

**UNITED STATES MARINE CORPS**  
Utilities Instruction Company  
Marine Corps Engineer School  
PSC Box 20069  
Camp Lejeune, North Carolina 28542-0069

U-22A05  
OCT 99

**STUDENT HANDOUT**

**REPAIR REVERSE OSMOSIS WATER PURIFICATION UNIT**

**TERMINAL LEARNING OBJECTIVES:**

1. Provided a Worksheet for Quarterly Preventive Maintenance and Technical Inspection for Engineer Equipment (NAVMC 10560), an item of hygiene equipment, a water source, and fuel, with the aid of references, perform a Limited Technical inspection on the equipment in accordance with the appropriate technical manual. (1171.05.09)
2. Provided a Reverse Osmosis Water Purification Unit (ROWPU), an Equipment Repair Order (NAVMC 10245), a water source, power source, with the aid of references, DIAGNOSE A MALFUNCTION in accordance with TM-08580B-24/3. (1171.05.05)
3. Provided a Reverse Osmosis Water Purification Unit (ROWPU), an Equipment Repair Order (NAVMC 10245), tools, repair parts and facility, with the aid of references, REPAIR THE UNIT in accordance with TM-08580B-24/3. (1171.05.12)

**ENABLING LEARNING OBJECTIVES:**

1. Provided a Reverse Osmosis Water Purification Unit and a Worksheet for Quarterly Preventive Maintenance and Technical Inspection for Engineer Equipment (NAVMC 10560), inspect the unit in accordance with TM-08580B-24/P2 and TM-08580b-24/3. (1171.05.09c)
2. Provided a Reverse Osmosis Water Purification Unit (ROWPU), with a malfunctioning chemical feed pump assembly, a water source, a power source, and references, diagnose the malfunction in accordance with TM-08580B-24/P2 and TM-08580B-24/3. (1171.05.05a)
3. Provided a Reverse Osmosis Water Purification Unit (ROWPU), with a malfunctioning chemical feed pump assembly, an Equipment Repair Order (NAVMC 10245), tools, repair parts, and repair facility, with the aid of references, repair the chemical feed pump assembly in accordance with TM-08580B-24/P2 and TM-08580B-24/3. (1171.05.12a)
4. Provided a Reverse Osmosis Water Purification Unit (ROWPU), with a malfunctioning six-way valve, a water source, a power source, and references, diagnose the malfunction in accordance with TM-08580-24/P2 and TM-08580B-24/3. (1171.05.05b)

5. Provided a Reverse Osmosis Water Purification Unit (ROWPU), with a malfunctioning six-way valve, an Equipment Repair Order (NAVMC 10245), Tools repair parts, and a repair facility, with the aid of references, repair the six-way valve in accordance with TM-08580B-24/P2 and TM-08580B-24/3. (1171.05.12b)
6. Provided a Reverse Osmosis Water Purification Unit (ROWPU), with a malfunctioning piping system, a water source, a power source, and references, diagnose the malfunction in accordance with TM-08580B-24/P2 and TM-08580B-24/3. (1171.05.05c)
7. Provided a Reverse Osmosis Water Purification Unit (ROWPU), with a malfunctioning piping system, an Equipment Repair Order (NAVMC 10245), repair parts, and repair facility, with the aid of references, repair the piping system in accordance with TM-08580B-24/P2 and TM-08580-24/3. (1171.05.12c)
8. Provided a Reverse Osmosis Water Purification Unit (ROWPU), with a malfunctioning gauge, a water source, a power source, and references, diagnose the malfunction in accordance with TM-08580B-24/P2 and TM-08580B-24/3. (1171.05.05e)
9. Provided a Reverse Osmosis Water Purification Unit (ROWPU), with a malfunctioning gauge, an Equipment Repair Order (NAVMC 10245), tools, repair parts, and a repair facility, with the aid of references, repair the gauge in accordance with TM-08580B-24/P2 and TM-08580B-24/3. (1171.05.12d)
10. Provided a Reverse Osmosis Water Purification Unit (ROWPU), with a malfunctioning R.O. vessel, a water source, a power source, and references, diagnose the malfunction in accordance with TM-08580B-24/P2 and TM-08580B-24/3. (1171.05.05d) (1171.05.05e)
11. Provided a Reverse Osmosis Water Purification Unit (ROWPU), with a malfunctioning R.O. vessel, an Equipment Repair Order (NAVMC 10245), tools, repair parts, and a repair facility, with the aid of references, repair the R.O. vessel in accordance with TM-08580B-24/P2 and TM-08580B-24/3. (1171.05.12d)
12. Provided a Reverse Osmosis Water Purification Unit (ROWPU), with malfunctioning R.O. pump, a water source, a power source, and references, diagnose the malfunction in accordance with TM-08580B-24/P2 and TM-08580B-24/3. (1171.05.05f)
13. Provided a Reverse Osmosis Water Purification Unit (ROWPU) with a malfunctioning R.O. pump, an Equipment Repair Order (NAVMC 10245), tools, repair parts, and repair facility, with the aid of references, repair the pump in accordance with TM-08580B-24/P2 and TM-08580B-24/3. (1171.05.12F)

**OUTLINE:**

1. **INSPECT THE UNIT**

**(WARNING: HIGH VOLTAGE ELECTRICITY CAN CAUSE SERIOUS INJURY OR DEATH. BE CERTAIN THAT ALL POWER IS OFF.)**

a. Organizational maintenance is responsible for ensuring that the ROWPU remains fit for continuous operation, by performing the checks and services necessary to correct the troubles recorded by the operator on NAVMC 10245 (Worksheet for Quarterly Preventive Maintenance and Technical Inspection)

b. Checks and Services

(1) Backwash Pump

(a) Check the pump frame assembly for bent rails, broken welds, or missing hardware.

(b) Inspect the power cable for cracked insulation or damaged cable plug.

(c) Check the pump strainer assembly for cracks or damage and the fittings for damage.

(2) Distribution Pump

(a) Check the pump frame assembly for bent rails, broken welds, or missing hardware.

(b) Inspect the power cable for severe cracks and the plug for bent pins.

(3) Raw Water Pump

(a) Check the pump frame assembly for bent rails, broken welds or missing hardware.

(b) Inspect the power cable for service cracks and the plug for bent pins.

(4) Valves

(a) Check the valves for cracks, leaks, and ease of operation.

(b) Replace bad valves.

(5) Storage Box

(a) Check the storage boxes for serviceable condition.

(b) If hinges, lids, or hardware are bad, repair or replace them.

(6) Motor starting and Protective Devices

- (a) Inspect motor starters.
  - (b) Tighten loose screws.
  - (c) Remove dirt and remains of corrosion.
  - (d) Replace defective or damaged wires.
- (7) Pulleys - Check the pulleys for damage. (Cracks or dents)
- (8) Electric Controls - Test the electrical controls and switches to be sure that they turn the equipment on and off.
- (9) Signaling devices - Test the pilot and lamp holders.
- (10) Wiring fittings and ground rod
- (a) Check the control panel wiring for clean and solid connections
  - (b) Ensure that the grounding rod is making a solid electrical connection.
- (11) R.O. Pump Crankcase
- (a) Inspect the crankcase for leaks.
  - (b) Check the sight gauge for breaks or cracks.
  - (c) Check that the filter cover fits tightly and that the breather is not clogged.
  - (d) Check that the drain is closed.
  - (e) Look for traces of water in the sight glass and in the filter opening.
- (12) Control Panel Gauges and Fittings
- (a) Inspect the flow meter and pressure gauges, and insure that they are operable.
  - (b) Ensure that all connections are tight and that the valves/vent
- (13) R.O. Pump Drive
- (a) Inspect the pulleys and belt guard.
- (14) Chemical Feed Pump Motor
- (a) Remove the motor top cover plate and conduit box covers.

(b) Clean and treat the wiring and connectors with an approved corrosion control substance.

## 2. DIAGNOSE AND REPAIR THE CHEMICAL FEED PUMP ASSEMBLY

### a. Pump Fails to Prime

(1) If solution level is low, fill chemical container with solution.

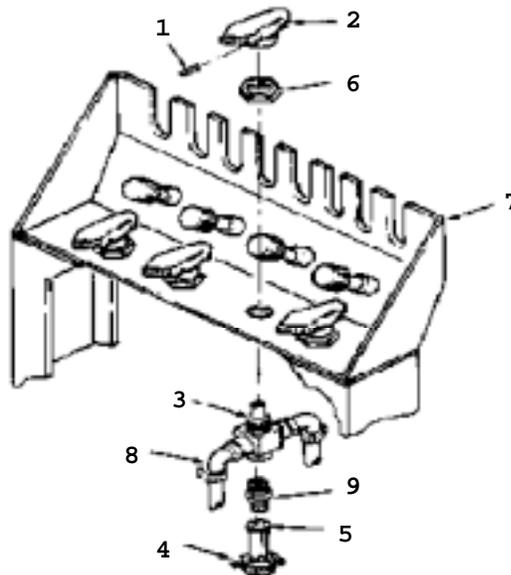
(2) Check the two hoses from the container to the three way ball valve for loose connections.

(3) If connections are loose, tighten connections.

(4) If a hose has a hole, replace the hose.

(5) If connections are tight and there are no holes in the hoses, replace three way ball valve.

#### (a) Remove Three Way Ball Valve



1 Remove set screw (1) and handle (2) from three way ball valve (3).

2 Loosen three clamps (4) and remove flexible tubing (5).

3 Remove lock nut (6) and three way ball valve from mounting plate (7).

4 Remove two elbows (8) and adapter (9).

(b) Install three Way Ball Valve

1 Apply antiseize tape to pipe fittings before installation.

2 Install two elbows (8) and adapter (9).

3 Position three way ball valve (3) on mounting plate (7) and install on two elbows (8) and adapter (9). Tighten clamps.

b. Chemical Feed Pump Manual Stroke will not adjust

(1) Check Allen screw inside adjustment head (1) to see if it is tight. If Allen screw is loose tighten the screw.

(2) Check Grub screw (7) on the flexible shaft (3), if Grub screw is loose tighten the screw.

(3) If Allen screw inside the adjustment head (1) and the Grub screw (7) on the Flexible shaft are tight, adjustment of the Chemical Feed Pump Manual Stroke is required.

(a) Adjust Chemical Feed Pump Manual Stroke

**(NOTE: THERE ARE FOUR MANUAL STROKE ADJUSTMENT ASSEMBLIES, ALL ARE ADJUSTED THE SAME. ONE IS SHOWN. TAG HOSES BEFORE DISCONNECTING TO AVOID MIXING UP THE CHLORINE HOSES.)**

1 Disconnect eight hoses (10 and 11) from four chemical cans.

2 Place ends of two hoses (10 and 11) associated with manual stroke adjustment assembly into a bucket of vent vessel or raw water.

3 Apply power to the ROWPU.

4 Set ball valves control handle (12) to the prime position.

5 Start chemical feed pump.

6 Loosen grub screw (7) and set adjustment head (1) to zero settings on both shaft (13) and head.

7 Turn flexible shaft collar (14) counterclockwise until a steady flow of water comes out of hose (10). Then turn flexible shaft collar slowly clockwise until flow just stops.

8 Ensure adjustment head settings (1) are still at zero and tighten grub screw (7).

9 Turn chemical feed pump to the stop position and shut down power to the ROWPU.

10 Install eight hoses (10 and 11).

c. Chemical Feed Pump Diaphragm Body Assemblies will not operate

(1) Valve carrier is clogged with chemical residue.

(2) Diaphragm body is clogged with chemical residue.

**(NOTE: CLEAN ALL CHEMICAL FEED PUMP PARTS IN BAKING SODA AND WATER TO REMOVE CHEMICAL RESIDUE.)**

(a) Disassembly of chemical feed pump valve carrier and diaphragm drive assemblies

1 Remove O-ring (8) and valve carrier (9).

2 Working at the bottom of valve carrier (9), remove O-ring (10), valve guide (11), and second O-ring (12).

3 Remove ball (13), valve seat (14), and O-ring (15).

4 Turn chemical feed metering pump with top down on a bench.

5 Repeat steps 1 through 4 at the bottom of diaphragm body (16).

6 Remove four screws (17), washers (18), and diaphragm body (16).

7 Grip diaphragm (19) by the edge and turn counterclockwise.

8 Remove V-ring (20) and grooved ring (21) from diaphragm drive housing (22).

9 Remove diaphragm (19), intermediate diaphragm (23), push plate (24), and splash disk (25).

10 Remove four cylindrical screws (26), washers (27), diaphragm drive (22), and gasket (28).

11 Remove spring (29), thrust rod (30), and locking sleeve (31).

12 Clean all pump parts with baking soda, and replace all damaged O-rings.

(b) Assembly of the Chemical Feed Pump Valve Carrier and Diaphragm Drive Assemblies.

1 Install locking sleeve (34), in thrust rod (35).

2 Position gasket (36) on Diaphragm drive housing (37) and install grooved ring (38), V-ring (39), spring (4) and thrust rod (35). Align locking sleeve (34) with slot in diaphragm drive housing (37).

3 Compress spring (40) and install splash disk (41), push plate (42), intermediate diaphragm (43), and diaphragm (44). Towards the drive housing.

4 Position diaphragm drive housing (37) on drive unit and install four screws (45) and washers (46).

5 Position diaphragm body (47) on diaphragm housing (37) and install four screws (48) and washers (49). Ensure arrow on face of diaphragm body points to top of diaphragm drive housing.

6 Install O-ring (50), valve seat (51), ball (52), second O-ring (53), valve guide (54), and third O-ring (55) in valve carrier (56).

7 Install valve carrier (56) and O-ring (57) in diaphragm body (47).

8 Turn chemical feed metering pump with top down on bench.

9 Repeat steps 6 and 7 at bottom of diaphragm body.

### 3. DIAGNOSE AND REPAIR SIX-WAY VALVE

a. Water coming out of waste hoses during service cycle

(1) Check to see if the backwash timer is in service position.

(2) Check to see if the backwash timer strainer is clean.

(3) If the backwash timer is in the service position and the backwash timer strainer is clean, disassemble the six-way valve for cleaning.

(a) Disassemble the Six-Way Valve

1 Remove four screws (1) from cap (2) and valve body (11).

- 2 Remove cap (2) from valve body (11).
- 3 Lift out cartridge assembly (3) from valve body (11).
- 4 Remove cartridge gasket (4) from valve body (11). Discard seat gasket (6).
- 5 Lift out seat (5) and seat gasket (6) from valve body (11). Discard seat gasket (6).
- 6 Unscrew and remove all parts to cap assembly (9) and O-ring (10) from valve body (11). Discard O-ring (10).
- 7 Clean all valve components with sodium hex and water until all parts move freely.

**(NOTE: THE ABSENCE OF THE CHEMICAL SODIUM HEX IN RAW WATER WILL CAUSE SCALING AND CALCIUM BUILD UP IN THE SIX WAY VALVE AND CAUSE IT TO MALFUNCTION NEVER OPERATE THE ROWPU WITHOUT SODIUM HEX.)**

(b) Assembly of the Six-Way Valve

- 1 Install O-ring (10) and pipe plug (9) into valve body (11).
- 2 Install O-ring (8) and all parts to cap assembly (7) into valve body.
- 3 Install seat gasket (6) and seat (5) into valve body (11).
- 4 Install cartridge gasket (4) into valve body (11).
- 5 Position cartridge assembly (3) into valve body (11) and align mounting holes.
- 6 Position cap (2) over cartridge assembly (3) and align mounting holes.

**(CAUTION: TO PREVENT DAMAGE TO VALVE CAPS, TORQUE SCREWS TO A MAXIMUM OF 30-INCH - 1 LBS.)**

- 7 Install four screws (1) through cap (2), cartridge assembly (3) and valve body (11).

#### 4. DIAGNOSE AND REPAIR PIPING SYSTEM

a. RUPTURE DISC - The rupture disc is a safety device for the R.O. Pump Assembly. If the pressure ever reaches 1425 psi on the R.O.

pressure PSI gauge, the rupture disc tears open relieving the pressure. The disc is mounted in a screw-type mount body on top of the R.O. Pump discharge pipe. Replace the rupture disc after it blows, and before starting the ROWPU again.

**(CAUTION: CONTINUED OPERATION AFTER THE RUPTURE DISC OPENS COULD DAMAGE THE ROWPU. IMMEDIATELY SHUT OFF THE ROWPU WITH THE EMERGENCY STOP BUTTON AND OPEN THE REGULATE PRODUCT FLOW VALVE.)**

(1) Removal

- (a) Remove hold down screw (1) from body (4).
- (b) Remove hold down ring (2).
- (c) Remove rupture disc (3) and discard.

(2) Installation

- (a) Place the side of new rupture disc (3) that curves upward toward the top.
- (b) Insert it into body (4).
- (c) Replace hold down ring (2).

**(CAUTION: TO AVOID DAMAGING RUPTURE DISC, DO NOT OVER TIGHTEN HOLD DOWN SCREW.)**

- (d) Reinsert hold down screw (1). Tighten until hand tight (snug), then tighten 1/8 turn with wrench.

b. Pressure Relief Valve

(1) Removal

- (a) Disconnect two connectors (1).
- (b) Remove six nuts (2) and screws (3) and three clamps (4) and gaskets (5).
- (c) Remove screw (6) and loop clamp (7).
- (d) Remove pipe sections (8) and (9).
- (e) Remove pipe sections (10) and relief valve (11) from adapter (12).

(2) Installation

**(NOTE: APPLY ANTISEIZE TAPE TO ALL MALE PIPE THREADS BEFORE INSTALLATION.)**

- (a) Install relief valve (11) on adapter (12).
- (b) Install pipe section (10) on relief valve (11).
- (c) Install pipe section (9).
- (d) Position pipe section (8) and install three gaskets (5) and clamps (4) and six screws (3) and nuts (12).
- (e) Connect two connectors (1).

5. DIAGNOSE AND REPAIR R.O. VESSEL

a. Product Water TDS Level is above 1500 ppm

(1) Check product water from each pressure vessel

(a) Start up ROWPU normally.

(b) Adjust R.O. pressure to 900 psi for sea water feed or 600 psi for fresh/brackish water feed. Collect a sample of product water in a clean container and measure TDS with portable TDS meter and record value.

(c) Using clean containers, collect a sample of product water from each end of R.O. vessel. Be sure to rinse each container twice with sample water before collecting sample. Mark container appropriately as front or rear.

(d) Measure TDS of each product water sample.

(e) Based on the TDS measurements of the collected samples, one of the following four conditions can exist.

1 Condition 1 - Front Sample high, rear sample normal.

a Cause - Leak at front end-connector O-rings.

2 Condition 2 - Front sample normal, rear sample high.

a Cause - Leak at rear end-connector O-rings.

3 Condition 3 - Front sample high, rear sample high.

a Cause - Leak at front and rear end-connector O-rings end/or element interconnector O-rings.

(f) Repeat steps (c) through (e) for all the remaining vessels to determine the correct source(s) of high TDS.

(g) If any of the conditions exist, you will need to do the following:

1 Condition 1 : Remove front end cap and end connector and check condition, lubrication, and size of O-rings. Replace damaged or wrong size O-rings, and lubricate O-rings with glycerin before installation. Carefully reinstall end connector and end cap.

2 Condition 2 : Remove rear end cap and end connector and check condition, lubrication, and size of O-rings. Replace damaged or wrong size O-rings, and lubricate O-rings with glycerin before installation. Carefully reinstall end connector and end cap.

3 Condition 3 : Remove the R.O. elements from the pressure vessel. Check condition, lubrication, and size of all O-rings. Replace damaged or wrong size O-rings, and lubricate O-rings with glycerin before installation. Carefully install elements and end cap.

(h) For each R.O. vessel in which O-rings were inspected, collect a sample of product water from each end of vessel. Do one vessel at a time. Mark the sample front or rear.

(i) Measure TDS of each product water sample. If one or both samples are still high, leaky O-rings or faulty (cracked) connectors may still be present, or one or both R.O. elements may be faulty.

(2) R.O. elements may be scaled or fouled.

(a) Clean R.O. elements.

## 6. DIAGNOSE AND REPAIR R.O. VESSELS GAUGE

a. General The R.O. vessels gauge shows the difference in pressure between the input and output of the R.O. vessels. What causes the gauge to malfunction?

- (1) Dirt
- (2) Corrosion
- (3) Any type of suspended matter found in a water source.
- (4) Broken glass
- (5) Broken or bent screws.
- (6) Cracked fittings or tube couplings.

### b. Inspection

- (1) Inspect gauge and glass for damage.

(2) Inspect threads of screws, nuts, elbow fittings, and tube coupling nuts.

(3) Inspect wrench seats on fittings and hardware.

(4) Check screw stems for breaks and bends.

(5) Check lock washers for compression.

**NOTE: ROWPU PIPING AND EQUIPMENT CAN CONTAIN EXTREMELY HIGH PRESSURE DURING AND AFTER OPERATION. BE SURE TO OPEN ALL DRAINS AND VENTS BEFORE BEGINNING ANY DISASSEMBLY.**

c. Removal of R.O. Vessels Gauge

(1) Remove both tubing nuts (17) from 90° elbow (19).

(2) Remove three nuts (20) and three lock washers (21) from three screws (22).

(3) Remove three screws (22).

(4) Remove two 90° piping elbows (19) from gauge.

(5) Remove gauge (23) from front of control panel (10).

d. Repair or Replace R.O. Vessels Gauge

(1) Remove dirt from meter cut out in panel.

(2) Remove dirt and corrosion from the threads of screws, nuts, and fittings.

(3) Replace damaged tube assembly or piping fittings.

(4) Replace damaged or unserviceable pressure gauge.

(5) Send damaged pressure gauge and replaced parts to DS/I maintenance.

(6) Replace damaged nuts, bolts, screws, and washers.

e. Installation of R.O. Vessels Gauge

(1) Insert gauge (23) in mounting hole in panel (10).

(2) Insert three screws (22) through gauge (23) and panel.

(3) Install three lock washers (21) and three nuts (20) on screws (22).

(4) Install two 90° piping elbows (19) on gauge.

(5) Connect two pressure tube coupling nuts (17) on 90° piping elbow (19).

(6) Test pressure tube fittings for leaks.

## 7. Diagnose and Repair R.O. Pump

a. R.O. Pump knocks excessively/water squirts from barrel cover.

(1) If the following symptoms occur simultaneously it may indicate unseated valves:

(a) Loud knocking noise.

(b) Wildly fluctuating gauges.

(c) Pulsating and vibration in the entire ROWPU.

(d) Decrease in water pressure flow.

b. Replace R.O. Pump Fluid End Assembly.

(1) Remove two wing nuts (1) and barrel cover (2) from R.O. pump power frame assembly (3).

(2) Using a spanner wrench, loosen five stuffing nuts (11) from plunger (9).

(3) Remove eight nuts (4) and R.O. pump fluid end assembly (5) from R.O. pump power frame assembly (3).

**(NOTE: THERE ARE FIVE ADAPTER ASSEMBLIES AND PLUNGERS. ALL ARE REMOVED THE SAME. ONE IS SHOWN.)**

(4) Remove adapter assembly (6).

(5) Slide baffle disc (7) off knurled surface (8) of plunger (9).

**(CAUTION: NICKS ON THE PLUNGER BODY WILL CAUSE PACKING RING FAILURE. USE TOOLS ONLY ON PLUNGER KNURLED SURFACE TO PREVENT DAMAGE TO EQUIPMENT.)**

(6) Using a wrench, remove plunger (9) from cross heads (10) in R.O. pump power frame assembly.

(7) Remove baffle disc (7) from plunger.

**(NOTE: THERE ARE FIVE ADAPTER ASSEMBLIES. ALL ARE SEPARATED THE SAME. ONE IS SHOWN. RECORD SEQUENCE OF COMPONENTS IN PACKING KIT FOR INSTALLATION. PACKING KIT COMPONENTS MAY SEPARATE DURING REMOVAL OF STUFFING BOX NUT.)**

(8) Using a spanner wrench, remove stuffing box nut (11).

(9) Remove packing kit (12) and throat bushing (13) from adapter (14). Discard packing kit.

c. Cleaning

(1) Wash plungers, baffle discs, stuffing box nuts, throat bushings, and adapters with mild soap solution.

(2) Rinse with clean water and dry with clean rags.

d. Inspection

(1) Inspect plungers, stuffing box nuts, adapters, and nuts for stripped threads. Replace damaged parts.

(2) Inspect throat bushing for excessive wear. Replace as required.

(3) Inspect plungers for nicks or burrs. Replace as required.

(4) Inspect baffle disc for excessive wear, cracks, or tears. Replace as required.

e. Installation

**(NOTE: THERE ARE FIVE ADAPTER ASSEMBLIES. ALL FIVE ARE ASSEMBLED THE SAME AS THE ONE SHOWN.)**

(1) Position throat bushings (13) on adapter (14).

(2) Position new packing kit (12) on throat bushing (13) with components in same sequence as recorded during removal.

(3) Install stuffing box nut (11) finger tight on adapter (14).

**(NOTE: THERE ARE FIVE ADAPTERS ASSEMBLIES AND PLUNGERS. ALL ARE INSTALLED THE SAME AS THE ONE SHOWN.)**

(4) Install baffle disc (7) on plunger (9).

(5) Position plunger (9) in R.O. pump power frame assembly (3).

**(CAUTION: NICKS ON THE PLUNGER BODY WILL CAUSE PACKING RING FAILURE. USE TOOLS ONLY ON PLUNGERS KNURLED SURFACE TO PREVENT DAMAGE TO EQUIPMENT.)**

(6) Using wrench, install plunger (9) on cross head (10) in R.O. pump power pump frame assembly (3).

(7) Slide baffle disc (7) over knurled surface (8) of plunger (9).

(8) Position adapter assembly (6) in R.O. pump fluid end assembly (5).

(9) Carefully position R.O. fluid end assembly (5) by sliding adapter assemblies (6) over R.O. plunger (9) and studs (12) on R.O. power frame assembly (3).

(10) Install eight nuts, (4). Using spanner wrench, tighten five stuffing box nuts (11).

(11) Position barrel cover (2) on R.O. pump power frame assembly and install two wing nuts (1).

f. Repair R.O. Pump Fluid End Assembly

(1) Disassembly

**(CAUTION: R.O. PUMP FLUID END ASSEMBLY IS MADE FROM CAST ALUMINUM BRONZE. TO PREVENT DAMAGE TO EQUIPMENT, DO NOT HIT OR DROP R.O. PUMP FLUID END ASSEMBLY.)**

**(NOTE: THERE ARE FIVE CYLINDER HEADS, SEALS, AND DISCHARGE VALVE ASSEMBLIES AT TOP OF FLUID END ASSEMBLY. ALL ARE REMOVED THE SAME AS THE ONE SHOWN.)**

(a) Remove cylinder head (1) and seal (2). DISCARD SEAL.

(b) Remove nut (3), retainer (4), spring (5), sleeve (6), and disc (7). Save disc for assembly.

(c) Using valve seat puller, remove seat (8).

**(NOTE: THERE ARE FIVE CYLINDER HEADS, SEALS, AND SUCTION VALVE ASSEMBLIES IN BOTTOM OF FLUID END ASSEMBLY. ALL FIVE ARE REMOVED THE SAME AS THE ONE SHOWN.)**

(d) Remove cylinder head (9) and seal (10). Discard seal.

(e) Working through top cylinder opening (11), loosen nut (12).

(f) Remove nut (12), retainer (13), spring (14), sleeve (15), and disc (16) through cylinder opening (17). Save disc for assembly.

(g) Working through top cylinder opening (11) and using seat valve puller, loosen seat (19).

(h) Remove seat (18) through cylinder opening (17).

(2) Cleaning

(a) Wash R.O. pump fluid end body with strong soap solution.

(b) Wash cylinder heads and valve assembly components.

(c) Rinse all parts with clean water.

(d) Dry cylinder heads and valve assembly components with clean rags.

**(WARNING: COMPRESSED AIR CAN BLOW DUST INTO THE EYES. WEAR EYE PROTECTION. DO NOT EXCEED 30 PSI (207 KPA) AIR PRESSURE.)**

(e) Use compressed air to dry the R.O. pump fluid end body.

(f) Remove rust and loose paint from cylinder heads and R.O. pump fluid end body.

(3) Inspection

(a) Inspect R.O. pump fluid end body for cracks, deformed threads, and warping. Replace as required.

(b) Inspect cylinder heads for cracks and deformed threads. Replace as required.

(c) Inspect valve assemblies for broken or excessive wear on seats and disc, bent or broken retainers, and broken springs. Replace as required.

(d) Inspect valve assembly nuts for deformed heads and threads. Replace as required.

(4) Assembly

**(NOTE: THERE ARE FIVE SUCTION VALVE ASSEMBLIES, SEALS, AND CYLINDER HEADS IN BOTTOM OF FLUID END ASSEMBLY. ALL ARE INSTALLED THE SAME AS THE ONE SHOWN.)**

(a) Position old disc (16) on seat (18).

(b) position seat (18) in R.O. pump fluid end body through cylinder opening (17).

**(CAUTION: A BROKEN OR DISTORTED SEAT WILL CAUSE THE R.O. PUMP ASSEMBLY TO MALFUNCTION. USE CARE WHEN INSTALLING SEAT TO PREVENT EQUIPMENT DAMAGE.)**

(c) Using 1-inch pipe and mallet through cylinder opening (11), tap seat (18) until firmly seated.

(d) Remove and discard disc (16).

(e) Working through cylinder opening (17), install new disc (16), sleeve (15), spring (14), and retainer (13) on seat (18).

(f) Position seal (10) on cylinder and install cylinder head (9).

**(NOTE: THERE ARE FIVE DISCHARGE VALVE ASSEMBLIES, SEALS, AND CYLINDER HEADS ON TOP OF FLUID END ASSEMBLY. ALL ARE INSTALLED AT THE SAME TIME. ONLY ONE IS SHOWN.)**

(g) Working through cylinder opening (11), position seat (8) in R.O. pump fluid end body.

(h) Position old disc (7) on seat (8).

(i) Using 1-inch pipe and mallet, tap seat (8) until firmly seated.

(j) Remove and discard disc (7).

(k) Install new disc (7), sleeve (6), spring (5), retainer (4), and nut (3) on seat (8).

(l) Position seal (2) on cylinder and install cylinder head (1).

(m) Install R.O. pump fluid end assembly.

REFERENCES:

TM 08580B-24 P/2  
TM 08580B-24/3  
TM 08580A-24 P/2  
TM 08580A-10/1  
TM 08580C-10/1  
TM 08580C-24 P/3