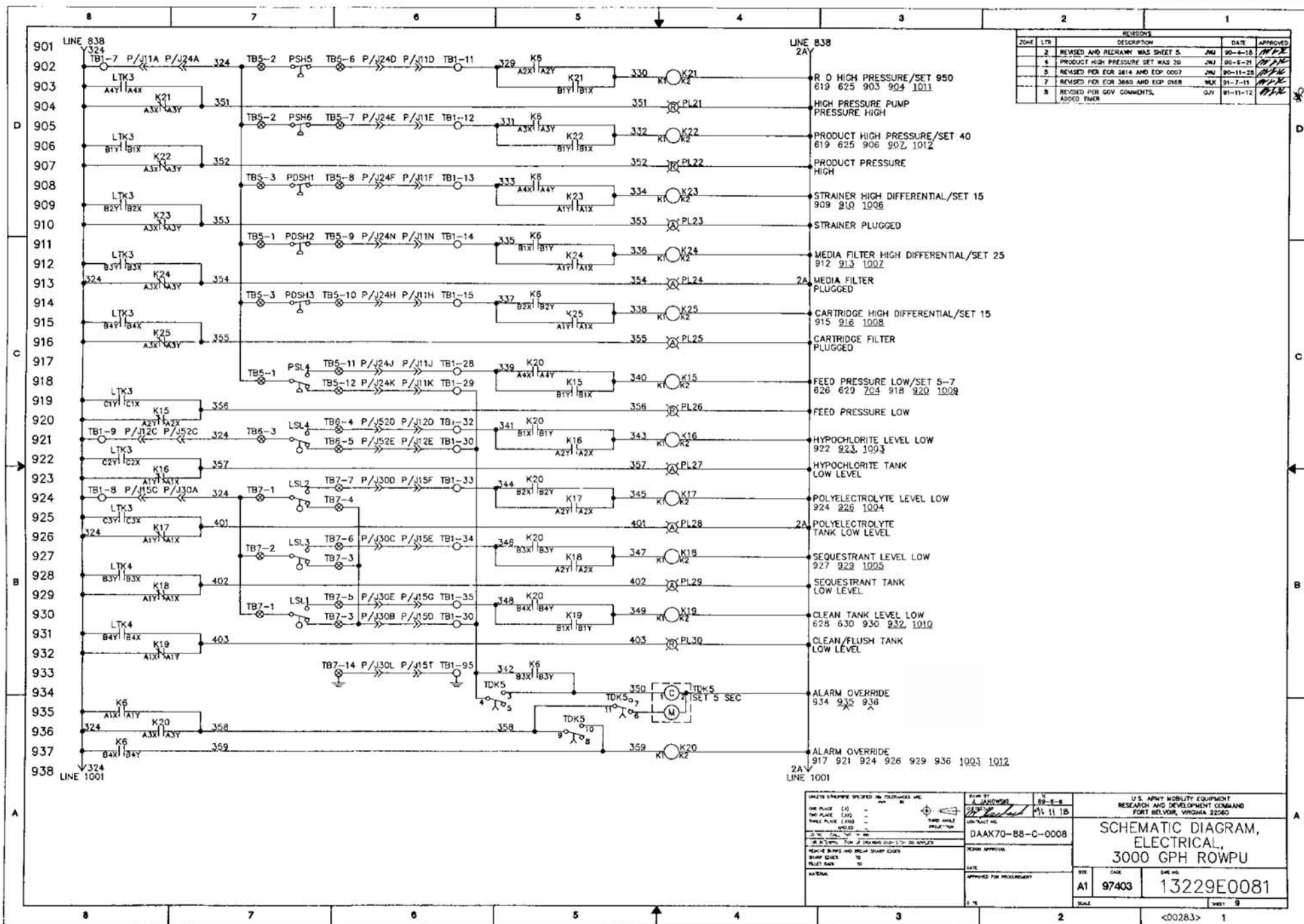


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Figure FO-1 (Sheet 9 of 11)
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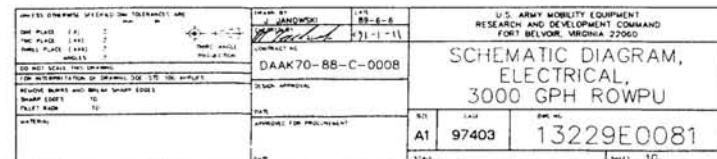
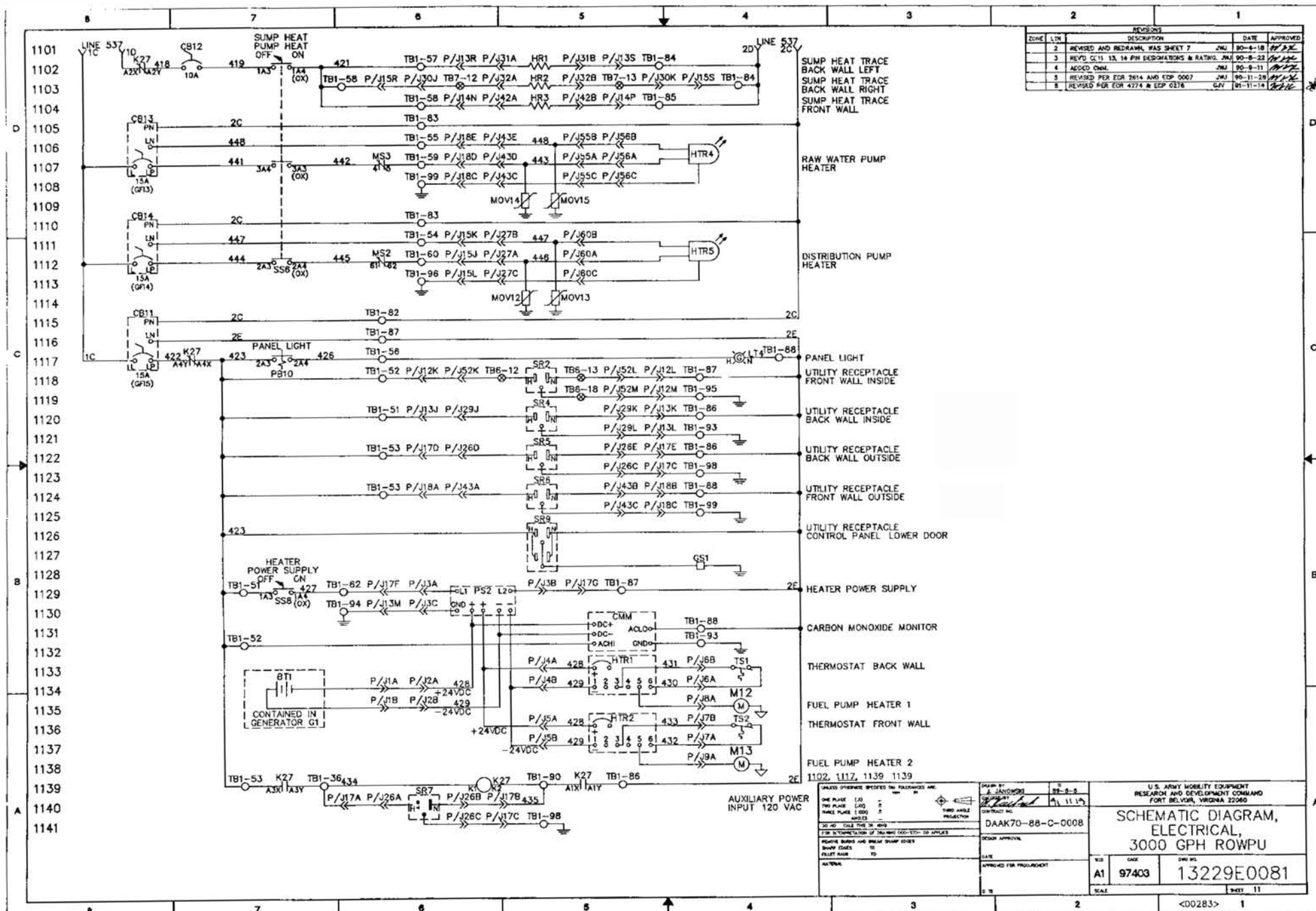


Figure FO-1 (Sheet 10 of 11)
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COMPONENT REFERENCE LIST			
ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO	DESCRIPTION	LOCATION
BT1		BATTERY PART OF GENERATOR SET G1	SH 5-82
CB1	13229E0718-5	CIRCUIT BREAKER MAIN POWER	SH 10-C8
CB2	13229E0718-6	CIRCUIT BREAKER AIR COMPRESSOR	SH 10-B4
CB3	13229E0718-8	CIRCUIT BREAKER DISTRIBUTION PUMP	SH 10-B4
CB4	13229E0718-2	CIRCUIT BREAKER RAW WATER PUMP	SH 10-B4
CB5	13229E0718-3	CIRCUIT BREAKER BOOSTER PUMP	SH 10-A5
CB6	13229E0718-4	CIRCUIT BREAKER HIGH PRESSURE PUMP	SH 10-B5
CB7	13229E0717-3	CIRCUIT BREAKER MAIN INTERNAL POWER	SH 8-B4
CB8	13229E0717-1	CIRCUIT BREAKER CHEMICAL PUMPS	SH 8-B4
CB9	13229E0717-1	CIRCUIT BREAKER SOLENOID VALVES METERS	SH 8-B4
CB10	13229E0717-1	CIRCUIT BREAKER LVIT & PRESSURE SWITCHES, FAN	SH 8-B4
CB11	13229E0717-2	CIRCUIT BREAKER, A/C OUTLETS, DIESEL HEATERS	SH 8-B3
CB12	13229E0717-2	CIRCUIT BREAKER, SLUMP HEATERS	SH 8-B3
CB13	13229E0717-2	CIRCUIT BREAKER RAW WATER PUMP HEATER	SH 8-B3
CB14	13229E0717-2	CIRCUIT BREAKER DISTRIBUTION PUMP	SH 8-B3
CB15	13229E0718-7	CIRCUIT BREAKER, MAIN POWER T1	SH 10-A5
CB16	13229E0718-1	CIRCUIT BREAKER MAIN POWER, T2	SH 10-A4
CB17	13229E0718-6	CIRCUIT BREAKER PUMP SKID HEATER, HTR3	SH 10-A4
CM1	13229E1334	CARBON MONOXIDE MONITOR	SH 14-C5
CS1	13229E1220	CURRENT SENSOR GROUND FAULT	SH 10-C4
CS2	13229E1220	CURRENT SENSOR GROUND FAULT	SH 10-B7
ETM1	13229E0215	ELAPSED TIME METER	SH 13-C4
ETM2	13229E0215	ELAPSED TIME METER	SH 13-D4
FM1	13229E0732-1	FLOWMETER, POWERED, FEED FLOW	SH 11-B4
FM2	13229E0732-3	FLOWMETER POWERED PRODUCT FLOW	SH 11-B6
FM3	13229E0732-2	FLOWMETER POWERED WASTE FLOW	SH 11-B8
FS1	13229E0210-1	FLOW SENSOR FEED	SH 15-B4
FS2	13229E0210-2	FLOW SENSOR, PRODUCT	SH 14-O3
FS3	13229E0210-3	FLOW SENSOR, WASTE	SH 14-O3
G1	6115-00-118-1243	GENERATOR SET 50/60 HERTZ	SH 5-82
GFI 1	13229E1219	GROUND FAULT RELAY	SH 13-C6
GFI 2	13229E1219	GROUND FAULT RELAY	SH 13-C8
GS1	13229E0244	GROUND STRIP	SH 10-B8
HN1	13229E0090-2	HORN, PULSING	SH 15-O6
HN2	13229E0090-1	HORN CONTINUOUS	SH 15-D6
HR1	13229E1270-1	SUMP HEATER, BACK WALL	SH 14-A6
HR2	13229E1270-2	SUMP HEATER, BACK WALL	SH 14-A4
HR3	13229E1270-3	SUMP HEATER, FRONT WALL	SH 15-B4
HTR1	13229E0158-1	HEATER, MULTI-FUEL, INTERIOR	SH 14-C3
HTR2	13229E0158-2	HEATER, MULTI-FUEL, INTERIOR	SH 14-C3
HTR3	13229E0876	HEATER, ELECTRIC, PUMP SKID	SH 16-C3
HTR4	13229E1271-1	HEATER, ELECTRIC, RAW WATER PUMP	SH 16-B2
HTR5	13229E1271-2	HEATER ELECTRIC, DISTRIBUTION PUMP	SH 16-D3
J1	13229E1205-2	CONNECTOR, RECEPTACLE	SH 14-C4
J2	13229E1206-10	CONNECTOR, RECEPTACLE	SH 14-C5
J3	13229E1206-4	CONNECTOR, RECEPTACLE	SH 14-C7

1 REFERENCE DESIGNATIONS ARE FOR REFERENCE ONLY AND MAY NOT APPEAR ON PART
2 FOR ELECTRICAL SCHEMATIC DIAGRAM
SEE 13229E0081 (120-00283)































CCB Approved By <u>W. J. King</u> Date <u>1-28-91</u>	VALUES OTHERWISE SPECIFIED MAY VARY AND ARE: 1. ONE PLACE E/D ————  2. TWO PLACE E/D ————  3. ONE PLACE E/D ————  4. TWO PLACE E/D ————  5. TWO PLACE E/D ————  6. TWO PLACE E/D ————  7. TWO PLACE E/D ————  8. TWO PLACE E/D ————  9. TWO PLACE E/D ————  10. TWO PLACE E/D ————  11. TWO PLACE E/D ————  12. TWO PLACE E/D ————  13. TWO PLACE E/D ————  14. TWO PLACE E/D ————  15. TWO PLACE E/D ————  16. TWO PLACE E/D ————  17. TWO PLACE E/D ————  18. TWO PLACE E/D ————  19. TWO PLACE E/D ————  20. TWO PLACE E/D ————  21. TWO PLACE E/D ————  22. TWO PLACE E/D ————  23. TWO PLACE E/D ————  24. TWO PLACE E/D ————  25. TWO PLACE E/D ————  26. TWO PLACE E/D ————  27. TWO PLACE E/D ————  28. TWO PLACE E/D ————  29. TWO PLACE E/D ————  30. TWO PLACE E/D ———— 	DRAWN BY: <u>J. J. JAWORSKI</u> DATE: <u>80-10-10</u> <u>07-412</u> CONTRACT NO. DAAK70-88-C-0008 SCHEM APPROVAL APPROVED FOR PROCUREMENT DATE:	U.S. ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND FORT BELVOIR, VIRGINIA 22060 INTERCONNECTION DIAGRAM ELECTRICAL, 3000 GPH ROWPU SIZE: CASE: BPP NO. A1 97403 13229E1079 SCALE: NONE SHEET: 1 OF 18
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Figure FO-2 (Sheet 1 of 16)
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REVISIONS			
ZONE	LTN	DESCRIPTION	DATE
2		REVISED AND REDRAWN	JUN 90-10-10

COMPONENT REFERENCE LIST				
AQUA-CHEM PART NUMBER	ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO.	DESCRIPTION	LOCATION
120-02314-4	J4	13229E1206-4	CONNECTOR, RECEPTACLE	SH 14-C5
120-02314-4	J5	13229E1206-4	CONNECTOR, RECEPTACLE	SH 14-C5
120-02314-1	J6	13229E1206-1	CONNECTOR, RECEPTACLE	SH 14-C2
120-02314-1	J7	13229E1206-1	CONNECTOR, RECEPTACLE	SH 14-C2
120-00682-7	J8	MS27144-2	CONNECTOR, PART OF HARNESS 13229E0158-1 ITEM 7	SH 14-C2
120-00682-8	J9	MS27144-2	CONNECTOR, PART OF HARNESS 13229E0158-2 ITEM 8	SH 14-C2
120-02312-2	J10	13229E1204-2	CONNECTOR, RECEPTACLE	SH 9-D3
120-02312-11	J11	13229E1204-11	CONNECTOR, RECEPTACLE	SH 9-D3
120-02312-14	J12	13229E1204-14	CONNECTOR, RECEPTACLE	SH 9-C3
120-02312-16	J13	13229E1204-16	CONNECTOR, RECEPTACLE	SH 9-D3
120-02312-17	J14	13229E1204-17	CONNECTOR, RECEPTACLE	SH 9-B3
120-02312-13	J15	13229E1204-13	CONNECTOR, RECEPTACLE	SH 9-C2
120-02312-15	J16	13229E1204-15	CONNECTOR, RECEPTACLE	SH 9-B2
120-02312-5	J17	13229E1204-5	CONNECTOR, RECEPTACLE	SH 9-B2
120-02312-8	J18	13229E1204-8	CONNECTOR, RECEPTACLE	SH 16-C8
120-02312-3	J19	13229E1204-3	CONNECTOR, RECEPTACLE	SH 16-C8
120-02312-8	J20	13229E1204-8	CONNECTOR, RECEPTACLE	SH 16-C8
120-02312-9	J21	13229E1204-9	CONNECTOR, RECEPTACLE	SH 16-C8
120-02314-8	J22	13229E1206-8	CONNECTOR, RECEPTACLE	SH 16-B7
120-02314-8	J23	13229E1206-8	CONNECTOR, RECEPTACLE	SH 16-B7
120-02312-10	J24	13229E1204-10	CONNECTOR, RECEPTACLE	SH 14-D7
120-02314-5	J25	13229E1206-5	CONNECTOR, RECEPTACLE (MODEL WTA-060 ONLY.)	SH 14-C7
120-02314-6	J26	13229E1206-6	CONNECTOR, RECEPTACLE	SH 14-B7
120-02314-7	J27	13229E1206-7	CONNECTOR, RECEPTACLE	SH 14-B7
120-02314-1	J28	13229E1206-1	CONNECTOR, RECEPTACLE	SH 14-B7
120-02314-11	J29	13229E1206-11	CONNECTOR, RECEPTACLE	SH 14-B3
120-02312-6	J30	13229E1204-6	CONNECTOR, RECEPTACLE	SH 14-A7
120-02314-1	J31	13229E1206-1	CONNECTOR, RECEPTACLE	SH 14-A7
120-02312-1	J32	13229E1204-1	CONNECTOR, RECEPTACLE	SH 14-A5
120-07549-3	J33	13229E0700-1 ITEM 3	CONNECTOR, RECEPTACLE	SH 14-B5
120-02314-8	J34	13229E1206-8	CONNECTOR, RECEPTACLE	SH 16-C7
120-02314-3	J35	13229E1206-3	CONNECTOR, RECEPTACLE	SH 15-C7
120-02314-2	J36	13229E1206-2	CONNECTOR, RECEPTACLE	SH 15-C7
120-02314-1	J37	13229E1206-1	CONNECTOR, RECEPTACLE	SH 15-C7
120-07549-3	J38	13229E0700-1 ITEM 3	CONNECTOR, RECEPTACLE	SH 15-C7
120-07549-3	J39	13229E0700-1 ITEM 3	CONNECTOR, RECEPTACLE	SH 15-C7
120-07549-3	J40	13229E0700-1 ITEM 3	CONNECTOR, RECEPTACLE	SH 15-B5
120-07549-3	J41	13229E0700-1 ITEM 3	CONNECTOR, RECEPTACLE	SH 15-B5
120-02314-1	J42	13229E1206-1	CONNECTOR, RECEPTACLE	SH 15-B5
120-02314-6	J43	13229E1206-6	CONNECTOR, RECEPTACLE	SH 15-B5
120-02314-5	J44	13229E1206-5	CONNECTOR, RECEPTACLE (MODEL WTA-060 ONLY.)	SH 15-A2
120-02314-1	J45	13229E1206-1	CONNECTOR, RECEPTACLE	SH 15-B2
120-02314-2	J46	13229E1206-2	CONNECTOR, RECEPTACLE	SH 15-B2
120-02314-1	J47	13229E1206-1	CONNECTOR, RECEPTACLE	SH 15-B2
120-07549-3	J48	13229E0700-1 ITEM 3	CONNECTOR, RECEPTACLE	SH 15-B2
120-02314-1	J49	13229E1206-1	CONNECTOR, RECEPTACLE	SH 15-C2

COMPONENT REFERENCE LIST				
AQUA-CHEM PART NUMBER	ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO.	DESCRIPTION	LOCATION
120-02314-2	J50	13229E1206-2	CONNECTOR, RECEPTACLE	SH 15-C2
120-02314-3	J51	13229E1206-3	CONNECTOR, RECEPTACLE	SH 15-C2
120-02312-12	J52	13229E1204-12	CONNECTOR, RECEPTACLE	SH 15-D7
120-02312-1	J53	13229E1204-1	CONNECTOR, RECEPTACLE	SH 15-D3
120-02312-1	J54	13229E1204-1	CONNECTOR, RECEPTACLE	SH 15-C3
120-02312-4	J55	13229E1204-4	CONNECTOR, RECEPTACLE	SH 16-B3
120-02314-9	J56	13229E1206-9	CONNECTOR, RECEPTACLE	SH 16-B2
120-02312-3	J57	13229E1204-3	CONNECTOR, RECEPTACLE	SH 16-A3
120-02314-8	J58	13229E1206-8	CONNECTOR, RECEPTACLE	SH 16-A3
120-02313-1	J59	13229E1205-1	CONNECTOR, RECEPTACLE	SH 16-A2
120-02312-4	J60	13229E1204-4	CONNECTOR, RECEPTACLE	SH 16-D4
120-02312-1	J61	13229E1204-1	CONNECTOR, RECEPTACLE	SH 16-D4
120-02312-3	J62	13229E1204-3	CONNECTOR, RECEPTACLE	SH 16-C4
120-02312-18	J63	13229E1204-18	CONNECTOR, RECEPTACLE	SH 16-C3
120-02312-19	J64	13229E1204-19	CONNECTOR, RECEPTACLE	SH 16-C3
120-02312-7	J65	13229E1204-7	CONNECTOR, RECEPTACLE	SH 16-C3
120-02312-4	J66	13229E1204-4	CONNECTOR, RECEPTACLE	SH 16-C4
120-02312-3	J67	13229E1204-3	CONNECTOR, RECEPTACLE	SH 16-C4
120-02312-21	J68	13229E1204-21	CONNECTOR, RECEPTACLE	SH 16-C4
120-02312-20	J69	13229E1204-20	CONNECTOR, RECEPTACLE	SH 16-B4
120-07603-1	K1	13229E0719-1	RELAY, 12 POLE	SH 6-D8
120-07603-2	K2	13229E0719-2	RELAY, 12 POLE	SH 6-D6
120-07603-3	K3	13229E0719-3	RELAY, 12 POLE	SH 6-D4
120-02391-1	K4	13229E1248-1	RELAY, 4 POLE	SH 6-D3
120-02392-1	K5	13229E1249-1	RELAY, 8 POLE	SH 7-D8
120-02392-2	K6	13229E1249-2	RELAY, 8 POLE	SH 7-D6
120-02391-2	K7	13229E1248-2	RELAY, 4 POLE	SH 7-D5
120-02391-3	K8	13229E1248-3	RELAY, 4 POLE	SH 7-D3
120-02391-3	K9	13229E1248-3	RELAY, 4 POLE	SH 8-D8
120-02391-3	K10	13229E1248-3	RELAY, 4 POLE	SH 6-C8
120-02391-4	K11	13229E1248-4	RELAY, 4 POLE	SH 6-C6
120-02391-5	K12	13229E1248-5	RELAY, 4 POLE	SH 6-C4
120-02391-2	K13	13229E1248-2	RELAY, 4 POLE	SH 6-C3
120-02391-3	K14	13229E1248-3	RELAY, 4 POLE	SH 7-C8
120-02392-3	K15	13229E1249-3	RELAY, 8 POLE	SH 7-C6
120-02391-5	K16	13229E1248-5	RELAY, 4 POLE	SH 7-C5
120-02391-5	K17	13229E1248-5	RELAY, 4 POLE	SH 7-C3
120-02391-5	K18	13229E1248-5	RELAY, 4 POLE	SH 8-C8
120-02392-4	K19	13229E1249-4	RELAY, 8 POLE	SH 6-B8
120-02392-5	K20	13229E1249-5	RELAY, 8 POLE	SH 6-B6
120-02392-1	K21	13229E1249-1	RELAY, 8 POLE	SH 6-B4
120-02392-1	K22	13229E1249-1	RELAY, 8 POLE	SH 6-B3
120-02391-6	K23	13229E1248-6	RELAY, 4 POLE	SH 7-B8
120-02391-6	K24	13229E1248-6	RELAY, 4 POLE	SH 7-B6
120-02391-6	K25	13229E1248-6	RELAY, 4 POLE	SH 7-B5
120-02391-7	K26	13229E1248-7	RELAY, 4 POLE	SH 7-B3

UNLESS OTHERWISE SPECIFIED THE TOLERANCES ARE: DIM. PLACES (X) 2 TWO PLACES (X) 2 THREE PLACES (X) 2 DIMENSIONAL TOLERANCES FOR INTERPRETATION OF DIMENSIONAL TOLERANCES APPLY REMOVE DIMENSIONS AND SPECIFY DIMENSIONAL TOLERANCES DIMENSIONAL TOLERANCES TO: DIMENSIONAL TOLERANCES TO:		DRAWN BY J. J. JENSEN CHECKED BY J. J. JENSEN CONTRACT NO. DAAK70-88-C-0008 DATE 90-10-10 APPROVED FOR PROCUREMENT DATE	U.S. ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND FORT BELVOIR, VIRGINIA 22060 INTERCONNECTION DIAGRAM, ELECTRICAL, 3000 GPH ROWPU CASE NO. 97403 SHEET NO. 13229E1079 SHEET 2
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Figure FO-2 (Sheet 2 of 16)
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COMPONENT REFERENCE LIST			
ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO	DESCRIPTION	LOCATION
K27	13229E1248-8	RELAY 4 POLE	SH 8-B8
K28	13229E0101	RELAY SOLID STATE	SH 6-B2
LK1	13229E0363	RELAY SOLID STATE	SH 6-B5
LS1/SV1	13229E0700-1	LIMIT SWITCH PART OF SOLENOID VALVE SV1	SH 15-B2
LS2/SV2	13229E0700-1	LIMIT SWITCH PART OF SOLENOID VALVE SV2	SH 15-94
LS3/SV3	13229E0700-1	LIMIT SWITCH PART OF SOLENOID VALVE SV3	SH 15-C4
LS4/SV4	13229E0700-1	LIMIT SWITCH PART OF SOLENOID VALVE SV4	SH 15-C4
LS5/SV5	13229E0700-1	LIMIT SWITCH PART OF SOLENOID VALVE SV5	SH 15-B4
LS7/SV7	13229E0700-1	LIMIT SWITCH PART OF SOLENOID VALVE SV7	SH 14-A4
LSH	13229E1268-3	LEVEL SWITCH HIGH	SH 15-C7
LSLL	13229E1268-1	LEVEL SWITCH LOW/LOW	SH 15-C7
LSL1	13229E0310	LEVEL SWITCH LOW	SH 14-C5
LSL2	13229E0310	LEVEL SWITCH LOW	SH 14-C5
LSL3	13229E0310	LEVEL SWITCH LOW	SH 14-C5
LSL4	13229E0310	LEVEL SWITCH LOW	SH 15-C3
LSL5	13229E1268-2	LEVEL SWITCH LOW	SH 15-C7
LT1	W-L-101/77A	LAMP INCANDESCENT	SH 14-D7
LT2	W-L-101/77A	LAMP INCANDESCENT	SH 14-D6
LT3	W-L-101/77A	LAMP INCANDESCENT	SH 14-D5
LT4	W-L-101/77A	LAMP INCANDESCENT	SH 14-D4
LTK1	13229E0719-4	RELAY 12 POLE	SH 7-B7
LTK2	13229E0719-4	RELAY 12 POLE	SH 7-B5
LTK3	13229E0719-6	RELAY 12 POLE	SH 7-B3
LTK4	13229E0719-7	RELAY 12 POLE	SH 8-B8
M1	13229E0217	MOTOR AIR COMPRESSOR 2 H.P.	SH 16-C3
M2	13229E0130	MOTOR DISTRIBUTION PUMP 2 H.P.	SH 16-C3
M3	13229E0128	MOTOR RAW WATER PUMP 5 H.P.	SH 16-A1
M4	13229E1266-2	PUMP ASSEMBLY POLYELECTROLYTE	SH 15-C2
M5	13229E1268-1	PUMP ASSEMBLY SEQUESTANT	SH 15-C2
M6	13229E1266-3	PUMP ASSEMBLY PRODUCT CHLORINE	SH 15-C2
M7	13229E0216	MOTOR BOOSTER PUMP 7.5 H.P.	SH 16-B6
M8	13229E0152	MOTOR HIGH PRESSURE PUMP 60 H.P.	SH 16-C3
M9	13229E1267	PUMP ASSEMBLY BACKWASH	SH 15-B2
M10	13229E0447-1	MOTOR CHLORINE MIXER 1/20 H.P.	SH 15-C3
M11	13229E0806	EXHAUST FAN	SH 15-D3
M12	13229E0158-1 ITEM 4	FUEL PUMP HEATER 1	SH 14-C1
M13	13229E0158-2 ITEM 9	FUEL PUMP HEATER 2	SH 14-C1
MOV4	13229E0326-2	SUPPRESSOR TRANSIENT, RAW WATER PUMP	SH 16-A4
MOV5	13229E0326-2	SUPPRESSOR TRANSIENT, RAW WATER PUMP	SH 16-A4
MOV6	13229E0326-2	SUPPRESSOR TRANSIENT, RAW WATER PUMP	SH 16-A5
MOV7	13229E0326-1	SUPPRESSOR TRANSIENT DISTRIBUTION PUMP	SH 16-C5
MOV8	13229E0326-1	SUPPRESSOR TRANSIENT DISTRIBUTION PUMP	SH 16-C6
MOV9	13229E0326-1	SUPPRESSOR TRANSIENT DISTRIBUTION PUMP	SH 16-D6
MOV10	13229E1221	SUPPRESSOR TRANSIENT REMOTE DISTRIBUTION PUMP SW	SH 16-D5
MOV11	13229E1221	SUPPRESSOR TRANSIENT REMOTE DISTRIBUTION PUMP SW	SH 16-D5
MOV12	13229E0326-1	SUPPRESSOR TRANSIENT DISTRIBUTION PUMP HEATER	SH 16-D6

COMPONENT REFERENCE LIST			
ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO	DESCRIPTION	LOCATION
MOV13	13229E0326-1	SUPPRESSOR TRANSIENT DISTRIBUTION PUMP HEATER	SH 16-D6
MOV14	13229E0326-1	SUPPRESSOR TRANSIENT RAW WATER PUMP HEATER	SH 16-A5
MOV15	13229E0326-1	SUPPRESSOR TRANSIENT, RAW WATER PUMP HEATER	SH 16-A6
MOV16	13229E0326-1	SUPPRESSOR TRANSIENT HIGH PRESSURE PUMP	SH 16-C5
MOV17	13229E0326-1	SUPPRESSOR TRANSIENT, HIGH PRESSURE PUMP	SH 16-C5
MOV18	13229E0326-1	SUPPRESSOR TRANSIENT, HIGH PRESSURE PUMP	SH 16-C6
MOV19	13229E0326-1	SUPPRESSOR TRANSIENT, HIGH PRESSURE PUMP	SH 16-C5
MOV20	13229E0326-1	SUPPRESSOR TRANSIENT, HIGH PRESSURE PUMP	SH 16-C5
MOV21	13229E0326-1	SUPPRESSOR TRANSIENT, HIGH PRESSURE PUMP	SH 16-C6
MOV22	13229E0326-1	SUPPRESSOR, TRANSIENT, AIR COMPRESSOR	SH 16-B5
MOV23	13229E0326-1	SUPPRESSOR TRANSIENT AIR COMPRESSOR	SH 16-B5
MOV24	13229E0326-1	SUPPRESSOR TRANSIENT AIR COMPRESSOR	SH 16-B6
MOV25	13229E0326-1	SUPPRESSOR TRANSIENT PUMP SKID HEATER (HTR3)	SH 16-B5
MOV26	13229E0326-1	SUPPRESSOR TRANSIENT PUMP SKID HEATER (HTR3)	SH 16-B5
MOV27	13229E0326-1	SUPPRESSOR TRANSIENT PUMP SKID HEATER (HTR3)	SH 16-B6
MS1	13229E1231	MOTOR STARTER, SIZE 00	SH 10-D5
MS2	13229E1232	MOTOR STARTER, SIZE 00	SH 10-C7
MS3	13229E1233	MOTOR STARTER, SIZE 0	SH 10-B6
MS7	13229E1234	MOTOR STARTER SIZE 1	SH 10-D8
MS8-1M	13229E1235	MOTOR STARTER SIZE 3	SH 10-D6
MS8-1S/2M	13229E1236	MOTOR STARTER WYE-DELTA SIZE 3	SH 10-D4
MS8-2S	13229E1237	MOTOR CONTACTOR SIZE 1	SH 10-C5
P1	13229E1207-14	CONNECTOR PLUG	SH 14-C3
P2	13229E1207-13	CONNECTOR PLUG	SH 14-C5
P3	13229E1207-5	CONNECTOR PLUG	SH 14-C7
P4	13229E1207-5	CONNECTOR PLUG	SH 14-C5
P5	13229E1207-5	CONNECTOR PLUG	SH 14-C5
P6	13229E1207-1	CONNECTOR PLUG	SH 14-C2
P7	13229E1207-1	CONNECTOR PLUG	SH 14-C2
P8	MS27142-2	CONNECTOR PART OF FUEL PUMP 13229E0158-1 ITEM 4	SH 14-C2
P9	MS27142-2	CONNECTOR PART OF FUEL PUMP 13229E0158-2 ITEM 9	SH 14-C2
P10	13229E1207-4	CONNECTOR, PLUG	SH 14-D8
P11	13229E1208-7	CONNECTOR PLUG	SH 14-D8
P12	13229E1208-9	CONNECTOR PLUG	SH 15-D8
P13	13229E1208-11	CONNECTOR, PLUG	SH 14-C8
P14	13229E1208-13	CONNECTOR PLUG	SH 15-C8
P15	13229E1208-8	CONNECTOR PLUG	SH 14-B8
P16	13229E1208-10	CONNECTOR PLUG	SH 15-B8
P17	13229E1208-3	CONNECTOR PLUG	SH 14-A8
P18	13229E1208-4	CONNECTOR, PLUG	SH 15-A7
P19	13229E1208-1	CONNECTOR PLUG	SH 16-C8
P20	13229E1208-4	CONNECTOR PLUG	SH 16-C8
P21	13229E1208-5	CONNECTOR PLUG	SH 16-B8
P22	13229E1207-9	CONNECTOR PLUG	SH 16-B7
P23	13229E1207-9	CONNECTOR PLUG	SH 16-B7
P24	13229E01207-15	CONNECTOR PLUG	SH 14-D7

U.S. ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND FORT BELVOIR, VIRGINIA 22060	
SHEET NO. 13229E1079 SHEET 3	INTERCONNECTION DIAGRAM, ELECTRICAL, 3000 GPH ROWPU
DAAK70-88-C-0008 APPROVED FOR PROCUREMENT DATE	APPROVED DATE

Figure FO-2 (Sheet 3 of 16)
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REVISIONS			
ZONE	LTN	DESCRIPTION	DATE
2		REVISED AND REDRAWN	JUN 90-10-10

COMPONENT REFERENCE LIST				
AQUA-CHEM PART NUMBER	ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO.	DESCRIPTION	LOCATION
120-02315-6	P25	13229E1207-6	CONNECTOR, PLUG (MODEL WTA-060 ONLY.)	SH 14-C7
120-02315-7	P26	13229E1207-7	CONNECTOR, PLUG	SH 14-B7
120-02315-8	P27	13229E1207-8	CONNECTOR, PLUG	SH 14-B7
120-02315-1	P28	13229E1207-1	CONNECTOR, PLUG	SH 14-B7
120-02315-16	P29	13229E1207-16	CONNECTOR, PLUG	SH 14-B2
120-02315-12	P30	13229E1207-12	CONNECTOR, PLUG	SH 14-B7
120-02315-1	P31	13229E1207-1	CONNECTOR, PLUG	SH 14-A7
120-02315-1	P32	13229E1207-1	CONNECTOR, PLUG	SH 14-A5
120-07549-4	P33	13229E0700-1 ITEM 3	CONNECTOR, PLUG, PART OF VALVE 13229E0700-1	SH 14-A5
120-02315-9	P34	13229E1207-9	CONNECTOR, PLUG	SH 16-C7
120-02315-3	P35	13229E1207-3	CONNECTOR, PLUG	SH 15-C7
120-02315-2	P36	13229E1207-2	CONNECTOR, PLUG	SH 15-C7
120-02315-1	P37	13229E1207-1	CONNECTOR, PLUG	SH 15-C7
120-07549-4	P38	13229E0700-1 ITEM 3	CONNECTOR, PLUG, PART OF VALVE 13229E0700-1	SH 15-C5
120-07549-4	P39	13229E0700-1 ITEM 3	CONNECTOR, PLUG, PART OF VALVE 13229E0700-1	SH 15-C5
120-07549-4	P40	13229E0700-1 ITEM 3	CONNECTOR, PLUG, PART OF VALVE 13229E0700-1	SH 15-B5
120-07549-4	P41	13229E0700-1 ITEM 3	CONNECTOR, PLUG, PART OF VALVE 13229E0700-1	SH 15-B5
120-02315-1	P42	13229E1207-1	CONNECTOR, PLUG	SH 15-B5
120-02315-7	P43	13229E1207-7	CONNECTOR, PLUG	SH 15-B5
120-02315-6	P44	13229E1207-6	CONNECTOR, PLUG (MODEL WTA-060 ONLY.)	SH 15-A2
120-02315-1	P45	13229E1207-1	CONNECTOR, PLUG	SH 15-B2
120-02315-2	P46	13229E1207-2	CONNECTOR, PLUG	SH 15-B2
120-02315-1	P47	13229E1207-1	CONNECTOR, PLUG	SH 15-B2
120-07549-4	P48	13229E0700-1 ITEM 3	CONNECTOR, PLUG, PART OF VALVE 13229E0700-1	SH 15-B2
120-02315-1	P49	13229E1207-1	CONNECTOR, PLUG	SH 15-C2
120-02315-2	P50	13229E1207-2	CONNECTOR, PLUG	SH 15-C2
120-02315-3	P51	13229E1207-3	CONNECTOR, PLUG	SH 15-C2
120-02316-12	P52	13229E1208-12	CONNECTOR, PLUG	SH 15-D7
120-02315-1	P53	13229E1207-1	CONNECTOR, PLUG	SH 15-D3
120-02315-1	P54	13229E1207-1	CONNECTOR, PLUG	SH 15-C3
120-02315-10	P55	13229E1207-10	CONNECTOR, PLUG	SH 16-B3
120-02315-10	P56	13229E1207-10	CONNECTOR, PLUG	SH 16-B2
120-02315-9	P57	13229E1207-9	CONNECTOR, PLUG	SH 16-A3
120-02315-9	P58	13229E1207-9	CONNECTOR, PLUG	SH 16-A2
120-02315-11	P59	13229E1207-11	CONNECTOR, PLUG	SH 16-A2
120-02315-10	P60	13229E1207-10	CONNECTOR, PLUG	SH 16-D4
120-02315-1	P61	13229E1207-1	CONNECTOR, PLUG	SH 16-D4
120-02315-9	P62	13229E1207-9	CONNECTOR, PLUG	SH 16-C4
120-02316-16	P63	13229E1208-16	CONNECTOR, PLUG	SH 16-C7
120-02316-17	P64	13229E1208-17	CONNECTOR, PLUG	SH 16-C7
120-02316-6	P65	13229E1208-6	CONNECTOR, PLUG	SH 16-C7
120-02316-2	P66	13229E1208-2	CONNECTOR, PLUG	SH 16-C4
120-02316-1	P67	13229E1208-1	CONNECTOR, PLUG	SH 16-C4
120-02316-15	P68	13229E1208-15	CONNECTOR, PLUG	SH 16-C4
120-02316-14	P69	13229E1208-14	CONNECTOR, PLUG	SH 16-B4
120-07622	PB1	13229E0733	PUSHBUTTON SWITCH	SH 14-B1

COMPONENT REFERENCE LIST				
AQUA-CHEM PART NUMBER	ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO.	DESCRIPTION	LOCATION
120-02377-1	PB2	13229E1242-1	PUSHBUTTON SWITCH	SH 14-B1
120-00352	PB3	13229E0108	PUSHBUTTON SWITCH	SH 11-C8
120-02379	PB4	13229E1244	PUSHBUTTON SWITCH	SH 12-C8
120-02378	PB5	13229E1243	PUSHBUTTON SWITCH	SH 11-A2
120-07622	PB6	13229E0733	PUSHBUTTON SWITCH	SH 11-C4
120-02377-1	PB7	13229E1242-1	PUSHBUTTON SWITCH	SH 11-C4
120-07622	PB8	13229E0733	PUSHBUTTON SWITCH	SH 11-C4
120-02377-1	PB9	13229E1242-1	PUSHBUTTON SWITCH	SH 11-C4
120-07624	PB10	13229E0735	PUSHBUTTON SWITCH	SH 12-B2
120-07622	PB11	13229E0733	PUSHBUTTON SWITCH	SH 11-C4
120-02377-1	PB12	13229E1242-1	PUSHBUTTON SWITCH	SH 11-C4
120-07622	PB13	13229E0733	PUSHBUTTON SWITCH	SH 11-C4
120-02377-1	PB14	13229E1242-1	PUSHBUTTON SWITCH	SH 11-C4
120-02377-2	PB15	13229E1242-2	PUSHBUTTON SWITCH	SH 11-A4
120-07624	PB16	13229E0735	PUSHBUTTON SWITCH	SH 12-B2
120-02378	PB17	13229E1243	PUSHBUTTON SWITCH	SH 12-C2
120-02377-2	PB18	13229E1242-2	PUSHBUTTON SWITCH	SH 12-B2
120-07624	PB19	13229E0735	PUSHBUTTON SWITCH	SH 15-B6
120-07624	PB20	13229E0735	PUSHBUTTON SWITCH	SH 14-B7
120-07620-1	PL1	13229E0731-1	PILOT LIGHT	SH 14-C7
120-07620-3	PL2	13229E0731-3	PILOT LIGHT	SH 11-D8
120-07620-3	PL3	13229E0731-3	PILOT LIGHT	SH 12-D2
120-07620-1	PL4	13229E0731-1	PILOT LIGHT	SH 12-D4
120-07620-3	PL5	13229E0731-3	PILOT LIGHT	SH 12-D5
120-07620-3	PL6	13229E0731-3	PILOT LIGHT	SH 12-D6
120-07620-3	PL7	13229E0731-3	PILOT LIGHT	SH 12-D8
120-07620-3	PL8	13229E0731-3	PILOT LIGHT	SH 11-D3
120-07620-3	PL9	13229E0731-3	PILOT LIGHT	SH 11-D4
120-07620-3	PL10	13229E0731-3	PILOT LIGHT	SH 11-D6
120-07620-3	PL11	13229E0731-3	PILOT LIGHT	SH 11-D7
120-07620-4	PL12	13229E0731-4	PILOT LIGHT	SH 12-C8
120-07620-4	PL13	13229E0731-4	PILOT LIGHT	SH 12-C7
120-07620-4	PL14	13229E0731-4	PILOT LIGHT	SH 12-C7
120-07620-4	PL15	13229E0731-4	PILOT LIGHT	SH 12-C6
120-07620-4	PL16	13229E0731-4	PILOT LIGHT	SH 12-C6
120-07620-4	PL17	13229E0731-4	PILOT LIGHT	SH 12-B7
120-07620-4	PL18	13229E0731-4	PILOT LIGHT	SH 12-C8
120-07620-4	PL19	13229E0731-4	PILOT LIGHT	SH 12-C6
120-07620-3	PL20	13229E0731-3	PILOT LIGHT	SH 11-D2
120-07620-2	PL21	13229E0731-2	PILOT LIGHT	SH 12-A7
120-07620-2	PL22	13229E0731-2	PILOT LIGHT	SH 12-A8
120-07620-1	PL23	13229E0731-1	PILOT LIGHT	SH 12-A2
120-07620-1	PL24	13229E0731-1	PILOT LIGHT	SH 12-A4
120-07620-1	PL25	13229E0731-1	PILOT LIGHT	SH 12-A5
120-07620-2	PL26	13229E0731-2	PILOT LIGHT	SH 12-B8
120-07620-1	PL27	13229E0731-1	PILOT LIGHT	SH 12-B5

APPROVED FOR PRODUCTION DATE: 90-10-10 BY: [Signature] TITLE: [Blank]		U.S. ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND FORT BELVOIR, VIRGINIA 22060	
DRAWN BY: [Blank] CHECKED BY: [Blank] DATE: 90-10-10 BY: [Signature] TITLE: [Blank]		INTERCONNECTION DIAGRAM, ELECTRICAL, 3000 GPH ROWPU	
PART NUMBER: 13229E1079 SCALE: 1:1		SHEET: 4	

Figure FO-2 (Sheet 4 of 16)
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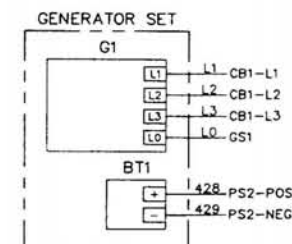
REVISIONS				
ZONE	LTB	DESCRIPTION	DATE	APPROVED
2		REVISED AND REDRAWN	NOV 80-10-10	WJL
3		REVISED PER ECR 2772 AND ECP DOWB1	NOV 11 2001	WJL

(MODEL WTA-060 ONLY.)

COMPONENT REFERENCE LIST				
AQUA-CHEM PART NUMBER	ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO.	DESCRIPTION	LOCATION
120-07620-1	PL28	13229E0731-1	PILOT LIGHT	SH 12-B2
120-07620-1	PL29	13229E0731-1	PILOT LIGHT	SH 12-B4
120-07620-2	PL30	13229E0731-2	PILOT LIGHT	SH 12-B7
120-07615	PRA/B/C	13229E0730	POWER RESISTORS, FIXED RESISTANCE	SH 10-C3
120-00337	PDB	13229E0098	POWER DISTRIBUTION BLOCK	SH 10-B8
120-00346-2	PDSH1	13229E0105-2	PRESSURE DIFFERENTIAL SWITCH	SH 14-D5
120-00346-1	PDSH2	13229E0105-1	PRESSURE DIFFERENTIAL SWITCH	SH 14-D5
120-00346-2	PDSH3	13229E0105-2	PRESSURE DIFFERENTIAL SWITCH	SH 14-D5
120-00345	PSH5	13229E0104	PRESSURE SWITCH (HIGH)	SH 14-D5
120-00347-2	PSH6	13229E0106	PRESSURE SWITCH (HIGH)	SH 14-C5
120-00350	PSH7	13229E0107	PRESSURE SWITCH (HIGH)	SH 14-C5
120-00347-1	PSL4	13229E0106-1	PRESSURE SWITCH (LOW)	SH 14-D5
120-02182	PSL8	13229E1115	PRESSURE SWITCH (LOW)	SH 14-D3
120-02325	PSK1	13229E1218	POWER SUPPLY, 9VDC	SH 8-B5
120-07693	PS1	13229E0754	POWER SUPPLY, 12VDC	SH 8-B6
120-02235	PS2	13229E1176	POWER SUPPLY, 28VDC	SH 14-C6
120-02180	R1	MIL-R-11 TYPE BB	RESISTOR, GROUND, 1.1 MEG	SH 10-B7
120-02180	R2	MIL-R-11 TYPE BB	RESISTOR, GROUND, 1.1 MEG	SH 10-B7
120-0611-1	SR2	13229E0151-1	RECEPTACLE, 120VAC, INTERIOR	SH 15-D4
120-0611-1	SR4	13229E0151-1	RECEPTACLE, 120VAC, INTERIOR	SH 14-A1
120-0611-2	SR5	13229E0151-2	RECEPTACLE, 120VAC, EXTERIOR	SH 16-D7
120-0611-2	SR6	13229E0151-2	RECEPTACLE, 120VAC, EXTERIOR	SH 16-A5
120-01724	SR7	13229E0597	RECEPTACLE, 120VAC, PLUG, EXTERIOR	SH 16-D7
120-00745	SR9	13229E0187	RECEPTACLE, 120VAC, DUPLEX, INTERIOR	SH 13-C5
120-01492	SS1	13229E0503	SELECTOR SWITCH, 2 POSITION	SH 16-D3
120-02380	SS2	13229E1245	SELECTOR SWITCH, 2 POSITION	SH 12-D3
120-02382	SS3	13229E1247	SELECTOR SWITCH, 3 POSITION	SH 12-C7
120-07625	SS4	13229E0736	SELECTOR SWITCH, 2 POSITION	SH 15-D5
120-07625	SS5	13229E0736	SELECTOR SWITCH, 2 POSITION	SH 11-C2
120-02381	SS6	13229E1246	SELECTOR SWITCH, 2 POSITION	SH 12-B4
120-07625	SS7	13229E0736	SELECTOR SWITCH, 2 POSITION	SH 15-D4
120-07625	SS8	13229E0736	SELECTOR SWITCH, 2 POSITION	SH 13-C5
120-07549-1	SV1	13229E0700-1	SOLENOID VALVE	SH 15-B2
120-07549-1	SV2	13229E0700-1	SOLENOID VALVE	SH 15-B4
120-07549-1	SV3	13229E0700-1	SOLENOID VALVE	SH 15-C4
120-07549-1	SV4	13229E0700-1	SOLENOID VALVE	SH 15-C4
120-07549-1	SV5	13229E0700-1	SOLENOID VALVE	SH 15-B4
120-07549-2	SV6	13229E0700-2	SOLENOID VALVE	SH 15-B2
120-07549-1	SV7	13229E0700-1	SOLENOID VALVE	SH 14-B4
120-02414-3	SV8	13229E1269-3	SOLENOID VALVE ASSEMBLY	SH 15-B2
120-02414-1	SV9	13229E1269-1	SOLENOID VALVE ASSEMBLY	SH 14-B6
120-02230	SV10	13229E0445	SOLENOID VALVE ASSEMBLY	SH 15-B7
120-07600	T1	13229E0716	TRANSFORMER, 3KVA	SH 10-A6
120-01896	T2	13229E0840	TRANSFORMER, 5KVA	SH 10-A7
120-00331-1	TB1-1/-91	13229E0093-1	TERMINAL, 15 AMP	SH 9-D8
120-00332-2	TB1-92/-99	13229E0094-2	TERMINAL, GROUND, 20 AMP	SH 9-B5

COMPONENT REFERENCE LIST				
AQUA-CHEM PART NUMBER	ELECTRICAL REFERENCE DESIGNATION	NSN AND PART NO.	DESCRIPTION	LOCATION
120-00331-1	TB2-1/-5	13229E0093-1	TERMINAL, 15 AMP	SH 10-A7
120-00331-2	TB3-1/-22	13229E0093-2	TERMINAL, 20 AMP	SH 10-C1
120-00332-2	TB3-23/-25	13229E0094-2	TERMINAL, GROUND, 20 AMP	SH 10-B1
120-00331-1	TB4-1/-5	13229E0093-1	TERMINAL, 15 AMP	SH 16-D5
120-00332-1	TB4-2/-4	13229E0094-1	TERMINAL, GROUND, 15 AMP	SH 16-D5
120-00331-1	TB5-1/-12	13229E0093-1	TERMINAL, 15 AMP	SH 14-D6
120-00332-1	TB5-13/-15	13229E0094-1	TERMINAL, GROUND, 15 AMP	SH 14-C6
120-00331-1	TB6-1/-16	13229E0093-1	TERMINAL, 15 AMP	SH 15-D5
120-00332-1	TB6-17/-18	13229E0094-1	TERMINAL, GROUND, 15 AMP	SH 15-C5
120-00331-1	TB7-1/-13	13229E0093-1	TERMINAL, 15 AMP	SH 14-B6
120-00332-1	TB7-14	13229E0094-1	TERMINAL, GROUND, 15 AMP	SH 14-A6
120-01082	TBM	13229E0289	TURBIDITY METER	SH 15-A2
120-00353	TDK1	13229E0109	TIMER, CYCLE	SH 8-D3
120-07604-3	TDK2	13229E0720-3	RELAY, TIME DELAY	SH 8-C6
120-07604-2	TDK3	13229E0720-2	RELAY, TIME DELAY	SH 8-D6
120-07604-2	TDK4	13229E0720-2	RELAY, TIME DELAY	SH 8-D5
120-07604-1	TDK5	13229E0720-1	RELAY, TIME DELAY	SH 8-C5
120-01318	TDS	13229E0413	TOTAL DISSOLVED SOLIDS METER (CONDUCTIVITY)	SH 14-C6
120-01280	TDSS	13229E0387	TOTAL DISSOLVED SOLIDS SENSOR (CONDUCTIVITY)	SH 14-C5
	ST1	MS24523-22	SWITCH, TOGGLE	SH13-B4

(MODEL ROWPU-1 ONLY.)



VALUED DIMENSIONS SHOWN BY TOLERANCES ARE: DIM PLANE (X) 1 DIM PLANE (Y) 2 DIM PLANE (Z) 3 DIM PLANE (W) 4 DIM PLANE (V) 5 DIM PLANE (U) 6 DIM PLANE (T) 7 DIM PLANE (S) 8 DIM PLANE (R) 9 DIM PLANE (Q) 10 DIM PLANE (P) 11 DIM PLANE (O) 12 DIM PLANE (N) 13 DIM PLANE (M) 14 DIM PLANE (L) 15 DIM PLANE (K) 16 DIM PLANE (J) 17 DIM PLANE (I) 18 DIM PLANE (H) 19 DIM PLANE (G) 20 DIM PLANE (F) 21 DIM PLANE (E) 22 DIM PLANE (D) 23 DIM PLANE (C) 24 DIM PLANE (B) 25 DIM PLANE (A) 26		DRAWN BY: J. JAWORSKI DATE: 80-10-10 CONTRACT NO: DAAK70-88-C-0008 REVISION: 1 DATE: 80-10-10 APPROVED FOR PRODUCTION: [Signature] DATE: 80-10-10		U.S. ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND FORT BELVOIR, VIRGINIA 22060 INTERCONNECTION DIAGRAM, ELECTRICAL, 3000 GPH ROWPU NSN: 13229E1079 CASE: 97403 SHEET: 5	
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Figure FO-2 (Sheet 5 of 16)
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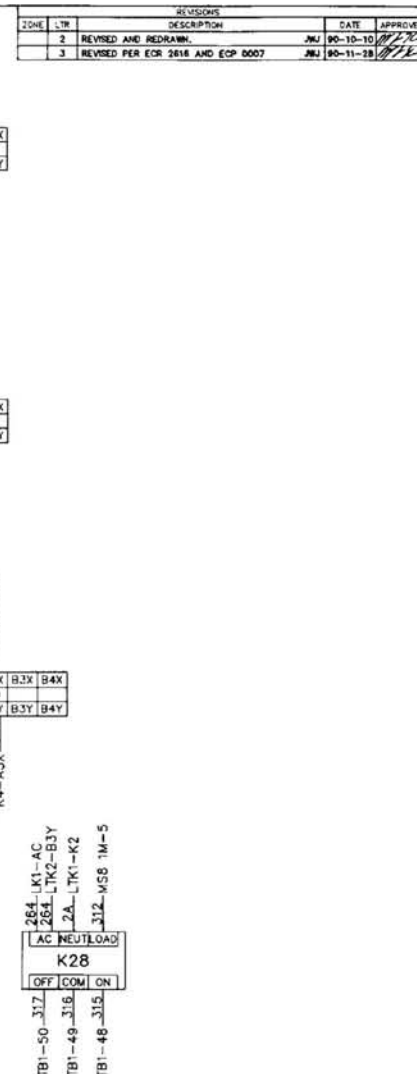


Figure FO-2 (Sheet 6 of 16)
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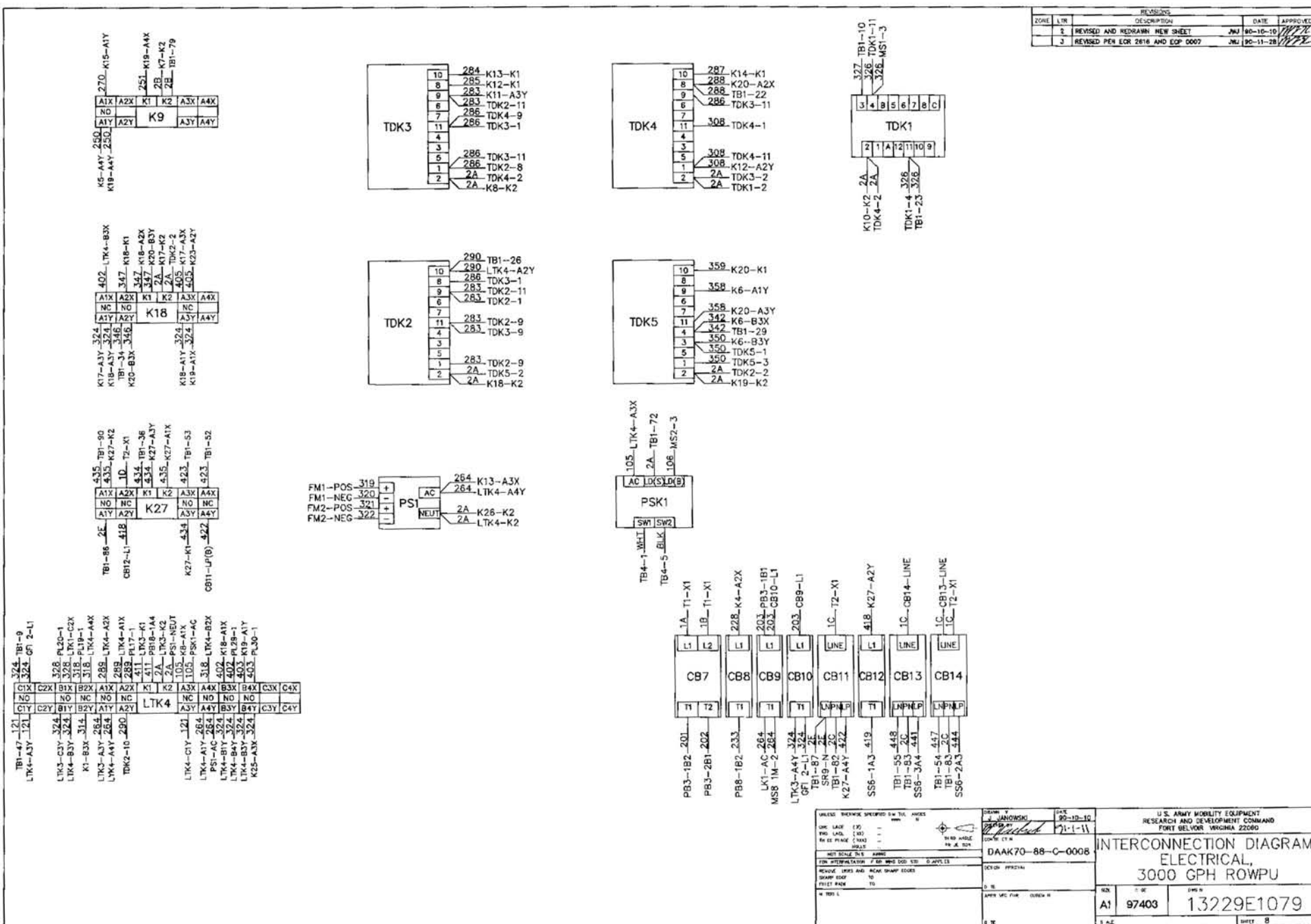
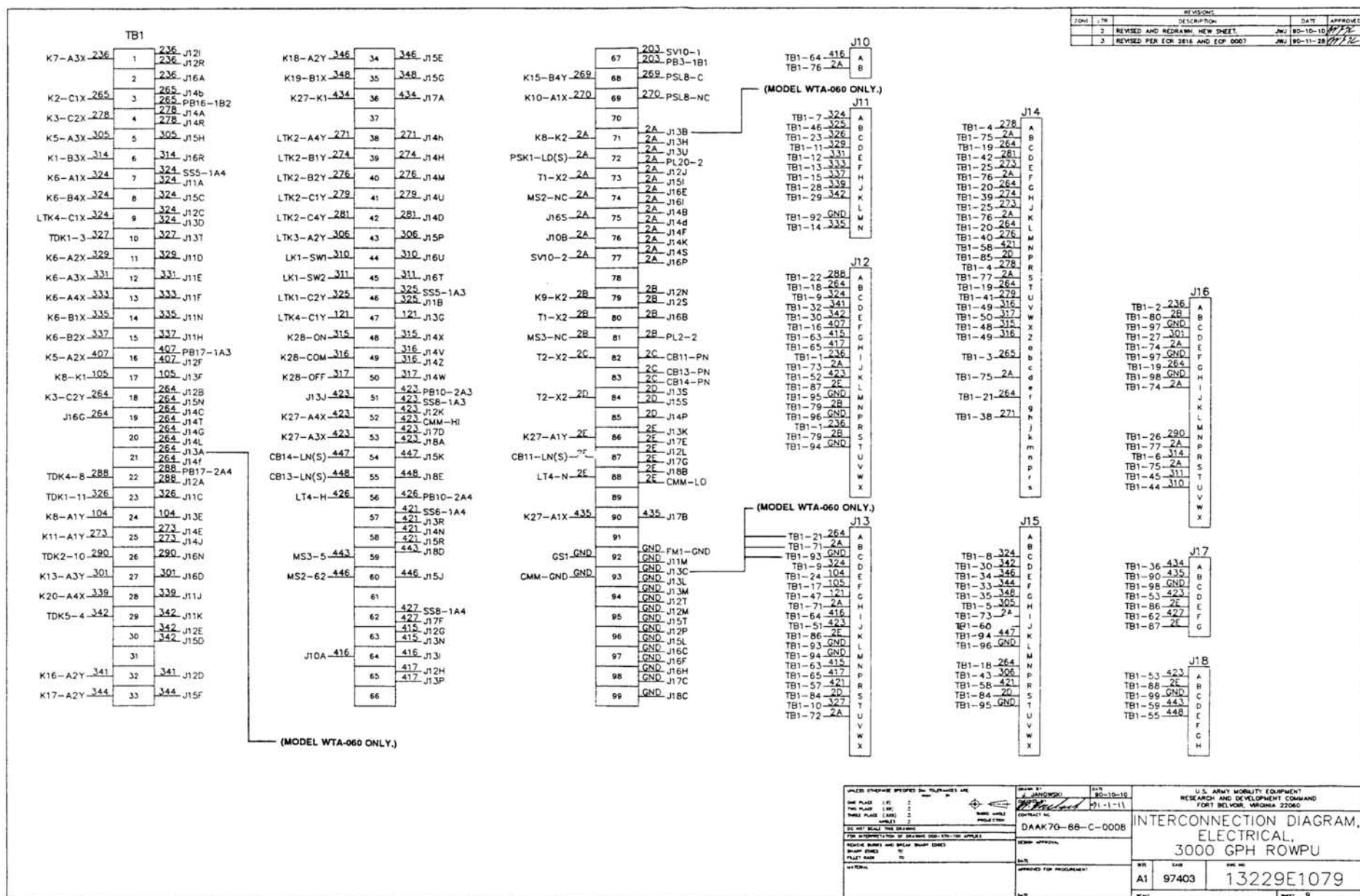
HAZARD IDENTIFICATION SHEET FOR AIR TRANSPORTATION AND (NAME) (IN)		DRAWN BY: J. JANDROVSKY DATE: 10-10-10 CHECKED BY:  DATE: 10-11-11		U.S. ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND FORT BELVOIR VIRGINIA 22060	
USE PLACE (X3) - REF PLACE (X4) - IN USE (X5) (X6) - WHEELS PROJECTIONS				INTERCONNECTION DIAGRAM ELECTRICAL, 3000 GPH ROWPU	
(X7) (X8) (X9) (X10) (X11) (X12) (X13) (X14) (X15) (X16) (X17) (X18) (X19) (X20) (X21) (X22) (X23) (X24) (X25) (X26) (X27) (X28) (X29) (X30) (X31) (X32) (X33) (X34) (X35) (X36) (X37) (X38) (X39) (X40) (X41) (X42) (X43) (X44) (X45) (X46) (X47) (X48) (X49) (X50) (X51) (X52) (X53) (X54) (X55) (X56) (X57) (X58) (X59) (X60) (X61) (X62) (X63) (X64) (X65) (X66) (X67) (X68) (X69) (X70) (X71) (X72) (X73) (X74) (X75) (X76) (X77) (X78) (X79) (X80) (X81) (X82) (X83) (X84) (X85) (X86) (X87) (X88) (X89) (X90) (X91) (X92) (X93) (X94) (X95) (X96) (X97) (X98) (X99) (X100) (X101) (X102) (X103) (X104) (X105) (X106) (X107) (X108) (X109) (X110) (X111) (X112) (X113) (X114) (X115) (X116) (X117) (X118) (X119) (X120) (X121) (X122) (X123) (X124) (X125) (X126) (X127) (X128) (X129) (X130) (X131) (X132) (X133) (X134) (X135) (X136) (X137) (X138) (X139) (X140) (X141) (X142) (X143) (X144) (X145) (X146) (X147) (X148) (X149) (X150) (X151) (X152) (X153) (X154) (X155) (X156) (X157) (X158) (X159) (X160) (X161) (X162) 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Figure FO-2 (Sheet 7 of 16)
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Figure FO-2 (Sheet 8 of 16)
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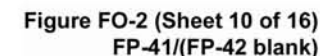
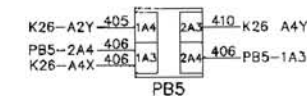
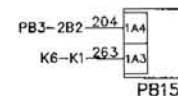
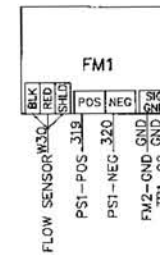
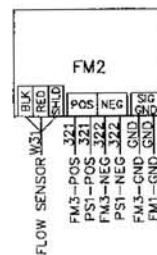
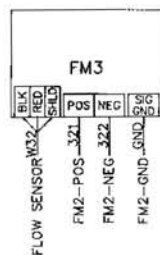
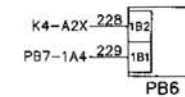
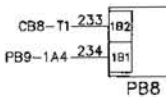
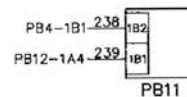
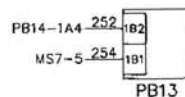
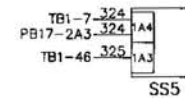
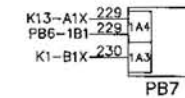
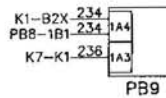
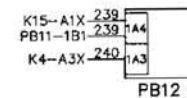
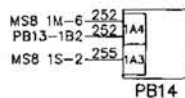
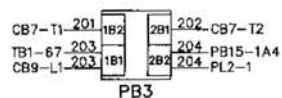
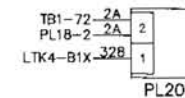
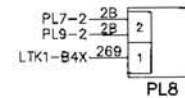
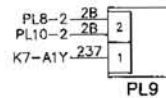
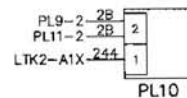
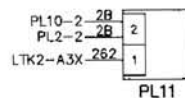
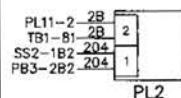


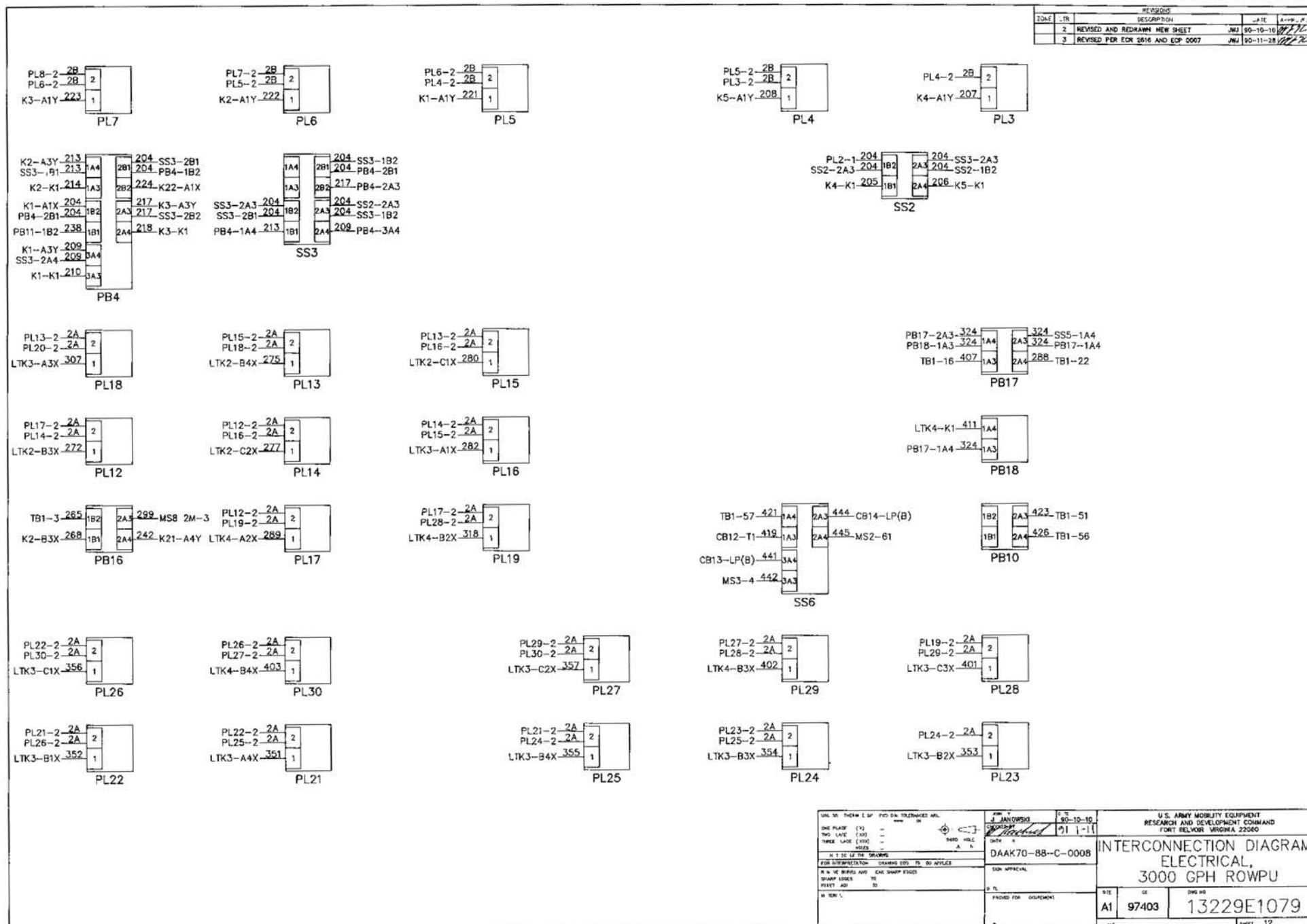
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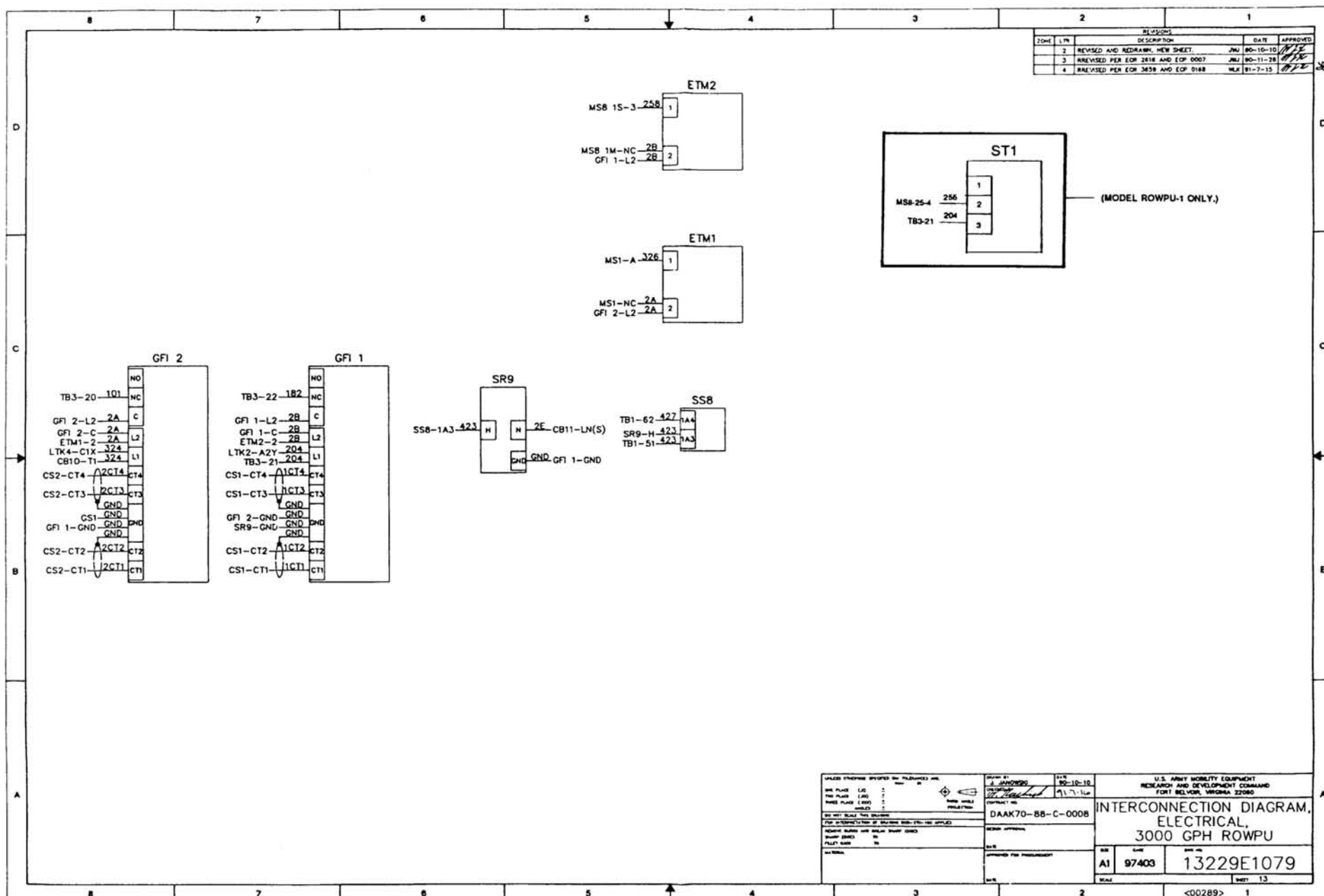
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
2		REVISED AND REDRAWN NEW SHEET	JUN 90-10-10	
3		REVISED PER ECR 2816 AND ECP 0007	JUN 90-11-20	

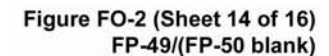


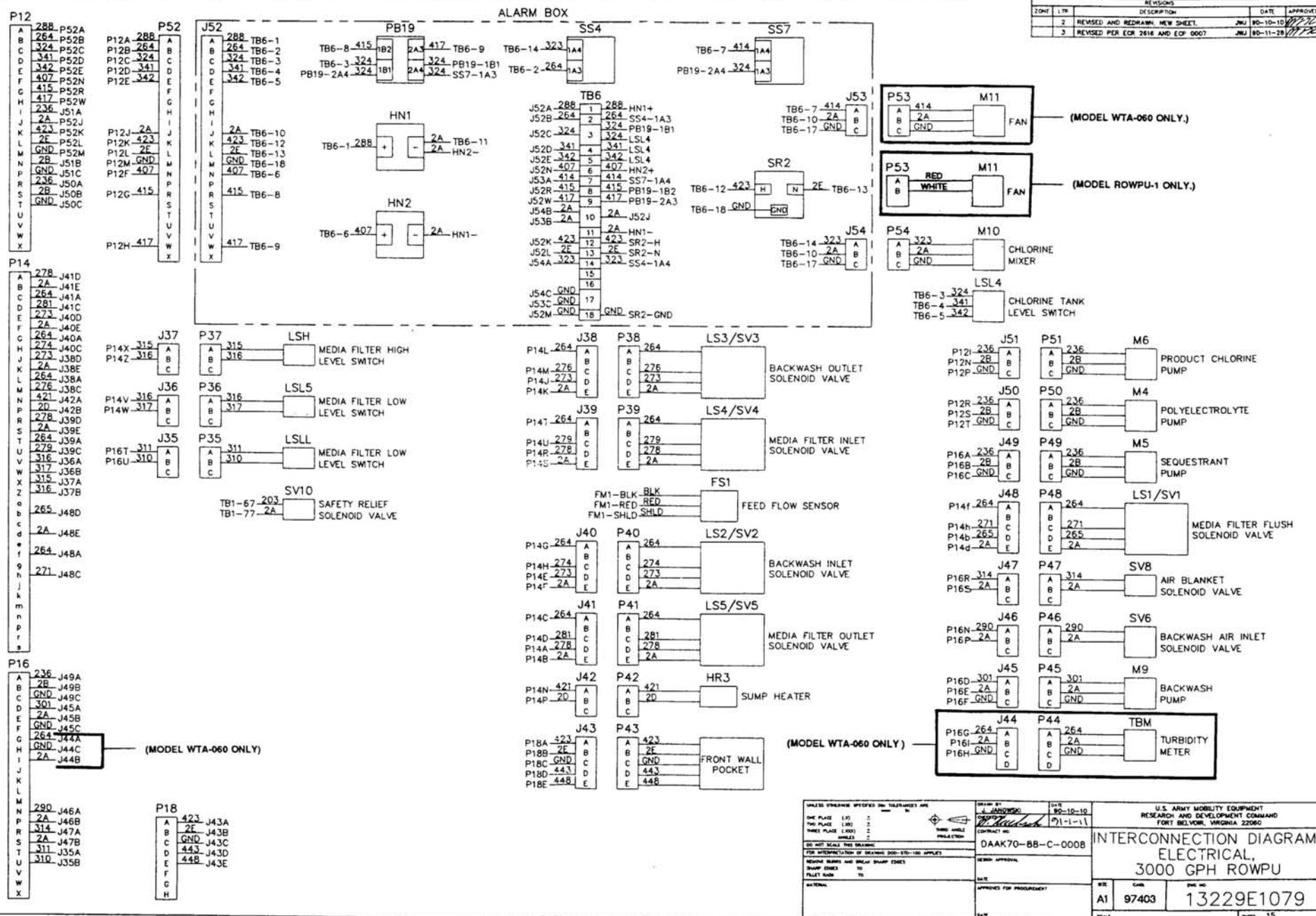
UNLESS OTHERWISE SPECIFIED - ALL DIMENSIONS ARE IN INCHES		BY: J. JANOWSKI		DATE: 90-10-10	
ONE SCALE: (1:1)		FOR INTERPRETATION OF DIMENSIONS (DOWNSIDE) - APPROVES		DAAK70-86-C-0008	
FOR INTERPRETATION OF DIMENSIONS (DOWNSIDE) - APPROVES		APPROVED FOR PROCUREMENT		DATE: 97403	
APPROVED FOR PROCUREMENT		DATE: 97403		13229E1079	
SCALE: 1:1		SHEET: 11		13229E1079	

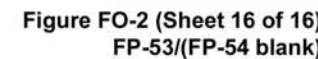
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Figure FO-2 (Sheet 12 of 16)
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Figure FO-2 (Sheet 13 of 16)
FP-47/(FP-48 blank)



Figure FO-2 (Sheet 15 of 16)
FP-51/(FP-52 blank)



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. lathes
 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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