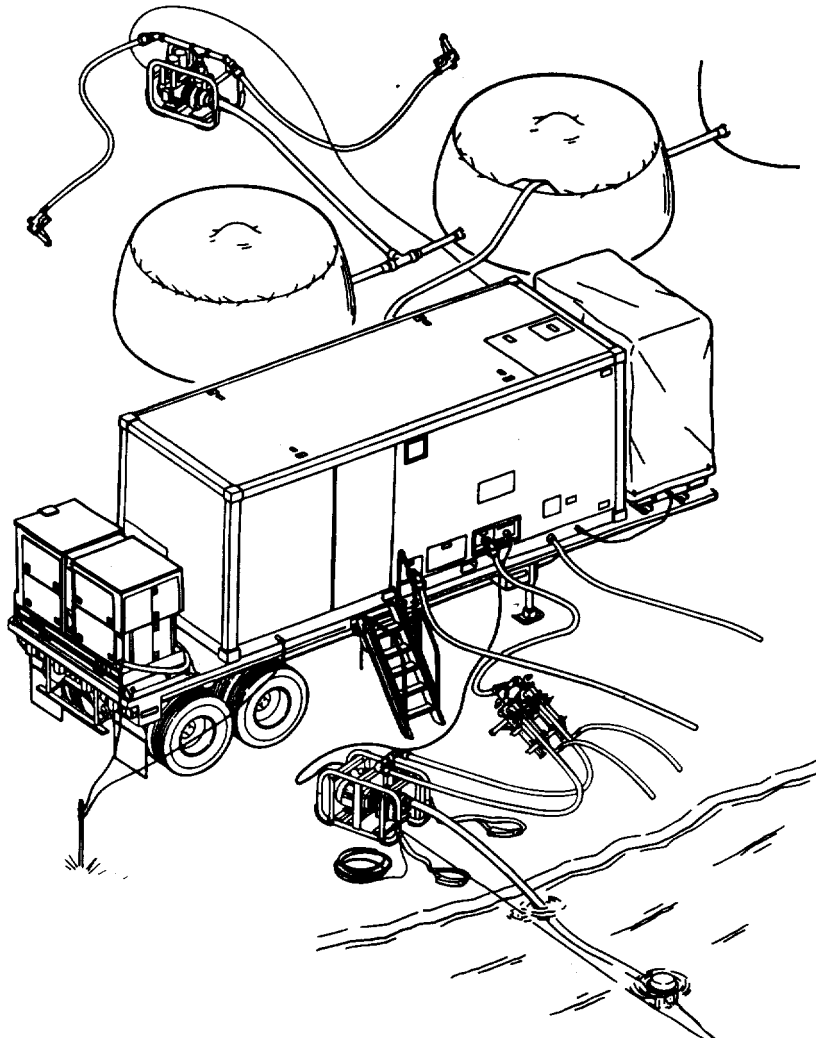


TECHNICAL MANUAL

**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
MODEL NO. WTA-060
NSN 4610-01-219-8707



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**GENERAL SUPPORT
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HEADQUARTERS, DEPARTMENT OF THE ARMY

17 July 1991

TECHNICAL MANUAL

NO. 10-4610-232-34

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC., 17 JULY 1991DIRECT 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 NUMBERS WTA-060
NSN 4610-01-219-8707
AND
ROWPU-1
NSN 4610-01-371-1790

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 these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. You may also submit your recommended changes by E-mail directly to <mpmt%avma28@st-louis-emh7.army.mil>. A reply will be furnished directly to you. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028.

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CHAPTER 1. INTRODUCTION

SECTION I. GENERAL INFORMATION.

1-1. SCOPE.

a. *Type of Manual.* Direct Support and General Support Maintenance Manual.

b. *Model Number and Equipment Name.* Reverse Osmosis Water Purification Unit, referred to from now on in this manual as the ROWPU. Two models are covered by this manual; Model WTA-060 as manufactured by Aqua-Chem, Inc., and Model ROWPU-1 as manufactured by Keco industries, Inc. When any portion of this manual refers to only one of these models, the statement "(MODEL WA-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.

c. *Purpose of the Equipment.* Purifies water from many different sources to make potable (drinkable) water. Can purify:

- (1) Dirty fresh water.
- (2) Brackish water (dirty and a little salty).
- (3) Sea water (very salty).
- (4) Fresh water containing nuclear, biological, or chemical (NBC) agents,

d. *Special Limitations on Equipment:*

- (1) Operates in temperatures between -25°F and 110°F (-32°C and 43°C).
- (2) Winterization kit must be used if operating temperature is below 32°F (0°C).
- (3) RO elements may be ruined if they are allowed to freeze.
- (4) Temperatures of the source water cannot be greater than 110°F (43°C).
- (5) The amount of water produced depends on the temperature of water being purified.
- (6) Must be hauled by M818 or M932 tractors.
- (7) Side-to-side slope of the ROWPU cannot be more than 5 degrees. Greater slopes could cause unit to tip over.

1-2. MAINTENANCE FORMS AND RECORDS. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS).

1-3. 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.

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs). If your ROWPU needs improvement let us know. Send us an EIR. You, the user, are the only one who can tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it directly to Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MDO, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. We'll send a reply.

1-5. WARRANTY INFORMATION. The ROWPU is covered by a warranty. For the details of this warranty, refer to TB 10-4610-232-24.

SECTION II. EQUIPMENT DESCRIPTION.

1-6. GENERAL. The ROWPU description and performance data are covered in Chapter 1 of TM 10-4610-232-12, Operator's and Unit Maintenance Manual.

1-7. SAFETY, CARE AND HANDLING. Always keep in mind the general CAUTIONS and WARNINGS, listed on the warning page at the front of this manual and the specific CAUTIONS and WARNINGS given with procedures throughout this manual and as data plates and decals on the ROWPU.

CHAPTER 2. DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

SECTION I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

2-1. GENERAL. This section gives references to lists of all repair parts, special tools, Test, Measurement, and Diagnostic Equipment (TMDE) and Support Equipment required to perform Direct Support Maintenance and describes service on receipt of the ROWPU and preparation for short term storage or shipment.

2-2. REPAIR PARTS, TOOLS, AND SUPPORT EQUIPMENT.

- a. Repair Parts. Repair parts for the ROWPU are listed and illustrated in TM 10-4610-232-24P.
- b. Common Tools. For authorized common tools and equipment, refer to the Maintenance Allocation Chart. Appendix B, Section III of TM 10-4610-232-12 and the Modified Table of Organization and Equipment (MTOE) applicable to your unit.
- c. Special Tools. Special tools and support equipment required for the ROWPU are listed and illustrated in TM 10-4610-232-24P.
- d. Test. Measurement and Diagnostic Equipment (TMDE) and Support Equipment. For authorized TMDE, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

SECTION II. TROUBLESHOOTING

2-3. GENERAL. This section covers the Troubleshooting Procedures and are for the most frequent problems encountered in operation of the ROWPU.

2-4. TROUBLESHOOTING TABLE.

a. Use of Table. Table 2-1 lists common malfunctions during operation or maintenance of the ROWPU or its parts. Tests, inspections, and corrective actions should be made or taken in the order listed.

b. Limitation. This manual cannot list all the problems that may occur, or all tests, inspections, and corrective actions. If a problem is not listed, or is not corrected after corrective actions are taken, notify General Support Maintenance.

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Table 2-1. Direct Support Troubleshooting Guide

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

RAW WATER PUMP.

1. Raw water pump assembly is noisy.

Step 1. Check for foreign objects in pump.

Disassemble pump (para. 2-11).

Step 2. Inspect pump internals for wear and damage.

Replace worn or damaged parts (para. 2-11).

Step 3. Turn the motor shaft by hand. It should turn easily, without noise, without dragging, and without rough spots.

If rotation is not smooth, bearings are bad. Replace motor bearings (para. 2-12).

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

Check pump internals for wear and damage.

Replace worn or damaged parts (para. 2-11).

3. Raw water pump motor hums but won't turn.

Step 1. Check for foreign objects in pump.

Disassemble pump (para. 2-11).

Step 2. Inspect pump internals for wear and damage.

Replace worn or damaged parts (para. 2-11).

Step 3. Tag and disconnect motor leads (T1, T2, T3) (REF: 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.

Replace motor if the meter reading is zero (para. 2-12).

Step 4. 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.

Replace motor if reading is infinity (para. 2-12).

Step 5. Turn the motor shaft by hand. It should turn easily, without noise, without dragging, and without rough spots.

If rotation is not smooth, bearings are bad. Replace motor bearings (para. 2-12).

Step 6. Refer to raw water pump electrical troubleshooting (malfunction 4).

AIR BLOWDOWN SOLENOID VALVE.

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

Check valve for plugging or damage.

(a) Remove valve from piping and disassemble (para. 2-51).

(b) Clean out valve and inspect for wear.

(c) If necessary, replace valve stem and seat (para. 2-51).

(d) If necessary, replace valve and solenoid assembly (para. 2-51).

AIR COMPRESSOR.

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

Visually inspect that there is oil and water mixed.

Send to General Support Maintenance and have them inspect/repair pistons and piston rings.

Table 2-1. Direct Support Troubleshooting Guide (Continued)

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<hr/>		
2. Air compressor does not turn over easily by hand.	Visually confirm malfunction.	Send air compressor to General Support Maintenance for overhaul.
3. Air compressor motor is noisy.	Turn motor shaft by hand. It should turn easily, without noise, without dragging, and without rough spots.	(a) Replace bearings if rotation is not smooth (para. 2-72). (b) Replace motor if teardown inspection reveals worn or damaged rotor or stator (para. 2-71).
4. Air compressor has localized overheating.	Locate which cylinder is overheating as recompression or high cylinder pressure is causing the problem.	Replace the inlet and outlet valves on the affected chamber (para. 2-72).
5. Air compressor is noisy.	Identify noise.	
NOTE		
Light tapping when compressor is started is normal.		
(a) Continuous light tapping is caused by the oil dipstick. Remove it and make sure it is straight.		
(b) Light knocking is probably a small-end bearing. Replace air compressor and send it to General Support Maintenance for repair (para. 2-72).		
(c) A rumbling noise in the main bearings. Replace the air compressor and send to General Support Maintenance for repair (para. 2-72).		
6. Air compressor interstate relief valves keep blowing.	Locate which relief valve is blowing as this generally indicates pressure leaking back or rising cylinder pressure on the following stage.	(a) Replace the leaking interstage relief valve (para. 2-72). (b) Replace the inlet and outlet valves on the following stage (para. 2-72). (c) Replace the air compressor and send it to General Support Maintenance for repair (para. 2-72).
7. Air compressor runs but does not build up pressure.	Step 1. Close the air tank block valve and operate the air compressor.	(a) If the pressure goes up to compressor shutdown point, the air compressor is working correctly. Check for leaks downstream of the air regulator. (b) If the pressure does not rise to compressor shutdown-check for leaks or plugging upstream of the pressure regulator.
	Step 2. Check all relief valves for leakage. If any are leaking, check for plugging of air lines (especially in freezing conditions) which might be causing the valve to relieve.	If no cause can be found for the valve leak, replace the leaking relief valve. (Interstate and high pressure relief, para. 2-70). (Low pressure relief, para. 2-61.)
	Step 3. Check air blowdown solenoid valve for internal leakage. Remove the outlet tubing from the solenoid valve and feel if air is leaking through the valve when it is supposed to be closed. Disconnect the valve electrical connector if air can be felt leaking.	(a) If air leaks through the valve at all times, clean/repair the air blowdown solenoid valve (para. 2-51). (b) If the air leak stops when the electrical connector is disconnected, refer to air blowdown solenoid valve electrical troubleshooting and also unit level troubleshooting.
	Step 4. Check the relief valve on the back of the air pressure regulator.	If it is leaking, replace the regulator (para. 2-61).