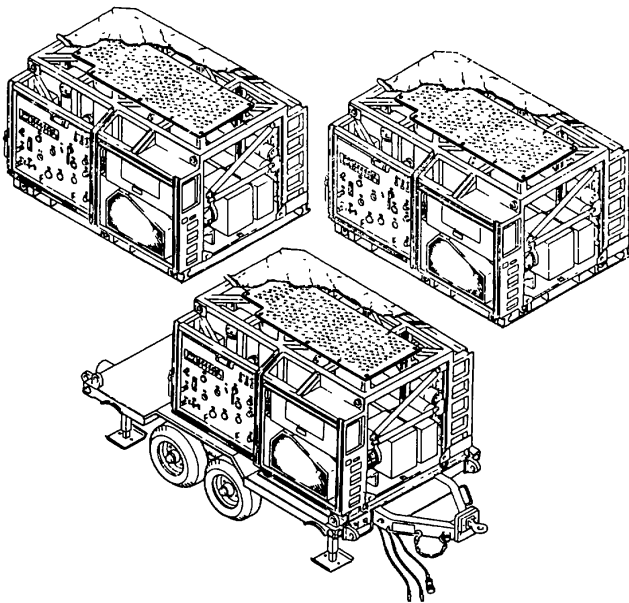


TECHNICAL MANUAL

UNIT, DIRECT SUPPORT, AND GENERAL
SUPPORT MAINTENANCE MANUAL
FOR
WATER PURIFICATION UNIT,
REVERSE OSMOSIS, 600-GPH

TRAILER MOUNTED, FLATBED CARGO
5-TON, 4-WHEEL TANDEM
MODEL WPES-1 (ARMY)
(NSN 4610-01-295-2720)

AND
SKID-MOUNTED
MODEL WPES-2 (AIR FORCE)
(NSN 4610-01-300-0198)
MODEL WPES-3 (MARINE CORPS)
(NSN 4610-01-295-2719)



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TECHNICAL MANUAL
ARMY NO. 10--4610-240-24
MARINE CORPS 08580C-24/2
AIR FORCE TO 40W4-13-22

HEADQUARTERS,
DEPARTMENTS OF THE ARMY,
AIR FORCE AND HEADQUARTERS,
UNITED STATES MARINE CORPS
Washington, D.C. 15 May 1991

Unit, Direct Support, and
General Support Maintenance Manual
For
WATER PURIFICATION UNIT, REVERSE OSMOSIS, 600-GPH

**TRAILER MOUNTED, FLATBED CARGO,
5 -TON, 4-WHEEL TANDEM
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(NSN 4610-01-295-2719)**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: US Army Troop Support Command, ATTN: AMSTR-MMTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. Marine Corps users submit NAVMC Form 10722 to: Commanding General, Marine Corps Logistics Bases (Code 850), Albany, Georgia, 31704-5000, Air Force users submit AFTO Form 22 to WR-ALC/LZD, Robins AFB, Georgia 31098-5609. A reply will be furnished directly to you.

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HOW TO USE THIS MANUAL

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

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

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

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

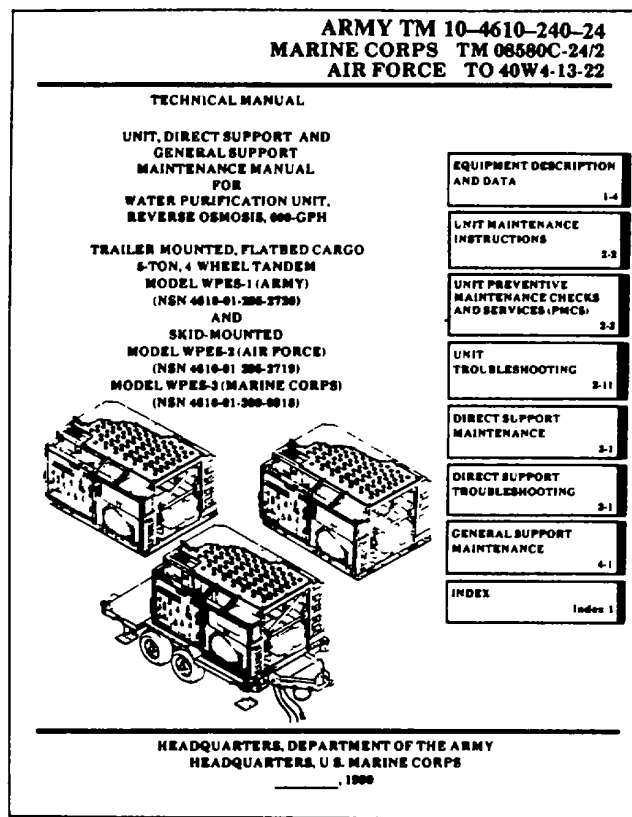
So, HOW DO YOU USE THIS MANUAL?

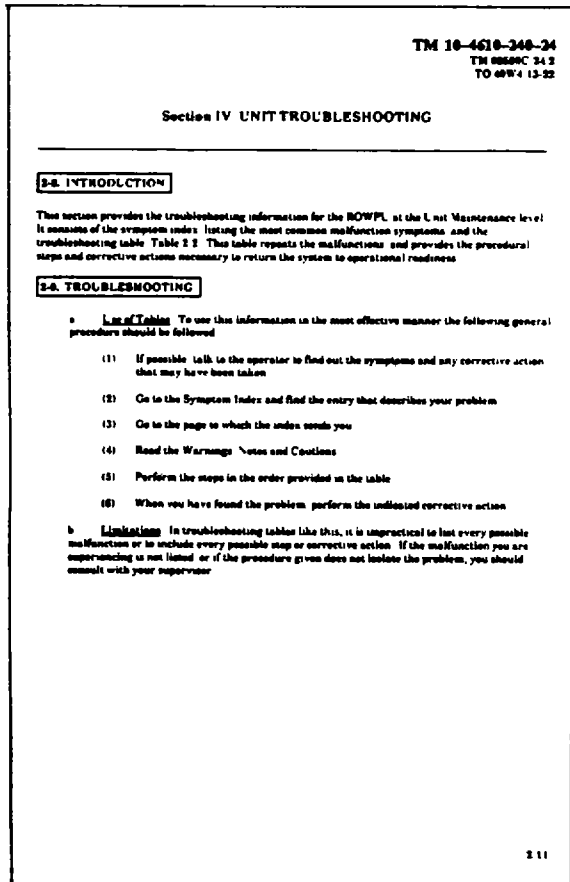
Like This:

1. Suppose the trailer vibrates when being towed and you want to troubleshoot the unit.
2. Look at the cover and you'll see index boxes near the right-hand edge with subject titles in them. You'll find "UNIT TROUBLESHOOTING 2-11." You can skip over to page 2-11.

OR

3. Bend the pages a bit and look at the edges. You'll see black bars on some of the pages that are lined up with the index boxes on the cover.





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 TO 40W4 13-22

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4. If you put your thumbnail on the black bar that is lined up with the box on the cover for UNIT TROUBLESHOOTING and open the manual, you'll be on page 2-11.
5. On page 2-11, you'll find Section IV, TROUBLESHOOTING. The first major item in the section is a SYSTEM INDEX listing the systems and major assemblies that make up the flatbed cargo trailer and the ROWPU. Look for TRAILER ELECTRICAL SYSTEM in the Equipment column. Item 2 under TRAILER ELECTRICAL SYSTEM will give you page number 2-70 for "DIM OR FLICKERING LAMPS."

TM 10-4610-240-24 TM 08580C-24/2 TO 40W4-13-22	
Table 2-2. Unit Troubleshooting continued	
MALFUNCTION	TEST OR INSPECTION CORRECTIVE ACTION
FLATBED CARGO TRAILER ELECTRICAL SYSTEM (Model WPES-1) continued	
2. DIM OR FLICKERING LIGHTS.	
Step 1 Disconnect power cable from towing vehicle and check for loose, broken or corroded pins. If pins are defective, repair or replace power cable. Refer to paragraph 2-94.	
Step 2 Check for loose or corroded ground wire. a. If wire is loose, tighten it. b. If wire is not loose, remove wire from chassis, clean mounting surfaces and reattach securely.	
Step 3 Check for damaged or loose "in-line" connectors. a. If loose, tighten them. b. If damaged, replace power cable wiring harness (para 2-94) or light assemblies (para 2-93) whichever is damaged.	
Step 4 Check if one or both light assemblies are affected. a. If both light assemblies are affected, replace first the power cable assembly (para 2-94) then the wiring harness (para 2-96). b. If only one light assembly is affected, replace the light assembly (para 2-93), the power cable assembly (para 2-94) and the wiring harness (para 2-96) in that order.	
2-70	

6. Turn to page 2-70 and find the symptom DIM OR FLICKERING LAMPS.

7. As you do the tests and corrective actions in the order listed, you will get to "If pins are defective, repair or replace power cable. Refer to paragraph 2-94."

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 TM 08580C-24/2
 TO 40W4-13-22

2-94 TRAILER CABLE ASSEMBLY MAINTENANCE (MODFL WPFS 1)

This task consists of: a. Removal; b. Installation.

INITIAL SET UP:

Tools/Equipment
 General Mechanics Tool Kit, Appendix B, Section III, Item 4;
 Multimeter (Appendix B, Section III, Item 2)

Environmental Conditions
 None

Reference
 Power cable disconnected from towing vehicle, TMS 4610 213 102.

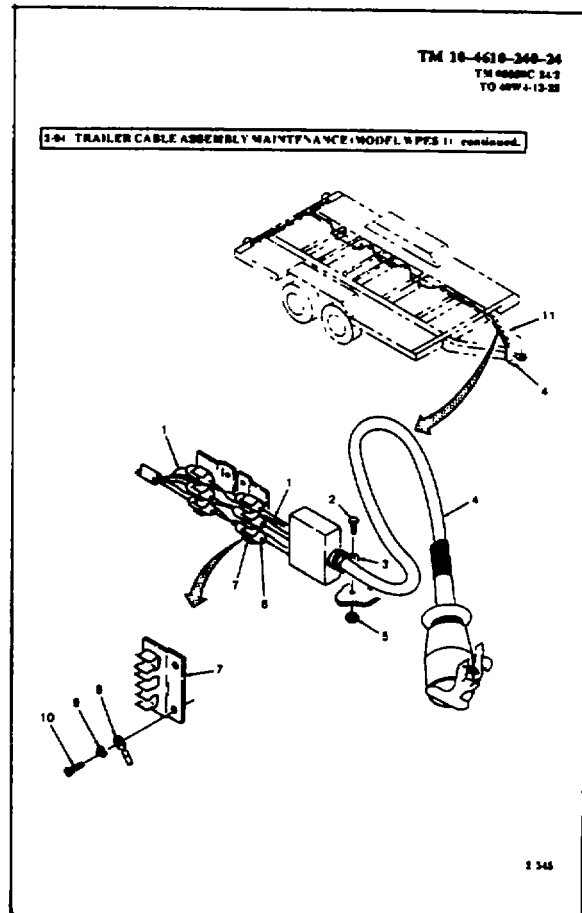
REMOVAL

- Check all wires (1) for readable wire labels.
- If wire labels are missing or cannot be read, tag wires (1).
- Remove six connectors (6) from spring clips (7).
- Separate two halves of six connectors (6). Perform continuity test between cable assembly plug and six connectors.
- Remove nut (5), screw (2), and cable clamp (3). Release power cable assembly (4) from drawbar (11).
- Remove screw (10) and lock washer (9) and disconnect ground wire (8) from drawbar (11).
- Remove cable assembly (4) from drawbar (11).

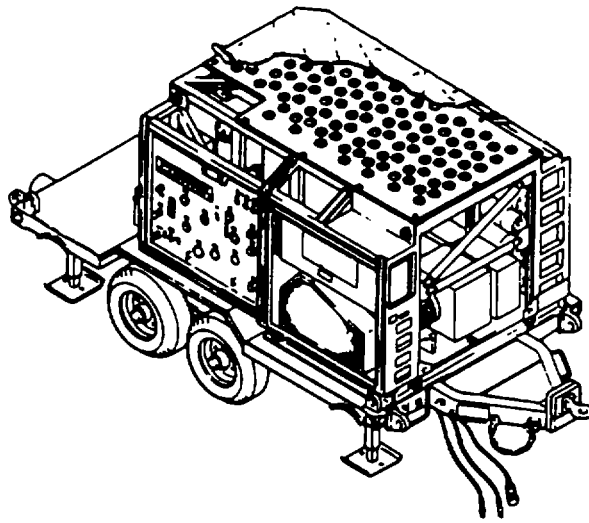
INSTALLATION

- Position power cable assembly (4) in place on drawbar (11).
- Install ground wire (8), lock washer (9), and screw (10) on drawbar (11).
- Use wire labels (6) to match halves of six connectors (6). Push halves together until they lock.
- Push six connectors (6) into spring clips (7).
- Secure cable assembly (4) to drawbar (11) with cable clamp (3), screw (2), and nut (5).
- Connect trailer cable assembly to tow vehicle and check for proper operation (TMS 4610 213 102).

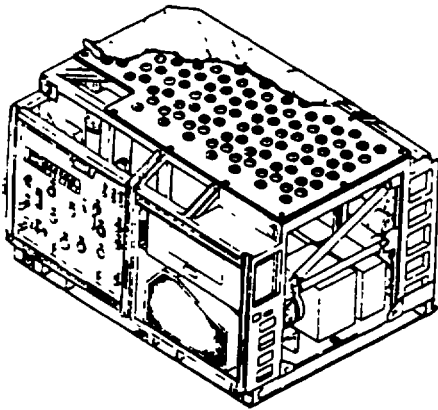
2 344



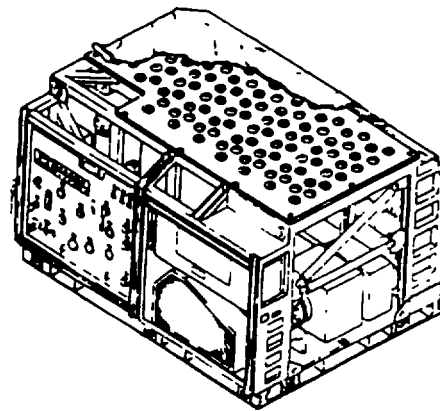
- Turn to paragraph 2-94 and look at the procedure. The "INITIAL SETUP" section tells you what tools, materials, and parts are needed to do this task. It also tells you anything you must do before starting this task and it gives general warnings about hazards that can exist while you do this task.
- The procedure itself has a picture to show you where to look and what to look at, plus the steps you will do to perform the task.
- Notice the numbered arrows. These are the callout numbers. As you read each step, we tell you where to look by including the callout number (in parentheses) after the name of each thing we call out.
- Do the procedure, then check to see if you have corrected the fault symptom.



MODEL WPES-1



MODEL WPES-2



MODEL WPES-3

CHAPTER I
 INTRODUCTION

Section I.	General Information
Section II.	Equipment Description and Data
Section III.	Technical Principles of Operation

Section I. GENERAL INFORMATION
 Alphabetical Index

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Destruction of Army Materiel to Prevent Enemy Use.....	1-3
Maintenance Forms, Records, and Reports	1-2
Official Nomenclature, Names and Designations	1-5
Preparation for Storage or Shipment	1-4
Reporting Equipment Improvement Recommendations (EIRs).....	1-6
Safety, Care and Handling	1-8
Scope	1-1
Warranty Information	1-7

1-1. SCOPE.

This manual covers unit, direct support, and general support troubleshooting and maintenance procedures required to repair and maintain the 600-gallon per hour (gph) Reverse Osmosis Water Purification Unit (ROWPU), Models WPES-1 (Army), WPES-2 (Air Force), and WPES-3 (Marines). The ROWPU produces up to 600 gph of drinking water from any nonpure water source, i.e., streams, rivers, lakes, or salt water.

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

- a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, as contained in Maintenance Management Update. Marine Corps personnel refer to TM 4700- 15/1 for equipment records and forms procedures. Air Force personnel will comply with MASCOM requirements for maintenance data reporting.
- b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 [Report of Discrepancy ROD]] as prescribed in AR 735-11/2DLAR 4140.55/NAVMATINST 4355.73B/ MCO 4430.3H.
- c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/MCO P4610.19D/DLAR 4500 1

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

Methods and/or procedures for the destruction of Army materiel to prevent enemy use are covered in TM 750-244-3

1-4. PREPARATION FOR STORAGE OR SHIPMENT.

Instructions on preparation for storage or shipment are found in Chapter 2, Section VI.

1-5. OFFICIAL NOMENCLATURE, NAMES AND DESIGNATIONS.

Common Name	Official Nomenclature
ROWPU	Reverse Osmosis Water Purification Unit, 600 GPH

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

- a. Army. 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. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at: Commander, U. S Army Troop Support Command, ATTN: AMSTR-MPTF, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. We'll send you a reply.
- b. Marine Corps. USMC personnel submit EIRs in accordance with MCO 1650.17.
- c. Air Force. AF personnel submit improvement reports in accordance with AFR 900-4 or T.O. 00-5-1 as applicable

1-7. WARRANTY INFORMATION

The ROWPU is warranted by Engineered Air Systems, Inc. in accordance with the terms of contract DAAK-01-87-C-A018 Refer to TB 10-4610-240-24 for details of the warranty program. Report all defects in material or workmanship to your supervisor who will take appropriate action

1-8. SAFETY, CARE AND HANDLING

Observe all WARNINGS, CAUTIONS and NOTES in this manual. This equipment can be dangerous or may be damaged if these instructions are not followed

Section II. EQUIPMENT DESCRIPTION AND DATA

Alphabetical Index

Paragraph Title	Paragraph
Differences Between Models	1-11
Equipment Data	1-12
Equipment Characteristics, Capabilities, and Features	1-9
Location and Description of Major Components.....	1-10

1-9. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

For information on equipment characteristics, capabilities, and features of the equipment covered in this manual, refer to TM 10-4610-240-10 ; TM 08580C-10/1, T.O 40W4-13-21

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

For information on the location and description of the major components, refer to TM 5-4610-215-10/2, TM 08580A-10/; T O 40W4-13-11

1-11. DIFFERENCES BETWEEN MODELS.

There are three models of the ROWPU covered in this manual. These model are designated as follows

Army.....	Model WPES-1
Air Force.....	Model WPES-2
Marine Corps	Model WPES3

Major differences between the three models are listed below and are described in subsequent paragraphs Maintenance procedures appearing in this manual that are applicable to only specific models of the ROWPU are identified with the designation (Model WPES-1, Model WPES-2 or Model WPES-3) in the paragraph heading or procedural step Procedures applicable to all three models do not contain any designation

DIFFERENCES BETWEEN MODELS			
	WPES-1	WPES-2	WPES-2
USER	ARMY	AIR FORCE	MARINE CORPS
EQUIPMENT			
Flatbed cargo trailer	x		
30KW Generator set	x		
Two forklift pockets in frame		x	
Four forklift pockets in frame			X
Single power input	X		X
Dual power input		x	
Front removal of R.O elements	x		
Front/rear removal of R O elements		x	x

1-11. DIFFERENCES BETWEEN MODELS- continued.

- a. Only model WPES-1 is mounted on a flatbed cargo trailer. A self contained 30KW generator set installed on the trailer supplies electrical power for operation of the unit Models WPES-2 and WPES-3 are skid mounted (no trailer)
- b. Both models WPES-2 and WPES-3 get electrical power from an external source that is not supplied with the unit
- c. Differences In the electrical systems are
 - (1) Models WPES-1 and WPES-3 have only one external power connector on the junction box internal wiring between these two models is identical
 - (2) Model WPES-2 has two external power connectors on the junction box One connector supplies power to the high pressure pump (R.O. pump) motor, the other supplies power to remaining system components Both power cords must be connected to operate the unit Internal wiring is different between this unit and models WPES-1 and WPES-3
- d. Differences In the piping systems are
 - (1) Piping on models WPES-2 and WPES-3 is identical On both models, the R.O. elements must be removed from both the front and back of the of the R.O vessels.
 - (2) The 30KW generator set installed on the flatbed cargo trailer of model WPES-I prevents removal of the R O elements from the back of the R.O. vessels. Piping is different on this model to allow removal of all R O elements from the front of the R O vessels

1-12. EQUIPMENT DATA.

For equipment data pertaining to the ROWPU, refer to TM 10-4610-240-10, TM 08580C-10/1, TO 40W4-13-21

Section III. TECHNICAL PRINCIPLES OF OPERATION
Alphabetical Index

Paragraph Title	Paragraph
Component Technical Principles of Operation.....	1-14
System Technical Principles of Operation.....	1-13

1-13. SYSTEM TECHNICAL PRINCIPLES OF OPERATION.

Reverse osmosis is the process by which purified water is separated from the available seawater or brackish water source Pressure is applied to the raw water side of a semipermeable membrane, and desalinated water diffuses through the membrane to the freshwater side The 600 GPH ROWPU is arranged so that prefiltered water is pumped under pressure across the semi-permeable membranes, called R O membranes The R O membranes separate this water stream into a product water stream and brine concentrate stream, both of which continuously flow away from the membranes